RESEARCH PAPERS IN JOURNALS

التعليم الإلكتروني كتكنولوجيا واعدة

عبد المجيد تي[١]

هذه مناقشة فكرةٍ جديدة والبحث عليها هو "التعليم الإلكتروني كتكنولوجيا واعدة " كحل أساسي لتطوير المستوى التعليمي في اللغة العربية والعالم العربي والسمو به إلى أرقى المستويات ليواكب التطور التكنولوجي والعمل على تحديد وجهة الجيل القادم نحو مجتمع ناجح فعال. وزيادة وعي المجتمع بمؤسساته وحكوماته ووسائطه لأهمية هذا التعليم كتحد تكنولوجي معاصر. ودراسة موضوع التعليم الالكتروني وما هي التحديات التي يواجه تطبيقه في تعليم اللغة العربية والعالم العربي .

مقدمة:

إن عالم اليوم تحول إلى قرية صغيرة حيث أدت عملية التزاوج بين ثورة الاتصالات وثورة المعلومات إلى عمليات الاتصال بين الثقافات المختلفة. وفي العصر الحالي والذي يسمى بالعصر الرقمي سوف يصبح بإذن الله التعليم معتمداً على المدرسة الإلكترونية والتي تعتمد على التقنية الحديثة من أجهزة حاسب وشبكات داخلية وشبكات الإنترنت. ويمكن القول إن عالم اليوم هو عالم مليء بالصور والصوت عبر الوسائط التقنية المتعددة.

وأصبحت المعرفة ليست فقط عملية نقل المعلومات من المعلم إلى الطالب بل أيضاً كيفية تلقي الطالب لهذه المعرفة من الناحية الذهنية. فالتعليم الإلكتروني يمكن الطالب من تحمل مسؤولية أكبر في العملية التعليمية عن طريق الاستكشاف والتعبير والتجربة فتتغير الأدوار حيث يصبح الطالب متعلماً بدلاً من متلق والمعلم موجهاً بدلاً من خبير.

كما أن التعليم التقليدي في الوقت الراهن لم يعطِ الجديدَ للمحتوى التعليمي للأجيال لأنه وحده لا يستطيع مواكبة الفكر العصري لطلاب القرن الواحد و العشرين . لذا وجدت أن التوجه إلى تطبيق آليات تعليمية مُساندَة للتعليم التقليدي كالتعليم الإلكتروني لها القدرة على تحسين و دعم و بناء جيل متميز هو من أهم التحديات التي يجب علينا العمل عليها. ولذلك يجب أن نأخذ التعليم الإلكتروني موقعاً مناسباً في الخطوط الأساسية في حركة الإصلاح التربوي

[١] الاستاذ المساعد، قسم البحوث والدراسات اللغة العربية وأدابها كلية فاروق، كيرالا

.وأستطيع القول إن التعليم الإلكتروني من الأدوات التي يحتاجها المعلم والمتعلم في رحلة البحث والمعرفة والتطبيق.

التعليم الالكتروني ماهيته وتطوراته

ما هو التعليم الإلكتروني ؟

التعليم الالكتروني هو نوع من التعليم الذي يعتمد أساساعلى استخدام الوسائط الالكترونية في نقل المعلومات والمعارف والمهارات. وتضم تطبيقاته التعلم والتعليم عبر الوب و بالحاسوب وغرف التدريس الافتراضية. ويتم تقديم محتوى الدروس عبر الإنترنت والأشرطة السمعية والفيديو وعبر السواتل والأقراص المدمجة بين المعلمين والمتعلمين والمؤسسة التعليمية برمتها.

يقول الدكتور عبدالله بن عبد العزيز الموسى عميد كلية الحاسب والمعلومات بجامعة الإمام ما يلي: "التعليم الإلكتروني هو طريقة للتعليم باستخدام آليات الاتصال الحديثة من حاسب وشبكاته ووسائطه المتعددة من صوت وصورة ورسومات وآليات بحث ومكتبات إلكترونية وكذلك بوابات الإنترنت سواء كان عن بعد أو في الفصل الدراسي المهم المقصود هواستخدام التقنية بجميع أنواعها في إيصال المعلومة للمتعلم بأقصر وقت وأقل جهد وأكبرفائدة "[١]

التعليم الالكتروني Electronic education

ويري الدكتور حسن زيتون أن التعليم الالكتروني هو : " تقديم محتوى تعليمي (الكتروني) عبر الوسائط المعتمدة على الكمبيوتر وشبكاته إلى المتعلم بشكل يتيح له إمكانية التفاعل النشط مع هذا المحتوى ومع المعلم ومع أقرانه سواء أكان ذلك بصورة متزامنة أم غيرمتزامنة وكذا إمكانية إتمام هذا التعلم في الوقت والمكان وبالسرعة التي تناسب ظروفه وقدراته، فضلاً عن إمكانية إدارة هذا التعلم أيضا من خلال تلك الوسائط."[٢]

وهناك مصطلحات كثيرة تستخدم بالتبادل مع هذا المصطلح كما في الجدول :

أنواع التعليم الإلكتروني

أ. التعلم الإلكتروني ذو التوجيه الفردي المباشر-Individualized self-paced e learning online

---

١ www.imamu.edu.sa

٢ "رؤية جديدة في التعليم التعلم الالكتروني" ، أ.د. حسن زيتون، ١٤٢٦هـ.

هو التعليم الإلكتروني الذي يقوم فيه الفرد بالاتصال بمصادر ومحتويات وبرامج التعليممباشر عبر الانترنت، مثل الفرد الذي يقوم بعملية بحث في الانترنت.

ب. التعلم الإلكتروني ذو التوجيه الفردي غير المباشر Individualized self-paced e-learning offline

هو التعلم الإلكتروني الذي يقوم فيه الفرد باستخدام مصادر ومحتويات وبرامج التعليمبصورة غير مباشرة دون الاتصال بالانترنت، مثل استخدام الأقراص المدمجة.

ج. التعلم الإلكتروني المباشر المتزامن(synchronous e-learning)

هو أسلوب وتقنيات التعليم المعتمدة على الانترنت لتوصيل وتبادل الدروس وموضوعات الأبحاث بين المتعلم والمعلم في الوقت نفسه ليتم بينهم اتصال متزامن لتدريس المادة مثل المحادثة الفورية أو الفيديو، أو تلقي الدروس من خلال ما يسمى بالفصل الافتراضي ومن إيجابيات هذه الدراسة ان الطالب يستطيع الحصول من المعلم على التغذية الراجعة المباشرة لدراسته في الوقت نفسه.

د. التعلم الإلكتروني غير المباشر أو غير المتزامن(Asynchronous e-learning)

وهو اتصال بين المعلم والدارس، والتعلم غير المتزامن، وفيها يحصل المتعلم على دروس مكثفة أو حصص وفق برنامج دراسي مخطط ينتقي فيه الأوقات والأماكن التي تتناسب مع ظروفه، عن طريق توظيف بعض أساليب التعلم الإلكتروني، مثل: البريد الإلكتروني وأشرطة الفيديو، ويعتمد هذا التعليم على الوقت الذي يقضيه المتعلم للوصول إلى المهارات التي يهدف إليها الدرس ومن إيجابيات هذه الدراسة أن المتعلم يتعلم حسب الوقت المناسب له وحسب الجهد الذي يرغب في إعطائه، كذلك يستطيع الطالب إعادة دراسة المادة والرجوع إليها الكترونيا كلما احتاج إلى ذلك. أما السلبيات فهي عدم استطاعة الطالب الحصول على تغذية راجعة من الأستاذ إلا في وقت متأخر، أو عند الانتهاء من الدروس أو البرنامج، كذلك يحتاج الطالب دائما إلى تحفيزنفسه للدراسة، وذلك لأن معظم الدراسة تقوم على التعلم الذاتي.

ه. التعليم المدمج Blended Learning

هوالتعليم المدمج يشتمل على مجموعة من الوسائط التي يتم تصميمها لتكمل بعضها البعض، وبرنامج التعلم المدمج يمكن أن يشتمل على العديد من أدوات التعلم، مثل برمجيات التعلم التعاوني الافتراضي الفوري، المقررات المعتمدة على الانترنت،

ومقررات التعلم الذاتي، وأنظمة دعم الأداء الالكترونية، وإدارة نظم التعلم، و كذلك يمزج أحداث متعددة معتمدة على النشاط تتضمن التعلم في الفصول التقليدية التي يلتقي فيها المعلم مع الطلاب وجها لوجه، والتعلم الذاتي فيه مزج بين التعلم المتزامن وغير المتزامن.

طرق التعليم الإلكتروني

- التعليم الالكتروني الموجه بالمتعلم Learner-led e-learning

وهو تعليم الكتروني يهدف إلى إيصال تعليم عالي الكفاءة للمتعلم المستقل، ويطلق عليه التعليم الالكتروني الموجه بالمتعلم، ويشمل المحتوى على صفحات ويب، ووسائط متعددة، وتطبيقات تفاعليه عبر الويب، وهي امتداد للتعلم المعزز بالحاسب في برمجيات CD-ROM.

- التعليم الالكتروني الميسر :Facilitated e learning

وهو تعلم يوظف تقنية الانترنت ويستخدم فيه المتعلم البريد الالكتروني والمنتديات للتعلم ، ويوجد فيه ميسر للتعلم عبارة عن مساعده (help)، ولكن لا يوجد فيه مدرس.

- التعليم الالكتروني الموجه بالمعلم Instructor-led e-learning

وهو تعليم الكتروني يوظف تقنية الانترنت لإجراء تدريس بالمفهوم التقليدي بحيث يجمع المعلم والطالب في فصل افتراضي يقدم فيه المعلم العديد من تقنيات الاتصال المباشر مثل مؤتمرات الفيديو والصوت، والمحادثة النصية والصوتية audio and text Chat، والمشاركة في الشاشة، والاستفتاء، ويقدم المعلم عروض تعليمية، وشرح للدروس.

- التعليم الالكتروني المضمن Embedded e-learning

هو التعليم الالكتروني الذي يقدم في الوقت على الطلب ويكون مضمن في البرنامج، مثال ذلك التعليم المقدم في نظام التشغيل ويندوز، فتجد في help and support معالج يقدم أجوبة أو روابط على أسئلة محدد من قبلك، وقد يكون فيه معالج للكشف عن الأخطاء وإصلاحها داخل النظام. وهو تعلم من اجل حل مشكلة محددة، ويقدم منه نسختين إحداهما مع البرنامج الذي تم تحميله على حاسب المستخدم، والنسخة الثانية هي دعم عبر الويب، حيث يتصل المستخدم بالويب على رابط محدد ويقدم له حل المشكلة من خلال معالج يتبعه على الموقع.

- E-coaching and telemetering

وهو نمط التعليم الالكتروني الذي يعتبر امتداد لنمط التعليم الخصوصي Tutorial في CD-ROM،وفيه يتم التعليم باستخدام تقنية الانترنت مثل مؤتمرات الفيديو التفاعلي، التراسل الفوري، الهاتف عبر الانترنت، والعديد من الأدوات التي تشرف وترشد التعلم.

أهداف التعلم الإلكتروني

يمكن من خلال التعلم الإلكتروني تحقيق العديد من الأهداف على مستوي الفرد والمجتمع والمؤسسات ومن أهمها فيما يلي:

- تحسين مستوى فاعلية المعلمين وزيادة الخبرة لديهم في إعداد المواد التعليمية وتعويض نقص الخبرة لدى بعضهم .
- تقديم الحقيبة التعليمية بصورتها الإلكترونية للمدرس والطالب معاً وسهولة تحديثها مركزياً من قبل إدارة تطوير المناهج .
- الوصول إلى مصادر المعلومات والحصول على الصور والفيديو و أوراق البحث عن طريق شبكة الانترنت واستخدامها في شرح وإيضاح العملية التعليمية.
- توفير الكثير من أوقات الطلاب والموظفين كما يحدث في الطرق التقليدية .
- تواصل المدرسة مع المؤسسات التربوية والحكومية بطريقة منظمة وسهلة.
- بناء شبكة لكل مدرسة بحيث يتواصل من خلالها أولياء الأمور مع المعلمين والإدارة لكي يكونوا على اضطلاع دائم على مستوى أبناءهم و نشاطات المدرسة.
- نشر التقنية في المجتمع و إعطاء مفهوم أوسع للتعليم المستمر .
- مساعدة المعلمين والطلاب على التفكير الإبداعي والناجح في الفصل الإلكتروني.
- ابتكار أساليب وطرق حديثة تساعد على توصيل المعلومة بشكل أفضل للطلاب.
- رعاية الطلاب المبدعين عبر برامج خاصة.

أدوات التعليم الإلكتروني وعناصره

تشتمل أدوات التعلم الإلكتروني على عناصر متعددة، ومن أهمها مايلي:

- الأجزاء الصلبة (Hardware) ، وتتألف من:

- حاسب شخصيمزود بالأدوات التالية: معالج (السرعة – الماركة – الذاكرة الداخلية) – الذاكرةالعشوائية – RAM كرت فيديو (Resolution- color depth – refresh rate –video memory – acceleration –multiple monitor support) – شاشة – CD- ROM , DVD – كرت صوت – ميكرفون – مودم – لوحة مفاتيح – فأرة – Pointing Device – كاميرا – منافذ Ports.

- خادم:(Server)
- يجب أن يراعى في اختيار الكمبيوترالخادم عدد من متطلبات التعلم الإلكتروني التي تتطلبها مهام التدريس ومنها ما يلي :حجم المحتوى - نوح الملفات المستضافة: نص، صوت، رسوم، فيديو.... – نسبة النفاذللخادم – Band Width مدى تطور المحتوى لديك - البرامج التي يجب أن ينفذها الخادم،مثل Perl Script, Java : Server Pages, Active Server Program.

- الشبكات :(Networks) حيث يتوافر ثلاثة أنواع من الشبكات في التعلم الإلكتروني:

١)الشبكة المحلية :LAN وهي مجموعة أجهزة حاسب تتصل مع بعضها بعدة طرق، وترتبط معبعضها باستخدام كرت شبكةEthernet ، أوToken Ring ، وهي تستخدم لربط الشبكاتالمرتبطة بشكل دائري أو نجمي . ٢) الشبكة الواسعة :WAN وهي ربط شبكة لعدد من أجهزة الحاسب المتباعدة في المواقع،وتقدم شركة الاتصالات خدمة ربط الشبكة باستخدامT-1 and T-3 telecommunication ، أواستخدام ISDN .٣) شبكة الانترنت: للإنترنت في المدرسة الإلكترونية أربع خدمات أساسية وهي : البريد الإلكتروني، نقل الملفات، الاتصال عن بعدبالحاسبات، المنتديات العالمية.

- القرص المدمج CD

هو الوسيلة الثالثة المستخدمة في المدرسة الإلكترونية في مجال التعليم والتعلم ، إذ يجهز عليها المناهج الدراسية ويتم تحميلها على أجهزة الطلابوالرجوع إليها وقت الحاجة.

- الكتاب الإلكتروني

الكتاب الإلكترونيهو اختصار منات و آلاف الأوراق التي تظهر بشكل الكتاب التقليدي في قرص مدمجة CD الذي تتخطى سعته ثلاثين مجلداً تحمل أكثر من ٢٦٤ مليون كلمة ، ٣٥٠ ألف صفحة. ويمتاز الكتاب الإلكتروني بتوفير الحيز أو المكان بحيث لن يكون هناك حاجةلتخصيص مكان للمكتبة ويمكن الاستعاضة عنها بعلبة صغيرة تحتوي على الأقراص توضع على المكتب.

ما هو دور المعلم فيالتعليم الإلكتروني ؟

التعليم الإلكتروني لا يعني إلغاء دور المعلم بل يصبح دوره أكثر أهمية وأكثر صعوبة فهو شخص مبدع ذو كفاءة عالية يدير العملية التعليمية باقتدار ويعمل على تحقيق طموحات التقدم والتقنية . لقد أصبحت مهنة المعلم مزيجا من مهام القائد ومدير المشروع البحثي والناقد والموجه. ولكي يكون دور المعلم فعالاً يجب أن يجمع المعلم بين التخصص والخبرة مؤهلاً تأهيلاً جيداً ومكتسباً الخبرة اللازمة لصقل تجربته في ضوء دقة التوجيه الفني. فعلى المعلم أن يقوم بما يلي :

١. أن يعمل على تحويل غرفة الصف الخاصة به من مكان يتم فيه انتقال المعلومات بشكل ثابت وفي اتجاه واحد من المعلم إلى الطالب إلى بيئة حيث يقوم الطلاب مع رفقائهم على شكل مجموعات في كل صفوفهم وكذلك مع صفوف أخرى من حول العالم عبر الإنترنت.
٢. أن يتبع مهارات تدريسية تأخذ بعين الاعتبار الاحتياجات والتوقعات المتنوعة والمتباينة للمتلقين.
٣. أن يطور فهما عمليا لتكنولوجيا التعليم مع استمرار تركيزه على الدور التعليمي الشخصي له.
٤. أن يعمل بكفاءة كمرشد وموجه حاذق للمحتوى التعليمي.
٥. ان يحث الطلاب على استخدام الوسائل التقنية وابتكار الرامج التعليمية التي يحتاجونها.

الموازنة بين التعليم الإلكتروني والتعليم الصفي		
العناصر	التعليم الإلكتروني	التعليم الصفي
المعلم	موجه ومشرف	مصدر للمعلومات
الطالب	فاعل ونشط	متلقي
زملاء الصف	من أي مكان	من حي واحد
وقت الدراسة	في أي وقت	محدد
مكان الدراسة	في أي مكان	محدد
المدرسون	النظام / من أي مكان	المدرس / في مكان محدد
المحتوى	مقرر حاسوبي / كتابإلكتروني	كتاب مطبوع
المتابعة	إلكترونية	بشرية
عدد الطلاب	غير محدود	محدود

ومما لاشك فيه هو أن دور المعلم سوف يبقى للأبد وسوف يصبح أكثر صعوبة من السابق، فالتعليم الإلكتروني لا يعني تصفح الإنترنت بطريقة مفتوحة ولكن بطريقة محددة وبتوجيه

لاستخدام المعلومات الإلكترونية وهذا يعتبر من أهم أدوار المعلم. ولإن المعلم هو جوهر العملية التعليمية لذا يجب عليه أن يكون منفتحا على كل جديد. ونفهم الفرق بين التعليم الالكتروني والتعليم الصفي من الموازنة التالية :

أهمية التعليم الإلكتروني

تتزايد أهمية استخدام التكنولوجيا والتقنيات في المجال التربوي إضافة لأسباب كثيرة وهي:

- انخفاض مستوى التعليم، إذ أن الأنظمة التعليمية أصبحت غير قادرة على مواكبة التطور العالمي.
- تشتت المناهج الدراسية مع تعدد مصادر المعرفة و سرعة تدفق المعلومات.
- أهمية التعلم الذاتي و تطوير قدرات الفرد على التفكير و الإبداع.
- ازدياد وعي الفئة العاملة من المجتمع اتجاه تطوير معرفتهم وخبراتهم ومعرفة الجديد دائما من تغيرات أو مؤتمرات عالمية حول مجال تخصصهم، لمواكبة التطور الدائم في عصر السرعة.
- رغبة الأشخاص الذين فاتتهم فرصة التعليم لظروف معينة بالإلتحاق بالمدارس و مواصلة التعليم.
- عدد الطلاب الكبير في الصف الواحد لقلة المدارس، بالإضافة لعدم التوازن في التوزيع الجغرافي للمؤسسات التعليمية نتيجة التركيز على المناطق ذات الكثافة السكانية العالية.
- الحاجة لتقليل كلفة التعليم.

اللغة العربية على الانترنت

وضع محتوي اللغة العربية.

لتطوير التعليم الالكتروني باللغة العربية يجب أن نعمل على توفير مواد محوسبة تعليمية على شبكة الانترنت باللغة العربية ، وهذا يفتح قضية المحتوى العربي الرقمي العلمي الموجود على الانترنت، لو نظرنا إلى تصنيفات المواقع العربية المنشورة في موقع تابع لشركة صخر، نلاحظ أن معظم هذه المواقع تتعلق بالاقتصاد والتجارة وتكنولوجيا المعلومات ويليها مواقع التسلية والرياضة والتي تتساوى بدورها مع المواقع المجتمعية مثل دين وعقائد ، مؤسسات، أفراد ، مجلات فقط.

ولو نظرنا للبلدان العربية فنحن نلاحظ ضعف انتشار تقنيات الاتصال السريع و قلتها وعدم كفاءتها بالمقارنة بالوسائل وحلول الاتصال بالدول الغربية المتقدمة وهذا يلعب دور سلبي في نشر وزيادة المحتوى الالكتروني باللغة العربية ويؤدي إلى ضعف انتشار الكثير من التطبيقات التي تزيد من حجم المحتوى العربي المخصص التعليم الالكتروني .

ومن الجوانب الأخرى المتعلقة بالمعالجة الطبيعية للغة العربية هي المعوقات المرتبطة بأمور البحث واسترجاع المعلومات بطرق فعالة وسريعة والحصول على المطلوب والمهم. إن عدم وجود أنظمة معالجة واسترجاع معلوماتي قوية، تحاكي اللغة العربية وتبنى عليها فهرست المواقع في محركات البحث ورقمنة الوثائق العربية والكتابة الصحيحة قواعديًا، أدى إلى صعوبة الوصول للنصوص التعليمية والعلمية والمحتوى العربي الايجابي وبدوره هذا يؤثر في التعليم الالكتروني باللغة العربية. والجدير بالذكر هنا أن مشاكل اللغة العربية الفنية لا تعاني منها اللغات اللاتينية وغيرها بقدر ما تعاني منه اللغة العربية وذلك يعود إلى البنية التشكيلية والصرفية الواسعة للغة العربية.

التحديات الاقتصادية والأكاديمية في مجال اللغة العربية :

١. المشاكل التقنية والتي تتمثل بصعوبة الوصول للمعلومات وانقطاع الشبكة المفاجئ نتيجة لضعف شبكة الانترنت.
٢. عدم توافر الأجهزة الكافية للطلاب في المدارس، حيث يعتبر استخدام الحاسوب مكلفا كما أن التعليم الحديث يتطلب أجهزة ذات مستوى عال للبرامج المتطورة.
٣. نقص الخبرة لدى الأشخاص القائمين على البرامج التعليمية وعدم التحاقهم بالدورات و المؤتمرات في الدول العالمية والمتطورة.
٤. صعوبة المعلمين والطلاب مع هذا النوع من التعليم بسبب تعودهم على التعليم التقليدي والخوف من التغيير.
٥. التعارف بالمواقع الالكترونية.

١. الموسوعية العربيةArabic encyclopedia

www.ar.wikipedia.org
www.brill.nl
www.mawsoah.net
www.adab.com
www.megaupload.com

٢. موسوعوعة الشعر والشعراءArabic poetry

www.adab.com
www.poetrytranslation.org
www.arabicpoems.com
www.sh3r.info

www.arabic.nadwah.com www.aladeeb.com

٣. الكتب والمذكرات Books, Notes and slides

www.awraq.net www.madinaarabic.com
www.ummah.com www.4share.com
www.orbit.com www.elc.edu.sa
www.alkitab.com www.goodreaders.com

٤. علم اللغة والتجويد Linguistics and phonetics

www.alwaet.org www.dur.ac.uk
www.halqat.com www.qurancompex.org

٥. دليل المواقع آلية البحث Search Engine And Directories

www.arabicdirectory.com www.raddadi.com
www.arabo.com www.star28.com
www.alyusufi.com www.arabphilosophers.com

٦. القواميس Dictionaries

www.dictionory-sakhr.com www.languagesource.com
www.arabicenglishdictionary.org www.bablyon.org
www.lingvosoft.com www.almuajam.com

٧. الأفلام العربية Films

www.arabfilm.com www.listenarabic.com
www.almahata.com www.2hgs.com

٨. الحاسوب Computer knowledge

www.schoolarabia.net www.alhasoob.com
www.arab-ency.com www.moudir.com

٩. علم البلاغة Rhetoric

www.archive.com www.arabic-stylistics-ju.4t.com
www.mediafire.com www.youtube/arbiclikeaboss
www.fajr.com

١٠. اللغة العربية والادب والنحو والصرف
Arabic language, literature and grammar

www.syrianstory.com www.wikipedia.org
www.kayma.com www.drmosod.com
www.mediafire.com www.ibnmalik.8m.com
www.waqfiya.com www.arabictripod.com
www.learnarabiconline.com www.voiceofarabic.net
www.aruc.org www.arabicspeak7.com
www.tutor.lootah.com www.yemanlinks.com
www.uqu.edu.sa www.adabatfal.com

١١. الدكتورة الالكترونية Online PhD.

www.ignou.ac.in www.kiu.org
www.imamu.edu.sa www.media.edu

١٢. المساقات والدورات عبر الانترنت Online Courses

www.elc.edu.sa www.arabic-georgetown.edu
www.shariaprogram.ca www.eaalim.com
www.dalilusa.com www.arabacademy.com
www.madinaarabic.com www.arabicegypt.com
www.arabiccollege.com

١٣. المكتبات الرقمية أو الالكترونية Digital/ E- library

www.arab.de
www.kotobarabia.com
www.inflibnet.ac.in
www.mbrfoundation.ae
www.bibalex.org

١٤. المدونات ، البلوجات Blogs

www.albab.com
www.arabickerala.blogspot.com

١٥. القرآن والحديث Quran and Hadith

www.altafsir.com
www.tvquran.com
www.tanzil.com
www.qurancomplex.org
www.al-iman.com
www.thafsirulquran.com
www.quran.com
www.quranexplorer.com
www.assunna.com
www.hadith.com

١٦. للمعلم الالكتروني E- Teacher

www.v-arabic.com
www.earabic.com
www.moodle.com
www.casaw.ac.uk
www.joomla.com

١٧. الترجمة Translation

www.translate.google.com
www.translatorbase.com
www.proz.com
www.stars.21.com
www.bablyon.com

١٨. المنتديات الاسلامية Islamic Clubs

www.forum.stop55.com

أهم المراجع والمصادر :

الكتب في العربية

- الهادي، محمد ، التعليم الإلكتروني عبر شبكة الإنترنت ، القاهرة، الدار المصرية اللبنانية ، ٢٠٠٥.
- قنديل ، أحمد ، التدريس بالتكنولوجيا الحديثة ، القاهرة ، عالم الكتب ، ٢٠٠٦ .
- قطيط، غسان ، الحاسوب وطرق التدريس والتقويم ، عمان ، دار الثقافة،٢٠٠٩ .
- سعادة، جودت ، استخدام الحاسوب والإنترنت في ميادين التربية و التعليم، رام الله، الشروق، ٢٠٠٣.

الكتب في اللغة المليامية

- باب راج . بي . يم ، كيف تكتب على البلوج ، dc books, kottayam, kerala ,India 2009.
- وي. كي. آدرش ، القراءة الإلكترونية ، dc books, kottayam, kerala ,India 2009.

الكتب في الانكليزية

- SOM NAIDU, E-Learning A guide book of principles, procedures and practices, 2nd edition, published by CEMCA, New Delhi, 2006.
- Bill Brandon, e –Learning strategy, published by e learning guild, Santa Rosa, California, 2007.

المواقع الالكترونية

- http://en.wikipedia.org/wiki/OLPC_XO-1
- www.imamu.edu.sa
- www.casaw.ac.uk
- www.earabic.com
- www.alhasoob.com

NEW DIMENSIONS IN ARABIC SEMANTICS

K. Ali Noufal
Assistant Professor
Farook College, Calicut.

ABSTRACT:

Arabic language is the official language of the twenty two countries and it is the official language of the United Nations. It is spoken more than 250 million people. Vocabulary of Arabic is rich and that helped the language to coin the new words to name the scientific inventions and technical devices. Various linguistics methods adopted to make Arabic equivalents of emerging terms, keeping the root and standard of the language. Linguistic organizations and Arabic Language academies are contributing to the emerging Arabic Semantics and to standardize the phenomena of Diglossia in Arabic Terms and Terminologies. Arabic Language is live and standardized after the thousand and half years of its glory.

Introduction

Spoken by more than 250 million people today, the Arabic language is the only language among the Semitic languages that has undergone a constant expansion in its lexicon. The expansion of the media and the impact of Western civilization have more recently introduced tremendous changes. The rapid technological developments continue to have a great impact on the languages and cultures of the entire world. The 20th century began under the slogan of the language as the emergence of nationalism, whether it was Pan Arab such as in Syria and Lebanon, or regional such as in Egypt, was invariably linked to the language. In order to reclaim the medieval Arabic language a modern form of literary Arabic evolved - commonly known as standard Arabic, which distinguished itself from the old Arabic at the lexical, syntactical, and stylistic levels.

Meanwhile, many Arab linguists and various academies have been continuing their ceaseless efforts in the 'arabization' of technical vocabularies. As a result, countries like Syria and Algeria have acquired a virtual progress in this attempt. Even the subjects like medicine and engineering are taught there, though not wholly, in Arabic. Furthermore, several steps have been taken at official level also to teach all subjects in Arabic. For instance, in 1991, an Algerian law mandated that all subjects must be taught in Arabic. Morocco also has passed

a resolution demanding the same. Similarly, educational departments of various Arab countries have taken measures in this regard.

Influenced by the French academy, the Arabic academies of Cairo and Damascus aimed to preserve the purity of the Arabic language as well as adapt its lexicon to modern scientific and technical needs, a concern that has dominated the Cairo Arabic Academy since 1960.The difficulties in coining precise political terminology, which marked the 19th century, gave way in the 20th century to more daring innovations in the expansion of the lexicon.

Method of Lexical Innovation

The methods of innovation during the 20th century varied. Terms or concepts were transferred to the Arabic language - an example is the term aristoqratiyya, which is borrowed from the French aristocratie. In other instances, semantic components of terms were literally translated into their Arabic equivalents. a method called calque. One example of this is 'awlama , which means "globalization," a term that has gained wide acceptance in contemporary Arab social science. Yet another approach, neologism - inventing new words and expressions - was used in a number of ways, among which are: the analogical derivation such as suffixation of the iyya in order to form abstract nouns such as qawmiyya which means nationalism; the multiple Arabic schemes as the instrumental scheme used to form new words like mis'ad , meaning the instrument to elevate; the extension of the meaning of an existing word such as jarida which presently means newspaper; the composition that gave us some current words like raddfi'l , which means reaction, and which was formed of two nouns, radd and fi'l ; and the integration of new notions passed often from the simple transfer of a foreign word to the formation of a new word better integrated in the structure of the language. For instance, the word communism was transferred into Arabic in the 19th century. but was Arabized into shuyu'iyya in the 20th. Some borrowed words produced new derivations: for example talfana (to call on the phone) from tilifoon (telephone).

The concern of being grammatically incorrect was gradually abandoned, especially in Egypt, in favour of expressing the self, free from rules. Because they are primarily interested in describing reality, authors in the last two decades have resorted to using European words borrowed by various dialects. They have also used the dialect vocabulary, and in certain contexts used dialect in whole passages. Since its expansion, and in order to get closer to the reader, the print press has undergone a similar evolution. On the other hand, undoubtedly, the audiovisual media have been decisive in creating new linguistic usages, where the spoken has become both formal and intelligible. The impact of Globalisation and the domination of English in the international communication have made stylistic changes in the structure of the Arabic language. In the cases of loanwords, scores of English words are used in the modern Arabic language, beyond the terminologies of various fields of science and technology. They include the terms

generally related to socio political and media domains. Many of such loan words have corresponding Arabic words also in usage. There are various approaches adopted by the Arabic Language academies of the Arab world towards the Modernisation of the Arabic Language. Many studies have been carried out locally and regionally on the lexical developments in Arabic and its dialects.

The Headquarters of the United Nations and the other major special organisations within the United Nations system are almost all active in the preparation and distribution of terminology for their own purposes. Such activities are generally designed to support their translation services and documentation departments. Since the Arabic is one of its official languages UN has contributions in the formation of Arabic terminologies and translation activities.

The introduction of Computer operating system in the Arabic language and its Arabic home editions led to the formation of computer terminologies in Arabic. These attempts of renewal and attachment to the canons of the language characterized the position of the Arab academies, particularly the Damascus Academy of Arabic (founded in 1919) and the Cairo Academy of Arabic (founded in 1932), both of which played an important role in what appeared to be the most urgent task in the beginning of the century, namely the modernization and the expansion of the lexicon. However, a lot more work needs to be done.

Linguistic Organisations in the Arab World

The Ottoman Empire and the colonial power made impact on Arabic language, since they gave more importance to their language and that side lined the development of Arabic language for a period of time. The invasion of the Napoleon Bonaparte was a turning point in the development of Arabic language and literature. Muhammad Ali who came in power of Egypt after his period made a firm determination for the development of the country and spend major share of the revenue for the education and knowledge. Fellowships were given to the students for higher studies and send them in groups with a supervisor to Paris to spend years there to study French Language and culture. The other rulers who came to power after Muhammad Ali also followed his path. When these delegations came back to Egypt appointed in different schools opened in different parts of the country in different standards and they also worked as translators in Medical Colleges and other institutions. Because higher education was imparting in French medium for Arab students, since teachers were French people. The scarcity of translators and the need to translations lead them to open a school of language that trained and produced skilled translators. These translators made additions to the genre of Arabic language and literature by their valuable contributions in the translation. They translated major reference works in to Arabic language from French and other foreign languages. The scholars of Arabic language who got French and European education applied the new methods on Arabic language and literature and it produced Arabic language and literature in new dress and

color. The renaissance started in Egypt circulated to other parts of the Arab world and made positive impact on the language and literature.

The translation of knowledge and information from scientific and cultural arena produced numerous Arabic equivalents of scientific and cultural terms and terminologies in foreign languages comprising French, Latin and English. The flow of new terms and terminologies in the modern period by the scientific development and information explosion occurred in the period, lead to the phenomena of Diglossia in Arabic semantics.

The linguistic scholars in the Arab world of having the feel of some bad trend in putting the Arabic equivalents thought of making the efforts organized in systematic method. They organized linguistic organization in the Arab world to promote and protect the standard of Arabic.

The Arabic Language Academy, the first of its kind formed in the year 1919 and made pioneering efforts in the field of Arabic Terms and Terminologies. In the year 1932 Egyptians made their own Arabic Academy that took the leadership of the linguistic contributions of the Arab world in the later period. Ira also established a scientific academy in the year 1947. The following years witnessed the establishment of Arabic Language Academy or a linguistic organization in each Arab country contributing to Arabic Semantic field. The establishment of Union of Arabic Language academy in the year 1971 made them to work under the same umbrella coordinating the efforts in the field. The Arabic linguistic organization includes:

- Jordan Arabic Language Academy, established in the year 1976
- Morocco Academy, established in the year 1977
- Algerian Arabic Language Academy, established in the year 1986
- Jordan Arabic Language Academy, established in the year 1976
- Tunisian Academy for science, literature and Art, established in the year 1992
- Sudan Arabic Language Academy, established in the year 1993
- Libyan Arabic Language Academy, established in the year 1994
- Palestine Arabic Language Academy, established in the year 1994

Seminars, symposiums and conferences were conducted on various aspects of Arabic word coining and standardization of Terms and Terminologies under the various Academies supervised by the union of Arabic language academy in different times. Methods and principles were adopted to put the Arabic equivalents of new terms and terminologies as a part of standardizing the various versions of emerging terms in the field as well as to protect the root of Arabic language. Creation. Transliteration, Translation, and giving new meaning for the unused semantic versions are the major methods in Arabic Semantics. In short the Arabic Language still remains live and standardized after the thousand and half years of its past period of glory. The credit goes to the scholars and organizations spent their sincere efforts to protect their language, the language of Holly Quran.

Reference

1 Abdul Sahib and Mehdi Ali (1987), *A Linguistic Study of the development of Scientific Vocabulary in Arabic*, KPI Ltd., London.

2 Al – Ma'thuq, Ahmad Muhammed (1996), *Al–Haseelath al – Laghaviyya* (Arabic), Kuwait, *Al Majlis al-Wathani Li al-Saqafati Wa al-Fununi Wa al-Adabi.*

3 Al – Sa'ran, Mahmood (1986), *Ilmu al–Lughath* (Arabic), Bairuth, *Daru al Nahdhath al – arabiyya.* Ameel Bade'e, Ya'qub, *Fiqh al-Lughath al-Arabiyya wa-Khasa'esuha* (Arabic), Darul Ilm Lil Malayeen, Labnan.

4 American Translators Association (1993), *Scientific and Technical Translation*, Binghamton University, Philadelphia, USA.

5 Council of Experts (1988), *Simplified English Grammar (Arabic – English)*, Dar al-Bihar, Beirut.

6 Dayravi, Muhammed (1992), *Ilmu al-Tharjama Baina Nadhriyyath Wa Thathbeeq* (Arabic), Tunis, Dar al Ma'arif li thiba'ath Wa al-Nashr.

7 Dimashqiyya, Afeef (1982), *Khutha Mutha'athira Ale Thareeq'i Thajdeedi al-Nahw al-Arabi* (Arabic), Dar al-Ilm Lil Malayeen, Beirut.

8 Dr. K.P. Aboobacker (1998), *A Hand Book on Commercial Arabic*, Calicut, Al – Huda Book Stall.

9 Elsaid Badwai, M.G. Carter and Adrian Gully (2004), *Modern written Arabic-A Comprehensive Grammar*, Routledge, London.

10 Jamali, Basheer Ahmad (2004), *Muqaranath Baina al-Nahwi al-Arabi wa al-Injileezi* (Arabic), Arabnet Publications, Calicut, Kerala.

11 King Abdul Azeez Library (1992), *Proceedings of Symposium on using Arabic in Information Technology*, Riyadh.

12 Ministry of art and culture (1978), Nahva Lughatin Arabiyyatin Saleemathin (Arabic), Iraq.

13 Muhammed Hasan, Abdul Azeez, Al-Arabiyyat al-Fusha al-Hadeesa (Arabic), Kairo, Egypt.

الشاعر علوي كوتي الكوتوري وإبداعاته الشعرية

الدكتور ك. علي نوفل
الأستاذ المساعد، كلية فاروق كالكوت

الشاعر علوي كوتي الكوتوري هو من فحول شعراء العربية في ولاية كيرالا. زرته مرتين للغرض الأدبي وتحدثت معه طويلا حول عناصر الشعر العربي كما أصغيت إلى تجرباته في مجال الشعر العربي. فوجدته شاعرا يتمسك بقواعد علم العروضة ويلتزم به طوال قصائده ومنظوماته كما وجدته شاعرا يفرغ جل أوقاته لنظم الشعر والفكر حوله. وهذه محاولة متواضعة للقاء الضوء إلى ترجمة هذا الشاعر ومؤلفاته الشعرية.

ولد علوي كوتي الكوتوري بقرية القريبة من كوتاكال بمقاطعة مالابرام من ولاية كيرالا سنة ١٩٤٣م. بعد الدراسات الإبتدائية إلتحق بالدروس المساجدية للتعاليم الدينية العالية. ومن أساته أو كى زين الدين مصليار ومولا بالي زين الدين مصليار الذي حرضه على قرض الشعر. وذلك إن هذا المدرس اختبر تلامذته في قرض الشعر بعد أن وزع لك واحد منهم جانبا من كتاب إحياء علوم الدين للإمام الغزالي، قائلا أن يحولوها نظما. لم يكن أحد فيهم أتم هذه المسؤولية بنجاح إلا علوي كوتي. فهذه تلك الأبيات التي نظمها الكوتوري في أوائل أيامه في عنوان شروط الشهادة وأركانها:

شروط الشهادة ستة ياساهي — عـقل بلـوغ عـدم الإكـراه
نـطـق وتـرتـبيب وموالاة — وهـكـذا أركـانـها اثبـات
لـذتـه أوصـافـه أفـعالـه — تـصـديق ما جاء نبيّه به
إحـيـاء علوم الديم للغزالي — نـظمتها منها ببـالي البالي[1]

فهذه التجربة أدخلت في قلبه الشوق في قرض الشعر. وبعد عشر سنوات دراسية إلتحق مدرسا في التعاليم الدينية. وهناك فاز الإمتحان لتأهلية تدريس اللغة العربية في المدارس الحكومية أولا ثم وصل في المدرسة الحكومية كوتاكال وتقاعد منها سنة ١٩٩٩م. فعين مدرسا في مجمع نجم الهدى الإسلامية بكوتاكال.

أما اليوم يعرف الكوتوري كشاعر قدير مشهور في كيرالا يكتب الشعر في كافة الحوادث والوقائع في كيرالا وفي الهند وفي العالم، حينما تؤثر في قلبه هذه الحوادث والكوارث عاطفة وشعورا. أما ميدان المسابقات

[1] نقل مباشر من الشاعر لما زرته في تاريخ نوفمبر سنة ٢٠١٣م

الشعرية في المسابقات الأدبية التي تجري كل سنة لطلاب المدارس الرسمية تحت حكومة كيرالا، ينشد فيها الطلاب القصائد التي يكتبها هذا علوي كوتي الكوتوري في الحوادث والكوارث التي حدثت في الهند، أو في وفيات الأعيان من زعماء الولاية أو الوطن. يوجد في شعره عاطفة قومية وتأثير بليغ يلقيها الطلاب في لحن بديع.

ومن أشعاره المشهورة: آه غوجرات، مأساة القطار، دموع التطرف، إرهابية أمريكا، تربية النساء، يوم العربية العالمي، وراء سترة الرداء، عويل شفيق، حادثة المرور، ظلم الأطفال، سن زواج البنات، سباع ذوات رجلين، بكت السماء والأرض، لهيب مسافر نكر، هل من منج لمسلمي الهند، على ظلم الصبا، من لا يرحم لايرحم وأمثالها. فكل هذه الأغراض من الشعر ملتقطات من الحوادث اليومية التي تحدث في الهند عامة وفي كيرالا خاصة.

وإنه يهاجم على كارثة غوجرات التي حدثت في سنة ٢٠٠٢م قائلا:

أوقدوا القطار بالركاب في غودروا وحرقوا ركبانها
قتلوا الكثير بهتانا على منع إرهابية يا هولها
قطعوا أطرافهم أموالهم قد أغاروا دمروا بيوتها
مزقوا أعراضهم واستهزؤوا بالأقليات حقدا نحوها
دبروا استئصال جنس قل من بينهم ينجزون وعدها

وقد أثار الشاعر علوي كوتي الكوتوري في أشعاره ضد العادات والتقاليد الفاحشة التي انتشرت في حفلات الزواج بين أبناء المسلمين وغيرهم حتى تجعل آبائهم في ضيق وتعب أو البنت تضطر أن تعيش آنسة إلى الأبد. يتأسف الشاعر في هذه العادات القبيحة وصور فكره في قصائد منها:

ولي بنت بها كوخي مليئ تعدت سن تزويج الإماء
ولا تزويج فينا دون مال لآباء البنات بلا مراء
كما في العرب للزوجات مهر كثير لا يطاق بلا عناء
على العشرات حيلتها جنيها كذا الآلاف مالا للنساء
وذا سرطان داء عم قومي وليس له دواء ذو شفاء
وذا معكوس مهر ليس دينا ولكن لا يجنب من فتاء

ولعلوي كوتي الكوتوري قصيدة رائعة في ذكرى الشهداء الذين قتلوا في ثورة مليبار المعروفة بحادثة عربة القطار سنة ١٩٢١م قال فيها:

أسروا بلا جرم سوى عدل إلى نفي لبلاري على ما شاؤوا
شدوا وراء عجال ثورا قودوا صوب الرصيف ترور قهرا ساؤوا
والجند أجلسهم ولكن جلهم هبطوا جياعا كلهم مظماء

وأتى قطار للبضاعة ثم في عرباته زحموا وهم أملاء
ضربوا بساق البندقية ما بدى عضوا وقفل بابها الأعداء
عطشوا وجاعوا عض بعض بعضهم أشرابهم أبوالهم ودماء
لما توصل بوتنور مديرها فتح القفول فجلهم خنقاء

كتب الكوتوري في ذكرى حركة استقلال الهند والحالة الراهنة في البلد:

قد صرت يا وطني هنيئة حرة يا هند في استقلالك الإغرام
بذلت لك القيم الغوالي غيرما قد ضحى الأبطال والأعلام
في حركة استقلالك المتجسد كم من رجال نابهم أعوام
لكن تغير هذه الأحوال قد عم التعصب والتدمي السام
إن للزنادقة الجماهير انطووا ضد الأقليات دوما ضاموا
قتلوا أبا الهند مهاتما غاندجي بدأوا به ويضلهم أوهام

كتب الشاعر في التطرف والإرهابية التي توجد حاليا في الهند وفي العالم ويكون الفرائس فيها أحيانا الأبرياء، يكتب متأسفا فيها:

في كل جيل من الأقوام طائفة تطرفا توقد الأخدود نيرانا
يشتد هذا بإرهابية ولهم جند فدائية ينهد بركانا
ويجبرون بها غير اهتداء وهم يهبطون بهم فيها كما كانا
كم من حتوف جرت في العالمين بها من أبرياء مساكين فسبحانا
ا لا تطرف في دين ولا ملل إلا تحكمهم ظلما وطغيانا

ولهذا الشاعر قصيدة في لعب أمريكا في الأمور الداخلية في البلاد الأخرى راجين منها أغراضهم الشتى من العلو كأنهم الشرطة العالمية. يقول إن أمريكا هي التي تشعل لظى الحرب بين البلاد، لجلب المنافع لهم. وهي من قصائده الرائعة يقول فيها:

بأقوى دولة الدنيا عليها بقوة قهرهتم يتسيطرونا
إلى دول على الأخرى بحرب بلا سبب مهم يحرضونا
يبيعون السلاح خلال هذا يريدون التجارة يربحونا
كإسرائيل يحرضها دواما فلسطينا بحقد يهلكونا
يناطح ثعلب كبشين طمعا للحس دم وسخرا يبسمونا
بطشتم بطش جبار عنيد كبوليس الدنا تتمثلونا

وله قصائد في مواضيع العصر الراهن، حيث طرق طريقة الناقد الاجتماعي ووقف وقفة المراقب الجاد ومن تلك القصيدة ما كتب في عنوان "عويل شفيق":

ذاب قلب كل ذي قلب حنون والـذي لا قـلـب مـا لـه شؤون
والسـباع من ذوي الرجلين قد كابت في الناس كالغول الحرون
عـنـهـم يـقـل أم ثانية أو أب خـال وكـل تحـت دون
كـلـهـم يـؤذون للـربائب والبـنـيـن والبنـات بـالفـنون
أنـظروا إلى شفيق كومضي قـارب الموت فيشفى من شجون

الخاتمة:

الشاعر علوي كوتي الكوتوري هو شاعر بارع في علم العروض وقوافيه. نظم خمس مائة قصيدة حول مواضيع شتى بما فيها المراثي، والمأسات، والمدائح، والقضايا الاجتماعية، والنقد الاجتماعي وغيرها من المواضيع. وفي السنة الجارية نفسها كتب الشاعر علوي كوتي الكوتوري حوالي خمسة عشر قصائد، منها عويل شفيق، حادثة مرور، ظلم الأطفال، سن زواج البنات، سباغ ذوات رجلين، بكت السماء والأرض، لهيب مسافر نكر، وغيرها.

وقد يلتمس إليه الطلاب للحصول على قصائد جميلة لإلقائها في المسابقات، ولهذا السبب كتب الشاعر علوي كوتي الكوتوري قصائد مختلفة في رسالة واحدة أو حول موضوع واحد تلبية لحوائج هؤلاء الطلاب. ولكنه الشاعر قد قال لي أن الشعر الذي كتبه أولا هو الشعر الأصلي الذي ينبثق من قلمه الطبيعي كشاعر عربي. والأخرى هي لأغراض فني ثانوي فقط.

وفي رأي الشاعر علوي كوتي الكوتوري الشعر يستلزم العروض والقوافي والأخرى لا تدخل في دائرة الشعر. الشاعر علوي كوتي الكوتوري ينفق أوقاته لاختيار الألفاظ اللائقة لأشعاره وقال إنه ذهب مرات لزيارة علماء اللغة في كثير من الأحيان لهذا الغرض. وكثيرا ما كان الشاعر يشجع الجدد في مجال الشعر. ولي تجربة شخصية بهذا الصدد، وذلك ان زميلي الأخ \ عبد المجيد أستاذ اللغة العربية في قسم الماجستير والبحوث في اللغة العربية وآدابها، كتب شعرا في عنوان "نشيج بغداد" ولما زار الشيخ كروالي المولوي، رئيس السابق، إتحاد معلمي اللغة العربية في ولاية كيرالا، كليتنا فاروق ناقشنا معه حول هذه القصيدة وأخذ منا نسخة القصيدة وأعطى للشيخ علوي كوتي الكوتوري فنقد الكوتوري من القصيدة كما كتب تعليقات قيمة حولها وأرسل إلينا بواسطة البريد فعزمنا لزيارة بيته تقديرا لخدمته الجليلة. وهذه الخصلة الكريمة في شخصية الشاعر علوي كوتي الكوتوري هي التي لفتت انتباهي إلى شخصيته والشعر الذي ينبثق من تلك الشخصية الكريمة. وله رجاء في الجيل الناشئ حيث أن كثيرا منهم يهتمون بالشعر وفنونه. والله هو الموفق وحسبنا الله ونعم الوكيل.

المصادر والمراجع:

- **المقابلة الشخصية** التي عقدت مع الشاعر في تاريخ نوفمبر سنة ٢٠١٣م
- الدكتور ويرا محي الدين، **علاقة الهند وتأثيرها في حياة الكيرليين الثقافية والاجتماعية**، مشروع قدم إلى المجلس الأعلى للجامعات الهندية بنيو دلهي، سنة ٢٠١٣م.
- الدكتور ويران محي الدين، **شعراء كيرالا**، كالكوت، كيرالا، الهند.

SEASONS OF ARAB ÉMIGRÉS IN THE UNITED STATES

Dr K. Ali Noufal
Assistant Professor
Farook College

Abstract

The turn of the 20th century witnessed the emergence of a new style in Arabic literature. Its exponents were the émigrés from Lebanon and Syria to American countries. These migrants who had sought new homes because of social and economic reasons made additions and changes in theory and practice of Arabic language and literature. They made contributions to all the genres of literature, but their efforts in poetry found more results and became an essential part of Arabic literature. Arab émigrés were having more contacts with western culture and literature than the others back home in Lebanon and Syria comprising the works of great writers like Emerson, Longfellow, Poe, Whitman and others. This exposure enabled them to lead the revolt against the conventional styles of Arabic prose and poetry.

Introduction

Migrant Literature or Mahjar Literature is the literature in Arabic that developed among the Arabs who migrated from Lebanon and Syria to the United States. The word 'Hijra' means migration and the term 'Adab al-Mahjar' in Arabic Language is refers to 'Migrant Literature'.

Migration means movement of people or a group of people from one place to another due to socio-political and economic reasons. Arabs from Syria and Lebanon migrated to North and South American countries in the second half of the nineteenth century. But their literature didn't come into existence until the late period of the century. They migrated in search of food and livelihood as their motherland was oppressed by the Turkish people for a long period of four hundred years since 1516. The Arabs of Lebanon and Syria love adventure and travelling. The poet Shukri al- Khoori says " if there is a way to Moon, certainly you can see a Lebanonee trying to reach there carrying his baggage".

Their migration from Lebanon and Syria to the U.S. was really individual in their early periods and later on the number of migration started to increase from year to year and they became a powerful group in the beginning of the twentieth century. It was very clear that the motive behind

their migration was economic but their rich experience on their way from home land to U.S. made them to express it in different forms of literature. So they narrated their rare experience in poems, stories and novels in their Mother tongue, Arabic Language. The personal experience is the best resource for a piece of literature and as far as the Mahjar writers were concerned, they were having enough of personal experience in all spheres of life. So we can call their literature as the pages from their personal life.

Arab Émigrés in the United States

Arabs from Lebanon and Syria reached America in the second half of the nineteenth century but their literature gained circulation only in the beginning of the twentieth century. Because they were engaged in their settlements in their new home at their first phase, but when they stood on their on foot they started social works and made contributions in various fields of life. We can divide the life of the émigrés in American countries into three phases. In the first phase we found them roaming around the streets of New York and Boston to sell the commodities which they collected from their home land and other eastern countries like Jerusalem which was precious among the Christians in the United States. The first phase of their life was filled with difficulties and sorrows. They had to face many troubles on their journey from home land to the United States. They also faced hardships to earn their livelihood and to establish their business and to settle their lives in the new country.

In the second phase, we could see them in a better condition. Their financial conditions were developed in to a relaxed stage and they found leisure time for the well fare activities in the beginning and later on for the cultural and literary contributions as well. In this stage they used to gather in colonies and streets of the cities to exchange their feelings and emotions among the migrants. The second phase is the golden period of Mahjar literature. They contributed to all major branches of Arabic literature. The Mahjar literature got wide circulations among the émigrés and among the people at their home town as well.

In the third phase, we see them confused and thinking whether they could return to Lebanon and Syria or should remain in the new land. There were elements which compelled some of them to remain in exile as some of them had accepted U.S. nationality and had married foreign women. Their children who were born and brought up in the new land also wanted to stay there and build life in the United States. The spirit of nationalism among the Arabs was weak in the second generation and some of them did not even know the mother tongue of their parents.

Due to the facts mentioned above, the Mahjar literature left the scene after forty or fifty years of its rich presence in Arabic literature. But the literature which they produced became treasure for Arabic language and decorated the milieu of Arabic language and literature. The Mahjar poets and

prose writers are still alive in their literary works which became a mile stone in the field of Arabic literature.

Salient features of Mahjar literature

Natural Descriptions: Arabs from Lebanon and Syria reached America in search of livelihood, leaving behind all their families and relatives at home. The life in the cities of America was really a new experience for them since they were hailing from village backgrounds. The mechanical life of America left its impact on their life and thoughts. There were poets like Rasheed Ayyoob who often complained about the mechanical life of America and wrote many poems describing the beauty of the nature in Labnon and Syria. Themes like 'the spring', 'the darkness of the Night', 'the forest', etc. appeared in the poems of the émigrés.

Nostalgic Feelings: The Arab émigrés of America left their motherland in a pathetic situation. They left behind their country in financial crisis and sectarianism of Ottoman rule. There are poems and poets among the émigrés who adorned the milieu of Arabic literature with nostalgic feelings. The poet Rsheed Ayyoob wrote beautiful poems praising the natural beauty of Labanon and Syria. His 'Deevan' (collection of poems) 'Aghanee Darvesh', is a collection of such poems. Iliya Abu Madi in his collection 'al- Khamail' describes the world around him, but he slips with his pen and praised the nature of his own mother land.

Different incidents occurred in Lebanon and Syria also influenced the mindsets of the Arab migrants in America. They wrote provoking articles on issues which were prevailing in their motherland and regarding the freedom of their country from the Ottoman rule. There were calls from the poets to help and work for the welfare of the people in Lebanon. They raised trends to help the poor back home in Lebanon and Syria.

Revolution against the conventions: Mahjar poets and writers stood against the conventional style of writing in Arabic Language and Literature. It was a result of the influence by the American culture and thoughts. A writer is a product of his environment and as far as the Mahjar writers were concerned they were living among the forward and modern people of the United States.

Well known Arabic writer Ameen al- Raihani encouraged poets to drop the older themes and to concentrate on innovative themes and subjects. He said in one of his articles to "free your writings from *kifa Nabki*, you have in hand the aircrafts to drive along with the stars". There is no wonder in such an influence as they were living in a country where people were enjoying the freedom of thought and expression. In addition to that they were influenced by the western poets. Fro instance, Jibran Khaleel Jibran was influenced by the William Blake and by the world famous artist *Rodman*. Another writer Meekhaeel Nuaima was influenced by Tolstoy and Destevoyski.

Iliya Abu Madi expressed his opinion when he said: "You are not one of us if you think that poetry is mere meter and rhyme. These are only external attributes and impediments to get to the real cone of things".

Jibran Khaleel Jibran says in his article *your language and mine* "you have your encyclopedias and Dictionaries and I have my ears selects and memory retains of the conversation familiar to man in his grief of happiness ... you pick up the rags of the garments that is your language and I tear all the old and worn bits with my fingers and throw away all that comes in my way to mountain top".

Meekha'eel Nu'aima says "This new movement aiming at transporting our literature from stagnation to life, from imitation to creation is worthy of all encouragement on the other hand, the tendency to keep out language and literature with in the narrow bounds of aping the ancient in the form and substance is a most pernicious tendency, if left unopposed it will soon lead to decay and disintegration. Yet we do no aim to break away completely from the ancient. For there be some among them who will remain to us and those who follow a source of inspiration for many ages to come. To revere them is a great honor. To imitate them is deadly shame. For our life, our needs, our circumstances are far different from theirs".

All the above mentioned quotations of Mahjar writers clearly spoke about the revolutionary thoughts and ideas, for which they stood and worked through out their life.

Literary and Cultural Organizations

As the migration of people from Lebanon and Syria was in large number, they could form Arab streets and colonies in the cities of America comprising New York, Boston, Philadelphia, Washington and so on. All these émigrés used to gather in the evenings after they finished their daily works in the streets and cities. They exchanged their feelings and emotions. As a result of these gatherings they formed cultural and literary organizations.

Pen League: It is the literary organization formed at New York in North America, in the year 1920 by the efforts of Abdul Maseeh Haddad, the owner of *al- Sa'ih* journal. The office of the journal witnessed various meetings which lead to the formation of "Pen League". Jibran Khaleel Jibran was the chairman of the Pen League. Meekhaeel Nuaima, Naseeb Areeda, Iliya Abu Madi, Rasheed Ayyoob, As'ad Rustham, Nadrath Haddad were other office bearers and active members of this organization.

It was Meekhaeel Nua'ima, the consultant of the organization, who wrote the by-law for the Pen League. According to him the Pen League was "today's expectation and tomorrow's support''. The Pen League published literary works extensively in their own name and made valuable contributions. After the formation of the Pen League 'al – Sa'ih' journal

became its mouth peace and published their views and articles in its different issues. Under the leadership of Gibran Khaleel Gibran, Pen League made changes in literary theory and application of Arabic language and literature. They took revolutionary steps to free the Arabic language and literature from the clutches of conventional theories and meters.

Jibran himself says: "you have what Seebavaihi, Abul Aswad al – Dua'li, Ibnu Uqail and other grammarians said, and I have what a mother says to her kid, a lover to her counterpart and one who prays to his God, the almighty, in his solitude".

According to Meekhaeel Nua'ima, "All writings on the paper with ink could not be considered as literature and one who edited an article or composed a poem could not be counted as a writer. The literature which we consider is only one which took the resource from the air and lights of real life".

Al- Usbath al- Andalsiyya: It is the literary organization formed among the arab émigrés of South America, Brazil, in the city of Sanbavalo in the year 1932. Well known Mahjar writer Mayshal al- Ma'loof was the President of this group, Davood Shukoor was vice president, Nadeer Zaithoon was treasurer, George Hasoon was the spokesperson and Naseer Sama'an, Husni Gharab, Yusuf Aghanim, Habeeb Masuood, Iskandar Karbaj, Shukrulla al-jarr and Anthoon Saleem Sa'ad were other members of the organization.

There were certain differences between the ideologies and views of the Pen League and Usbath al – Anthalsiyya. Because the members of the Usbath al – Anthalsiyya were rigid and stringent regarding the linguistic rules and its preservation while the members of Pen League were having revolutionary ideas towards the renewal of language and writing styles. The Al-Usbath al-Anadalsiyya published a magazine which had 80 issues in a period of 7 years. The Magazine was comprised valuable articles and literary works on various topics and forms of literature. There were also other organizations appeared among the migrants, but left the scene after a short period like Minerva, Rabithath al-Adabiyya etc.

Conclusion

After a period of forty or fifty years of active participation which brought changes in Arabic language and literature, Mahjar literature left the field. Because, the second generation of the Arab émigrés were not acquainted with Arabic language since they were born and brought up in the U.S. It is very strange to know that the son of famous Arabic poet Mayshal al-Ma'loof was a poet in Portuguese language and he did not even know Arabic language. He understood the poems of his father from their translated versions.

Jibran died in the year 1931 and following him Rasheed Ayyoob in 1941, Naseeb Areeda in 1946, Nadrath Haddad in 1949 and when Meekhaeel

Nua'ima reached back home in Lebanon after the death of his colleagues one after another Pen League and its activities became silent and left the field afterwards.

But all the poets and writers of Mahjar literature are still alive in their literary works and contributions which brought drastic changes in theory and practice of Arabic literary composition.

Reference:

1) Abdul Mun'im al- Khaffaji, *Qissathul Adab al-Mahjari*, Darul Kuthub al-Lebanoni, Bairuth, 1986.
2) Ameen al- Raihani, *Al- Raihaniyat*, Darul Kuthub al-Lebanoni, Beirut, 1978.
3) Anees al- Muqaddasi, *al –Ithijahath al –Adabiyya fil Alamil al-Arabi al-Hatheeth*, Darul Ilm Lil Malayeen, Beirut, 1967.
4) George Antony, *Yaqdathul Arab*, Beiruth, Dar al-Ilm, Lil- Malayeen, 1987.
5) George Saidah, *Adabuna wa Udaba'una fil Mahjar; al – Amreeki*, Beirut, 1957.
6) Havee Khaleel, *Jibran Khaleel Jibran*, Darul Ilm Lil Malayeen, Beirut, 1982.
7) Isa Meekha'il Saba, *Navabghul fikr al-Arabi (Ameen al-Raihani)*, Darul Ma'rif, al –Qahira.
8) Mahdi, Ismat, *Modern Arabic Literature*, Hyderabad, Dar al-Ma'rif, Usmania Univrsity press, 2000.
9) Mahmood Zalat Abdul Raheem, *Al- A'roobath fi Shi'rul Mahajir al-Amreeki al- Janoobi*, Darul fikr al – Arabi, Al- Qahira, 1972.
10) Nadra Jameel Siraj, *Shua'rau al- Rabtath al-Qalamiyya*, Darul Ma'rif, Egypt.

Available online at http://www.urpjournals.com

International Journal of Environmental Biology

ISSN 2277–386X

Original Article

Chemical composition of the essential oils of four *Pogostemon* spp. and their larvicidal activity against *Aedes albopictus* Skuse (Diptera: Culicidae)

S. Anjana and J. E. Thoppil
Cell and Molecular Biology Division, Department of Botany, University of Calicut, Kerala, India
Phone: 09496224689, Fax: 049-4400269,
Email: anjana.s586@gmail.com, Email: jethoppil@gmail.com

Received 02 February 2013; accepted 19 February 2013

Abstract

The larvicidal potential of the essential oil extracted from the leaves of four species of *Pogostemon* were evaluated against the fourth instar larvae of *Aedes albopictus* Skuse, the chikun gunya vector. The larvicidal activity of the essential oil at seven different concentrations (5, 10, 20, 25, 50, 100 and 200 ppm) was evaluated. GC-MS analysis of the test essential oils was also done. All the essential oils showed high larvicidal activity in 24 h exposure tests. Mortality rates were dosage dependent. Among the four species studied, *Pogostemon deccanensis* showed maximum activity with an LC_{90} of 21.72 ppm and LC_{50} of 6.00 ppm. This was followed by *P. heyneanus* and *P. benghalensis*. Considerable activity was also shown by *P. auricularius,* but was low when compared to the other three. Thus, the essential oils of all the four *Pogostemon* species used in this study seem to have potential larvicidal activity.

Keywords: Lamiaceae; *Pogostemon*; essential oil; GC-MS; mosquito larvicidal

1. Introduction

In the last two decades, the use of chemical insecticides in mosquito control programmes has resulted in the instability of the environment, mosquito resistance, mosquito resurgences and are toxic to non-target organisms including natural enemies in the agriculture ecosystem [1]. This necessitates the development of an alternative method which involves the use of potential biocontrol agents or compounds isolated from the biological world.

Botanical pesticides and essential oils are the essential alternatives for chemicals as they possess an array of chemicals that includes larvicidal, adulticidal and repellency activities against medically important vectors that transmit disease to humans [2].

Mosquitoes are one of the most important groups of insect vectors causing diseases to human beings. These organisms cause several diseases including dengue fever, filariasis, encephalitis, yellow fever and malaria. The most important pest and vector species belong to the genera *Anopheles*, *Culex* and *Aedes*.

Aedes species are important vectors of yellow fever, dengue, encephalitis viruses and many other arboviruses. Dengue fever is an epidemic afflicting millions of people and causing thousands of deaths annually which is transmitted by *Aedes* species such as *A. aegypti, A. albopictus* etc. *Aedes albopictus* Skuse (Diptera: Culicidae) is an epidemiologically important vector for the transmission of many viral pathogens, including the West Nile virus, yellow fever virus, dengue virus, and chikungunya virus, as well as several filarial nematodes such as *Dirofilaria immitis*. *Aedes albopictus* has proven to be very difficult to suppress and control due to their remarkable ability to adapt to various environments, their close contact with humans, and their effective reproductive biology.

Plant-derived products are extensively used as biologically active compounds. Recent research on insecticidal action of plant materials especially secondary metabolites and essential oils showed that they are eco-friendly, biodegradable and species specific [3, 4, 5, 6, 7]. Essential oils are natural volatile substances found in a variety of plants [8]. Essential oils can be used as an alternative to synthetic insecticides for vector control programmes.

Several researchers have shown that plants belonging to the family Lamiaceae have larvicidal activities. Ethanol extracts of the aerial parts from five Labiatae (Lamiaceae) species showed considerable larvicidal activity when compared to the organophosphorus insecticide, temephos,

against the third and fourth instar larvae of *Culex pipiens* [9].

Cetin and Yanikoglu [10] investigated the insecticidal activity of essential oils from *Origanum onites* and *O. minutiflorum* against third and fourth instar larvae of *Culex pipiens* and they attributed this potential to carvacrol, the major constituent of these oils.

The insecticidal properties of the essential oils of *Mentha*, *Melissa and Salvia* were screened on *Culex pipiens* larvae and the constituent piperitenone oxide was found to be highly active [11].

The toxicity of the plant *Moschosma polystachyum* was evaluated against early third instar larvae of *Culex quinquefasciatus* [12].

Abbassy *et al*. [13] evaluated the insecticidal activity of the essential oil from leaves of *Majorana hortensis* oil, against the fourth instar larvae of *Spodoptera littoralis* and the adults of *Aphis fabae*. They found that the oil showed a remarkable toxic effect against *S. littoralis* larvae and *A. fabae* adults.

Kovendan *et al*. [14] reported the potential of ethanolic extracts of *Leucas aspera* for controlling the malarial vector, *A. stephensi.* The repellent activities of the essential oils of *Thymus* and *Mentha* species against *Ochlerotatus caspius* were evaluated by Koc *et al*. [15].

The larvicidal potential of *Pogostemon cablin* was reported by Trongtokit *et al* [16]. The present investigation was carried out to evaluate the larvicidal efficacy of four species of *Pogostemon* (*P. auricularius*, *P. benghalensis*, *P. heyneanus* and *P. deccanensis*).

2. Materials and Methods

2.1. Collection of plant materials

Four species of Pogostemon were used in this study viz., *P. auricularius, P. benghalensis, P. heyneanus and P. deccanensis.* The plant specimens were collected from Wayanad, Kannur and Kozhikode districts of Kerala. Botanical identity of these samples was confirmed by Dr A. K. Pradeep, Assistant Professor, Department of Botany, University of Calicut. Voucher specimens (CALI 123731, CALI 123730, CALI 123733 and CALI 123732) were deposited in Calicut University Herbarium (CALI).

2.2. Extraction of essential oil

Fresh leaves of the above four plants were separated and shade dried. To extract the volatile oil, a weight of 250 g each was separately subjected to hydro-distillation for 4 h at 60° C using a Clevenger apparatus. The essential oil was extracted with diethyl ether and was dried over anhydrous sodium sulphate, which was then stored at 4°C in amber coloured bottles.

2.3. GC-MS analysis of the essential oil

GC-MS analysis of the essential oils were carried on a Hewlett Packard (HP) 6890 GC interfaced with a Hewlett Packard 5973 Mass Selective Detector (MSD) system at 75 eV at 250°C, equipped with a splitless injector. GC column used was a cross linked 5% phenyl methyl siloxane column HP-5 (DB5) and the carrier gas was Helium at a flow rate 1.4 ml/min. Temperature programme was set initially at 60°C for 1 min and then heated at the rate of 3°C/ min to 246°C. Runtime was 62 min. Quantification was performed using percentage peak area calculations and the identification of individual compounds was done using the NIST MS Search and literature survey. The relative concentration of each compound in essential oil was quantified based on the peak area integrated by the analysis program.

2.4. Mosquito larvicidal assay

The test organism was the fourth instar larvae of the mosquito *Aedes albopictus*, commonly called as tiger mosquito. These were reared in a dish containing water which was kept open. Decaying leaves and yeast granules were added to this. The dish was kept open until mosquito larvae appeared. Excess food was avoided to prevent the non specific death of the test organism. Larvae appeared in 10-15 days and the dish was covered with a net to prevent the escape of adult mosquitoes. The silvery patch on the back of mesotonum serves to identify *Aedes albopictus* larvae from among others. These were collected and reared separately and all others were selectively destroyed. This yielded fourth instar larvae in 15-20 days which was used for the present study.

The larvicidal activity of the oil was evaluated as per the method recommended by WHO [17]. A stock solution (10 mg/ml of acetone) of each essential oil was prepared. The test concentrations were 200, 100, 50, 25, 20, 10 and 5 ppm of the essential oil, which were prepared by diluting the stocks with distilled water. Two controls were kept, one of acetone alone and one with distilled water alone.

