Women were not a part of the migration process. The domestic demands on their labour were high as most migrants had agricultural land. Women had to undertake such activities as sowing, weeding, reaping, and other forms of manual labour on the family land. Also, simultaneously women raised animals like lamb, hens, cows and buffaloes. It meant they could not sell their labour to earn wages in the labour market. Their dependence on the remittance for cash and for purchase of other needed articles increased. Often the structure of the families became joint as a result of the migration of the young male members and women have very limited role in decision making. The patriarchal control on women has increased. It is reflected in the increased ritual burden on Dalit women.

Most Dalit women experience the benefits of reservation only indirectly. They have not been able to take advantage of reservation in job because they could not acquire education early enough. The boys were the first to get there and as a result have run away with the benefits of reservation while women have been squarely tied to domestic work.

The age at the time of marriage for both boys and girls has increased. Non-Dalits attend the weddings of Dalit if they are a part of their circle. It has a lot to do with outside catering in dalit weddings, which has become a rule among upwardly mobile, for instance at Phulchand's daughter's wedding.

Entertainment
Television has become a major source of entertainment. Other than that, there is Disc Jockey or DJ and such religious festivals as durga puja, which provide entertainment.

3. Benefits to College (100 words):

The faculty and students have had an opportunity to visit the migrants' native village which otherwise would not have been possible.

It provided the students a deep insight into the lives of the Dalit migrants, the social and identity challenges that they encounter everyday in their lives

The presentation of the project sensitized the college to the various findings and experiences of the project team. The college had an opportunity to interact with Chander Bhan Prasad, our mentor and an internationally recognized Dalit Intellectual and activist.

The project drew the attention to the problems faced by the migrants in the immediate neighbourhood in the city and the support system they need to become better citizens.

The NSS students of the college/ university can help people in the Chander Shekar Azad Basti to utilize their hours productively.

The college may choose in the long run to continue to work towards the cause as we build a base. The college may undertake more projects and thereby build its reputation for commitment to a social cause.

4. Benefits to Society (100 words):

It draws the attention to the problems faced by the Migrants in the city and the support system they need to become better citizens and to the strains it puts on the urban infrastructure.

It made the students aware of the changes in the villages as result of increase in migrant family's income, seen for instance in pucca houses, better education, changing roles of women, changes in agricultural practices etc.

The project can help to understand the indirect causes of increase in agricultural goods prices. The labour has become costlier and scarce and so landlords are relying more on machines. The cropping pattern is in favour of cash crops and not so much for wheat and rice as it needs more time and effort. The changes in caste system are also evident.

5. Learning for Students (200 words):

They learnt that caste is an important part of India's social and political reality.

The students understand that the Dalits may take a long time to boast of multiple generations of education, but certainly the process has begun.

The students saw the social face of labour in Delhi; became sensitive to the process of migration and the various problems involved therein; to provide the solutions thereof, like how the Dalit slum dwellers' children's may get better education.

It promoted a sense of social responsibility in them. They feel there is a need to focus on understanding the pattern of access to educational facilities available to Dalit slum dwellers in Delhi and to find a way to give them quality education thereby making the RTE a viable one.

The students today have become more alert to such items in the newspapers as "Dalit rides horse for marriage procession, defies threats from upper caste villagers", and a long standing ban that did not permit Dalits to move on horses.

They learnt how to carefully frame the questions that would elicit the needed information. These had to be contextual or related to the lived experience of the respondents.

6. Further Plans (100 words):

A nodal interactive group may be created to provide counseling to the slum dwellers with regard to 1) Education 2) Career 3) Health 4) Hygiene 5) Govt. Schemes. This counseling centre may be opened under the auspices of Delhi University.

Armed with the understanding of the theoretical underpinnings of the issue of migration, and an empathetic perception of the migrant's view of his problems, his needs and aspiration, the students will to embark upon an outreach programme that aims to understand the access to free and compulsory education to the Dalit child located in the slums of Delhi.

The access to free and compulsory education provided by the RTE Act does not just mean admission to a school. It means retaining the students, male and female, in the schools and imparting quality education to them. It will go a long way in empowering the Dalits. We will coordinate with different agencies/groups such as Government Agencies, alternative Agencies, such as the Non-Governmental Organization, Schools, Industry, and Academia. We would also like to evolve a model that would allow the RTE to become a viable right.

SHYAMA PRASAD MUKHERJEE COLLEGE FOR WOMEN

Project Title: An Exploratory Study of Environmental Awareness and Consumer Behaviour towards Eco- Friendly Household Products

Project Code: SPM -102

Our slogan

The above slogan is designed by our project team. It is an original design.

1. Objective (150 words):

- To examine consumer's environmental awareness and behavioral practices on environmental issues.
- To develop the theoretical understanding towards eco friendly household consumer goods in the reduction of adverse environmental impact vis a vis non eco friendly products in the same category.
- To deliver insights into the factors such as environmental concerns, age, education, gender and level of income that shape consumption of eco friendly products.

2.Final Findings (300 words):

There has been unprecedented number of eco friendly products available in the market. In the survey it has been found out that people are aware of most of the environmental issues facing mankind like problem of drinking water, proper sanitation and garbage disposal, air pollution, etc. Most of them are concerned with the adverse effect of the harmful chemicals used in many household consumer goods on their health. They are also concerned with the protection of their environment but their participation in the form of use of eco-friendly household products is very less. Some of them were not even aware of these earth and health friendly products such as organic food, biodegradable soaps and detergents, wall paints, energy efficient design of the buildings etc. Even if they had faint knowledge of these, biggest hurdle was their availability and cost. They were of the opinion that why these products are not advertised like other products? Respondents from the high and middle income groups were more than happy to use some of the eco friendly products but they needed assurance of quality, as any other brand would give them. Many of them showed keen interest in knowing more about the health and environmental impacts of the products they are presently using. Research project also reveals that people want to separate garbage, reduce electricity consumption and water wastage, use organic foods and products, and use non chemical paints among many from our questionnaire. Most of them are ready to bring a change in themselves.