The fourth instar larvae were collected and introduced into the test solutions of varying concentrations (5-200 ppm) as well as to the controls. A minimum of ten larvae/ concentration were used for all the experiments, which were replicated five times. The larval mortality was recorded after 24 hrs. The larvae were considered dead if they do not respond to gentle prodding with a fine needle.

Mortality was reported as LC_{50} and LC_{90}, representing the concentrations in ppm with 50% and 90% larval mortality rate in 24h, respectively. The percentage mortality was calculated using the formula,

$$\text{Percentage of mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times 100$$

2.5. Statistical analysis

All data were subjected to statistical analyses using SPSS version 20. Data from mortality experiments were subjected to one way analysis of variance (ANOVA). LC_{50} and LC_{90} values were determined using probit analysis. Results with $P<0.05$ were considered to be statistically significant.

3. Results and discussion

3.1. GC-MS analysis of the leaf essential oils

Analysis of the essential oil from the above four species of *Pogostemon* revealed a complex mixture of constituents (Table 1). The oils represent mainly a mixture of monoterpenes and sesquiterpenes. The essential oil obtained from the leaves of *P. auricularius* had the sesquiterpene, valeranone as the major volatile component (57.7%), followed by the diterpene, cembrene, which constituted 11.1%. The essential oil also showed the presence of sesquiterpenes like carypohyllene (3.0%), trans-nerolidol (2.28%) and β-elemene (2.29%) and two sesquiterpene alcohols, α-cadinol (8.24%) and α-bisabolol

Table I. Constituents of the leaf essential oil of the four test plant species (GC-MS analysis)

No	Constituent	RT	Concentration (%)			
			P. auricularius	*P.benghalensis*	*P.deccanensis*	*P.heyneanus*
1	γ -Terpinene	5.292	-	0.91	-	-
2	β –Cymene	5.829	-	1.02	-	-
3	β- Pinene	4.670	-	-	-	25.51
4	Acetophenone	7.060	-	-	-	48.28
5	β –Linalool	8.151	-	0.32	-	-
6	Borneol	10.371	-	0.50	-	-
7	L- Bornyl acetate	15.195	-	4.04	-	-
8	γ - Elemene	17.031	-	0.22	-	-
9	Di-epi-α- cedrene epoxide	19.242	-	0.39	-	-
10	Caryophyllene	20.228	3.0	2.27	6.84	2.85
11	Bergamotene	21.031	-	1.13	-	-
12	Cedrene	21.344	-	1.11	-	-
13	α– Caryophyllene	21.534	-	-	2.48	-
14	β -cis-Farnesene	22.215	-	6.11	-	-
15	γ -Cadinene	23.002	-	11.17	10.05	-
16	Di epi alpha cedrene	23.479	-	2.62	-	-
17	β- Bisabolene	24.219	-	8.40	-	-
18	δ –Cadinene	24.351	-	-	4.01	-
19	β-Sesquiphyllandrene	24.710	-	4.12	-	-
20	Trans- nerolidol	26.080	2.28	-	-	18.07
21	α-Cadinol	26.465	8.24	3.45	-	-
22	Caryophyllene oxide	26.486	-	1.62	3.85	-
23	Cubenol	27.733	-	-	2.23	-
24	1,5,6,7-Tetramethylbicyclo[3.2.0]hept-6-en-3-one	28.321	8.51	-	-	-
25	τ- Cadinol	28.727	-	-	30.33	-
26	δ- Cadinol	29.040	-	23.06	-	-
27	Patchouli alcohol	29.07	-	-	-	3.68
28	Valeranone	30.042	57.70	-	-	-
29	α- Bisabolol	30.410	4.38	11.46	-	-
30	2,4,6,7,8,8a—hexahydro 3,8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-5(1H)-azulenone	30.748	-	4.92	-	1.61
31	Dehydranone	31.577	-	26.66	-	-
32	1,5-dimethyl-3-hydroxy-8-(1-ethylene-2 hydroxyethyl-1)-bicyclo[4.4.0] dec-5-ene	32.309	-	4.42	-	-
33	4-(3,3-Dimethyl-but-1-ynyl)-4-hydroxy-2,6,6-trimethylcyclo hex-2-enone	34.148	-	2.40	-	-
34	Phytone	36.026	-	-	2.99	-
35	3-Oxo-10(14) -epoxyguai-11(13)-en-6,12-olide	36.707	-	0.28	-	-
36	2,2,7,7-Tetramethyl tricyclo[6.2.1.0(1,6)] undec-4-en-3-one	37.049	-	1.80	-	-
37	2-(4a,8-Dimethyl-2,3,4,4a,5,6-hexa hydro-naphthalen-2-yl) -prop-2-en-1-ol	38.326	-	0.30	-	-

38	Cembrene	38.546	11.10	-	-	-
39	3-hydroxy-6-isopropenyl-4,8a-dimethyl-1,2,3,5,6,7,8, 8a-octahydro naphthalen-2-yl acetic acid	38.698	-	-	-	-
40	β – Elemene	39.400	2.29	-	-	-
41	Trans-nuciferol	39.493	-	0.17	-	-
42	α –Terpinene	40.906	2.50	-	-	-
43	Tetrakis(1-methyl ethylidiene) cyclobutane	41.062	-	1.07	-	-
44	Geranyl linalool	41.819	-	-	3.34	-
45	Phytol	44.365	-	0.12	-	-
46	Sclareol	48.428	-	-	7.22	-

Table II. Lethal concentrations (with the corresponding 95% lower and upper confidence intervals) of the essential oils of four *Pogostemon* species against the fourth instar larvae of *A. albopictus.*

Plant	LC_{50}	Confidence Limits		LC_{90}	Confidence Limits		Regression equation	χ^2
		Lower	Upper		Lower	Upper		
P. auricularius	24.89	21.87	28.27	138.67	111.67	181.09	y= 7.92+ 0.10x	1.500
P. deccanensis	6.00	4.77	7.15	21.72	18.31	27.11	y=18.45+ 0.05x	3.097
P. benghalensis	9.35	8.03	10.64	37.09	31.64	45.24	y=15.33+0.06x	1.692
P. heyneanus	7.53	6.52	8.50	23.92	20.83	28.40	y=17.26+0.05x	0.172

Table III. Mortalities (with standard error) caused by different concentrations of essential oils of the four *Pogostemon* species

Plant	200ppm	100ppm	50ppm	25ppm	20ppm	10ppm	5ppm
P. auricularius	23±2.23a	22.4±2.17a	18.4±2.15a	11.6±1.64a	8.8±1.37a	5.8±1.2a	4.2±1.38a
P. deccanensis	25.0±0 b	25.0±0b	25.0±0b	24.6±2.23c	19.0±2.05c	17.4±2.21c	11.6±1.66c
P. benghalensis	25.0±0b	25.0±0 b	25.0±0b	20.8±2.12b	15.8±2.10 b	13.6±2.11b	9.2±1.43b
P. heyneanus	25.0±0b	25.0±0b	24.8±2.25b	23.8±2.21c	20.0±2.06 c	14.2±1.79bc	9.4+1.39bc

Within columns, means followed by the same letter(s) are not significantly different at 5% level (P<0.05) by DMRT

(4.38%). A monoterpene compound, α-terpinene (2.50%) and a ketone derivative, 1,5,6,7-tetramethylbicyclo [3.2.0] hept-6-en-3-one (8.51%) were also present.

The essential oil analysis of *P. benghalensis* revealed the predominance of δ-cadinol (23.06%), followed by α-bisabolol (11.46%) and γ-cadinene (11.17%). Other major sesquiterpenes in the leaf essential oil of *P. benghalensis* were β-cis-farnesene (6.11%), β-bisabolene (8.4%), β-sesquiphyllandrene (4.12%), α-cadinol (3.45%), caryophyllene (2.27%), di epi α- cedrene (2.62%), caryophyllene oxide (1.62%), bergamotene (1.13%), cedrene (1.11%) and γ-elemene (0.22%). A diterpene alcohol, phytol was also present in trace amounts (0.12%). Monoterpenes were also present, though in small amounts. These include γ-terpinene (0.91%), β- cymene (1.02%), β-linalool (0.32%) and borneol (0.5%).

Sesquiterpenes like trans-nerolidol (18.07%), patchouli alcohol (3.68%) and caryophyllene (2.85%) and the monoterpene, β-pinene (25.51%) were the major constituents of *P. heyneanus* leaf essential oil.

GC-MS analysis of *P. deccanensis* leaf essential oil showed the presence of sesquiterpenes such as caryophyllene (6.84%), α –caryophyllene (2.48%), γ- cadinene (10.05%), δ-cadinene (4.01%), caryophyllene oxide (3.85%), cubenol (2.23%), τ-cadenol (30.33%) and the diterpene alcohol, sclareol (7.22%).

3.2. Effect of the test essential oils against Aedes albopictus larvae

All the essential oils evaluated in this study were found to be effective against the fourth instar larvae of *Aedes albopictus*. The mean larval mortality rates (± SE) induced by the different test concentrations are shown in Table 3. The effect on larval mortality was concentration dependent (Figure 1).

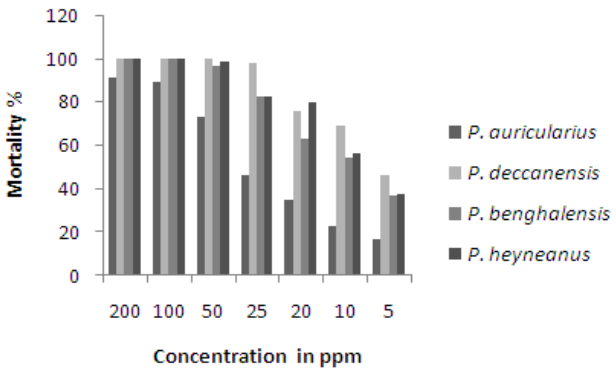


Figure 1. Percentage of mortalities observed in *Aedes albopictus* larvae after treatment with essential oils from four species of *Pogostemon*

The essential oils of all the four species induced 100% mortality at concentrations of 200 and 100 ppm and

therefore mortality rates were examined at lower concentrations of 50, 25, 20, 10 and 5 ppm.

Even at low concentrations, the essential oil from *P. deccanensis* showed high mortality rates with an LC_{50} of 6.00 ppm and LC_{90}, 21.72 ppm. This was followed by *P. heyneanus* (LC_{50} 7.53 ppm and LC_{90} 23.92 ppm) and *P. benghalensis* (LC_{50}, 9.35 ppm and LC_{90}, 37.09 ppm). LC_{50} and LC_{90} of *P. auricularius* were 24.89 ppm and 138.67 ppm respectively. The LC_{50} and LC_{90} values, along with the regression equations are given in Table 2.

The essential oil of *P. deccanensis* was the most effective, inducing 100 % mortality at 200, 100 and 50 ppm. At 25 ppm, 98.4% mortality was observed. The mortality percentages at 20, 10 and 5 ppm were 76, 69.6 and 46.64% respectively.

P. benghalensis also induced 100% mortality at 200 and 100 ppm. At 50 ppm the mortality percentage was 96.8% which was further reduced to 83.2% at 25 ppm and 63.2% at 20 ppm. 54.4% and 36.8% larvae were killed at concentrations of 10 and 5 ppm respectively.

100% larval mortality was induced at concentrations 200 and 100 ppm of the essential oil of *P. heyneanus*. At 50 ppm the mortality was reduced to a negligible extent (99.2%). At 25 ppm and 20 ppm, the larval mortalities observed were 83.2 and 80 %. This was considerably reduced to 56.8 and 37.6% at 10 ppm and 5 ppm respectively.

P. auricularius showed the least larvicidal potential among the four species studied. At 200 ppm, it caused 92 % larval mortality and a mortality percentage of 89.6 was observed at 100 ppm. The concentrations 50 ppm and 25 ppm caused a mortality of 73.6% and 46.4% respectively. The mortality percentages were very low at 20, 10 and 5 ppm (35.2%, 23.2% and 16.8% respectively).

4. Conclusions

The essential oils obtained from the above four species of *Pogostemon* can be considered as effective larvicidal agents against the larvae of *A. albopictus*.

The larval mortality rates were dosage dependent, in all cases. All the species tested were found to be highly effective against the fourth instar larvae of *Aedes albopictus*, with *P. deccanensis* inducing the highest mortality followed by *P. heyneanus* and *P. benghalensis* which possessed nearly equal LC_{50} and LC_{90} values. Considerable activity was shown by *P. auricularius* also, but was low when compared to the other three.

At 200, 100 and 50 ppm, *P. deccanensis*, *P. benghalensis* and *P. heyneanus* showed equivalent activity, but the activity of *P. auricularius* was significantly different. At 25 and 20 ppm, *P. deccanensis* and *P. heyneanus* had no significant difference in their larvicidal potential whereas *P. auricularius* and *P. benghalensis* differed significantly.

For the concentration of 10 ppm, larvicidal activity was highest for *P. deccanensis*, whereas *P. benghalensis* and *P. heyneanus* showed no significant difference in their activities, but the mortality caused by *P. auricularius* was significantly lesser (at $P<0.05$).

Analysis of the activity of these plants at 5ppm showed that *P. auricularius* had significantly lower values than the other three. The highest value was shown by *P. deccanensis*, which was the most effective in this concentration also. In the case of *P. heyneanus*, the values did not differ significantly from *P. benghalensis* and *P. deccanensis.*

The differences in the toxicity of essential oils of these species against *A. albopictus* were due to both qualitative and quantitative variations of the components. Terpenoid compounds dominate the essential oil isolated from all these four *Pogostemon* species. Among these, sesquiterpenes occupy the major portion; therefore the larvicidal effect may be due to higher amount of sesquiterpenes. Several studies have shown that sesquiterpenoids possess significant larvicidal activity against *A. albopictus* [18, 19, 20].

The essential oils extracted from these plants constitute a rich source of bioactive compounds and thus may be considered as a safe alternative source for mosquito larval control agents in integrated management programmes. They are also valuable in the sense that they are biodegradable into nontoxic products and are thus environment-friendly.

5. References

1. Greenwood, B. and Mutabingwa, T. (2002). Malaria in 2002. *Nature*, 415: 670– 672.
2. Shaalan, E., Canyon, D.V., Younes, M., Abdel-Wahab, H. and Mansour, A. (2005). A review of botanical phytochemicals with mosquitocidal potential. *Environment International*, 31: 1149-1166.
3. Senthil-Nathan, S. (2007). The use of *Eucalyptus* leaf extract as a natural larvicidal agent against malarial vector *Anopheles stephensi* Liston (Diptera: Culicidae). *Bioresource Technology*, 98(9): 1856–1860.
4. Senthil-Nathan, S., Kalaivani, S. and Sehoon, K. (2006a). Effects of *Dysoxylum malabaricum* Bedd. (Meliaceae) extract on the malarial vector *Anopheles stephensi* Liston (Diptera: Culicidae). *Bioresource Technology*, 97(16): 2077–2083.
5. Senthil-Nathan, S., Savitha, G., George, D.K., Narmadha, A., Suganya, L. and Chung, P.G. (2006b). Efficacy of *Melia azedarach* L. extract on the malarial vector *Anopheles stephensi* Liston. *Bioresource Technology*, 97(11): 1214–1221.
6. Senthil- Nathan, S., Hisham, A. and Jayakumar, G. (2008). Larvicidal and growth inhibition of the malaria vector *Anopheles stephensi* by triterpenes from *Dysoxylum* spp. (Meliaceae). *Fitoterapia*, 76: 106–111.
7. Rattan, R.S. (2010). Mechanism of action of insecticidal secondary metabolites of plant origin. *Crop Protection*, 29(9):913–920.
8. Zebitz, C.P.W. (1984). Effects of some crude and Azadirachtin enriched neem (*Azadirachita indica*) seed kernel extracts on larvae of *Aedes aegypti*. *Entomologia Experimentalis et Applicata*, 35:11–16.
9. Cetin, H., Cinbilgel, I., Yanikoglu, A. and Gokceoglu, M. (2006). Larvicidal activity of some Labiatae (Lamiaceae) plant extracts from Turkey. *Phytotherapy Research*, 20: 1088–1090.
10. Cetin, H. and Yanikoglu, A. (2006). A study of the

larvicidal activity of *Origanum* (Labiatae) species from southwest Turkey. *Journal of Vector Ecology*, 31(1): 118-122.
11. Koliopoulos, G., Pitarokili, D., Kioulos, E., Michaelakis, A. and Tzakou, O. (2010). Chemical composition and larvicidal evaluation of *Mentha*, *Salvia*, and *Melissa* essential oils against the West Nile virus mosquito *Culex pipiens*. *Parasitology Research*, 107(2): 327-335.
12. Rajkumar, S. and Jebanesan, A. (2004). Mosquitocidal activities of octacosane from *Moschosma polystachyum* Linn. (Lamiaceae). *Journal of Ethnopharmacology,* 90(1): 87-89.
13. Abbassy, M.A., Abdelgaleil, S.A.M. and Rabie, R.Y.A. (2009). Insecticidal and synergistic effects of *Majorana hortensis* essential oil and some of its major constituents. *Entomologia Experimentalis et Applicata*, 131:225–232.
14. Kovendan, K., Murugan, K., Vincent, S. and Barnard, D.R. (2012). Studies on larvicidal and pupicidal activity of *Leucas aspera* Willd. (Lamiaceae) and bacterial insecticide, *Bacillus sphaericus*, against malarial vector, *Anopheles stephensi* Liston. (Diptera: Culicidae). *Parasitology Research*, 110(1): 195-203.
15. Koc, S., Oz, E. and Cetin, H. (2012). Repellent activities of some Labiatae plant essential oils against the salt marsh mosquito *Ochlerotatus caspius* (Pallas, 1771) (Diptera: Culicidae). *Parasitology Research*, 110(6): 2205-2209.
16. Trongtokit, Y., Rongsriyam, Y., Komalamisra, N. and Apiwathnasorn, C. (2005). Comparative repellency of 38 essential oils against mosquito bites. *Phytotherapy Research,* 19(4): 303-309.
17. WHO. (1981). Instructions for determining the susceptibility or resistance of mosquito larvae to insecticides. WHO/VBC/81.807. World Health Organization, Geneva.
18. Arriaga, A.M.C., Malcher, G.T., Lima, J.Q., Magalhães, F.E.A., Gomes, T.M.B.M., Oliveira, M.C.F., Andrade-Neto, M., Mafezolli, J. and Santiago, G.M.P. (2008). Composition and larvicidal activity of the essential oil from *Tephrosia cinerea*. Pers. *Journal of Essential Oil Research,* 20: 450-451.
19. Magalhães, L.A.M., da Paz Lima, M., Marques, M.O.M., Facanali, R., da Silva Pinto, A.C. and Tadei, W.P. (2010). Chemical composition and larvicidal activity against *Aedes aegypti* larvae of essential oils from four *Guarea* species. *Molecules*, 15: 5734-5741.
20. Lima, M.A.A., de Oliveira, F.F.M., Gomes, G.A., Lavor, P.L., Santiago, G.M.P., Nagao-Dias, A.T., Arriaga, Â.M.C., Lemos, T.L.G. and de Carvalho, M.G. (2011). Evaluation of larvicidal activity of the essential oils of plant species from Brazil against *Aedes aegypti* (Diptera: Culicidae). *African Journal of Biotechnology*, 10(55): 11716-11720.

Source of support: CSIR; Conflict of interest: None declared

International Journal of Research and Development in Pharmacy and Life Sciences
Available online at http//www.ijrdpl.com
August - September, 2013, Vol. 2, No. 5, pp 562-566
ISSN: 2278-0238

Research Article

ANALYSIS OF CYTOTOXIC POTENTIAL OF THE AQUEOUS LEAF EXTRACTS OF *POGOSTEMON AURICULARIUS* (L.) HASSK. USING *ALLIUM CEPA* ROOT TIP ASSAY

Anjana S.[1*] and John E. Thoppil[1]

1. Cell and Molecular Biology Division, Department of Botany, University of Calicut, Kerala-673635, India

***Corresponding Author: Email anjana.s586@gmail.com**

(Received: March 18, 2013; **Accepted:** May 02, 2013**)**

ABSTRACT

Pogostemon auricularius is an aromatic herb belonging to the family Lamiaceae. **Objectives:** In the present study we have utilized the *Allium cepa* root tip meristem model to evaluate the cytotoxic and antimitotic potential of *P. auricularius*. **Methods:** The roots of *Allium cepa* were exposed to different concentrations of the aqueous leaf extracts (0.01%, 0.05%, 0.1% and 0.5%), for four different time durations, using distilled water as the control. **Results:** Chromosome anomalies including formation of sticky chromosomes, chromosome bridges and several other metaphasic and anaphasic disorders were induced by all the extract concentrations. **Conclusions:** Mitotic index was found to be decreasing, which was concentration dependent. All the extracts induced lowering of the mitotic index when compared to the distilled water control.

Keywords: *Pogostemon auricularius*, cytotoxicity, *Allium cepa* assay, aberrations, mitotic index.

INTRODUCTION

Medicinal plants continue to play an important role in the healthcare system of a significant portion of world population. There are several medicinal plants which are being widely used in the traditional systems of medicine for the prevention and treatment of diseases like cancer. Several plant derived compounds have been found to play significant role in the development of clinically useful anti-cancer agents.

Herbs have always been the principal form of medicine in India. In recent years the use of complimentary medicines has increased. Moreover, about 50% of all modern clinical drugs are derived from natural products. Some plants contain anti-tumour compounds and such plant derived compounds can be used for the development of chemo-preventive agents against cancer. Plant substances continue to be a valuable source of drugs for the world population and several plant based drugs are in extensive clinical use. Agents capable of inhibiting cell proliferation, including apoptosis modulating signal transduction are currently used for the treatment of cancer [(1)].

An assessment of cytotoxic and antimutagenic activity is necessary to understand their antiproliferative activity. Recent reports have suggested the use of several plant derived compounds as antitumour agents.

Allium test is a sensitive test that has often been used for the determination of cytotoxic and/or genotoxic effects of various substances [(2, 3)]. *Allium* assay has been shown to have correlation with tests in other living systems and serve as an indicator of toxicity of the tested material [(4)]. *Allium cepa* root tip meristems have been widely used for the evaluation of cytotoxicity, anti-mitotic activity, and genotoxicity, by employing the growing roots of *A. cepa*. Root meristematic

cells of *A. cepa* have been used extensively in screening of drugs to evaluate their antimitotic activity.

The use of plant tissues, primarily root tip for studying the induction of chromosomal aberration is one of the oldest, simplest, most reliable and inexpensive method [5]. The assessment of anti mitotic activity using *A. cepa* root meristematic cells has been used extensively in the screening of drugs with antimitotic activity. The division in these cells is similar to normal human cells and cancer cell division. Hence, these meristematic cells can be used for screening of drugs with potential human anticancer activity [6].

Several authors have reported the cytotoxic activities of different medicinal plants [7-9]. The cytotoxic potential of *Pogostemon quadrifolius* was evaluated by Ancy and Thoppil [10].

P. auricularius is an aromatic herb and an oil rich taxon of the family Lamiaceae. There are no previous reports regarding the cytotoxic activities of this plant. The present study was therefore aimed at investigating the cytotoxic effects of the aqueous leaf extracts of the above said species using *A. cepa* root tip assay.

MATERIALS AND METHODS

Collection of plant materials

An aromatic species of *Pogostemon* viz., *P. auricularius*, was used for the present investigation. The plants were collected from Wayanad district of Kerala. The identification and verification of the plants were done by Dr A. K. Pradeep, Assistant Professor, Department of Botany, University of Calicut. Voucher specimen was deposited at Calicut University Herbarium (CALI 123731).

Preparation of leaf extracts

The fresh leaves were collected and washed thoroughly with tap water and air dried at room temperature. It was then powdered and extracted with hot water by boiling for 30 minutes to get the aqueous extract. This was then filtered to remove particulate matter. Distilled water was used as medium for dilution.

Allium cepa assay

The antimitotic activity of the test plant extract was screened using *Allium cepa* root tip meristematic cells which have been used extensively in the screening of drugs with antimitotic activity. The bulbs were germinated over water before being transferred to each of the test plant extracts. When the roots were about 5 mm long, the bulbs were placed on beakers containing the leaf extracts of four different concentrations (0.5%, 0.1%, 0.05% and 0.01%), such that the roots were immersed in the extracts. The duration of treatments for each extract was 2h, 1h and 30 minutes. The sprouted roots were also treated with distilled water, which served as control. The experimental set up had five replicates.

The root tips were harvested after the treatment duration and fixed in Carnoy's fluid (1 part of glacial acetic acid: 2 parts of absolute alcohol). The root tips were hydrolysed in 1N HCL for 5 minutes. The squashing was done over 2% aceto - orcein stain. The slides were then scanned under Leica DM 1000 trinocular research microscope and photomicrographs were taken.

The numbers of cells, dividing and non- dividing, were recorded. Incidence of chromosome aberrations was calculated by expressing the number of aberrant cells as a percentage of total dividing cells for each treatment. Mitotic index was calculated by expressing the number of dividing cells as a percentage of total cells counted for each of the treatments and the control.

$$\text{Mitotic Index} = \frac{\text{Number of dividing cell}}{\text{Total number of cells}} \times 100$$

Statistical Analysis

The data were subjected to statistical analysis using analysis of variance followed by appropriate post-hoc tests. The means, with 95% confidence limits and the standard errors for results of the root inhibition and chromosome aberrations of each concentration of the extracts were calculated. Data were expressed as Mean ± Standard Error of Mean (SEM). $P < 0.05$ was considered to be statistically significant. All statistical analyses were carried out using SPSS 17.0 statistical package.

RESULTS AND DISCUSSION

The results showed that the aqueous extract of the *P. auricularius* had excellent cytotoxic activity. Clastogenic abnormalities including nuclear lesions, chromosome bridges, and non clastogenic aberrations like ball metaphase, binucleate cell formation, stellate anaphase, chromosome laggards, equatorial separation, shift in microtubular

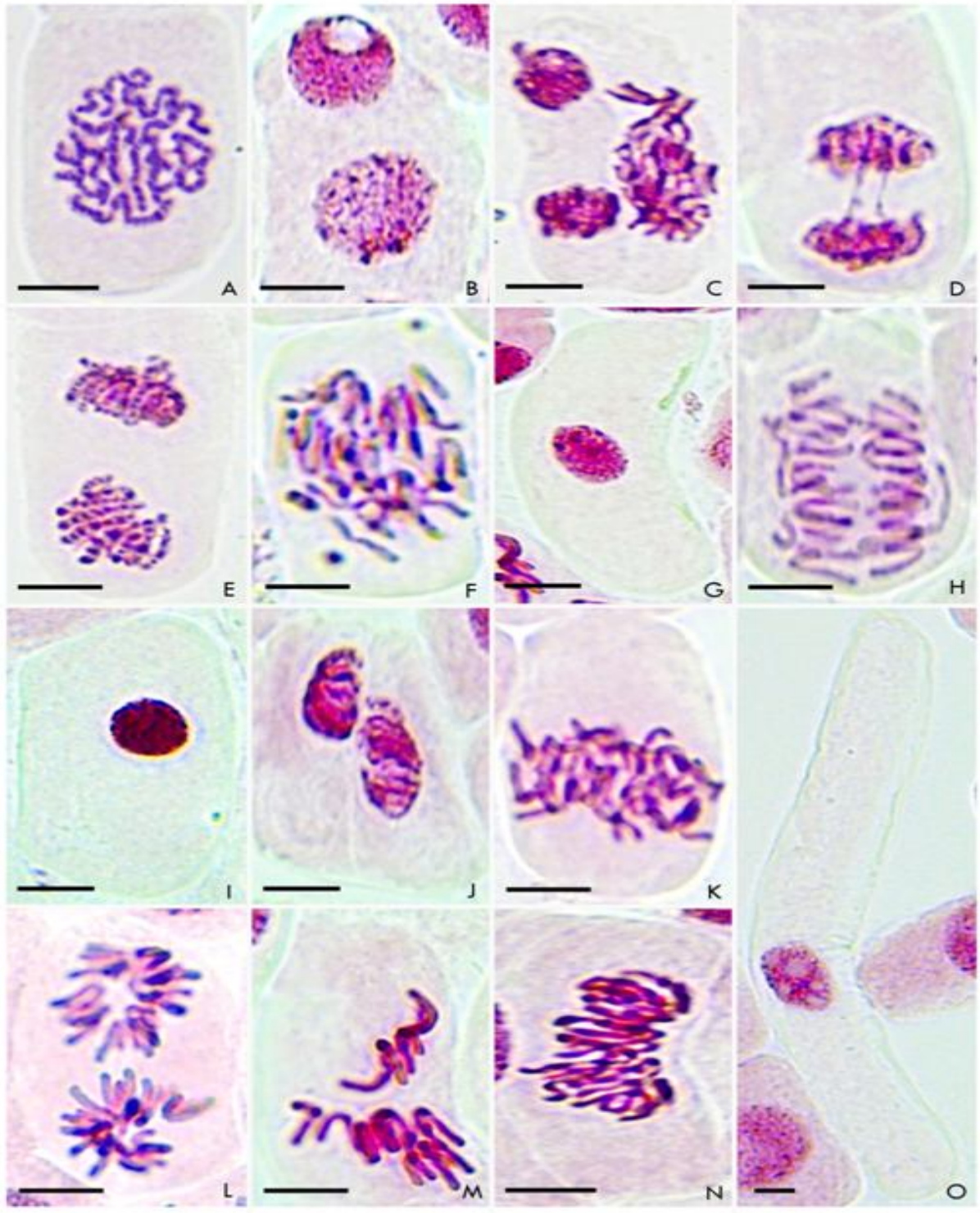


Fig. 1 Chromosomal aberrations caused by aqueous leaf extracts of *P. auricularius* A)Ball Metaphase B) Binucleate cell with one showing lesion C) Binucleate cell showing sticky Anaphase and Metaphase D)Chromosome bridges at Anaphase E) Chromosome gaps at Anaphase F) Chromosome laggards at Anaphase G) Cytoplasmic heteropyknosis H) Equatorial separation at Anaphase I) Heterochromasia J) Shift in MTOC at Cytokinesis K) Stathmo-Anaphase L) Stellate Anaphase M) Unequal grouping at Metaphase N) Unilateral Anaphase O) Multiple nuclear lesions in a giant cell

Table 1: Effect of varying concentrations of *P. auricularius* leaf extracts on the mitotic index of *Allium cepa* root meristems and the percentage of chromosomal aberrations observed

Concentration	Mitotic index (± SE)			% of aberrant cells (± SE)		
	½ hr	1 hr	2 hr	½ hr	1 hr	2hr
Control	24.25 ± 0.25^{a}	26.10 ± 0.34^{a}	27.56 ± 0.05^{a}	0^{a}	0^{a}	0^{a}
0.01 %	15.74 ± 1.02^{b}	15.06 ± 0.30^{b}	14.58 ± 0.41^{b}	39.16±1.32^{bc}	41.81±0.56^{b}	46.07±1.30^{b}
0.05 %	14.03 ± 0.52^{bc}	13.40± 0.38^{bc}	12.89 ± 0.60^{c}	36.03±0.75^{b}	43.64±1.82^{bc}	48.14±0.93^{bc}
0.1 %	12.74 ± 0.79^{c}	12.63 ± 1.01^{bc}	12.49 ± 0.33^{c}	39.50±1.86^{bc}	48.32±1.61^{c}	51.60±2.61^{c}
0.5 %	12.27± 0.21^{c}	12.06± 0.46^{c}	11.88 ± 0.47^{c}	42.88±2.88^{c}	47.98±3.07^{c}	62.85±1.91^{d}

Figures with different superscripts are statistically significant ($p<0.05$) (Duncan's multiple range test)

organizing centres, unilateral anaphase and stathmo anaphase were observed. Table 1 shows the data on the mitotic indices and the percentage of chromosome aberrations observed in *A. cepa* root tip cells treated with the aqueous leaf extracts of the test plant material. The mitotic indices of all the extract treated roots were significantly lower than that of the control. Also, the mitotic index values were observed to be decreasing with increasing concentrations of the extracts. The number of aberrant cells was also observed to be increasing with the concentration of extract. Cell division was normal in the root tips kept as control. A one way ANOVA showed that there was a significant effect of treatment on mitotic activity. Post-hoc analysis using Duncan's multiple range test showed that the activity of all the different extracts were significant when compared with that of control.

The chromosomal aberrations induced in the treated onion root cells were definitely caused by the chemical ingredients in the aqueous leaf extracts of the tested plant species, since such aberrations were not observed in the control. The observation of cells with laggards, chromosome gaps, and giant cells in the treated onion cells is an indication that the extract, especially at high concentrations, is capable of causing changes in chromosome number and structure. The reduction of the mitotic index might be explained as being due to the obstruction of the onset of prophase, the arrest of one or more mitotic phases, or the slowing of the rate of cell progression through mitosis [11].

Earlier reports suggest that the presence of nuclear lesions and nuclear dissolution offer cytological evidence for the inhibitory action on DNA biosynthesis [12, 13]. Ball metaphase results from the complete destruction of spindle fibres and a subsequent clumping of chromosomes into a tight ball. Separation of daughter chromosomes parallel to the equator rather than towards the poles is an acute aberrant condition that arises as a result of errors in mitotic spindle assembly and dynamics [14]. Chromosome bridges may be caused by stickiness of chromosomes which make their separation and free movements incomplete and thus they remain connected by bridges [15].

Inhibition of cytokinesis following telophase is responsible for binucleated cell formation [16]. The occurrence of lagging chromosomes was attributed to the hindrance of pro-metaphase movement accompanied by adhesion of centromere to the nuclear membrane or to the surrounding surface of plasma membrane [17]. Chromosome bridges may arise due to stickiness or due to the formation of dicentric chromosomes by breakage and reunion [18]. Stathmo-anaphase may be due to the abnormal functioning of the spindle fibres [19].

CONCLUSIONS

Mitotic index is an acceptable measure of cytotoxicity in all living organisms [3]. The cytotoxicity level can be determined by the decreased rate of mitotic index. Mitotic index was found to be decreasing with increasing extract concentration and duration of treatment. Mitotic index observed in the

treated root tip meristems were significantly different from the control group. Significant difference in the percentage of chromosomal aberrations was also observed in the test samples, when compared to the distilled water control.

The decreased mitotic index values in the treated onion roots may be an indication of the presence of cytotoxic substances in the aqueous leaf extracts, which causes inhibition of mitotic activities, while the aberrant cells in the treated onion root tip meristems indicates genotoxic effects of the leaf extract [20]. Reduction in the mitotic activity could be due to inhibition of DNA synthesis or a blocking in the G2 phase of the cell cycle, preventing the cell from entering mitosis [21].

Chromosome aberrations were observed in all stages of mitosis. The abnormalities of chromosomes could be due to the blockage of DNA synthesis or inhibition of spindle formation. The cells of *A. cepa* root tips after treatment with extracts of *P. auricularius* showed decreased mitotic index with increasing extract concentration. The results of the present investigation suggest the potential use of *P. auricularius* as a therapeutic agent. The mitodepressive effects induced by this plant extract suggest that it has some effect on the cell division of *A. cepa* which may be due to the conditions induced by the chemical components of the extracts. These results also suggest that, although the plant has beneficial effects as medicinal herbs, it can cause harm and damage on cells if not used in appropriate dose and period.

Further studies are required to isolate the compounds, responsible for the cytotoxic activity, from this plant and establish the antitumor activity of the isolated compounds *in vivo* and *in vitro* with different human cancer cell lines. More works are also essential to prove the specificity of this plant to be used as an anticancer agent.

ACKNOWLEDGEMENT

The funding provided by the Council of Scientific and Industrial Research is thankfully acknowledged.

REFERENCES

1. Trichopoulos D, Willett WC. (1996). *Cancer Causes Cont*. 7: 3-4.
2. Grant WF. (1982). *Mutat. Res*. 99: 273-291.
3. Smaka-Kinel V, Stegnar P, Lovaka M, Toman J. (1996). *Mutat. Res*. 368: 171–179.
4. Fiskesjo G. (1985). *Hereditas* 102: 99-112.
5. Auti S, Pagare R, Ahire D, Sawale V. (2010). *J. Cell Tissue Res*. 10(3): 2331-2335.
6. Saboo S, Deore SL, Khadabadi SS, Deokate UA. (2007). *Nig. J. Nat. Prod. Med*. 11: 75-78.
7. Adegbite AE, Sanyaolu EB. (2009). *Sci. Res. Essays* 4 (11):1311-1314.
8. Bhattacharya S, Haldar PK. (2010). *Pharmacognosy Res*. 2(6): 355–358.
9. Akinboro A, Bakare AA. (2007). *J. Ethnopharmaco*l. 112(3): 470–475.
10. Ancy CA, Thoppil JE. (2009). *J. Cytol. Genet*. 10: 59-64.
11. Christopher HB, Kapoor MB. (1988). *Cytologia* 54**:** 203-209.
12. Akaneme FI, Iyioke IV. (2008). *Bio – Research*. 6(1): 293-297.
13. Mercykutty VC, Stephen J. (1980). *Cytologia* 45: 769-777.
14. Ford JH, Correl AT. (1992). *Genome* 35: 702-705.
15. Kabarity A, El-Bayoumi A, Habib A. (1974). *Biol. Plantarum*. 16: 275–282.
16. Majewska AE, Wolska E, Sliwinska M, Furmanowa N, Urbanska A, Pietrosiuk A, Zobel A, Kuras M. (2003). *Caryologia* 56: 337-351.
17. Nagpal A, Grover IS. (1994). *Nucleus* 37: 99-105.
18. Raj A, Rao R. (1972). *Cytologia* 37: 245-246.
19. Shehab AS. (1979). *Cytologia* 44: 607-613.
20. El-Shahaby OA, Abdel-Migid HM, Soliman MI, Mashaly IA. (2003). *Pak J. Biol. Sci*. 6(1): 23-28.
21. Sudhakar R, Ninge Gowda KN, Venu G. (2001). *Cytologia* 66(3): 235–239.

Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 5, Suppl 2, 2013

Research Article

EVALUATION OF GENOTOXIC EFFECTS OF BAKING POWDER AND MONOSODIUM GLUTAMATE USING *ALLIUM CEPA* ASSAY

P. K. RENJANA*, S. ANJANA AND JOHN E. THOPPIL

Cell and Molecular Biology Division, Department of Botany, University of Calicut, Kerala 673635, India. Email: pkrenjana@gmail.com

Received: 26 Feb 2013, Revised and Accepted: 18 Apr 2013

ABSTRACT

Objective: To investigate the genotoxic effects of two food additives, baking powder (BKP) and monosodium glutamate (MSG) using *Allium cepa* root tip cells as a test system.

Methods: Roots of *A. cepa* were treated with four concentrations (0.01%, 0.05%, 0.1% and 0.5%) of these additives for different time durations (½h, 1h, 2h and 3h).

Results: Exposure to different concentrations of these chemicals showed an inhibitory effect on cell division in root tips of *A. cepa* and caused a general decline in mitotic index values. Additionally, a wide range of abnormal mitotic stages, both clastogenic and non-clastogenic were detected in treated cells when compared to the control. The total percentage of aberrations generally increased in a dose and time dependent manner. Among these, frequently observed chromosomal abnormalities were stickiness, chromosome fragments, polyploidy, disturbed meta and anaphases, laggards, ring chromosomes, chromosome bridges, multipolar anaphases, vagrant chromosomes *etc*.

Conclusion: The results of the present study clearly prove the sensitivity of *Allium* test and hence substantiate its use as a cytogenetic assay to assess the genotoxic effects of chemicals that are consumed as food additives or preservatives.

Keywords: *Allium cepa*, Baking powder, Chromosomal aberrations, Food additives, Monosodium glutamate, Mitotic index.

INTRODUCTION

Food additives are a large group of substances that are added to foods directly or indirectly either during the storage or processing of foods [1]. Diverse types of food additives serve different purposes such as preservatives, nutritional additives, flavouring agents, colouring agents, texturing agents *etc*. Baking powder (BKP) and Monosodium glutamate (MSG) are two widespread and regularly used food additives in a range of foods. MSG, known as a flavour enhancer, is commonly used particularly in West African and traditional Asian cuisine [2] and BKP, a texturing agent, is indispensable in baked foods and so is extensively used worldwide.

MSG can be defined as the monosodium salt of the naturally occurring L-form of glutamic acid, produced by the hydrolysis of vegetable proteins. It elicits a unique fifth basic taste that is quite distinct from the tastes of sweet, bitter, salt and sour, referred to as 'umami' [3]. The optimum concentration used is from 0.2 to 0.5% in normally salted food. Some of its names used in trade are Ajinomoto (most common), Glutacyl, RL-50, Vetsin, Chinese seasoning, Accent, Zest, Glutavene *etc*. Generally, MSG is accepted as a safe food additive that needs no specified average daily intake or an upper limit intake [4]. Ingestion of even large quantity of MSG did not present any adverse effect when taken with food [5]. There are however, divergent reports on the safety of the use of MSG in humans since there are many other studies that reveal MSG-induced toxicity as well [6-9]. An experimental study by Burde *et al*. [10] demonstrated that both subcutaneous injection and oral administration of MSG to immature rats and mice could damage the nerve cells of the hypothalamus. Mohammed [11] investigated the possible effects of MSG on the histology and ultra-structure of testes of the adult rats and found that MSG could induce severe damage in long term treatment. So the question of whether MSG is a harmless food additive remains highly controversial even now.

BKP, used as a leavening agent, lightens the texture and increases the volume of baked foods. Most commercially available baking powders are made up of an alkaline component (sodium bicarbonate, also known as baking soda), one or more acid salts (either sodium aluminium sulphate or sodium aluminium phosphate) and an inert starch (corn starch mostly or potato starch). There are no significant reports on any toxicological evaluations of BKP recently. Baking powders have so far been found to be safe for consumption and no definitive correlation has scientifically been proved regarding the health problems arising from regular intake of BKP.

The human population is continuously been exposed to a plethora of diverse chemicals, and this long term exposure can cause several deleterious effects on specific biomolecules. Among them, DNA alterations are known to be the early signs of damage in the affected organisms [12]. Though a considerable volume of work has been carried out in the past investigating the possible effects of MSG and BKP on humans and experimental animals, only limited information is available on the effects of these food additives on sensitive plant systems. *A. cepa* assay is now considered as one of the most efficient and cost effective approaches to determine the toxic potential of chemical compounds in the environment because of its high sensitivity and good correlation with the results of mammalian test systems [13]. Study of the effect of several chemicals on plant mitosis may provide valuable information in relation to possible genotoxicity in mammals and especially in humans [14]. So the present study was designed to investigate the effects of BKP and MSG on the mitotic index and the frequencies of chromosomal abnormalities in the root tip cells of *A. cepa* L., with a view to detect their mutagenic potential.

MATERIALS AND METHODS

Samples of BKP, MSG used were well known commercial products purchased from a local super market. They were dissolved in distilled water and diluted to obtain different concentrations (0.01%, 0.05%, 0.1% and 0.5%) of test solutions. Onion bulbs weighing 15-30 g were purchased freshly from local markets. The bulbs were carefully unscaled and the old roots were removed. They were then placed on top of small jars containing distilled water and were allowed to germinate for 36 hours at room temperature (25±2˚C). When the emerged roots were 1-2 cms long, the bulbs were treated with the series of concentrations of the two test substances for ½, 1, 2 and 3 h. The control group was treated with distilled water.

After each treatment, a few healthy root tips excised from each bulb were fixed in ethanol/glacial acetic acid (2:1) fixative for 1 h. After hydrolysis in 1N HCl for 15 min at room temperature, mitotic squash preparations were made with improved techniques [15] using 2% acetocarmine. Two slides were made for each treatment and scoring

was done from five sites that were randomly selected from these slides to determine the mitotic index and the percentage of chromosomal aberrations. The mitotic index was calculated for each treatment as the number of cells in mitosis/total number of cells counted and expressed as percentage. The cells were also scored for cytological abnormalities and the percentage of chromosomal aberrations was measured as the ratio of number of aberrant cells to total number of cells observed. The relative frequency of the different aberrations at each dose was calculated. Preparations were scanned under Leica ICC 50 integrated camera attached to Leica DM 500 research microscope. The most frequent abnormalities are shown in photomicrographs (Fig. 1).

Statistical Analysis

The data of mitotic index (MI) and chromosomal aberrations (CA) are represented in percentage mean±SE of five scorings. For statistical analysis, one-way analysis of variance (ANOVA) and Duncan's multiple range test (DMR) [16] were used. All statistical analyses were performed by using the computer software SPSS 20.0 for Windows. Results with $P < 0.05$ were considered to be statistically significant.

RESULTS

Exposure to different concentrations (0.01%, 0.05%, 0.1% and 0.5%) of the food additives significantly and dose dependently inhibited the mitotic index (Tables 1 and 2) in the root tip cells of A. *cepa*. There were significant differences in the mitotic index values as compared to the control ($P< 0.5$) at all treatments right from the lowest dose. The highest concentration of BKP (0.5%) at the 3 h treatment could bring about a considerable reduction in mitotic index (54.38%), whereas the same concentration of MSG caused a decrease of mitotic index to 37.12%.

The tables 1 and 2 also show the exponential relationship between the percentage of aberrations and the concentrations of the test compounds. Both the chemicals could significantly increase the percentages of chromosomal aberrations at all concentrations more or less in a dose dependent manner. The frequency of mitotic aberrations was significantly increased when exposure time was increased from ½ to 3 h. The highest number of mitotic aberrations was recorded in root tips subjected to 3 h treatment in 0.5% BKP (46.48%) whereas MSG could induce 27.38% aberrations at the same dose and duration of treatment.

Table 1: Mitotic index and chromosomal aberrations in *Allium cepa* root tip cells exposed to increasing concentrations of BKP for different periods.

Treatment duration (h)	Concentrations (%)	Mitotic index (mean±S. E.)	(%)Abnormalities (mean±S. E.)
	Control	24.74±0.23^{a}	0.00^{a}
½	0.01	22.64±0.77^{a}	10.5±0.80^{b}
	0.05	18.31±0.15^{b}	13.46±0.21^{c}
	0.1	13.21±0.38^{c}	12.84±0.23^{c}
	0.5	13.56±2.15^{c}	18.83±0.55^{d}
	Control	23.48±0.28^{a}	0.00^{a}
1	0.01	21.77±0.93^{ab}	16.46±1.08^{b}
	0.05	20.19±0.18^{b}	15.62±0.68^{b}
	0.1	17.39±0.18^{c}	15.94±0.71^{c}
	0.5	13.09±0.21^{d}	21.33±0.24^{c}
	Control	25.09±0.19^{a}	0.00^{a}
2	0.01	19.48±2.09^{b}	13.69±0.94^{b}
	0.05	15.3±0.36^{c}	23.79±0.47^{c}
	0.1	16.25±0.46^{c}	28.5±0.66^{d}
	0.5	13.88±0.30^{c}	34.81±1.27^{e}
	Control	24.92±0.12^{a}	0.00^{a}
	0.01	20.07±1.20^{b}	29.52±0.42^{b}
3	0.05	15.52±2.25^{c}	37.57±0.46^{c}
	0.1	14.7±0.18^{cd}	42.08±1.19^{d}
	0.5	11.37±0.39^{d}	46.48±0.63^{e}

Each value (mean ± S. E.) represents mean of five replicates.

Means in a column followed by the same superscript letters are not significantly different ($P < 0.05$, one-way ANOVA, DMR test)

Table 2: Mitotic index and chromosomal aberrations in *Allium cepa* root tip cells exposed to increasing concentrations of MSG for different periods.

Treatment duration (h)	Concentrations (%)	Mitotic index (mean±S. E.)	(%) Abnormalities (mean±S. E.)
	Control	24.74± 0.23^{a}	0.00^{a}
½	0.01	23.59 ± 1.27^{ab}	6.56 ±0.48^{b}
	0.05	22.51±0.12^{ab}	10.30 ±0.13^{c}
	0.1	18.13 ± 1.82^{c}	13.76 ±0.43^{d}
	0.5	20.32 ± 0.63^{bc}	15.38 ±0.80^{e}
	Control	23.48±0.28^{a}	0.00^{a}
1	0.01	23.84 ±0.26^{a}	8.60 ± 0.35^{b}
	0.05	21.31 ± 1.00^{b}	13.38 ±0.16^{c}
	0.1	19.54 ±0.37^{bc}	17.74± 1.12^{d}
	0.5	18.77 ±0.54^{c}	19.07 ± 1.89^{d}
	Control	25.09±0.19^{a}	0.00^{a}
2	0.01	20.71 ± 0.51^{b}	5.13 ± 1.15^{b}
	0.05	17.02 ± 1.38^{c}	14.89±0.51^{c}
	0.1	16.43 ±0.12^{c}	19.90 ± 2.10^{d}
	0.5	16.23 ±0.47^{c}	22.19 ±1.03^{d}
	Control	24.92±0.12^{a}	0.00^{a}
3	0.01	18.66 ± 0.24^{b}	9.14 ±0.92^{b}
	0.05	16.40 ± 0.87^{c}	15.68 ± 2.15^{c}
	0.1	17.16 ±0.60^{bc}	21.39 ± 0.94^{d}
	0.5	15.67±0.89^{c}	27.38± 1.90^{e}

Each value (mean ± S. E.) represents mean of five replicates.

Means in a column followed by the same superscript letters are not significantly different ($P < 0.05$, one-way ANOVA, DMR test)

A wide spectrum of both clastogenic and non-clastogenic aberrations (Fig. 1) were observed in the treated meristematic cells. The results regarding the type and frequency of chromosomal abnormalities induced by different concentrations of the test compounds are shown in Fig. 2. More or less similar types of aberrations were noticed in response to both the chemicals used. The most common clastogenic abnormalities noted were chromosome stickiness, pulverization, ring chromosomes, chromosome bridges, fragments, binucleate cells, polyploidy *etc*. The major non-clastogenic aberrations found were disturbed meta/anaphases, binucleate cells, laggards, vagrants, diagonal orientation *etc*. Stickiness, chromosome fragments, vagrants and disturbed metaphase and anaphase were the most frequently recorded aberrations in all treatments with both the test compounds (Fig. 2). In addition to that, a very high frequency of ring chromosomes, stickiness and laggards were noted in response to BKP, while MSG caused a high incidence of binucleate cells and fragmented chromosomes. Significant increase in the frequency of mitotic abnormalities was observed after 2 and 3 h of exposure to BKP treatments at all doses (Table 1).

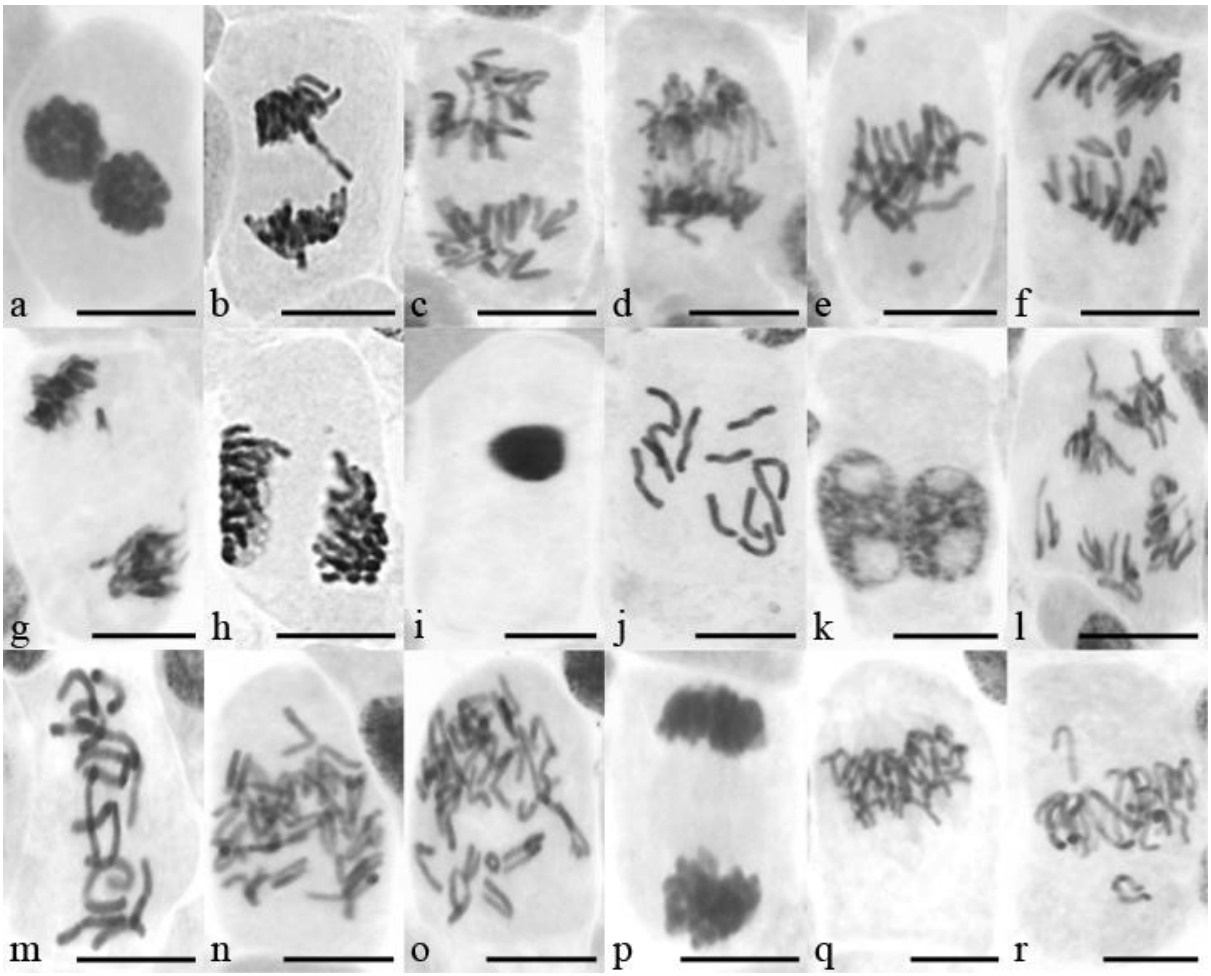
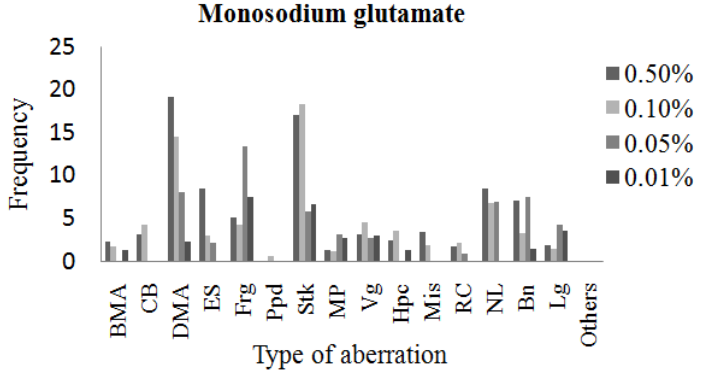


Fig. 1: Different Chromosomal aberrations induced by BKP and MSG in root tip cells of *Allium cepa*.

a) Diagonal ball anaphase, b) Broken chromosome bridge at anaphase, c) Centromeric attraction at anaphase, d) Chromosome bridges at anaphase, e) Chromosome fragments at anaphase, f) Chomosome laggards at Anaphase, g) Diagonal sticky anaphase with a laggard, h) Equatorial separation at anaphase, i) Hyperchromasia, j) Hypoploid cell showing cytostasis at metaphase, k) Lesions in a binucleate cell at interphase, l) Multipolar anaphase, m) Disturbed pole to pole arrangement of chromosomes at metaphase, n) Polyploid cell at metaphase, o) Ring chromosomes in disturbed metaphase in a polyploid cell, p) Sticky anaphase, q) Unipolar anaphase, r) vagrant chromosomes at metaphase.

Bar represents 5µm.



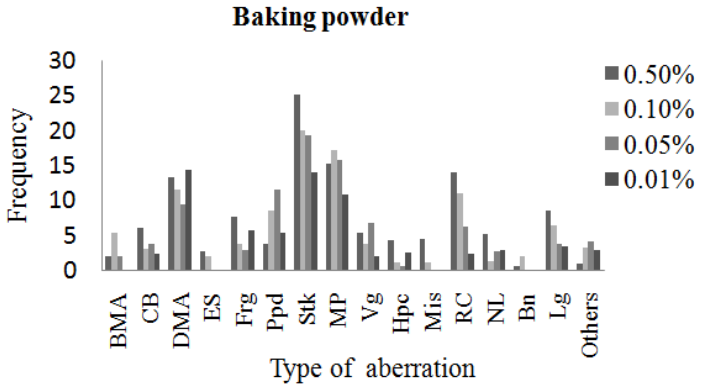


Fig. 2: Relative frequency of different chromosomal aberrations in root meristematic cells of *Allium cepa* following treatments with different concentrations of the food additives.

BMA – Ball meta and anaphases, CB – Chromosome bridge, DMA – Disturbed meta and anaphases, ES – Equatorial separation, Frg – Fragments, Ppd – Polyploidy, Stk – Stickiness, MP – Multipolar anaphases, Vg – Vagrant chromosomes, Hpc – Hyperchromasia, Mis –Misorientation, RC – Ring chromosomes, NL – Nuclear lesions, Bn – Binucleate cells, Lg –Lagging chromosomes.

DISCUSSION

The results of the present study demonstrated clear evidence of the genotoxic potential of the tested food additives. The wide range of observed abnormalities proved that even short term exposure to relatively small doses of BKP and MSG significantly affects the mitotic index and chromosome structure and disturbs mitotic spindle formation. The cytotoxic effects of BKP and MSG are seen to be dependent more on their concentration than the time period, with even the low doses causing a significant rate of decrease of mitotic index and increase in percentage of mitotic abnormalities.

The lowering of mitotic index in the treated root tips could be due to inhibition of DNA synthesis [17], arrest of one or more mitotic phases [18] or blocking of G2 phase in the cell cycle [19] preventing the cell from entering mitosis. The reduction in mitotic activity with increasing concentrations clearly demonstrates the ability of the food additives to inhibit DNA synthesis. Significant genotoxicity observed at the highest concentrations (0.1% and 0.5%) can be another probable reason for the lower mitotic index scores noted at these doses.

The decrease in mitotic activity was accompanied by several clastogenic and non-clastogenic aberrations (Figs 1a – 1r). The two food additives are found to have more or less similar effects on the chromosomes. The most noticeable cytological aberrations detected in treatments were stickiness, fragments, bridges, multipolarity, disturbed meta and anaphase, polyploidy, vagrants *etc.*

BKP treatments showed a high incidence of spindle abnormalities like disturbed meta and anaphases, multipolar anaphases, polyploidy, binucleate cells, laggards, vagrants, diagonal orientation, unequal separation, unipolar movement, stellate anaphase *etc.*, demonstrating its acute damaging effects on the mitotic spindle. Apart from these, many clastogenic abnormalities like stickiness, ring chromosomes, fragmentation, bridges, ball meta and anaphases *etc.* were observed indicating its direct destructive effects on the chromosomes also. Most of the commercial baking powders contain aluminium and cytotoxicity of aluminium on meristematic cells of *A. cepa* and *Zea mays* has previously been reported [20]. Aluminium has been found to affect the control mechanisms of the microtubule cytoskeleton organization and also the normal chromosome movements through the spindle [21], leading to the occurrence of laggards, polyploidy and other physiological aberrations.

The aberrations induced by MSG are more or less comparable to those caused by BKP showing considerable cytotoxic effect. But the frequency of chromosomal aberrations induced was lesser. A high frequency of binucleate cells and chromosome fragments could be noted in response to MSG whereas BKP was found to be more cytotoxic which is evident from the remarkably high proportion of polyploid cells, fragments, stickiness and ring chromosomes it could induce.

Stickiness of chromosomes (Figs 1p, 1g) is one of the major abnormalities noted in the present study. We could observe different degrees of stickiness in all the treatments. Stickiness might have been caused by the physical adhesion of chromosomal proteins [22] or due to the disturbances in the nucleic acid metabolism of the cell or the dissolution of protein covering of DNA in chromosomes [23]. It is suggested that stickiness reflects a highly toxic and usually irreversible condition that probably leads to cell death [19, 24, 25]. Disturbed meta and anaphases (Figs 1m, 1o) are another most frequently observed abnormality noted in the treated cells. It may be caused by the loss of activity of microtubules in spindle fibres leading to complete inhibition of spindle formation [26]. Mitotic bridges (Figs 1b, 1d) are another commonly observed abnormality probably formed by the breakage and fusion of chromosomes [27-29]. Double and multiple bridges were also common. Chromosome bridges and fragments are signs of extreme lethal clastogenic effects resulting from chromosome and chromatid breaks [30]. Fragments (Fig. 1e) may arise due to stretching of chromosomes at metaphase followed by breakage at these fragile sites [31]. The induction of ring chromosomes (Fig. 1o) suggests the possibility of two breaks that occur in the same chromosome or may result from telomeric losses. According to Hall and Garcia [32], presence of ring chromosomes is a condition which is highly lethal to the cell.

High frequency of polyploid cells (Figs 1n, 1o) was observed especially in treatments with BKP. Polyploidy has been attributed to the inhibition of complete disturbance of spindle mechanism [33]. Another important chromosomal aberration noted was presence of binucleate cells (Fig. 1k). The occurrence of binucleated cells was the result of inhibition of cytokinesis or cell plate formation [34, 35]. Lagging chromosomes (Figs 1f, 1g) also have been a regular feature of all the treatments of the present study. Occurrence of lagging chromosomes might be due to the hindrance of pro-metaphase movement of chromosomes, accompanied by adhesion of centromere to the nuclear membrane [36]. Ball anaphases (Fig. 1a) and ball metaphases observed in almost all the treatments with the food additives might be caused by the localized activity of the spindle apparatus at the centre. A considerable proportion of nuclear lesions (Fig. 1k) also could be recorded in most of the treatments which may be due to the disintegration of portion of nuclear material by the action of plant extracts.

Hypoploid cells (Fig. 1j) noted in the treatments might be due to the occurrence of multipolar mitosis or lagging chromosomes producing two hypoploid daughter cells [37]. Multipolar movement of chromosomes (Fig. 1l) observed is another major abnormality that results from severe disturbances in the spindle mechanism [33].

Abnormal pole to pole orientation of chromosomes (Fig. 1m) at metaphase leading to equatorial separation of chromosomes at anaphase (Fig. 1h) is an acute aberrant condition that arises as a result of irregular pathways of spindle assembly and abnormal spindle activity [38, 39]. Diagonal orientation (Figs 1a, 1g) was a

frequent abnormality that may be due to a slight tilt in the spindle apparatus. Scattering of chromosomes could be attributed to the interference of the food additives with the polymerization of the microtubular subunits [40]. Hyperchromasia (Fig. 1i) is one of the most distinguishable states of aberration which is an extremely condensed and deeply staining state of nucleus caused by the influence of toxic chemicals or during incompatible conditions. Gernand *et al*. [41] has suggested that hyperchromasia could be caused by gradual heterochromatinization in response to stress.

It is suggested that compounds shown to be reactive with DNA in one species, have the potential to produce similar effects in other species also [42]. The Significant reduction in mitotic index reported in the present study indicates that the food additives used are having clear antimitotic effects and so should be regarded as having strong cytotoxic potential. The chemicals could disturb nucleic acid metabolism and possibly inhibit the enzymes concerned with spindle production, assembly and orientation which is apparent from the vast array of abnormalities induced. According to Fiskesjo [43], a positive result in *Allium* test should be taken to indicate a potential biological hazard and thus the occurrence of the wide variety of abnormalities is an indication of the high mutagenic potentials of the food additive compounds tested.

CONCLUSION

The results of the current study points out that MSG and BKP that are frequently being used in the food industry possess high genotoxic risks. Both the chemicals could produce a very clear mito-depressive effect in onion root tips. The occurrence of cytological abnormalities like stickiness, breaks, bridges, multipolar anaphases and laggards in high frequencies clearly shows that BKP and MSG are potent clastogens and are having severe damaging effects on the mitotic spindle too.

The outcome of the present investigation suggests that attention should be paid to estimate the toxic potential of the regularly used food additives and other chemicals in consumable items and that *A. cepa* assay can be recommended as a practical and reliable cytogenetic assay for such toxicity assessments.

REFERENCES

1. Leung YA, Foster S. Encyclopaedia of Common Natural Ingredients (used in food, drugs and cosmetics). New York: Wiley Interscience Publication; 1995.
2. Farombi EO, Onyema OO. Monosodium glutamate-induced oxidative damage and genotoxicity in the rat: modulatory role of vitamin C, vitamin E and quercetin. Hum Exp Toxicol 2006; 25: 251-259.
3. Jinap S, Hajeb P. Glutamate. Its applications in food and contribution to health. Appetite 2010; 55: 1–10.
4. Samuels A. The toxicity/safety of MSG: A study in suppression of information. Account Res 1999; 6: 259-310.
5. Prawirohardjono W, Dwiprahasto I, Astuti I, Hadiwandowo S, Kristin E, Muhammed M *et al*. The administration to Indonesians of monosodium L-glutamate in Indonesian foods: an assessment of adverse relations in a randomized double-blind, crossover, placebo-controlled study. J Nutr 2000; 130: 1074S-1076S.
6. Onyema OO, Farombi EO, Emerole GO, Ukoha AI, Onyeze GO. Effect of vitamin E on monosodium glutamate induced hepatotoxicity and oxidative stress in rats. Indian J Biochem Biophys 2006; 43: 20-24.
7. Cotman CW, Kahle JS, Miller SE, Ulas J, Bridges RJ. Excitatory amino acid neurotransmission. In: Bloom FE, Kupfer DJ, editors. Psychopharmacology - The fourth generation of progress. New York: Raven Press; 1995. p. 75-85.
8. Walker R, Lupien JR. The safety evaluation of monosodium glutamate. J Nutr 2000; 130: 1049S-1052S.
9. Praputpittaya C, Wililak A. Visual performance in monosodium glutamate-treated rats. Nutr Neurosci 2003; 6: 301-307.
10. Burde RM, Schainker B, Kayes J. Acute effect of oral and subcutaneous administration of monosodium glutamate on the arcuate nucleus of the hypothalamus in mice and rats. Nature 1971; 233: 58-60.
11. Mohammed KI. The effects of oral dosage of monosodium glutamate applied for short- and long-terms on the histology and ultra structure of testes of the adult rats. J Anim Vet Adv 2012; 11: 124-133.
12. Jija Mathew, John E. Thoppil. Investigation of the antimutagenic activity of three *Salvia* extracts. Int J Pharm Pharm Sci 2012; 4 Suppl 3: 225-230.
13. Herrero O, Perez Martin JM, Fernandez Freire P, Carvajal Lopez L, Peropadre A, Hazen MJ. Toxicological evaluation of three contaminants of emerging concern by use of the *Allium cepa* test. Mutat Res 2012; 743: 20-24.
14. Turkoglu S. Genotoxic effects of mono-, di-, and trisodium phosphate on mitotic activity, DNA content and nuclear volume in *Allium cepa* L. Mutat Res 2009; 62: 171-179.
15. Sharma AK, Sharma A. Chromosome Technique – Theory and Practices. 3rd ed. London: Butterworth; 1990.
16. Duncan DB. Multiple range and multiple *F* tests. Biometrics 1995; 11: 1-42.
17. Sudhakar R, Ninge Gowda N, Venu G. Mitotic abnormalities induced by silk dyeing industry effluents in the cells of *Allium cepa*. Cytologia 2001; 66: 235–239.
18. Kabarity A, Mallalah G. Mitodepressive effect of Khat extract in the meristematic region of *Allium cepa* root tips. Cytologia 1980; 45: 733-738.
19. El-Ghamery AA, El-Nahas AI, Mansour MM. The action of atrazine herbicide as an inhibitor of cell division on chromosomes and nucleic acids content in root meristems of *Allium cepa* and *Vicia faba*. Cytologia 2000; 65: 277–287.
20. De Campos S, Salabert JM, Viccini LF. Cytotoxicity of aluminium on meristematic cells of *Zea mays* and *Allium cepa*. Caryologia 2003; 56: 65-73.
21. Frantzios G, Galatis B, Apostolakos P. Aluminium effects on microtubule organization in dividing root-tip cells of *Triticum turgidum*. I. Mitotic cells. New Phytol 2000; 145: 211-224.
22. Patil BC, Bhat GI. A comparative study on MH and EMS in the induction of chromosome aberration on root meristem of *Clitoria ternata* L. Cytologia 1992; 57: 259-264.
23. Mercykutty VC, Stephen J. Adriamycin induced genetic toxicity as demonstrated by *Allium* test. Cytologia 1980; 45: 769-777.
24. Tipirdamaz R, Gomurgen AN, Kolankaya D, Doğan M. Determination of toxicity of pulp-mill effluents by using *Allium* test. Tarim Bilimleri Dergisi 2003; 9: 93–97.
25. Turkoglu S. Genotoxicity of five food preservatives tested on root tips of *Allium cepa* L. Mutat Res 2007; 626: 4–14
26. El-Khodary S, Habib A, Haliem A. Effect of herbicide Tribunil on root mitosis of *Allium cepa*. Cytologia 1990; 55: 209-215.
27. Haliem AS. Cytological effects of the herbicide sencor on mitosis of *Allium cepa*. Egypt J Bot 1990; 33: 93-104.
28. Anis M, Aijas AW. Caffeine induced morpho-cytological variability in fenugreek, *Trigonella foenum-graecum* L. Cytologia 1997; 62: 343-349.
29. Gomurgen AN. Cytological effect of the herbicide 2, 4-D Isooctylester 48% on root mitosis of *Allium cepa*. Cytologia 2000; 165: 383-388.
30. Young SW, Young PW. Effect of plant growth regulators on mitotic chromosomes. The Nucleus 1993; 36: 109-113.
31. Chauhan N, Chauhan AKS. Genotoxicity of fluoroquinolones in *Allium* test system. J Cytol Genet 1999; 34: 153-160.
32. Hall EJ, Garcia AJ. Radiobiology for the Radiologist. 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2006. p. 656.
33. Minija J, Tajo A, Thoppil JE. Mitoclastic properties of *Mentha rotundifolia*. L. J Cytol Genet 1999; 34: 169-171.
34. Borah SP, Talukdar J. Studies on the cytotoxic effects of extract of castor seed (*Ricinus communis* L.). Cytologia 2002; 67: 235–243.
35. Gomurgen AN. Cytological effect of potassium metabisulphite and potassium nitrate food preservative on root tips of *Allium cepa* L. Cytologia 2005; 70: 119-128.
36. Nagpal A, Grover IS. Genotoxic evaluation of systemic pesticides in *Allium cepa* L. Mitotic effects. The Nucleus 1994; 37: 99-105.
37. Seoana AI, Giierci AM, Dulout FN. Mechanisms involved in the induction of aneuploidy: The significance of chromosome loss. Genet Mol Biol 2000; 23: 4.

38. Ford JH, Correl AT. Chromosome errors at mitotic anaphase. Genome 1992; 35: 702 – 705.
39. Waters J and Salmon ED. Pathways of spindle assembly. Curr Opin Cell Biol 1997; 9: 37-43.
40. Mathur J, Chua NH. Microtubule stabilization leads to growth reorientation in *Arabdiopsis* trichomes. Plant Cell 2000; 12: 465-478.
41. Gernand D, Rutten T, Varshney A, Rubtsova M, Prodanovic S, Brüß C *et al*. Uniparental chromosome elimination at mitosis and interphase in wheat and pearl millet crosses involves micronucleus formation, progressive heterochromatinization and DNA fragmentation. Plant Cell 2005; 17: 2431-2438.
42. Houk VS. The genotoxicity of industrial wastes and effluents – A review. Mutat Res 1992; 277: 91-138.
43. Fiskesjö G (1995). Allium test. In: O'Hare S, Alterwill CK, editors. *In vitro* Toxicity Testing Protocols – Methods in Molecular Biology. Vol. 43. Totowa, N.J. USA: Humana Press Inc.; 1995. p. 119 – 127.

Modern Research in Catalysis, 2013, 2, 35-38
http://dx.doi.org/10.4236/mrc.2013.22005 Published Online April 2013 (http://www.scirp.org/journal/mrc)

Kinetics of the Oxidation of Benzhydrols with Permanganate under Phase Transfer Catalysis in Organic Solvents

Koottil Muhammad Basheer[1], Joy Joseph[2], Thengumthanam Damodaran Radhakrishnan Nair[3*]
[1]Department of Chemistry, Farook College, Feroke, India
[2]Department of Chemistry, St. Joseph's College, Devagiri, India
[3]School of Chemical Sciences, Payyanur Campus, Kannur University, Payyanur, India
Email: [*]tdrnair@rediffmail.com

Received December 21, 2012; revised January 28, 2013; accepted February 6, 2013

ABSTRACT

Kinetic studies of the oxidation of benzhydrol and some of its para-substituted derivatives using phase transferred permanganate in organic solvents that are immiscible with water have been carried out. The products of oxidation were the corresponding benzophenones. Kinetically first order dependence on the concentrations of substrate as well as the oxidant has been observed. The reaction rate was found to decrease with an increase in the dielectric constant of the organic solvent employed. The electronic effects of the substituents were found to be interesting. Both electron withdrawing and electron releasing groups at the para position of benzhydrol increased rate of the oxidation. The effects of different phase transfer catalysts (PTC) were also compared. The activation parameters have been evaluated and a mechanism consistent with the kinetic results has been proposed.

Keywords: Phase Transfer Catalysis; Kinetics; Oxidation; Benzhydrols; Permanganate

1. Introduction

Permanganate is an inexpensive oxidant being widely used in organic synthesis. It is not soluble in organic solvents and hence, oxidations have traditionally been conducted in the aqueous medium. The discovery that materials known as phase transfer catalysts such as crown ethers or quaternary ammonium salts can transport permanganate ions into organic solvents across the aqueous-organic solvent boundary helped to extend its use in organic syntheses to a great extent when the organic substrates are soluble in organic solvents only [1,2]. Kinetics of the permanganate oxidation of some other organic compounds, have been investigated under phase transfer catalysis and the results reported elsewhere [3-5]. We have reported the kinetics of the monochromate oxidation of benzhydrols in non-polar media [6]. In the present kinetic study, we report the results of the kinetic study of the PTC catalysed oxidation of benzhydrols with permanganate along with its p-chloro, p-methyl and p-methoxy derivatives in benzene, chlorobenzene, chloroform and methylene chloride as the organic solvents used.

[*]Corresponding author.

2. Experimental

Benzhydrol (BH), para-chlorobenzhydrol p-(ClBH), paramthylbenzhydrol (p-MeBH) and para-methoxy-benzhydrol (p-MeOBH) used were Lancaster make. The organic solvents were purified by methods known and refluxed with PTC and $KMnO_4$ for three hours and then distilled before use. Analar grade potassium permanganate (Fluka) was used and its solution was prepared in doubly distilled water. Tetrabutylammonium bromide (TBAB) and tetrabutylammoniumhydrogen sulphate (TBAHS) were SRL make and tetrabutylphosphonium bromide (TBPB) was Merck quality and were used as such without further purification.

Solutions of permanganate ions in organic solvents were prepared by shaking an aqueous solution of $KMnO_4$ (0.005 M) with an equal volume of PTC solution (0.01 M) in the organic solvent. Transports of the permanganate ions were almost quantitative. The organic layer was separated and dried over anhydrous Na_2SO_4 and the concentration of the ions ascertained.

The stoichiometry of the reaction was determined by treating a known amount of benzhydrol with a known

excess of phase transferred permanganate and by estimating the permanganate remaining after completion of the reaction. Formation of benzophenone as the only product was qualitatively and quantitatively ascertained by its conversion into the 2, 4-DNP derivative.

Kinetic measurements were carried out under pseudo-first order conditions where, [substrate] ≫ [oxidant] at all the four different temperatures employed. Progress of the reaction was monitored through spectral measurements at definite intervals of time by measuring the absorbance (OD) at 528 nm using the Systronics double beam uv-vis spectrophotometer (model 2201). The pseudo-first order rate constants, kobs, were calculated from the slope of the linear plots of log Absorbance versus time. The second order rate constant, k_2 was obtained from the relation.

k_2 = kobs/[substrate]. Successive scan of the absorption spectra taken at definite time intervals yielded isosbestic points at 498 nm and 582 nm. Experiments were carried out at various concentrations of oxidant and substrate, at different temperatures and in various organic solvents. Different PTCs were also used.

3. Results and Discussion

The stoichiometry of the oxidation was found to be in the molar ratio benzhydrol: permanganate as 3:2. The reaction may be represented by the equation:

$$3Ph_2CHOH + 2Q^+MnO_4^- \rightarrow 3Ph_2CO + 2MnO_2 + 2Q^+OH^- + 2H_2O$$

The successive scans of the absorption spectra which showed isosbestic points at 498 nm and 582 nm, suggests formation of a single product. This oxidation reaction failed to induce any polymerization of added acrylonitrile, which rules out involvement of any radical intermediate during the course of the reaction (Q^+ represents the quarternary ammonium cation).

The values of rate constants determined at different substrate concentrations and oxidant concentrations are given in **Table 1**. The plots of log absorbance due to the [oxidant] versus time were linear, indicating first order dependence on the [oxidant]. This is further supported by the fact that kobs values are constant for different initial concentrations of $Q^+MnO_4^-$ when the substrate concentration was fixed. The second order rate constant, k_2 values are reasonably constant indicating first order dependence on the [substrate] also. This is further supported by the linearity of the log kobs versus log [substrate] plots with a slope of almost unity (slope = 0.9113) and good correlation coefficient (r = 0.9960).

The rates of oxidation of benzhydrol in different organic solvents were found to decrease with increase in the dielectric constant (D) of the medium (**Table 2**). The plot of log k_2 vs 1/D is linear. The decrease in rate of oxidation in solvents with high dielectric constant can be attributed to larger stabilization by solvation extended to the organic part of the quaternary catalyst-oxidant moiety. Moreover, solvents with low dielectric constant exert larger relative desolvation effect on the inorganic MnO_4^- ion part and make it more reactive so that the reaction proceeds faster in solvents with lower D-values.

The experimental activation energy for the oxidation of benzhydrol in chlorobenzene using TBAB as PTC has been found to be 44.04 kJ·mol^{-1}, that with TBPB is 38.26 kJ·mol^{-1} and that with TBAHS is 32.5 kJ·mol^{-1}. The other thermo dynamical parameters such as enthalpy, entropy and free energy of activation values for these different catalysts are given (**Table 3**). The entropies of activation values being largely negative suggests formation of an ordered transition state, possibly with involvement of internal bonding, both inter nuclear and intra-nuclear. The free energies of activation values remain practically constant at 86 kJ·mol^{-1} which is indicative of the operation of similar mechanistic modes for the oxidations.

The same trend is kept up with the oxidation of the para substituted derivatives also (**Table 4**).

Table 1. Effect of change in [oxidant] and [substrate] on the rate of oxidation of benzhydrol.

[BH] × 10^2 (mol·dm^{-3})	$[Q + MnO_4^-]$ × 10^4 (mol·dm^{-3})	kobs × 10^4 s^{-1}	k_2 × 10^3 dm^3·mol^{-1}·s^{-1}
5.00	3.75	2.207	4.414
5.00	5.00	2.240	4.480
5.00	6.25	2.147	4.294
5.00	7.50	2.222	4.444
3.75	7.50	1.735	4.627
5.00	7.50	2.222	4.444
6.25	7.50	2.633	4.213
7.50	7.50	3.263	4.351

Solvent: Chlorobenzene; PTC: TBAB; Temperature: 298 K.

Table 2. Effect of dielectric constant (D) of the medium on the rate of oxidation of BH by $Q + MnO_4^-$.

Solvent	D	k_2 × 10^3 dm^3·mol^{-1}·s^{-1}
Benzene	2.3	6.056
Chloroform	4.8	4.738
Chlorobenzene	5.6	4.444
Methylene chloride	8.9	4.202

$[Q + MnO_4^-]$ × 10^4 = 7.5 mol·dm^{-3} [BH] × 10^2 = 5.0 mol·dm^{-3}; PTC: TBAB; Temperature: 298 K.

Table 3. Activation parameters for the oxidation of BH by $Q+MnO_4^-$ assisted by different PTCs in chlorobenzene.

	$k_2 \times 10^3$ dm^3·mol^{-1}·s^{-1}				Activation parameters at 298 K		
PTC					$\wedge H^{\#}$	$\wedge S^{\#}$	$\wedge G^{\#}$
	293 K	298 K	303 K	308 K	kJ·mol^{-1}	JK^{-1}·mol^{-1}	kJ·mol^{-1}
TBAB	3.360	4.444	5.924	8.116	41.53	−150.64	86.42
TBPB	4.352	5.464	7.204	9.278	35.77	−168.25	85.91
TBAHS	5.042	6.188	7.759	9.618	29.99	−186.6	85.60

$[Q+MnO_4^-] \times 10^4 = 7.5$ mol·dm^{-3}; [BH] × 10^2 = 5.00 mol·dm^{-3}.

Table 4. Reaction rates at different temperatures and activation parameters for the oxidation of parasubstituted benzhydrols by $Q+MnO_4^-$ in chlorobenzene.

	10^3 k_2 dm^3·mol^{-1}·s^{-1}				Activation parameters at 298 K		
Substrate					$\wedge H^{\#}$	$\wedge S^{\#}$	$\wedge G^{\#}$
	293 K	298 K	303 K	308 K	kJ·mol^{-1}	JK^{-1}·mol^{-1}	kJ·mol^{-1}
BH	3.360	4.444	5.924	8.116	41.53	−150.64	86.42
4-ClBH	4.798	6.276	8.064	10.27	35.61	−16.61	85.55
4-MeBH	4.302	5.456	6.958	9.702	37.76	−161.58	85.91
4-MeOBH	5.164	6.840	8.650	10.80	34.32	−171.26	85.35

$[Q+MnO_4^-] \times 10^4 = 7.5$ mol·dm^{-3}; [Substituent] × 10^2 = 5.0 mol·dm^{-3}; PTC: TBAB.

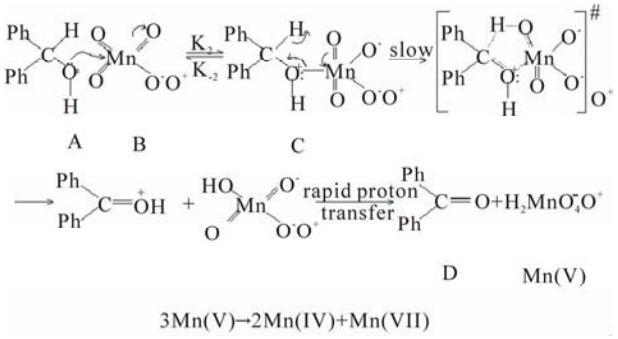
The rates of oxidation of BH at different temperatures were determined using $Q^+MnO_4^-$, phase transferred using different PTCs, and the activation parameters were computed (**Table 3**). The efficiency of different PTCs were found to be in the order TBAHS > TBPB > TBAB.

The higher rate with TBPB in comparison with TBAB may be due to the stronger cation-anion interaction of the ion-pair with TBAB which makes the anion less available for oxidation. The higher rate with TBAHS compared to TBPB may be attributed to the easy ion-pair formation between catalyst cation and reagent nucleophile in non-polar solvent. Moreover, the HSO_4^- anion of TBAHS is highly hydrophilic compared to bromide and readily get partitioned into the aqueous phase, making the transfer of MnO_4^- ions into the organic phase with better ease. Further, the values of $AG^{\#}$ are very close to each other (~85 kJ·mol^{-1}) indicating that same mechanism operates with different PTCs.

Study of the effect of substituents at the para position of one of the benzene rings showed that, both electron donating and electron withdrawing groups enhance the rate (**Table 4**).

The log k_2 vs σ plot is non-linear which was concave upwards. The activation enthalpies and entropies are linearly related. The linear isokinetic correlation implies that all the substituted benzhydrols under investigation are oxidised by the same mechanism. This is further confirmed by the in $AG^{\#}$ values.

According to the Frontier Molecular orbital approach the reaction would be initiated by an interaction of the HOMO of the substrate (an oxygen 2P-orbital containing a lone pair of electrons) with the LUMO of the oxidant (an antibonding orbital located primarily on Mn) resulting in the formation of a permanganate ester [7]. This is followed by the rate limiting slow decomposition of the ester via a five membered cyclic transition state. The large negative entropy of activation is consistent with the formation of a transition state having greater degree of order in its structure.



A rate expression consistent with the above mechanism can be given from the equilibrium, [C] = Keq [A] [B]

$$\text{rate} = k2(C) = k2_{\text{Keq}}[A]\,[B]$$
$$= \text{kobs}\,[B] \text{ When } [A] \gg [B].$$

In the rate determining slow decomposition of the permanganate ester, breaking away of the αC–H bond and formation of the carbon-oxygen double occurs. It is probable that electron donating groups enhance the rate by facilitating the cleavage of αC–H bond, while electron withdrawing groups enhance the rate by facilitating the formation of carbon-oxygen double bond.

4. Conclusion

The kinetics of the permanganate oxidation of benzydrols under PTC in water immiscible organic solvents have been made. The oxidation proceeds faster in solvents with low dielectric constants. Of the three catalysts used TBAHS gave maximum rate. It was interesting to see that both electron donating and electron withdrawing substituents increased the rate. The mechanism explained with necessary kinetic parameters.

5. Acknowledgements

Two of the authors (KMB and JJ) thank the HOD, Chemistry Department, and Calicut University for providing facilities.

REFERENCES

[1] D. J. Sam and H. E. Simmon, "Crown Polyether Chemistry—Potassium Permanganate Oxidation in Benzene," *Journal of American Chemistry Society*, Vol. 94, No. 11, 1972, pp. 4024-4025. doi:10.1021/ja00766a069

[2] A. W. Herriot and D. Picker, "Purple Benzene: Permanganate Oxidations Using Quartenary Ammonium Ions," *Tetrahedron Letters*, Vol. 15, No. 16, 1974, pp. 1511-1514. doi:10.1016/S0040-4039(01)93123-5

[3] R. Sumichrast and V. Helba, "Knetic Studies of the Oxidation of Alcohols by Cetyltrimethylammonium Permanganate," *Reaction Kinetics and Catalysis Letters*, Vol. 48, No. 1, 1992, pp. 93-98.

[4] N. T. D. Radhakrishnan and P. Rajendran, "Phase Transfer Catalysis and Kinetics of Oxidation of Some Secondary Aromatic Alcohols by Permanganate in Organic Media," *Indian Journal of Chemistry*, Vol. 41A, No. 1, 2002, pp. 64-67.

[5] K. Bijudas and N. T. D. Radhakrishnan, "Selective Oxidation of Benzyl Alcohol with Monochrmate in Non Polar Solvents," *Indian Journal of Chemistry*, Vol. 43A, 2004, pp. 1216-1218.

[6] K. M. Basheer, J. Joseph and T. D. N. Radhakrishnan, "Catalysis Onium Salts on the Monchromate Oxidation of Benzydrols in Non Plar Media—A Kinetic Study," *Indian Journal of Chemistry*, Vol. 46A, 2007, pp. 273-275.

[7] K. N. Rankin, Q. Liu, J. Hendry, H. Yee, N. Noureldin and D. G. Lee, "Mechanisms for the Oxidation of Para-Substituted Benzyl Alcohols and Benzyl Ethers by Permanganate," *Tetrahedron Letters*, Vol. 39, No. 10, 1998, pp. 1095-1098. doi:10.1016/S0040-4039(97)10788-2

Acta Chimica & Pharmaceutica Indica

Acta Chim. Pharm. Indica: 3(1), 2013, 10-16
ISSN 2277-288X

MOLECULAR TRANSPORT OF CHLOROMETHANES THROUGH EPDM/PVC SYSTEMS

C. P. MOHAMED KUTTY[*], M. SUNILKUMAR[a], A. SUJITH[a] and M. JAHFAR

Department of Chemistry, Farook College, CALICUT – 673632 (Kerala) INDIA
[a]Department of Chemistry, National Institute of Technology Calicut, CALICUT – 673601 (Kerala) INDIA

(*Received : 14.11.2012; Revised : 28.11.2012; Accepted : 30.11.2012*)

ABSTRACT

The transport behavior of EPDM/PVC composites has been investigated using the three halogenated hydrocarbons; methylene chloride, chloroform and carbon tetrachloride, which are part of the homologous series of the chloromethanes, as probe molecules. Sulphur and peroxide were used for crosslinking the matrix. The dependence of the transport property on crosslink density, nature of penetrants and type of crosslinking system was studied. A peculiarity can be seen among the group of chloromethanes, i.e. sorption increases with increasing number of chlorine atoms or molar volume, as it would be predicted from simple solubility parameter considerations. The mechanism of transport was found to be deviated slightly from Fickian trend. The differences in the equilibrium uptake can be explained on the basis of morphological changes.

Key words: Swelling, Diffusion, Crosslinking, Composites.

INTRODUCTION

Long-term stability and performance of polymeric membranes in solvent and mixed solvent media can be reduced due to sorption and swelling of the membrane matrix. For this reason quantification of sorption and swelling is of major importance for the development of future applications of membrane processes in solvent and mixed solvent media. It is important to understand phenomena like swelling and sorption that contribute to a reduction of the life-time of the membrane. The transport phenomenon is a complex process with a variety of industrial applications. Solvent sorption and diffusion are the limiting factors of polymer end-use applications because these processes might change the mechanical properties and sometimes cause destruction in polymer structures. An investigation of the causes of such phenomena requires a thorough knowledge of the solvent-transport characteristics. Polymer composites have attracted in recent years a great deal of interest. In most cases, fillers are used as additives for improving the behavior of the host polymeric matrix[1].

Reports on the transport of small molecules into selected polymer membranes are available in the literature[2-9]. The sorption equilibria and kinetics of three volatile organic compounds (VOCs) -benzene, chloroform, and acetone- in a newly developed divinyl-terminated poly (dimethylsiloxane) (PDMS[vi]) -oligo polymer were studied[10]. The sorption uptake of each VOC by the polymer was measured gravimetrically at different VOC partial pressures at a constant temperature and at different temperatures between 24 and 50°C. The rate of VOC sorption was monitored until equilibrium was established. Jacob et al.[11], evaluated the water

Available online at www.sadgurupublications.com
[*]Author for correspondence; E-mail: cpmkutty6927@gmail.com

absorption characteristics of the natural rubber composites with reference to fiber loading. The influence of temperature on water sorption of the composites is also analyzed. Moisture uptake was found to be dependent on the properties of the biofibers. The mechanism of diffusion in the gum sample was found to be Fickian in nature, while in the loaded composites, it was non-Fickian. Sisal and oil palm fibers were subjected to different treatments such as mercerization and silanation. The effect of chemical modification on moisture uptake was also analyzed. Chemical modification was seen to decrease the water uptake in the composites.

EXPERIMENTAL

Ethylene propylene diene monomer (EPDM) with an E/P ratio of 62/32 and a diene content of 3.92% was obtained from Herdilla Unimers, New Mumbai. Poly vinyl chloride (PVC) was obtained from Sigma Aldrich. The additives such as sulphur, dicumyl peroxide, zinc oxide, stearic acid, and mercapto benzothiazyl disulphide (MBTS) used were of commercial grade. The fuels were of commercial grade.

The composites EPDM/PVC with different PVC loading and crosslink systems were prepared on a two roll mixing mill (150 x 300 mm), with a nip gap of 1.3 mm and a friction ratio 1 : 1.4. The compounding formulations are given in Table 1. The different crosslinking systems in the study were sulphur (S) and peroxide (DCP). The cure characteristics of the compounds were determined according to ASTM d 2084 by using Zwick rheometer model ODR at 160^{o}C. The composite membranes were compression moulded at 160 degree for optimum cure time using a hydraulic press having electrically heated platens, under a load of 30 tones.

Table 1: Formulation of Mixes (phr)

Ingredient	Vulcanizing system	
	Sulphur	**DCP**
EPDM	100	100
PVC (varying amount)	(0, 2.5, 5, 7.5, 10)	(0, 2.5, 5, 7.5, 10)
Zinc oxide	4	-
Stearic acid	2	-
MBTS	1.5	-
Sulphur (varying amount)	2,3	-
Dicumyl peroxide	-	4

Examination of sorption characteristics

For diffusion experiments, circular samples of diameter 19.6 mm and 2 mm thickness were punched out from the vulcanized sheets and were dried in vacuum desiccators over anhydrous $CaCl_2$ at room temperature for about 24 hours. The original weights and thickness of the samples were measured before sorption experiments. They were then immersed in solvents (15-20 mL) in closed diffusion bottles, kept at constant temperature in an air oven. The samples were removed from the bottles at periodic intervals of 30 minutes, dried for 5-10 s between filter papers to remove the excess solvent on their surfaces and weighed immediately using an electronic balance (Shimadzu, Libror AEU-210, Japan) that measured reproducibly within ± 0.0001 g. They were then placed back into the respective test bottles. The process was continued until equilibrium swelling was achieved. Since the weighing was done within 40 s, the error associated with the evaporation of solvents is negligible. The experiments were duplicates or triplicates in most cases and the deviation was within ± 0.08 to 0.1 mole percentage. The results of the sorption experiments have been expressed as moles of solvent taken by 0.1 Kg of the polymer blend sample, *Qt* (mol %).

$$Qt = \frac{\text{Mass of solvent sorbed/Molar mass of solvent}}{\text{Mass of polymer sample}} \times 100$$

Morphology

The samples for Field Emission Scanning Electron Microscopy (FESEM) were prepared by cryogenically fracturing them in liquid nitrogen. They were sputter coated with gold and morphology examination were performed on a scanning electron microscope (JEOL-JS IN-T330-A-SEM; ISS Group, Whittington, Manchester, U.K).

RESULTS AND DISCUSSION

Effect of PVC Loading

Fig. 1 shows the amount of carbon tetrachloride sorbed throughs pure EPDM and EPDM/PVC systems. It has been observed from the figure that pure EPDM shows higher sorptrion than the PVC loaded system due to the flexible nature of the chains that creates more free volume in the matrix. Adding rigid PVC to EPDM phase improves the barrier property due to the reduction in free volume or microvoids. Increase in PVC content also restricts the macromolecular chain mobility resulting in a tortuous path for the diffusion of the penetrants.

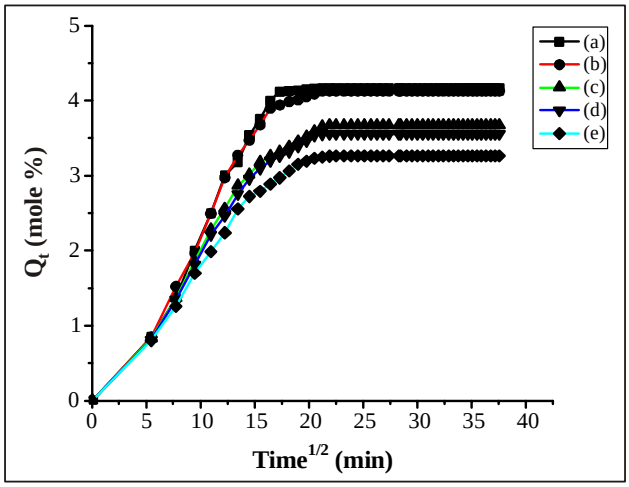


Fig. 1: Mole % uptake of CCl_4 in dynamically vulcanized EPDM/PVC composites: (a) 100/0 EPDM/PVC, (b) 100/2.5 EPDM/PVC, (c) 100/5 EPDM/PVC, (d) 100/7.5 EPDM/PVC and (e) 100/10 EPDM/PVC

Effect of penetrants

Fig. 2 shows the effect of penrtrant size on the sorption and diffusion of three chloromethanes through sulphur cured 100/5 EPDM/PVC composite It follows from the graph that the trend is in the order: carbon tetrachloride > chloroform > methylene chloride i.e., a systematic trend with penetrant size was not observed. The unusual behavior can be explained as follows:

The permeation through any matrix is a combination of sorption and diffusion. The kinetics of diffusion depends on the molecular mass of the solvent whereas sorption depends on the difference in the solubility parameter values[12]. The highest uptake exhibited by carbon tetrachloride is due to the dominance of the solubility parameter over the molecular mass of the solvent during transport. The smaller the difference in solubility parameter, the greater is the affinity of polymer towards the solvent. The Qt value of

methylene chloride is very low as solubility parameter value is far from EPDM. It exceeds size effect of methylene chloride on sorption. Between chloroform and carbon tetrachloride upto four hours, CCl_4 shows low Qt value due to the fact that the diffusion of the larger carbon tetrachloride has a retarding influence compared with chloroform[13]. When the sorption rate increases after that, the size effect is exceeded by solubility product i.e., sorption increases with increasing number of chlorine atoms or molar volume, as it would be predicted from simple solubility parameter considerations. So in chlorinated hydrocarbons, the main deciding factor is solubility parameter. A similar trend has been observed for poly (ethylene-co-vinyl acetate) membranes for aliphatic hydrocarbons[14].

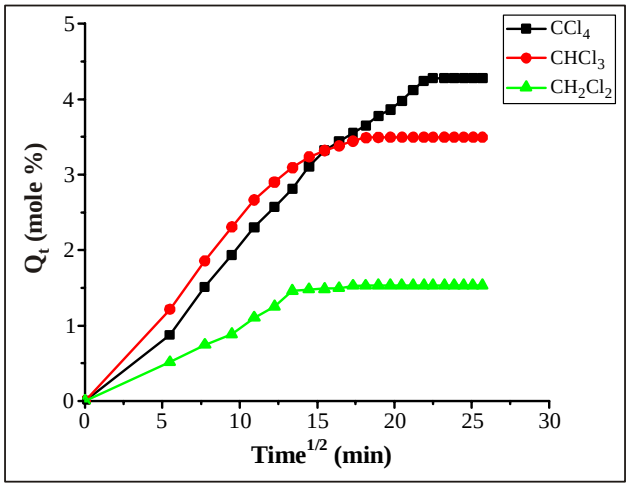


Fig. 2: Mole % uptake of chloromethanes in (sulphur cured) dynamically vulcanised 100/5 EPDM/PVC composite

Effect of type of vulcanization

Fig. 3 shows the effect of the type of vulcanization techniques on the sorption behavior of EPDM/PVC membranes, using carbon tetra chloride as penetrant. It is observed that dynamically vulcanized samples showed a lower swelling compared to the corresponding statically vulcanized one. The dynamic vulcanization produces a fine dispersion[15] of the rigid PVC particles in EPDM matrix as shown in Fig. 4.

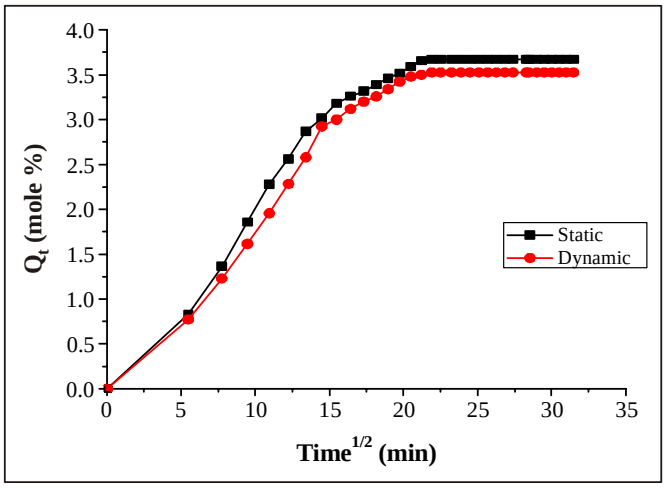


Fig. 3: Effect of type of vulcanization on CCl_4 uptake in sulphur cured 100/5 EPDM/PVC composite

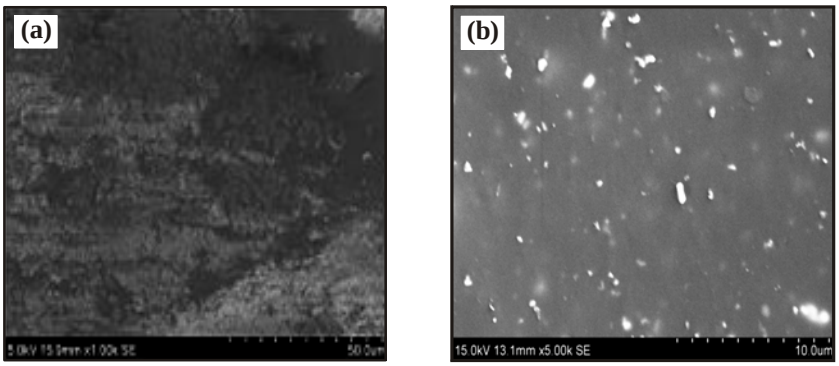


Fig. 4: Scanning electron micrographs of sulphur cured 100/7.5 EPDM/PVC composites; (a) Statically vulcanized (b) Dynamically vulcanized.

Swelling mechanism

In order to investigate the type of transport mechanism, the sorption results were fitted to the following Equation:

$$\text{Log } Q_t/Q_\infty = \log K + n \log t$$

where Q_t and Q_∞ are the mole percent monomer uptake at time t and at equilibrium. k is a constant, which depends both on interaction between solvent and polymer and on the structure of the polymer. The value of n determines the mode of diffusion mechanisms[16]. The values of n and K are given in Tables 2 and 3. Plots of log (Q_t/Q_∞) versus log t showed that the values of n were between 0.5 and 1 and this suggested that the mechanism of transport slightly deviates from normal Fickian behavior observed for conventional elastomers. There is no systematic variation in the value of 'n' with respect to PVC loading.

Table 2: Values of n and K for different PVC loading

EPDM/PVC	n	K x 10^2 (g/g min^2)
100/0	0.661	2.32
100/2.5	0.697	1.99
100/5	0.613	3.04
100/7.5	0.636	2.76
100/10	0.578	3.65

Effect of concentration of sulphur

The Q_t decreases with increase in sulphur concentration. This is due to crosslinking of rubber phase and thereby exerting greater resistance to the flow of solvent. Fig. 5 shows the effect of sulphur concentration on sorption values of EPDM/PVC composite. The crosslink density increases with increase in sulphur concentration.

Effect of crosslinking system

It can be seen that the solvent uptake is higher in sulphur vulcanized system than peroxide cured system. This can be explained by the difference in the nature of the networks possible using sulphur and peroxide systems as can be seen from the Fig. 6. The mono, di and polysulphidic linkages in sulphur system

impart high chain flexibility to the polymer network when compared to the DCP system where only rigid C-C linkages are present.

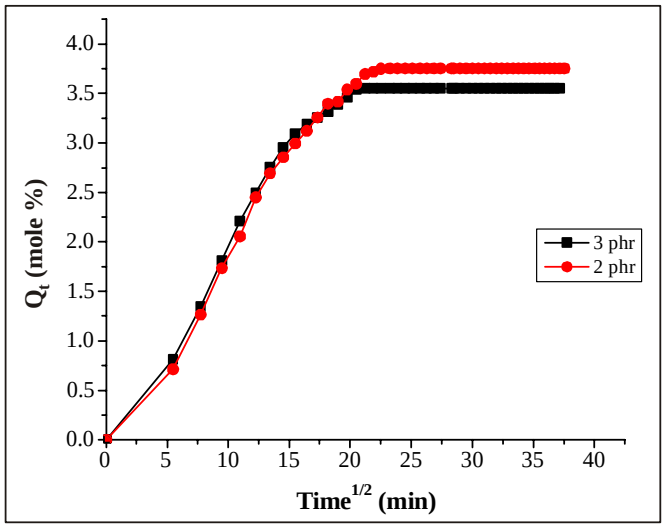


Fig. 5: Effect of sulphur concentration on CCl_4 uptake in 100/5 EPDM/PVC composite

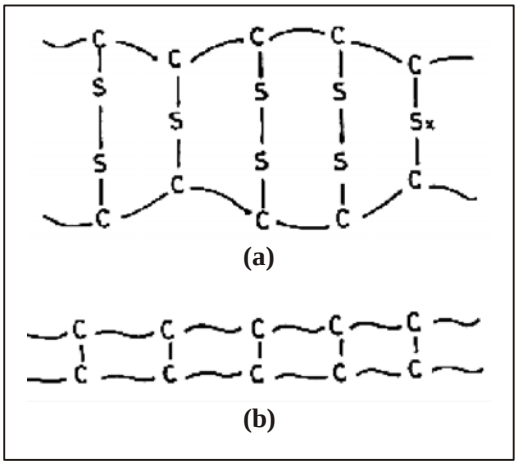


Fig. 6: Structure of networks formed by different vulcanization techniques; (a) sulphur (b) peroxide

CONCLUSION

The transport characteristics of EPDM/PVC composites were studied using carbon tetrachloride, chloroform and methylene chloride as penetrants, with special reference to filler loading, crosslinking systems, concentration of sulphur and penetrant's nature. The diffusion of halogenated hydrocarbon solvents through EPDM/PVC composites revealed that the diffusion was found to decrease with an increase in PVC content, which was attributed to the rigid nature of PVC particles. The sample crosslinked by DCP showed the lowest equilibrium uptake compared to the sample with sulphur vulcanization mode. This can be explained in terms of the differences in the nature and distribution ofcrosslinks in the network. A peculiarity can be seen among the group of chloromethanes, i.e. methylene chloride, chloroform and carbon tetrachloride. Sorption increases with increasing number of chlorine atoms or molar volume, as it would be predicted from simple solubility parameter considerations. The values of n suggest that the mechanism of transport is anomalous.

REFERENCES

1. L. Bokobza, Application of Vibrational Spectroscopy for the Analysis of Polymer Composites, Analytical Sciences, **17**, 675-678 (2001).
2. U. Shanthamurthy Aithal and Tejraj M. Aminabhav, Sorption and Diffusion of Organic Solvents in Polyurethane Elastomers, Polym., **31(9)**, 1757-1762 (1990).
3. I. H. Halimatuddahliana and H. Ismail, Properties of Thermoplastic Elastomers Based on PP/EPDM/ENR 25 and PP/EPDM/NR Blends, J. Teknologi., **39(A)**, 97-106 (2003).
4. K. Karadag, G. Onaram and H. B. Sonmez, Synthesis and Swelling Properties of New Crosslinked Poly Orthocarbonates, J. Appl. Polym. Sci., **121(6)**, 3300-3305 (2011).
5. E. Froehling, D. M. Koenhen, A. Bantjes and C. A. Smoldersn, Swelling of Linear Polymers in Mixed Swelling Agents, Predictability by Means of Solubility Parameters, Polym., **17(9)**, 835-836 (1976).
6. F. A. Long and L. J. Thompson, Diffusion of Water Vapor in Polymers, J. Polym. Sci., **15(80)**, 413-426 (1955).
7. J. Vargas, H. Martimez, A. Santiago, A. Mikhail, T. R. Garino, M. Aguilar-vega, The Effect of Fluorine Atoms on Gas Transport Properties of Poly Norbornene Dicarboximides, J. Fluorine Chemistry, **130**, 162-168 (2009).
8. P. Tiemblo, J. Guzman, E. Rinade, F. Garcia, J. M. Garcia, Gas Transport Properties of Crown-ether Methacrylic Polymers, Polymer, **44**, 6773-6780 (2003).
9. F. Abd El-Salam, M. H. Abd-El Salam and M. I. Mohamed, Vulcanizing System Dependence of the Rubber Swelling, Dielectric and Doppler Shift Characteristics of IIR/EPDM Blends, Egypt, J. Solids, **29(1)**, 181-192 (2006).
10. H. Zhen, S. Jang and W. K. Teo, Sorption Studies of Volatile Organic Compounds in a Divinyl-Terminated Poly(dimethyl siloxane)-oligo Polymer, J. Appl. Polym. Sci., **92**, 920 (2004).
11. M. Jacob, K. T. Varughese and S. Thomas, Water Sorption Studies of Hybrid Biofibiber Reinforced Natural Rubber Biocomposites, Biomacromolecules, **6(6)**, 2969-2979 (2005).
12. M. Padmini, C. K. Radhakrishnan, A. Sujith, G. Unnikrishnan and E. Purushothaman, Molecular Transport of Aliphatic Hydrocarbons Through Styrene Butadiene Rubber/Ethylene Vinyl Acetate Blends, J. Appl. Polym. Sci., **101**, 2884-2897 (2006).
13. I. Blume, P. J. F. Schwering, M. H. V. Mulde and C. A. Smolders, Vapor Sorption and Permeation Properties of Poly (dimethyl siloxane) Films, J. Membr. Sci., **61**, 85-97 (1991).
14. S. Anil Kumar, M. G. Kumaran and S. Thomas, Sorption and Diffusion of Normal Alkanes Through Poly (Ethylene-co-vinyl Acetate) Membranes, J. Polym. Sci., Part B, Polym. Phys., **45**, 2470-2480(2007).
15. R. Asalatha, M. G. Kumaran and S. Thomas, Thermoplastic Elastomers from Blends of Polystyrene and Natural Rubber: Morphology and Mechanical Properties, Eur. Polym. J., **35**, 253-271 (1999).
16. O. Arukalam and I. C. Madufor, The Influence of Penetrant Sizeon the Molecular Transport of Aromatic Solvents Through Calcite-Filled Low Density Polyethylene Composites, Int. J. Academ. Res., **3(5)**, 1, 199-203 (2011).

Marketing strategies of Kudumbashree micro enterprises

Reshmi R

Abstract

Kudumbashree believes that poverty is a multi-phased phenomenon. Hence, they have adopted a holistic approach to tackle the multiple manifestations of poverty and this approach is equivocally stated in the Mission Statement of the project, that for eradicating absolute poverty in ten years through concerted community action under the leadership of local governments, by facilitating organization of the poor for combining self-help with demand-led convergence of available services and resources to tackle the multiple dimensions and manifestations of poverty, holistically .The aim of the project is to study the role of Kudumbashree in alleviating poverty with special reference to their marketing strategies. For the collection of data both secondary and primary sources were used. Interview Schedule was administered for collecting primary data. Kudumbashree micro enterprises perceptibly depict how grass roots-level activities are essential for women's active participation in social and economic life. Even though there are so many pitfalls and shortcoming .These micro units has been successful in reaching the unreached through providing ways and means of living and financial independence.

Keywords: *Area Development Society, Community Development Society, Micro Enterprises, Neighbourhood Groups*

Introduction

Darkness can be removed only by bringing in light. Similarly, poverty can be eradicated only by bringing in prosperity. Poverty is a multi-faced sorry state of deprivation. Hence by meeting one disadvantage in the lives of the poor, poverty cannot be eradicated or mitigated. It cannot be reduced or removed simply by giving money or by charity activities. Unlike the conventional Poverty theories and practices, the monetary factors are not the only contributory to poverty but also due to the deprivation of basic needs, basic facilities and basic rights. Eradication of absolute poverty means restoration of the denied or deprived basic needs, basic facilities and basic rights. To restore the denied or deprived entitlements of the poor the capability of the poor has to be improved first. Capability deprivation is the root cause of poverty and to make them aware of their entitlements is the only solution to overcome this hurdle.

The centrally planned, rigid, individual-oriented uncoordinated, income criteria based poverty eradication programmes of the past that implemented throughout the world didn't give the expected result. More over they were implemented by different agencies and they never gave any room at all for the involvement and commitment of the poor and viewed the poor only as 'resource less receivers of benefits'., Most of the anti-poverty programmes implemented in the world especially in India during the last decades, though seemingly well conceived, have failed due to various reasons. Every programme of the past tried to meet only one of the disadvantages in the lives of the poor and the programmes were implemented by a host of agencies with no co-ordination with one another. The programmes therefore lost focus and the resources got scattered. Being implemented by different agencies also meant many parallel structures for delivering, resulting high delivery costs. The programmes were centrally planned with little flexibility to suit local needs. The target-oriented programmes did not take into account the resource handling capacities of the poor.

All these experiences emphasized the necessity to adopt a holistic approach to fight poverty, with the active participation of the community in the developing countries especially in India. It paved way for a trend in these countries to start poverty eradication programmes with poor people's participation. In tune with this global trend the central government of Indian union also started joint ventures with state governments. One of the participants was Kerala state which took clear and bold steps in this direction. The state designed its own poverty reduction projects by obeying national guidelines. As a result, small ventures took place in different districts in Kerala with the financial help from the central government.

Kerala is a State with an impressive array of achievements in the field of women development. It has a high female literacy rate of 86.2%, a low IMR of 13 (against the national average of 80) a favourable sex ratio of 1032 female/1000 male, low MMR 0.8/1000, High Life Expectancy ratio 74 female/70 male etc., just to mention a few. But in spite of all these achievements the conspicuous absence of women in the public domain remains as a paradox of the Kerala model of development. The economic marginalization of women in the development process has drawn considerable attention during recent years. While the female work participation rate in India increased from 19.7% to 22.7% between 1981 and 1991, in Kerala the ratio declined from 16.6% to 15.9% during the same period. The incidence of unemployment among females in the State is higher

than that among males by 5 times in rural areas and 3 times in urban areas. The unemployment in Kerala is severe and is 3 times larger than that in India.

The sexual division of labour has resulted in the concentration of women in low paying unorganized sectors such as agricultural labour, cottage and traditional industries and selected service sectors. Despite the powerful trade union movements, equal wages for equal work still remains a mirage and gender discrimination at the work place is widely prevalent. The marginalization of women in the economic process and lack of control over resources have been major impediments in improving the status of women in Kerala. In 1993 a beacon light of good hope penetrated the dark and morbid scenario prevailed in the state. The phenomenal success of the CDS(community development society) systems of Alappuzha and Malappuram district encouraged the planners to formulate a participatory, community-based programme for fighting poverty. The concept of Kudumbashree took a definite shape then. Kudumbashree is the inevitable offspring of the collective experience derived from the bleak plight of the anti-poverty programmes of the past, when most of the seemingly well conceived anti-poverty programmes of the Central and State Governments failed to bring about the desired result. Kudumbashree is a mission formed for the total eradication of absolute poverty in 10 years through concerted community action under the leadership of Local Self Government, by facilitating organisation of the poor women for combining self help with demand-led convergence of available services and resources to tackle the multiple dimensions and manifestations of poverty holistically.

This project aims at the empowerment of women, giving them the central place in the programmes meant for their benefit. They will no longer be passive recipients but active leaders. The action plan charted out by this process is to enable women to realize their latent potential, strengthening them through self-help. Kudumbashree views Micro Enterprise Development as an opportunity for providing gainful employment to the people below poverty line and thereby improving their income and living standard. Micro enterprise development is an emerging process which will start with low capital low risk and low profit at the initial stage which will gain momentum and later switch on to low to medium capital and then to low to medium risk. In an advanced stage, it may even reach medium capital medium risk and medium profit with appropriate technology, emerging technology or even with low technology.

To generate additional employment opportunities and to bring down the incidence of poverty, micro enterprise is found to be the best tool by Kudumbashree and it has acquired vast experiences by venturing into innovative micro enterprises in this field over the last 5 years. The micro enterprises set up by Kudumbashree in urban and rural areas of the State by individuals and groups. Providing skill up gradation trainings, self-employment opportunities and infrastructural development through wage employment schemes are the preparing grounds for further development of successful micro enterprises that adopted by this project.. Kudumbashree is bent on giving necessary resource support and facilitate forward/backward linkages etc., to promote micro-entrepreneurship among poor women. Kudumbashree enterprises giving special focus on their marketing strategies, capital accumulation and skill up gradation.

Operational definitions

Area Development Society (ADS)

Area Development Society (ADS) is the federation of 8-10 NHG's formed at ward level, consists of representatives of the poor elected from various federating NHGs. The Area Development Society functions through three distinct bodies viz., General Body, Governing Body and Monitoring and Advisory Committee.

Community Development Society (CDS)

Community Development Society (CDS) is a registered body under the Charitable Societies Act is formed by federating various ADS's at Panchayath level. The CDS has three distinct bodies viz, General Body, Governing Body and Monitoring & Advisory Committee

Micro Enterprises

Micro enterprise is any income generating activity owned, operated and managed by a group, consists of at least five and not more than fifteen women members of the Kudumbashree NHG s with an investment ranging from Rs 5000 to Rs 5 lakh and should have a potential to generate atleast Rs 1500 per member per month by way of wages or profit or both together, with an expectation of turnover ranging from Rs 1 lakh to Rs 5 lakh per year".

Neighbourhood Group (NHG)

It consists of women from 20 – 40 families and acts at grassroots level .NHG are the building block of the organisation. In each Neighbourhood Group from

among its members, five Volunteers are elected for undertaking various functional activities. They are Secretary, President, Community Health Volunteer, Income generation activities volunteer and Infrastructure Volunteer.

Women Entrepreneur

Women entrepreneurs are those who owe organize or operate and control an enterprise including small and cottage industries with not less than 80% of the total workers are woman and whose holding in the enterprise is at least 51%.

Review of literature

Kannan (et al) (2004) made an attempt to analyze the significance of informal women entrepreneurs in generating income for their families .The major findings of the study are- women entrepreneurs depend upon the family for involvement in entrepreneurship. The major reason for involvement in informal trade is due to poverty in their families. In rural India, women turn to self employment and entrepreneurship as a means of earning for livelihood. The study was conducted in five villages around Tuticorn town.

Mohammed Seik (et al) (2004) suggested that in the rural context women's control over ownership of land can play an important role not only in economic betterment but also in terms of social and political empowerment as land is the symbol of political power and social status. Micro credit programmes have to be visualized in the context of new global economic order in liberalization, globalization and privatization policies which have led to job losses in the formal sector decline in social sector spending and growing unemployment. In this scenario the last option left for poor women is self-employment, which micro credit aims to promote. He concluded that since the efficiency of micro credit programmes is not independent of other developmental interventions, it could at best be one of the components of wider developmental agenda.

Jose, Executive Director of Kudumbashree (2006) commented that Kudumbashree views Micro Enterprise Development as an opportunity for providing gainful employment to the people below poverty line and thereby improving their income and living standard. In setting up of Micro enterprises for the poor and enabling to take up livelihood activities Kudumbashree has developed its own methodology. So far 27477 women

from urban area and 2.07 lakh women from rural areas were given the sustainable self-employment opportunities with reasonable income.

Objectives

- To identify different trainings & practices acquired by Kudumbashree units to market their products
- To find various promotional measures adopted by Kudumbashree enterprises for marketing their product.
-

Hypothesis

Kudumbashree micro enterprises face major setback in marketing due to absence of branding, inadequate advertisements, improper personnel selling techniques, unattractive packing and lack of marketing practices. Inadequate marketing strategies have adversely affected the overall performance of each Micro enterprise especially the Repayment Profit making, value addition and diversification.

Area of the study

The study was undertaken in Kozhikode District in Kerala where the activities of Kudumbashree are widespread. It is one of the few districts in Kerala where Kudumbashree has formed highest number of NHG's which are the basic units developed for grass root level functioning. Kudumbashree establishment in Kozhikode district has succeeded in strengthening their activities in urban and in rural areas equally. Kozhikode also enjoys a top rank in the volume of cash turned up through thrift collection and lending by NHG members. With a population of more than 20 lakh, Kozhikode has to bear and solve the problems of a large number of BPL families who constitute around 40% of the total population. People under BPL include destitutes, landless farmers, fishermen, agricultural labourers and artisans. Major chunk of them are the members of Kudumbashree. Kozhikode is also one of the few districts in Kerala where most of the central and state sponsored poverty alleviation programmes are implemented with the support of Kudumbashree. In Kozhikode Kudumbashree has paid attention to start various types of micro enterprises ,giving weightage to variety and innovativeness.

Source of Data

Both primary and secondary data are used for this study. Primary data were collected through specially designed interview schedule or questionnaire. Secondary data were collected from books, magazines, websites, journals, house journals, hand outs, research papers and periodicals.

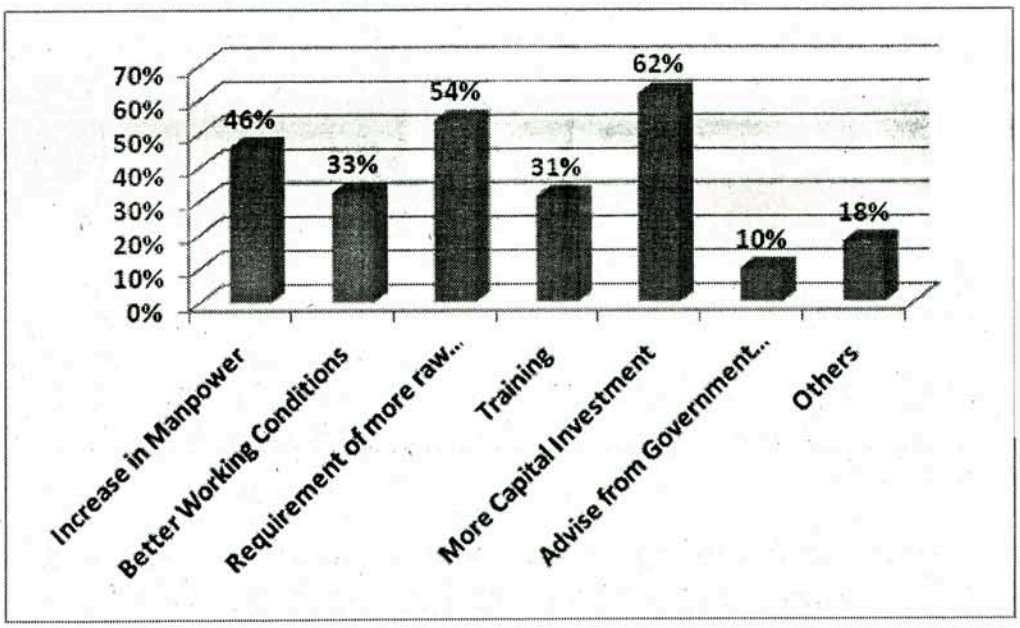
Tools and techniques used for analysis

- Descriptive Analysis
- Average Score and Average Rank Analysis
- Chi-Square Analysis

Table 1 **Steps taken for improvement of the enterprises**

Steps Taken	Frequency	Percentage
Increase in Manpower	41	46%
Better Working Conditions	29	33%
Requirement of more raw material Machineries etc	48	54%
Training	28	31%
More Capital Investment	55	62%
Advice from Government Officials	9	10%
Others	16	18%
Total	**89**	

Figure 1



There is more than one step taken by many of the respondents to improve their enterprises. 62% specified the need of more capital investment. Secondly respondents need more raw materials and machineries for the improvement of their enterprise. Then came increase in manpower better

working conditions and training. Least respondents needed advice from government officials for the improvement of their enterprise.

Table 2 **Factors affecting increase in demand**

	RANKS							
Factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Not Responded**
Price	13 (14.6%)	30 (33.7%)	14 (15.7%)	1 (1.12%)	1 (1.12%)	(0%)	(0%)	30 (33.7%)
Quality	66 (74.1%)	11 (12.3%)	(0%)	(0%)	(0%)	(0%)	(0%)	12 (13.4%)
Increase in Size	(0%)	5 (5.61%)	6 (6.74%)	8 (8.98%)	4 (4.49%)	2 (2.24%)	(0%)	64 (71.9%)
Attractive packing	1 (1.12%)	15 (16.8%)	15 (16.8%)	7 (7.86%)	4 (4.49%)	2 (2.24%)	(0%)	45 (50.5%)
Brand Names	(0%)	(0%)	5 (5.61%)	2 (2.24%)	5 (5.61%)	1 (1.12%)	1 (1.12%)	75 (84.2%)
Colour	(0%)	(0%)	3 (3.37%)	6 (6.74%)	4 (4.49%)	4 (4.49%)	1 (1.12%)	71 (79.7%)
More Advertisement	1 (1.12%)	(0%)	3 (3.37%)	(0%)	(0%)	1 (1.12%)	5 (5.61%)	79 (88.7%)

Source: Primary Data

The factors which occurred mostly under each rank are highlighted. Price and quality are the factors with highest percentage occurred under rank 1.Thus it can be concluded that price and quality are the most affecting factors to increase demand.

Price and Attractive packing got 2nd rank. Thus it can be said that attractive packing affects the demand of the product.

From the above table, it can be seen that 13 respondents (14.6%) have given first rank to price. 30 (33.7%) ranked it as second and 14(15.7%) gave it third rank. Hence price can be considered as an important factor which affects the increase of demand.

74.1% gave first rank to quality and 12.3% ranked it as 2nd .So quality can also be considered as a prominent factor which would increase the demand of the product.

Chi-square analysis

Null Hypothesis: Help extended from Kudumbashree mission has significant influence on profit making of Kudumbashree enterprises

Table 3 Responses on working Results

		Business Profitable		
		Yes	No	Total
Kudumbashree help	Yes	58 85.3%	10 14.7%	68 100.0%
	No	11 61.1%	7 38.9%	18 100.0%
Total		69 80.2%	17 19.8%	86 100.0%

When the cross tabulation of two data count of respondents who got help from Kudumbashree units and count of respondents whose business were running on profit was made, it was found that out of the total 68 respondents who got help from Kudumbashree , 58 made profit from business. 11 out of 18 who never got any help from Kudumbashree also made profit from their enterprise.

It can be inferred from the above table that help from Kudumbashree mission has significant influence on making their business profitable since the hypothesis is accepted at 5% level of significance. It can be therefore concluded that assistance from Kudumbashree mission has a significant influence on profitability of business.

Table 3 Chi square Test- Help from Kudumbashree Versus Business Profitability

	Value	Df	**P value**
Pearson Chi-Square	5.248[a]	1	**.022**
N of Valid Cases[b]	86		

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.56.

b. Computed only for a 2x2 table

Significant= (P value<=0.05)

Limitations of the study

- The research area is restricted to Kozhikode District.
- The sample size is limited to 101 respondents.
- The study is restricted to the women microenterprises formed and organized by the District Kudumbashree Mission
- The respondents who were selected for the study are either the secretary or the president of the microenterprise who acts as leader in respective groups. Opinions of other members were seldom taken in to account.
- The district coordination team of Kudumbashree, Panchayath level community organizers and office bearers of CDS who organize and monitor the Kudumbashree micro enterprise activities did not come under the respondent category.
- The findings are based on a sample survey. Hence, all the limitations of sampling research are applicable.

Findings

- It was found that majority of the respondents i.e. around 70% were exposed to training at the initial stages of the establishments of the units,
- In the initial stages it was seen that 37% got training in manufacturing, 58% in marketing, 29% in personnel selling , 50% in technical and 52% was given training on general orientation.

- Only 53% got training on marketing and 30% never attended any training on marketing.
- It was found that those who got training on marketing, 49% agreed that they got training on direct selling, 30% on conducting sales promotion activities while 34% got training on showroom selling.
- From the study it was seen that 64% of the respondents considered product as the primary component of marketing mix, 15% considered place as the major component, 12% considered price as the major component of marketing mix, while 7% of the respondents did not reveal their opinion.
- It was seen that 75% of the respondents depends on personnel selling, 19% on sales promotion, while only 4% depended on advertisement to promote their product.
- From the study it was concluded that only 7% of the respondents advertised their product. 16% designed their own logo and only 3% assigned outside agency for advertising their product.
- It was observed from the study that 65% of the total respondents have not spent any amount for branding. 6% spent a sum between Rs 1000 to Rs.5000 for branding and advertisement whereas 3% spent a sum above Rs.5000. 26% of the total population did not respond to the question.
- From the study it was found that 78% of the respondents are getting assistance from Kudumbashree in the marketing activities.
- Around 29% were getting assistance in training programme. They help 12% to conduct events, 4% for infrastructure and 61% of the respondents were even getting financial assistance.
- It was clearly observed that 80% of the respondents expected financial assistance from Kudumbashree and 31% required personnel assistance.
- It was seen the 85% of the respondents never developed separate slogan for their micro enterprises.
- It was inferred that 39% of the respondents believed that advertisement made a tremendous impact on total sales whereas 42% felt that advertisements had no impact on sales volume.
- It was observed that 16% of the respondents got an increase above 10% due to advertisement, while 16% responded that there was no increase in sales volume due to advertisement.
- It was explored that marketing campaign helped only 13% of the respondents to sell their product outside the state while for majority (75%) of the respondents, marketing campaign did not help in selling their product outside the state.

- It was seen that for more that 50% respondents, direct selling helped them to increase the sales, 42% accepted point of purchase and 28% considered exhibitions as a technique to increase the sales.
- It was found that 81% of the respondents implemented their project fully.
- Out of 15 who implemented the project partially, 9 said that project is not profitable due to reasons like lack of proper machinery and raw materials, increase in the price of raw material and lack of training.
- From the study it was also observed that out of 89 respondents, 9 opined that their customers belonged to lower income group, 33 responded that their customers were from middle income group, while a small percentage about 3% belonged to higher income category. 46% had the opinion that their customers belonged to all categories.
- From the study, 80% of the respondents claimed that their business was running on profit.
- It was found that 37% of the respondents conducted exhibitions while 54% did not.
- It was seen the 76% viewed their product as eco friendly.
- It was observed that 24% of the units got a profit less than Rs.5000 from these exhibitions, 58% got a profit between Rs.5000 and Rs.10000, 12% got a profit between Rs10000 and Rs.250000. 6% did not respond to the question.
- Another observation of the study was that for the improvement of the enterprises. 62% specified the need of investment of more capital, 54% needed more raw materials and machinery for the improvement of their enterprise and around 46% needed increase in manpower.
- It was inferred from the study that quality was the most affecting factor to increase demand while brand name, colour, increase in size and advertisement did not have much role in increase in demand of the product.
- It was observed that exposure to training of the respondents had significant influence in the profitability of business.
- It was seen that regarding the help from Kudumbashree enterprise, out of the 68 microenterprises who got help from Kudumbashree, 58 made profit from business, 11 out of 18 never got any help from Kudumbashree also make profit from their enterprise.
- Designing of separate slogan had significant influence on the profitability of the business.

Suggestions

- Kudumbashree must ensure that Special camps, orientation classes, workshops are conducted by those people having expertise in the concerned subjects.
- Advanced level classes in topics like Organizational management, financial accounting, entrepreneurship and marketing have to be imparted at CDS level.
- Officials must ensure that they make a visit to the enterprises more frequently giving proper support system, clarifying doubts and proper guidance.
- Follow up classes at ADS level should be arranged for reinforcing the basic level courses given at NHG level.
- Proper guidance and communication must be given to the local authorities, semi government organizations and government aided institutions to purchase the products made by Kudumbashree units. They have to give priority to Kudumbashree units while inviting quotations from the suppliers. This ensures a ready marketability of the products.
- Kudumbashree should ensure that proper guidance should be given for the hygienic disposal of wastages for those who undertake waste disposal project.
- Showrooms, sales counters, small business outlets and discount counters should be opened at every market place in each taluk.
  It would be better if Kudumbashree organizations select each panchayat and taluk and give awareness programmes, show documentary films on hygiene, cleanliness, importance of bio gas plant, water harvesting, solar energy, organic farming .
- The harmful and adverse effect of plastic pollution must be properly imparted to the public as well as to the entrepreneurs.
- Kudumbashree must compel and encourage the entrepreneurs to use eco friendly product in their enterprises.
- Women entrepreneurs should get the benefit of Information technology so that it can be utilized for communicating urgent information about processes, products and marketing strategies. This may help them sharpen their tactics to cope up with the competing world
- Permanent outlets must be opened by the enterprises for selling their products. The organizations must support the entrepreneurs by giving proper advertisement.

- The appeal of the product can be enhanced by attractive packaging as well as the design of a logo for all Kudumbashree enterprises would give a professional touch and even provide a boost in their sales.
- The size of the Micro Enterprises group must be small so as to help the smooth functioning of the group activities and to increase the margin of the individual earning.
- It is recommended to consider atleast the locally available resources, local skills, market conditions, social back ground of the unit members and local needs before selecting the types of micro enterprises for NHG groups. The nature of activity and the products should be designed based on these factors.
- Motivation and Leadership classes must be conducted by the organisation which will definitely help the entrepreneurs to deal with people, lessen conflicts among the groups, boost morale, increase self confidence and gain self respect.
- More importance should be given for adopting alternative advertising modes. Discount melas, display advertising, film advertising, point to point sales, etc can be taken up. They are suitable for tiny enterprises.
- Campaign programmes can be conducted by the organizations by educating the public regarding the importance of small scale business.

Conclusion

The relative success of Kudumbashree enterprises is a clear sign of widespread acceptance of community-based activities done to uplift the poor and downtrodden people. Kudumbashree program has cut across the ideological divide and successfully overcome all the social and economical hindrances in the society. Poor Women have truly been empowered by joining in Kudumbashree organs like Neighbourhood groups and Micro enterprises. It may be stated that perception like capability deprivation as one among the root causes of poverty and building capability of poor is inevitable to make poverty alleviation efforts sustainable is true in all sense. For attaining that goal, it is necessary to smoothen the activities of Micro enterprises. Neighbourhood groups and their allied micro enterprises seems to be the one and only solution to save the rock bottom poor who live in utter distress and despair and who were left out from the coverage.

Kudumbashree micro enterprises perceptibly depict how grass roots-level activities are essential for women's active participation in social and economic life. Even though there are so many pitfalls and shortcoming .These micro units has been successful in reaching the unreached through providing

ways and means of living and financial independence. Even though the Kudumbashree Micro enterprises are in their early stages, they show a clear symptom of sustainability. Around 75% of the units are running on profit. Shortcomings in some areas (in marketing and product standardization) still exist but through more exposure to training and experiences, these hurdles can be bypassed. Adopting all the ways of advertising, appointing Professional agencies for outside advertising, developing a separate logo and slogan for the product, diversifying the product portfolio, conducting regular exhibitions and increasing small outlets and exclusive showrooms for Kudumbashree products are found to be some of the measures to build up a bright future for Kudumbashree enterprises.

Ignorance Management- An Organisational Perspective

Sirajudheen. K.C
Research Scholar
P.G & Research Department of Commerce
The Cochin College, Kochi-2
e.mail: **sirajkca@gmail.com**

Hamamali. E.K
Assistant Professor
Department of Commerce and Management Studies
Farook College, Kozhikode.
e.mail: **hamamaliek@farookcollege.ac.in**

Abstract

This paper aims to bring organizational ignorance to the attention of different scholars to ini the development of a managerial perspective on the unknown. The paper begins with an account of organizational ignorance warrants attention. It also provides a brief overview of ignorance and an acc of how to manage the neglect of the unknown as well as the creation of ignorance. The implications ari from the examination of organizational ignorance are briefly outlined.

Key Words: Ignorance; Organizational Ignorance; Ignorance Management.

Introduction

Most of the people in an organization do not realize that they lack some informatio knowledge. Unknown or ignorance is one of the important factors affecting the organizati performance. Since 1990s the application of knowledge management techniques has bec widespread among organizations. But Most of the organizations are neglecting the fact of ignora among people, even though they are having a good Knowledge Management system. The ro ignorance in the organization's internal and external operations is multifaceted. Nevertheless, management of ignorance may prove productive with positive outcomes for all organizati stakeholders.

The paper begins with a brief overview of ignorance. The nature of ignorance and relation to knowledge is then considered. A review of existing efforts to understand organizati ignorance is then provided before a broader appreciation of ignorance in organizations is elabora The implications arising from the examination of organizational ignorance are briefly outlined call for the development of managerial perspective on the unknown in the concluding section

What is Ignorance?

Ignorance is a state of being uninformed or lack of knowledge. It can lead to "unwise" acts which may hinder organizational performance. Two distinct types of ignorance must be recognized. Firstly, ignorance as known unknowns refers to knowledge of what is known about the limits of knowledge. There are certain things that we know that we do not know. We know the question but we don't know the answer – we are aware of our ignorance. Secondly, ignorance as unknown unknowns refers to a total lack of knowledge such that we are not aware of our ignorance. Unknown unknowns are completely beyond anticipation.

From this brief attempt to define ignorance it is clear that identifying and exploring ignorance in organizations is methodologically challenging. While ignorance in the form of known unknowns can be explored, unknown unknowns, or nescience, are by their very nature impossible to identify. One cannot refer to one's own nescience because it is not part on one's knowledge. However, one can refer to someone else's or to one's own earlier nescience. Furthermore, an important point is the extent to which ignorance is absolute or relative. At the level of the organization, it is the relative ignorance between organizational members and between the organization and its competitors, suppliers and customers that will be of particular significance. However, in relation to the innovative practices of organizations, absolute ignorance will have relevance.

Organizational Ignorance

Organizational Ignorance is defined it in terms of four unique knowledge-processing problems:

1. Uncertainty: not having enough information;
2. Complexity: having to process more information than you can manage or understand;
3. Ambiguity: not having a conceptual framework for interpreting information;
4. Equivocality: having several competing or contradictory conceptual frameworks.

Ignorance Management

Ignorance Management is an integral part of the business organizations. "Ignorance Management is a process of discovering, exploring, realizing, recognizing and managing ignorance outside and inside the organization through an appropriate management process to meet current and future demands, design better policy and modify actions in order to achieve organizational objectives and sustain competitive advantage.

Organizational ignorance can be managed by considering the four unique problems:

Managing Uncertainty

Uncertainty comes from not having enough information to describe a current state or to predict future states, preferred outcomes, or the actions needed to achieve them. Organizations often experience uncertainty as the lack of enough information to make a decision or the inability to predict events upon which some decision depends. In all cases, however, the context of the uncertainty is assumed to be well-defined and meaningful.

Uncertainty can be managed by reducing it or by increasing the organization's ability to tolerate it. Uncertainty can be reduced by:

- Acquiring additional information about something;
- Acquiring, developing or improving the knowledge and ability to predict, infer or estimate sufficiently well using incomplete information.

•Using existing situational knowledge to predict, infer, estimate, or assume facts in j of missing information, with some resulting level of confidence and reliability; and

•developing an ability to respond quickly and flexibly to unanticipated events, for exa by using programmable machining centers or just-in-time inventory processes;

Managing Complexity

Complexity can be defined as a large number of intricately related elements. Com situations are not necessarily vague or unpredictable. Rather, the variety of elements and relations that must be considered simultaneously is just too large to process easily. So, for example, com problems have many potential and interrelated variables, solutions and methods. Complex t are made up of many interrelated steps and factors. Complex organizations have diverse memt functions, processes, organizational units, and reporting relationships. Bringing the appropi level and variety of knowledge and expertise to bear on a situation helps an organization to mar its complexity. Complexity must be reduced by breaking things into simpler parts. This notio reflected in division of labor, market segmentation, and pre-manufactured subassembl Organizations facing complexity must have the capability to locate, develop and bring appropr knowledge, expertise, and skills to bear on those issues. If not, they must restructure their proble roles and routines to simplify those problems or render them more familiar.

Managing Ambiguity

Ambiguity means the inability to interpret or to make sense of something. Regardless the amount of information available about them, situations or events are often neither immediat clear nor understandable. Events are perceived as so new and unfamiliar that one cannot ev make a vague guess about what is important or about what may happen. If uncertainty represe not having answers, and complexity represents difficulty in finding them, then ambiguity represe not even being able to formulate the right questions. No framework for interpreting or applyi potential answers is available; the ability to know what clarifying questions to ask is lacking.

Ambiguity is resolved either by acquiring or creating explanatory knowledge, l reinterpreting a situation to be more meaningful, or by having an interpretation externally impos by others. Ambiguity cannot be resolved by gathering more information. It typically requir repetitive cycles of interpretation, explanation and collective agreement. Hypotheses are iterative created and discussed until some plausible explanation emerges. Rich, interactive face-to-fa conversation among a socially familiar and well-connected yet intellectually diverse set of individua is the key organizational activity for reducing ambiguity.