The project team strongly feels that more awareness has to be spread amongst the people. The manufacturers of eco friendly products should try to gain the trust of the public by giving them the assurance of the quality of these products. There are few to no regulations on disclosing ingredients in conventional cleaning and cosmetics.

3.Learning for Students (200 words):

It gives us immense pleasure to share that this project has helped the students to grow, advance and update themselves. This project has given them the platform by which they can make a difference in the society. Very enthusiastically they took part in many activities related to the project such as household surveying; attending seminars, conferences, work shops; designing original slogan, poster and brochure; preparing for Nukkad Natak and exhibition; making presentations and a film etc. All these activities have polished them and made them more knowledgeable. With this experience they will surely make a difference in the society.

4. Benefits to College (100 words):

Direct benefit to the college is that their ten students and three faculty members got the privilege to undertake this project. What ever they have learned will surely be distributed to others. One candle can lit many more. Also, project team has given the following proposal to the college principal.

- Segregation, management of the waste and composting it.
- Install solar panels on the roof of administrative block. Govt. gives subsidies.
- To make a garden of hope- organic farm at any small piece of land in the SPM campus. Navdanya has offered help.
- To plant bamboos in clusters. Govt gives subsidy.
- To make bamboo gazebos (sitting places) at few selected places such as outside the canteen for students.
- Switch over to CFL/ LED bulbs as and when new bulbs are required

5. Benefits to Society (100 words):

The findings of the project may be of great help in building an eco and health friendly consumer movement in India. The outcome may directly or indirectly help in policy making and to the manufacturers. The project has great significance at this crucial juncture when the entire human kind is under severe pressure to save environment for survival of future generation. Through our survey, Nukkad Natak and exhibition at antardhwani cultural festival of university of Delhi we could make many people aware of these simple eco-friendly practices. It is a matter of habit than anything else. One can begin with just one product once a month adding another the next month. Gradually people will realize their benefits not only on the health but also on their surroundings.

6. Further Plans (100 words):

As we had opportunity to network with many organizations both from Government sector as well as from alternate agencies, we have found many interesting practices that can be taken up at Delhi University campus to make it environment friendly. Some of these practices are:

- To make an Eco - haat. Products displayed / sold may be the result of the interconnections between the industry and the university students, who wish to work in this direction. It may be integrated in their curriculum. In this whole process new earth friendly ideas will be generated. It will be a swadeshi self-reliant production centre.

- To make a garden of hope- organic farm at any small piece of land in the campus. This will bring our students close to the earth and their food. Navdanya , the organic pioneers run by Dr. Vandana Shiva has offered us the help to make an organic farm.

- Segregation and management of the waste and composting it. A lot of organic waste is generated by the college canteens. If this waste is managed, the output may be used in the organic farm mentioned in point no. 2.

- To plant bamboo clusters. Bamboo is amazingly versatile, making it one of the most renewable sources on the planet. Since it is a grass it can grow in most climates and environments without chemicals or pesticides, and it produces 35% more oxygen than hardwood trees. Bamboo's tensile strength or the measurement of a material's ability to handle stress is very high.

- Above all, we propose that a school / institute for sustainable Living may be opened by the University of Delhi, offering opportunities to explore and practice the art and science of sustainability based on ecological principles.

  We as project team found a significant opportunity to make university of Delhi a model campus for the entire university community by integrating some of these best practices.

SHYAMA PRASAD MUKHERJEE COLLEGE FOR WOMEN

Project Title: A study of Student Absenteeism in Primary School in Delhi

Project Code: SPM-103

1. Objective (150 words):

An effort is being made through this study to explore the issues involved in regular participation of children in government schools in Delhi. There has been random sampling of different schools from different zones. The schools that have been visiting are primary schools of MCD, Kendriya Vidyalaya Sangathan, and Directorate of Education schools in Delhi. The study is an in-depth analysis of classes V in all the schools with respect to enrolment, attendance, teaching- learning material, mid-day meal, causes of student absenteeism, and its effect on learning outcomes. The data has been collected with respect to access to school, school infrastructure, students, teachers, grants etc. through a semi -structured questionnaire. Non participant observation has been used for collecting data from classroom. The data has been collected through field notes in the schools, records like attendance records, Mid-Day Meal data, Report Cards etc. The data is being collected through photographs, and audio and video camera etc. There are many problems that have been recorded by study.

The Aim of the project is to Study of Student's Absenteeism in primary schools in Delhi with the following objectives:

- To explore the Sociological, Psychological & Educational cause for Student's Absenteeism.
- To study the pattern of attendance and enrolment in schools.
- To assess the effect of student Absenteeism on learning outcomes.
- To study the demographic profile of the students.
- To find out the problems in schools related to participation in terms of dual enrolment/irregular attendance/frequent absenteeism.
- To study the causes of dual enrolment /irregular attendance and frequent absenteeism.
- To provide suggestions for policy makers, administrators to reduce Student Absenteeism in the schools.