Managing Equivocality

Equivocality refers to multiple interpretations of the same thing. Taken singly, eac interpretation is unambiguous, but they differ from each other and may be mutually exclusive or i conflict. Managing equivocality requires coordinating meaning among members of an organizatior and is an essential part of organizing. Equivocality arises because everyone's experiences ar unique; individuals and communities develop their own sets of values and beliefs and tend t interpret events differently. Equivocality also may result from unreliable or conflicting informatio sources, noisy communication channels, differing or ambiguous goals and preferences, vague role and responsibilities, or disparate political interests.

Conclusion

Through an examination of organizational ignorance this paper has demonstrated that managing ignorance is more than merely the flip side of knowledge management. Though knowledge management and ignorance management are closely related there are elements of ignorance in organizations that need to be considered as distinct from knowledge and its management. This paper has shown that the role of ignorance in a business organization's internal and external operations is multifaceted. The development of sophisticated organizational systems, which overcome the individual's ability to hold and process knowledge, actually contributes to the ignorance of organizational members. A number of implications arise from the exploration of organizational ignorance. Firstly, the active management of ignorance can contribute to the organization's ability to compete because as illustrated above ignorance can be employed in a strategic fashion. Secondly, ignorance can have an important role in the creative process. Thirdly, ignorance stimulates curiosity and the search for knowledge, as well as promotes new ways of thinking that challenge existing paradigms and thereby it help to push back the boundaries of knowledge. These implications suggest that we must develop our understanding of organizational ignorance so that the opportunities and challenges that it offers can be exploited and managed effectively.

References

1. Beck, U. (1992), Risk Society: Towards a New Modernity, Sage Publications, and London.
2. Boldrin, M. and Levine, D. K. (2008), Against Intellectual Monopoly, Cambridge University Press. Cambridge.
3. Brocas, I. and Carrillo, J. D. (2007), 'Influence through ignorance', RAND Journal of Economics, vol. 38 no. 4, Winter, pp. 931-947.
4. B. Kogut and U. Zander, "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology", Organization Science, Vol. 3, No. 3, August, 1992, pp. 383-397
5. Simon, H. A., "The Architecture of Complexity", in The Sciences of the Artificial, second edition, (Cambridge, MA: The MIT Press, 1969/1981), pp. 193-229

Influence of ICT in Higher Education - A Critical Study of institutions in Northern Part of Kerala State

Dr. V. Kabeer[1] & Sameer V.V.[2]
Department of Computer Science, Farook College,
Kozhikode, Kerala, India
Email: [1]kabeer@farookcollege.ac.in, [2]sameer@farookcollege.ac.in

This paper presents the report of a pilot study conducted to bring out the actual usage of Smartboards and other ICT tools in higher education institutions for teaching learning process. The report is based on the data collected from the selected colleges in Malabar region. It shows that use of ICT tools in higher education institutions are pathetically low demanding high level of attitudinal changes in stake holders and infrastructural upgrade in the higher educational institutions.

Our society has been revolutionized by the influence of Information and Communication technologies. In the last few decades, technology has significantly penetrated into every area of society and, every aspect of social and cultural lives. Computer Networks made it possible for vast amount of information to be made instantly available and modified without much effort. Our children have been grown-up in a world of instant access to knowledge. (Senapaty, 2011), (Summit, 2009).

The effect of globalization and influence of ICT has permeated largely in educational filed also. A teacher who is supposed to mould the future of the students has to perceive his job in a much elevated level. He is producing a commodity that should meet the requirements of the effervescent world and he himself has to comprehend and pond over the following questions for delivering his duty in an excellent way.

- How to remain competitive in Education Sector globally?
- How to attain Excellence in Teaching?
- How to guide & equip our students with satisfactory level of technical knowledge and skills in this competitive and career oriented world?

One apparent method to deal with these concerns is to increase the use of ICT elements in teaching and learning process.

We express our deep sense of gratitude to the following for providing us the details regarding the ICT Tools and usage information in their institutions. Dr. Lajish VL, Dr. Babu Anto, Dr. Mohammed Salim, Dr. Mohammed Ali T, Mr. Remesh Babu, Mr. Riyad, Mr. Shameem Kappan, Dr. Binu P. Chacko, Ms. Beena Cherian, Prof(Dr.) N.K. Narayanan and Mr. Mohammed Saheed.

Benefits of using ICT in Higher Education

Many educationists are predicting that ICT will bring about several benefits to the learner and the teacher. These include sharing of resources and learning environments as well as the promotion of collaborative learning and a general move towards greater learner autonomy (J.David & Sophia, 2013), (Labs, 2012).

Shared learning resources

One of the most striking use of ICT is the enhanced level of sharing of the learning resources, for example in America, educational institutions use video systems to transmit television programmes and information throughout an entire institution and even between institutions in the same district. Students and teachers enjoy the facility to share information wherever they are in the school. Television monitors provide details of timetables, projects and assessment, mealtime menus and a host of other useful up-to-the-minute information. There are also regular play-outs of short films and videos created by children, and some institutions can use several channels for broadcast purposes.

Shared learning spaces

Networked computing facilities create a distributed environment where learners can share work spaces, communicate with each other and their teachers in text form, and access a wide variety of resources from internal and external databases via web based systems through the Internet. Using these shared systems, pupils develop transferable skills such as literary construction, keyboard techniques and written communication skills, whilst simultaneously acquiring knowledge of other cultures, languages and traditions. Furthermore, children are able to make links between internal thinking and external social interaction via the keyboard, to improve their social and intellectual developments in the best constructivist tradition. Children are quickly mastering

the ability to communicate effectively using these new technologies because the experience has been made enjoyable in an unthreatening environment, and there are immediate perceived and actual benefits.

The promotion of collaborative learning

Reasoning and intellectual development is embedded in the familiar social situations of everyday life so the social context of learning has a great deal of importance. Collaborative learning is therefore taking an increasing profile in the curricula of many institutions, with ICT playing a central role. Schools in the UK are already starting to use discussion lists, and other forms of computer mediated communication (CMC) to promote collaboration in a variety of learning tasks and group projects (J.David & Sophia, 2013).

The move towards autonomous learning

At the same time, computers - and the power they bring to the student to access, manipulate, modify, store and retrieve information - will promote greater autonomy in learning. Inevitably, the use of ICT in the classroom will change the role of the learner, enabling children to exert more choice over how they approach study, requiring less direction from teachers. Students will be able to direct their own studies to a greater extent, with the teacher acting as a guide or moderator rather than as a director. This facilitation will take on many facets and will also radically change the nature of the role of the teacher as we currently understand it.

Some available ICT tools for Higher Education

There are several tools available today for facilitating ICT for education. Some of the ICT tools that are very much useful in higher education sector include Media and Audio Visual(AV) Communication - delivery systems like Gyan-Vani, Gyandersan etc are example of this , vocational training tools like CAD, CBT etc, Computer Based Systems - CAI(Computer Assisted Instructions), Internet/Web based education, Smart Educational Institutions, Smart Classes / Digital Class Rooms. Apart from this, use of Multimedia and Animation Tools enables better understanding of concepts, effective and more productive learning experience. E-Community Resources provides mechanism for both Synchronous and Asynchronous modes of communication of students with experts and teachers at different parts of the world.

Audio and Video Based Instructional Tools have proven their effectiveness in many cases, the effectiveness of Audio and Video Conferences, short animations, virtual reality, simulations need no explanation at all. Video based learning as available through NPTeL, eGyankhosh etc has revolutionized impact in higher education sector. Digital devices like Digital Blackboards, electronic pens, touch screens etc. along with LCD Presentations can improve learning experience using visualization tools (Summit, 2009), (Wikipedia, 2014).

Table 1
Human,ICT Resources & Investment available in the selected Colleges

College	Total Teachers	No of Smart Boards	No of T Projectors	Investment in Lakhs
FC	119	7	20	15
FTC	26	2	11	7
UC	250	64	64	64
KU	140	6	30	40
Arts	80	0	13	7
KU ASC	1	1	2	2.5
SS	71	3	15	8
EMEA	65	1	10	5
MAMO	65	0	12	5
PRAJ	28	2	14	7
SSM	60	2	14	10

Real ICT Scenario in Higher Education Sector in Northern Part of Kerala

Though the effectiveness of ICT tools has been recognized, by various means, their uses in many of the Higher Education institutions in Northern Part of Kerala are minimal. Various Governmental and other organizations have started fruitful ventures for supporting educational institutions in the form of funded projects to the institution for establishing ICT facilities in the Colleges/ institutions. Agencies like MHRD, UGC, AICTE, DST etc. have spent crores of rupees to support the institutions to equip them in having ICT facilities in the institutions.

We have made a pilot study to understand the usage and effective utilization of ICT in higher education in the northern part of Kerala. Results of this study show that real world situation is much pathetic than expected. Table 1 presents the available resources int the selected colleges and Table 2 refers the usage of various ICT tools in the selected colleges. Both these tables together derives nutshell inference of the study and the status of each institution and their contribution on ICT enabled higher education in and around Malabar. Figure 1 shows the usage of PPT as an ICT Tool for teaching in the Higher Education sector. It is observed that there is an optimum use of power point presentations in higher education sector for teachings. Figure 2 shows the usage of Digital Libraries and other software tools for higher education in selected colleges. Minimal usage of Digital Libraries are observed in the selected colleges except a very few. However usages of eLearning software in the selected colleges are incredibly low. Finally the figure 2 shows the use of smartboards in the selected colleges. This figure shows that though considerable numbers of smartboards are available in the selected institutions, its usage is unbelievably low. Smartboards in most of the colleges have become mere showpieces or a projection screens.

Table 2
Utilization of available resources in the selected Colleges

College	Teachers using PPT Regularly (%)	Use of Smart Boards (%)	Use of Digital Library (%)	Use of S/w for T&L	Total Avg. Use (%)
FC	40	10	5	3	15
FTC	98	1	7	40	37
UC	3	5	2	0.5	3
KU	10	0	1	0	3
Arts	45	0	1	0	12
KU ASC	10	0	0	0	3
SS	40	10	0.5	0	13
EMEA	90	0	0	0	23
MAMO	30	0	2.5	0	8
PRAJ	50	0	2.5	0	13
SSM	40	0	8.0	0	12

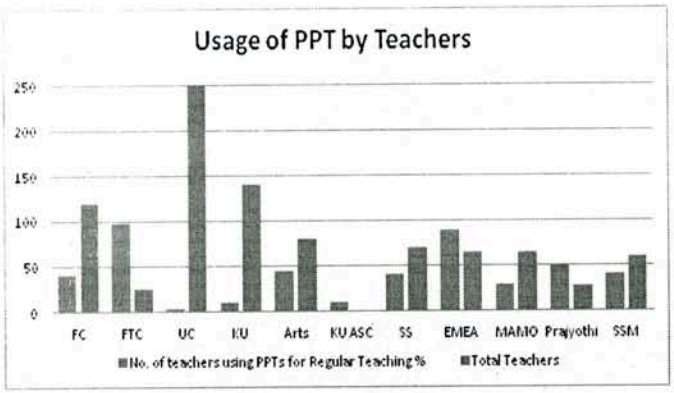


Figure 1. Usage of PPTs by the Teachers for Higher Education in selected colleges

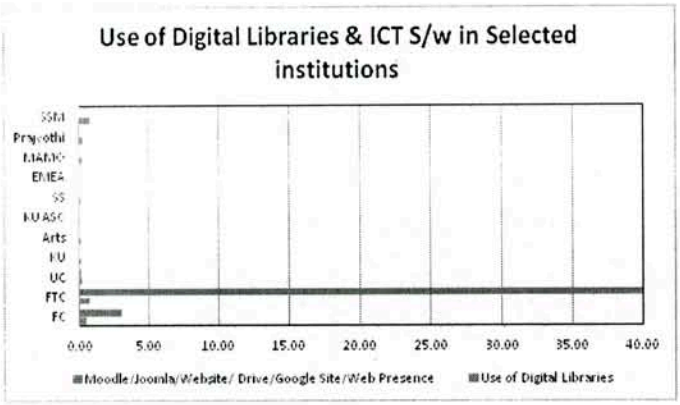


Figure 2. Usage of Digital Libraries and other software tools for higher education in selected colleges.

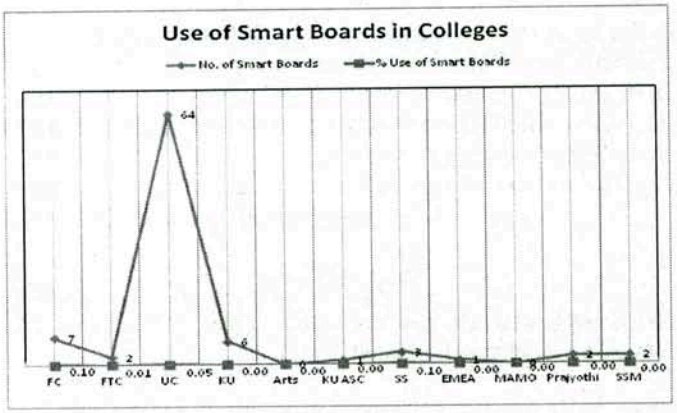


Figure 3. Usage of Smart boards for higher education in selected colleges.

Reasons for low usage of ICT Resources for Teaching & Learning Process in Colleges

It is well understood that ICT resources in many of the institutions are under-utilized. There are varying reasons for this situation. Some of the reasons which came our notice are listed below.

Lack of proper infrastructural facilities. Though many of the institutions have bought smart boards and other equipments they lack the minimal supporting facilities required. For example, most of the institutions which have purchased smartboards do not have sufficient power backup facilities like UPS or seminar rooms etc., so that many a times these devices become useless.

Lack of proper management. Many a times teachers find issues with hardware part of smart devices due to the lack of management devices. Many a times this causes to pull back the teachers to use such devices.

Lack of proper materials. for using ICT enabled education, especially for using smart boards, properly designed delivery materials are required. But no such materials are available in the market presently. It causes reduction in the use of such equipments. This is largely true in the case of language teachers.

Lack of pressure. One of the major reasons why aided college / Govt. college teachers are not using ICT tool and equipments is for the warrant of compulsions from Management or higher authorities. Proper instruction and compulsion may change the situation drastically.

Attitude and laziness. to some extend the attitude of teachers towards using such devices is the main cause of reduced use of ICT equipments. Teachers may not be ready to learn new technologies; rather they are lazy or reluctant to adopt new technologies and trends.

Climate conditions. Since the smart board like devices needs rooms with less lighting the students and teacher find difficult to endure even in normal climate condition. The heat produced by the projector and equipments demand the need of AC rooms which is not available in most of the institutions.

Health problems. Continuous use of projectors or smart boards causes health problems because of the body exposure to the high intensity light beams. Especially it is the case with smart boards since the teacher has to stand before the board while using it.

Conclusion

Although educational institutions are embedded in our culture and reflect its values, the technological changes that have swept through society at large have left the educational system largely untouched. It is true in higher education sector at least in the colleges about which this report pertains to. This study shows that the use of eLearning software and ICT tools like Smartboards are incredibly low in the colleges of the state. Smartboards established in the colleges have become mere show pieces rather than an ICT tool. This situation demands proper training and attitudinal boosting in the higher educational sector so that the stakeholders will start using such tools. Also there should be proper maintenance mechanism and infrastructural facilities to have an increased use of ICT tools in the Colleges.

Références

J.David, L., & Sophia, L. (2013). Ict, in teacher education: Heralding a fresh wave. *ICT in Education International Electronic Journal*, *1*(1), 6-9.

Labs, C. (2012). *Report on it/ict adoption in indian higher education* (Rapport technique). Auteur.

Senapaty, H. (2011). Teacher education in a new paradigm of ict integrated constructivist learning.

Summit, H. E. (2009). Making the indian higher education system future ready,an ernest and young report.

Wikipedia. (2014). Higher education in india. http://en.wikipedia.org/wiki/higher_education_in_india.

Automated Face Recognition using Artificial Light Receptor Model and SVM Classifier

V. Kabeer* & Zainul Abid T.P.**

*Head, Postgraduate Department of Computer Science, Farook College, Kozhikode, Kerala, INDIA. E-Mail: vkabeer@gmail.com
**Research Scholar, Kadalundi, Kozhikode, Kerala, INDIA. E-Mail: zain.tp@gmail.com

Abstract—Machine simulation of human vision has been a subject of intensive research for scientists and engineers due to the numerous challenges associated with it. This paper presents a potential application of a novel biologically-inspired and wavelet-based model for face recognition using Support Vector Machine as classification algorithm. The biological knowledge about the distribution of light receptors, cones and rods, over the surface of the retina, and the way they are associated with the nerve ends for pattern vision forms the basis for the design of this model. A combination of classical wavelet decomposition and wavelet packet decomposition is used for simulating the functional model of cones and rods in pattern vision. The paper also describes results of experiments performed for face recognition using the features extracted on the AT & T face database (formerly, ORL face database) containing 400 face images of 40 different individuals. A feature vector of size 40 is formed for face images of each person and recognition accuracy is computed using the SVM classifier. Overall recognition accuracy obtained for the AT & T face database found to be very promising.

Keywords—Artificial Light Receptor; Feature Extraction; Face Recognition; Pattern Recognition; Support Vector Machine; Wavelets.

Abbreviations—Classical Wavelet Decomposition (CWD); Decision Directed Acyclic Graph (DDAG); Support Vector Machines (SVM); Vapnik-Chervonenkis (VC); Wavelet-based Artificial Light Receptor Model (WALRM); Wavelet based Artificial Light Receptor Feature Parameter (WALRFP); Wavelet Packet Decomposition (WPD).

I. INTRODUCTION

MACHINE simulation of human vision has been a subject of intensive research for scientists and engineers for the last three decades. However automatic face recognition is yet to achieve a completely reliable performance. There are several challenges involved in automatic face recognition -large variation in facial appearance, head size, orientation, changes in illumination and poses, occlusion, presence or absence of structural components etc are some of them to list. The interest devoted to this work is not only by the exciting challenges associated, but also the huge benefits that a Face-recognition system, designed in the context of a commercial application, could bring. Moreover, wide availability of powerful and low-cost desktop and embedded computing systems has also contributed to enormous interest in automatic processing of digital images and videos in a number of applications - Entertainment, Smart cards Information security, Low enforcement and Surveillance are some of them [Grudin, 2000; Daugman, 2001; Yang et al., 2002; Zhao et al., 2003].

Face recognition lies at the core of the discipline of pattern recognition where the objective is to recognize an image of face from a set of face images. A complete face recognition system generally consists of three stages. The first stage involves detecting and localizing the face in arbitrary images [Haddadnia et al., 2000; Wang & Tan, 2000; Li & Jain, 2004; Haddadnia & Ahmadi, 2004].

The second stage requires extraction of pertinent feature from the localized image obtained in the first stage. Finally, the third stage involves classification of facial images based on derived feature vector obtained in the previous stage. In order to design high accuracy recognition system, the choice of feature extraction method is very crucial. Two main approaches to feature extraction have been extensively used in conventional techniques [Daugman, 2001; Li & Jain, 2004]. The first one is based on extracting structural facial features that are local structures of face images, for example, the shapes of the eyes, nose and mouth. The structure based

approaches deals with local information rather than global information, and, therefore is not affected by irrelevant information in an image. However, because of the explicit model of facial features, the structure-based approaches are sensitive to unpredictability of face appearance and environmental conditions. The second method is statistical-based approach that extracts features from the entire image and, therefore uses global information rather than local information.

There have been a lot of popular attempts towards automated face recognition which kept the research in the area active and vibrant. Some of them are Eigenfaces (PCA based approach) [Turk & Pentland, 1991; Moon & Phillips, 2001], Independent Component Analysis (ICA) [Bartlett et al., 2002], Linear Discriminant Analysis (LDA) [Etemad & Chellappa, 1997], a specific kind of genetic algorithm called Evolutionary Pursuit (EP) [Liu & Wechsler, 2000], Elastic Bunch Graph Matching (EBGM) where faces are represented as graphs, with nodes positioned at fiducial points [Wiskott et al., 1999] Kernel Methods which are a generalization of linear methods [Yang, 2002] like KPCA, KLDA, KICA etc., Trace transform, a generalization of the Radon transform [Kadyrov & Petrou, 2001], Active Appearance Model (AAM) is an integrated statistical model which combines a model of shape variation with a model of the appearance variations in a shape-normalized frame [Cootes et al., 2000], Hidden Markov Models (HMM) [Nefian & Hayes, 2000], and Support Vector Machine (SVM) [Guo et al., 2000]. The authors have already made a fruitful attempt for modeling Light Receptors, *cones* and *rods*, using wavelets in the reference [Kabeer & Narayanan, 2009]. And classification results using Artificial Neural Network (ANN) has also been found promising. The present paper is an attempt to use the method with SVM classifier which resulted in better recognition accuracy.

The paper is organized as follows. In Section 2 Wavelet-based Artificial Light Receptor Model (WALRM) for feature extraction method is described. In Sec. 3, Support Vector Machine for face recognition is discussed. Section 4 presents the simulation experiment conducted using AT & T face database and reports the recognition results obtained using SVM classifier. Finally, Sec. 5 gives the conclusions and direction for future research.

II. WAVELET BASED ARTIFICIAL LIGHT RECEPTOR MODEL

Pattern vision is afforded by the distribution of light receptors over the surface of the retina. There are two classes of receptors, called cones and rods. The cones in each eye number between six and seven million, and are located primarily in the central portion of retina. These cones help humans to resolve fine details they see around, largely because each one is connected to its own nerve end. On the other hand, rods are very huge in number when compared to cones. Several rods are connected to a single nerve end, which in turn reduces the amount of detail carried by these receptors. Figure 1 shows this arrangement of rods and cones in retina and biological signal passing structure from retina to the brain. This association of rods and cones with the nerve ends forms the basis for the design of the model in this study.

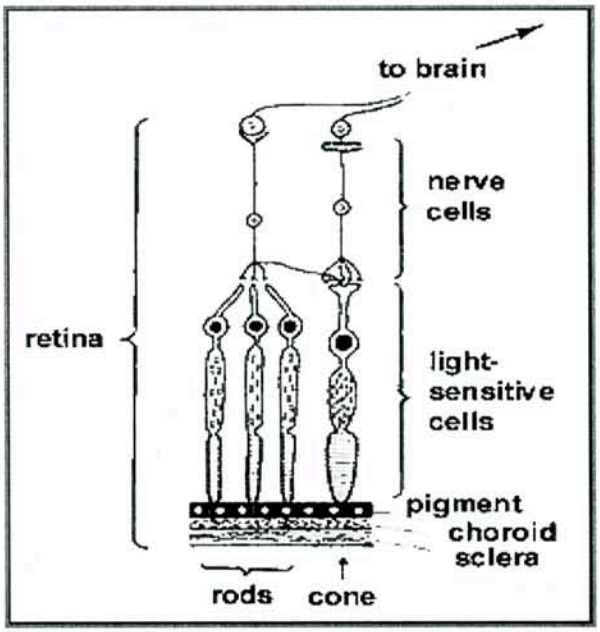


Figure 1: Rods and Cones in Retina and Biological Image Signal Passing Structure

The model is simulated using a combination of Classical Wavelet Decomposition (CWD) and Wavelet Packet Decomposition (WPD). Each face image is described by a subset of band filtered images containing wavelet coefficients. The elements from these coefficients matrices are subjected to simple statistical operations and the results are organized in such a fashion similar to the arrangements of rods and cones in retina giving compact and meaningful feature vectors. Figure 2 shows the block diagram for the entire recognition system using Wavelet based Artificial Light Receptor Feature Extraction Model.

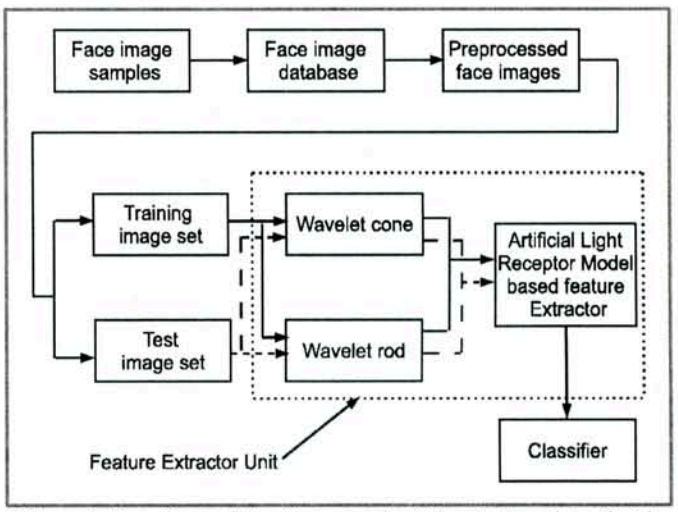


Figure 2: Face Recognition System using Wavelet based Artificial Light Receptor Model for Feature Extraction

2.1. *Feature Extraction Process*

The feature extraction process consists of three stages. In the first stage one component of Wavelet based Artificial Light Receptor Feature Parameter (WALRFP) is created by subjecting the face image to undergo CWD recursively to decompose it into fifth level of resolution (fifth level has been found to be optimum experimentally as illustrated by Table 1). Therefore, the approximation matrix at this level of resolution is significantly small representative of the original image and carries enough information content to describe face image characteristics coarsely. This matrix can be considered as analogous to an image formed in retina at cone area. We call this functional unit in our model as Wavelet Cones. And, each element in the matrix is sent to separate units (nerve ends) as the case may be with human visual system.

Let A_k represents this approximation matrix at decomposition level k, which can be written as:

$$A_k = \begin{bmatrix} A_{1,1} & A_{1,2} & \ldots\ldots & A_{1,n} \\ A_{2,1} & A_{2,2} & \ldots\ldots & A_{2,n} \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ A_{m,1} & A_{m,2} & \ldots\ldots & A_{m,n} \end{bmatrix}$$

Then, the first component of Wavelet based Artificial Light Receptor model driven Feature vector, V_{kC}, is given by,

$$V_{kC} = \bigcup_{i=1}^{m} \bigcup_{j=1}^{n} \{A_{i,j}\}$$

In the second stage, the *Wavelet rods* are used to extract the other component of Wavelet based Artificial Light Receptor feature vector by decomposing each face image using WPD to its fifth level (for the same reason stated before) of resolution. Then we find the best level of wavelet packet decomposition tree. The first coefficient matrix at the best level tree contain enough information to represent the given input face image without loss of much facial features. Let μ represent mean of one row in this coefficient matrix then the second component of the WALRFP vector, V_{bR}, is given by, $V_{bR} = \{\mu_i\}, \forall i, i = 1, 2, 3 \ldots . m$ (number of rows in the best level coefficient matrix).

In the third stage we combined V_{kC} and V_{bR} to form the final wavelet based Artificial Light Receptor Model feature vector $V_{WALRMFP}$.

$$V_{WALRMFP} = \bigcup \{V_{kC}, V_{bR}\}$$

As the wavelet *cone* feature component is of size 12 and wavelet rod component is 28 the estimated $V_{WALRMFP}$ dimension is constraint to forty.

Feature vectors of representative samples had been generated from the database at different decomposition levels, and these feature vectors were subjected to classification using *k-NN* classifier - comparatively faster classification algorithm with lesser accuracy. Table 1 gives the classification results on this representative subset using k-NN classifier.

Table 1: Classification Results on a Representative Subset of Face Database at Various Resolution Levels using k-NN

S. No.	Resolution Level	Feature Size	%Accuracy
1.	1	2604	25
2.	2	672	33
3.	3	196	56
4.	4	70	70.5
5.	5	40	81.5
6.	6	32	46
7.	7	29	30
8.	8	29	30

Analysis of table 1 shows that feature vector generated at resolution level 5 is better than feature vectors at other resolution levels. This analysis lead us to decide the features at resolution level 5 is optimal for recognition.

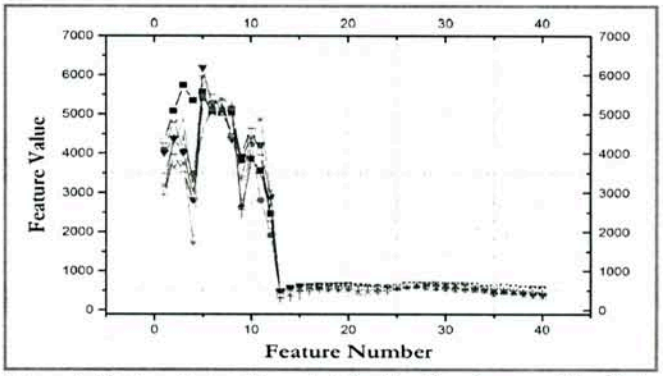


Figure 3: Feature Vector Generated for Ten Face Images of the First Person in AT & T Face Database using the Artificial Light Receptor Model

Figure 3 shows feature vector graph obtained from face database plotted for ten samples of first person in AT&T face database along with the mean curve. The graphs obtained for different samples of same person are found to be quite similar while the graphs for different persons are highly distinguishable.

III. Support Vector Machine (SVM) for Human Face Image Classification

Basically, SVM is a linear machine with some nice properties. In the context of pattern classification, the main idea of a support vector machine is to construct a hyperplane as the decision surface in such a way that the margin of separation between positive and negative examples is maximized. Basically, the support vector machine has the inherent ability to solve a pattern-classification problem in a manner close to the optimum for the problem of interest. Moreover, it is able to achieve such a remarkable performance with no problem domain knowledge built into the design of the machine. The machine achieves this desirable property by following a principled approach rooted in statistical learning theory, structural risk minimization. This induction principle is based on the fact that the error rate of a learning machine on test data (i.e., generalization error report) is bounded by the sum of the training-error rate and

the term that depends on the Vapnik-Chervonenkis (VC) dimension [Vapnik, 1982; 1998].

In the case of separable patterns, the support vector machine produces a value of zero for the first term and minimizes the second term. Accordingly, the support vector machine can provide a good generalization performance on pattern classification problems despite the fact that it does not incorporate problem-domain knowledge [Burges, 1998]. This attribute is unique to support vector machines.

In the present study, an effort is made to build a recognition system using the support vector machine for human face recognition. A notion that is central to the construction of the support vector learning algorithm is the inner-product kernel between a "support vector" $\mathbf{x}_i$ and the vector x drawn from the input space. The support vectors consist of small subset of the training data extracted by the algorithm. We used WLRM based features discussed in the previous section for human face recognition. The recognition results show that this method is more efficient and can be adopted for developing a complete FR system for human face images.

A relatively new learning architecture is employed in the paper the Decision Directed Acyclic Graph (DDAG) [John C. Platt et al., 2000], which combines many two-class classifiers into a multiclass classifier. For an *N-class* problem, the DDAG contains classifiers, one for each pair of classes. DAGSVM operates in a kernel- induced feature space and uses two-class maximal margin hyperplanes at each decision-node of the DDAG. The DAGSVM is substantially faster to train and evaluate than either the standard algorithm or Max Wins, while maintaining comparable accuracy to both of these algorithms.

3.1. Multi-Class Classification using SVM

The problem of multi-class classification, especially for systems like SVMs, doesn't present an easy solution. It is generally simpler to construct classifier theory and algorithms for two mutually-exclusive classes than for N mutually-exclusive classes. Literatures reveal that constructing N-class SVMs is still an unsolved research problem. The standard method for N-class SVMs [Vapnik, 1998] is to construct N-SVMs. The i^{th} SVM will be trained with all of the examples in the i^{th} class with positive labels, and all other examples with negative labels. SVMs trained in this way are referred as 1-v-r SVMs (one-versus-rest). The final output of the N 1-v-r SVMs is the class that corresponds to the SVM with the highest output value. Unfortunately, there is no bound on the generalization error for the 1-v-r SVM, and the training time of the standard method scales linearly with N. Another method for constructing N-class classifiers from SVMs is to combine two-class classifiers.

We have used a multiclass learning architecture, called the Decision Directed Acyclic Graph (DDAG) proposed by John C. Platt et al., (2000). The DDAG contains $N(N-1)/2$ nodes, each with an associated 1-v-1 classifier.

A Directed Acyclic Graph (DAG) is a graph whose edges have an orientation and no cycles. A Rooted DAG has a unique node such that it is the only node which has no arcs pointing into it. A Rooted Binary DAG has nodes which have either 0 or 2 arcs leaving them. Here, rooted Binary DAGs are employed in order to define a class of functions to be used in classification tasks. The class of functions computed by Rooted Binary DAGs is formally defined as follows.

Given a space X and a set of boolean functions $F = \{f: X \to \{0,1\}\}$, the class DDAG(F) of Decision DAGs on N classes over F are functions which can be implemented using a rooted binary DAG with N leaves labelled by the classes where each of the $N(N-1)/2$ internal nodes is labelled with an element of F. The nodes are arranged in a triangle with the single root node at the top, two nodes in the second layer and so on until the final layer of N leaves. The i-th node in layer $j < N$ is connected to the i-th and $(i+1)$-th node in the $(j+1)$-st layer.

To evaluate a particular DDAG G on input $x \epsilon X$, starting at the root node, the binary function at a node is evaluated. The node is then exited via the left edge, if the binary function is zero; or the right edge, if the binary function is one. The next node's binary function is then evaluated. The value of the decision function $D(x)$ is the value associated with the final leaf node (see Figure 4(a)). The path taken through the DDAG is known as the evaluation path. The input x reaches a node of the graph, if that node is on the evaluation path for x. It is referred that the decision node distinguishing classes i and j as the ij-node. Assuming that the number of a leaf is its class, this node is the i-th node in the $(N-j+i)$-th layer provided $i < j$. Similarly the j-nodes are those nodes involving class j, that is, the internal nodes on the two diagonals containing the leaf labelled by j.

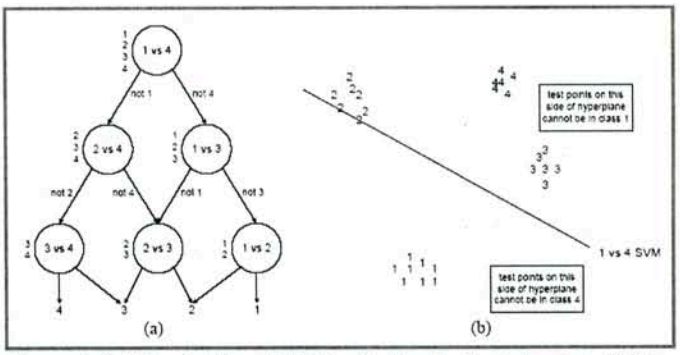


Figure 4: (a) The decision DAG for finding the best class out of four classes. The equivalent list state for each node is shown next to that node. (b) A diagram of the input space of a four-class problem. A 1-v-1 SVM can only exclude one class from consideration

The DDAG is equivalent to operating on a list, where each node eliminates one class from the list. The list is initialized with a list of all classes. A test point is evaluated against the decision node that corresponds to the first and last elements of the list. If the node prefers one of the two classes, the other class is eliminated from the list, and the DDAG proceeds to test the first and last elements of the new list. The DDAG terminates when only one class remains in the list. Thus, for a problem with N classes, $(N-1)$ decision nodes will be evaluated in order to derive an answer. Figure 4(a)

shows the decision DAG for finding the best class out of four classes. The equivalent list state for each node is shown next to that node. Figure 4(b) shows a diagram of the input space of a four-class problem. A *1-v-1* SVM can only exclude one class from consideration.

The current state of the list is the total state of the system. Therefore, since a list state is reachable in more than one possible path through the system, the decision graph the algorithm traverses is a DAG, not simply a tree.

Decision DAGs naturally generalize the class of Decision Trees, allowing for a more efficient representation of redundancies and repetitions that can occur in different branches of the tree, by allowing the merging of different decision paths. The class of functions implemented is the same as that of Generalized Decision Trees [Bennett et al., 2000], but this particular representation presents both computational and learning-theoretical advantages.

IV. Experiments and Results

All the experiments were carried out using the AT & T face database, which contains face images of 40 distinct persons. Each person has ten different images, taken at different times. Figure 5 shows five individuals (in five rows) in the AT & T face images.

Figure 5: Sample Faces Images taken from the AT & T Face Database

There are variations in facial expressions such as open/closed eyes, smiling/non-smiling, and facial details such as with glasses/without glasses. All the images were taken against a dark homogeneous background with the subjects in an up-right, frontal position, with tolerance for some side movements. There are also some variations in scale.

The face image database containing 400 images of 40 different persons were divided into training set and test set by randomly selecting images from the database. The SVM was trained using training set images separately. Then the test set was used to check the recognition accuracy of the method. The results were drawn against each person class in a cumulative manner, and the cumulative recognition accuracy was plotted. The plot in figure 6 shows this. The result shows that there is an overall recognition of 96.65% in AT & T face database for the method proposed. This result obtained was found to be promising when compared to the other methods investigated by the authors.

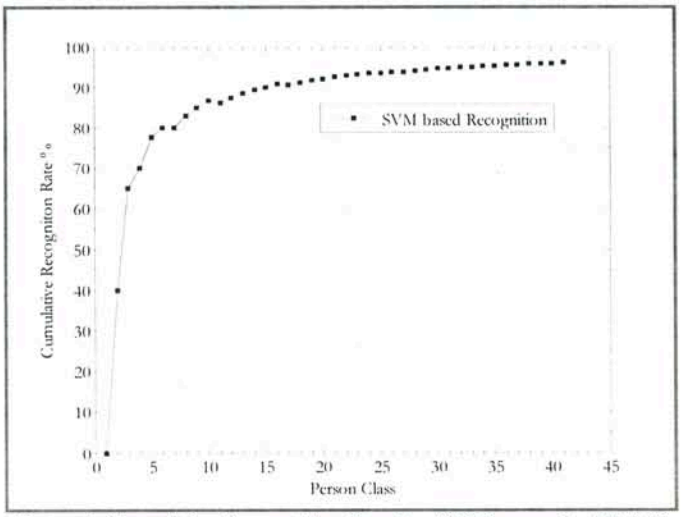


Figure 6: Cumulative Recognition Results of 40 Persons in AT & T Face Database

V. Conclusion

This paper presented a robust Wavelet-Based Artificial Light Receptor Model for extracting face image feature vectors. A feature vector of size 40 is formed for face images of each person and recognition accuracy is computed using SVM classifier. Overall recognition accuracy obtained for the AT&T face database is 96.65%. There is significant dimensionality reduction as we used a feature vector of a 40-element size to represent a face image. More effective implementation of multiple classifier system is one of our future research directions and more research is needed to deal with building a fully functional system.

References

[1] V. Vapnik (1982). "Estimation of Dependences based on Empirical Data" [in Russian]. Nauka, Moscow, 1979. (English translation: *Springer Verlag*, New York).

[2] M. Turk & A. Pentland (1991), "Eigenfaces for Recognition", *Journal of Cognitive Neuroscience*, Vol. 3, No. 1, Pp. 71–86.

[3] K. Etemad & R. Chellappa (1997), "Discriminant Analysis for Recognition of Human Face Images", *Journal of the Optical Society of* America, Vol. 14, No. 8, Pp. 1724–1733.

[4] V. Vapnik (1998), "Statistical Learning Theory". *Wiley*, New York.

[5] C.J.C. Burges (1998), "A Tutorial on Support Vector Machines for Pattern Recognition", *Data Mining and Knowledge Discovery,* Vol. 2, No. 2, Pp. 121–167.

[6] L. Wiskott, J.-M. Fellous, N. Krueuger & C. von der Malsburg (1999), "Face Recognition by Elastic Bunch Graph Matching, in Intelligent Biometric Techniques in Fingerprint and Face Recognition", Editor: L. C. Jain et al. *CRC Press*, Chapter 11, Pp. 355–396.

[7] John C. Platt, Nello Cristianini & John Shawe-Taylor (2000), "Large Margin DAGs for Multiclass Classification", Editors: S.A. Solla, T.K. Leen & K.-R. M¨uller, *MIT Press*, Pp. 547–553.

[8] K. Bennett, N. Cristianini, J. Shawe-Taylor & D. Wu (2000), "Enlarging the Margin in Perceptron Decision Trees", *Machine Learning*, Springer Netherlands, Vol. 41, Pp. 295–313.

[9] T.F. Cootes, K. Walker & C.J. Taylor (2000), "View-based Active Appearance Models", *Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition*, Grenoble, France, Pp. 227–232.

[10] V. Nefian & M.H. Hayes (2000), "Maximum Likelihood Training of the Embedded HMM for Face Detection and Recognition", *Proceedings of the IEEE International Conference on Image Processing (ICIP)*, Vancouver, Canada, Vol. 1, Pp. 33–36.

[11] G. Guo, S.Z. Li & K. Chan (2000), "Face Recognition by Support Vector Machines", *Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition*, Grenoble, France, Pp. 196–201.

[12] J. Haddadnia, M. Ahmadi & K. Faez (2000), "An Efficient Method for Recognition of Human Face using High Order Pseudo Zernike Moment Invariant", 5th *IEEE International Conference on Automatic Face and Gesture Recognition*, Washington, DC, USA, Pp. 315–332.

[13] J. Wang & T. Tan (2000), "A New Face Detection Method based on Shape Information", *Pattern Recognition Letters*, *Vol.* 2, Pp. 463–471.

[14] M.A. Grudin (2000), "On Internal Representation of Face Recognition Systems", *Pattern Recognition*, Vol. 33, No. 7, Pp. 1161–1177.

[15] C. Liu & H. Wechsler (2000), "Evolutionary Pursuit and its Application to Face Recognition", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 22, Pp. 6, Pp. 570–582.

[16] Kadyrov & M. Petrou (2001), "The Trace Transform and its Applications", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 23, No. 8, Pp. 811–828.

[17] J. Daugman (2001), "Face Detection: A Survey", *Computer Vision and Image Understanding*, Vol. 83, No. 3, Pp. 236–274.

[18] H. Moon & P.J. Phillips (2001), "Computational and Performance Aspects of PCA-based Face Recognition Algorithms", *Perception* 30, Pp. 303–321.

[19] M.S. Bartlett, J.R. Movellan & T.J. Sejnowski (2002), "Face Recognition by Independent Component Analysis", *IEEE Transactions on Neural Networks*, Vol. 13, No. 6, Pp. 1450–1464.

[20] M.-H. Yang (2002), "Kernel Eigenfaces vs. Kernel Fisherfaces: Face Recognition using Kernel Methods", *Proceedings of the Fifth IEEE International Conference on Automatic Face and Gesture Recognition*, Washington DC, USA, Pp. 215–220.

[21] M.-H. Yang, D. J. Kriegman & N. Ahuja (2002), "Detecting Faces in Images: A Survey", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 24, Pp. 134–58.

[22] W. Zhao, R. Chellappa, P. J. Philips & A. Rosenfeld (2003), "Face Recognition: A Literature Survey", *ACM Computing Surveys*, Vol. 35, No. 4, Pp. 399–458.

[23] J. Haddadnia & M. Ahmadi (2004), "N-Feature Neural Network Human Face Recognition", *Image and Vision Computing*, Vol. 22, Pp. 1071–1082.

[24] S.Z. Li & A.K. Jain (2004), "Handbook of Face Recognition", *Springer*.

[25] V. Kabeer & N.K. Narayanan(2009), "Wavelet-based Artificial Light Receptor Model for Human Face Recognition", *International Journal of Wavelets, Multiresolution and Information Processing*, World Scientific Publishing Company, Vol. 7, No. 5, Pp. 617–627.

Dr. V. Kabeer, MCA, Ph.D., is the present head of the Postgraduate Department of Computer Science, Farook College, Kozhikode, which is a College identified with Potential for Excellence by the UGC and affiliated to University of Calicut. He earned his Ph.D. in Information Science and Technology from Kannur University, Kerala, India and his MCA Degree from TKM College of Engineering, Kollam, Kerala, India. Previously, he was Associate Professor at MES College of Engineering, Kuttippuram, Kerala. He has more than 17 publications in his credit which include International and National Journals and Conferences. Also, he has made more than 20 invited talks in the areas of his research in particular and Computer Science & Applications in general. He has served as the editor of the MES Journal of Technology and Management in the year 2010. He is a life member of ISTE.

Zainul Abid T P, B.Tech (Computer Engg.), M.E (Computer Science & Engg.) is a research scholar having more than eleven years of teaching and research experience. He has previously worked in M.E.S college of Engg, Kuttippuram, Kerala and Royal College of Engg, Thrissur, Kerala. He pursued his bachelor degree from Cochin University of Science & Technology and masters from University Visheswaraya College of Engg, Bangalore University.

The Global Financial Crisis and Performance of the Indian Corporate Sector: A Firm Level Analysis

** T. G. Saji*
*** S. Harikumar*
**** Mohammed Kasim C.*

Abstract

The U.S. financial crisis has made its upshots on both developed and developing economies of the world. However, India did not face a full - blown recession, but only experienced an economic deceleration, which is normally considered as a temporary phenomenon. Analysis of the financial parameters of corporate India revealed intersectoral as well as intrasectoral differences among them in respect of their financial fundamentals during the period of crisis, which could be attributed to many factors. The Banking sector found an opportunity for growth during the period of crisis, the credit of which goes to wise and judicious policies of the central bank of the country. The Automobile and construction sector were hit most adversely by the crisis due to their high capital intensive nature and stringent measures taken by the lending institutions by cutting back of credit to individuals for adding luxuries to their personal lives. Our IT industry is more exposed to the U.S. and European markets; hence, the financial crisis in these advanced economies affected the export earnings of this sector. However, sharp depreciation of the Rupee helped them to compensate in aggregate what they lost due to the crisis in the global market. Domestic market orientation and not being very capital-intensive are among the factors that insulated the FMCG sector from the downturn. The degree of shock exerted by the global financial turmoil on the performance of the Indian corporate sector was also not the same. While some companies under a particular sector were severely hit by the crisis, fundamentally strong companies could unshackle themselves from it.

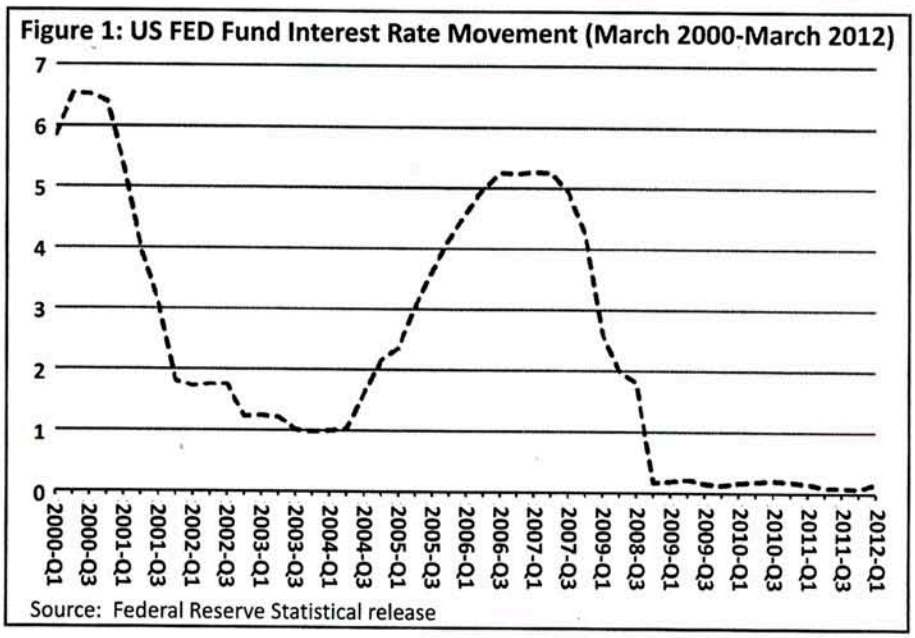
Keywords: **global financial crisis, economic growth, financial performance, t test**
JEL Classification : G01, E4, G3

The U.S. financial crisis has had its aftershock on both - the developed and the developing world. This is because the whole world largely depends on the mighty U.S. for their economic activities. The USA constitutes an average 24 percent of the World GDP. Above all, it is the world's largest exporter, importer, and of course investor in the global financial market. So, the crisis that primarily happened in the U.S. economy was immediately transmitted to its integrated economies, which finally hit their industrial as well as financial markets alike. India is also now closely linked to the world economy by trade in goods as well as trade in services, including investments and its economy is more sensitive to changes in international demands, on account of which the crises across the globe are bringing in multifarious impact on various sectors of the Indian economy. What impact the crisis might have had on a sector can easily be traced out from the performance of its corporate firms. In this paper, we made an attempt to investigate the impact of the global financial crisis on selected industrial sectors of the country. An effort is also made to identify whether there are any firm-level differences in receiving the reverberations of the global crisis by a particular sector or in other way, whether the fundamental strength inherent in a firm itself is immune to the crisis.

The Genesis of the Financial Crisis

The crisis began with the bursting of the United States housing bubble and high default rates on "subprime" and adjustable-rate mortgages (ARM) beginning in approximately 2005- 2006. For a number of years prior to that, declining lending standards (especially reduction of interest rate), an increase in loan incentives such as easy initial terms, and a long-term trend of rising housing prices encouraged borrowers to assume difficult mortgages in the belief they would be able to quickly refinance at more favorable terms. The U.S. Fed fund interest rate (base interest rate of

* *Assistant Professor,* Post Graduate Department of Commerce and Management Studies, Sri C. Acutha Menon Government College, Thrissur, Kerala - 680014. Email:sajthazhungal@gmail.com
** *Professor,* Department of Applied Economics, Cochin University of Science and Technology, Kerala.
E-mail : shari@cusat.ac.in
*** *Research Scholar,* Department of Applied Economics, Cochin University of Science and Technology, Kerala.
E-mail:turn2kas@gmail.com



the U.S. monetary system) has been showing much volatility for the last 10 years (Figure 1). It fell down from the highest point of 6.53 percent in June 2000 to a low of 1 percent by March 2004, which completed its first phase of cyclical change. Again, it started to increase and reached a subsequent high of 5.26 percent in March 2007. Once interest rates began to rise, and housing prices started to drop moderately in 2006 - 2007 in many parts of the U.S., refinancing became more difficult. Defaults and foreclosure activity increased dramatically as easy initial terms expired, home prices failed to go up as anticipated, and ARM interest rates reset higher. Foreclosures accelerated in the United States in late 2006 and triggered a global financial crisis through 2007 and 2008. Then, US central bank intervened to restore equilibrium in the market by slashing interest rates, and as a result, Fed fund rate dropped to an ever time low of 0.12 percent by the end of 2009. The unsteady monetary policy of the country during such a short interval itself forewarned of the miserable days in the near future.

Who can be blamed for the credit crunch of the US financial crisis? Was it due to the unwise and non judicious policies of the U.S. Central bank and other govt. machinery, or due to the imprudent financial practices adopted by U.S. banks and financial institutions in performing their financial functions? The answer is both. When the Federal Reserve and other Govt. machinery of U.S. failed to control the banes of financial capitalism through proper monetary measures, the governance system of its financial market collapsed, which made it more asymmetric in terms of information efficiency. Valuation of assets based on future earnings done by third party agencies for deciding lending standards and very liberal but dodgy formalities followed by the financial institutions for advancing loans to their customers - all these factors lead to bursting of the housing bubble - "the most significant risk of the U.S. economy". Integration of investment banking with commercial banking made the banks and other financial institutions more exposed to stock market imperfections. Loss of value of their investments due to the volatility of the bourses was a double shock for these financial institutions, who had already sustained losses due to the default in payment of loans by their customers.

Slowdown In Economic Growth

❖ **The Global Scenario :** For a layman, recession is a contraction of business activity. But as per the definition universally accepted by economists, an economy is in recession when its GDP growth becomes negative for two consecutive quarters. The Table 1 summarizes the quarterly GDP growth rate of the selected economies of the world.

U.S. GDP became negative during the last two quarters of 2008 and the first two quarters of 2009. After that, it showed symptoms of recovery, and the year ended with a positive GDP rate of 5.9 percent. Germany and France were also on the same path of economic growth as was the U.S., however, their relative performance during the end of the accounting year 2009 was not something to cheer about. UK has been in recession for the last two years. Japan's

Table 1: Quarterly GDP Growth Rate of Selected Economies (March 2007 - March 2012)							
	USA	Germany	France	U.K.	Japan	China	India
2007-Q1	1.2	0.3	0.7	0.8	1.8	13	9.8
2007-Q2	3.2	0.3	0.4	0.6	-1.6	12.6	9.2
2007-Q3	3.6	0.8	0.7	0.5	0.1	11.5	9
2007-Q4	2.1	0.1	0.3	0.5	1.5	11.2	9.3
2008-Q1	-0.7	1.6	0.5	0.7	5.6	10.6	8.6
2008-Q2	1.5	-0.6	-0.4	-0.1	-8.1	10.1	7.8
2008-Q3	-2.7	-0.3	-0.2	-0.9	-4	9	7.7
2008-Q4	-5.4	-2.4	-1.5	-1.8	-10.2	6.8	5.8
2009-Q1	-6.7	-3.5	-1.4	-2.5	-4.9	6.2	5.8
2009-Q2	-0.7	0.4	0.3	-0.7	2.2	7.9	5.8
2009-Q3	1.7	0.2	0.2	-0.2	-0.5	9.1	7.9
2009-Q4	3.8	0.7	0.6	0.1	1.5	10.7	7.2
2010-Q1	3.9	0.2	0.3	0.4	2.2	11.9	8.8
2010-Q2	3.8	1.1	0.6	1.1	0.1	10.3	8.4
2010-Q3	2.5	0.7	0.3	0.7	0.9	9.6	8.3
2010-Q4	2.3	-0.5	0.3	-0.5	-0.8	9.8	7.8
2011-Q1	0.4	0.2	0.9	0.2	-0.2	2.2	7.7
2011-Q2	1.3	-0.1	-0.1	-0.1	-0.3	2.3	6.9
2011-Q3	1.8	0.6	0.3	0.6	1.9	2.4	6.1
2011-Q4	3	-0.3	0.1	-0.3	0	1.9	6.9
2012-Q1	2.2	0.5	0.2	0.3	4.1	1.8	6.6

Source: USA: Bureau of Economic Analysis; Germany: German Federal Statistical Office ; France: INSEE National Statistics Office; U.K: U.K Office for National Statistics; Japan: Economic and Social Research; China: National Bureau of Statistics; India: Central Statistical Organization.

conomic growth was in the negative zone for most of the year 2008 and also in the first quarter of 2009, but later, it ould somehow manage to consolidate its position. However, the growth rate of the economies of India and China did ot plunge into the negative terrain.

• **The Indian Response :** After a long spell of growth from 2001, the Indian economy experienced a slump in 2008. showed a low growth rate of 6.7 percent in 2008-09, but achieved 7 percent or little more growth in the financial year 009-10 and 2010-11 (Table 1). The economy expanded by an average of 8.5 percent between 2003-04 and 2008-09. .ll these data reveal that India was not facing a recession, but experiencing an economic deceleration, which is ormally considered as a temporary phenomenon. Even though India has not been experiencing a recession at the ame scale that the global economy is passing through, our industrial growth is faltering, inflation was at double digit evel, the current account deficit has been widening, foreign exchange were depleting and rupee was declining, specially in 2008-09 (Table 2). The most immediate effect of the crisis on India has been the outflow of foreign stitutional investment from the equity market. Foreign Institutional investors, forced to retrench assets in order to over losses in their home countries and seeking havens of safety in an uncertain environment, became major sellers in ie Indian market. This action pulled down the SENSEX. It fell from its closing peak of 20,873 on January 8, 2008, to ss than 10,000 by December 2008 by bringing an average 50 to 55 percent loss to the investors (see the trend in the ovement of SENSEX and FII net investments given in Table 3).

Certain sectors, especially Textiles, Gems, Jewels, Leather products, Information Technology and IT enabled rvices, etc. are mainly dependant on the U.S. and European markets. Recession generated by the financial crisis in iese advanced economies as a group, and the U.S. in particular, adversely affected export of these products, and these ctors in India experienced deceleration at a relatively faster pace. More than 75 percent of our software and IT

enabled services exports are directed to the U.S. market. In this uncertain environment, banks and financial institutions concerned about their balance sheets, have been cutting back on credit, especially volume of housing, automobile and retail credit provided to individuals. As per the RBI figures, the rate of growth of auto loans fell from close to 30 percent over the year ended June 30, 2008 to as low as 1.2 percent. Direct housing loans, which had increased by 25 percent during 2006-07, declined to 11 percent growth rate in 2007-08 and 12 percent over the year ended in June 2008. Loans to finance consumer durables purchases fell from around ₹ 6000 crore in June 2007 to a little over ₹ 4000 crore up to June 2008. All these data in aggregate shows that the global financial crisis considerably affected both automobile and real-estate - construction sector of our country.

Table 2: Performance of the Indian Economy at a Glance

Year	Forex reserves (US$ Million)	Exchange rate (Rsvs US$)	Current account deficit (US$ Million)	Index of Industrial production Base: 2004-05=100	Inflation WPI (12 Month Average)
2006-07	199179	43.59	9565	122.6	6.5
2007-08	309723	39.98	15737	141.7	4.8
2008-09	251985	50.94	27915	145.2	8.0
2009-10	279057	45.13	38383	152.9	3.6
2010-11	304818	44.64	44281	165.5	9.4

Source: Economic survey 2010-11 and RBI Hand Book of Statistics on Indian Economy 2010-11

Table 3: SENSEX and FII Net Investments in Equity - A Comparison

Period	2006-07		2007-08		2008-09	
	SENSEX	FII net investments -Equity(crores)	SENSEX	FII net investments -Equity(crores)	SENSEX	FII net investments - Equity(crores)
June	10609	1418.1	14651	7169.8	13462	-10577.5
September	12454	6231.1	17291	18948.6	12860	-7936.6
December	13787	-3593.6	20287	4896.6	9647	1319.1
March	13072	1403.1	15644	124.5	9708	269.2

Source: Capital markets, CMIE

Data and Methodology

❖ **Sample and Data Frame :** For the purpose of the study, we have identified six sectors viz. Banking, Information Technology, Real Estate, Automobiles, Pharmaceuticals and Fast Moving Consumer Goods (FMCGs). While the first two sectors (Banking and IT) represent growth industry groups (sectors which have a good potential for growth), the third and fourth (Real Estate and Automobiles) sectors give proxy for cyclical industry groups (performance of which truly reflects the changes in phases of an economic cycle). The last two sectors (Pharmaceuticals and FMCGs) are true approximations for the defensive category (industry, due to its inherent nature, can immune itself to the shocks exerted by the most terrible days of the economy). From each sector, we identified the 10 top companies in terms of sales and earnings, and the needed data were obtained from their annual reports. However, we are reporting the financial performance of only 4 prominent companies from each identified group. The data set covered the period from 2006-07 to 2008-09 for getting proper insight on the performance of the companies during the pre and post crisis period.

❖ **Methodology :** We have mainly used the key financial variables - sales and earnings (profit after tax) for the purpose of the analysis. Profit margin, Solvency position, Return on Net Worth, EPS and Dividend yield were in part also used in this study. Paired t- test was used for testing the significance of difference between the selected financial variables (earnings and sales revenue) at different points of time.

Results and Discussion

❖ **Performance of the Indian Corporate Sector - An Overall View :** The Tables 4 to 7 analyze the financial

performance of the selected corporate firms in India during the study period. From the analysis, we can observe intersectoral as well as intrasectoral differences in financial fundamentals of the corporates during the period of crisis. In absolute terms of EPS, the entire sector except Realty did well, but only the banking companies could maintain parity among them in terms of their growth in earnings. However, almost all companies under study declared dividend at a relatively attractive rate. However, the rate of earnings distributed by companies like Unitech and Maruti were marginal only. When the Realty sector proved to be the most sensitive to market changes motorized by the crisis, the performance of the Pharma sector could not substantiate its name of 'defensive' sector. The Automobile sector had mixed reactions to the market conditions, but the FMCG sector was able to consolidate its position.

❖ **Sector Wise Analysis of Performance of Corporate Firms :** Industry wise explanation of glimpses of facts revealed through the analysis of this study is briefly explained in the following discussion :

Table 4: Financial Performance of the Selected Companies in 2006-07

Industry	Sales growth	Earnings growth	Profit margin(net)	Solvency ratio	ROI	Return on networth	Dividend yield	EPS
Banking								
BOI	0.31	0.24	15.89	16	1.92	25.51	16.34	23.04
SBI	0.09	0.03	10.12	13.92	1.66	14.5	18.98	86.29
UBI	0.27	0.25	10.62	18	1.54	17.86	24.2	16.74
PNB	0.16	0.07	12.53	13.79	1.56	15.18	30.71	48.84
Reality &Infrastructure								
Unitech	2.74	13.12	10.62	18	1.54	17.86	24.2	6.35
JP Associates	0.10	-0.35	11.61	2.12	12.89	16.18	21.91	18.92
DLF	0.16	0.78	28.38	10.37	8.87	62.15	98.3	2.65
Relinfra	0.45	0.23	12.43	0 .68	3.6	9.27	17.68	35.07
Automobile								
Hero Honda	0.14	-0.12	8.58	0 .07	45.61	34.73	6.25	42.96
Maruti	0.21	0.31	10.29	0 .09	29.45	22.78	9.72	54.07
M&M	0.22	0.25	10.34	0 .46	22	30.33	30.39	44.88
Tata Motors	0.33	0.25	6.94	0 .59	23.88	28	35.34	49.65
FMCG								
Marico	0.31	0.17	8.39	0 .91	53.93	62.4	39.09	1.88
Dabur India	0.30	0.33	14.41	0 .05	72.07	65.75	55.24	2.92
United Spirits	0.36	10.76	17.81	1.09	15.64	36.97	5.64	52.21
Colgate	0.16	0.16	11.82	0 .02	87.9	57.09	92.47	11.78
Pharmaceuticals								
Cipla	0.19	0.10	14.58	0 .22	23.6	17.89	23.41	8.59
Pfizer	0.10	0.55	14.1	0	39.07	24.79	40.23	35.43
Sun Pharma	0.29	0.36	26.69	0.44	-1.55	25.68	23.57	32.52
Dr. Reddy's Lab.	0.89	3.19	29.01	0 .08	28.22	26.9	6.25	70.09
Information Technology								
Infosys	0.46	0.48	28.05	0	37.86	33.89	19.85	66.23
Wipro	0.34	0.41	20.34	0 .03	34.04	30.5	35.2	19.48
TCS	0.39	0.38	11.61	0 .01	53.04	46.62	34.46	38.39
Tech Mahindra	0.30	-0.70	2.35	0 .06	77.44	7.42	46.52	26.84

Source: Compiled from annual reports of companies

❖ **Banking :** There was a significant growth in both sales and earnings of the banking industry over the study period. Out of the 10 banking companies selected from the group, except for ICICI, all received terrific growth in their sales and earnings. Their solvency position diluted slightly as the public deposited a large volume of funds with banks on the verge of imperfect stock market conditions. EPS improved significantly, and the yield was really good. Return on net worth was also on an upward swing. Credit for this amazing growth goes to the Reserve Bank of India. Wise regulations, judicious policies, and meticulous supervision by RBI made the Indian banks take fewer risks and kept them away from the contagion spreading from the global economic tsunami.

❖ **Information Technology :** The trend that was perceived in the banking sector, the same was repeated in case of the IT industry in its sales and earnings profile. Both earnings and sales of this industry improved considerably, even during the period of crisis. As our IT industry is more exposed to the U.S. and European markets, the crisis affected the

Table 5: Financial Performance of the Selected Companies in 2007-08

Industry	Sales growth	Earnings growth	Profit margin(net)	Solvency ratio	ROI	Return on networth	Dividend yield	EPS
Banking								
BOI	0.35	0.53	13.96	17	1.48	22.76	12.23	38.26
SBI	0.24	0.48	11.65	10.96	1.86	13.72	22.64	106.56
UBI	0.30	0.64	13.2	18.47	1.56	24.66	17.04	27.46
PNB	0.26	0.33	12.68	15.44	1.97	19	23.4	64.98
Reality &Infrastructure								
Unitech	0.02	0.05	13.2	18.47	1.56	24.66	17.04	12.12
JP Associates	0.15	0.47	14.35	1.92	9.48	15.66	21.99	5.2
DLF	3.99	5.34	42.49	0 .74	15.62	22.84	30.99	15.1
Relinfra	0.10	0.35	15.34	0 .45	3.48	10.57	15.93	46.04
Automobile								
Hero Honda	0.04	0.13	9.27	0 .04	43.86	32.41	15.52	48.47
Maruti	0.22	0.11	9.34	0 .11	27.38	20.56	9.78	59.91
M&M	0.14	0.03	9.45	0 .60	16.74	25.51	29.1	46.15
Tata Motors	0.08	0.06	6.96	0 .80	21.54	25.98	32.51	52.63
FMCG								
Marico	0.15	0.23	9.06	1.09	35.68	51.17	32.54	2.35
Dabur India	0.20	0.26	15.06	0 .03	71.48	61.58	47.86	3.67
United Spirits	0.14	-0.37	9.82	0 .58	19.28	15.48	5.66	29.62
Colgate	0.14	0.45	15	0 .03	164.65	142.84	98.24	17.04
Pharmaceuticals								
Cipla	0.18	0.05	16.43	0 .15	19.73	18.72	25.92	9.02
Pfizer	0.00	2.21	43.75	0	25.21	52.48	28.32	113.58
Sun Pharma	0.42	0.61	31.01	0.02	4.6	24.09	25.11	48.96
Dr. Reddy's Lab.	-0.12	-0.56	13.57	0 .10	11.04	9.87	15.52	28.26
Information Technology								
Infosys	0.19	0.20	27.37	0	36.79	33.13	49.77	78.15
Wipro	0.28	0.08	17.19	0 .33	24.07	26.51	33.47	20.96
TCS	0.33	0.20	14.35	0	45.59	41.34	35.55	46.07
Tech Mahindra	1.30	3.99	9.01	0 .08	63.42	26.51	23.97	5.38

Source: Compiled from annual reports of companies

export earnings of our IT companies. But sharp depreciation of the rupee helped them to compensate in aggregate what they lost due to the crisis in the global market. Cost reduction programmes implemented by them, mainly through downsizing of their workforce made better their profitability during the recession period. Thus, from the analysts perspective, the crisis did not affect the profitability of the IT industry in India. EPS improved, while their financial solvency remained unaffected. However, dividend yield of investments in their stocks declined. Increased amount of ploughing back of profits accumulated their net worth, which in turn reduced their return on net worth.

❖ **Realty and Infrastructure :** The Real Estate sector in India proved to be a major victim of the economic slowdown. Even though the sales in this sector increased marginally, its earnings witnessed a drastic fall throughout the crisis period. Because of the increased interest cost and reluctance on part of the lending institutions to advance property loans, the demand for houses reduced significantly, and property prices across India registered a 15 to 20 percent fall. Real estate companies slashed their property prices as a strategy for sales promotion, and as a way to get away from

Table 6: Financial Performance of the Selected Companies in 2008-09

Industry	Sales growth	Earnings growth	Profit margin(net)	Solvency ratio	ROI	Return on Net Worth	Dividend yield	EPS
Banking								
BOI	0.34	0.18	15.89	16	1.92	25.51	16.34	57.26
SBI	0.31	0.36	12.03	12.81	1.82	15.74	22.9	143.67
UBI	0.25	0.24	12.88	19.66	1.52	24.47	17.11	34.18
PNB	0.37	0.51	13.76	15.96	2.15	23.52	23.86	98.03
Reality &Infrastructure								
Unitech	-0.29	-0.28	12.88	19.66	1.52	24.47	17.11	4.56
JP Associates	0.45	0.47	14.55	2.04	9.23	14.5	15.9	7.58
DLF	-0.49	-0.40	40.36	0 .78	8.01	12.5	23.79	9.08
Relinfra	0.52	0.05	10.73	0 .65	2.4	10.81	16.19	50.38
Automobiles								
Hero Honda	0.19	0.32	10.3	0 .02	45.18	33.72	21.94	64.19
Maruti	0.15	-0.30	5.72	0 .07	18.95	13.04	9.7	42.18
M&M	0.16	-0.24	6.22	0 .77	11.77	16.03	37.29	30.6
Tata Motors	-0.11	-0.51	3.77	1.06	6.75	8.09	34.52	19.48
FMCG								
Marico	0.22	-0.01	7.35	0 .84	39.83	38.64	32.84	2.33
Dabur India	0.15	0.18	15.44	0 .19	50.33	51.2	47.41	4.32
United Spirits	0.30	-0.05	7.22	0 .62	12.78	9.56	8.51	31.06
Colgate	0.15	0.25	16.21	0 .02	148.87	134.17	82.05	21.34
Pharmaceuticals								
Cipla	0.25	0.11	18.41	0 .04	24.59	20.69	27.22	9.99
Pfizer	0.00	-0.12	37.59	0	17.84	33.25	14.59	100.24
Sun Pharma	0.17	0.25	31.43	0	1.56	24.56	26.33	61.09
Dr. Reddy's Lab.	0.20	0.30	13.2	0 .12	12.84	10.66	21.94	33.29
Information Technology								
Infosys	0.29	0.25	27.52	0	38.78	32.67	27.03	101.58
Wipro	0.23	-0.03	14.14	0 .40	27.14	23.76	23.05	20.3
TCS	0.24	0.04	14.55	0	44.64	35.13	34.2	47.92
Tech Mahindra	0.31	2.03	22.54	0	66.47	52.45	5.78	81.05

Source: Compiled from annual reports of companies

Table 7:Inferential Analysis of Sales and Earning Position of the Companies - Paired t- test						
	Revenue changes			Earnings changes		
	t value	df	Sig (two tailed)	t value	df	Sig (two tailed)
2007 and 2008						
Banking	3.316	9	0.009*	2.88	9	0.01*
Real estate & Infra	2.211	9	0.05**	1.03	9	0.327
Pharmaceuticals	1.545	9	0.157	-1.81	9	0.1***
Automobiles	1.75	9	0.1***	-2.1	9	0.05*
Information Technology	2.83	9	0.02**	-1.15	9	0.88
2008 and 2009				1.76	9	0.1***
Banking	2.539	9	0.03**	2.147	9	0.05**
FMCG	3.324	9	0.00*	3.324	9	0.00*
Real estate & Infra	0.632	9	0.543	2.08	9	0.05**
Pharmaceuticals	3.18	9	0.01*	1.15	9	0.27
Automobiles	0	9	1.00	1.38	9	0.2
Information Technology	2.31	9	0.04**	1.83	9	0.09***
2007 and 2009						
Banking	3.25	9	0.01*	2.65	9	0.026**
FMCG	2.74	9	0.02**	2.73	9	0.02**
Real estate & Infra	2.57	9	0.03**	1.47	9	0.18
Pharmaceuticals	2.88	9	0.02**	1.25	9	0.24
Automobiles	0.9	9	0.391	1.47	9	0.18
Information Technology	2.59	9	0.03**	2.05	9	0.07***
*Significant at 1 percent level,**Significant at 5 percent level,***Significant at 10 percent level						
Source: Compiled from annual reports of companies						

their liquidity crisis. As a result of this, the profit profile of the companies under this sector was negatively affected. Most of these companies resorted to the practice of using leveraged capital for financing their assets. Such leveraging brought in increased fixed cost obligations for the corporates, by way of interest on capital. This financial charge consumed a significant portion of their trade surplus and for pulling themselves out from such a critical situation emanating from the crisis, some real estate companies like Unitech disposed their assets worth ₹ 8500 crores, and used the proceeds for redemption of their debt. As the real estate sector in India is still overvalued, the monetary measures taken by the Government of India for reviving the sector did not prove to be significantly beneficial in reviving this crisis shattered sector.

❖ **Automobile :** Even though the sales of the automobile companies in India increased slightly, they showed a steep decline in their earnings during the period of crisis. The Government of India announced a 4 percent cut in the excise duty for stimulating certain sectors, including automobiles, and the companies passed this benefit on to their customers through slashed vehicle prices. However, this step did not prove to be quite helpful for the companies, and automobile sales in India remained under pressure. Meanwhile, financial institutions and banks were slowly cutting back on credit provided to customers for the purchase of automobiles. This again made the situation more critical. But if we take the financial performance of leading automobile companies such as Maruti, Bajaj, Hero Honda (now Hero MotoCorp) etc. in isolation, they attained a remarkable growth in their sales and continued with the same trend. Average monthly sales of Maruti for the last few months had been at an all-time record high of more than 100000 units per month, and Hero MotoCorp produced 14000 motor cycles per day. All these data are an indication of the recovery of the auto industry from the crisis. However, the situation of HMV and MMV sectors were pathetic.

❖ **FMCG :** The FMCG sector in India seems to be not much affected by the crisis. Its sales as well as earnings received

significant growth during the past three years. The growth of this industry is mainly driven by domestic demand and consumption, which remained unaffected by the global financial turmoil. Moreover, this industry is heavily capital intensive and has a relatively lower fixed cost component in its cost structure (lower operating leverage), which helped the FMCG companies in cushoning their income from fluctuations in their sales volume. Sales and profit position of all the ten companies observed in this study were going up during the crisis period. Companies could consolidate their EPS and were able to keep the dividend pattern constant . Trend of Return on Net Worth indicates that investors of this sector found their investments to give profitable returns.

❖ **Pharmaceutical :** The Pharmaceutical companies in aggregate were able to grow more rapidly and maintain sustainable growth, especially during the financial year ended 2009. Like FMCG firms, most of the pharma companies were able to achieve significant growth in their sales. But the pattern of growth in their earnings was not symmetric. When some companies like Cipla, Lupin Pharmaceuticals, etc. were able to make consistent earnings, the earnings of Biocon, Dr. Reddy's Laboratories, etc. shrunk considerably throughout the period. On account of this, other financials such as EPS, Dividend Yield and Return on Net Worth of these companies also showed a negative trend during this period. These findings pinpoint that the Pharmaceutical industry - normally labeled as 'defensive' to the changes in economic cycles - proved not to be strictly defensive during the days of the present global mayhem.

Conclusion

It could be perceived from the present paper that the Indian economy has had a dualistic performance. Some sectors of the economy like Banking and FMCGs did well, even in crisis. Perseverance of prudential policies for achieving financial stability in the country, as demanded by the Central bank, prevented banks and other financial institutions in the money market from taking excessive credit risks, which cushioned the Banking sector in India from the ongoing turmoil in financial markets of advanced economies. Domestic market orientation and not being very capital-intensive are among the factors that insulated the FMCGs sector from the downturn. But rising input prices, inflation, and increased commoditization of products are forcing FMCG companies to adopt new strategies to have viable business propositions.

Sectors like Construction and Infrastructure are lagging behind on account of their extreme exposure to domestic as well as the global economic forces. Moreover, the degree of shock exerted by the global financial turmoil on the performance of the Indian corporate sector is not the same. When some companies under a particular sector were severely hit by the crisis, some others could unshackle themselves from it due to their strong fundamentals. Over the last few years, India clocked an unprecedented 9 percent growth, driven largely by domestic consumption and investment, even as the share of net exports has been rising. The increasing trend in dominance of the service sector in making contribution to total GDP of the economy, and the availability of rich human capital in the country helped India to keep up its economic growth. India's growth will continue and even if there is some moderation, it will be a modest moderation. But it will not be a recession and there will only be a slight deceleration. However, India has to balance the concerns of maintaining price stability and sustaining growth. Once the global economy begins to recover, India's turnaround will be sharper and swifter, powered by its strong economic essentials. But the pace of recovery is decided more by the efficient working of regulatory mechanism of its financial system.

References

Anderson, D.R., Sweeney, D.J., & Williams, T.A. (2002). *"Statistics for Business and Economics."* Thomson Asia Pvt. Ltd., Singapore, pp. 200-220.

Bodie, Z., Kane, A., Marcus, A.J., & Mohanty, P. (2006). *"Investments."* Tata McGraw Hill Publishing Co. Ltd., New Delhi, p. 230.

Chakrabarti, R. (2001). "FII Flows to India: Nature and Causes." *Money and Finance, 2* (7), Retrieved from http://ssrn.com/abstract=649852

Fridson, M.S., & Alvarez, F. (2002). *"Financial Statement Analysis: A Practitioner's Guide."* John Wiley and Sons Inc., Canada, pp. 125-140.

Harikumar,S., Saji, T.G., & Kasim, C. M. (2010a). "Financial Market Investments during the Period of Global Recession." In: Arunachalam, P. (Ed). *"Impact of Global Financial Crisis on Indian Economy."* 1st Edn. Global Research Publications, New Delhi, pp. 588-592.

Harikumar, S., Saji T.G., & Kasim C.M. (2010b). "Foreign Institutional Investments and Stock Price Behaviour in Emerging Markets: Evidence from India." In: Cherunilam, F.(ed), *"International Business."* 1st Edn. Himalaya Publishing House, New Delhi, pp.107-116.

Khan, M.Y., & Jain, P.K. (2008). *"Basic Financial Management."* Tata McGraw Hill Publishers Ltd., 2nd Ed., New Delhi, pp. 115-150.

Kumar, K.G. (2009, February 9). "Investment Climate: Perception versus Realty, *Business Line*, Retrieved from http://www.thehindubusinessline.com/

Mohan, T.T. R. (2009). "The Impact of the Crisis on the Indian Economy." *Economic & Political Weekly, 44* (13), March 28, 2009, pp. 107-114.

Nachane, D. M. (2009). "The Fate of India Unincorporated." *Economic& Political Weekly, 44* (13), March 28, 2009, pp. 115-122.

Rakesh, M. (2006). *"Coping With Liquidity Management in India: A Practitioner's View."* Reserve Bank of India Bulletin, April, pp. 1-18.

Rakesh, M. (2008). *"Global Financial Crisis and Key Risks: Impact on India and Asia."* IMF-FSF High-Level Meeting on the Recent Financial Turmoil and Policy Responses at Washington D.C., October.

Reddy, Y.V. (2009). "India's Financial Sector in Current Times." *Economic & Political Weekly, 44* (45), November 7, 2009, pp. 13-15.

Singh, F.B., & Yadav, A.P. (2010). "Global Financial Crisis and India's Economic Growth: A Deep Insight." *Indian Journal of Finance, 4* (1), pp. 40-45.

Subbarao, D. (2009). *"Impact of the Global Financial Crisis on India: Collateral Damage and Response."* Speech delivered at the Symposium on "The Global Economic Crisis and Challenges for the Asian Economy in a Changing World" organized by the Institute for International Monetary Affairs, Tokyo on February 18, 2009.

Taylor, J.B. (2009). *"The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong."* NBER Working Paper, January, pp.1-19.

THE IMPACT OF LAND CERTIFICATION ON SOIL CONSERVATION PRACTICES- A CASE STUDY OF ESTIE WOREDA, AMHARA REGION, ETHIOPIA

Tefera Berihun Taw*

Dr. Abdul Jabbar. AT**

Abstract

The absence of secured land ownership right is one of the main causes of unsustainable land management practices and land degradation. Ethiopian government is trying to certify land owners under its "land registration and certification program". This research aims to evaluate the impact of this program on soil conservation practices. For this study household- and plot-level survey was conducted in Estie Woreda, Amhara Region, Ethiopia. Propensity score matching technique is used to control for program and self selection bias. Sensitivity test has been used to check how the outcome variables are sensitive to endogenous variables. The result shows that certified land owners worked more on stone terrace, soil bund, and stone-soil terrace compared to uncertified farmers.

Key words: Land degradation, Land certification, Propensity score matching, investment on soil conservation practices.

* Lecturer, Department of Economics , University of Gondar, Gondar, Ethiopia

** Assistant Professor , Department of Economics , University of Gondar, Gondar, Ethiopia

1. Background and Justification of the Problem

Agriculture, which depends mainly on land, is the back bone of an economy for developing countries. In Ethiopia, agriculture takes the largest share in terms of its contribution to gross domestic product (GDP), generation of employment opportunities, export earnings, supplies of raw material for agro-based domestic industries and national food security (Abegaz and Bekure, 2009; Tenaw *et al.*, 2009). Inspite of this fact, agricultural production has declined in many developing countries because of degradation of agricultural land (Kabubo-Mariara, 2006).

With reference to developing countries like Ethiopia agricultural production is declaiming due to land degradation which leads to food insecurity and makes the countries highly dependent on food aid (Kassie et al., 2011; Shiferaw and Holden, 2000; Tesfaye, 2008).

The problem of degradation of the soil stock and loss of production potential is severe in the highlands of Ethiopia that affects 88% and 75% of the human and livestock populations respectively (Shiferaw and Holden, 1999). It is estimated that, the annual average rates of soil erosion on croplands at national level is 42 t/ha and the annual average soil erosion induced productivity decline is 2.2% (Hurni, 1993).

Some evidences show that, lack of secure land ownership right becomes one of the main causes for this unsustainable land management practices and thereby to land degradation problem (Giri, 2010; Knox and Meinzen, 1999; Tenaw *et al.*, 2009). However, there are also other research findings which disprove the importance of land security to sustainable use of land (Kahsay, 2011; Tesfay, 2008).

Recently, Ethiopian government has realized that lack of land security has been affecting sustainable land management practices and it has been trying to promote land conservation by granting certificate to land holders in the country (Tesfaye, 2008; Adenew and Abdi, 2005). Checking the impact of this program on land management practices calls a research. This paper takes a step toward filling this gap by evaluating the improvement gains on the adoption of soil conservation practices associated with the program.

2. Literature review

Theoretical Review

Deininger (2003) and Besley (1995) briefly explained that property rights affect economic growth in different ways. First, formalized land use rights enhance tenure security which promotes long-term investment in land. Farm households' investment that enhances the long-term viability of agricultural production depends significantly on the expectations regarding the length of time over which the farmers might enjoy the benefits which mostly are long-term (Ghebru and Holden, 2008). Second, land entitlement may reduce an ownership uncertainty which improves smooth functioning of the land market. This ultimately increases farm level efficiency as factor-ratio adjustment can now be channeled through land markets. And third, it facilitates access to (informal) credit or informal collateral arrangement which may remove liquidity constraints and enable farmers to use the appropriate variable inputs that increase farm level efficiency.

Empirical Review

Kabubo-Mariara (2006), Tefera and Holden (no date), Mwakubo (2002), and Birungi and Hassan (no date), Holden, Deininger and Ghebru (no date) are some of the researchers who conducted researches to investigate the link between land security and land management practices. Their findings show that security of tenure is indeed important for the adoption of land conservation practices.

On the contrary some studies have shown that tenure security (land certification) has not significant impact on soil conservation practices. Kahsay (2011) and Tesfay (2008) conducted a research to investigate the effects of land tenure system on soil conservation practice. Their studies proved that land tenure security (certification) is not a factor in farm households' decisions to adopt soil conservation practices.

Despite the theory, evidences from those researches indicate that the link between tenure security and investment on soil conservation activities are contradictory and inconclusive.

3. Research methodology

Sampling Methods

The first step in the sampling procedure involved selecting study villages based on purposive sampling so as to get relatively large number of uncertified household sample size. The second step involved selecting the sample households randomly from the two purposely selected villages to arrive at the total number of households which were visited. Finally, 250 households, with 921 plots, were selected in these two villages.

Data Collection Methods

The main data collection method is questionnaire survey. Structured questionnaires were used to collect household and plot level primary data from the sampled households and their plots. The questionnaires were designed to fit into the objectives of the study. Before finalizing a questionnaire, discussion was done with a local supervisor so as to refine them. Pre-testing of the questionnaire was conducted in order to check its reliability and validity.

Methods of Data Analysis

Propensity score matching techniques were used to construct a matched control sample of uncertified farms that are very similar to the certified farms in terms of observable characteristics. The impact of certification on soil conservation practice is the difference of the average value of investment on soil conservation practice between certified and the matched uncertified plots. This can be presented by the following equation.

Let Ch denotes the dummy variable such that $Ch = 1$ if the hth house hold is certified and $Ch = 0$ if the hth household is uncertified. And let$Yh = 1$and $Yh = 0$ represents the values of long run investment on soil conservation for certified and uncertified households. X represents a set of observable characteristics believed to affect both program participation and the outcome. Then the mean impact on the treated; Average Treatment effect on the Treated (ATT) can be written as;

$$ATT = E[Yh(1)/X, Ch = 1] - E[Yh(0)/X, Ch = 1]$$

However, only $E\ (Yh\ (1)|Ch = 1)$, the average outcomes of the treated conditional on being in a treated area, and $E(Yh(0)|Ch = 0)$, the average outcomes of the untreated, conditional on not being in a treated area, are observed. The missing data here relates to the counterfactual mean, $E\ (Yh\ (0)|X, Ch = 1)$.We use the mean outcome of the untreated $E\ (Yh\ (0)|\ X, Ch = 0)$ as a proxy for the above counterfactual mean.

Different methods are used to match the certified and the uncertified land on the basis of the propensity score. In this paper, stratification and kernel matching methods were used. To check whether the mean difference in propensity score and covariates in each block have been eliminated, the paper used the balancing test.

If there are unobserved variables that simultaneously affect the decision to obtain the certification and the outcome variable, a selection or hidden bias problem due to unobserved variables might arise. In this study Rosenbaum bounds were calculated to check the sensitivity of our results to the failure of the assumption of endogeneity is not a problem (Kassie, Zikhali, Pender, and Köhlin, 2011).

Specification of Variables

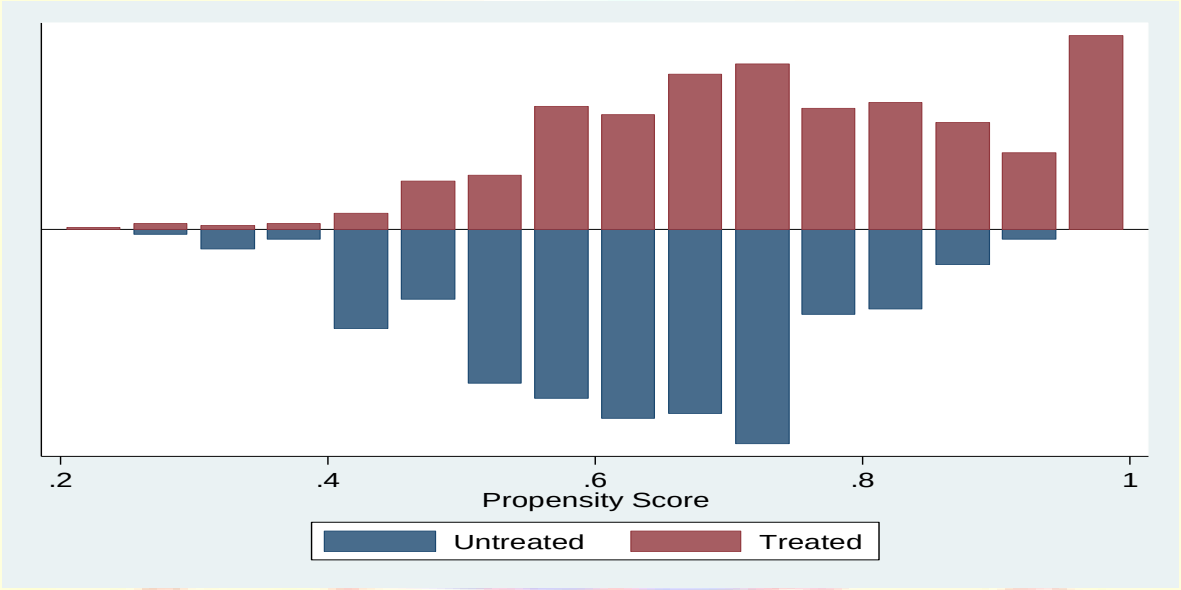
The variables of this study can be categorized in to dependent variables (outcome variable), treatment variable and independent variables (observable characteristics). The dependent variables are soil conservation practices which include stone terrace, soil bund, stone-soil bund, cutoff drain and tree plantation. The treatment variable is certification and the independent variables include factors which are expected to affect both the probability of getting the treatment (certification) and investment on soil conservation practice.

4. Result and discussion

Estimation of the Propensity Scores and balance tests

The basic reason behind using propensity score matching (PSM) is to match certified plots with uncertified ones to create two identical groups of plots. It shows that the balancing property between these two groups is satisfied.

Existence of good common support must also be satisfied for validity of PSM. The graph shown proves the existence of this good common support.



Using different matching techniques, the following sections estimate the average difference of investment on soil conservation practices between the treatment group and the matched control group.

Impacts of Land Certification on Stone-Terrace

The result of stratification matching method shows that land certification does have a significant positive impact on stone-terrace investment. The average effect of the treatment on stone terrace is 21.4 percent. Positive impact of certification on stone terrace at one percent level of significance was obtained by Kernel matching method. There is 18 percent increase in soil terrace investment due to certification (table 1).

Table 1. ATT estimation with Different Matching Methods for Stone-Terrace

Matching method	No. of certified plots	No. of uncertified plots	ATT	Std. Err.	t
Stratification Matching	655	266	0.214	0.029	7.257
Kernel Matching	655	266	0.180	0.038	4.666

Impacts of Land Certification on Soil Bund

Using the previous matching methods the average treatment effect on soil bund has been estimated. The result of stratification method indicates that certification significantly increase this conservation practice at 1 percent significance. The lever of soil bund practice is 12.5 percent higher for certified plots. Like other matching method the result of kernel matching also shows significant positive impact of certification at 1 percent significance. Certified households makes 12.5 percent higher soil bund investment on their plot (table 2).

Table 2. ATT estimation with Different Matching Methods for Soil Bund

Matching method	No. certified plots	No. uncertified plots	ATT	Std. Err.	t
Stratification Matching	655	266	0.125	0.017	7.188
Kernel Matching	655	266	0.125	0.016	8.034

Impact of Land Certification on Stone-Soil Terrace

Stone-soil terrace is one of the commonly used soil conservation techniques. The results of different estimators show that ATT is positive and significant at 1% level of significance. Investment on stone- soil terrace is 13.2 percent and 12.1 percent higher among certified using stratified and kernel matching methods, respectively(table 3).

Table 3. ATT estimation with Different Matching Methods for Stone-Soil Terrace

Matching method	No. of certified plots	No. of uncertified plots	ATT	Std. Err.	t
Stratification method	655	266	0.132	0.082	4.751
Kernel method	655	266	0.121	0.029	4.188

Impacts of Land Certification on Cutoff Drain

The regression result shows that land certification does not have significant impact on cutoff drain practice in both matching method (table 4).

Table 4. ATT estimation with Different Matching Methods for Cutoff Drain

Matching method	No. of certified plots	No. of uncertified plots	ATT	Std. Err.	t
Stratification method	655	266	-0.028	0.104	-0.266
Kernel method	655	266	0.022	0.042	0.512

Impact of Land Certification on Tree Plantation

Tree plantation is one of soil conservation methods practiced by farmers. To evaluate the impact of land certification on tree plantation, the researcher follows similar matching methods. The result of the t- statistics shows that certification has insignificant impact on tree plantation (table 5).

Table 5. ATT estimation with Different Matching Methods for Tree Plantation

Matching method	No. of certified plots	No. of uncertified plots	ATT	Std. Err.	t
Stratification method	655	266	0.024	0.022	1.067
Kernel method	655	266	-0.003	0.035	-0.096

Sensitivity Test

The sensitivity test results of Mantel-Haenszel's bound **(**mhbounds) show that endogeneity is unlikely to change the ATT for stone terrace, soil bund, stone-soil terrace and tree plantation, but it is likely to change results for cutoff drain practice.

5. Conclusion

The findings of this research proved that certification significantly increases soil conservation investment on stone-terrace, soil-bund, and stone-soil terrace and it has insignificant impact on tree plantation. However, it is difficult to make a correlation between certification and cut of drain practice. Because, the sensitivity test shows that cutoff drain practice is sensitive to unobservable factors.

References

Abegaz, G. and Bekure, S. (2009). Rural land transactions and agricultural investments. Ethiopia-Strengthening Land Administration Program (ELAP): USAID (United States Agency for International Development) and Ministry of Agriculture and Rural Development.

Adenew, B. and Abdi, F. (2005). Land registration in Amhara region, Ethiopia: Research report.

Besley, T. (1995). Property Rights and Investment Incentives: Theory and Evidence from Ghana. Journal of Political Economy.

Deinnger, K. (2003). Land policies for growth and poverty reduction: A World Bank policy research report.

Deininger, K., Ayalew, D. and Alemu, T. (2009).Impacts of Land Certification on Tenure Security, Investment, and Land Markets Evidence from Ethiopia.

Ghebru, H. and Holden, S. (2008). Land Certification in Ethiopia: An Illusion or a Solution?

Giri, S. (2010). The Effect of Rural Land Registration and Certification Programme on Farmers' Investments in Soil Conservation and Land Management In The Central Rift Valley of Ethiopia.

Holden, S.T, Deininger, K. and Ghebru, H. (2007). Land certification, land related investment and land productivity impacts.

Hurni, H. (1993). "Land degradation, famine and land resource scenarios in Ethiopia." In D. Pimentel (ed.). World soil erosion and conservation. Cambridge: Cambridge University Press.

Kabubo-Mariara. (2006). Land conservation in Kenya: The role of property rights: African Economic Research Consortium, Nairobi, Kenya.

Kahsay, T. (2011). The effects of land tenure system on soil conservation practice in Northern Ethiopia: A case study of Habru District in Amhara National Regional state, Ethiopia.

Kassie, M., Zikhali P., Pender, J. and Köhlin G. (2011). Sustainable Agricultural Practices and Agricultural Productivity in Ethiopia.

Knox, A. and Meinzen, R. (1999). Property right, collective action and technologies for natural resource management.

Mwakubo S.M (2002).Land tenure and natural resource management in semiarid area, Kenya.

Rosenbaum, P. (2002). Observational Studies, 2nd ed. New York: Springer-Verlag.

Rosenbaum, P., and Rubin, D. (1985). The central role of the propensity score in observational studies for causal effects.

Shiferaw, B. and S. Holden (2000). "Policy instruments for sustainable land management: the case of highland smallholders in Ethiopia." Agricultural Economics.

Tefera, T. and Holden, S. (no date) Property right and land management in Eastern and Southern Africa.

Tenaw, S., Islam, K.M. Zahidul and Parviainen, T. (2009). Effects of land tenure and property rights on agricultural productivity in Ethiopia, Namibia and Bangladesh.

Tesfaye, E. (2008). Continued Use of Soil and Water Conservation Practices: a Case study in Tulla District, Ethiopia.

Dissenting Voice of Shirin Ebadi: Representation of Democracy in *Iran Awakening: A Memoir of Revolution and Hope*

Aysha Swapna. K. A
Assistant Professor of English
Farook College, Calicut, Kerala.
Pin-673 632

"Democracy works when people claim it as their own" it is said. Dr. Shirin Ebadi, the 2003 recipient of the Nobel Peace Prize had risen quickly to become the first female judge in Iran. But when the religious authorities declared women unfit to serve as judges, she was demoted to the rank of clerk in the very courtroom in which she once had presided. She eventually fought her way back as a human rights lawyer. Dr. Ebadi is a passionate campaigner for human rights, democracy, and freedom of speech, especially those of women and children. In Iran Awakening, she writes about Iran from within Iran and speaks eloquently about her deep disillusionment with the 1979 Islamic Revolution and of direction that Iran has taken under the guidance of the mullahs. She defends individuals and groups who had fallen victims to a powerful politico- legal system that has been legitimized through an inhumane interpretation of Islam. Her memoir is a grueling account of how a government can forcibly hinder the primary rights of a citizen and filter media or even internet sites. This paper deals with analysis of her views on the repressiveness during the fundamentalist regime in Iran and also she believes that it is up to the Iranian people, who in their own way must transition to a democratic government that is representative of their needs. That belief, along with the conviction that change in Iran must come peacefully and from within, had underpinned all her work.

Democracy is a form of political organization in which all people, through consensus, direct referendum, or elected representatives exercise equal control over the matters which affect their interests. The term comes from the Greek: *dēmokratía* "rule of the people", which was coined from *dêmos* "people" and *Kratos* "power", in the middle of the 5th-4th century BC to denote the political systems then existing in some Greek city-states. Equality and freedom have been identified as important characteristics of democracy since ancient times. All citizens are equal before the law and have equal access to power. Democracy is not only a political system. It is an ideal, an aspiration really, intimately connected to and dependent upon a picture of what it is to be human—of what it is a human should be - to be fully human. Radical democracy is based on the idea that there are hierarchical and oppressive power relations that exist in society. Democracy's role is to make visible and challenge those relations by allowing for difference, dissent and antagonisms in decision making processes.

Today Iran is mostly in the headlines. It embodies 21st-century world politics: a geriatric, Islamic, post-revolutionary, nuclear state amidst a youthful, idea-hungry, proto-democratic, networked society. Reputed to be developing nuclear weapons, the future of Iraq's next-door neighbor is a matter of grave concern both for the stability of the region and for the safety of the global community. President Bush had labeled it as part of the "Axis of Evil," and like all his western counterparts rails against the country's authoritarian leadership. Though the present events trumpet the spread of democracy throughout the Middle East, its interesting to note that Iran has one of the longest-running experiences with democracy in the region.

Few countries today appear as erratic and unknowable as Iran, where Islamist president Ahmadinejad's increasingly striking pronouncements keep leaders awake at night from Washington to Paris. It is widely believed that the spread of democracy will sweep away intolerance in the Muslim

world. The present government system of Iran and its ascent represented a sharp popular rebuke to the republic's clerical establishment.

Dr. Shirin Ebadi, the 2003 recipient of the Nobel Peace Prize had risen quickly to become the first female judge in Iran. But when the religious authorities declared a compulsion on wearing of head scarves and also that women were unfit to serve as judges, then began a slow corroding decline. She was demoted to the rank of clerk in the very courtroom in which she once had presided. She eventually fought her way back as a human rights lawyer. Dr. Ebadi is a passionate campaigner for human rights, democracy, and freedom of speech, especially those of women and children.

“Democracy works when people claim it as their own” it is said. Shirin Ebadi asserts that in many regards, there is more progress toward democracy in Iran than in any other country in the Middle East, perhaps with the exception of Turkey," which would be highly suspect even if one accepted the Iranian position that Israel does not exist. In the election of Ahmadinejad's government, reformers and liberals had largely boycotted the vote. Ebadi’s Memoir offers a revealing glimpse into the paths that democratic ideas have traveled in Iran both before and after the 1979 revolution.

How has the Islamic Republic developed ideologically since the revolution of 1979? What are the best ways of comprehending the country at this critical juncture in its history? In her book, Shirin Ebadi combines her beliefs and lived experience to explain the social milieu and domestic politics of both pre and post-revolutionary Iran. She guides the reader in her memoir through the country's complex identity and actions from the nuclear issue to Iran's perpetual political standoff with the United States, from the future of Iranian democracy to Iranian-Arab relations, from American neoconservatism to Islamic utopian-romanticism, and from Avicenna to Ayatollah Khomeini. She shows a unique empathy towards the understanding of Iran’s cultural turfs.

Ebadi sketches her childhood during the reign of Shah. Despite economical growth, there was much opposition against the Mohammad Reza Shah. He had used the secret police the Savak, to control the country. With strong Shi'i opposition against the Shah, Iran came close to a situation of civil war. The opposition was lead by Ayatollah Khomeini, who lived in exile in Iraq and later in France. On January 16 1979, the Shah left Iran. This was the beginning of Iranian revolution Ebadi does describe vividly how even she and her colleagues had briefly been thrilled like fellow Iranians about the impending change. She felt she had more in common with ‘the opposition led by mullahs’ than ‘the officials who cavorted with American starlets at parties soaked in expensive French champagne.’ Her self righteous patriotism reaches its height when she says that ‘I’d rather be a free Iranian than an enslaved attorney.’

Shapour Bakhtiar as Shah’s new prime minister with the help of Supreme Army Councils couldn't control the civil situation anymore. Ayatollah Khomeini returned to Iran. Processes against the supporters of the Shah started, and hundreds were executed. On April 1, after a landslide victory in a national referendum in which only one choice was offered (Islamic Republic: Yes or No), Ayatollah Khomeini declared Iran an Islamic republic with a new Constitution reflecting his ideals of Islamic government. Ayatollah Khomeini became supreme spiritual leader (Valy-e-Faqih) of Iran.

Subsequently many demonstrations were held in protest to the new rules like extreme regulations on women's code of dress. In November, the republic's first Prime Minister Mehdi Bazargan resigned. In 1980 Abolhassan Beni Sadr was elected for president. Initially there was a period of euphoria like during the months of ‘Allaho akbar’ when Khomeini had played skillfully on the religious emotionalism of the masses in his campaign against the Shah. But soon things changed. Multiple centers of authority emerged within the government.

It was a government that controlled neither the country nor even its own bureaucratic apparatus. Central authority had broken down. Hundreds of semi-independent revolutionary committees, not answerable to central authority, were performing a variety of functions in major

cities and towns across the country. Factory workers, civil servants, white-collar employees, and students were often in control, demanding a say in running their organizations and choosing their chiefs. Governors, military commanders, and other officials appointed by the prime minister were frequently rejected by the lower ranks or local inhabitants.

Ebadi's inspiring memoir *Iran Awakening* offers a first-hand look at her remarkable life and Iran's human rights struggle. She was forced to resign as Iran's first female judge when the revolutionaries decided that women were unfit for such roles. As a result of their protest they promoted all former female judges to the position of "experts" in the Justice Department. Unable to tolerate the situation any longer she put in a request for early retirement and it was duly accepted. The Bar Association had remained closed for some time since the revolution and was being managed by the Judiciary, so her application for practising law was turned down and ended up housebound for many years. Finally in 1992 she succeeded in obtaining a lawyer's licence and set up practice. She turned her law practice into a base for rights campaigning, taking cases of dissident writers, intellectuals and pro-democracy activists that other lawyers deemed far too dangerous. She juggled motherhood and a career and at a time when "intellectuals are turning up dead all over the country."

In Iran Awakening, she writes about Iran from within Iran and speaks eloquently about her deep disillusionment with the 1979 Islamic Revolution and of direction that Iran has taken under the guidance of the mullahs. She defends individuals and groups who had fallen victims to a powerful politico- legal system that has been legitimized through an inhumane interpretation of Islam. Her memoir is a grueling account of how a government can forcibly hinder the primary rights of a citizen and filter media or even internet sites.

On September 22: Iraq massively invaded Iran, in the belief that Iran is too weak military to fight back. Iraq was claiming territories inhabited by Arabs like the Southwestern oil-producing province of Iran called Khouzestan, as well as Iraq's right over Shatt el-Arab. Some battles were won in the favor of Iraq, but a supposedly weakened Iranian army achieved surprising defensive success. What followed was a sporadic unstable form of power that could hardly be called as 'Democratic Governments' who were too frail to stand for stable and long periods. In July 1981, Beni Sadr was removed from power by Ayatollah Khomeini and former Prime Minister Mohammad Ali Rajai was elected president but in August President Rajai and his prime minister were killed in a bombing. In October, Seyed Ali Khamenei was elected president. He was one of the founders of the Islamic Republican Party, which dominated the Majlis (the national legislature) after the 1979 revolution.

By summer of 1982, Iraq's initial territorial gains had been recaptured by Iranian troops that were stiffened with Revolutionary Guards. The Iraqi forces were driven out of Iran. The war extended to shooting of boats in the Persian Gulf, in an attempt to hurt the other country's oil exports. On 20 August 1988, a cease fire was signed between Iran and Iraq.

Following Ayatollah Khomeini's death in 1989 of a heart attack, Khamenei assumed the role of supreme spiritual leader and Hashemi Rafsanjani, speaker of the Majlis (parliament) was elected as a president. In 1990-1991 Iran condemned both Iraq's invasion in Kuwait and the allied forces actions against Iraq. Rafsanjani was re-elected in 1993 but stepped down in 1997. From 1995 there was total ban on trade with Iran by USA. In 1997 Mohammad Khatami was elected president by gaining almost 70 percent of the votes cast. He pursued political reform and opposed censorship. He was a reformist towards democratisation of Iran's society and willing to normalize the relation with west and reduce tensions in the region. Although popular among much of the Iranian public, these policies met considerable opposition from conservatives who controlled the legislature and judiciary. It is interesting that Khatami was again re-elected as president in 2001 election by greater mandate (almost 78%) of Iranian people. In 2005 Dr. Mahmoud Ahmadinejad was elected as Iran's sixth president.

Ebadi, a committed Muslim, during all this turmoil has battled for an interpretation of her faith that is compatible with democracy, convinced "that change in Iran must come peacefully and from within". For her efforts she has been imprisoned and threatened with death by those who denounce her as an apostate "for daring to suggest that Islam can look forward, and denounced outside the country by secular critics of the Islamic republic, whose attitudes are no less dogmatic". But she is far from a lone, friendless voice in Iran and has many allies and supporters.

After receiving the Nobel Peace Prize in 2003 Ebadi was greeted at Tehran airport by a joyous crowd numbering "hundreds of thousands". Among her admirers was the granddaughter of Ayatollah Khomeini, who placed a garland of orchids around her neck. Iranian society is riddled with such bizarre paradoxes "Janus-like traits which puzzle, bemuse, and infuriate the outsider." Yet with headlines across the Western world screaming of a new era of international history in which Cold War rivalry has been replaced by a fundamental clash of civilisations, we cannot pander to ambiguities. Her Iran, and everything I had assumed about it, was dissolving before her eyes.

Her narrative reminds us how modern Iran, with its glowering visage of Khomeini once, is a now pale similitude of the days when Persia was the intellectual treasury of the world, and its culture a model of sophistication. Shirin Ebadi is earnest when she says that "…nothing useful and lasting can emerge from violence." Her writing reminds us of "the long reach of history in the Persian psyche" and of an ancient gripe by its people of "having been misrepresented to the world".

She writes how resentment at the regime's broken promises it was difficult not to suppose the whole country was disillusioned and weary and resentful and simmering. Democracy's a very fragile thing. Extreme care of democracy should be taken. As soon as one stops being responsible to it and allow it to turn into scare tactics, it's no longer democracy. It may be an inch away from totalitarianism.

Modern democracies have to make their system work much better than it does currently. That means making democratic decision-making effective, reintegrating constitutional liberalism into the practice of democracy, rebuilding broken political institutions and civic associations. Perhaps most difficult of all, it requires that those with immense power in our societies embrace their responsibilities, lead, and set standards that are not only legal, but moral. Without this inner stuffing, democracy will become an empty shell, not simply inadequate but potentially dangerous, bringing with it the erosion of liberty, the manipulation of freedom, and the decay of a common life.

Conclusion

The memoir reveals that the Iranian experience is far ahead of would-be Islamist states; they understood the limitations of theocratic rule better than any other Islamic nations, and the continuing debates on the nature of ruler ship were probably the world's most intellectually sophisticated. Every factor was in place for its evolution, which it would be a pity to usurp. She reminds us that it's much easier to wage war than to solve the challenges of peace. As proof of her against her so called Pro American allegiance at a press conference last month in Paris, Ebadi defended Iran's right to nuclear energy, and addressing the prospect of a U.S-led war against Iran was quoted as saying, "We will not allow an American soldier to set foot (in Iran). We will defend our country till the last drop of blood."

This paper is an analysis of her views on the repressiveness during the fundamentalist regime in Iran and also she believes that it is up to the Iranian people, who in their own way must transition to a democratic government that is representative of their needs. Regarding oppression of women in Iranian society she had always interpreted one refrain: an interpretation of Islam that is in harmony with equality and democracy is an authentic expression of faith. It is not religion that binds women but the selective dictates of those who wish them cloistered. That belief, along with the conviction that change in Iran must come peacefully and from within, had underpinned all her work. She says in her memoir "When I heard the statement of the Nobel prize read aloud, heard my religion mentioned specifically alongside my work defending Iranian's rights, I knew at that moment what was being

recognized: the belief in a positive interpretation of Islam, and the power of that belief to aid Iranians who aspire to peacefully transform their country."

A woman who was 'sidelined by the Islamic Revolution but stayed in Iran and carved out a professional and political role in the forbidding theocracy that emerged.' She feels that the 'cold antagonism between the United States and Iran made communication between the two societies more urgent than ever.' It is impossible to impose democracy on a country through military force. In the past, it has been movements for freedom from within tyrannical regimes that have led to flourishing democracies; movements that continue today. This doesn't mean abandoning one's values and ideals; It is Ebadi's interest to help foster democracy through the diplomatic and economic resources at our disposal. The institutions of democracy – free markets, a free press, a strong civil society – cannot be built overnight and they cannot be built at the end of a barrel of a gun. The freedom from want and freedom from fear are only realized once the personal and material security of a people is ensured as well.

Shirin Ebadi in her Epilogue says 'Iran, for its part, must peacefully transition to a democratic government that represents the will of the majority of Iranians…. Iranians are too tired of blood letting and violence. Many are willing to go to prison or risk their lives for their dissent, but I don't see Iran today as a country where people are ready to pick up weapons against their government.'

Ms Ebadi makes her stand very clear when she says that "The threat of regime change by military force endangers nearly all of the efforts democracy minded Iranians have made in these recent years.' The Iranians overlook their resentment of the regime and move behind their unpopular leaders out of defensive nationalism. She feels that she cannot relax and in the near future be ready to retire because people like her are needed to protect Iranians from their government. Revealing the truth about Iran as it is today, with a brief look at its past, was one of her incentives for writing Iran Awakening.

Works Cited:

Alexander,Yonah, Kraft,Michael. *Evolution of United States : Counter Terrorism Policy*. Greenwood Publishing Group, Westport: 2008.

Ebadi,Shirin, Moaveni,Azadeh. *Iran Awakening: A Memoir of Revolution and Hope*. Random House, 2006.

Gheissari,Ali, Nasr,Seyyed Vali Reza. *Democracy in Iran: History and the Quest for Liberty*. Oxford University Press, London: 2006.

Moghaddam, Arshin Adib. *Iran in World Politics: The Question of the Islamic Republic*. Columbia University Press, New York: 2008.

ISSN No. 0976-8602 VOL.-II, ISSUE-II, APRIL-2013
Asian Resonance

Comparative Literature: Defining the scope and Boundaries

Abstract

Comparative Literature Studies as a discipline seems to be confronted with a perpetual identity crisis. Often, as a comparatist, a scholar finds herself in a difficulty in the attempt to justify her scholarly and pedagogical activity. One has to admit that the trend of comparative literature studies has always been governed by heavy contextualization. This contextualization is often restrictive. It builds a wall of opacity closing out comprehensions. Comparative Literature Studies demands a capacity on part of the research scholar to cross borders, internalize the 'other', and overlook the politics of negation and rejection. Problems of negation of meaning, or even denegation, unrecognizability, gender, class, etc. stand in the way of the comparatist.

The strengths and the bane of the area of Comaparative Literature has been that it is so variegated in its objectives, its approaches, methodology and the very sources that feed its entity. Essentially, as it goes without saying, comparative literature is interdisciplinary in nature. The agenda of comparative literature borrows its basic features from different disciplines like Sociology, History, Political Science, Philosophy, Psychology and languages. In its European avatar, this discipline has been claimed to be an offshoot of area studies and also of regional studies. The heavy orientation of social sciences in comparative literature studies is explained thereby. The post-structuralist era has brought to the fore the linguistic centrality and has made the study of languages imperative for the student of comparative literature. Translation as a major practice of the discipline of CLS creates the problematic and politics for the discipline, mainly because of the inherent difficulty and inefficiency in understanding and comparing cross-cultural realities.

Muhamed Ali Ek
Ph.D Scholar
Department of English
Maulana Azad National
Urdu University,
Hyderabad.

Introduction

GayatriSpivak has said that the critical discipline comparative literature was founded on inter-european hospitality. Certainly she hinted at the political framework that fed the discipline in its first stages of emergence in the 20th century. She actually laments that the possibilities of "knowledge productions" should get dictated by the politics of hegemony. However, CLS, as a critical-theoretical construct or even as a creative activity is certainly not a packaged product of the 20th century.

The history of Comparative Literature is usually traced back to the early call from Goethe for weltliterature. Eckerman's work immortalized his teacher Goethe's coinage of the term which was to be translated as 'world literature', Goethe had said in 1827, "I am more and more convinced that poetry is the universal possession of mankind.... I like to look about me in foreign nations and advise everyone to do the same. National literature is now a rather unmeaning term; the epoch of the world is at hand and everyone must strive to hasten its approach". Goethe's diatribe against nationalism might have been provoked by historical and political events of his time. But one must note that he casts literature as an equalizer, a weapon of peace and not of war. Right from its conception then, the idea of CLS has been a radical idea that refigures divisive antagonisms based on parochialism into relations of engagement and exchange. We in India found the counterpart of these initiatives in Rabindranath Tagore's Vishwasahithyaconcept spelt out in his 1902 Culcutta lecture. In English perhaps, it was Mathew Arnold who used the concept.

However, it is not the mere tracing of the origin and development of terminologies and ideologies that is interesting. It is to be more concerned with the recognition of the possibilities and ways in which human imagination reaches out to the 'other' in its effort to explain, sustain, and nurture itself. The 'new' in literature emerges from such a reaching out. If that is a general concern then, what is the task laid out for CLS as an academic discipline? We all agree that the true objective of teaching literature is to "train the imagination". Spivak calls this "the great instrument of 'othering'".

Traditionally Comparative Literature advocated literacy in archetypes, a high linguistic competence, and an appreciation of the written word. Comparative Literature essentially thrives on wide scholarship and critical acumen. It calls for a capacity in the scholar to move vertically downwards (to unearth the links of literature to folklore, mythology, history, memory and methodology through native canon). The scholar is also required to move horizontally and laterally into the histories, the literatures and the patterns of other societies. With such a vast agenda required to be fulfilled, the scholar of Comparative Literature needs some versatile tools. First of the tools is literary critical theory. It helps the scholar acquire acumen of independent thinking along with the ability to juxtapose different types of art posited on different planes of time and space onto a plane of simultaneity. Other tools are languages. A comparatist benefits from her high degree of proficiency insideness with more than at least two languages. Extensive scholarship is a veritable boon for the scholar of Comparative Studies. It helps in intertextual recognitions and prospective comparisons. Several versatile theoretical formulations by a number of scholars have helped in setting the boundaries and the opportunities for the discipline of Comparative Studies, especially the comparative study of Literature. One can trace the early stages of theory of Comparativism to Bakhtinian elucidation of his notion of "dialogue between texts". Jonathan Culler speaks of the notion of comparability, sounding a much needed warning that any and every text need not and should not be expected to yield itself to facile comparisons. He speaks of the territorial impulses of literatures which are forever enlarging their scope, expanding geographically, intellectually and in terms of the genres of inter-disciplinarity. He maintains, however, that successful and effective comparisons emerge only when there is a viable intercultural distance available between texts to render them comparable. The Russian formalists held that texts relate to each other in ways that sometimes take the author by surprise. The reader is a partner in this exciting moment, even as she stands, in the middle of the reading of a text, overawed by sudden discovery, sudden recognition and resounding echo of connectedness.

Maps and Lines of Control create obstacles in the call for the "world without borders" that Comparative Literature works for. The earliest advocates had spoken the idiom of idealism. The vision was essentially internationalist. With the study of literature based on the study of literary masterpieces and archetypes, CL in the 19th century can be easily described as a global discipline. Sadly, the proliferation of comparative practice, instead of defining the boundaries of the discipline of CL, its theory and criticism, have shown a tendency towards a strong insularity in the name of nationalism, statehood, etc. Due to the onset of multiculturalism, the horizon of nations and literatures and discursive fields has multiplied. But the critical tradition, so useful to shed light on significant ways of visualizing relations between national and international or native and foreign literatures, has been affected by an ill-defined, often dilettantist perspective. In its essence CL is oriented towards continuity rather than rupture; and recognition of equalities rather than assertion of superiorities. But most practitioners appear to use the comparative method to settle scores.

The academic discipline of CLS at universities has not done much to prevent this loose expansion. In no time the discipline is now confronted by possibilities of displacement and appropriation of critical space by other disciplines. Why has this happened? Comparative Literature as an academic discipline and as practice has failed to the degree of dynamism matching the call of theory. The single author – single text approach had been a dead weight activity that had clung for long in Comparative Literary practice. When Translation Studies came to be identified as the strongest tool of comparativism, the rigors and the demands of translation as intercultural activity bogged the enterprise down. The project of CLS through translation is essentially meant to cultivate reading across linguistic and cultural boundaries to highlight not merely the national literatures but to illuminate both the sides involved in the partnership. The combination of rigorous literary studies and interdisciplinary area studies is a goal that present day academic programmes in CSL are yet to achieve.

One might argue from the other side of the fence that the numerousness of social theory that inundates the literary, critical and theoretical enterprise has rendered the firmament cloudy. Where the central concern should have been the collusion of human thought and human ideals, today different strands of human ideologies stand in a relationship of collision and conflict. In India, more than ever, the caste and class factors have now emerged as powerful metaphors of skepticism at the mildest, and rejectionist at the severest degree of expressiveness. The creed of comparativism which was idealistically taken as an equalizing creed does not seem to gel well with the growing emotional and intellectual insularities of interested groups. To speak of the core of humanism today appears to be a naive exercise and a simplistic strategy. Translations, parallel genres, borrowing, naming, retelling, spin-off and even parodies are tools of enrichment of the discipline of CL. But often, these strategies are viewed bleakly as signs of marginalization or dependency. The deep discerning and humane analysis and historicizing vision of the followers of Goethe or Tagore are now replaced by a querulous skepticism and a debilitating insularity. Literature is by nature transnational. CLS exploits this core quality of literature.

European interest in formally recognizing CL as a formal discipline was spelt out in the Green and Levine Report of 1956. This report had endorsed CL as an interdisciplinary activity. The agenda of CL was spelt out by the Bernheimer Report in 1993 through the recognition of the multiculturalities at the heart of the discipline. The core tradition that these reports recognized was certainly Eurocentric in its focus. The non-West was by and large seen only as a supplement to the mainstream. It turns out then that a closed self-directed approach can only harm and cloud the free winds of change and exchange, be it the notion of nation, ethnology, class, caste or tribe.

One must turn here to a theorist whose zealous advocacy of CLS has brought in the possibility of difference in thinking about the issue and has succeeded in influencing recent CL theory in a powerful manner.

GayatriSpivak's work speaks of a cross cultural approach that pays no heed to national borders. About two decades back, perhaps it would have seemed impossible for this notion to be viable as an approach in comparative evaluations. But recent trends in multiculturalism and globalization are perhaps successfully demolishing the walls of nation-statehoods that postcolonial anxieties had so diligently and faithfully erected. There are even efforts to revise and reformulate the literary canon in terms of the global inclusions of literatures and languages. This new setting has even given us the latest terminological formulation – Comp. Litization.

Spivak and Zepetnek have borrowed their theoretical idiom from Bakhtin's thesis on dialogism as spelt out around 1975. We hear strong echoes of the Bakhtinian concept of dialogue between texts in the work of Spivak. Zepetnek uses the "text in context" approach and advocates objectivity in reading 'other' texts. Bakhtin had defined utterance as the ability to "appropriate the words of others and populate them with one's own intention". Spivak speaks of the desirability of reading literary texts in original languages because because "this establishes the affinity between peoples through the depth of imaginative training and other-dircted reading practice – an inhabiting the other worlds and cultures – that fuels the ethical capacity of the humanities." Spivak's call for attending to the neglected languages of what she calls the global south as an essential comparatiststrategy, renders an ethical dimension of responsible criticism to the discipline of CLS. Spivak's argument in favor of subaltern languages goes a long way in solving our marginalization. Spivak is categorically suggesting that the task of the comparatist is incomplete unless the languages of the subaltern groups are studied, because, it is these languages that are "historically sedimented in literary texts". To learn and teach these forgotten bases is the only way to "structure the tear" in the continual history of humanity. As spivak says "subaltern groups are silenced and excluded. Transnational literacy can counter this."

Spivak regards CLS as a border-crossing discipline that is honed by careful, nonexclusive reading and committed academic criticism. The advantage of considering these theorists and practitioners of copmaratism is that we have already at hand alternate methodologies to choose from, or use them together in a judicious mix. Moretti's model would keep narrative as a base of comparison and goad us to read world narratives in terms of form, plot, etc. whereas the Spivak model would put us on the linguistic trail in search of the common language behind all world languages. If anything is promised it is an exciting journey of discovery. The discipline we are discussing today is a non-profitable activity for any institution or individual. In taking up comparative study of languages or literatures, one is taking up a lifetime of service to humanity. As Spivak says, one must think of it as "epistemological and ethical health care for the society at large."

Refernces

1. Bakhtin, Michael. The Dialogic Imagination: Four Essays. Ed. Michael Holquist.University of Texas Press. 1981.
2. Culler, Jonathan. "compaeability". World Literature Today. Vol. 69, Issue 2, 1995:288.
3. Damrosch, David. "Rebirth of aDescipline: The Global Origin of Comparative Studies". Comparative Critical Studies 3. 1-2 (2006): 99-112.
4. Moretti, Franco. "Conjuctures on World Literature".New Left Review, n.s. I (Jan-Feb. 2000): 68.
5. Spivak, Gayatri. Death of a Discipline.Columbia University Press. 2003.
6. Zepetnek, Steven Totsoy de. Comparative Literature: Theory, Method, Application. 1998.

Cultural Translation in Film Subtitles

Muhamed Ali Ek

A lot of theoretical attention has been recently paid to the cultural, aesthetic, and political implications of subtitling in film. Just as the study of translation reveals different ways in which different linguistic communities historically see themselves and relate to each other, so the study of subtitling helps us to understand such relationships in a contemporary context. In particular, interlingual subtitling expresses and influences perceptions of foreignness in the cultures that use it and simultaneously affects determinations of these cultures' sense of subjectivity. While the role of subtitles is to facilitate access to audiovisual products in a foreign language, they at the same time raise questions about the ethno-linguistic identity of those products as well as of their viewers. Watching films with subtitles can be considered as a special identity-forming experience, in so far as such films constitute fields of tension between their foreign and native elements, both of which are present at the same (film viewing) space and time.

First of all, translation and film – the two components of subtitling – has to be discussed as separate forms of representation which open a privileged and distinctly modern space for issues of alterity and identity to arise. The question will then be asked whether this shared feature of translation and film extends to the ways in which they have historically foregrounded or suppressed such issues. Secondly, we have to look into the particular ways in which subtitling raises questions of foreignness and I will refer to the opportunities for novel responses that subtitles offer as a result of their singular semiotic makeup.

Translation has always been about the experience of the foreign. However, perceptions of foreignness vary dramatically from culture to culture, and indeed from one historical period to the next. In the West, Enlightenment

tradition has perceived foreignness as an inflection of the dream of universal human identity, a perception still operative in various domains, including the political. As Antoine Berman points out in his study *The Experience of the Foreign* (1992), the moment when the foreign challenges the familiar, in whatever constructive fashion, can be located in (German) Romanticism. It was then, again according to Berman, that questions of nationality and internationality, mother and foreign tongue, properness and otherness acquired cultural relevance and philosophical urgency. The German Romantics looked at translation as the privileged practice in and through which these queries and themes could be accounted for in relation to each other. Translation thus enters modernity as an intellectual space for the thinking of modernity itself. In as much as issues of linguistic, ethnic and cultural belonging – or exclusion – inform the modern critique of Humanism and the Enlightenment, translation becomes a paradigmatic discipline for modernity.

As Atom Egoyan and Ian Balfour argue in their book *Subtitles*, "Every film is a foreign film, foreign to some audience somewhere – and not simply in terms of language" (Balfour and Egoyan 2004:21). Balfour and Egoyan's attention to marginality and heteronomy is conveyed in the title of this collection of essays, interviews and artworks: *Subtitles*. By exploring this privileged, if uncertain, space where film and translation meet, they emphasize double instance of foreignness. Firstly, formal foreignness, in the sense that subtitles belong properly neither to the text nor to the image; they occupy a hybrid and intermittent site that is never fully their own. Secondly, and more obviously, geopolitical foreignness: by allowing access to a film in a different language, interlingual subtitles both bring a "foreign" product to a "domestic" market *and* challenge cultural and linguistic stereotypes. Overall, subtitles exert a defamiliarizing effect; they intervene in the film viewing experience and draw attention to the formal and aesthetico-political characteristics of the cinematic medium itself.

The question remains whether the defamiliarizing effect of subtitles actually serves to foreground alterity or, as market practices rather suggest, it is considered as a necessary evil on the way to naturalize the foreign. There is no doubt that subtitles, along with other accessibility techniques such as dubbing and voice-over, have historically been used much more efficiently to promote mainstream – mostly American – film and television products to less dominant markets, than the other way round. With regard to the proverbial American resistance to subtitled films, B. Ruby Rich, one of the contributors to *Subtitles*, suspects that it is "part of a national narcissism that sees a mythical version of its 'own' culture as primary and consigns all others to a secondary status of bothersome detritus" (2004:163). It is intriguing how Rich's condemnation of the fear of subtitles coincides with Venuti's criticism of the fear of translation: both are based on similar ideas of ethno-linguistic narcissism and the failure of the dialectic between the same and the other.

Nonetheless, we must also acknowledge that the past twenty years have witnessed an impressive diversification in successes of subtitled films in the West and a growing interest in international film festivals. So, are subtitles finally having an effect on the way we view films and, more specifically, on dominant perceptions of otherness? It is important at this point to distinguish between subtitling and dubbing as cultural phenomena, for they operate differently in relation to the effect of transparency. In dubbing or re-voicing, the voices of dubbing actors fully replace the voice track of the film, following rules of lip synchronization, in addition to space, time and other linguistic constraints. In this way, dubbing aspires to reproduce the impression of authenticity of the film as an aesthetic object. On the contrary, subtitles are interposed between the viewer and the film, allowing the audio stream fully to be heard by the audience. This important formal difference means that subtitles interrupt the effect of transparency and the concomitant perception of naturalness in film. If, as Benjamin stressed, the "sight of immediate reality" is achieved in film through the total

exclusion of mechanical equipment from the image, then subtitles represent the return of the repressed artificiality. By disturbing the supposed continuity of cinematic space and time, they help to dissolve the aura of film. The authenticity of the cinematic representation gives way to a polysemiotic and visibly mediated reality. As an external addition which disputes the claims to authenticity of the original artefact, subtitles may be considered as the supplement of the language of film. Transposing this relation to the context of film and audiovisual translation, and with reference to Hollywood cinema as the dominant discourse in film-making, we may argue that subtitles are such a supplement which film represses in order to exist autonomously. Indeed, if film was an authentic representation of reality, as Hollywood realism would have it, then everyone would have immediate access to it in its original form. But the simple fact that the filmic image is in need of translation in order to reach a considerable part of its audience signifies its originary "inauthenticity". It shows that the passage from experienced reality into filmic field, itself a translation of chaotic polyglossia into staged monolingualism, was not accomplished in the first place. The nominal role of subtitles is to rectify the constitutive incompleteness of film; only, by doing so, they draw our attention to that very incompleteness.

The stitching-together of structural filmic elements (e.g. shots) produces the "suture" of subjectivities and the impression of a unified point of view in film. The cinematic code thus seems natural and eventually becomes naturalized, that is, it sustains national cinematic traditions. It is this situation which subtitles challenge. They halt the process of naturalization and suture by adulterating the image and the editing of the film, and introducing both a different authorial perspective (that of the subtitler) and a different language (that of the spectator). Yet such is the call for narrative unity, that the subversive ambiguity of subtitles is rarely used to enhance viewer awareness. Trinh T. Minh-ha, for instance, has argued that subtitles are often left on screen for longer than needed "as part of the operation of *suture*", whose

aim is "to collapse [...] the activities of reading, hearing, and seeing into one single activity, as if they were all the same" (1992:102, emphasis by the author). Minh-ha's point here is that by being left on screen for longer, subtitles are visually assimilated by it, thus becoming part of the invisible cinematic code. In this way, rather than resisting the system of suture, subtitles in fact reinforce it.

While the overlong duration of subtitles is more often than not due to carelessness and human error, Minh-ha's argument is correct in principle. Spotting (the process of timing the appearance and disappearance of subtitles on screen) does not simply follow the pace of film dialogue, as is often thought, but involves an active and complex effort to minimize the visual impact of subtitles. For example, the "on" and "off" times of a subtitle are very often defined by shot-changes, rather than by the actual enunciations which they are supposed to translate. Further, the duration of intervals between subsequent subtitles follows strict rules which have only partly to do with the flow of the dialogue. The list of tricks used by subtitlers to ensure the unity of image, sound and text is long, and is almost always imposed from above, that is, the subtitling companies. The defamiliarizing effect of subtitles is thus played down, since they no longer bring about a rupture of the filmic flow. Subtitles become complicit in the strategy of authentication of film – a strategy which involves the conflation, or suture, of image, sound and text into a unified marketable product.

The study of subtitling as a culturally and politically significant mode of translation involves an interdisciplinary approach drawing from film and translation studies, as well as from aesthetic, political and social theory. There can be no doubt that this globally accepted and constantly used practice is meaningful both as a cultural fact and as a channel for the expression of specific, local considerations and sensibilities. The interest of interlingual subtitling as a cultural fact lies primarily in its bringing together, literally in the same room, two disciplines – translation and film – and at least two

linguistic (and often national) traditions. Subtitling therefore constitutes a privileged forum not only for the comparative examination of such traditions, but also for an assessment of the (cinematic) representations of these traditions. Ultimately, subtitling is a good forum for the study of representation itself and its cultural and political implications in the post- or late modern world. As pointed out in the beginning, the two components of subtitling, translation and film, are textual and aesthetic strategies with a potential to subvert the classical perception of the unity of representation. This potential lies behind what is called the defamiliarizing effect of subtitles – an effect which is present even in cultures with a subtitling tradition. The question was whether this effect can, or does indeed, lead to an increased awareness of foreignness, and whether it is allowed to enrich the film-viewing experience. On the theoretical evidence discussed in this paper, the answer has to be a qualified no. The extensive translation practice of mobilising different strategies of text normalisation, so as to prevent the contamination of the domestic culture by the foreign source, applies also in subtitling. What is more, the exigencies of narrative unity in cinema determine the content, duration and positioning of subtitles, thus minimizing their visual impact. This conclusion certainly needs to be backed by pragmatic evidence. It also needs to be supplemented by sustained reference to "non-domesticating" types of translation, audiovisual or otherwise, and to other cinematic traditions beyond Hollywood. Such evidence will only reinforce it. Like translation itself, subtitling in its present forms does not, as a rule, do justice to the otherness of the foreign artefact; nor does it simply operate as an agent of acculturation. Rather, in subtitling, contemporary perceptions of nativeness and foreignness are thematized and problematized, without being rectified.

Works Cited:

Balfour, Ian and Atom Egoyan (eds) (2004) *Subtitles: On the Foreignness of Film*, Cambridge, Mass.: Cambridge MIT Press.

Calzada Pérez (ed) (1998), *Apropos of Ideology: Translation Studies on Ideology – Ideologies in Translation Studies*, St Jerome Publishing.

Gentzler, Edwin (1993) *Contemporary Translation Theories*, London: Routledge.

Lewis, Philip E. (2003) 'The Measure of Translation Effects', in Lawrence Venuti, *The Translation Studies Reader*, London: Routledge, 264-283; first published in 1985.

Nornes, Abé Mark (1999) 'For an Abusive Subtitling', in *Film Quarterly*, 52(3): 17-34.

Pym, Anthony (2004) 'On the Pragmatics of Translating Multilingual Texts', in *The Journal of Specialised Translation*, 1, January 2004, at http://www.jostrans.org/issue01/art_pym.php.

Steiner, George (1975) *After Babel: Aspects of Language and Translation*, Oxford: Oxford University Press.

<<>>

Mr. Muhamed Ali Ek is a PhD research scholar at the Department of English, MANUU

English Language Assessment: Theory and Practice

Dr. Sajitha.M.A
Assistant Professor
Department of English
Farook College (affiliated to the University of Calicut)
Calicut District,
Kerala, India.
sajiraz99@gmail.com

ABSTRACT

Language testing at any level is a highly complex undertaking that must be based on theory as well as practice. A language assessment system focusing only on Reading and Writing is outmoded and need to be modified, especially in this electronic era when the oral skills are dominating other skills.This paper analyses various techniques employed in language testing and examines the guiding principles of assessment. It investigates the assessment systems followed at CBSE, SSC, ICSE, IGCSE and the undergraduate levels. It advocates the urgency of assessing all the four skills which will be beneficial for students of different levels of intelligence. The Four Skill Assessment and Alternative Assessments are suggested remedies for improving the standard of English amongst the students.

When students learn English as a Second Language, they face various problems. These problems can be partially categorised as problems caused by mother tongue interference and partially those caused by the method of language teaching and assessment. The greatest curse of the modern educational system is the lack of harmony between what is taught and what is tested. Up-to-date methods are implemented, curriculum is innovated but the questions remain traditional to the core. Most of the questions asked in the Communicative English paper focus on the rules and regulations; practical oriented questions are ignored. Students naturally study with the purpose of scoring good grades in the exam. They are not concerned about the practicality of what they are studying. In this context, four-skill assessment plays a vital role. Unfortunately, the English language teaching in the school level and even at the college level gives importance to Reading and Writing and neglects Listening and Speaking.

Only when the four skills are tested independently, the purpose of language learning will be fulfilled. Testing is an integral part of the curriculum. Even though students are nervous and curious of exams, they will not be happy with a course which provides a pass certificate to all those who have attended a course. Graduates passing out of a university should be able to communicate in oral and written English. This would be possible only if the test is designed in a systematic manner. Tests help teachers to measure the progress of their students. Through tests, teachers can find out if their teaching has been effective. Tests help teachers to discriminate between good and bad learners. Tests provide proper feedback to the learners and understand their progress. Based on the feedback from the tests curriculum designers can modify or change the curriculum. Moreover tests serve as the tool for the researchers. There are mainly two techniques employed in testing. They are objective and subjective. The questions which fall under the objective category are true/false, multiple choice, matching, completion, rearrangement, transformation etc. The subjective questions are short answers, translation, interview, essay etc.

Heterogeneity of the classroom is a common problem that most teachers face. Handling a mixed ability class is not easy because each student has his own interest, attitudes, level of intelligence, learning style and linguistic background knowledge. So the teachers should conduct continuous assessments and individualise them as much as possible. The test should be congenial to all students. A good test should have certain guiding principles. They are validity, reliability, practicability, security, wash back and transparency.

Validity: A communicative language learning approach must be matched by communicative language testing. It should also have face validity which means that the test should measure what it is supposed to measure. It should also have content validity.

Reliability: Reliability suggests the consistency of the test scores. The result of a test should be the same if it is conducted at any other time. There should be consistency in the format, content and time of the exam. Exam administration and the ambience in which the test is conducted are also important.

Practicality: The practicality of the test can be obtained only when the tests are marked and the students are given proper feedback.

Security: It is part of both reliability and validity.

Wash back: It refers to the effect of testing on teaching and learning. The students accomplish the desired result when they perceive the tests are markers of their progress.

Transparency: Students should be provided clear, accurate information which is known as transparency.
Usefulness: It is an important quality of testing.

A good test should stick on to all the above mentioned features. A language assessment should stick on to the four skills. If the assessment is confined to one or two skills, we will not recognise the skill in which a student excels or in which he/ she keeps a low level of performance.

Four skill assessments will be beneficial for students of different intelligence level. When the four skills are tested independently, the purpose of language learning will be fulfilled. Each student will understand in which skill she excels and in which one she requires improvement. It is necessary to explore the language assessment system presently followed in the Grade X of CBSE (Central Board of Secondary Education), Kerala State syllabus –SSC (Secondary School Leaving Certificate), ICSE (Indian Certificate of Secondary Education) and IGCSE (International General Certificate of Secondary Education) Curriculum of University of Cambridge. While IGCSE tests the four skills, CBSE gives priority to written skills: Reading and Writing.

In the language assessment system of SSC, ICSE and CBSE syllabi only Reading and Writing are tested, whereas IGCSE curriculum of University of Cambridge assesses Reading and Writing along with Listening and Speaking (LS). A child will be given a pass certificate in English only if he goes through all these assessments. But in other systems a student who can memorise some part of literature will be able to get through the examination. Hence, after 10 years of English language learning, in order to perform marvellously in an interview or a job by conversing in good English, students need to join some spoken English classes. They may be excellent in writing but the first impression of a man is formed through the words he utters rather than the words he writes.

Assessments in SSC, CBSE, ICSE & IGCSE.

In SSLC examination, there is only one paper in English. It includes questions from poem, passages, supplementary reader and language elements. In short, it gives importance to Reading and Writing; Listening and Speaking are neglected.

In CBSE there is only one paper in English; it consists of four sections:

Section A: Reading
Section B: Writing
Section C: Grammar
Section D: Literature

The focus is given on literature and writing. LS are not assessed. Literature can be considered as a comprehension passage given in advance to the students, the answer to which can be memorised even by weak students. It rarely gives any chance for skill development. Any student who mugs up the literature section will be able to get through the English examination.

a) **English – I** is for two hours.

There will be 4 broad questions.

- A composition of 450 to 500 words
- A letter
- An unseen passage and related questions
- Questions to test grammar

b) **English – II** is also for two hours, but purely based on literature

- Section – A
- Section – B
- Section – C
- Section D

In IGCSE E2L students have to face three English examinations in 10th grade:

1. ***Oral Communication***: The students are given a test card based on which they have to converse with examiner for nearly 15 minutes.
2. ***Reading and Writing***: Students have to comprehend passages, brochures, advertisements etc. which they have to do in their daily life too. Moreover they must do some creative writing in this paper.
3. ***Listening:*** Students have to listen to the audio clippings and answer the questions provided in the question paper

If a child fails to obtain the minimum standard in any of these 3 papers in English, he will not be provided a pass certificate. Students may choose Core or Extended Paper depending on their calibre. The Core Paper is easier than the Extended Paper.

In IGCSE oral communication examination, there are 3 phases.

Phase-1: Warm-up.

Candidate is asked a few questions about herself/himself, the school etc. to give her/ him time to get used to the exam situation. This phase is not marked.

Phase-2: Initial Task.

The test card is given to the candidate to go through the instructions. The candidate is given a few minutes to prepare for the task. He/she is not supposed to make any written notes.

Phase-3: Development.

The candidate discusses his/her ideas and suggestion with the examiner.

In the undergraduate level, the curriculum has been revised and kept in balance with the international standard. The common course of the University of Calicut, A01: *Communication Skills in English* are aimed at the development of the four skills of the students. But unfortunately in the real sense it tests only writing. The main emphasis of the syllabus is the use of language in communicative situations. Some of the questions asked are purely based on theory: a) What is group discussion? b) What are the dos and don'ts of group discussion? c) What is communication? Students can prove their mettle if questions aid them in involving in imaginary debate or discussion on a particular topic like 'Can computers replace teachers?'. The questions like 'Analyse the character of Macbeth' or 'Write a critical appreciation of Ode to the West Wind' will not be that much beneficial for students in their real life.

The real problem of English Language Teaching lies in the assessment system followed. The international standard in the assessment is compromised because of the constraints of time, energy and money. Assessment in many parts of the world has focused primarily on high stake examination. Writing a three hour theory examination is of no significance. Instead of that Alternative Assessments can be employed. Alternative Assessment is a non conventional ongoing strategy involving both student and teacher in making judgments about the students' progress. It is different from traditional standardised testing. The principal aim of Alternative Assessment is to gather data about how students are processing and completing authentic tasks in the target language. Question paper should not be prepared during the last hour. Much care and attention should be given in the setting of the question paper so that it really tests the skills of the students rather than their memory.