2. Final Findings (300 words):

The sample was collected from 5th class students of govt. schools, only those students who had attendance below 40% in the month were selected as a sample. The Primary sources of data collection were attendance registers(May-October(ongoing till Dec) 2012), previous annual records , secondary sources include that of teachers, principals & classmates .The data collected was from MCD schools & Kendriya Vidyalaya Sangatan schools (i.e. north , south & west zone). Also the teachers, principal & parent (wherever possible) of the school were interviewed. The sample consists of 200 primary students

from Delhi who came in the category of high absenteeism, detailed profiling & case studies of each was collected & analyzed.
Results indicate that the Situations were found to be different in different zones. Teaching pattern differs in every school & so does absenteeism. Maximum absenteeism was observed in north zone schools with students having 2-5% attendance. Where as in south zone the absenteeism was lowest as the child with least attendance had at least 80% attendance. There was hardly any absenteeism found in KV schools.
The infrastructure of north zone MCD schools was poor out of all the three zones (i.e. north, south & west), with equally bad facilities provided by school (especially toilet area). There were many complaints regarding food as insects, nuts , bolts & bunches of hair were found in it due to which children got ill for days together. Other reasons included going to village/ for marriage purposes because of parental pressure. Poor health has been cited by parents as the major reason for absenteeism, followed by other social reasons. Among other reasons, majority of the parents of North Delhi MCD School children were illiterate. It was also observed that the students who were absent for more than 2-3 days per week had low attendance in their previous class as well. North zone children got good grades because of two main reasons, one that their class teacher allowed the children to cheat by keeping their copies beneath the table without the notice of principal. Secondly their teacher's at times told them the whole question paper before the exams. As a result the students' mug up the answers & got good grades. After administering the achievement tests it was found that some students in class 5 didn't even know how to write their own names. Absenteeism has led to a decrease in the quality of education in the North Zone. Case of dual enrollment, dropouts have been seen & also reported by the authorities.
Whereas in South Delhi Schools teachers used interactive methods to teach children. They even informed parents from time to time about the child's progress. It seemed that the policy implementation (of policies like mid-day meal, age appropriateness) was being executed properly. The children seemed to like going to school and studying. It was also found that parents of the student were relatively more educated than parents of North Delhi School students. There was hardly any absenteeism found in the KV's. The infrastructure, teaching- learning process, school environment, facilities, & school policies are very different from that of the MCD schools.

3.Learning for Students (200 words):
This study has taught the students lot methodologies in the field of research. This innovative project was an opportunity for the students to put the theoretical knowledge into practical use in the field.Highlight of the project is that students have presented this study as a paper in a national conference in Indian council for social science research in Jaipur, where the paper has been highly appreciated and published. The students have got extensive exposure from presenting the paper at seminars and also at Antardwani. The students also learnt data collection techniques like observation, questionnaire making, and e.t.c. Besides this they also developed presentation skills and learnt how to write research papers, do research in the field and collect data. Apart from this the psychology students got to know about the education system in government schools as this was an interdisciplinary project. They learnt about the education policies like mid-day meal, no detention policy and e.t.c. whereas the B.El.Ed students learnt how to do research and use various techniques in the field as they don't have a paper on research. Overall it was an enriching experience for the students wherein they learnt various research techniques and methodologies, data collection and data interpretation and can use and apply these techniques further in any other research they do.

4.Benefits to College (100 words):
By taking this initiative of introducing this topic as a part of this innovative project, we have given an opportunity to the present students of college from different education departments to look into this particular syndrome of education where children who are the future of this nation are going through various levels of problems and issues that need to be worked out and taken care of. Having a limitation of not using Quantitative analysis, further work can be promoted in college so as to have in depth

quantitative analysis of this issue through this project as we will be able to put forward the subjective details of the conditions and environment those children are having and facing in their home, school and surroundings.

5. Benefits to Society (100 words):
As our core objective was to study sociological, psychological and educational causes of student absenteeism, we have explored all these causes while maintaining a real touch of societal issues with it. Society indeed plays a very important role in our daily activities. While carrying out this project we observed many societal influences that made these children in this economic background to face various levels of adversities. Society can be of great help and by giving a start to this project; we have somehow created an initiative of looking across the various boundaries that explained the adverse causes behind the absenteeism of students in primary school.

6. Further Plans (100 words):
As this was an exploratory study it has thrown lot of insight into the topic and can be used as pilot study. In future if we get more time as a year was not sufficient to carry out quantitative as well as qualitative research. This study has helped us to identify lot of variables through semi structured tailor made questionnaire which in future we would like to standardize and for which we would like to develop norms reliability and validity for achievement test & a questionnaire on causes of student absenteeism so that other researchers can use it.We would like to conduct this study at a large scale covering NCR & Northern Region of the country. As it has been seen that we have to rethink on policy of education and more than that we have to ensure that these policies are implemented properly for that education the people concerned through workshops, seminars and interventions are required. Further, we could also have covered private schools, so as to have a comparison between the government and private schools.

SHAHEED BHAGAT SINGH EVENING COLLEGE

Project Title: PROBLEMS AND DEVELOPMENT OF SLUMS: STUDENTS PERSPECTIVE

Project Code: SBS(E)-101

PANJRAPOL SLUM, MUMBAI

1. Objective :

The project has been initiated with the major objective to inculcate innovative thinking among undergraduate students in the college as well as to expose them to real world environment. For this, survey of the selected slums – one in Delhi and other in Mumbai was carried out. Major objective of the present study are following:

- To understand living condition of people in slums
- To analyse the socio – economic condition and cultural , linguistic plurality of slum dwellers
- To ascertain the needs and aspiration of people
- To evaluate the ongoing governmental programmes
- To suggest measures for the development of slums
- To sensitize students about the various facets of slums
- To motivate students to work for the betterment of living condition in slums
- To establish contact with the local community for long term participation in the process of development
- To inculcate innovative thinking among under-graduate students and train them for carrying out research project

2. Final Findings:

1. The living environment in two selected slums Jagdemba Camp (Delhi) and Panjrapol (Mumbai) is of poor quality characteristics by -

a) Insecure residential status;

b) Inadequate access to safe water;

c) Inadequate access to sanitation and other infrastructure;

d) Poor structural quality of living;

2. Socio-economic condition in the slum is poor. Most of the people are engaged in low income jobs in the informal sector. Although literacy rate is high but there is high school dropout after middle level. Alcoholism and drug addiction is a major problem. Low income, insecure employment, poor living condition and inequality - all contribute to frustration, alcoholism and

pessimism among slum dwellers. Sometimes, these hard-earned low wages are also denied to them as they are unorganized sector workers. There does not exist any redressal system for such injustice.