The traditional tests are based on recall and reproduction where as Alternative Assessment asks students to show what they can do. It is unfortunate that even the pattern of NET/JRF examinations, the competitive examinations of University Grants Commission, is restructured and gives opportunities only to those students who can memorise the answers. The students are not given a chance to exhibit their language proficiency. The evaluation is based on what the students can integrate and produce. The important techniques employed in Alternative Assessment are Self Assessment, Portfolio Assessment, Student Designed Test, Learner Centred Assessment, Project, Presentations.

Self Assessment: It refers to students' evaluation of his or her performance at various stages in a course.

Portfolio Assessment: Portfolios are collections assembled by both teacher and student. It contains a variety of work in various stages.

Student Designed Test: It results in greater learner awareness of course content, test format and test strategies.

Learner Centred Assessment: Students can select themes, formats and marking schemes to be used.

Projects: Projects are content based. It requires individual or group work. It can be a poster, brochure, display or many other options.

Presentations: It is a real life skill that gives learners an opportunity to address socio-cultural aspects of communication. It helps them to use appropriate register and discourse.

The communicative approach has introduced radical changes in syllabus, methodology and curriculum design. t evaluation has not gone through any practical change. The future of testing holds out great promises and allenges the whole process because if it moves in the right direction, the entire process of language learning will benefited. The acquisition of oral skills would not be a problem for students of affluent families because they get ough exposure to the language. But the middle class category relies only on their school teaching and testing in ler to strengthen their language skills. With the advent of globalization, English has become the language of portunities and the main motivation for the language learner is to communicate successfully. Instead of teaching students the toughest words which they hardly use in their daily life, my suggestion is to make language learning ctical oriented. Or else, our students who have mastered Shakespeare will fail to comprehend an ordinary nphlet and brochure and will be bewildered to speak in English, when they go for higher studies in Indian versities or abroad.

Testing and teaching are closely linked and one can influence the other either positively or negatively. The books should be incorporated with cassettes providing ample listening exercises. Students should be made iliar with phonetics in lower grades itself as the language acquisition device is more active during the young age. s will build up confidence of students who are good at listening and weak at other skills. The students who have r listening skills will get a chance to improve their skill. In India, English links different states. Though it is a ign language, it is widely used. One big hindrance in our students obtaining excellent jobs is lack of poor mmunication skills. Four-skill-assessment will improve English competency. It will increase job opportunities and note tourism.

erence:

subramaniam, T, (Ed.) (1987).*A Text Book of English Phonetic for Indian Students*. India: Macmillan.
li, Mubeena. *Communicative Method in ELT: An Indian Perspective.* Atlantic, New Delhi: 2007.
on, J.B. (1995). *Writing English Language Test*. NewYork: Longman.
d, D., Davidson, P. & Coombe, C. (Eds.). (2005). *The Fundamentals of Language Assessment: A Practical le for Teachers in the Gulf.* Dubai: Tesol Arabia.
ards, J. & T. Rodgers. (2001). *Approaches and Methods in Language Teaching.* Cambridge: Cambridge ersity Press.
swathi,V. *English Language Teaching: Principles and Practice,* Orient Longman,Chennai:2004.
rhill N. (1998) .Testing *Spoken Language.* Cambridge: CUP.

The Dialectics of Being and Belonging:
An Analysis of Ampat Koshy's Poems

Dr. Zeenath Mohamed Kunhi
Asst. Professor
Centre of Research and Advanced Studies in English
Farook College, Calicut, Kerala

The literary world of the twentieth century saw a revolutionary rise in fiction-writing, sidelining poetry the once acclaimed genre. However, with the onset of the new millennium and the phenomenal spread and popularity of social networking sites, poetry writing and reading has gained renewed impetus. This one-time 'endangered species' which was limited to the syllabi of schools, colleges, universities, and probably to the few die-hard fans of poetry has found a productive platform on cyberspace, reclaiming its fading glory. A number of poets have stamped their marks with a repertoire of excellent poetry in the rising number of online poetry groups and literary hubs. Such groups also stand witness to some mediocre stuff, but, what remains significant is that poetry is now read, enjoyed and critiqued like never before.

One of the most prominent poetic voices acclaimed and acknowledged by academicians, writers and laymen alike is Dr. Ampat Koshy an Indian writer in English. He is one contemporary writer who has carved a niche for himself in the literary world of networking sites with his prolific outpour of poetry and a commendable collection of prose works. His published collections of poetry include *Soul Resuscitation* and *2 Phases 50 Poems*. His book *A Treatise on Poetry for Beginners* as the name suggests is a delightful discourse on the nuances of verses and verse-writing, and was chosen by Butterfly and the Bee as one of the best reads in India in 2012. His monograph of essays called *Wrighteings: In Media Res* and his doctoral thesis *Beckett's English Poetry: Transcending the Roots of Resistance in Language*, both published works are proof enough of his astounding scholarship and erudition. A short story collection awaits publication by Lifi and his poem "A Shayira of Sorts" was nominated for the Pushcart Prize for Poetry for 2012. His poems have also found prominence in many poetry journals, magazines, e-zines and anthologies in different parts of the world like USA, UK, Canada and India. He regularly contributes to The Camel Saloon where three of his poems have become

editor's picks, including "Africa" and "Hurt". He is presently teaching English Language and Literature in Faculty of Arts, Jazan University, Saudi Arabia as an Assistant Professor. A versatile genius, he dabbles in art, music and literary criticism as well.

Writing is the quintessence of his existence and this passion for writing is well articulated when he states: "I write, therefore I am. When I am no more, I won't write anymore, of course, but when I stop writing, even if I am, I am no more" (*terrestrian*). Though he has experimented with various genres and has excelled in probably all of them, it is his poetry that has attracted a wider readership. His verses are marked by a rare elegance that results from a blend of unmatched scholarship and eloquent simplicity. The poetic themes are variegated and are the products of a highly complex personality. His poetry also showcases experimentation in form and structure. Most of his poems deal with love, family, death, alienation, existential angst, meta-poetry and social issues. But mostly it is about a 'quest' for something: probably a quest for the self, a search for wholeness, an insatiable desire for perfection both in art and life or an attempt to relocate his roots through memories from the past that probably provide him anchorage in foreign lands despite his rootless identity. The most intense of his verses spring mostly from his solitary life abroad, far from family and friends. This partly self-imposed exile and its ramifications find expression in most poems of Dr. Koshy. The title and the opening line of the poem "I do not know what I seek" speaks volumes of his sense of nostalgia and his passionate yearning to be with his loved ones so as to add meaning to his exile:

I do not know what I seek.
In the midst of my island
This spreading pool of loneliness
widens
engulfing every green thing
on this auspicious day,
overflowing its borders.

His sense of longing is triggered by his inability to belong and the resultant attempt to find meaning in a converging experience defines his sense of being. The overflowing 'pool of loneliness' and its consumption of 'every green thing' evokes in the readers poignant images of

seclusion and emptiness. The image of the lone rock jutting out like an ugly tooth emphasizes the dilemma of the diaspora on alien shores. The recurring images of nostalgia and dislocation that reverberate through his poetry are also indications of his ambivalent identity. Again, the poet's attempts to escape or seek respite in fleeting ties are actually thwarted by his firm bonds of permanence that form the basis of his essence:

> The fish too escape.
>
> Only a lone rock remains
> jutting out like an ugly tooth
> splashed by black waves
> in the dying rays of the setting sun.
>
> It's another love I spay.

The poet's identity is marked by his multicultural exposure. The series of poems published in Brian Wrixon's anthology *Tripping on Words: a Literary Atlas"* is a mosaic of his variegated experiences that lie scattered over differing points in the space schema. The long poem is an attempt to recreate meaning out of a disjointed, disintegrated and dilemmatic life and personality. Each poem acts as a fragment of a coherent whole and at the same time exhibits an identity of its own. This poetry of assimilation is an exercise in the process of acculturation, integration and identity formation.

The section "Trivandrum" takes the readers to the by-lanes and alleys of his childhood and adolescence. Memories of immaculate nature and a non-corrupt world remain etched in his "mnemonic memory's cartography" (*ToW* 112). A world of smells and tastes haunts the poet who is still on the lookout for "the elusive answer" to a question that he never framed, that has none (*loc.cit.*).

The section "India" (*ibid.* 113) is the product of his indisputable love for his homeland – 'Kafka's father,' as he states. The ambivalent attitude that he displays in the poem is the objective outcome of his deep love that comes from an insider viewing his world with an

outsider's lens. The reference to Kafka is also an exercise in intertextuality, probably indicating the poet's quest for the Kafkaesque womb!

"Bangalore" (*ibid.* 112-113) for him does not offer the idyllic charm of the Trivandrum mapped in his memories. It is only a world marked by disparities where the poet enjoys watching and critiquing the "rich lap up luxuries," though he admits that he too was at times lured by the glitz and glamour of the 'jaded metropolis', when he states: "at such times/ you were the lover/ I wanted/ to rape/ surreptitiously." "Jeddah" (*ibid.* 113-114) recounts the love-hate relationship with the royal port city. The ambivalence is marked probably by the ordeals of his professional life there and the brief hiatus of measured happiness in the company of his family and friends. "Al Khums" (*ibid.* 114) is a poem where the poet calls to mind his dear and near ones even in moments of extreme happiness, anticipating them to partake in his joy in absentia.

Stuart Hall points out in his essay "Cultural Identity and Diaspora" that cultural identity in the diasporic existence "undergoes constant transformation" (435). Consciously or unconsciously the poet's self too undergoes constant transformations, and that is probably the reason why the poet appears more composed and stoic in the section on Jazan. Perhaps the theme of longing here harps on the desire for change and movement. The eponymous city Jazan provides him with more hope:

> …maybe you will be
> my Alexandria
> in Arabia Asia,
> you let me wander your crevices
> the why yet to be revealed
> amidst your minarets and muezzin calls
> as if I'm waiting for my Damascus

The last line of his poem "Hope" from *Soul Resuscitation* sums it all up: "Hope is what we live on." These different fractions of poems fit in like the pieces of a jigsaw puzzle, framing the 'whole' of the poetic persona where the joints bear reserves of some elusive meaning. These

series both in texture and structure reflect the fragmented self and its attempt to attain completeness through unification or the multiples selves that seek to converge into a single purpose of existence. The scattered presences of the 'self' without belonging to any particular place interrogate his sense of being. It is striking to note that his idea of being and becoming is rooted in the quest for meaning underlying the very fluid nature of his existence where the only waterfront seems to be love and duty. These fractions also assert the poet's liminality as a diaspora and his endeavour to assimilate his present and past; his host and home; the conscious and the unconscious and his self and the other. It is in these liminal spaces that the poet undergoes the individuation process of self-realization, i.e, "the process of strengthening, differentiation and assimilation (integration) into consciousness of the various non-egoic parts of the psyche…" (Fiumara 178). The unified structure of this poetic montage is also a metaphoric assertion of the fact that "Individuation begins with a withdrawal from normal modes of socialisation, epitomized by the breakdown of the persona...liminality"(207)..

The cultural plurality of his homeland reflects in the expansive use of his language and expresses itself in the sublime and grotesque array of words. The poem peppered with abuses strongly underlines his frustration and inability to coerce with the new cultural ethos. Simultaneously a part of him is sensitive to the changes and makes a constant effort to fit in. Self-imposed or not, displacement does act as a stimulant to Koshy, as some of his best verses spring from his diasporic sensibilities.

The lines from the poem "Birds" again emphasize the intensity of the poet's sense of nostalgia and grief at the thought of his separation from his beloved ones:

I never knew the face of death
has lips one longs to kiss
give death a miss!

and,

next year die of surfeit never stop
even an instant to think
of how those faces that face

you lost are tearing you up

The reader may be taken in to believe that the poet actually seeks to forget those bonds from which he finds no escape by indulging in the 'cup' of copiousness. But it is again his 'childhood dreams,' the 'blue sky' and 'white clouds' that he seeks solace in. A deep sense of *hiraeth* marks his poetry and the poet in fact tries to brace up his ties by embracing his pain and anguish that keep his dreams and memories animated: "sleep and dream/ and mayhap find peace." The poem redirects us to childhood memories and questions of being that the poet is now conscious of and inspired by.

"(After Rilke): An Explanation" the first poem by Koshy in *Soul Resuscitation* is one of his best and as the connection to the German poet implies, is a fine exercise in "impassioned monologue." The obvious take off is Rilke's first Duino elegy which takes Koshy's theme of alienation and isolation to existential dimensions, attempting to make occasional penetrations into the phenomenon of existence. The poem which abounds in symbolisms and allusions is characterized by an ontological chase creating meaning out of residues nonentities.

In the poem, memory and past images accentuate the poet's solitude and it is his sensitive consciousness that compels him to seek answers to his existential dilemma. His philosophy of living is rooted in love and faith and this forms the essence of his being:

you are that being
each atom beyond grasp
unexpected sweetness pierces him
occasionally
when he passes a window
and hears them play "in summertime"

The allusions to Bob Dylan's "Covenant Woman" and "In the Summertime," in fact, unveils man's desperation to achieve anchorage through the sublimity of love which he often feels eludes him. The mystery and elusiveness of love is as obscure as the phenomenon of existence itself. The oxymoron "murderously sweet" reminds one of Yeats' "terrible beauty" which again is highly eloquent in Rilke's line from his first elegy- "beauty is nothing but the beginning of terror." Love for the poet does not rest in the magnetism of physical forms of elegance but is something transcendental, a sublime entity that may even find expression in little

acts of kindness and unstinting commitment to causes as the men in Yeats' poem. It is through this medium that he aims to find answers to his ontological quest and connect to the Unknown.

On an autobiographical note, it could be argued that the poet's self- imposed exile which may partly be pecuniary in disposition, something not driven wholly out of materialistic ambitions, and as the introduction to *2 poets 50 poems* suggests, is something nobler: "His greatest desire is to build a village for people having autism where all their needs are met. He runs an NGO called "Autism for Help Village Project" with his wife for this dream to come true." The poetic persona waits for the Lord to "rebuild" him and "fill him up" so as to save him from the vacuity of a purposeless life. The line separating his becoming and being seems to grow fainter at times. The idea is elaborated in the poem "When I consider how my life is spent" from the anthology *2 Phases 50 Poems*:

> I beat my wings against a pane of glass
> behind it the light that would kill me of
> this is living death. I neither die nor live
> only one thing is clear. there is nothing called love.

To begin with, the pun on the word 'spent' is striking and antithetical. The idea of spending one's life points directly to questions of ontology and the meaning of spent when taken as 'wastes away' reflects on the possibilities of damnation. The paradoxical nature of existence is conveyed by the clever play on words.

Again, in the poem "(After Rilke): An Explanation" physical beauty is merely transient and lacks essence as the hair that "false/falls across your face," just a symbol of terror that points to the pseudo existence that mankind generally indulges in. The war images of "a cobbled street full of dead bodies" and the "small white wild flowers" littering the street take the readers to world of futility and terror. Man is obsessed with self-love and such narcissistic tendencies propel him to revel in a sense of false security, which eventually culminates in his own destruction –both physical and spiritual:

> it only wants security to establish what one calls love
> this is the secret
> fear rules the city and her
> and me and him (*After Rilke*)

Death and destruction leave man with residues of meaning to rebuild and reform his sense of being. The poet, probably see in 'nothingness' and 'void' the rationale of reformation that may carry one to the metaphysical realms of purpose and being. But man is yet to come to terms with the essence of his existence and penetrate into the secret of eternal happiness:

the little robin red-breast sings outside her wings
each and every atom of hers
is still beyond his reach (*After Rilke*)

The speaking persona, unable to comprehend the selfless song of the robin red-breast cries out in existential angst:

why do you love when such terror inhabits the world
of objects
that horrify us with their longevity? (*After Rilke*)

The bird is reminiscent of Hardy's "Darkling Thrush" with its "full-hearted evensong/ Of joy illimited." For both the birds, hope in humanity and love forms the basis of their living. The resilience of the birds, not altered by corrupt thoughts is contrasted with the "crumbling" humanity which disintegrates into a state of nothingness. Koshy demeans human life and diagnoses the limitations of mankind by the contradictory images of the selfless bird and self-obsessed man. The references to Kahlo and Diego implicate the 'false' notions of love as perceived by the ordinary. Kahlo's liaisons with Josephine Baker (*Hubpages*) and Diego's infamous and incestuous relationship with Kahlo's sister Christina (*Fridakahlo fans*) reinforces the images of Eliot's moral wasteland where love is mechanical, vacant and transient. Man's inability to find real love, to move beyond superficial sexual gratification and his obsession with momentary indulgences are congruous to the dissolution of his very essence, his purpose of life and his sense of being. The ethical degradation and moral decay prevent man from attaining *ubermensch* or 'superman' status. Violence, war and power are all consequences of man's self-oriented objectives that further belittle his existence, forcing him to degenerate from nothingness to nothing:

like kahlo
outcast other killed forever voices stilled

gone under the earth forever
will mine too?

In addition to the theme of existential angst, this poem can also be taken to be an artist's hunt for meanings, his/her attempts to trap "abstractions" in the permanence of his/her art and his/her urge to be heard. The bird mentioned earlier is as mortal as the speaking persona but it is its song that becomes the insignia of its essence and permanence. Perhaps the poet's intentions in alluding to Kahlo are manifold. As writing is living for Koshy, painting was Kahlo's essence. She states: "…I am happy to be alive as long as I paint" and "The only thing I know … is that I paint because I need to" (*Fridakahlo fans*). The act of painting and writing can be translated as the essential media for achieving what is 'beyond their reach' (*After Rilke*).

The poem "Son and father" is yet another poem that borders on the quest for ideal love. The poem set in a conversational mode begins with a question posed by the father: "why does your heart ache, my son?" The failure of the son to meet his soul mate is deftly drawn in the son's answer:

I longed to meet someone
in the journey who'd make me blossom
and someone I'd do the same for
I still haven't come across such a one.

The title is fraught with biblical connotations and definitely, on a more sublime level deals with the discord and disparity that mankind is doomed to be in. The mistrust, guile, deceit and treachery behind the crucifixion, now operate at a wider level and the poem ends on a note of dystopia. The same theme is extended in his poem "Nirbhaya" but his philosophy of life rooted in Christian existentialism is more hopeful of the consequences:

then what a good thing
heaven and hell are separate
and a great gulf is fixed in between

His poem"Yekaterina: A Russian folk story retold in verse," at the outset, comes across as the poetic adaptation of a simple Russian folklore. The poem recounts the tale of a poor girl who was alienated by her stepparents and given asylum by the moon. The moon which acts as a

saviour in this poem is shorn of its mask in the sequel poem "the girl in the moon." The 'moon' here functions as the metaphoric representation of the illusory gleam offered by his life abroad:

till later her laughter
suffused
by the orange
of a rising sun, changed to sorrow

Loveless reality on alien shores dawns on the persona as the 'moon' finally melts away "hiding in the sky's forests." Even though he finds respite in divine faith, it is not done at the sacrifice of his worldly duties. It is love, duty and conscientiousness that form the core of his existence. As he sings in the poem "O Rumi":

O Rumi
intoxication with the divine
is not the only way
O Ghalib
the way of the senses
is not the only one

It not sensual love either, but a love of a higher order, borne out his sense of trust and responsibility that opens the "unending vistas / of Keen Delight."

The poem "Hunger" is powerfully intense in its portrayal of the poet's sense of exile and solitude. The reference to Marcel is noteworthy, especially in the context of this study. The allusion to the Christian existentialist and philosopher is obvious. "What defines man are his *exigencies*" claims Marcel (34) and the poems of Koshy as portrayed are the products of his ontological exigencies. If the first name is to be considered, the 'Marcel' in question may be a reference to the French novelist and critic Marcel Proust. This leads one to the intertextual conclusion that the indication may be to his famous work *In Search of Lost Time* (previously translated as *Remembrance of Things Past*) which recapitulates certain past events as an attempt to anchor on to memories, which, again is a recurrent theme in Koshy's poems.

The process of rememoration found in many of his poems often functions as an antidote to his sense of isolation and aids in his strong urge for belonging. It is in his sense of belonging that he finds meaning. In addition to his endeavour to accommodate change and movement, he

also makes an attempt to come to terms with his hybrid sensibilities – postmodern, diasporic, Indian and sometimes even feminist. Milton Singer had remarked about A.K. Ramanujam's poems as having "double self" composed with the components of Eastern and Western epistemologies (Singer xiii), but Koshy's poetry points to the "multiple selves" that compose a complex personality. In spite of his sense of diaspora, it is not the physical places that matter to him but the "Real Spaces of the Mind" (*ToW* 114) where "places become driftwood" and residual experiences shape his being. "I did not find you in mandir or masjid" (*2 Phases* 30) is yet another poem that explores the inconsequentiality of physical spaces.

While most of his poems are retrospective in nature, the poem "Heart" is introspective and reflects on the desertion within. While his physical form experiences a floating existence, it is his heart that chains him to a 'shape' and this probably alludes to his love, his roots, his past, his God, his ideals or even his ideology. The ambivalence reflected in the line "I hate you for chaining me to a shape" echoes his heightened sense of existential angst. The dialectic of being and belonging is seen to run through most of his poems, sometimes explicit and at times implicitly woven.

Koshy's is a voice resonant with the anguish of living and loving. In an interview to *Copyleftwebjournal* he states : "I bleed red tears on to paper, mainly, and they become words and birds and fly away." The flight of his imagination and poetry is triggered by the politics of his identity, pain of separation and the recurring memories of a past that provide leverage to a conflicting present. It also marks a consciousness that is in constant struggle with the self and the external world where he tries to spin meaning out of the ensuing pain, anguish and dilemma. The adroit use of arresting allusions and images also points to the multi-layered nature of his verses and the possibility for further exploration of themes and forms. Borrowing the words of another noted poet and author of *Ekalavya* Prathap Kamath, it can also be said that Koshy's works are "the products of a mind that is restless and vibrant, with a micro-fine sensibility, down to earth humility despite its mind boggling scholarship and an eye that sees a detail always left unnoticed by others." He is definitely a distinctive and potent voice in the sprawling FB literaryscape. His postmodern sensibilities, adept use of English language, ever expanding intellect and sensitive approach to life put him across as a writer of extraordinary calibre.

References:

Fiumara, Romana. "The Psychology of the Individuation Process and Group Analysis: The Role of 'Pronominalism'." *Group Analysis*, 22(2), 1989. 177 – 187. doi: 10.1177/0533316489222007 . Web.

Kahlo, Frida. Qtd. *Fridakahlo fans*. 1 Jan. 2008. Web. 5 Oct. 2013. <http://www.fridakahlofans.com/biocomplete.html>.

Hall, Stuart. 2006. "Cultural Identity and Diaspora." The Postcolonial Studies Reader. Ed. Bill Asheroft, Gereth Griffiths, Helen Tiffin. 2nd ed. London: Routledge. 435-438. Print.

Homans, Peter. *Jung in Context: Modernity and the Making of a Psychology*. Chicago: University of Chicago, 1979. Print.

Koshy, Ampat. *The Camel Saloon*. 3 May 2010. Web. 20 Sept. 2013. <http://thecamelsaloon.blogspot.com/2013/02/i-do-not-know-what-i-seek.html>.

---. *Copyleftwebjournal. Archive of Alasdupur.* 7 Sept. 2013. Web. 8 Oct. 2013. <http://copyleftwebjournal.wordpress.com/2013/09/07/world-poetry-is-trending-now-because-of-the-possibilities-of-new-media-an-online-interview-with-ampat-koshy/>.

---. Slideshare. *Terrestrian. n.d*. Web. 25 Sept 2013. < http://www.slideshare.net/terrestrian >.

---. "*Tripping on Words: A Literary Atlas.* Ed. Brian Wrixon, et al. BrianWrixon Books, 2012.112-116. Print.

Koshy, Ampat and Gangane, Gorakhnath. *2 Phases 50 Poems.* Ontario, Canada: Brian Wrixon Books, 2013.

Marcel, Gabriel. *Tragic Wisdom and Beyond*. Trans. by Stephen Jolin and Peter McCormick. Evanston, IL: Northwestern University Press, 1973. Print.

Meredith, Angel and Koshy, Ampat V. *Soul Resuscitation*: *A Poetic Journey*. UK: Destiny to Write Publications, 2013. Print.

Nicole, Corinna. http://lifeofanartist.hubpages.com/hub/When-Frida-Kahlo-Set-Her-Eyes-on-Josephine-Baker. Web.

Rilke, Raina Maria. http://www.poemhunter.com/best-poems/rainer-mariarilke/elegy-i/. Web.

Singer, Milton B. “Introduction: Two Tributes to A.K. Ramanujan 1.”
Collected Essays of A.K. Ramanujan. Ed. Vijay Dharwadkar. 1st ed.
New Delhi: Oxford University Press, 1999. xii-xviii. Print.

Advances in Historical Studies
2013. Vol.2, No.2, 57-69
Published Online June 2013 in SciRes (http://www.scirp.org/journal/ahs)
http://dx.doi.org/10.4236/ahs.2013.22010

Temple as the Site of Struggle: Social Reform, Religious Symbols and the Politics of Nationalism in Kerala

M. R. Manmathan
Department of History, Farook College, Calicut University, Kerala, India
Email: mrmanmathanmr@gmail.com

Received December 31st, 2012; revised February 20th, 2013; accepted February 28th, 2013

The temple entry movement of the 1920s and '30s in Kerala, South India, has become a landmark in the history of social reform and nationalist movements for its uniqueness and sweeping success. Popular history has presented the episode as an integral part of the Nationalist Movement and the Gandhian Constructive Programme mainly because the temple-entry issue was endorsed by the Kerala State Congress Committee and the agitation was concluded under its auspices. But this popular and idealist impression of the movement has been challenged from various quarters. It is pointed out that there have been very little attempts at linking the event with the advancing civic rights movement led by the lower caste people for freedom of worship and social equality which was gaining a radical turn by the 20s and 30s; the pressure exerted by the untouchables to achieve civic freedom even at the cost of renouncing Hinduism had created an alarming situation which no caste-Hindu could ignore. Even more surprising is the absence of academic attempts to link the agitation with the Malabar Rebellion of 1921; in fact the Rebellion had challenged the very survival of the Congress organization in Kerala; this factor forced them to retreat from the earlier secular plane to a religious idiom of politics for which the question of temple-entry served their purpose. The Temple entry movement, therefore, has to be studied in the light of the antipathy shown by the Congress towards popular and radical agitations and in the context of its growing tendency to incline towards Hindu symbols in politics as a means to escape addressing vital and burning social issues.

Keywords: Temple-Entry; Constructive Program; Vaikam Satyagraha; 1921 Rebellion; Religious Conversion; Indian National Congress

Introduction

Social reform movements of early twentieth century Kerala differed from their north Indian counterparts in certain basic features. Firstly, they overlooked individualistic and usually female-oriented reform programs and confronted inequalities among Hindu castes, which were more glaring in Kerala than anywhere else in India. At the early stages of the all-India reform movements the "evils" of society, mostly inflicted upon women-sati, the prohibition on remarriage of young widows, purdah, the custom of early marriage, and lack of educational opportunities for them-engaged the reformers' attention, and crusades for laws to protect (mostly high-caste) women and the founding of institutions to support and educate them defined the practical reform programs (Heimsath, 1978: pp. 24-26). In Kerala, women's causes never caught on[1]; Kerala's social evil was caste. Secondly, they were all caste/community movements; preoccupation with community-subjects marked their social presence. The process of the "construction of Hinduism" (Muraleedharan, 1996; Viswanathan, 2003), which was one of the focal points of the early social reform movements of North India, both as a desperate resistance against colonialism ("Resistant Hinduism" against "Renascent Hinduism", Young, 1981) and as a prospective nationalist program, was only a succeeding agenda for the reformers of Kerala[2]. In other words, what was at stake was primarily the status relationship between communities; the formation of a unified Hindu religious community, by forging a symbolic unity of castes through the portal of the temple[3], was not taken up seriously till the early 1920s. Thirdly,

[1]Mainly for the reason that society had been impregnated with mother-right cultural norms and thus women—except in Nambutiri Brahmin and some Muslim households—were already liberated. Customs like Sati, female infanticide, and the disfigurement of widows which so enraged Indian social reformers, failed to emerge from the mother-right culture of Kerala. Widow remarriage, a highly charged issue throughout India, caused no ripples either, because most low caste and Nair widows freely remarried. Among the Nambutiris mature marriage was the norm, not child marriage, and so widowhood could not claim major attention among their reformers. Infant marriages among all communities were rare.

[2]The Renaissance intellectuals focused mainly on relieving Indian religion of the features most attacked by Christian missionaries and to remodel Hindu religion in accordance with the Judeo-Christian conceptions of monotheism and anti-idolatry. This process of shaping Hindu religion according to a totally alien concept is termed as "Construction of Hinduism".

[3]"Hinduism… does not meet the fundamental requirements of a historical religion of being a coherent system; but its distinct religious entities do. They are indeed religions; while Hinduism is not" (Stietencron, 1989: p. 20) The lower caste Hindus had their own shrines (*kavu*), the belief system and ritual practices of which were basically different from that of the Brahmanical temples. The Izhava social reform movement was a campaign to "sanskritize" their social customs, rituals and ceremonies: Aryan gods to replace primitive deities ("to obtain high gods for lower castes", Lemercinier, 1984: p. 248), learning of Sanskrit and founding of school for Vedanta and the congregation of monks.

these movements played a very insignificant part in the anti-British nationalist opposition (Houtart & Lemercinier, 1978: p. 5). The outstanding enemies here were internal, and the British colonist appeared to the depressed communities as an element favorable to their emancipation, since it was he who had been responsible for the abolition of slavery and for so many liberal reforms. For the upper castes too the British offered opportunities for emancipation, since educational progress and changes in marriage rules were largely dependent on their consent. In general, thus, the attitude of the caste associations towards the emerging nationalist movement was one of distrust and caution.

Against this background, my attempt here is to discuss how the temple-entry movement of the 1920s and '30s signified the above mentioned features and determined the nature and general course of nationalist politics in Kerala. It rejects the nationalist proposition of the temple-entry movement as a great humanitarian and philanthropic endeavor mediated by the Gandhian programme of social upliftment (Pilla, 1986: pp. 357-368; 409-415; Chandra, 1989: pp. 224-234; Menon, 2001: pp. 141-163; 316-331; Menon, 1997: pp. 74, 82) towards creating a "community of equals" and places it against deep social pressures from below. In fact the episode of temple entry agitation represented a conclusive act of the movement for civil rights led by the untouchable castes from the early nineteenth century (Jeffrey, 1978a: pp. 136-169). But the Congress involvement in the struggle in the 1920s, and even later, should be examined from two political standpoints—a shrewd drive to pacify lower caste radicalism (Aloysius, 2010: p. 181) (which was aggravated by religious conversions) and to find a quick deliverance from the moral setback inflicted by the Rebellion of 1921 (which in fact threatened to destroy the very foundations of the Congress in Kerala). The highly complicated socio-political environment brought about by the rebellion problematized both the future course of nationalist political action and the status quo of existing community and class relationships upon which nationalist politics had laid its roots.

This paper, apart from examining the role of lower caste radicalism in engendering the temple-entry movement, examines the hitherto unexplored story of the impact of the 1921 Rebellion in putting pressure on the Congress to deviate from its earlier secular stance to an apparent Hindu idiom of politics. Historians have noted this point earlier (Jeffrey, 1978a; Menon, 1994) but a serious effort to develop it into a polemic has not been undertaken. My attempt here is to create a counter-narrative, not by depending on any new sets of empirical data, but through a re-reading of the existing texts, which are, however, mostly of elite origin. Sources having subaltern inclination are rare, but those that are available from the part of both the Izhavas and the Mappilas are certainly made use of; the missionary and colonial records are treated with care as they represent another set of elite sources. The paper would first trace out the social situation of nineteenth century Kerala, the long history of the movement for civil liberties and the politics of rising nationalism, and then proceed on to discuss how the temple entry agitation reflected the concerns of the caste Hindus about the growing lower caste radicalism and attempted at addressing it through social reform measures.

Historiography

Though there are plenty of literature on the civil liberties movement, the nationalist struggle and the 1921 Rebellion, and a few attempts at connecting the temple entry movement with the conversion issue, there are practically no attempts at linking it with the 1921 rebellion. The Census Reports of Travancore and Cochin from 1871 to 1941 as well as the manuals of Travancore (Aiya, 1906; Pilla, 1940) and Cochin (Menon, 1911) contain rich data on the condition of the untouchable castes. The two manuals of Malabar (Logan, 1887; Innes, 1908) discussed the role of the colonial state as instrumental in emancipating the downtrodden. Some of the anthropological studies taken up during this period (Thurston, 1909; Iyer, 1909, 1939) discussed the social condition and inter-caste relationships to analyze how customs and traditions stood to counter the engagement with modernity. We have three important pieces of missionary literature (Day, 1863; Mateer, 1871, 1883) which looked down at the "primitive" and "superstitious" customs and systems of the people of the land and placed Christianity as a great redeeming force. Two recent studies also have tried to locate missionary intervention and the presence of a powerful Christian community as decisive factors in the modernization of Kerala society (Kawashima, 1988; Onwerkerk, 1994).

Academic studies on the social and religious reform movements of Kerala in general and the Izhava reform movement in particular placed them against the existing "context" (of caste, social evils, deprivation) and the impending forces of modernity (new education, missionary activity, colonial agency and the rising middle class consciousness) and analyzed the varied factors which helped or obstructed the potential of different social groups to appropriate reformism as a means to overcome their state of deprivation. (Rao, 1979; Isaac & Tharakan, 1988; Jeffrey, 1994). There were also attempts at examining the factors for the radicalization of the Izhava caste movement and its later inclination towards left-wing ideology (Jeffrey, 1978b). Some scholars considered missionary presence as instrumental in the gradual radicalization of the Izhava movement and the slow expansion of its emancipation agenda (Pulapilly, 1976). There were also attempts at analyzing the ideological foundations of the reform movements and to identify the unique features of the "Kerala Renaissance" (Houtart & Lemercinier, 1978; Heimsath, 1978, 1982).

On the Malabar Rebellion we have an unending series of literature belonging to diverse ideological streams ranging from colonial to nationalist and Marxist to subaltern. Discussion on the Rebellion has generally been focused on whether they were communal or agrarian uprisings, or whether they were motivated by economic or religious imperatives. Despite "fanatical outbreak" being the predominantly shared official version of the uprisings, agrarian grievances as a possible factor did not remain totally unnoticed. Two early exponents of the religious interpretation (Conolly, Strange), while recognizing the poverty and destitution of the Mappila "fanatics", rejected them as a reason for the "outbreaks". In contrast, Logan identified agrarian discontent as the main causative factor, but underlined the turbulence and fanatical character of the Mappilas (Logan, 1887). The government held that Mappila religiosity exacerbated by nationalist politics was the prime moving force behind the rebellion of 1921 (Tottenham, 1922; Nair, 1923; Hitchcock, 1925). More recent studies have attempted to interpret the militancy of the Mappilas as a means of defending the frontier of Mappila society-internal frontier was with the Hindu society dominated by landholding Brahmins and the external frontier with the Europeans, from Portuguese to the British. The nineteenth century uprisings were jihads to defend the internal Islamic frontier.

The rebellion of 1921 was different in that it was directed towards an identifiable political goal, i.e., establishment of an Islamic kingdom (Dale, 1980). The nationalist version is represented mainly by the autobiographical sketches of the Congress leaders which, while justifying the decision of the Congress to uphold the Khilafat issue, found fault with the government policy of repression and the irrationality and intense religiosity of the Mappilas (Nambutiripad, 1965; Nair, 1971; Menon, 1986). A dominant section of left wing historians followed an essentially economic interpretation, treating agrarian discontent as the prime factor with religion as a means of mobilization (Nambutiripad, 1952; Hardgrave, 1977; Dhanagare, 1977; Wood, 1987; Gangadharan, 1989; Panikkar, 1989). Among them Panikkar's study stood different in that it treated the context (anti-British feeling and the urge to free from the exploitation of the propertied classes) and ideology (religion translated discontent into action and provided the vision of an alternate society) equally decisive. A recent study examined the uprisings from a subaltern perspective and placed the Mappila insurgency along subalternity and religiosity, which are specific to premodern consciousness, in order to exonerate it from the alleged blemish of "communalism" and "jihadism" (Ansari, 2005).

For a survey of the nationalist movement in Kerala we have several studies, both panegyric and critical. Studies which followed the official Congress view (Pilla, 1986; Menon, 1997; Menon, 2001) perceived the shifting strands of nationalist position with reference to its primary (anti-colonial) preferences and its (umbrella-type) all-class and secular character. The disposition of the Congress in taking up the internal issues affecting class/caste relations on a secondary footing has been justified on this premise but it is further argued that the constructive program was actually devised to serve this purpose—to supplement political action through social and humanitarian work (including efforts to eradicate untouchability)—which aimed at cleansing the nation of blots which stood against true and ideal nationhood. The nationalist reading of the temple-entry movement followed such a glossy picture: uplift of the depressed sections of Hindu community through constructive program was an integral part of the work of the Indian National Congress in Kerala (Menon, 2001: pp. 141-163; 316-331). That the dual task taken up by the Congress, to build the nation and to construct a solid Hindu community, was not a mistaken strategy; in the context of the predominantly Hindu majority nation-state, the appropriation of Hindu religious symbolism was not incongruous (Chandra, 1989: pp. 230-234). A critical stream against the nationalist position came from various quarters, especially the left and the subaltern-dalit groups. The left perceived the nationalist movement as having had an implicit class agenda which got reflected in its ideology and method of political action and argued that the constructive programme was devised to establish Congress hegemony over low castes and untouchables and to pacify the mounting "pressures from below" which threatened to offset the interests of the dominant social groups who were steering the movement (Nambutiripad, 1952: pp. 131-132; Sarkar, 1990: p. 230). An article on Guruvayur satyagraha, while treating it as a part of the nationalist movement, analyzed the role of factionalism within the Congress as a possible reason for diverting the Civil Disobedience Movement (CDM) into a social struggle and attributed the failure of the struggle to the basic limitations of the Congress attitude towards untouchability (Gopalankutty, 1981). The Dalit perspective blamed Gandhi for perceiving untouchability simply as a religious issue, not as a question of civil right, and hence in practice, it appeared to counter their own idea and struggles for emancipation (Aloysius, 2010: p. 181; Ravindran, 1988).

Two studies have tried to link the temple-entry agitation with the struggle for civil rights and the inner politics of the nationalist movement (Jeffrey, 1978a; Menon, 1994). While the former identified the "modernizing" impact of colonialism and the "civilizing" impact of missionary work as decisive in the creation of a powerful middle class and a congenial ideological environment leading to radicalization of the reform process, the latter discussed the difference in the degree of power and deprivation among hierarchically arranged social groups in the traditional social order and presented the nature of their response to colonialism/nationalism on the basis of the degree to which the changes which took place under the colonial system favored their emancipation/retention of privileged position.

The Social Spectrum of Kerala

The caste structure of colonial Kerala stood different from the pan-Indian scenario. The existing varna and jati system varied from the ideal four-fold model with the total absence of the Vaishyas and a very marginal Kshatriya presence; the traditional trading and commercial functions were by and large the preserve of the non-Hindu communities like the Jews, Muslims and Syrian Christians and the ruling lineages of medieval Kerala were substantially drawn from Sudra-Nair caste who however were gradually elevated to Kshatriya-Samanta status. Brahmins (including the Kerala Brahmins called Nambutiris and the immigrant Tamil and Kannada groups) constituted a mere 1% of the population of the land but they occupied the upper echelons of ritual hierarchy and owned substantial landed properties. The populous, martial and matrilineal caste of the Nairs, who were the ruling class and constituted a substantial portion of the military force in the pre-British era, were accorded higher status for being "clean sudras" which led the Brahmins to enter into alliance with them by arranging liaisons with their women[4] and by entrusting them with the management of their landed estates and temples. All of the above groups along with the several tiny castes of temple-servants called Ambalavasis constituted the elite Hindus (*savarna*). All the castes below the Nairs were *avarnas* (untouchables) and included, in terms of hierarchy, the Izhavas, Pulayas, Cherumas, Parayas and Nayadis. In addition there were the fishing and tribal communities. Pulayas, Parayas and Cherumas served as agrestic laborers and occupied very low social position and economic power tantamount to serfs. Defilement practices consisting of untouchability, unapproachability and even un-seeability determined inter-caste relations and was apparently influenced by the notion of hierarchy. The *savarna-avarna* divide mediated by socioeconomic and political inequalities hardened and dehumanized relationships between social groups.

An examination of the position of the Izhavas in the traditional social structure reveals the range and magnitude of diverse kinds of relative deprivation. They are an ethnic category, found all over South India (Izhavas and Shannars in South Tra-

[4]Such conjugal alliances were called *sambandham* in which the male partners were just "visiting husbands" and the wives along with their children lived in matrilineal extended households maintained by impartible joint property. This practice was popular among matrilineal castes like the Nairs, Kshatriyas and Ambalavasis who had liaisons with the Brahmins.

vancore, Chovans in North and Central Travancore and Cochin, Tiya in Malabar, Billava in Tulunad, Nadar in Tamil Nadu and Idiga in Mysore) and the various cognate castes in Kerala constitute a large ethnic bloc. The most popular theory is that the Izhavas were migrants from Ceylon (Aiya, 1906: pp. 398-402; Thurston, 1909: pp. 292-418; Innes, 1908: pp. 124-125; Logan, 1887: p. 80) and were Buddhists by faith (Kunhuraman, 1925; Aiyappan, 1965: p. 119). The occupation of the Izhavas in the traditional caste order was coconut plucking and toddy-tapping, though they were engaged as tenant cultivators, agricultural laborers, weavers and coir workers. They also practiced ayurveda and astrology and had a tradition of military service (Iyer, 1909: p. 298). The Izhavas ranked lower than the Nairs and above the Cherumas/Pulayas in the caste hierarchy. Though the Izhavas were at the top of the category of castes who caused distance pollution, they had to keep a distance of 36 feet from the Nambutiri Brahmins and were not allowed to enter temples managed by the upper castes. They also did not have the right to use public roads and wells of the upper castes (Aiyappan, 1944: p. 39) and were denied admission in caste Hindu schools and government jobs. Their women were not allowed to wear upper garments or any ornaments. The Nairs often demanded unpaid labour (uzhiyam) from them (Mateer, 1871: p. 43; Day, 1863: p. 322). Under the existing three-tier agrarian social structure, most Izhavas occupied the position of sub-tenants or agricultural laborers. Most of the *janmis* were Nambutiris, Kshatriyas or aristocratic Nairs. *Kanam* tenants who held the lease for a period of twelve years (but sub-leased them) were mainly Nairs. *Verumpattam* was the lease for a three year tenure and Izhavas and Mappilas were the prominent sub-tenants. Agricultural laborers formed an important category, and this consisted of the Izhavas, Pulayas and Cherumas.

The political attitude of the Mappila community of Malabar represented a more complex pattern. Mappilas (or Moplahs), the Muslims of Malabar, traditionally trace their origins to the ninth century, when Arab traders brought Islam to the west coast of India (Miller, 1992: pp. 40-45). By 1921, they constituted the largest—and the fastest growing—community of Malabar. With a population of one million, 32 percent of that of Malabar as a whole, the Mappilas were concentrated in south Malabar, i.e., in the Ernad, Valluvanad and Ponnani taluks of the erstwhile British Malabar described in colonial records as "fanatical zone" (Innes, 1908: p. 89). In Ernad taluk, the center of the rebellion, they formed nearly 60 percent of the population and in Walluvanad, 35 percent. The community has been characterized as consisting of pure Arab settlers, of the descendants of the Arab traders and women of the country, and of converts to Islam from the lower Hindu castes (Innes, 1908: p. 26). The Mappilas were a mercantile community concentrated along the coast in urban centers. Segregated from the Hindu population in separate settlements, they had considerable autonomy, and under the Zamorin of Calicut, they enjoyed prestige as well as economic power (Zaynu'd-Din, 1942). From the sixteenth century, with the rise of Portuguese power in challenge to Mappila commercial interests, the greater portion of the community moved into the interior of Malabar and increasingly came to be agricultural tenants, low in status and desperately poor (Dale, 1980: pp. 54-82). In sharp contrast to the general prosperity enjoyed by the Mappilas of the North (where early converts included propertied classes of the high castes), the Mappilas of South Malabar were principally converted from the lower Tiyya, Cheruman and Mukkuva castes, for whom "the honor of Islam" brought freedom from the disabilities of ritual pollution. It was in these inland areas of the south and among the poorest sections of the population that the Mappila community expanded most rapidly (Hitchcock, 1925: p. 9).

During the successive invasion of Hyder Ali and Tipu Sultan, in the late eighteenth century, Malabar was thrown into social turmoil. The Mappilas tried to reap political and economic gains from it by declaring their proprietorship rights over their tenurial lands and by remitting land tax directly to the government defying caste-Hindu landowners (Dale, 1976; Miller, 1992: p. 81; Menon, 1999). The caste Hindus responded to this hopeless situation by fleeing from Malabar and seeking refuge in the self-proclaimed Hindu state of Travancore after either disposing of their property or deserting them to the Mappilas (Narayanan & Kesavan, 1983: p. 275). The situation was also significant in that large number of lower caste Hindus utilized the opportunity to enhance their social prestige by embracing the religion of the new rulers (Kunju, 1989: p. 79). The defeat of Tipu and the subsequent British land settlement policies in Malabar, leading to the restoration of the social and economic position of the dominant castes, severely affected the position of the Mappilas in South Malabar—by imposing enormous amount of rent and by fixing heavy renewal fees on tenurial contracts (*melcharth*) (Panikkar, 1989: pp. 1-48), they were oppressed in particular. Reduced to insecure tenancy, vulnerable to rack renting and eviction at the hands of Hindu *janmis* sustained by British courts, the Mappilas responded in a series of outbreaks[5]. During the course of these nineteenth century outbreaks, the number of conversions to Islam heightened dramatically. In converting to Islam, those of lower castes were not only freed from the traditional social disabilities of the outcaste, but they joined a community of resistance wherein their protest against *janmi* tyranny was supported by their fellow Muslims (Hardgrave, 1977: p. 62)[6]. The recurrent Mappila riots of the 19th century were, to a large extent, in spite of their predominant religious character (Dale, 1975), defensive responses to, or retaliatory acts against, such tyrannical acts and in that sense were essentially economic phenomena (Gough, 1968-1969). The sweeping militancy of the Mappilas and the exceptional enthusiasm they expressed in violating traditional caste dharma combined with the rise in their demographic strength intensified the

[5]The term "outrage" was used by the British to refer to those outbreaks of Mappilla violence in which the attack usually against a nambutiri or Nair landlord; sometimes against a European official or a convert who had slipped back into the Hindu fold and thus threatened community solidarity was followed climactically by the religious suicide of all involved, in the secure knowledge that by their martyrdom they would attain the *houri* bliss of Paradise. The incidents in which the mappillas "sought actively their own death", 29 in number between 1836 and 1919, were normally suppressed in a few days and involved in each case a relatively small number of people. Only in eight of the outbreaks did more than ten Mappillas become martyrs (or shahids) (Hardgrave, 1977: p. 62).

[6]The Census of India, Madras (1871: p. 7) noted that the Cherumas "have to a large extent embraced Mohammedanism, and in so doing have raised themselves and their successors in the social scale. The tyranny of caste no longer affects the Mussalman converts and under these circumstances it is no cause for surprise that the Mussalman population on the Western Coast should be fast increasing". Subsequent Census Reports recorded the continued Mappila increases and actual declines in the number of Cherumas reported. Between 1871 and 1881, the Mappila population of Malabar increased by 12.3 per cent, compared to only 3.4 per cent of non-Mappilas (Census of India, Madras, 1881: pp. 39-40). Between 1881 and 1891, Mappilas increased by 18 per cent, in comparison to a 10 per cent increase for Hindus (Census of India, Madras, 1891: p. 67).

social distance between the Mappilas and the high caste Hindus (Miller, 1992: p. 98). The setback inflicted on the material interests of the dominant groups had started to articulate slowly in the form of religious polarization and in widening the communal divide.

In 1852, a special commission, headed by T. L. Strange, was appointed to investigate the causes of the outbreaks. Strange rejected the view that the disturbances had their origin in agrarian discontent or poverty and attributed it to religious fanaticism stirred by the teachings of ambitious priests. He recommended a repressive policy, enacted into law in the Moplah outrages Act, XXIII and XXIV of 1854. A special force of police was raised in Ernad to enforce these measures (Logan, 1887: pp. 570-571). The failure to quell the outbreaks despite strong police measures persuaded the government to appoint William Logan, the District Collector, as Special Commissionaire, in 1881, to enquire into land tenures and tenant rights in Malabar. Logan believed the problem to be rooted fundamentally in the early British misunderstanding of the traditional relationship of the *janmi* to the land. Rather than seeing the *janmi* as one of several agricultural classes with rights to the land and its produce, British officials viewed him as rather like an English landlord to be protected with the force of Law (Logan, 1887: p. 584). However, the government refused to implement his recommendations which is evident from the statement of District Collector Innes who writing at the turn of the century attributed the outbreaks to "three main causes, poverty, agrarian discontent and fanaticism, of which the last is probably the chief" (Innes, 1908: p. 89).

The establishment of British rule marked the beginning of a social transformation. A notable feature was the consolidation of diverse political units into larger administrative ones. By 1793 the whole of Malabar came into the hands of the British and became a district of the Madras presidency. Travancore and Cochin continued under princely rule but as subordinate allies of the British and guided by a British officer called Resident in administration. The consolidation of power in the British hands led to the introduction of a uniformity in basic legislation. Slavery was abolished in Malabar in 1843 by the British and through Royal Proclamations in Travancore and Cochin in 1853 and 1854 respectively (Basu, 2008: pp. 57, 62-63). But in the realm of land tenure and educational progress law and custom stood opposite to each other. In 1793 the British recognized the *janmi* as the owner of the land and *kanakkar* as the lease, holding a mortgage. Thus the *verumpattakar* tenants were dependent on their lords and if they revolted against the landlord, they were evicted. From the beginning of the nineteenth century, large number of schools was started by the Christian missionaries to impart education to the converted people. Taking queue from them, the governments of Travancore, Cochin and Malabar opened schools, but it benefitted the Nairs and the Syrian Christians. As untouchables, the Izhavas could not profit from them but the mission schools provided them openings for education. The strong anti-British attitude of the Mappilas kept them away from English education for a long time. The Tiyyas of Malabar and the Muslims of Travancore fared well and did not face much deprivation; under direct British rule, the Tiyyas could prosper educationally and socially and as traders and landowners, the Muslims of the princely states could make use of the possibilities opened up by modernity (Logan, 1887: p. 144; Iyer, 1909: p. 283).

The Civil Rights Movement

Kerala began to experience the impact of colonial modernity from the early decades of the nineteenth century, the ramifications of which were felt in the public sphere in different times and in different degrees. One of the most important impact was felt in the social realm, in the form of efforts at reforming customs and democratizing social relationships. It was the (Protestant) Christian missionaries (such as the London Mission Society (L.M.S) in Southern Kerala, Church Mission Society (C.M.S) in Central Kerala and Basel Evangelical Mission Society (B.E.M.S) in Northern Kerala) who took the pioneering steps in promoting social reforms; they actively engaged in spreading the message of reform by imparting modern education to the untouchables and encouraging the new converts to openly question symbols of caste oppression and rules of ritual pollution (Aiya, 1906, I: p. 525; Manavalan, 1990: p. 120). The revolt of the Christian converted Shannar/Nadar women of Southern Travancore to get their right to wear upper garments really shook southern Travancore in the first half of the nineteenth century (Hardgrave, 1968)[7]. Similarly, the activities of the missionaries and the pressure exerted by them played a decisive role in coercing the governments to abolish slavery in both Travancore and Malabar in the middle of the nineteenth century (Basu, 2008: p. 74). The missionaries were also the first to introduce print-culture in Kerala. They utilized the print media to oppose customs and practices which had contradicted with modern outlook and human reason (Anderson, 1983: pp. 41-49)[8]. The efforts of the missionaries had had its desired effect, especially among the lower castes, and large mass of such people became converts to Christianity. But missionary appeal failed to much impress the upper or middle level caste groups; even the untouchable caste of the Izhavas took advantage of the new opportunity and the newly acquired knowledge to attain upward social mobility within the existing Hindu social order through radical social reform (Sahodaran, 1920: pp. 290-294; Jeffrey, 1974: p. 48)[9].

Early attempts at social reform were followed by organized struggle for social change which also had its genesis in the princely state of Travancore. Though being conservative and very vigilant in protecting the old social order, the government had started "modernizing" the state by founding schools, roads, law courts, and efficient bureaucracy. Meanwhile, a powerful middle class, which had been developing among the untouchable caste of the Izhavas, grew more and more frustrated over the state policy of keeping them away from government schools and service. In 1896 the Izhavas of Travancore submitted a huge memorandum (signed by 13176 men known as *Izhava Memorial*) calling upon the government to open public schools and services to them (Rao, 1979: p. 34). The failure of such

[7]The struggle is examined from various viewpoints. While some people from within the caste see it as part of an epic struggle to free the lower classes from feudal domination (Yesudas, 1975), the missionary perception take it as the triumph of decency and Christian values (Mateer, 1883: Ch.XXXIV). Hardgrave regards it as part of a wider movement within the caste order of south India for the Nadars to raise their status in the social hierarchy (Hardgrave, 1969).

[8]Anderson attributes the success of European Reformation to print-capitalism and stresses the coalition between Protestantism and print-capitalism.

[9]*Sahodaran*, the magazine published by the radical Tiyya lawyer C. Krishnan from Calicut, urged the Izhavas to concentrate on reforming Hinduism from within as no other religion was so liberal and tolerant. Jeffrey added that as large number of Izhavas prospered, they were able cautiously to imitate the manners of Nairs.

early steps persuaded them to turn towards more radical measures under a strong organization, that is, the S.N.D.P. Yogam under the powerful leadership of Sri Narayana Guru. The Yogam took up a two-pronged struggle—the fight for social equality and freedom of worship and the internal reform of the Izhava caste to make it a model community (Pulappilly, 1976: pp. 35-39). The radical demands raised by the S.N.D.P. in Travancore, such as the freedom to use public roads and temple-entry and representation in government jobs and legislatures, and the strategy of mass struggle they adopted to achieve their demands, clearly reflected their resolve to transform—not merely to reform—the existing social structure (Heimsath, 1982: p. 33). In British Malabar, the state did not adhere to caste rules and hence the lower castes could get recruited into even higher government posts (Menon, 1901: p. 182; Kesavan, 1968: pp. 263-270). Thus the Tiyyas in Malabar were not as deprived as their Izhava counterparts in Cochin or Travancore and hence militant lower caste social reform movements failed to take roots in Malabar.

By the 1920s the movement for civil liberties was taking new proportions. As already noted, the lower caste untouchables had expressed their resolve to better their social position through mass conversion (to Christianity in southern and central Kerala and to Islam in northern Kerala) and to distance themselves with the politics of nationalism since the Indian National Congress was identified to represent upper caste interests and to perceive the colonial master as a potential ally in the path to social emancipation. But the middle level caste of the Izhavas who till then refused to experiment the possibilities of the politics of religious conversion and worked to occupy a "respected place in Hindu society" than to satisfy with a "doubtful Christian role between contemptuous Syrians and polluting Pulaya converts" (Jeffrey, 1974: p. 48), now began to seriously think of renouncing Hinduism for getting a more honorable status in the civil society. The Congress decision to uphold the cause of temple-entry stemmed from this predicament, because religious conversion was slowly growing into a vital social issue capable of subverting the existing social equilibrium solidly rooted in birth rights and hereditary social privileges.

The Nationalist Politics

The nature of political awakening in Kerala differed in the three political regions in accordance with the prevailing political climate—while in Malabar where direct colonial rule existed, nationalist movement had made deep inroads by the beginning of the Gandhian era but in the princely states of Travancore and Cochin they were at low ebb. In Travancore and Cochin, political condition of the princely state weakened the possibilities of the spread of a strong nationalist movement and hence the rising middle class of both the upper and lower castes concentrated on promoting community interests (Kesavan, 1968: pp. 356-357). This was the background of the Izhava memorial, and the Abstention Movement of the 1930s, in which various deprived groups formed a coalition forum called Joint Political Congress to press forward their middle class demands for reserved representation in government jobs and legislatures in accordance with population strength against the huge monopoly of the Nairs and Brahmins. The non-cooperation or civil disobedience movements of the 1920s and 30s did not make any political effects here; politics of the princely states evolved around social issues, skillfully masterminded by caste/community organizations.

The nationalist movement came relatively late to "sleeping Malabar". While a District Congress Committee had been formed in 1908, it was not until 1916, with the beginning of the Home Rule Movement that Malabar began to awaken politically. The fifth Malabar District Conference was held at Manjeri in 1920 with Annie Basent in chair in which the extremist group could pass a resolution in favour of tenancy reforms against the moderate stand who under Basent boycotted the proceedings. The demands for tenancy reform came principally from the class of *kanakkar*, substantial tenants who were largely intermediaries between *janmis* and the vulnerable *verumpattakkar*, tenants-at-will. The *janmis* were mostly Nambutiri Brahmins, the *kanakkar* were disproportionately Nairs and the *verumpattakkar* were overwhelmingly drawn from the Mappila community and from Tiyyas, Cheruman and other depressed Hindu castes. The Nair *Kanakkar*, prosperous and articulate in defense of their interests, had long been active before government commissions and in the Madras legislative assembly in efforts to secure more favorable tenancy rights for themselves. But it was not until 1920, in linking the tenancy issue with the Congress-Khilafat struggle for Swaraj, that the tenancy movement gained momentum. The Congress was still a predominantly Hindu organization, dominated largely by Nair lawyers from the *kanakkar* class. The rise of the Khilafat issue[10] and Gandhi's decision to link it with the noncooperation movement fundamentally transformed the character of the Congress (Nambutiripad, 2005: p. 42)[11].

Non-cooperation was formally launched on August 1, 1920, and on the 18th of that month Gandhi and Shaukath Ali visited Calicut to bring its message. Khilafat committees began to sprout in Malabar and official reports revealed that Mappilas of Ernad were more interested in the tenant cause and only on upholding that issue the agitators could make any advance (Tottenham, 1922: p. 4). Agrarian tension increased in the light of the rumor of an impending tenancy reforms in Malabar and while landlords increasingly evicted tenants, Nair leaders of the Congress sought to mobilize the active support of the Mappila cultivators—both for tenancy reforms and in the name of Khilafat. Intense campaigning for Khilafat scared the official circles, in the light of "fanatic outbreaks" of the past, and ignorance and backwardness of the Mappilas, which led them to ban public meetings (Madras Mail, 1921, Feb. 8: 9; Ap. 27: 8); expansion of the tenancy movement under Congress auspices spread alarm among landlords and officials alike. In the context of all these the All Kerala Provincial Congress was held at Ottappalam on 26 April 1921, in which large number of Khilafat volunteers in uniform attended (Panikkar, 1989: p. 132) and an *ulema* conference exhorted all Muslims to support the Khilafat as a religious duty and to join the Congress to fight for the Khilaft through the struggle for swaraj. A tenants' conference convened at Ottappalam strongly supported resistance to land-

[10]The Khilafat movement sought to preserve the integrity of the Ottoman Empire and the Turkish Sultan as the Caliph. The movement beginning in 1919, protested against British support for the dismemberment of the Ottoman Empire and the abolition of the Caliphate. The Indian movement was led by the Ali Brothers (Shoukath and Muhammad) but Congress soon supported the issue as Gandhi saw in it a golden opportunity to weld Hindu-Muslim unity and combine anti-British issue of Khilafat with the movement for Swaraj through non-violent noncooperation.

[11]E.M.S. wrote that a striking solidarity had developed between the Mappilas and the class of lawyers, journalists and politicians (i.e., Congressmen) who brought them into nationalist politics; both were lured by tenant interests, and looked forward to get a tenancy legislation passed.

lords and Government in the form of noncooperation (Hardgrave, 1977: p. 70). Congress leaders like K. P. Kesava Menon and K. Kelappan addressed several Khiafat conferences (Menon, 1986: pp. 82-83). The "wonderful" organization of the Khilafat movement (Madras Mail, Aug. 8, 1921: p. 6) and the traditional system of communication among the Mappilas (Hitchcock, 1925: p. 3), along with the official anxiety over the Mappilas utilizing the newly forged solidarity to redress their immediate grievances (Tottenham, 1922: p. 26) forced the government to take strong punitive measures against them which, within a few days, led to the eruption of a violent uprising.

The rebellion actually started with the Tirurangadi incident in which nine Mappilas were killed in police firing while a group of 2000 people marched to the police station demanding the release of their fellowmen taken into custody during a police action at the Mambram mosque in search of some Khilafat volunteers (Hitchcock, 1925: pp. 31-34). Thereafter violence erupted which was marked by widespread attack on symbols of government authority, such as police stations, courts and record offices and cutting of railway and telegraph lines. Landlords-Nambutiris and Nairs—were the principal victims of the attacks, several of whom fled from the area to the nearby towns of Calicut or Trichur. At the earliest stages, Hindus were clearly involved, but with time and growing violence (and with the proclamation of the Khilafat kingdom in south Malabar), their numbers rapidly diminished (Hardgrave, 1977: p. 83), which imparted a communal color to the rebellion. For almost six months the "Mappila zone" was under the control of the rebel leaders. The government soon resorted to reinforcements which led the rebels to retire into safe areas and to fight a guerilla war. There were frequent reports of rebel atrocities, sporadic incidence of violence against Hindus and cases of forced conversions to Islam (Nair, 1923: pp. 76-79)[12]. This has been attributed primarily to two factors: the impression among many rebels of the movement leading to the establishment of an Islamic state and to the widespread suspicion of Hindus acting as informants for the government (Panikkar, 1989: pp. 179, 198). By the beginning of 1922 the rebellion was crushed causing heavy casualties on the rebel side and all the leaders were soon arrested or shot dead[13]. Panikkar identified at least three patterns of rebel activity in the whole course of the rebellion. The initial political mobilization was effected by the Khilafat and Congress activists who were soon rendered ineffective and the actual course of the revolt thereafter developed outside the political movement in which it had initially developed. In this second, but short-lived, stage the locally influential leaders took over the direction of the rebel proceedings but ceased to be effective when the army operations began. In the third and crucial stage, the insurrection was now conducted by the rural poor themselves, either under grass-root level leadership or without any recognizable leadership at all. The pattern of rebel proceedings underlined a consciousness primarily rooted in an opposition to the landlord and the colonial state. Against the selective and limited nature of rebel violence (against the janmis and their servants) of the nineteenth century, in 1921 a distinction was made between the lenient and exacting landlords (although attitude towards Europeans was uniformly hostile); several of the latter category were executed and murders and physical assaults on others were largely punitive actions against collaborators and informers of the British army (Panikkar, 1989: pp. 198-199).

In the context of the eruption of violence and the evolution of the revolt into a communal outbreak the Congress withdraw its support to their earlier ally, the Mappilas. The Congress leaders were in fact taken by surprise at the unexpected developments. But their activity was confined to the two trips they made to the rebel area in the early stage of the rebellion; afterwards they remained passive spectators-partly because they could not approve of the rebel action and partly because of their lack of confidence in being able to influence the rebels (Panikkar, 1989: pp. 149-151). The attitude of the Congressmen drove the Mappilas to identify the Congress with the Hindus (Panikkar, 1989: p. 189). The relief and reconstruction measures undertaken after the rebellion also underlined the communal divide—the Congress was active only among the Hindu refugees. The years that followed the suppression of the Rebellion and the withdrawal of the non-cooperation movement made it extremely difficult for the Congress organization to function in Malabar. K. P. Kesava Menon, the Congress leader, described the situation thus: "For a long time after the rebellion no public activity was possible in Malabar. Enmity towards the Congress was evident everywhere. The authorities stated that the Congress had brought down calamity on the country through participation in the Khilafat agitation. They even wanted all the Congressmen in Malabar to be imprisoned. The Muslims complained that those who had induced them to join abandoned them when police oppression and firing by the troops started" (Menon, 1986: p. 128). The caste-Hindus who were opposed to the Congress, on the other hand, denounced them for supporting the "foolish" and "fanatic" Mappilas and for inciting them to plunge into a violent action (Yogakshemam, 1921, 11: 47, 2). The Congress leadership sadly realized that the first political struggle it undertook in Kerala ended in tragedy and the alliance with the Mappilas proved self-annihilating as they not only not refused to adhere to Gandhian ahimsa but advanced it into a class and community struggle. More disturbing was the sense of unity evinced by the Mappilas and their resolve to sacrifice for a cause which was alien to the Hindu tradition and hence incompatible to "national" interests.

The Congress could not recover from the fatal blow inflicted on its morale by the rebellion for long; it could not think of political campaigning—even to summon a Congress meeting. It tried to overcome this political lethargy by focusing on the social front and by drifting towards political journalism. This was the background of the birth of the nationalist newspaper *Mathrubhumi* and the launching of the Vaikam satyagraha (Menon, 1986: pp. 139-149; Gangadharan, 2008: p. 248; Nambutiripad, 2005: pp. 65-68)[14]. The temple entry movement in fact

[12]The pro-British *Madras Mail* was in the forefront in this venture. The anti-Mappila reaction was presented by the *Mail* in its daily reporting and in a (later) series on "The Moplah Rebellion". It referred to the "innate characteristics" of the Mappila as "his mad fanatical fury, his murderous spirit and his reckless disregard for life" (Madras Mail, 1921, Nov. 14: 5; Nov. 15: 7). Gopalan Nair's *Malabar Rebellion* devotes 21 pages to atrocities allegedly committed by the Mappilas against the Hindus (Nair, 1923: pp. 52-72).

[13]Official figures recorded 2339 rebels killed, 1652 wounded and 5955 captured. K.P. Kesava Menon estimated that as many as 10,000 may have lost their life in the rebellion (Menon, 1986: p. 116).

[14]Mathrubhumi Daily was started in 1923 from Calicut with K. P. Kesava Menon as its founder editor. Congress leaders and people sympathetic to the nationalist movement helped to raise the necessary funds. It consciously tried to propagate nationalist and patriotic sentiments as well as a spirit of Hindu unity.

provided the Malabar Congressmen with a programme, and a lease of life, as it opened before them a safe field of activism; it shifted the centre of activity to further south where Mappilas were absent and furnished with a fine opportunity to compensate for the earlier "disastrous" alliance with the Mappilas by fighting for a Hindu cause (Jeffrey, 1978a: pp. 153-154)[15]. The Congress was turning more Hindu and more rightist; communities of foreign religious affiliation were increasingly identified as external to the national self and as threatening "national" interests.

The Temple-Entry Movement

The political and social atmosphere of Kerala in the 1920s and 30s grew tense with the Indian National Congress upholding the cause of temple entry. In 1924 the Congress organized the vigorous 20 month long satyagraha at the Vaikam temple with the simple aim of securing the right to use the approach roads of the temple for the untouchables. While the upper castes and non-Hindus including Christians and Muslims freely used the temple roads, the untouchables like the Izhavas and Pulayas were forbidden to pass through them. The Izhavas were on the verge of a revolt over the question of caste pollution and viewed it as an obvious act of social injustice and open violation of human rights. The S.N.D.P. Yogam was seriously discussing the means to overcome this social stigma. Since the Izhavas had their own temples in which they themselves acted as officiating priests, their eagerness to get access to *savarna* temples was more a matter of civil rights than a question of freedom of worship. T. K. Madhavan, the prominent leader of the S.N.D.P. Yogam and the true spirit behind the satyagraha, managed to get a resolution passed at the Congress session in 1923 at Kakinada on the question of the removal of untouchability. The Kerala Pradesh Congress Committee (KPCC) decided to launch a satyagraha at Vaikam on this basis (Menon, 1986: pp. 160-164). Gandhi blessed the satyagraha but cautioned against non-Hindu participation and non-savarna leadership in it as it was strictly a Hindu cause and a golden opportunity for caste-Hindus to atone for a heinous sin (Young India, 1925: p. 135; Proceedings, 1925). The satyagraha attracted countrywide attention and people from all over India reached Vaikam to support the struggle. The *savarna-jatha* (upper caste march) organized under the leadership of Mannath Padmanabhan to the capital Trivandrum, to impress upon the king of the urgency of the demand, truly reflected this spirit. The prolonged campaign and the direct involvement of Gandhi forced the authorities to come to a settlement according to which all the approach roads, except the eastern one, of the temple were thrown open to all people irrespective of caste and community. The modalities of the agreement was a subject of intense debate and the Congress was blamed for deserting the struggle halfway and for effecting the agreement only to the Vaikam temple (Ravindran, 1988: pp. 144-149). Due to this reason, several similar struggles had to be waged for the same purpose subsequently. As a result, in 1928, approach roads to all temples in Travancore were thrown open to all people (Menon, 1984: p. 327).

The second satyagraha struggle under the K.P.C.C. against caste based pollution, but now to get the temple open to all Hindus, was organized in 1931-32, in the course of the C.D.M, at the Guruvayur temple in Malabar. While the struggle at Vaikam was a social reform measure divorced from any political movements, at Guruvayur it was integral to a political program (Gopalankutty, 1981). Nevertheless, in Kerala, the zeal for social reform overshadowed the rising countrywide political enthusiasm; for the K.P.C.C. the temple-entry issue was more important than the C.D.M. and leaders like Kelappan concentrated heavily on the question of untouchability (Mathrubhumi, 1931, Ap. 6, June. 21, July. 29, July. 31 & Sep. 10; 1932, March. 5, March. 27 & Aug. 4). Gandhi also asked the satyagrahis to detach the struggle from all its political affiliations and from the organizational links of the Congress in order to rescue it from government repression and to ensure its success. Though the temple-entry agitation was perceived as tantamount to the "struggle against imperialism" by some of its leaders (Gopalan, 1973: p. 28) as it kept vigil against disunity and factionalism, what really prompted the Congress to confine the struggle to temple-entry was the bitter experiences of 1921[16]. The Zamorin, who was the trustee of the temple, however, refused to step down to negotiate a settlement which led Kelappan to start a fast unto death which, however, was withdrawn under the advice of Gandhiji (Mathrubhumi, 22 Sep. & 4 Oct. 1932). The satyagraha as a whole was finally terminated before achieving any of its declared objectives. A period of three months was given to the Zamorin to effect temple-entry, failing which Gandhi would himself offer satyagraha; but it was postponed and did not take place at all. A referendum was held among the caste Hindus of Ponnani taluk, where the temple was situated, which revealed that 70% of them supported the cause of temple entry (Mathrubhumi Weekly Temple Entry Special Issue, 16 Nov. 1937). N.P. Damodaran, one of the leaders of the satyagraha, later recollected that though the agitation failed to meet its immediate objective, it created a climate in favour of temple entry (Damodaran, 1981). The movement for temple entry registered its crowning victory when the Travancore government made the temple entry proclamation in 1936 by which all temples in Travancore were thrown open to all Hindus (Menon, 1984: pp. 327-328). Nevertheless, the temples of Cochin and Malabar remained closed before the *avarnas* till 1947.

Politics of the Temple-Entry Movement

The temple-entry movement was important for several reasons. Firstly, it was a conscious effort on the part of the Congress to integrate the various castes and communities under the Hindu fold through social and religious reform, which represented a powerful domain of the nationalist movement. Temple could rally diverse sections together without dislodging the existing power relations and a symbolic unity could pacify lower caste radicalism. The Congress decision to take up the issue in Kerala was certainly in the context of the inclusion of the removal of untouchability as part of the Gandhian constructive program and its decision to fight out social evils in accordance with the nation-building project, but the constructive

[15]In an interview K. P. Kesava Menon revealed that for the Congressmen from Malabar district, the temple-entry campaign gave an opportunity to revive interest—at a safe distance—in a Congress that had suffered a severe setback with the Mappila rebellion of 1921 (cited in Jeffrey, 1978a: pp. 153-154).

[16]The fear of the Mappilas loomed large even in the 30's and during the salt march it is reported that salt law had been broken all over Malabar except in the erstwhile "rebel" areas. Moreover, the procession on foot from Payyannur, heading for the Guruvayur satyagraha stopped short of the "rebel" area. The marchers took a train from Feroke to Tirur "because of a rumor that the Mappilas would prevent them from moving into Ernad" (Menon, 1994: pp. 103-104).

programme itself betrayed its elitist character (Kooiman, 1995: p. 45; Onwerkerk, 1994: p. 56). Writings of Gandhi in the early twenties, and even later, revealed how the Congress leadership was getting seriously troubled by lower caste radicalism and the increasing volume of religious conversions (Young India, 27.10. 1920: 135; 04.06.1925: 135; 19.01.1921: 6; 04.05.1921: 3; 27. 04.1921: 5; 22.09.1921: 11; 29.09.1921: 12; 13.10.1921: 13; Harijan, 11.02.1933; 31.10.1936)[17]. Of equal importance was the basic limitation of the anti-untouchability program: it searched for a moral solution to repair inequalities to recast the nation but without dislodging the basic social structure[18]. The Congress leadership in Kerala also refused to address the economic content or power relationships rooted in it but rather took it as a question of equality within religion and an unfortunate aberration from scriptural injunctions.

Secondly, the heated debates unleashed by the Izhava middle class on religious conversion was acquiring political and economic dimensions. C.V. Kunhuraman, the firebrand leader of the S.N.D.P. and the editor of *Kerala Kaumudi* had made the alarm signal by urging the Izhavas to renounce Hinduism if the upper castes did not support their cause of temple entry (Kunhuraman, 1936). A section of the Izhavas enthusiastically welcomed the suggestion. Though there were differences of opinion as to which religion they should opt—whether Christianity, Islam or Buddhism—the challenge fell like a bombshell on the *savarna* groups. Although conversions had been taking place among the untouchables from very early times and its pace had considerably increased by the nineteenth and early twentieth centuries, the '20s and '30s were special because now the challenge came from the Izhavas who though "are *avarnas* are rich and educated" (Kelappan, 1925). The loss of the middle class was exceptionally harmful as they could threaten—as in the case of the Christian middle class of central Travancore (Jeffrey, 1978a: pp. 153-154)—the material pursuits of the upper caste Hindus. A powerful section within the S.N.D.P—including Kumaran Asan, T. K. Madhavan and A. Ayyappan, and of course Sri Narayana Guru too—stood for a reformed Hinduism (Kesavan, 1968: pp. 274-276). But radicals held fast to the idea of conversion; preferably to Buddhism against the Sri Lankan background of the Izhavas (Kunhuraman, 1925); this had lent space to speculations, that the conversion issue was a pressure tactic to enforce a reform of customs. However, it had its desired effect: caste Hindus increasingly began to realize the need of ritual reform which is evident in the rhetoric against conversions with a stress on the innate quality of Hinduism (Thampan, 1932; Nambutiripad, 1932). The Nair aristocracy fanned Nair communal passions against the Christian capitalists who were buying up their land and prestige (Isaac & Tharakan, 1988: p. 166). Leaders like "Mannam, who was not a Gandhian and was in general opposed to the Congress", participated in the Vaikam Satyagraha for his concern over the loss to Hinduism of converts to Christianity (Onwerkerk, 1994: p. 59). The temple entry movement under the leadership of the Congress thus represented an attempt at forging a consolidated Hindu identity and to discourage conversions which was engendered by disabilities enforced by the caste system. Religious conversion could cause trouble to the caste Hindus because "it reduced their rhetorical constituency" (Jeffrey, 1978a: p. 143). The writings of Kelappan clearly demonstrated how the temple-entry movement was directly linked to the threat posed by religious conversions (Kelappan, 1925; 1932a; 1932b)[19].

Thirdly, the Congress interest in the temple-entry struggle was an attempt to offset the damage caused to its prestige and honor by the incidents of 1921. Congress leadership tried to escape from the initial shock by expressing its "firm conviction" that the non-cooperation and Khilafat movements were in no way responsible for the outbreak. The Congress view was recorded in the resolution of the Working Committee in September 1921, expressing a "sense of deep regret over the deeds of violence done by the Mappilas in certain areas of Malabar" and resolved that the rebellion was not caused by the Khilafat or Non-cooperation movements, and that the causes of the rebellion had nothing to do with these movements (Sitaramayya, 1946: p. 216). Prominent Congress leaders in Kerala shared this view as is understood from Kesava Menon's comment that "it was wrong to have connected the Khilafat problem with the Nationalist Movement" (Menon, 1977: p. 48). Congressmen in Kerala were under siege for upholding the Khilafat issue and forging an alliance with the "fanatic" Mappilas which brought about "great hardships to the Hindus and dishonor to the land". The committees appointed by the Congress failed to make a comprehensive and objective enquiry into the cause of the rebellion, which led to develop controversies with strong political and communal overtones. K. Moidu Maulavi, Khilafat leader and staunch nationalist, reiterated his firm conviction that the rebellion was a struggle for freedom, it started as an anti-imperialist rising, although "in the end the British authorities had succeeded to an extent in degrading it into a communal conflict" (Maulavi, 1981: pp. 136-141; 152-154). But Kesava Menon stated (later) that it would not be correct to consider the "Mappila Rebellion" as part of the Nationalist movement because the rebels "were motivated more by religious zeal and

[17]In a series of articles entitled "The Removal of Untouchability" wrote in *Young India* and *Harijan*, Gandhi viewed conversion rather more inspired by the desire for material benefits than for spiritual needs. The lower caste people were getting converted because of untouchability which has to be eliminated not only to cleanse Hinduism of its evils but to attain swaraj also. Foreign rule in India is a divine punishment for following this curse which "is a crime against god and humanity". In fact untouchability was not a part of original Hinduism and hence those who threaten to abandon Hinduism are deceiving their religion. He consoled the untouchables that their low social stature is not due to their fault and urged the *savarna* people to take up the removal of untouchability as an act of atonement before they were too late to do so.

[18]"Untouchability was both a moral and political problem: the former because its eradication involved undermining its moral legitimacy and changing, or at least softening, Hindu attitudes; the latter because it was deeply rooted in the highly unequal structure of power relationship between the upper castes and the harijans and could not be removed without restructuring it. It had therefore to be fought at both levels. Gandhi's campaign was conducted only at the moral and religious level. Hence he concentrated on caste Hindus…, appealed to their sense of duty and honor, mobilized their feelings of shame and guilt, and succeeded in achieving his initial objective of discrediting untouchability and raising the level of the Hindu… consciousness. Since he did not organize and politicize the harijans, stress their rights and fight for a radical reconstruction of the established social and economic order, Gandhi's campaign was unable to go further" (Parekh, 1989: pp. 245-246).

[19]K. Kelappan, the great Gandhian Congressman and the foremost champion of the temple-entry movement in Kerala, in his article on the Vaikam Satyagraha (1925: pp. 42-45), justified the struggle in the context of the increasing tendency of the lower castes, especially Izhavas, to renounce Hinduism. In another article written around the time of the Guruvayur Satyagraha, he expressed great concern over the harms caused by conversions. This article is specially noted for his attitude of the Muslim "other"; they are perceived as a threat to the nation and national unity; mainly because of their solidarity and stress on international brotherhood (1932a: pp. 7-8). He also suggested a "secular" programme the government should follow to curb the growth of (Muslim) communalism (1932b: pp. 4-5, 10).

interest in the Khilafat than by true national consciousness" (Menon, 1977: p. 48). In their highly illuminating accounts of the event, two other prominent Congress leaders—K. Madhavan Nair and Mozhikunnath Brahmadathan Nambutiripad—traced the origin of the rebellion back to the high-handed British policy of repression (Nair, 2002; Nambutiripad, 1965). By attributing the violence of 1921 to the official atrocities, they justified the decision of the Congress to ally with the Mappilas but regretted for associating with a group still unfit for a modern and secular political struggle—and thus justified the official Congress position rejecting the struggle as a part of the national movement. They also shared the colonial perception of the uprising as nothing but a "riot" and treated the Mappilas as "wild" and "fanatic" people who could not be trusted or easily tamed.

Neither did the rebellion confine its impact to Malabar politics alone. The widespread propaganda recounting awesome details of the "Hindu suffering" at the hands of the Mappila rebels gave birth to an aggressive Hindu campaign, at first against the "cruel Mappilas" and later against Muslims in general. On the other hand, the sufferings of the Mappilas deeply moved Muslims all over India. Frantic appeals for helping them received generous response from the North. All these affected the relationship between the Hindus and Muslims all over India. "The exaggerated tales (about the rebellion)… inflamed feelings. The cry of Hinduism in danger was raised and movements of *Shuddhi* (reconversion) and *Sanghathan* (organization) planned. A vicious cycle of accusation and counter-accusation was set up which created the heat in which the tender plant of Hindu-Muslim unity began to wither" (Chand, 1972: p. 497). The "communal antagonisms generated by the Malabar Rebellion" (Brown, 1972: p. 329) and the steadily advancing nationalist discourse centered on religious and cultural nationalism greatly strengthened the concept of the Muslim "other" to the extent that even the great Izhava reformer and poet Kumaran Asan wrote a tale of the Rebellion villainizing the Mappilas in which he told the tale of a Nambutiri girl thrown desolate by the "cruel Muhammedans" during the revolt of 1921 (Asan, 1969). Similarly, in his "statement" attached to the 1970 edition of K. Madhavan Nair's *Malabar Rebellion*, K. Kelappan shared the concern of the Congress leadership towards the "minority Hindus of Ernad" against the "illiterate", "ignorant" and hence "rude" Mappilas (Nair, 2002: ix-xii)[20].

The fear of the Mappilas for their "lack of civility", the widespread concern over the hardships of the (upper caste) Hindus who had escaped from the affected areas to take shelter in the nearby town of Calicut or in the princely states of Travancore and Cochin, the cooperation extended by Congress to the relief measures undertaken by the Arya Samaj, which was also very active in reconverting the Hindus who were converted to Islam, (Ansari, 2005: p. 64) the total breakdown of the organizational structure of the Congress and its inability to carry on even normal political activity in the face of official retribution and popular distrust in its programs, all forced the Congress to retreat to a Hindu idiom of politics (Menon, 1994: p. 78). Gandhi's statement—"The Moplahs are Muslims"—reveals the stereotypical character-construct of the Muslim (Ansari, 2005: p. 73). The leadership of the Congress in Kerala could not get out of the shock inflicted by the events of the rebellion, especially the attack of the Mappila rebels on caste Hindus. This was not surprising because in Malabar caste system conformed to a kind of class order: the caste Hindus were the landlords or the prominent leaseholders of the area while the Mappilas were the sub-tenants under them (Panikkar, 1984). Among the higher castes in particular, it is observed, the attitude towards Islam was coloured by the way in which Islam impinged upon their interests (Misra, 2004: p. 20). That the lower caste tenants refused to rebel against their upper caste lords in Malabar clearly revealed the manner by which caste hierarchy and the mode of class response got enmeshed. The higher castes could realize that the threat posed by conversion to their interests could only be countered by bringing various caste groups together on some common issue and by reforming social practices which segmented them; efforts to forge a symbolic unity among Hindu communities around the question of temple-entry appeared a useful weapon to discourage the untouchable castes to get attracted to religions which promised to emancipate them. For the dominant groups, religion offers the necessary ideological justification for existing social divisions, makes these divisions appear non-antagonistic and holds together a potentially divided society into a single whole (Chatterjee, 1989: p. 172).

Thus, the championing of the temple-entry cause (mainly at Vaikam) provided the Congress with a big lease of life: it gave a platform for action with a strictly non-political program; it saved them from official surveillance as the centre of activity was shifted to the safe environs of the princely state of Travancore; it eschewed the fear of communal tension because the Mappila factor was absent in Travancore (Menon, 1994: pp. 103-104) and above all, it provided the Congress with an opportunity to expiate for the "sin" of allying with the "dangerous" Mappilas by upholding a "Hindu" cause. Congressmen played the role of an arbiter between various Hindu castes, which in fact signaled a retreat from secular political activity, but it opened before them a program of action after the "Mappila" rebellion (Menon, 1994: p. 80).

Conclusion

The temple-entry movement decided the future course of politics in Kerala at least in three respects. Firstly, it provided a conclusive end to the civil rights movement undertaken by the untouchable castes leading to the attainment of the right of universal temple-entry. The questions of religious disability and freedom of worship slowly subsided to become less and less powerful to command the discourse of civic life and political culture. The debates centered on religious conversion as a means of social emancipation also faded out altogether (Isaac & Tharakan, 1988: p. 168; Narayanan, 2011). The (upper caste) leadership of the Congress was able to coerce the caste-Hindus to compromise on the question of temple-entry as the only viable means to ward off religious conversion which challenged the very survival of the Hindu community. Secondly, with the success of the temple-entry agitation the conversion movement certainly began to wane in Kerala, but it greatly undermined the secular image of the Congress for its propagandist role in dis-

[20]Chatterjee (1995: p. 126) writes that the fact that Indian nationalism is synonymous with "Hindu nationalism" is an entirely modern, rationalist and historicist idea. The notion of "Hinduness" is not defined by any religious criteria at all. There are no specific beliefs or practices which characterize this "Hindu" and the many doctrinal or sectarian differences among Hindus are indifferent to this concept. Even anti-Vedic and anti-brahmanical religions as Buddhism and Jainism count here as "Hindu". Clearly excluded from this *jati* are religions like Christianity and Islam. The criterion for inclusion and exclusion is determined by their historical origin. Buddhism and Jainism are 'Hindu' because they originated in India while Islam and Christianity originated outside and are, therefore, foreign.

seminating the so-called "Essentials of Hinduism" and in seeking to forge a (Hindu) "community of equals" (Menon, 1994: p. 80) through a common bond of religiosity and uniformity of religious worship around temples. In that sense the temple-entry movement marked a definite stage in the process of the disjunction of folk religion and other currents of religion. Religion is no longer divided into lower religion and higher religion, but into religion and superstition (Sontheimer, 1995: p. 396). Hence it was a *shuddhi* movement—to cleanse religion of blots identified incompatible with modernity and the essentials of nationhood. The temple-entry satyagraha attains significance against the dual task taken up by the Indian National Congress —to construct a modern nation-state and to mould a national (Hindu) religion. But it had its disastrous consequences—in driving religious minorities away from the organizational fold and ideological appeal of the Congress. The bitter experiences of 1921 followed by the conscious involvement of the Congress in the affairs of religious nationalism forced the Mappilas to keep away from nationalist politics and slowly drift towards a marked sectarian identity. The slow but steady drift of the Mappilas into communal politics became inevitable (Panikkar, 1989: p. 190). Thirdly, the struggle for temple-entry helped in delivering the Congress from the moral setback it faced after the Malabar rebellion, but in the unique social context of Kerala where reform movements had succeeded in shaping an ideological environment in favor of social equality, its withdrawal from direct politics to engage with socio-religious issues, disregarding more important questions of material deprivation and class disparities, transcending caste/religious affiliations, reduced its political constituency and created a fertile ground for the proliferation of left political ideology in subsequent times. Moreover, in the 1930s, the strong communal and caste consciousness let loose by the agitation against caste disabilities could lead the poor towards class consciousness (as caste roughly coincided with class in Kerala). With the Temple entry Proclamation in Travancore in 1936—"the final act in the embourgeoisment of society" as Nambutiripad saw it (Jeffrey, 1978: p. 82)—the middle class members were accorded the right to use temples and abruptly lost interest in the poor of their own caste. But the political excitement awakened among the poor and low caste could not be made to go away; it lay ready to be developed into class consciousness.

REFERENCES

Newspapers/Periodicals

Harijan
Madras Mail
Mathrubhumi Daily
Mathrubhumi Weekly
Mitavadi
Sahodaran
Yogakshemam
Young India

Government Publications

Aiya, V. N. (1906). *The Travancore State manual, I&II.* Trivandrum: Travancore Government Press.

Cornish, W. R. (1874). *The census of India 1871, Madras Vol. I, Report.* Madras: Government Press.

Hitchcock, R. H. (1925). *A history of the Malabar rebellion, 1921.* Madras: Government Press.

Innes, C. A. (1908). *Madras District gazetteers, Malabar I.* Madras: Government Press.

Logan, M. (1882). *Report of the Malabar special commission 1881-2, I.* Madras: Government Press.

Logan, W. (1887). *Malabar manual, I.* Madras: Government Press.

McIvery, L. (1883). *Census of India, 1881, Madras, Vol. I, Report.* Madras: Government Press.

Menon, C. A. (1911). *Cochin State manual*. Ernakulam: Government Press.

Menon, M. Sankara. (1901). *Census of India, Vol. 20 (Cochin) Part I (Report).* Ernakulam: Government Press.

Pillai, T. K. V. (1940). *Travancore State manual, Vol. I*. Trivandrum: Travancore Government Press.

Proceedings of the Conference held at Mr. Idamturuttil Devan Neelakantan Nambutiripad's House, Vaikam on 10 March 1925. *Correspondence on the Vaikam Satyagraha, Vol IX*, English Records, Secretariat, Trivandrum.

Stuert, H. A. (1893). *Census of India, 1891, Madras, Part. I Report.* Madras: Government Press.

Tottenham, G. R. F. (1922). *The Mappila rebellion, 1921-22*. Madras: Government Press.

Autobiographies

Kesavan, C. (1968). *Jeevitasamaram.* Kottayam: National Book Stall.

Maulavi, M. (1981). *Atmakatha.* Kottayam: SPCS/National Book Stall.

Menon, K. P. K. (1986). *Kazhinja Kaalam.* Calicut: Mathrubhumi Books.

Nambutiripad, E. M. S. (2005). *Atmakatha* (6th ed.). Thiruvananthapuram: Chintha Publishers.

Books

Aiyappan, A. (1944). *Iravas and culture change.* Madras Government Museum Bulletin, 1.

Aloysius, G. (2010). *Nationalism without a nation in India.* New Delhi: Oxford University Press.

Anderson, B. (1983). *Imagined communities: Reflections on the origin and spread of nationalism.* London: Verso Editions and NLB.

Ansari, M. T. (2005). Refiguring the fanatic: Malabar, 1836-1922. In S. Mayaram, M. S. S. Pandyan, & A. Skaria (Eds.), *Subaltern studies, XII* (pp. 36-77). Delhi: Permanent Black and Ravi Dayal.

Asan, K. (1969). *Duravastha (Distress).* Trivandrum: Sarada Book Depot (Rpt).

Brown, J. M. (1972). *Gandhi's rise to power: Indian politics, 1915-1922*. Cambridge: Cambridge University Press.

Chand, T. (1972). *History of the freedom movement in India, III*. New Delhi: New Delhi Publications Division, Government of India.

Chandra, B. (1989). *India's struggle for independence 1857-1947.* New Delhi: Penguin Books.

Chatterjee, P. (1989). Caste and subaltern consciousness. In R. Guha (Ed.), *Subaltern studies: Writings on South Asian history and society, No. 6* (pp. 169-209). Delhi: Oxford University Press.

Chatterjee, P. (1995). History and the nationalization of Hinduism. In V. Dalmia, & H. Von Steitencron (Eds.), *Representing Hinduism: The contraction of religious tradition and national identity* (pp. 103-128). New Delhi: Sage Publications.

Cooiman, D. (1995). *Communities and electorates: A comparative discussion of communalism in colonial India.* Amsterdam: V.U. University Press.

Dale, S. F. (1980). *Islamic society on the South Asian frontier: The Mappilas of Malabar, 1498-1922.* Oxford: Clarendon Press.

Day, F. (1863). *The land of Perumals or Cochin and its past and its present*. Madras: Oantz Brothers at the Adelphi Press.

Gangadharan, M. (2008). *The Malabar rebellion.* Kottayam: D.C. Books.

Hardgrave Jr., R. L. (1969). *The Nadars of Tamilnad: The political culture of a community in change.* Berkeley: University of California Press.

Isaac, T. M. T. & Tharakan, P. K. M. (1988). Sree Narayana movement in Travancore. In S. K. Sreevastava & L. Sreevastava (Eds), *Social movements for development* (pp. 155-177). Allahabad: Chugh Publications.

Iyer, L. A. K. (1909). *The Cochin Tribes and castes.* Madras: Higginbotham's.

Iyer, L. A. K. (1939). *The Travancore Tribes and castes.* Trivandrum: Government Press.

Jeffrey, R. (1978a). Travancore: Status, class and the growth of radical

politics, 1869-1940—The temple entry movement. In R. Jeffrey, (Ed.), *People, princes and paramount power: Society and politics in the Indian princely states* (pp. 136-169). Delhi: Oxford University Press.
Jeffrey, R. (1994). *Decline of Nair dominance: Society and politics in Travancore, 1847-1908.* New Delhi: Manohar.
Kawashima, K. (1988). *Missionaries and a Hindu state: Travancore 1858-1936.* New Delhi: Oxford University Press.
Kunhuraman, C. V. (1936). *Izhavarude mathaparivarthana samrambham (Religious conversion enterprise of the Izhavas).* Kottayam: Kaumudi Press.
Kunju, A. P. I. (1989). *Mappila Muslims of Kerala.* Trivandrum: Sandhya Publishers.
Lemercinier, G. (1984). *Religion and ideology in Kerala.* Delhi: D. K. Agencies.
Manavalan, P. (1990). *Kerala samskaravum Kraistava missionarimarum (Kerala culture and Christian missionaries).* Kottayam: DC Books.
Mateer, S. (1871). *The land of charity: A descriptive account of Travancore and its people.* London: John Snow & Co.
Mateer, S. (1883). *Native life in Travancore.* London: W. H. Allen & Co.
Mathew, G. (1989). *Communal road to a secular Kerala.* New Delhi: Concept Publishing Company.
Menon, A. S. (1984). *A survey of Kerala history*. Madras: S. Viswanathan Pvt Ltd.
Menon, A. S. (1997). *Kerala and the freedom struggle*. Kottayam: D.C. Books.
Menon, D. M. (1994). *Caste, nationalism and communism in South India: Malabar, 1900-1948.* New Delhi: Cambridge University Press.
Menon, K. P. K. (1977). Some aspects of the nationalist movement in Malabar. In K. P. S. Menon (Ed.), *Kesava Menon* (pp. 43-48). Calicut: K. P. Kesava Menon 90th Birthday Celebration Committee.
Menon, P. K. K. (2001). *History of the freedom movement in Kerala, Vol. II.* Thiruvananthapuram: Department of Cultural Publications.
Menon, M. G. (1989). *Malabar rebellion, 1921-1922.* Allahabad: Vohra Publishers.
Miller, R. E. (1992). *Mappila Muslims of Kerala: A study in Islamic trends.* Madras: Orient Longman.
Misra, A. (2004). *Identity and religion: Foundations of anti-Islamism in India*. New Delhi: Sage Publishers.
Nair, G. G. (1923). *The Moplah rebellion, 1921*. Calicut: Norman Printing Bureau.
Nair, K. M. (2002). *Malabar kalapam (Malabar rebellion).* Calicut: Mathrubhumi Books.
Nambutiripad, E. M. S (1952). *The national question in Kerala.* Bombay: People's Publishing House.
Nambutiripad, M. B. (1965). *Khilafat smaranakal (Khilafat reminiscences).* Kozhikkode: Navakerala Co-operative Publishing House.
Narayanan, M. G. S., & Kesavan, V. (1983). A history of the Nambutiri community in Kerala. In F. Stall (Ed.), *Agni: The Vedic ritual of the fire altar* (pp. 256-278). Delhi: Motilal Banarsidas.
Onwerkerk, L. (1994). *No elephants for the Maharaja: Social and political change in Travancore 1921-47.* New Delhi: Manohar Publishers.
Panikkar, K. N. (1984). Peasant exploitation in Malabar in the nineteenth century. *Journal of Kerala Studies, 11*, 155-185.
Panikkar, K. N. (1989). *Against lord and state: Religion and peasant uprising in Malabar, 1836-1921*. Delhi: Oxford University Press.
Parekh, B. (1989). *Colonialism, tradition and reform: An analysis of Gandhi's political discourse.* New Delhi: Sage Publications.
Pilla, A. K. (1986). *Congressum Keralavum* (*Congress and Kerala*). Trivandrum: Prabhath Book House.
Rao, M. S. A. (1979). *Social movements and social transformation: A study of two backward classes movement in India.* Delhi: MacMillan.
Ravindran, T. K. (1988). *Vaikam satyagraha and Gandhi.* Trivandrum: Sri Narayana Institute of Social and Cultural Development.
Sarkar, S. (1990). *Modern India, 1885-1947*. Madras: Macmillan.
Sitaramayya, P. (1946). *The history of the Indian national congress 1885-1936*. Bombay: Padma Publications Ltd.
Sontheimer, G. D. (1995). The erosion of folk religion in modern India: Some points for deliberation. In V. Dalmia, & H. Von Steitencron, (Eds.), *Representing Hinduism: The contraction of religious tradition and national identity* (pp. 389-398). New Delhi: Sage Publications.
Thurston, E. (1909). *Castes and tribes of southern India, II.* Madras: Government Press.
Viswanathan, G. (2003). Colonialism and the construction of Hinduism. In G. Flood (Ed.), *The Blackwell companion to Hinduism* (pp. 23-44). Oxford: Blackwell. doi:10.1002/9780470998694.ch2
Von Stietencron, H. (1989). Hinduism: On the proper use of a deceptive term. In G. D. Sontheimer, & H. Kulke (Eds.), *Hinduism reconsidered*. Delhi: Manohar.
Wood, C. (1987). *The Moplah rebellion and its genesis.* New Delhi: People's Publishing House.
Yesudas, R. N. (1975). *A people's revolt in Travancore: A backward class movement for social freedom.* Ernakulam: Kerala Historical Society.
Young, R. F. (1981). *Resistant Hinduism: Sanskrit sources on anti-Christian apologetics in early nineteenth century India.* Vienna: De Nobili Research Library.
Zaynu'd-Din, S. (1942). *Tuhfat-al-Mujahidin*. Translated by S. M. H. Nainar. Madras: University of Madras.

Articles

Basu, R. S. (2008). Pulayas in Kerala: The nineteenth century emancipation question re-explored. *The ICFAI University Journal of History and Culture, 2*, 47-76.
Dale, S. F. (1975). The Mappila outbreaks: Ideology and social conflict in nineteenth century Kerala. *Journal of Asian Studies, XXXV*, 85-97.
Dale, S. F. (1976). The Mappilas during Mysorean rule: Agrarian conflict in eighteenth-century Malabar. *South Asia, 6*, 1-13.
Damodaran, N. P. (1981). Oru sathyagrahathinte katha (The story of a satyagraha). *Mathrubhumi Weekly*, 22-25.
Dhanagare, D. N. (1977). Agrarian conflict, religion and politics: The Moplah rebellion in the nineteenth and early twentieth centuries. *Past and Present, 74*, 112-141. doi:10.1093/past/74.1.112
Gopalankutty, K. (1981). The Guruvayur satyagraha, 1931-32. *Journal of Kerala Studies, 8*, 43-55
Gough, K. (1968-1969). Peasant resistance and revolt in South India. *Pacific Affairs, XVI*, 526-554. doi:10.2307/2754563
Hardgrave Jr., R. L. (1968). Breast cloth controversy: Caste consciousness and social change in southern Travancore. *Indian Economic and Social History Review, 5*, 171-187.
Hardgrave Jr., R. L. (1977). The Mappilla rebellion, 1921: Peasant revolt in Malabar. *Modern Asian Studies, 11*, 57-99. doi:10.1017/S0026749X00013226
Heimsath, C. H. (1978). The functions of Hindu reformers—With special reference to Kerala. *The Indian Economic and Social History Review, XV*, 21-39. doi:10.1177/001946467801500102
Heimsath, C. H. (1982). From social reform to social struggle. *Man and Development, IV*, 29-34.
Houtart, F., & Lemercinier, G. (1978). Socio-religious reform movements in Kerala: A reaction to the capitalist mode of production. *Social Scientist, 6*, 25-43. doi:10.2307/3516673
Jeffrey, R. (1974). The social origins of a caste association, 1875-1905: The founding of the S.N.D.P. Yogam. *South Asia, 4*, 39-59.
Jeffrey, R. (1978b). Matriliny, marxism and the birth of the communist party in Kerala, 1930-1940. *Journal of Asian Studies, XXXVIII*, 77-98.
Kelappan, K. (1925). Vaikam satyagraham. *Matrubhumi Onam Special*, 42-45.
Kelappan, K. (1932a). Mathavum samudayavum: Mathaparivarthana sramam kondulla dosham (Religion and community: The harms caused by religious conversion). *Matrubhumi Weekly, 10*, 7-8.
Kelappan, K. (1932b). Mathavum samudayavum: Oru swathantra government cheyyendathenthellam (Religion and community: What should an independent government do). *Mathrubhumi Weekly, 10*, 4-5.
Kunhuraman, C. V. (1925). Tiyyarku nallathu buddhamatham thanne (Buddhism is better for the tiyyas). *Mitavadi Special, II*, 6-24.
Menon, D. M. (1999). Houses by the sea: State formation experiments in Malabar, 1760-1800. *Economic and Political Weekly, 34*, 1995-

2003.
Muralidharan, M. (1996). Hindu community formation in Kerala: Processes and structures under colonial modernity. *South Indian Studies, 2,* 234-259.
Nambutiripad, E. M. S. (1937). *Congress socialist*. 7-9.
Nambutiripad, K. S. (1932). Matha parishkaram (Religious reform). *Mathrubhumi Weekly, 10,* 7-8.
Narayanan, M. G. S. (2011). Malayala manorama. *Sunday Supplement, IX*.
Pulapilly, C. K. (1976).The izhavas of Kerala and their historic struggle for acceptance in the Hindu society. *Journal of Asian and African Studies, XI,* 24-46. doi:10.2307/3516673
Thampan, M. R. V. (1932). Kshetra pravesanam (Temple-entry). *Mathrubhumi Weekly, 9,* 5-6.

IOSR Journal of Mathematics (IOSR-JM)
e-ISSN: 2278-5728.Volume 6, Issue 1 (Mar. - Apr. 2013), PP 53-58
www.iosrjournals.org

Optimal Estimating Sequence for a Hilbert Space Valued Parameter

P.Anilkumar[1] , N.V.Samiyya[2]
Department of statistics farook college Kerala India

Abstract: *Some* optimality criteria used in estimation of parameters in finite dimensional space has been extended to a separable Hilbert space. Different optimality criteria and their equivalence are established for estimating sequence rather than estimator. An illustrious example is provided with the estimation of the mean of a Gaussian process

Key words: *sieves, Gaussian process, reproducing kernel Hilbert space , MVUE , estimating sequence*

I. Introduction

The classical theory of statistical inference deals with the sample spaces and parameter spaces as finite dimensional Euclidian spaces or subsets of it. The observations are assumed to be n independent and identical realizations of a random vector. Much of the inference methodologies can be said to be likelihood based. A first step in solving such a problem is the calculation of the likelihood function. The assumption that the samples are from R^k is not true in general. Sometimes the data may be curves or in general, elements from some abstract spaces. Since most of the methods in classical inference are likelihood based, any attempts to extend classical method of interest should start with the determination of the likelihood function. A major difficulty is that in the spaces of interest, there is no natural invariant Lebesgue measure which plays an important role in classical inference. However, fortunately in the abstract spaces, Radon-Nikodym derivative of one hypothetical measure with respect to another plays the role of the likelihood. Likelihood based inferences in abstract spaces have been discussed in the literature with considerable depth. "Statistical inference for stochastic process" by Basava and Prakasa Rao (1980) contains good account of this exposition.

There are instance, for example, in inference for stochastic process where both sample space and parameter space are abstract. Here also the first step involved is the calculation of the likelihood. But even after obtaining the likelihood, the estimation is not straight forward. In most of the cases likelihood function will be unbounded. [See for example, Grenander (1981, P.395), Karr (1987), Beder (1987, 88)]. One possible approach to overcome this difficulty is to apply the method of sieves systematical exposition by Grenander (1981). Adopting Grenander's approach some authors have already studied estimation for stochastic processes. Works of Mckeague (1986), Beder (1987, 88), Karr (1987), Lesbow and Rozanski (1989) can be mentioned in this context.

In this paper we will define an optimality criterion for a Hilbert space valued parameter through the notations of estimating sequence. The criterion so developed is then applied to obtain an optimal estimating sequence for the mean of a Gaussian process'

II. An optimality criterion for a sequence of parameters

We begin with certain optimality results available in simultaneous estimation of several parameters. Let $x_1,x_2,\ldots,x_n$ be random sample of size n from a population characterized by the probability density function $f(x, \theta)\ \theta \in \Omega\ CR^m$ where R^m being m dimensional Euclidian space. Suppose we are interested in k functions $\Psi(\theta) = (\Psi_1(\theta), \Psi_2(\theta), \ldots, \Psi_k(\theta))^T$. A vector of statistics $T = (T_1,T_2,\ldots T_k)^T$ is unbiased for $\Psi(\theta)$. If $E_\theta(T_i) = \Psi_i(\theta)$ for all $\theta \in \Omega$ for every i = 1,2,…,k. We would also say T is marginally unbiased for $\Psi(\theta)$. For any two estimators T and S define

$M_{T=} E(T - E(T))(T - E(T))^T$

And $M_{TS} = E(T - E(T))(S - E(S))^T$

Let U_ψ denote the class of all unbiased estimators of ψ.

Definition 2.1

The estimator $T^* \in U_\psi$ is M- optimal for Ψ if $M_T - M_{T^*}$ is nonnegative definite for all $\theta \in \Omega$.

A necessary and sufficient condition that $T^* \in U_\psi$ is M- optimal is that $M_{T^*U} = M_{U\,T^*} = 0$ for all $\theta \in \Omega$, $u \in U_0^{(k)}$ where $U_0^{(k)}$ is the class of all k-dimentional statistics that are unbiased for $0 = (0,0,\ldots,0)^T$. This is known as klebenov- Linnik- Rukhin theorem.

Definition 2.2

An estimator $T^* = (T_1^*, T_2^* \ldots, T_k^*)$ is marginally optimal for ψ provided T_i^* is MVUE

for ψ_i, i = 1,2,…,k.

By an application of klebenov- Linnik- Rukhin theorem one conclude that an estimator is M – optimal if and only if it is marginally optimal. Some other equivalent optimality criteria are D-optimality, T- optimality and E-optimality. See B.K. Kale (1999) for a fairly good discussion.

A natural question that can arise is, can we consider a more general abstract parameter space and derive a similar optimality criteria. As an immediate generalization suppose that the parameter space Ω is a real separable Hilbert space. Then there exists a countable orthonormal basis $\{e_i\}$ such that any $\theta \in \Omega$ can be written as $\Theta = \Sigma\psi_i e_i$, where $\psi_i = (\theta,e_i)$ where (.,.) is the inner product associated with the Hilbert space Ω. Thus estimation of θ reduces to that of estimating ψ_i , 1,2,…. It is also well known that

$\boldsymbol{\Sigma\psi_i^2 < \infty}$ **……**(2.1)

Notice that practically one cannot estimate all ψ_i's simultaneously. But the condition (2.1) tells us that $\psi_i \to 0$ as $i \to \infty$. Thus one take $\psi_i = 0$ after a stage say I d and estimate θ. This is precisely method of sieves suggested by Grenander (1981). Instead of resorting to method of sieves we will consider an estimating sequence and formulate an optimality criteria for an estimating sequence $\{T_i\}$.

Definition 2.3

A sequence of estimators T=$\{Ti\}$is called an unbiased estimating sequence for $\psi=\{\psi_i\}$if $E_\theta(T_i) = \psi_i$ for all $\theta \in \Omega$, I =1,2,…….. Now we define three optimality criteria and establish their equivalence.

Definition 2.4

An unbiased estimating sequence $T=\{T_i\}$is sequential M-optimal for $\Psi=\{\psi_i\}$ if $(T_1,T_2…..T_k)'$ is M-opti∈∈mal for $(\psi_1, \psi_2,….. \psi_k)'$for every K=1,2,…

Definition 2.5

An unbiased estimating sequence $\{T_i\}$is marginally optimal if T_i is MVUE for ψ_i, for all i = 1,2,3….

For an estimating sequence $\{T_i\}$, consider the linear functional $\sum_{i=1}^{\infty} l_i\psi_i$, such that $\sum_{i=1}^{\infty} l_i^2 < \infty$.

Definition 2.6

An unbiased estimating sequence $\{T_i\}$ is functionally optimal if $\sum_{i=1}^{\infty} l_i T_i$ is MVUE for $\sum_{i=1}^{\infty} l_i\psi_i$ for all $\{l_i\}$ satisfying $\sum_{i=1}^{\infty} l_i^2 < \infty$.

Theorem 2.1

Let U_0 be the set of all unbiased estimators of 0 ,that is $U_0 = \{u, E_\theta(u) = 0$, for all $\theta \in \Omega\}$, then an estimating sequence $T^* = \{T_i^*\}$ is functionally optimal if $E_\theta((\Sigma l_i T_i^*) u) = 0$ for all $u \in U_0$ and all $\theta \in \Omega$

Proof

Suppose the condition $E_\theta((\Sigma l_i T_i^*)u) = 0$ for all $u \in U_0$ consider the estimator

$\Sigma l_i T_i^* - \Sigma l_i T_i$ where $\{T_i\}$is any other unbiased estimating sequence. Then,

$\boldsymbol{E_\theta(\Sigma l_i T_i^* - \Sigma l_i T_i) = 0}$ **and so** $\boldsymbol{E_\theta(\Sigma l_i T_i^*)(\Sigma l_i T_i^* - \Sigma l_i T_i) = 0}$ **which implies**

$$E_\theta(\Sigma l_i T_i^*)^2 = E_\theta(\Sigma l_i T_i^*)(\Sigma l_i T_i)$$
$$\leq E_\theta^{1/2}(\Sigma l_i T_i^*)^2 \; E_\theta^{1/2}(\Sigma l_i T_i)^2$$

Hence

$$E_\theta(\Sigma l_i T_i^*)^2 \leq E_\theta(\Sigma l_i T_i)^2$$

Or $$Var_\theta(\Sigma l_i T_i^*) \leq Var_\theta(\Sigma l_i T_i)$$

Proving that $\sum_{i=1}^{\infty} l_i T_i^*$ is MVUE for $\sum_{i=1}^{\infty} li\,\psi i$. Conversely suppose $\sum_{i=1}^{\infty} l_i T_i^*$ is MVUE and if possible suppose $E_{\theta_0}((\sum_{i=1}^{\infty} l_i T_i^*)u_0) \neq 0$ for some given choice of $\theta = \theta_0$ and $u_0 \in U_0$

Define

$$\lambda = \frac{-E_{\theta_0}\left((\Sigma li\, Ti^*)u_0\right)}{E_{\theta_0}(u_0^2)}$$

Then

$$E_{\theta_0}(\sum l_i T_i^* + \lambda u_0)^2 = E_{\theta_0}(\sum l_i T_i^*)^2 + \lambda^2 E_{\theta_0}(u_0^2) - 2E_{\theta_0}((\sum l_i T_i^*)u_0)\frac{E_\theta(\sum l_i T_i^*)u_0}{E_{\theta_0}(u_0^2)}$$

$$= E_\theta(\sum l_i T_i^*)^2 - \frac{E_{\theta_0}{}^2((\sum li\, T_i^*)u_0}{E_{\theta_0}(u_0^2)}$$

$$< E_{\theta_0}(\sum l_i T_i^*)^2$$

Hence

$$var_{\theta_0}((\sum l_i T_i^*) < var_{\theta_0}(\sum l_i T_i^* + \lambda u_0)$$

This is a contradiction to the assumption that $\sum l_i T_i^*$ is MVUE for $\sum_{i=1}^{\infty} l_i\psi_i$ this proves the theorem,

Theorem 2.2

An estimating sequence $\{T_i\}$ is marginally optimal if and only if it is functionally optimal,

Proof

Suppose $\{T_i\}$ is functionally optimal. Then $\sum_{i=1}^{\infty} l_i T_i$ is MVUE for $\sum_{i=1}^{\infty} l_i \psi_i$. Choose $l_i = 0$, $i \neq k$ and $l_k = 1$, then T_k is MVUE for Ψ_k , k = 1,2,… Thus $\{T_i\}$ is marginally optimal. Conversely suppose $\{T_i\}$ is marginally optimal. Then

$$\boldsymbol{E_\theta(T_i\, u) = 0, \forall\, \theta \in \Omega, u \in U_0}$$

Hence

$$\boldsymbol{E_\theta((\sum l_i\, T_i)\, u) = \sum_1^\infty l_i\, E_\theta\ (T_i\, u) = 0}$$

Thus by theorem 2.1 $\{T_i\}$ is functionally optimal.

Theorem 2.3

The estimating sequence $\{T_i\}$ is sequentially M-optimal if and only if it is marginally optimal

Proof

Let $T^k = [T_i, \ldots . T_{k_i}]^T$ and

$U^{(k)} = [u_i \ldots .. u_k]^T$, where $u_i \in U_0$.

The proof immediately follows from the following observations

$E_\theta(T_i\, U_j)$ for all j,θ, I =1,2,…. If and only if $E\ (T^{(K)} U^{(k)^T}) = 0$, for all $u^{(k)} \in U_0^k$ and for every θ if and only if

$Cov(T^K, U^K) = 0$, For all $u^{(k)} \in U_0{}^K$ and all θ

Remark

The last two theorems tells us that all the optimality criteria are one and the same . later on we simply say the estimating sequence is optimal if it satisfy any one of the criteria discussed above.

We now proceed to illustrate the criteria in the estimation of mean of a Gaussian process

III. Gaussian process

Let $\{x(t), t \in T\}$ be a stochastic process defined on (Ω, Ғ) where T is some general index set. Let V be the set of all finite linear combinations of the form $\sum_{i=1}^{n} c_i\, x(t_i)$. Let P be a probability measure attached to the measurable space (Ω, Ғ). Then under the probability measure P, V_P – the set of all P – equivalent classes of elements of V becomes a vector space. We say that the process is Gaussian under P, if each element of V_p is a normal random variable. In this case V_P C $L_2(\Omega, Ғ, p)$ and its completion H_p consist of only normal random variables. We denote the norm and inner product in H_p by $\| . \|_p$ and $(. , .)_p$ respectively

where $(x, y)_p = cov_p(x , y)$ for x , y ∈ H_p the space H_p is usually called Gaussian space. The process $\{x(t), t \in T\}$ is called a Gaussian process.

The function $m(t)=E_P(x(t))$ is called mean function of Gaussian process and R(s, t)= Cov(x(s),x(t)) is called covariance function . We now introduce the concept of reproducing kernel Hilbert space with kernel R, for every t ∈ T

Definition 3.1

(a) R (. , t) ∈ K (R,T) and

(b) For every f ∈ K(R,T)

< f , R(. , t) > = f (t)

Where < . , . > denote inner product on K(R , T)

Example

Let T=[o,b], b <∞ and R (s,t)=min (s,t) for s , t ∈ [o,b]. define

$$\mathbf{K\ (R,T)} = \{ \boldsymbol{f : f\ (t) = \int_0^t f^I(u)du, f^I \in L_2(T)} \}$$

Where $L_2(T)$ is the set of all square integrable functions defined on T and f^I is the derivative of f. if we define

$$\mathbf{< f , g > = \int_0^b f^I\ (u)\ g^I\ (u)\ du}$$, for f , g ∈ k (R,T),then k (R,T) is a Hilbert space

To see this observe that R(s,t)= Min (s,t) $= \int_0^s I_{[0,t]}(u)du$

Therefore R(.,t) ∈ K(R,T) as $I_{[0,t]} \in L_2(T)$

Also < f, R (. , t) > = $\int_0^b f'(s)\ I_{[0,t]}\ (s)\ ds = \int_0^t f'(t)\ dt = f(t)$

The following lemma from Becker (1987) gives a Fourier type expansion for the covariance function R

Lemma 3.1

Let $\{e_k, K \in A\}$ be complete orthonormal set in K (R,T),then we have $R(s,t) = \sum_{k \in A} e_k(s) e_k(t)$ For all (s, t)∈ T x T and that the set $A' = \{k \in A: e_k(s)\ e_k(t) \neq 0\}$ is atmost countable . The isomorphic isomorphism between H_P and K(R, T) is established through the next lemma.

Lemma 3.2

Let $\{x (t), t \in T\}$ be a centered Gaussian process (that is E(x(t)=0) define on (Ω, Ғ,P)and R(s,t)be the covariance function of the process then the following holds:

(a) The R.K.H.S. k(R,T) is given by $\{ f : f(t) = (x(t), y_f)$ for a unique $y_f \in H_P\}$ with inner product

$< f , g > = (y_f, y_g)$ the map given by $\wedge (y_f) = f$ is an isomorphism of H_P onto K(R,T).

(b) For each t, $x(t)= \sum_{k\in A} e_k(t)(U_k)$ where $U_k = \Lambda^{-1}(e_k)$, $k \in A$ are iid N(0,1) variables . Further the series $\sum_{k\in A} e_k(t)e_k(U_K)$ converges almost surely. The map $\Lambda(y_f)=f$ is called Loeve map.

Let $\{x(t),t \in T\}$ be a Gaussian process define on (Ω,π,P) with mean function $m(t) = E_p(x(t))$ and covarience function $R(s,t) = Cov_p(x (s) , x (t))$. Let P_0 be a another Gaussian measure set . $E_{p0}(x(x))=0$ and $cov_p(x (t),x (s))= R (s,t)$.assume that the RKHS K(R,T) generated by R is complete so that an orthonormal basis $\{e_k\}$is always countable Chatterji,S.P. and Handrekar,V.(1978) has shown that P_0 and p are equivalent if and only if $m \in k(R , T)$ assume that $m \in k(R , T)$. since $\{e_k\}$is a complete orthonormal basis for $k(R , T)$ and $m \in k(R , T)$,$m=\sum_{k=1}^{\infty} a_k e_k$ where $a_k \in l_2$,the set of square summable sequence. From elementary Hilbert space theory $\{a_k\}$is unique to m. notice that

$$\boldsymbol{E_P^{(X(t))} = m(t) = (x(t) , y_m)_{p_0}}$$

Where $Y = \Lambda^{-1}$ (m). since $U_k= \Lambda^{-1}$ (e_k)

$$\boldsymbol{E_P\,(Uk) = (U_k , Y_m)_{p_0}}$$

$$= (\Lambda^{-1}(\boldsymbol{e_k}), \Lambda^{-1}(\boldsymbol{e_k}))_{p_0}$$

$$=< \boldsymbol{e_k} , \boldsymbol{m} >= \boldsymbol{a_k}$$

And

$$\boldsymbol{Cov_p\,(U_k, U_l) = (\Lambda^{-1}(e_k), \Lambda^{-1}(e_l))_{p_0}}$$

$$= < \boldsymbol{e_k, e_l} >$$

$$= \boldsymbol{\delta_{kl}}$$

Thus U_k's are independent $N(a_k,1)$ random variable under the probability measure P.
Finally the Radon Nikodym derivative of P with respect to P_0 is given by

$$\boldsymbol{\frac{dp}{dp_0} = exp\{\sum_{k=1}^{\infty}(a_k\, U_k\, - \frac{a_k^2}{2})\}}$$ (see Beder (1987)

Example 3.1

Let= [0,b] and R is any continuous Covarience function defined on T X T. Define the integral operator with kernel R as

$$\boldsymbol{R(f(s)) = \int_0^b R(s,t)\, f(t)\, dt}$$

Then R is an operator on L_2 with countable system of eigen values $\{\lambda_k\}$and eigen functions $\{\varphi_k\}$. We use R for the operator as well as Kernel) and we have

$$\boldsymbol{R(s,t) = \sum_k \lambda_k\, e_k(s) e_k(t)}$$ (C.F. Ash and Gardner(1975) p 37)

Let k(R,T) be the space spanned by $\{\varphi_k\}$and define the inner product on K(R,T) as follows. For $f= \sum_k a_k \varphi_k$ and $g = \sum b_k \varphi_k$, define .

$$< \boldsymbol{f , g} > = \sum\sum \boldsymbol{a_j\, b_j\, \frac{\varphi_j(t)\varphi_k(t)}{\sqrt{\lambda_k\, \lambda_j}}\, dt}$$

$$= \boldsymbol{\sum_k \frac{a_k\, b_k}{\lambda_k}}$$

Set $e_k=\sqrt{\lambda_k}\, e_k$, then $\{e_k\}$is a complete orthonormal basis for k(R,T)

$$\mathbf{R(s,t)} = \boldsymbol{\sum_k e_k(s) e_k(t)} \quad \& \quad \boldsymbol{< R(.,t), f > = < \sum e_k(t) e_k , \sum a_j\, e_k >}$$

$$= \boldsymbol{\sum a_k\, e_k(t) =\ } \mathbf{f\,(t)}$$

Thus k(R,T) is a R.K.H.S. of x(t) is Gaussian process with mean function $m \in k (R,T)$ and covariance function R then m admits the decomposition. $M=\sum a_k e_k$ and $x(t)=\sum_k U_k e_k (t)$ where $a_k = < m , e_k >$ and

$$\boldsymbol{U_k = \frac{1}{\lambda_k} \int_0^b x\,(t)\, e_k(t)\, dt}$$ (C.F. Ash and Gardner(1975))

Example 3.2 (wiener process)

Let x(t) be a wiener process defined on [0,b] with mean m (.) and covariance function R(s,t)=Min (s,t).

since R(s,t)= Min (s,t) the integral equation $\int_0^b \boldsymbol{R(s,t)\, \varphi(t)\, dt = \lambda\, \varphi(s)}$ becomes

$$\boldsymbol{\int_0^s t\, \varphi(t)\, dt + \int_s^b s\, \varphi(t) dt = \lambda\, \varphi(s) \quad \rightarrow (3.1)}$$

On differentiating (3.1) with respect to S we have

$$\boldsymbol{S\, \varphi(s) + \int_s^b \varphi(t) dt - s\, \varphi(s) = \lambda\, \varphi^I(s)}$$

$$\boldsymbol{i.e. \quad \int_s^b \varphi(t) dt = \lambda\, \varphi^I(s) \quad \rightarrow (3.2)}$$

Differentiating again we get

$$\boldsymbol{-\varphi(s) = \lambda\, \varphi^{II}(s)}$$

If $\lambda = 0$ then $\varphi(s)=0$ and so $\lambda = 0$ is not an eigen value. Putting $s = 0$ in (3.1) we get

$$\boldsymbol{\lambda\,\varphi(0) = 0 \quad \rightarrow \varphi(0) = 0}$$

Putting s= b in (3.2) we get $\mathbf{0 = \lambda\,\varphi^{I}(b) \rightarrow \varphi^{I}(b) = 0}$

Thus $\{\varphi, \lambda\}$ satisfies

$$\boldsymbol{\varphi^{II} + \lambda^{-1}\varphi = 0 \text{ with } \varphi(0) = \varphi^{I}(b) = 0}$$

solving the above differential equation after putting $\lambda^{-1} = \beta^2$ we get

$$\boldsymbol{\varphi_k(t) = \left(\frac{2}{b}\right)^{\frac{1}{2}} Sin\,\beta_k(t), \quad k \in z^{+}}$$

with eigen values $\lambda_k = \beta_k^{-2}$, where $\beta_k = (k - \frac{1}{2})\,\pi/b$

thus the function $e_k(t) = \sqrt{\lambda_k}\,\varphi_k(t) = \beta_k^{-1}(2/b)^{1/2} \sin\beta_k(t)$ is a completely orthonormal basis for k (R , T) and

$$\boldsymbol{U_k = \beta_k (2/b)^{1/2} \int_0^b x(t) sin\,\beta_k\, t\, dt}$$

Estimation problem

Let $\{x_i(t), t \in T\}$, i = 1,2,……..n consist of n iid sample of observations of the process x(t) defined on the probability space (Ω, F, p) with mean function $m(t) = E_p(x(t))$ and covariance function $R(s,t) = cov_p(x(s),x(t))$ as before take P_0 as Gaussian measure so that $E_{p_0}x(t)) = 0$ and cov_{p_0} (x(s), x(t)) = R (s , t) assume that $m \in k(R,T)$ then the Radon Nikodym derivative of P with respect to P_0 in the product sample space is

$$\frac{dp^{n\Theta}}{dp_0^{n\Theta}} = \prod_{i=1}^{n} exp\ \{\sum_{k=1}^{\infty}(a_k U_{k_i} - \frac{1}{2}\,a_k^{\,2})\}$$

$$= \mathbf{exp}\{\sum_{i=1}^{n}\sum_{k=1}^{\infty}(a_k U_{k_i} - \frac{a_k^2}{2})\}$$

$$= exp\{n\sum_{k=1}^{\infty}(a_k\,\overline{U_k} - \frac{a_k^2}{2})\}$$

where $\overline{U_k} = 1/n \sum_{i=1}^{n} U_{k_i}$. Since $m(t) = \sum_{k=1}^{\infty}(a_k e_k(t)$, estimation of m can be carried out by estimating $\{a_k\}$. For the estimation purpose the above Radom Nikodym derivative can be used as the likelihood function . Berder (1987) observed that the above likelihood function is unbounced in $\{a_k\}$ and a direct maximum likelihood method cannot be adopted. He introduced a sieve based on orthogonal projection to derive a consistant estimator Subramanyam, A and U. N. NaikNimbalkar (1990) has shown that $\sum_{k=1}^{\infty}(w_k n(\overline{U_k} - a_k)e_k$ in an optimal estimating function for estimating the mean function m . Solving the equation

$$\sum_{k=1}^{\infty}(w_k n\,(\overline{u_k} - a_k)e_k = 0$$

We get $\widehat{a_k} = \overline{U_k}$, k=1,2,…

Theorem 3.1

The estimating sequence $\{\widehat{a_k} = \overline{U_k}\}$ is an optimal estimating sequence

Proof

Since $\mathbf{E}(U_{k_i}) = a_k$

$\mathbf{E}(\overline{U_k}) = \frac{1}{n}\sum_{i=1}^{n} U_{k_i} = a_k$

thus $\{\overline{U_k}\}$ is an unbiased estimating sequence. Again since $U_{k1},\ldots\ldots U_{kn}$ and iid observations from $N(a_k,1)$ further ($U_{k1},\ldots\ldots U_{kn}$) and $U_{l1},\ldots\ldots U_{ln}$ are independent. Therefore $\overline{U_k}$ is a complete sufficient statistic for a_k and hence it is MVDE for a_k. Thus we consider that $\{\overline{U_k}\}$is marginally optimal for $\{a_k\}$. This proves the theorem.

IV. Conclusion

A limitation for the estimating sequence is that usually it can not be directly used as an estimator of the infinite dimensional parameter (Anilkumar (1994), Subramanian & Naik Nimbalkar(1990). Some modifications is to be made on the estimator so that range of the modified estimator falls in the parameter space. Method of sieves is one such approach (Beder (1988, 1989). Sometimes a Bayes procedure is useful in picking up a suitable estimator (Anilkumar (1994)). But in such modification, one has to sacrifice the optimality property enjoyed by the estimating sequence and has to be satisfied by asymptotic properties. However in all such situations optimal estimating sequence is a right point to start.

References

[1]. Anilkumar, p. (1994)on estimating the mean function of a Gaussian process. Statistics and prob. Letters 19 (1994) 77-84
[2]. Ash, R.B. and Gardner, M.F(1975) Topics in Stochastic process, Academic press , New York
[3]. Basavu, I.V, Prakasa Rao,B.L.V (1987) Statistical inference for stochastic process .Academic press, New York
[4]. Beder, J. H. (1987) A Sieve estimator for the mean of a Gaussian process . Ann. Statist 15, 59-78
[5]. Beder, J. H. (1988) A Sieve estimator for the covariance of a Gaussian process. Ann statist 16 No: 2,648-660
[6]. Chatterji,S.P. and Handrekar,V.(1978) equivalence and singularity of a Gaussian measure and applications. In probabilistic analysis and related topics. Vol.1 Ed. Bharucha – Reid A.T
[7]. Geman and Hwang, C.R (1982) Non – Parametric Maximum Likelihood Estimation by the method of sieves Annals. Statist. 10,401-414
[8]. Grenander,U (1981) Abstract inference John wiley and sons
[9]. Kale, B.K. (1999) A First Course on Parametric Inference Narosa Publishing House, Delhi
[10]. Leskow,J and Rozanski (1989) Histogram maximum likelihood estimation for the multiplicative intencity models. Stochastic process and their applications, 31, 151-159
[11]. Mckeague, I (1986) Estimation of a martingale regression using method of sieves Annals of Statistics. 14, 579-589.
[12]. Subramanyam, A and U. N. NaikNimbalkar (1990) Optimal unbiased estimating functions for the Hilbert space valued parameters

IOSR Journal of Mathematics (IOSR-JM)
e-ISSN: 2278-5728. Volume 6, Issue 1 (Mar. - Apr. 2013), PP 01-04
www.iosrjournals.org

Refining Measure of Central Tendency and Dispersion

DR. P. Anilkumar[1], Samiyya. N.V[2]
Department of Statistics, Farook College, Calicut, Kerala,673632

Abstract: *A unified approach is attempted to bring the descriptive statistics in to a more refined frame work. Different measure of central tendencies such as arithmetic mean, median, mode, geometric mean and harmonic mean are derived from a generalized notion of a measure of central tendency developed through an optimality criteria. This generalized notion is extended to introduce the concept of an interval of central tendency. Retaining the spirit of this notion, measure of central tendency may be called point of central tendency. The same notion is further extended to obtain confidence interval for population mean in a finite population model and confidence interval for probability of success in Bernoulli population.*
Key words*: Point of central tendency, Interval of central tendency, Metric space, Confidence coefficient.*

I. Introduction

Descriptive statistics or Elementary data analysis is used to describe the basic features of the data gathered from an experimental study, a survey or from a similar situation. Here no assumption is made on the nature of the population and hence there is no explicit mention of a parameter. Usually we try to extract some characteristic features of the available data and use them for comparative and other purposes. A fairly good account of exploratory data analysis can be found in (Tukey, J.W.[4]). Two fundamental characteristics of the data frequently used in practice are measures of central tendency and measures of dispersion. A measure of central tendency is a point around which majority of the observations are clustered. Arithmetic mean, Median, Geometric mean and Harmonic mean is important measures of central tendencies used in practice. A limitation of a measure of central tendency is that the loss of information in condensing the whole data in to a single point is substantial.

This loss is partially recovered by supplementing it with a measure of dispersion. Our aim in this note is to suitably combine these two measures in to a pair of related entities, one representing a measure of central tendency and the other representing dispersion.

.

II. Measures of central tendencies

Arithmetic mean is probably the most commonly taught and encountered statistic today, appearing in numerous everyday contexts. Given n observations $x_1 , x_2 , \ldots , x_n$ it has the interesting property that the sum of the squared deviations taken about a point A given by

$D_1(A) = \sum (x_i - A)^2$, is minimum at A= $\bar{x}$ (AM) (1)

The square root of the average of this minimum squared deviation is called standard deviation. Thus we can say arithmetic mean and standard deviations are a related pair of measures. Similarly

$D_2(A) = \sum | x_i - A |$, is minimum at A = Median = M (2)

The quantity $\frac{1}{n}\Sigma| xi - M |$ is called mean deviation. Again median and mean deviation are related pairs. Again

$D_3(A) = \sum (\log x_i - \log A)^2$, is minimum at A = Geometric mean = GM (3)

And Antilog $\frac{1}{n}\ \Sigma(log\ (\frac{x_i}{GM})^2)^{1/2}$ is the measure of dispersion associated with GM. This measure finds use in averaging ratios where it is desired to give each ratio equal weight, and in averaging percent changes, discussion of which are found in Croxton, Couden and Klein [5]. Finally

$D_4\ (A) = \Sigma(1/xi - 1/A)^2$, is minimum at A =$n/(\Sigma\ 1/x_i)$ = Harmonic mean = HM (4)

It is occasionally used when dealing with averaging rates. And the reciprocal of the quantity

$(1/n \sum 1/x_i - 1/A)^2)^{1/2}$ is the measure of dispersion associated with HM.

Motivated by the different measures of central tendencies we are going to have a unified definition for measure of central tendencies. First a suitable metric 'd' is defied on the data space. Let our data set be $\{x_1, x_2 , , ,x_n\}$ With frequencies $f_1 , f_2 , \ldots , f_n$,with $f_i = N$. For convenience we use S to denote the data set $\{(x_1 , f_1), (x_2 , f_2), \ldots , (x_n , f_n)\}$. In general $x_1 , x_2 , \ldots , x_n$ need not be real numbers. They can be elements of any metric space. Now define a deviation from a point A to the data set S by

$D(S,A) = \sum \rho(d(x_i , A)\ \varphi\ (f_i)$ (5)

Where ρ is an increasing function and φ is again a suitable nonnegative non decreasing function. In general a point of central tendency is defined as the value of A that minimizes D(S, A). Different measures of central tendencies are defined by choosing an appropriate metric d, function ρ and φ.

Example 1:- Let X = R, d(x, y) = | x − y |, $\rho(t) = t^2$, φ(t) = t (identity function) Then D(S,A) = = $\sum (x_i - A)^2\ f_i$

, is minimized at the mean = $1/n \sum (x_i f_{i.} = \bar{X}$

Example 2:- In the above example put ρ(t) = t, the identity function Then D(S, A) = $\sum | (x_i - A) | f_i$ and is minimized at the sample median M.

Example 3:- In the example 1 if we choose d(x, y) = | log x – log y | then D(S, A) = $\sum (\log x_i - \log A)^2 f_i$ and is minimized at the G M.

Example 4:-Choosing, d(x, y) = |1/x – 1/y |, in example 1 Then D(S ,A) = $\sum (1/x_i - 1/A)^2 f_i$,attains minimum at A = HM

Example5:- Mode is the value that occurs most frequently in a data set or a frequency distribution. Mode is in general different from mean and median especially for skewed distributions. In the example 1 choose φ(fi) as φ(fi) = 1 if f_i= Max f_i, 0 otherwise then D(S, A) will be minimized at the mode.

III. Interval of central tendency

Now we see how the notion of point of central tendency can be extended to derive interval of central tendency. The idea is initiated by defining a distance from a point to an interval. Naturally the distance from a point x to an interval is defned as d(x, I) = $\inf_y \{d(x, y), y \in I\}$

In particular if we choose the interval of length l in the form I_a^l = (a – l, a) and d(x, y) = | x – y |, then

$$d(x, I_a) = \begin{cases} 0 \ if \ \ a - l \le x \le a, \\ (a - l) - x \quad \text{if } x \le (a - l) \\ x - a \ , \text{if } x \ge a \end{cases} \qquad (6)$$

Now use the above definition to arrive at an aggregate deviation from a data set to the interval I_a^l , minimize it with respect to a. If a^* is the optimum choice of a, ($a^* - l$, a^*) is the desired interval.

Using this procedure the interval of central tendency associated with arithmetic mean, Median, Geometric mean and Harmonic mean are obtained by minimizing

$$D_1(S, I_a^l) = \sum_{xi<a-l} ((a - l) - xi) 2 \, fi + \sum_{xi>a} (xi - a) 2 \, fi$$

$$D_2(S, I_a^l) = \sum_{xi<a-l} | (a - l) - xi | \, fi + \sum_{xi>a} | xi - a | \, fi$$

$$D_3(S, I_a^l) = \sum_{xi<a-l} (log(a - l) - log \ xi)^2 \, f_i + \sum_{x_i>a} (log \ xi - log \ a) 2 \, fi$$

$$D_4(S, I_a^l) = \sum_{xi<a-l} (\frac{1}{x_i} - \frac{1}{a-l})^2 \, f_i + \sum_{x_i>a} (\frac{1}{x_i} - \frac{1}{a})^2 \, f_i$$

respectively. Now the question of fixing the length of the interval is to be addressed. This can be done incorporating it with a confidence measure. As there is no probability measure defined on the sample space we should be satisfied by crude measure of confidence governed by the data. The ratio of the number of observations falling in the estimated interval to the total number of observations in the data set can be chosen as a confidence measure. Clearly the above measure varies from 0 to 1 as the length of the interval varies from 0 to the range of the data set. Another confidence measure is obtained in the following way. For the optimum interval of length l chosen say $l_{a^*}^l$ define confidence measure by

$$\text{?}(l) = 1 - \{D(S, l_{a^*}^l) \div D(S, A^*)\} \qquad (7)$$

where A* is the associated measure of central tendency and a* is the estimated value of a. A graph can be plotted taking the length of the interval along X axis and confidence measure on Y axis. The shape of this graph will shed more light in to the nature of the data.

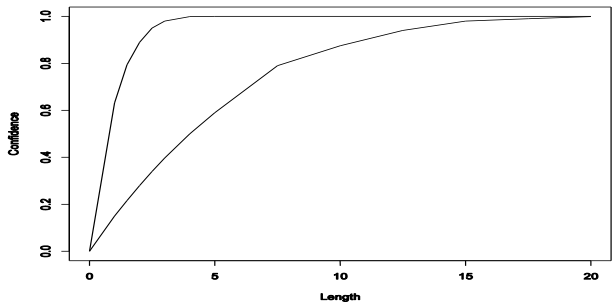
IV. Simulation studies

Twenty five values are simulated from Lognormal distribution. Interval of central tendency associated for arithmetic mean and Geometric mean are estimated and their confidence calculated. The results are displayed in the table (1).The table values clearly show that the interval of central tendency of given length associated with GM captures more observations than the interval of central tendency associated with AM of that length. Thus we can say that GM is a better measure of central tendency to represent the above data than AM. In general different intervals of central tendencies can be compared to choose an appropriate measure of central tendency for a given data.

Table (1): Confidence coefficient associated with GM and AM

Length	20 40	60 80	100 120	140 160	180 200	250 500
CC GM	0.12 0.20	0.32 0.44	0.52 0.56	0.56 0.64	0.64 0.64	0.68 0.84
CC AM	0.04 0.04	0.04 0.08	0.12 0.12	0.12 0.12	0.12 0.16	0.32 0.40

Twenty five values are simulated from N(5,1) and from N (5,5). Interval of central tendency associated with arithmetic mean is computed for various lengths and their confidence coefficients are graphically displayed in thefigure (1). It shows how the dispersion of the data is reflected in the nature of the graph.



figure(1) Confidence for samples of different standard deviations

V. Finite population situations

The method of constructing interval of central tendency described in this paper can be used to construct confidence interval for population mean in a finite population model. In a finite population situation even though there is no specific model assumption on the nature of the population, the statistical investigation is targeted towards one or two parameters. The parameters of interest are usually population mean, population total etc. In the present case we confine our attention to the population mean $\bar{Y} = \frac{1}{N}\Sigma Yi$, where Y_1 , Y_2 , . . . , Y_N are unknown population observations. We can consider $\bar{Y}$, as the value 'A' that minimizes $\Sigma(yi - A)^2$. Based on the sample y_1, y_2, …,y_n an estimate of Y is supposed as the quantity a that minimizes $\Sigma\,(yi - A)^2$. Clearly the estimator is $\bar{y}$, the sample mean. One can extend the same optimality criteria to arrive at a confidence interval for Y . The answer coincides with the interval of central tendency associated with arithmetic mean discussed in the last section. But it lacks a method of evaluating the confidence coefficient. The following indirect method may be used in practice. Use asymptotic normality to construct a confidence interval of required confidence coefficient Choose the length of that interval and construct the interval of central tendency of that length. What is the real advantage? Since no probability model is involved we cannot make a comparison but we can say that the new method is based on an optimality principle.