3. The status of women is low and cases of domestic violence were reported.

4. Awareness about government programmes and policy among slum dwellers is low.

5. Needs and aspiration of the people have remain neglected.

6. It has been observed that physical conditions improve as slum grows older due to government effort.

RECOMMENDATIONS

1) Slums come into existence due to migration of mostly agricultural labour from the backward districts in search of employment opportunities. This is a result of widening regional inequality; stagnation of rural economy as well as small and medium towns in the backward regions. There is an urgent need to develop these backward regions so that slums do not come up in enclaves of 'Developed regions/cities'.

2) There is a need to focus on socio-economic development of slums. Quality education and vocational training is needed.

3) Ongoing government programmes and policies need to be effectively implemented.

4) There is a need to develop "micro finance" mechanism.

5) Labor in informal sector are fired without any notice. At times, they are not even paid the wages for the number of days they work. There is a need to establish a regulatory authority to look into the grievances of these labors.

6) There should be social mechanism to develop their social integration with the rest of the community.

7) There is an urgent need for government intervention to protect slum dwellers from injustice and exploitation and to provide them dignified living which has been guaranteed to every citizen of India by Indian Constitution.

3. Learning for Students :

The project has been an eye opener for students. For the first time besides the conventional class room teaching, students of undergraduate colleges got an opportunity to work in the innovation project. Through the preset project students were exposed to real world environment of the disadvantaged sections of society.

In the present project, students were trained to carryout research and be innovative. They were trained to conceptualize a problem and preparing the research design. They were thoroughly trained to carry out field survey which included preparation of questionnaire, collection and analysis of data and being innovative in suggesting solution to the problem.

The multi-disciplinary nature of innovation project helped students in developing a holistic perspective of the problem which they were not used to in the conventional university education system.
During the project students have been sensitized about the problems of deprived and marginalized section of the society, as well as need to address their problem in order to attain inclusive society.
Overall, students have immensely benefited from the project and the project has helped them in becoming responsible citizens of the society.

4. Benefits to College :

Innovation project is a major initiative of the University of Delhi to bring about a qualitative change in the teaching-learning process at undergraduate level and has rejuvenated the environment in the college.
This scheme has motivated college teachers to undertake research projects of multi – disciplinary nature. Students are also enthusiastic to work in the project, which exposes them to real world environment and have practical experience.

The innovation project has also helped college in improvement of infrastructure as equipments purchased in the project will be available for use to college fraternity in future.

5. Benefits to Society :

Under the innovation project we have studied the living conditions of the selected slums – Jagdamba camp in Delhi and Panjrapol Slum in Mumbai. Our students extensively surveyed the two slums and got first-hand experience of living conditions in slums. In the process the outlook of students towards slums has gone drastic change.

We also organized a sensitization programme to sensitize the students of the college towards the pathetic living environment of the slums. This has led to students realizing the condition of disadvantaged sectors of society and need to improve their lot. Consequently the outlook of students towards slum and slum dwellers have changed and a number of students are willing to work for improvement of slums.

6. Further Plans :

We are in dialogue with slum dwellers at Jagdamba Camp, Delhi and we are identifying areas of cooperation in order to become partners in the developmental process of slums. Our students are willing to volunteer to work for improvement of living condition in slums.

While doing the present project, we have also identified certain areas which needs in depth study. We would like to extend the project for one more year to have in-depth understanding for which we require a grant of about two lacs.

SHIVAJI COLLEGE

Project Title: Development of University Social Networking site for D.U. Community

Project Code: SWC 101

1.Objective (150 words):
The aim of our project is to create such a system for the university which facilitates the improvement of student's academic as well as personal life

- We shall provide the students with the opportunity of bringing to light their personal problems without any hesitance.
- Students are provided a platform where they can put forth their creative ideas and display their creative works.
- This system will ensure that there will be direct contact and interactions among all the members of the university and experts of various fields.
- Updates of Delhi University must be brought to notice of all the mentors through this system.
- Students will be given a common platform to put forth various social issues concerning the university and other matters

- Thus, we developed www.dupsi.in which achieved all desired objectives of project

2. Final Findings (300 words):

The study found that of the students interviewed, approximately 93 percent used the Internet, 70 percent had internet access at home and 79 percent had a profile on a social networking site. Data were collected over six months from students and teachers of several colleges of Delhi University. After analysis of questionnaires and interviews of teachers and students it came to the fore that in the era of information technology students and teacher lag far behind. Students cannot communicate freely and regularly about personal and academic problems. Majority of students opined that lack of communication is causing a not only schism academically but also social and psychological crises situation among students. Both students and teachers saw the lack of communication as a cause of academic mediocrity, alienation and disinterest in existing pedagogical methods and suggested for personal counseling sessions, frequent parent-teacher meetings and a need for common platform for parents, teachers and for students as a solution for this.

It was found that students in the study were aware of the academic and professional networking opportunities that the social networking web sites provide. Making this opportunity more known to students, colleges and teachers can work with students and their experiences on social networking sites.

What may be the most important aspect of social networking platforms is that they encourage people to share personal problems without any reservation or hesitation and students are aware of this dimension and are therefore confident to be part of the project.
When it was asked to both students and teachers as what students learn from using social networking sites, they listed technology skills, creativity, being open to new or diverse views and communication skills. It was found that students using social networking sites for academic purposes were actually practicing the kinds of skills we want them to develop to be successful today.

3. Learning for Students (200 words):
The Web sites www.dupsi.in offers a tremendous potential to the students. It not only has potential to provide a platform for academic and career guidance and counseling without any hassles but also a space for expression of students' creativity, talent, facilitator of speedy and open communication, leading to enhanced information delivery to the students. The site will allow students and teachers to discuss ideas, post news, ask questions and share links and hence will provide an opportunity to widen their horizons. The site may also targets a wider audience, making it a useful and effective nodal of communication with minimal use of time and expenditure The site has potential to encourage and expand horizons of research, through online academic materials, journals, and direct interested students/researchers to specific web sites.
Students are developing a positive attitude towards using technology systems, editing and customizing content and thinking about online design and layout. They can also share creative work like poetry and film and practice safe and responsible use of information and technology.

4.Benefits to College (100 words):
Social networking sites offer more than just social fulfillment or professional networking, they have implications for educators, and educational institutions who now have a vast opportunity to support what students are learning on the Web sites.
Since now we can know that students are actively learning through internet and are exposed to varied knowledge's, college as part of university can help foster and extend those skills. Since college knows from where the students are coming and what they are interested in so that it can build on that their course-teaching. By understanding how students may be positively using these networking technologies in their daily lives and where the unrecognized educational opportunities are, college as part of university can be helpful in making learning even more relevant, connected and meaningful to the students.

5.Benefits to Society (100 words):
The study suggested that in a country like India where there is huge income disparity, academic social networking sites can be used to bridge the digital divide between low-income students who are technologically deprived and the well to do tech-savvy students. This can be concluded from the study according to which it was found that internet usage of students from low income families was low in percentage than the higher income group students. Apart from this, the web site is relevant to the society as it can channalise the energy and time of youth towards more creative and responsible activities.

6. Further Plans (100 words):
Dupsi.in the first phase aimed to provide social networking to limited audience –i.e., the Delhi University community, future plan is to develop it on a larger scale. The second phase aims to develop a similar site for other universities in Delhi and later to connect other Universities in India through social networking sites.

SHAHEED RAJGURU COLLEGE OF APPLIED SCIENCES FOR WOMEN

Project Title: An assessment of consumer's exposure to pesticides in conventional vegetables and vegetables sold with the 'Organic' tag in Delhi-NCR region, India

Project Code: SRCA – 101

Collection, Extraction and Analysis of pesticide residue in vegetables across Delhi-NCR

1. Objective:

- To find out the pesticides used for vegetables currently and frequency of their use on vegetables grown in Delhi and NCR region.
- To know about the awareness level of farmers regarding pesticides and their use.
- To compare the residue levels of pesticides on vegetables (like okra, eggplant, tomato and cauliflower) collected from organic farms, plains along Yamuna banks and farms away from Yamuna.
- To help in developing a regional exposure database and in facilitating assessment of health risks from pesticide exposure in our day to day lives.

2. Final Findings:

- Based on the survey it was found that farmers across Delhi-NCR region are using chemical herbicides, fungicides and insecticides like cypermethrin, profenos, endosulfan, butachlor etc. In fact they are well aware of their usage, frequency and the adverse effects caused by these chemicals to health. However, the farmers still feel that government support is lacking in providing the awareness, education and related inputs for farming.
- Usage of organic vegetables across Delhi-NCR region is not very popular. Even the availability of organic vegetables which comply by the government norms are in dearth.
- Another interesting finding is that the standardized conventional method for extraction of residual pesticide is at par with the commercial method of QuEChERS. But the conventional method requires more time for extraction.
- Analysis of pesticide residue using either GC-ECD or GC-MS, revealed the same results. In both the cases it has been found that no significant residues of the targeted pesticides were present. Thus, it can be established, based on the analysis, that the organic vegetables are not superior to conventional vegetables with respect to the presence of residual pesticides. However, the presence of more number of peaks in conventional vegetables than in organic vegetables indicates the presence of other unfocussed chemicals.

- In nutshell, it could be concluded with a happy note that the consumers in Delhi and NCR region are safe with the consumption of all types of vegetables against the residual harmful pesticides as confirmed by the scientific evidences provided by the study.

3.Learning for Students:

The project was a substantial learning experience for the students involved as it helped them understand the aesthetics of an investigatory project and imbibe its principles. It was an academic breakthrough for an undergraduate level program which broadened their horizon and assisted them in taking a leap towards the realistic dimension of studies/education. The project has been a magnificent way of understanding and analyzing the intricate involvement of pesticides in the food system and the environment. Besides, it has paved the way for students towards understanding the standard method of conducting analysis for estimation of pesticide residues in vegetables (food) and subsequently, gaining a practical experience of working on experiments with precision and enhancing laboratory skills, obtaining meaningful results. To a larger extent, hands-on experience of using modern instruments like Gas Chromatograph was a major erudition for students. The project has not only instilled confidence in students but also helped in developing research aptitude, art of field work, interaction/survey skills, interpretation of results and presentation skills and majorly of all, writing the report of a project. Amalgamation of all this learning further opens up opportunities for students to work on other investigatory/research projects during their higher studies.