VI. Statistical inference on population proportion

In the statistical inference concerning proportion, the under laying model is Bernoulli distribution and the parameter of interest is the probability of success. The data is always the number of successes x in n trials. If we look at individual data x , they are either 0 or 1 with $\Sigma\, x_i = x$. Thus there are x ones and n-x zeroes. Since E(xi) = p, xi is an unbiased estimator of p. For every point p in the parameter space consider the distance d(p, xi) = | p − x_i |, clearly d(p, x_i) is either p or 1-p according as x is 0 or 1.Define the aggregate deviation from the point p to the data set S = {x_1,x_2,….,x_n} as

$D(p,S) = \Sigma\,(p - x_i)^2 = x(1-p)^2 + (n - x)p^2$. (8)

It is immediate to see that D(p, S) is minimized at p = x/n which is also MLE of p. A confidence interval for p is usually obtained using asymptotic normality. We now see how a confidence interval for p can be obtained using the method described in this paper. As before consider an interval of length of length l as $l_a^{\,l}$= (a – l, a), then

$$d(I_a^l, x_i) = \begin{cases} a - l, & \text{if} \quad x_i = 0 \\ 1 - a, & \text{if} \quad x_i = 1 \end{cases}$$

Therefore

D(l_a^l, S) = Σ (d(l_a^l , x_i))^2 = (n – x) (a – l)^2 + x(1 –a)^2
Consequently D((l_a^l , S) is minimized at $\hat{a}=\frac{x}{n}+l(1-\frac{x}{n})$. Hence confidence interval is $(a^{\wedge}-l,a)=(\frac{x}{n}-\frac{x}{n}l,\frac{x}{n}+\left(1-\frac{x}{n}\right)l$. The performance of this estimator is compared with the interval suggested using asymptotic normality using simulation. Samples of different sizes are generated with various success probability p = 0.2,0.3, …,0.8. In each case 95% confidence intervals are constructed using asymptotic Normality. Then interval of same length is obtained using the present approach. Exact confidence coefficient of both intervals are evaluated using the frequency approach based on 5000 simulations. The results are reported for comparison. In the table (2) CC1 denote estimated confidence coefficient using asymptotic normality and CC2 denote the confidence coefficient based on the new approach.

Table(2) Confidence for p using Normal approximation and New method

p	Size 20		Size 30		Size 10	
	CC1	CC2	CC1	CC2	CC1	CC2
0.2	0.90	0. 90	0.93	0.79	0.92	0.89
0.3	0.94	0.96	0.95	0.92	0.94	0 94
0.4	0.92	0.97	0.94	0.98	0.95	0.98
0.5	0.93	0.98	0.95	0.98	0.91	0.98
0.6	0.93	0.99	0.93	0.98	0.95	0.98
0.7	0.94	0.98	0.95	0.96	0.94	0.95
0.8	0.91	0 .91	0.95	0.84	0.92	0.85

The result clearly shows that the new method has better confidence level than the interval based on asymptotic Normality. In particular the new estimator shows substantially improved performance when p is close to 0.5.

VII. Concluding Remarks

In classical inference point estimators as well as the interval estimators suggested are based on optimality principle (cf. G. Casella, R.L.Berger [1]). The situations are also not different in a Bayesian set up (cf. Berger.J.O. [2]). But various measures suggested in elementary data analysis generally lacks any optimality criteria behind it. Our aim through this paper is to bring the elementary data analysis to that level by introducing suitable optimality criteria. It is also found that optimality principle used here has also its natural extension in classical inference. For example, the estimation of the population proportion discussed in this paper is closely associated with the concept of U – statistics (cf. Serfling R.J.[3]). But we had gone a step further by suggesting new optimality criteria for deriving confidence interval for the parameter. This idea can be found a further exposition in a forth coming paper.

References

[1]. G. Casella, and Berger R.L. (1990**), Statistical inference**, Wadsworth Group ,California.
[2]. Berger J.O, (1985**), Statistical Decision theory and Bayesian Analysis 2nd edition**-Springer-verlag, New York.
[3]. Serfling R.J,(1980**),Approximation theorem in mathematical statistics**, Wiley ,New York.
[4]. Tukey,John.W. (1977),**Exploratory data analysis** ,Addison Wesley..
[5]. Croxton,F.E.D, J.Cowden and S.Klein (1967: 178-182), **Applied general Statistics** 3rd edition ,Prentice-Hall,Englewoodcliff,New Jersey.

American Journal of Theoretical and Applied Statistics
2013; 2 (1) : 1-6
Published online January 10, 2013 (http://www.sciencepublishinggroup.com/j/ajtas)
doi: 10.11648/j.ajtas.20130201.11

SciencePG
Science Publishing Group

Time series outlier analysis of tea price data

S. D. Krishnarani

Department of Statistics, Farook College, Kozhikode, Kerala, India

Email address:
krishna_manoharan@yahoo.com (S. D. Krishnarani)

To cite this article:
S. D. Krishnarani. Time Series Outlier Analysis of Tea Price Data. *American Journal of Theoretical and Applied Statistics.* Vol. 2, No. 1, 2013, pp. 1-6. doi: 10.11648/j.ajtas.20130201.11

Abstract: In this article Autoregressive Integrated Moving Average (ARIMA) models were fitted and outliers are identified for the auction price of tea in three regions- North India, South India and All India. The ARIMA models with seasonal differencing are found to be quite appropriate for the data. The region specific dynamics are distinctly assessed based on the autocorrelation functions. Further we are concerned with outliers in time series with two special cases, additive outlier (AO) and innovational outlier (IO).These outliers have been detected using two recent methods and conclusions drawn based on the data pertaining to the three regions. The reason for these types of outliers in the tea price have been further identified pointing towards the factors of environmental, weather conditions, pest attacks etc.

Keywords: Autoregressive Integrated Moving Average; Additive Outlier; Innovational Outlier; Tea Price Data

1. Introduction

Time series observations are usually influenced by abnormal observations which deviate significantly from the rest of the observations. Such observations are called outliers. These outliers appear because of the unexpected or irregular events like weather conditions, strikes, economic instability, natural calamities and error in recording observations. The outliers do affect the time series observations seriously, especially the autocorrelation function, partial autocorrelation function, model parameters etc. So they should be treated carefully. We mainly look into two types of outliers additive outliers (AO) and innovational outliers (IO). Additive outlier affects only a single observation and it is a result of a mistake made by a person in observation or record. But innovational outlier affects the subsequent observations starting from its position. The AO affects seriously the estimates of the autoregressive moving average (ARMA) parameters, but the IO has less effect than AO. For more details about outliers see [1], [3], [4], [5], [7] etc.

Tea is one of the major agricultural commodities and India remains a major producer and exporter of tea worldwide. In India, tea production and exports of tea show a growing tendency for the last few years. The enormous fluctuations in the price of Indian Tea in the world market and quality deterioration of tea have become matters of concern for some time and these problems had already surfaced in the past years of the Indian Tea industry. The present paper seeks to throw fresh light on the recent trends of tea price in India. Currently, India is the fourth largest tea exporting nation. The tea price in India has fluctuations although the general tendency is that of an increase over the years. One may refer to a recent report [9] which analyzed the tea price fluctuations in South India and North India using a secondary data collected from tea statistics. The information we have from some reliable market source is that during 1990's the average price of tea was not stable. In early 1990's it was decreasing, in the mid 90's there was a sudden increase and then a decline in the price. The price was lowest in 2001 compared with the price in late 90's. But from 2002 it was increasing consistently. The price of almost all agricultural commodities has shown decrease in 1990's. All these fluctuations may be mainly due to weather conditions, geographical conditions, pest attacks etc. It is difficult to identify the variable effects and outliers. Our attempt is to identify the outliers and the reason for these outliers. We have taken monthly data of tea price from the month of January 2006 to July 2011. We analyze the data and an ARIMA model with seasonal differencing is fitted and the outliers are identified.

2. Study Methods

The approach used to analyse the tea price time series was three folded. First, we identified the appropriate time series model for each data system based on autocorrelation patterns and the ARIMA modeling technique [1] was used. The adequacy of the fit of the model was examined through the

residuals. Then we detected the presence of outliers in each data series through the procedure developed in [1] and [6]. Finally, we discussed each outlier in terms of management strategy and environmental influences.

Now we present the ARIMA models that we use in this paper. A useful class of time series model for modeling stationary data is autoregressive moving average models (ARMA) of the form,

$$\phi(B)\, X_t = \theta(B)\, \varepsilon(t) \tag{1}$$

where $\phi(B)$ and $\theta(B)$ are polynomials of degree p and q in B, the backward shift operator.

But real time series data often exhibit some trend, which can be removed by taking differences. Such data is modeled using autoregressive integrated moving average process of order (p,d,q)(ARIMA(p,d,q)) having the general structure,

$$\phi(B)\, X_t \nabla^d X_t = \theta(B)\, \varepsilon(t) \tag{2}$$

where $\nabla = 1 - B$ is the differencing operator, $\phi(B)$ is of order p, θ(B) is of order q and d is the order of difference.

Reference[1] generalized the ARIMA model to deal with seasonality and defined the model as

$$\phi_p(B)\Phi_P(B^s)W_t = \theta_q(B)\Theta_Q(B^s)\varepsilon_t \tag{3}$$

where B denotes the backward shift operator, $\phi_p, \Phi_P, \phi_q, \Theta_Q$ are polynomials of order p,P,q,Q respectively. $W_t = \nabla^d \nabla_s{}^D X_t$ denotes the differenced series. This model is called SARIMA model of order (p, d, q)(P, D, Q)s (See [2]).

Tea auction price data in three regions North India (NI), South India (SI) and All India (AI) are taken for study. The data is taken from the website of Tea Board of India. In section 2, we fit an ARIMA model with seasonal differencing for the data. In section 3 outlier analysis of the same is done.

3. Time Series Analysis of Tea Price Data

We analyze the tea price data of three regions, NI, SI and AI. We seek appropriate ARIMA models for these data. Time series plot of the three types of data (Figure 1) revealed that the data is not stationary, but shows an upward trend. To make the data stationary successive differences are taken to create new series. Now we look at the autocorrelation function (ACF) and partial autocorrelation function (PACF) of the differenced series for determining the order of the most appropriate model.

The functions used in identifying model parameters are autocorrelation function (ACF) and partial autocorrelation function (PACF). First we analyze the data of NI. The time series plot shows non-stationary. For NI region the ACF (Figure 2) shows slight sine-cosine waves and each value is highly significant. PACF (Figure 3) is significant at lags 1, 5 and 13. This shows that differencing is needed. After differencing the data by order 1, the ACF (Figure 4) and PACF (Figure 5) are plotted. The differenced data shows significant ACF at lags 1, 11, 12, 13 and 14 and PACF at 1,2,3,5 and 11. It is clear that an appropriate model can be ARIMA model or ARIMA model with seasonal component. The possible models are ARIMA(1, 0, 1), ARIMA(1, 0, 0)(1, 0, $0)_{12}$, ARIMA(1, 0, 0)(1, 0, $1)_{12}$, ARIMA(1, 0, 1)(1, 0, $0)_{12}$ and ARIMA(1, 0, 1)(1, 0, $1)_{12}$. The normalized BIC values (Table 1) are calculated for each model and it is minimum for ARIMA(1,0, 0)(1, 0, $0)_{12}$. The plot of the sample ACF and the PACF of the residuals (Figure 6) show that the values are within the given confidence intervals. The estimate of the model parameters are given in Table 2. Testing the significance of the model parameters is also done and the results are also shown in Table 2.

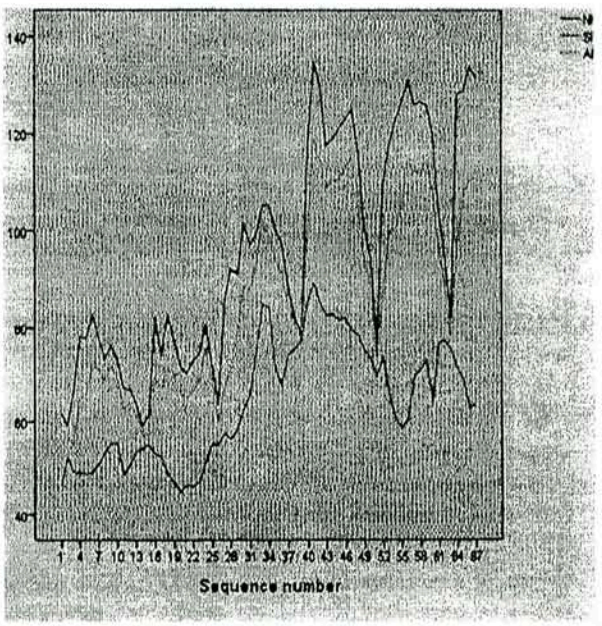


Figure 1. Time series plot of North India, South India and All India regions.

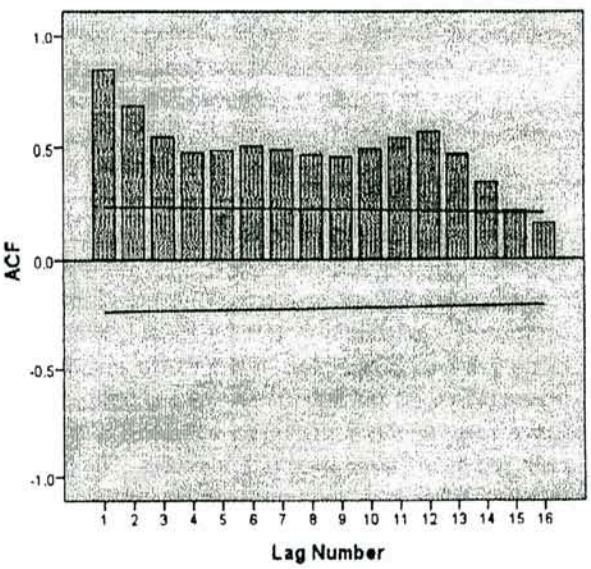


Figure 2. Sample auto-correlation function of North India region.

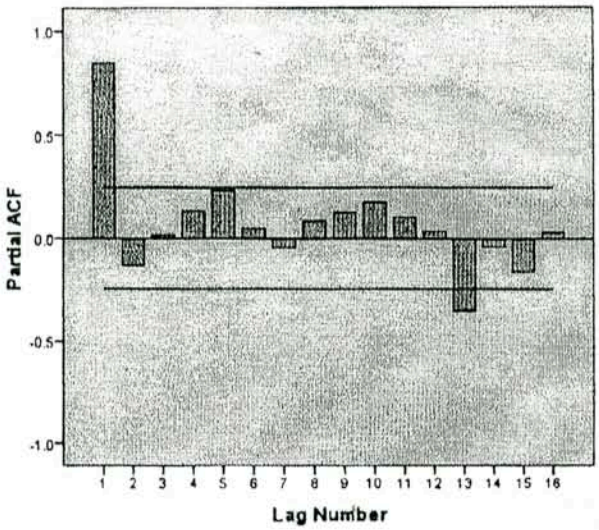


Figure 3. Sample partial auto-correlation function of North India region.

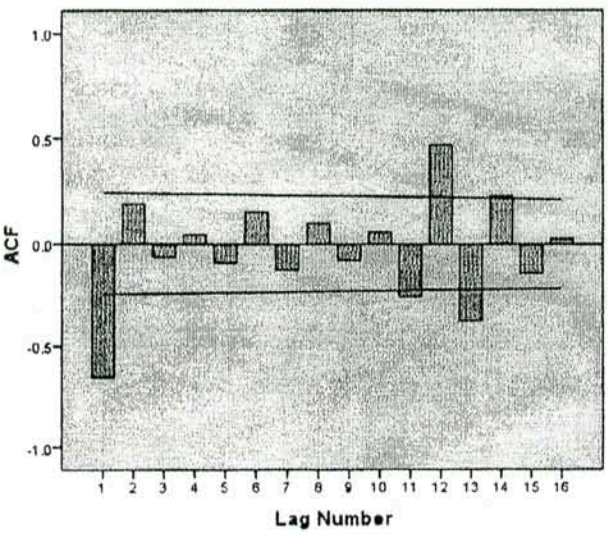


Figure 4. Sample auto-correlation function of the differenced series of North India region.

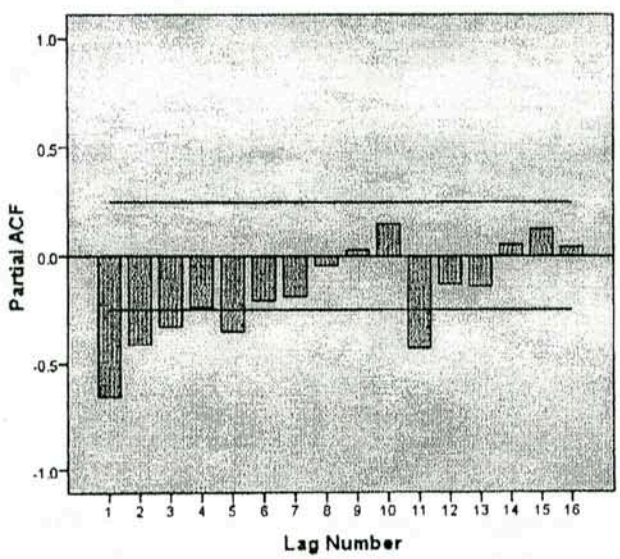


Figure 5. Sample partial auto-correlation function of the differenced series of North India region.

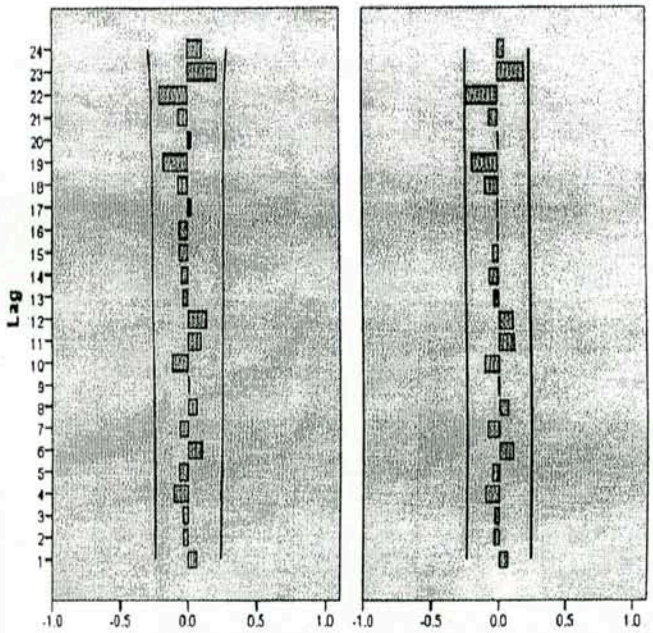


Figure 6. Sample auto-correlation and partial auto-correlation function of the residuals of North India region.

Table 1. Normalized BIC values for the North India region.

Models	BIC Values
ARIMA(1, 0, 1)	5.055
ARIMA(1, 0, 0)(1, 0, 0)$_{12}$	4.685
ARIMA(1, 0, 0)(1, 0, 1)$_{12}$	4.738
ARIMA(1, 0, 1)(1, 0, 0)$_{12}$	4.762
ARIMA(1, 0, 1)(1, 0, 1)$_{12}$	4.805

Table 2. Estimate of the model parameters for the North India region.

Type	Estimate	S.E.	t value	p-value
Constant	89.288	15.548	5.743	0
AR(1)	0.851	0.064	13.39	0
SAR	0.653	0.116	5.260	0

The fitted model is

$$X_t = 89.288 + 0.851X_{t-1} - 0.556X_{t-12} + 0.653X_{t-13} + \varepsilon_t \qquad (4)$$

Next turning to the data from SI region, the time series plot shows that the data is not stationary (Figure 1). ACF falls slowly (Figure 7) and PACF is significant only at lag 1 and then cuts off as revealed in Figure 8. This shows that a suitable model is ARIMA(1,0,0). Also the ACF and the PACF of the residuals are within the region and that also confirms the model adequacy. These types of models are usually used in modeling economic data. Further differencing of the series makes the fit worser than the ARIMA (1,0,0) model. The model parameters are in Table 3.

Table 3. Estimate of the model parameters for the South India region.

Type	Estimate	S.E	t value	p-value
Constant	62.965	7.919	7.951	0
AR(1)	0.946	0.036	26.034	0

Using the parameters, the estimated model is,

$$X_t = 62.965 + 0.946\ X_{t-1} + \varepsilon_t \ .$$

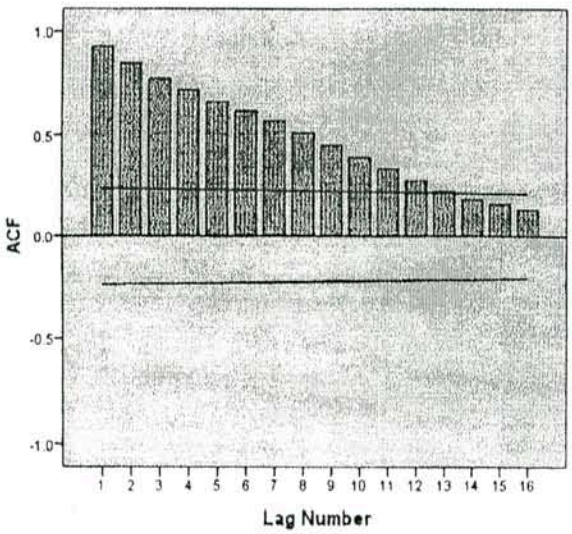


Figure 7. Sample auto-correlation function of South India region.

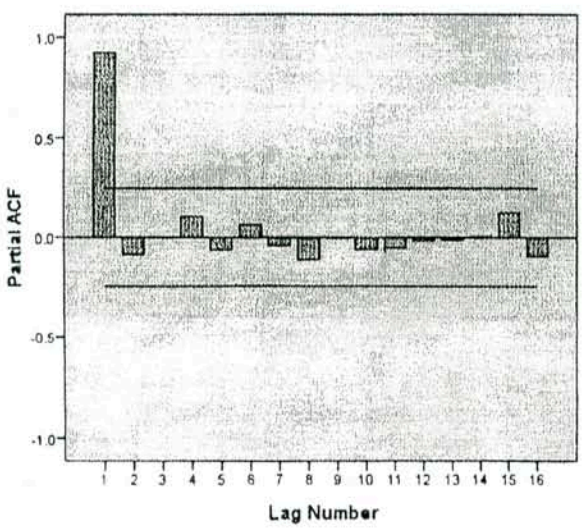


Figure 8. Sample partial auto-correlation function of South India region.

Lastly we consider the AI data. The ACF (Figure 9) shows a wave-like pattern and PACF (Figure 10) significant at lags 1,2 and 13 which means that seasonal AR and MA terms are needed to model the data. First order differencing shows ACF (Figure 11) high at lag 3,6,12, but no clear pattern of PACF (Figure 12) suggesting that normal differencing is not needed. So the possible models are ARIMA(1, 0, 1), ARIMA(1, 0, 0)(1, 0, 0)$_{12}$, ARIMA(1, 0, 0)(1, 0, 1)$_{12}$, ARIMA(1, 0, 1)(1, 0, 0)$_{12}$, ARIMA(1, 0, 1)(1, 0, 1)$_{12}$. The normalized BIC values (Table 4) are computed and it is shown that the suitable model is ARIMA(1, 0, 0)(1, 0, 0)$_{12}$. Also the sample ACF and sample PACF of the residuals support the suitability of the model.

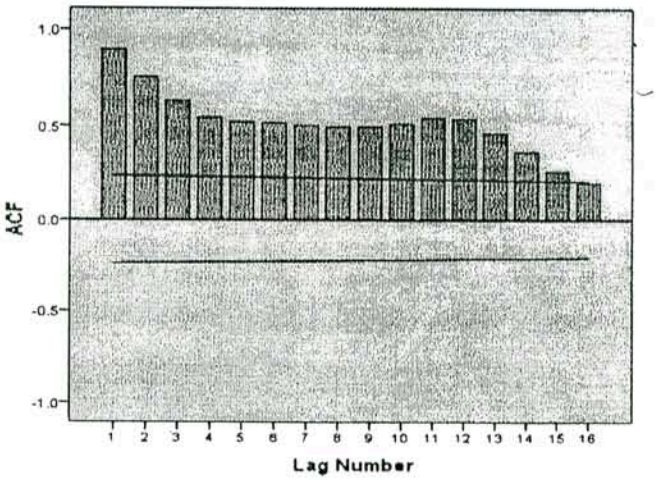


Figure 9. Sample auto-correlation function of All India region.

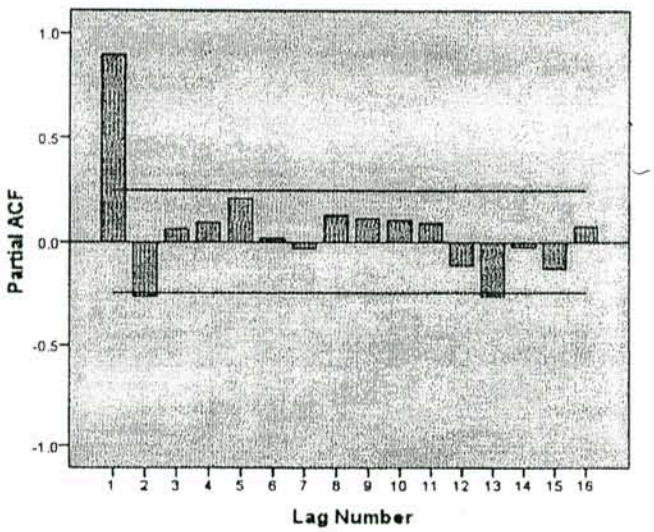


Figure 10. Sample partial auto-correlation function of All India region.

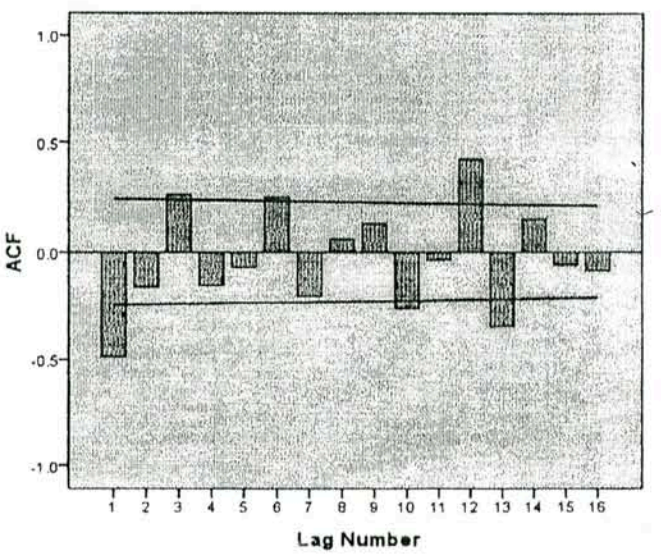


Figure 11. Sample auto-correlation function of the differenced series of All India region.

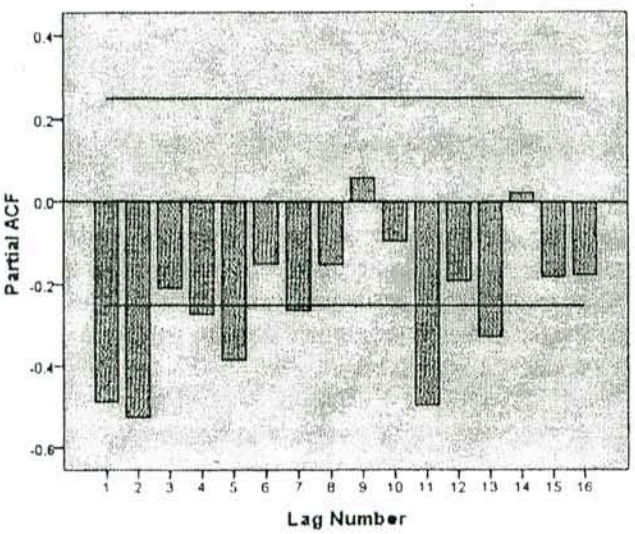


Figure 12. Sample auto-correlation function of the differenced series of All India region.

Table 4. Normalized BIC values for the All India region.

Models	BIC Values
ARIMA(1, 0, 1)	4.239
ARIMA(1, 0, 0)(1, 0, 0)$_{12}$	4.031
ARIMA(1, 0, 0)(1, 0, 1)$_{12}$	4.072
ARIMA(1, 0, 1)(1, 0, 0)$_{12}$	4.067
ARIMA(1, 0, 1)(1, 0, 1)$_{12}$	4.140

From the parameters (Table 5) we can form the model,

$$X_t = 8066 + 0.91X_{t-1} - 0.5069X_{t-12} + 0.557X_{t-13} + \epsilon_t \quad (5)$$

Table 5. Estimate of the model parameters for the All India region.

Type	Estimate	S.E	t value	p-value
Constant	80.66	14.18	5.7	0
AR(1)	0.91	0.05	18.266	0
SAR	0.557	0.119	4.671	0

The adequacy of fit of the models in the three cases is examined by considering the residuals as mentioned above. The estimated autocorrelation function and partial auto-correlation function of the fitted models are within the upper and lower bounds.

The significance of the model parameters are tested using t- statistic. The modified L-jung Box Chi-square statistic is also used for testing the significance of residual sample autocorrelation functions with test statistic,

$$Q_k = n(n+2)\sum_{l=1}^{k} \frac{r_l^2}{(n-l)} \quad (6)$$

where r_k^2 is the residual autocorrelations. When n is large, Q_k has a chi-square distribution with degrees of freedom k − p − q, where p and q are autoregressive and moving average orders, respectively. The significance level of Q_k is calculated from the chi-square distribution with k- p - q degrees of freedom. The Box-Ljung statistic is defined in [8]. The value of the Ljung Box Chi-square statistic in the above three cases are given in Table 6.

Table 6. Ljung Box Chi-square statistic.

Region	LBC	d.f
NI	9.955	16
SI	6.704	17
AI	14.031	16

The values are not significant for the given degrees of freedom, and the corresponding models for the three data sets are accepted.

4. Outlier Analysis

This section mainly focuses on the additive and innovational outliers present in the data. The outliers in time series data severely affects the estimates of the model parameters and hence the model fitting. So it is necessary to have an idea about the presence of the outliers in the data. According to [1], an AO is modeled as

$$Y_t = \omega P_t^T + \epsilon_t \quad (7)$$

where $P_t^T = 1$ if t=T and 0 if $t \neq T$.
An IO at time T is modeled as,

$$Y_t = \frac{\theta(B)}{\phi(B)}(\omega P_t^T + \varepsilon_t) \quad (8)$$

From this it is clear that AO affects the level of the observed time series only at time T, while IO affects the subsequent observations also. The presence of an outlier is tested using the likelihood ratio test criteria while the test statistics for IO and AO are respectively,

$$\lambda_{I,T} = \frac{\widehat{\omega_{I,T}}}{\sigma_a} \text{ and } \lambda_{A,T} = \frac{T\widehat{\omega_{A,T}}}{\sigma_a}.$$

It is known that under the null hypothesis both follow standard Normal distribution. We have taken a critical value of 2.5 for this test. The detection of outliers is again verified with the method proposed in [6]. He has proposed a sequential test, using the test statistic $T^* = \max T_k^*$ where

$$T_k^* = \max(T_{1k}, T_{2k}) \quad (9)$$

$$T_{1k} = \frac{(e_k - \sum_{i=1}^{p} \pi_i e_{k+i})^2}{[\sigma^2(1+\sum_{i=1}^{p} \pi_i^2)]} \quad (10)$$

$$\text{and } T_{2k} = \frac{e_k^2}{\sigma^2} \quad (11)$$

The significance point is,
$t(\alpha) = -2\log(\log(1-\alpha)) + 2\log(n-2p) + \log(\pi 8) - \log(2\log(n-2p))$. We have taken $\alpha = 0.1$, for the NI region analysis and critical region is $T^* > 5.802$. For the SI outlier analysis, critical region is $T^* > 6.155$ with $\alpha = 0.1$ and AI region it is $T^* > 6.4274$ when $\alpha = 0.05$. If T^* is T1k, the outlier at time

point k is additive otherwise innovational.

In the NI data four outliers are detected, additive outlier in March 2008 and Innovational outliers in April 2009,May 2009 and April 2011. For the SI region we could identify two outliers, innovational outliers in September 2008 and in December 2010. But in AI data innovational outliers come up in April 2009 and May 2009.

Now we examine the reasons for these types of outliers in the tea price. There is a decrease in production in the first three months of 2009 and this may be the reason for innovational outliers in 2009. As a result, a sudden increase can be seen in the price data. Also decrease in rain and severe drought conditions resulted in the outliers in the summer seasons like April, May 2009 and April 2011. Pest attacks and weather conditions also resulted a decrease in price in North India in 2009. Production in SI increased in November 2010 and as an output an outlier can be seen in December 2010.In the AI region again outliers are present during the summer season of 2009.

The analysis we have done in the second section is under the assumption that no outlier is present in the data. Now we modify the model by considering the outliers and the model parameters are estimated. Table 7 reveals that there is not significant change in the model parameters before and after outlier detection. The residual sum of squares show a decrease of 34%, 23% and17% respectively for the NI, SI and AI regions after identifying and adjusting outliers.

The model parameters after outlier detection are given in Table 7.

Table 7. Model parameters after outlier detection.

Region	Type	Parameter estimates	Outliers
NI	AR(1)	0.868	March 2008
	MA(1)	0.019	April 2009
	SAR(1)	0.899	May 2009
	SMA(1)	0.208	April 2011
SI	AR(1)	0.936	September 2008
			December 2010
AI	AR(1)	0.883	April 2009
	SAR(1)	0.560	May 2009

5. Conclusion

In any statistical data analysis outlier has a major role in the model fitting and prediction processes. For the NI, SI and AI data we found that the most appropriate models are ARIMA(1, 0, 1)(1, 0, 1)12, ARIMA(1, 0, 0) and ARIMA(1, 1, 1)(1, 0, 0)12 respectively. The outliers were detected using two different methods proposed in [1] and [6]. In the NI data four outliers are detected, additive outlier in March 2008 and Innovational outliers in April 2009, May 2009 and April 2011. For the SI region we could identify two outliers, innovational outliers in September 2008 and December 2010. But in AI data innovational outliers come up in April 2009 and May 2009. The reasons for these types of outliers in the tea price are attributed to a decrease in production in the first three months of 2009 accounted for innovational outlier in 2009. As a result, a sudden increase can be seen in the price data. Also decrease in rain and drought conditions in April 2009 resulted in the outliers. Pest attacks and weather conditions also resulted a decrease in price in North India in 2009. Production in SI increased in November 2010 and as an output an outlier can be seen in December 2010. In the AI region again outliers are present during the summer season of 2009.

Acknowledgement

The author would like to thank the anonymous reviewer and the editorial team for their constructive criticism and suggestions on an earlier version of this manuscript which led to this improved version.

References

[1] Box, G. E. P., Jenkins, G. M. and Reinsel, G. C., Time Series Analysis Forecasting and Control,3rd Edition, Pearson Education, Inc., 2009.

[2] Brockwell, P.J. and Davis, R. A., Introduction to Time Series and Forecasting,2nd Edition, Springer-Verlag, New York, Inc., 2006.

[3] Chatfield, C. , The Analysis of Time Series: An Introduction, 6th Edition, CRC Press LIC, 2009.

[4] Fox, A. J., Outliers in time series, J. Roy. Statist. Soc., B34, 350-363, 1972.

[5] Farley, E. V. , Jr. and Murphy, J. M. . Time series outlier analysis: Evidence for Management and Environmental Influences on Sockeye Salmon Catches in Alaska and Northern British Columbia, Alaska Fishery Research Bulletin, Vol.4, No.1, 1997.

[6] Louni, H. , Outlier detection in ARMA models, Journal of time series analy-sis., Vol.29,No.6,1057-1065, 2008.

[7] Kaya, A. , Statistical Modelling for Outlier Factors, Ozean Journal of Applied Sciences, 3 (no.1), 185-194. 2010.

[8] Ljung, G. M. and Box, G.E.P., On a measure of lack of fit in time series models, Biometrika, 65, 297-303, 1978.

[9] Saravanakumar, M. , An analysis of the tea price fluctuations in South India and North India, International Journal of Social Science Tomorrow, 1, no.7, 1-7, 2012.

International Journal of Statistics and Analysis.
ISSN 2248-9959 Volume 3, Number 2 (2013), pp. 123-134

http://www.ripublication.com/ijsa.htm

Generalized Half Semi-Logistic Distributions and Processes

Krishnarani, S.D.[1*] and Jayakumar, K.[2]

[1]*Department of Statistics, Farook College, Kozhikode, Kerala, India*
[2]*Department of Statistics, University of Calicut, India*
**Corresponding author: Email: krishna_manoharan@yahoo.com*

Abstract

Generalized half semi-logistic distribution is introduced. The well-known distributions such as exponential, Weibull, Pareto, half logistic etc. belong to this class. The properties of this class of distributions are studied. Autoregressive processes with generalized half semi-logistic marginal distribution are constructed and their properties are studied. The autoregressive model so developed is a generalization of several minification models. Multivariate extension is also considered.

Keywords: Autoregressive processes, Half semi-logistic distribution, Marshall-Olkin form, minification process.

1. Introduction

Consider the logistic random variable Y with probability density function (p.d.f.)

$$g(y)=\frac{e^{\frac{y-\mu}{\sigma}}}{\sigma(1+e^{\frac{y-\mu}{\sigma}})^2},\ -\infty<y<\infty,-\infty<\mu<\infty,\sigma>0. \qquad (1.1)$$

The folded logistic distribution is the distribution of X=|Y|. If fold occurs at the mean of the logistic density, then the distribution of X is called half logistic. Cooray et al. (2006) considered the folded logistic p.d.f. and estimated the parameters of the same. They discussed a number of situations where this distribution arises. Marshall and Olkin (1997) introduced a scheme for adding a new parameter to the distribution function. Our primary interest centers on the class of life distributions generated by the survival function $\bar{F}$ through the Marshall-Olkin form given by

$$\bar{G} = \frac{\alpha \bar{F}}{1 - \bar{\alpha} \bar{F}}, \ \bar{\alpha} = 1 - \alpha, \ 0 < \alpha < 1. \tag{1.1}$$

As noted in the previous works (see for example, Jayakumar and Mathew (2004)) the survival function $\bar{F}$ is given by

$$\bar{F}(x) = \frac{2}{1 + \psi(x)}, \tag{1.2}$$

where $\psi(x)$ satisfies the functional equation

$$\psi(x) = \frac{1}{p}\psi\left(\frac{1}{\beta}\ln p + x\right), \quad 0 < p, \beta < 1, \tag{1.3}$$

leads to a useful class of life distributions, that of half semi-logistic distributions. It may be noted that the solution of the functional equation (1.3) is $\psi(x) = e^{\beta x} h(x)$, where h(x) is periodic in x with period $\frac{1}{\beta}\log p$. This new class of distributions can be used to model real life data having periodic fluctuations.

Using the Marshall-Olkin parameterization scheme, in this paper we propose generalized half semi-logistic distribution and study the properties of these classes of distributions. The generalized half semi-logistic family of distributions is useful for modeling datasets having periodic fluctuations. The exponential, Pareto, Weibull, etc. belong to the family of generalized half semi-logistic distributions. The family of generalized half semi-logistic distributions is found to be useful in reliability studies, also where the lifetimes of the components have periodic failure rate.

Autoregressive minification model $\{X_n\}$ has the structure (see Tavares (1980)),

$$X_n = k \min(X_{n-1}, \varepsilon_n), \text{k>1} \tag{1.4}$$

and $\{\varepsilon_n\}$ is a sequence of independent and identically distributed (i.i.d.) random variables defining the innovation process chosen so that $\{X_n\}$ defines a stationary process. Model (1.4) with stationary distribution as Pareto was proposed by Yeh et al. (1988) and with stationary distribution as logistic by Arnold & Robertson (1989). Note that the model (1.4) exists only when there exists $\{\varepsilon_n\}$ such that (1.4) is properly defined. It can be seen that for the generalized half semi-logistic class of distributions, the model (1.4) doesn't exist always and consequently we consider a variant of (1.4) and the corresponding half semi-logistic process is developed and studied.

In the present study, we investigate the class of distributions generated by semi-logistic distributions through the Marshall-Olkin form given by (1.1). In Section 2, we introduce a generalized half semi-logistic distribution obtained through the Marshall-Olkin scheme and study its properties. This class includes a number of well-known distributions such as Pareto, Weibull, exponential, half logistic etc. In Section 3, the generalized half semi-logistic autoregressive processes are developed and their properties are studied. Some special classes of distributions that are generalizations of some well-known life distributions are studied in Section 4. Section 5 deals with multivariate half semi-logistic distribution and some results.

2. A Generalized Half Semi-Logistic Distribution

When $\overline{F}$ assumes the form (1.2), the associated Marshall-Olkin form is given by

$$\overline{G}(x) = \frac{2\alpha}{\psi(x) + 2\alpha - 1}. \tag{2.1}$$

Note that when $\alpha = 1/2$, $\overline{G}(x) = (\psi(x))^{-1}$ and that provides a generalization of exponential distribution. Necessarily we have $\psi(0) = 1$ and $\psi(\infty)=\infty$. When $\alpha = 1$, $\overline{G}(x)$ corresponds to half semi-logistic distribution. We call the distribution given by (2.1) as generalized half semi-logistic (GHSL) distribution and is denoted by GHSL (α, β, p).

We present below some basic characteristics of the generalized class of distributions given by (2.1).

(i) The probability density function is

$$g(x;\alpha) = \frac{2\alpha\psi'(x)}{(\psi(x) + 2\alpha - 1)^2}, x > 0.$$

(ii) Median, $M = \psi^{-1}(2\alpha + 1)$.

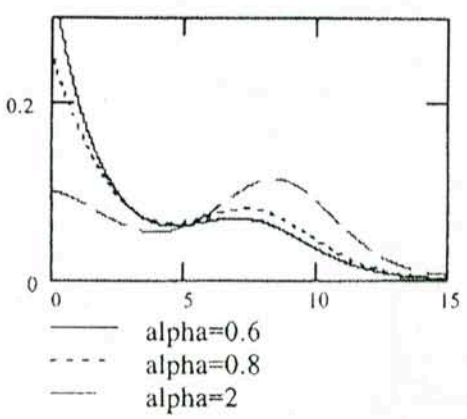
(iii) Hazard rate, $h(x) = \dfrac{\psi'(x)}{\psi(x) + 2\alpha - 1}$.

(iv) Mean Residual Life function,

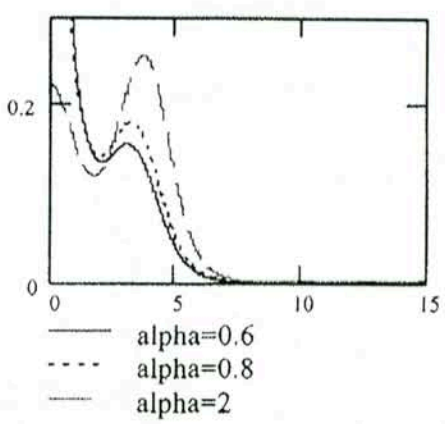
$$\mu(x) = (\psi(x) + 2\alpha - 1)\int_x^\infty \frac{1}{\psi(t) + 2\alpha - 1}\, dt.$$

The density plot, the hazard rate function and the mean residual life function of GHSL distribution are presented in **Figures 2.1, 2.2** and **2.3** respectively. As an illustration, we take

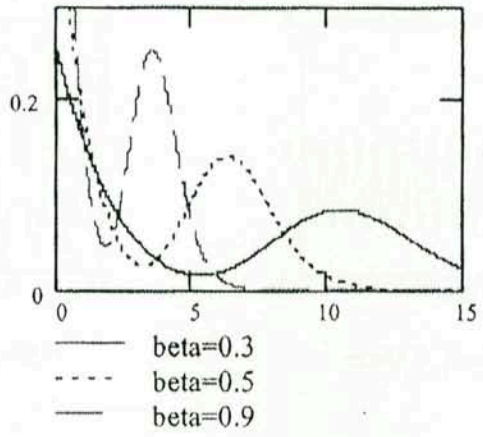
h (x) = $e^{\gamma(\cos \beta x - 1)}$ $(0 < \beta, \gamma < 1)$. Note that h (x) satisfies (1.3) with $p = e^{-2\pi}$.



β=0.4,γ=0.6



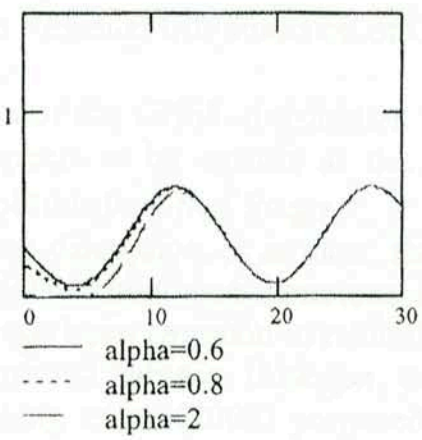
β= 0.9,γ=0.6



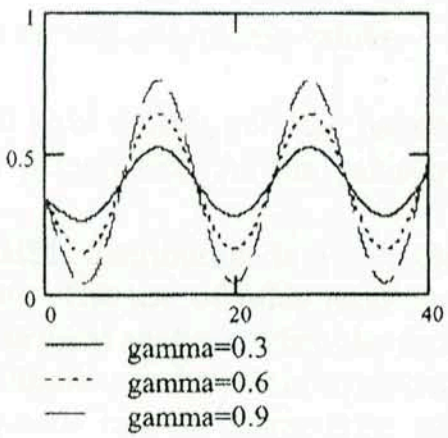
$\alpha=0.6,\gamma=0.9$

Fig. 2.1 Density plots of GHSL for various parametric values

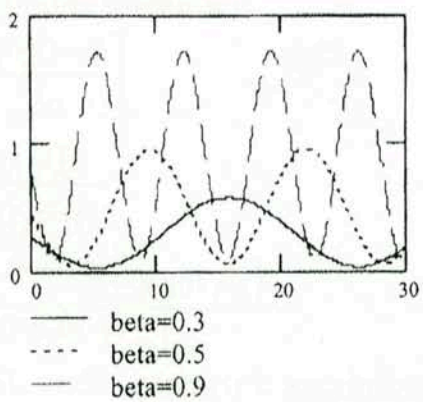
The density plots exhibits more peakedness when the value of any parameter is increased, while the other two held fixed. The parameter γ enhances the symmetric nature of the plot.



$\beta=0.4,\gamma=0.6$



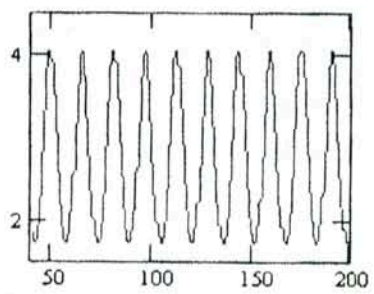
$\alpha=0.6,\beta=0.4$



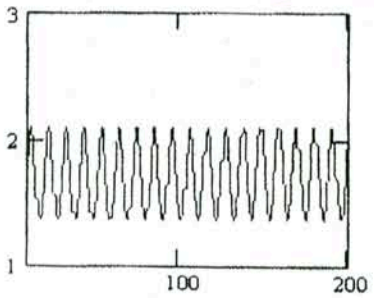
$\alpha=0.6,\gamma=0.9$

Fig. 2.2 Hazard rate function of GHSL for various parametric values

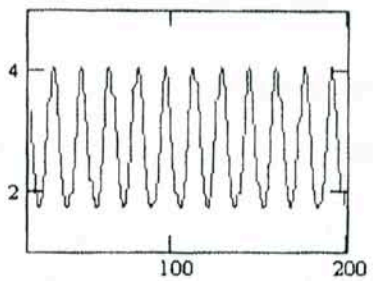
The hazard rate function of GHSL distribution is periodic in nature. This property of the distribution makes it more useful in many situations, for instance modeling of units under maintenance or replacement wherein the rate is usually periodic.



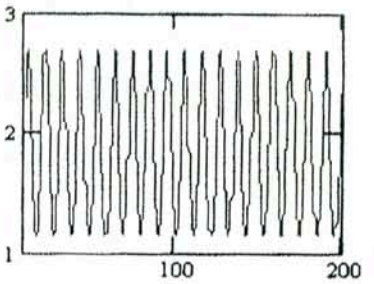
α=0.3,β=0.4,γ=0.6



α=0.7,β=0.6,γ=0.3



α=0.7,β=0.4,γ=0.6



α=0.7,β=0.6,γ=0.6

Fig. 2.3 Mean Residual Life Function of GHSL for various parametric values

The MRL function of the GHSL distribution is seen to have a clear periodic nature. The amplitude appears to be smaller as the value of β increases. As the value of γincreases the amplitude becomes longer.

From the foregoing discussion, it is clear that the GHSL distribution is a suitable model when the data exhibit non-monotone failure rate. The use of odds ratio and proportional odds has been common in reliability and survival analysis when the data exhibit non-proportional hazards. However, there are situations where this modeling is not suitable. Wang et al. (2003) proposed the log-odds rate to characterize the distribution of failure time. The log-odds rate may be viewed as a new way of modeling failure processes.

For the GHSL distribution, the log-odds function is

$$\log \frac{F(x)}{\overline{F}(x)} = \log\left[\frac{\psi(x)-1}{2\alpha}\right].$$

The log-odds rate is LOR (t) = $\dfrac{f(t)}{\overline{F}(t)F(t)}$

$$= \frac{2\alpha\beta\, e^{\beta x+\gamma(\cos\beta x-1)}\left[1-\gamma\sin\beta x\right]}{e^{\beta x+\gamma(\cos\beta x-1)}-1}.$$

Now we obtain a property of GHSL under geometric maximization.

Theorem 2.1

Let $X_1, X_2, \ldots$ be i.i.d. random variables with common distribution function F and N is geometric (α) distribution with $P(N=n) = \alpha(1-\alpha)^{n-1}$. Then the distribution of Max $(X_1, X_2, \ldots X_N)$ is half semi-logistic if and only if F is GHSL.

Proof:

Suppose $\overline{F}(x) = \dfrac{2\alpha}{\psi(x) + 2\alpha - 1}$.

Then $P(\text{Max}(X_1, X_2, \ldots, X_N) < x) = \sum_{n=1}^{\infty} F(x)^n \alpha(1-\alpha)^{n-1} = \dfrac{\psi(x)-1}{\psi(x)+1}$,

which is the distribution function of half semi-logistic .

Conversely suppose $P(\text{Max}(X_1, X_2, \ldots X_n) \le x) = \dfrac{\psi(x)-1}{\psi(x)+1}$.

Then, $\sum_{n=1}^{\infty} F(x)^n \alpha(1-\alpha)^{n-1} = \dfrac{\psi(x)-1}{\psi(x)+1}$.

Therefore, $\overline{F}(x) = \dfrac{2\alpha}{\psi(x) + 2\alpha - 1}$.

Hence the Theorem.

3. First Order Autoregressive Generalized Semi-Logistic Processes

Here we give a stationary autoregressive minification process with GHSL distribution as marginals. The following theorem gives a necessary and sufficient condition for an autoregressive minification process to have GHSL distribution as stationary marginal.

Theorem 3.1

Let $X_0 = \text{GHSL}(\alpha, \beta, p)$. For $n \ge 1$, define

$$X_n = \begin{cases} \varepsilon_n & w.p. \quad \alpha \\ \min(X_{n-1}, \varepsilon_n) & w.p. \quad 1-\alpha \end{cases} \tag{3.1}$$

Then $\{X_n\}$ defines a stationary $\text{GHSL}(\alpha, \beta, p)$ first order autoregressive process if and only if ε_n' s are i.i.d. $\text{FSL}(\alpha, \beta, p)$ random variables.

Proof:

Assume ε_n's as i.i.d. FSL random variables and $X_0 \sim \text{GHSL}(\alpha, \beta, p)$

Equation (3.1) in terms of survival function is $\overline{F}_{X_n}(x) = \overline{F}_{\varepsilon_n}(x)\left(\alpha + (1-\alpha)\overline{F}_{X_{n-1}}(x)\right)$

For n=1,

$$\overline{F}X_1(x) = \overline{F}\varepsilon_1(x)\left[\alpha + (1-\alpha)\frac{2\alpha}{\psi(x) + 2\alpha - 1}\right] = \frac{2\alpha}{\psi(x) + 2\alpha - 1}$$

If $X_{n-1} \sim \text{GHSL}(\alpha, \beta, p)$, weget $X_n \sim \text{GHSL}(\alpha, \beta.p)$.

Thus $\{X_n\}$ in (3.1) is stationary with GHSL distributions as marginals.

Conversely assume $\{X_n\}$ as stationary GHSL.

From (3.1), we get $\overline{F}_X(x) = \overline{F}_\varepsilon(x)\left(\alpha + (1-\alpha)\overline{F}_X(x)\right)$.

Thus, $\overline{F_\varepsilon}(x) = \dfrac{2}{1+\psi(x)}$.

Now we look into some properties of the stationary GHSL distribution.
The joint survival function of (X_n, X_{n+1}) is

$$\overline{F}_{X_n,X_{n+1}}(x,y) = \begin{cases} \dfrac{2}{1+\psi(x_{n+1})}\left[\dfrac{2\alpha^2}{\psi(x_n)+2\alpha-1} + \dfrac{2\alpha(1-\alpha)}{\psi(x_{n+1})+2\alpha-1}\right] & \text{if } X_n < X_{n+1} \\ \dfrac{4\alpha}{(\psi(x_n)+2\alpha-1)}\dfrac{1}{(1+\psi(x_{n+1}))} & \text{if } X_n > X_{n+1} \end{cases}$$

$$P(X_{n+1} > X_n) = 2\alpha \int_0^\infty \frac{\psi(y)-1}{(\psi(y)+2\alpha-1)} \frac{\psi'(y)}{(1+\psi(y))^2} dy$$

In Figure 3.1, the sample path of the process is presented for $\psi(x) = e^{\beta x + \gamma(\cos\beta x - 1)}$ for $\alpha = 0.75, \beta = 0.8, \gamma = 1.75$ and in Figure 3.2 the joint distribution of (X_n, X_{n+1}) is given.

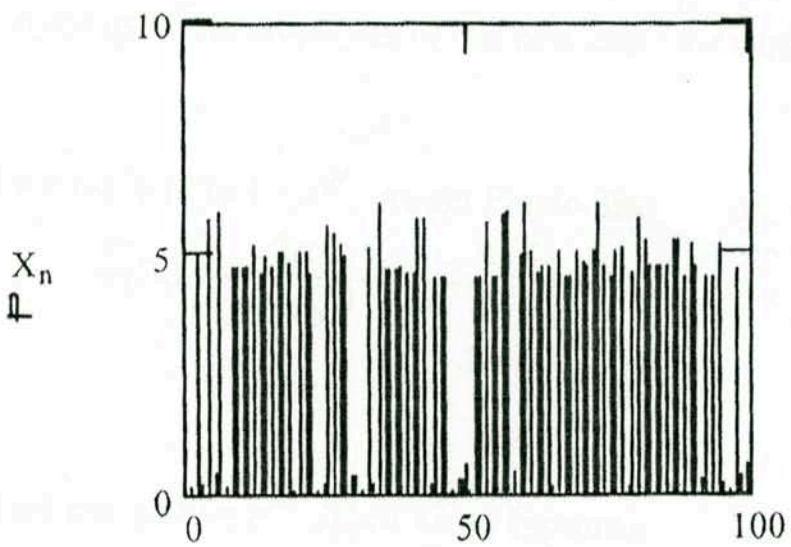


Fig.3.1 Sample path of the process

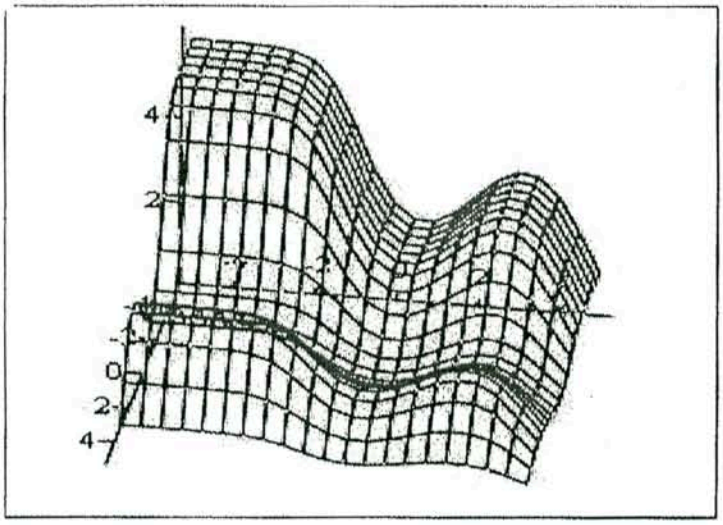


Fig.3.2 Joint distribution of (X_n, X_{n+1})

4. Some Special Classes of Distributions

Now let us relax the condition on $\psi(x)$ taken in (1.2), but only assume that $\psi(x)$ is a monotone increasing function with $\psi(0)=1$ and $\psi(\infty)=\infty$.

Then

$$\overline{G}(x)=\frac{2\alpha}{\psi(x)+2\alpha-1} \tag{4.1}$$

gives the corresponding Marshall-Olkin form.

We shall investigate the properties of this new class for various choices of $\psi(x)$.

Case 1

In (4.1) if we put $\psi(x)=1+x^{\beta}$, we get Pareto distribution, with survival function

$$\overline{G_1}(x)=\frac{2\alpha}{2\alpha+x^{\beta}}=\frac{1}{1+\frac{1}{2\alpha}x^{\beta}}.$$

Case 2

In (4.1), if we put $\psi(x)=e^{x^{\beta}}$, then $\overline{G}(x)$ becomes

$$\overline{G}_2(x)=\frac{2\alpha}{e^{x^{\beta}}+2\alpha-1}. \tag{4.2}$$

This is a generalization of Weibull (Exponential power) distribution. We call this distribution as Generalized Exponential power (GEP) distribution.

Properties of GEP distribution

i. Probability density function is, $g_2(x) = \dfrac{2\alpha\beta\, e^{x^\beta}\, x^{\beta-1}}{\left(e^{x^\beta} + 2\alpha - 1\right)^2}$.

ii. Figure 4.1 shows the behaviour of p.d.f. for different values of α *and* β

iii. Median $= \left[\log(2\alpha+1)\right]^{\frac{1}{\beta}}$

iv. Hazard Rate $= \dfrac{\beta\, e^{x^\beta}\, x^{\beta-1}}{e^{x^\beta} + 2\alpha - 1}$

Hazard rate plot is given in Fig. 4.2

v. Log-odds function $= \ln\left(\dfrac{e^{x^\beta} x^{\beta-1}}{2\alpha}\right)$.

vi. Log-odds rate $= \dfrac{2\beta\, pt^{\beta-1}}{1-e^{-t^\beta}}$.

vii. Mean Residual Life Function $= (e^{x^\beta} + 2\alpha - 1)\int_t^\infty \dfrac{1}{e^{u^\beta} + 2\alpha - 1}\, du$

The graph of MRL function is given in Fig.4.3

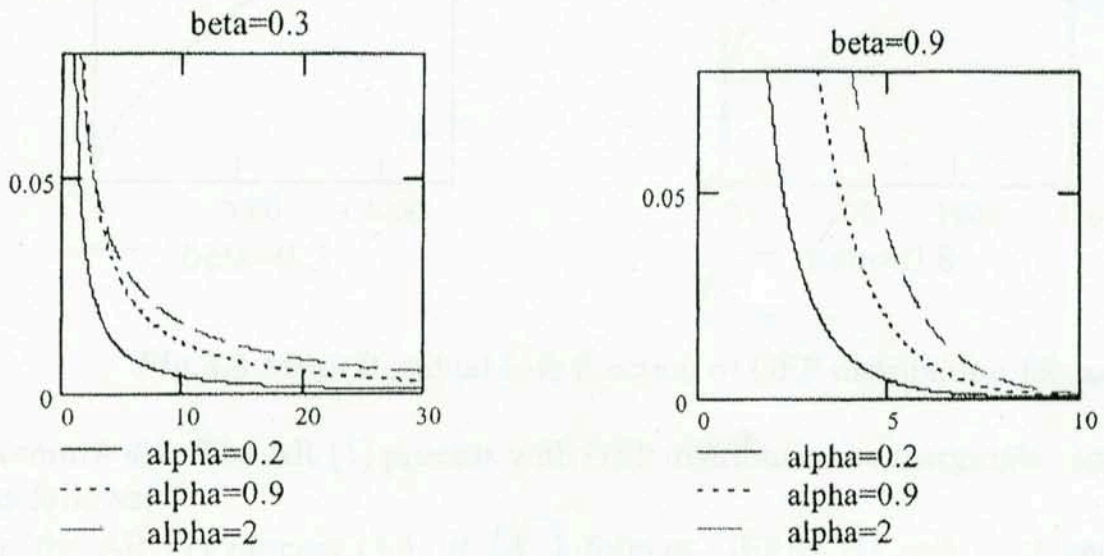


Fig.4.1 Density function of GEP distribution

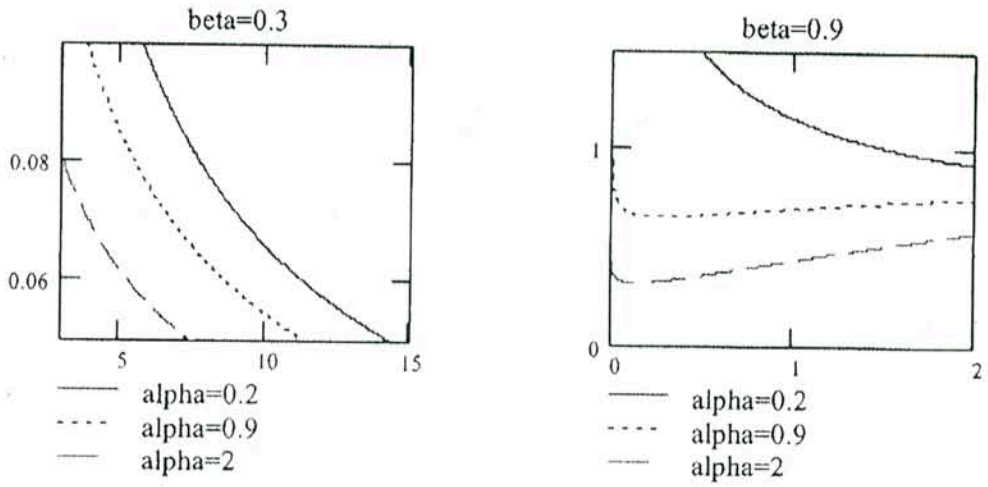


Fig. 4.2 Hazard Rate of GEP distribution

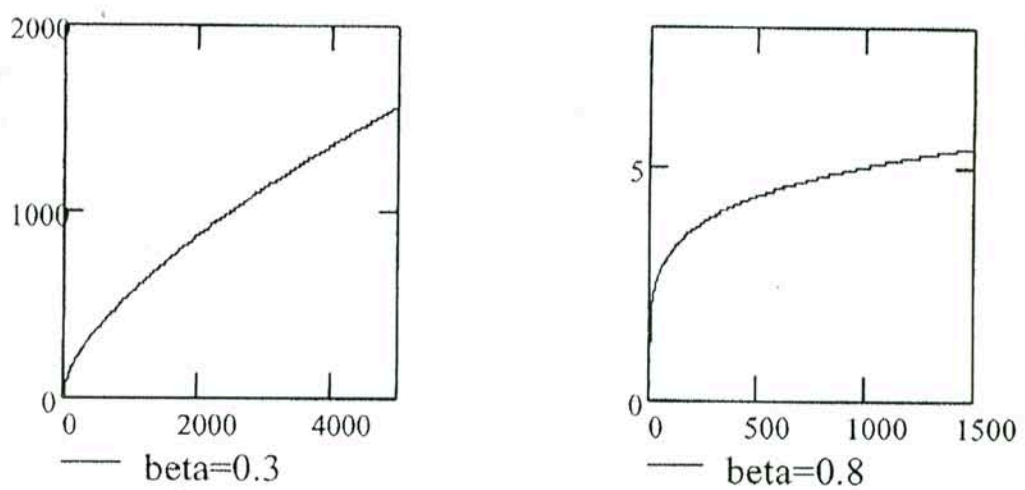


Fig.4.3 Mean Residual Life function of GEP distribution for α=0.6

Remark 4.1: The AR (1) process with GEP distribution as marginals can be defined as follows:

In the AR (1) process (3.1) if $\{X_0\}$ follows GEP(α,β) and $\{\varepsilon_n\}$ has the survival function $\frac{2}{1+e^{x^\beta}}$, $0<\beta<1$, then X_n's are stationary with GEP(α,β) marginals.

Remark4.2: If β=1 in (4.2), then $\bar{G}_2(x)$ becomes $\bar{G}_3(x)=\frac{2\alpha}{2\alpha+e^x-1}$, which is a generalization of the exponential distribution. Note that the distribution with survival function $\bar{G}_3(x)$ is called as generalized half logistic distribution (GHLD).

The corresponding probability density function is

$$g_3(x) = \frac{2\alpha e^x}{\left(e^x + 2\alpha - 1\right)^2}. \tag{4.3}$$

Next we establish a characteristic property of GHLD.

Theorem 4.1

Let X be a random variable with $g(x)$ as probability density function. Then $g(x)$ is the probability density function of GHLD if and only if $g(x)$ satisfies the equation $g(x) = G(x)\bar{G}(x) + \frac{\bar{G}^2(x)}{2\alpha}$, where $G(x)$ and $\bar{G}(x)$ denote respectively the distribution function and survival function.

Proof:

Suppose that $g(x)$ satisfies the equation

$$g(x) = G(x)\bar{G}(x) + \frac{\bar{G}^2(x)}{2\alpha}. \tag{4.4}$$

We know that any distribution function can be written in the form $G(x) = \frac{a(x)}{1+a(x)}$ for some function $a(x)$.

Substituting this in (4.4) and simplifying, we get

$$a(x) = \frac{e^x - 1}{2\alpha}.$$

Therefore $G(x) = \frac{e^x - 1}{e^x + 2\alpha - 1}$, which is the distribution of GHLD.

The converse part easily follows.

Hence the theorem.

5. Multivariate Half Semi-logistic Distribution

The multivariate extension of semi-Weibull distribution and Marshall- Olkin Weibull distribution is done in Yeh (2009).

In a similar way we can define Marshall-Olkin multivariate half semi-logistic distribution.

Definition 5.1: The Marshall-Olkin multivariate half semi-logistic distribution of an n-component vector $\underline{X}$ is defined by its survival function as

$$\bar{G}_{\underline{X}}(\underline{x}, \alpha) = \frac{2\alpha}{\psi(\underline{x}) + 2\alpha - 1},$$

where $\psi(\underline{x})$ satisfies the functional equation,

$$\psi(\underline{x}) = \frac{1}{p}\psi(\frac{1}{\beta_1}\ln p + x_1, \frac{1}{\beta_2}\ln p + x_2, \ldots, \frac{1}{\beta_n}\ln p + x_n), \quad 0 < p, \beta_i < 1.$$

As an example, let us consider the multivariate extension of the Bivariate half semi-logistic distribution given in Krishnarani & Jayakumar (2008).

Example 5.1:

Let

$$\overline{G}_X(x,\alpha) = \frac{2\alpha}{e^{\sum_{i=1}^{n}\beta_i x_i} - \sum_{i=1}^{n-1}\sum_{j=2}^{n} e^{\min(\beta_i x_i, \beta_j x_j)} + \ldots + (-1)^{n-1} e^{\min(\beta_1 x, \beta_2 x_2, \ldots, \beta_n x_n)} + 2\alpha - 1}$$

where $\psi(\underline{x}) = e^{\sum_{i=1}^{n}\beta_i x_i} - \sum_{i=1}^{n-1}\sum_{j=2}^{n} e^{\min(\beta_i x_i, \beta_j x_j)} + \ldots + (-1)^{n-1} e^{\min(\beta_1 x, \beta_2 x_2, \ldots, \beta_n x_n)}$

Remark 5.1: The properties of the multivariate half semi-logistic distribution is largely unknown and will be a topic for future research. It seems that it inherits most of the properties of the univariate counterpart.

References

[1] Arnold, B.C. and Robertson, C.A. (1989). Autoregressive logistic process. Journal of Applied Probability, 26, 524-531.

[2] Cooray, K., Gunasekhara, A and Ananda, M.M.A (2006). The Half Logistic Distribution. Communications in Statistics-Theory and Methods,35, 385-393.

[3] Jayakumar, K. and Mathew, T. (2004). Semi-Logistic distributions and processes. Stochastic Modelling and Applications, 7, 20-32.

[4] Krishnarani,S.D and Jayakumar,K.(2008). On bivariate logistic distributions and processes. Far East Journal of Theoretical Statistics, 24,109-124

[5] Marshall, A.W. and Olkin, I (1997). A new method for adding a parameter to a family of distributions with application to the exponential and Weibull processes. Biometrika, 84, 641-652.

[6] Tavares, L.V. (1980). An exponential Markovian stationary process. Journal of Applied Probability, 17, 1117-1120.

[7] Wang, Y., Hossain, A.M. and Zimmer, W.J. (2003). Monotone log-odds rate distribution in reliability analysis. Communicationsin Statistics-Theory and Methods,32, 2227-2244.

[8] Yeh, H.C., Arnold, B.C. and Robertson, C.A. (1988). Pareto processes.Journal of Applied Probability, 25, 291-301.

[9] Yeh, H.C. (2009). Multivariate semi-Weibull distributions. Journal of Multivariate Analysis,100, 1634-1644.