4.Benefits to College:

With the grants received from the university, the college is now well-equipped with technology and infrastructure to estimate pesticide residues. The method standardized during the project tenure can now be used readily for further research work. In simulation to the project, the method standardized can be used to analyze other food products and other samples in collaboration with other departments like food technology and chemistry. The college has been profusely delighted to conduct the project as it helped its students to go beyond the framed curriculum and contribute a little to the concern of pesticide consumption in food.

5.Benefits to Society:

With the conclusion of the project and the interpretation of the results, it comes to society's relief that the vegetables grown along the Yamuna banks have been found to contain no significant levels of residual pesticides and thus, they are safe for consumption. Also, it confutes the misconception that the farmers are unaware of the pesticides they are using that is likely to affect the consumers adversely. People residing in Delhi-NCR can now step out of the myth that the vegetables they consume contain residues of pesticides because the farmers here are using the pesticides within maximum residual limit (MRL), owing to their awareness and concern.

6.Further Plans:

Further plans include:

- Covering greater area for sample collection and targeting more number of pesticides in detection so as to give more diversified and substantial results.
- Expanding the project work to include other sophisticated analytical techniques like GC – MS.
- The awareness level of farmers dwelling away from Delhi – NCR can also be accessed through this scheme and can be enhanced through training in college.
- Most importantly, with the standardization of the method and availability of infrastructure, the college can be treated as centre for analysis of pesticide residues in local fruits and vegetables as the college is in close proximity to the rural areas of Uttar Pradesh.

SHAHEED SUKHDEV COLLEGE OF BUSINESS STUDIES

Project Title: Investor Sentiment in The Indian Financial Market: An Empirical Study

Project Code: SSCB-101

"Indexing Investor Sentiment: A Critical review", Seminar organized by the team

1. Objective (150 words):

The study was started with the following objectives:

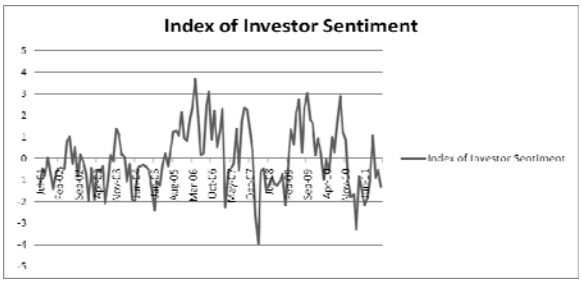
- Identify factors affecting investor sentiment in India.
- To test the relation of selected factors with investor sentiment through multivariate model (Bayesian VAR).
- To test Baker and Wurgler (2007) model for Indian financial market

However during the course of the project, based on the review of literature, the study tried to look into the following dimensions as well:

- Creating an index using certain proxies reflecting sentiment in the market through which the varying degrees of sentiment levels in the market over the time period from 2001-2011can be gauged.
- To use the Index to ascertain the effect of various global events such as the 2007-08 subprime mortgage crises on the sentiment levels in the market.
- To study the applicability of the Index in the context of return predictability by studying the bilateral relationship between the broad market indices and the sentiment level index.
- To check whether periods of very high (low) sentiment are subsequently followed by periods of low (high) returns as per behavioral finance theories

2. Final Findings (300 words):

The index created in the study is shown in the chart below:



The Index over the period has been highly positive in certain periods. From late 2005s to mid 2007, when the economy was performing well and the benchmark indices gave steady and high returns, the sentiment level is highly positive. In the wake of the subprime mortgage crisis 2008-09, the Index indicates very low sentiment levels, in fact the lowest in the past 10 years. Thereafter, the sentiment levels rises again as the global economy started recovering and a number of stimulus measures were taken in the country in mid 2009. As the European Sovereign Debt Crisis began to surface in mid 2010, the sentiment level in the country begins to drop again in this period and reaches very low levels as is evident from the graph and remains low till the end of 2011.

The results of Johanssen Test indicate that a long-term relationship does exist between the sentiment level in the country and the market-wide returns. The results are tabulated below:

TABLE 1		
Market Index	Lags (Based on SIC) (In months)	Number of Cointegrating equations
BSE Sensex	1	1
BSE 500	1	1
CNX Midcap	1	1

TABLE 2	
Hypothesis	Result of hypothesis
Sensex doesn't granger cause Sentiment Index	Accepted
Sentiment Index doesn't granger cause Sensex	Rejected
BSE 500 doesn't granger cause Sentiment Index	Accepted
Sentiment Index doesn't	Rejected

granger cause BSE 500	
CNX Midcap doesn't granger cause Sentiment Index	Accepted
Sentiment Index doesn't granger cause CNX Midcap	Accepted

These results indicate that the Market-wide Indices don't explain future sentiment levels in the country. However, the granger-causality tests show that sentiment levels in the country do significantly affect future values of market indices and in turn the returns of the indices at a lag of 1 month.

TABLE 3	
Period and Market Index	Next Month's average returns
1 and Sensex	-4.23%
1 and BSE 500	-3.73%
1 and CNX Midcap	-2.80%
2 and Sensex	4.46%
2 and BSE 500	5.84%
2 and CNX Midcap	7.12%

It is evident that for (1) periods (the ones with very high sentiment), next month's returns are negative on all the three indices. On the other hand, Periods of Very low sentiment (2) are followed by positive returns on all the three indices.

4.Learning for Students (200 words):
The study turned out to be a very knowledgeable experience for the team through which the team learned a lot of things:

- The team understood the basic concepts of 'Behavioral Finance'. This helped us understand the financial markets and their performance in a better way.
- A lot of statistical tools were used in the creation of the index. That helped in improving the understanding of the team in that scholastic area.
- During the course of creation of the index, a lot of problems were faced while the data collection which also served as a teaching for the students.
- A lot of new concepts were learned about financial markets which will help the students in their career.
- 'Research Methodology' is another thing which was learnt by the team during the course of the project.
- The team also learned the intricacies and behavioral requirements of working in a team.

- The team learned organization, conforming to deadlines and respect for fellow team members through this project.

5. Benefits to College (100 words):

The major benefits for the college are as follows:

- A separate room dedicated to research and innovation has been created in the college. The room is well equipped with basic IT infrastructure to help students and professors undertake research.
- A cult for research and innovation has been fostered in the college. A number of students have informally learned research techniques from the project students and this has helped them enhance the quality of their college projects.
- A number of students have been inspired to take part in the Innovation scheme 2013-14, not only in the discipline of finance but other disciplines too such as marketing and Technology.

6. Benefits to Society (100 words):

The following could be the beneficiaries of this study:

- The foremost advantage of this study is its potential to encompass bubbles, crashes, and more everyday patterns in stock prices in a simple, intuitive, and comprehensive way
- Retail investors- This study will be of great help to the Individual investors in the market since knowing about the 'investor sentiment' will help them stabilize their earnings and rule out abrupt gains and losses to a considerable extent.
- Business organizations- This study can help business organizations to know whether irrational behavior by small investors drive post-IPO prices. So the study can prove to be a helping hand while companies deciding price bands for it's IPO.
- Government agencies – Currencies, equities, commodities and other securities are very different from one another in many aspects but they all fall under the scope of investor sentiment. So it becomes handy for government agencies in formulating policies if there is an index of investor sentiment.
- Mutual fund houses- It will help them in managing their portfolios more efficiently
- Investment Banks- As mentioned above ,this study could prove to be of great importance in pricing the IPOs. Also the effect of mergers and acquisitions on the shareholders of the companies involved could be seen.

7. Further Plans (100 words):

Till now, the study has concentrated on developing a model to quantify the degree of investor sentiment in the Indian Financial Markets. This year, a new proposal, titled "The relationship between Investor sentiment, corporate fundamentals and price multiples: An empirical study" has been submitted to the university. The essential aim for the next year is to check the applicability of sentiment levels to asset pricing models in the context of Indian Financial Markets. If results indicate that such applicability exists, then new models can be suitably developed to incorporate sentiment in asset pricing models and thus contribute to the industry in terms of portfolio management as well as capital market literature.

SRI GURU NANAK DEV KHALSA COLLEGE

Project Title: Youth Empowerment: What it means to young minds & Implications for Educational Institutions

Project Code: SGND - 101

Youth Empowerment Project Group (YEP)

1. Objectives:

Initial estimates from 2011 census identify a significantly high proportion of nearly 46% youth population in India making it one of the youngest nations, giving it, in the words of policy practitioners, demographic dividend which is vital for the future growth and development of the country. However, there are reasons to believe that these resources must find enabling conditions to realize their potential. In his seminal thesis on the clash of civilisations, Huntington (1996) portends the difficulties that face a nation of young by arguing that societies are vulnerable to war and conflict when the number of young people aged 15-24 reaches a 'critical level' of 20% of the overall population in a country. The empirical tests on relationship between armed conflicts and youth bulge disturbingly suggest that youth bulge increases the risk of conflicts, especially under the conditions of economic stagnation (Urdal, 2004).

Are the youth aware and adequately prepared for the unfolding uncertain scenario and how do policy makers respond to expectations and aspirations of the youth are some of the key policy questions that have come to the fore in the beginning of 21st century. Unless the enabling conditions and favourable environment is provided to address the vulnerability of youth, there is a high probability that the demographic dividend may become a demographic liability. This is only possible only if we have a comprehensive understanding of needs, concerns, aspirations and perceptions of youth.

The National Youth Policy 2003 defines youth to be a distinct social group of persons in the age group of 13-35 years. This artificial classification does not necessarily represent a homogenous class of persons sharing common concerns and needs and so the target group for social inquiry in the current project is limited to youth pursuing their graduate level study in various colleges and universities in India. Most of these persons fall in the age category of 18-24 years and are considered to be on the threshold of entering the job market in next two to three years. In a broad sense, this section of youth represents an educated profile which is fairly mature to discern the subtleties of youth-adult relationships. The degree of their concerns about social and economic issues, their aspirations and value preferences are, however, expected to vary on the basis of gender, geographical background and socio-economic and cultural differences within the target group.

For the purpose of this project, the project team has adopted the definition followed by Commonwealth Secretariat which states that young people are empowered when they acknowledge that they have or can create choices in life, are aware of the implications of those choices, make an informed decision freely, take action based on that decision and accept responsibility for the consequences of those actions. Youth empowerment also means creating and supporting the enabling conditions under which young people can

act on their own behalf, and on their own terms, rather than at the direction of others.

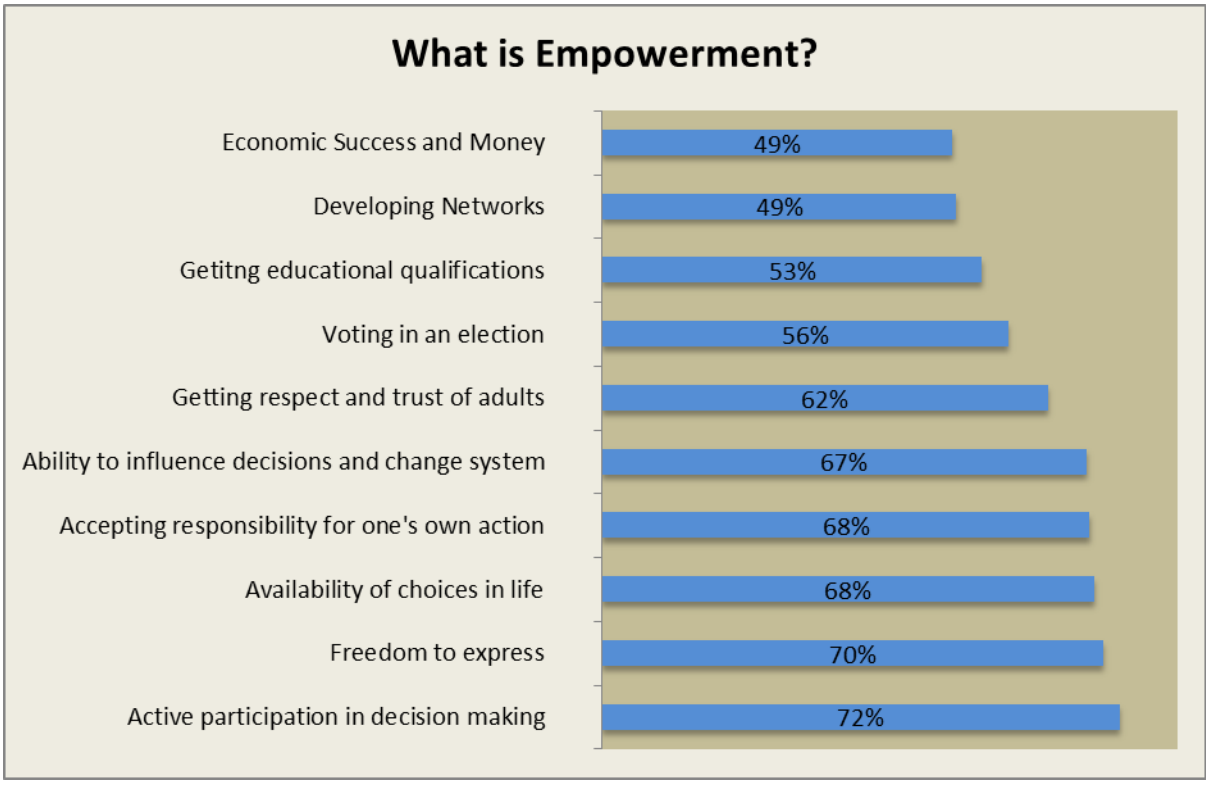
The primary purpose of the project is to develop a better understanding about the relationship between youth empowerment and their engagement in decision-making. By identifying critical enabling factors in adult-youth relationships. The study focuses on understanding the characteristics of youth empowerment from youth perspective and how they can be incorporated in the functioning and management of educational institutions. Instead of concentrating on the issues aimed at controlling youth problems such as indiscipline, violence, drugs, skill development etc., the study emphasizes on supportive solutions for enhancing youth engagement using a youth centric approach to explore youth-adult relationships, youth apprehensions and aspirations and how their participation can be more meaningful and constructive for their own self-development as well as for the educational institutions. Equally important objective of the project is the process of participatory research itself that provides an opportunity to both teachers and students learning and experiential opportunity to document the experiences and develop best practices for wider application of participatory model in future research.

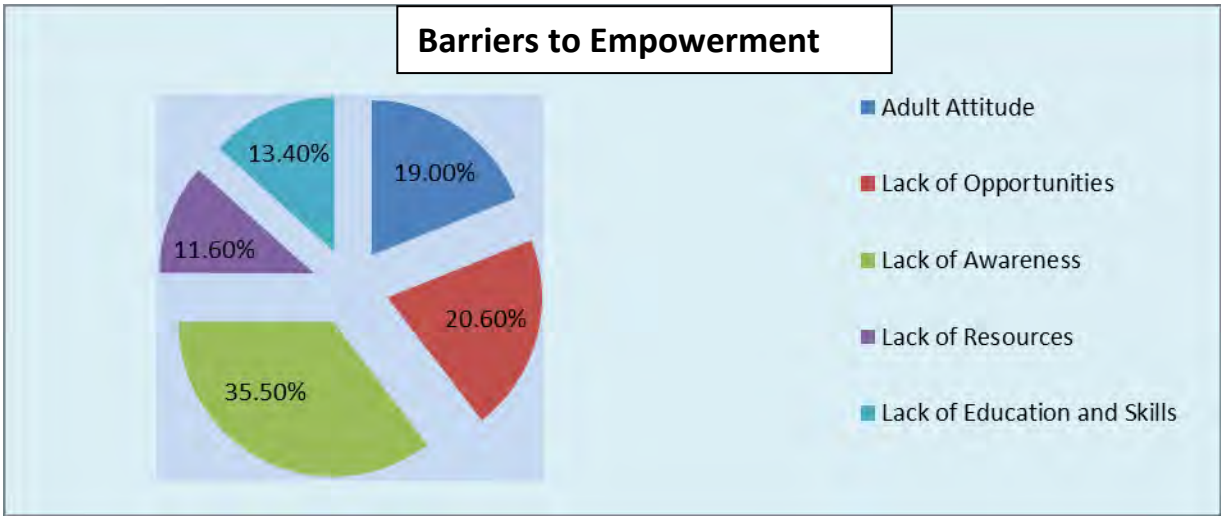
The project investigates the validity of concepts and methodologies for youth empowerment through a questionnaire that is designed to seek youth responses to specific issues. These are:

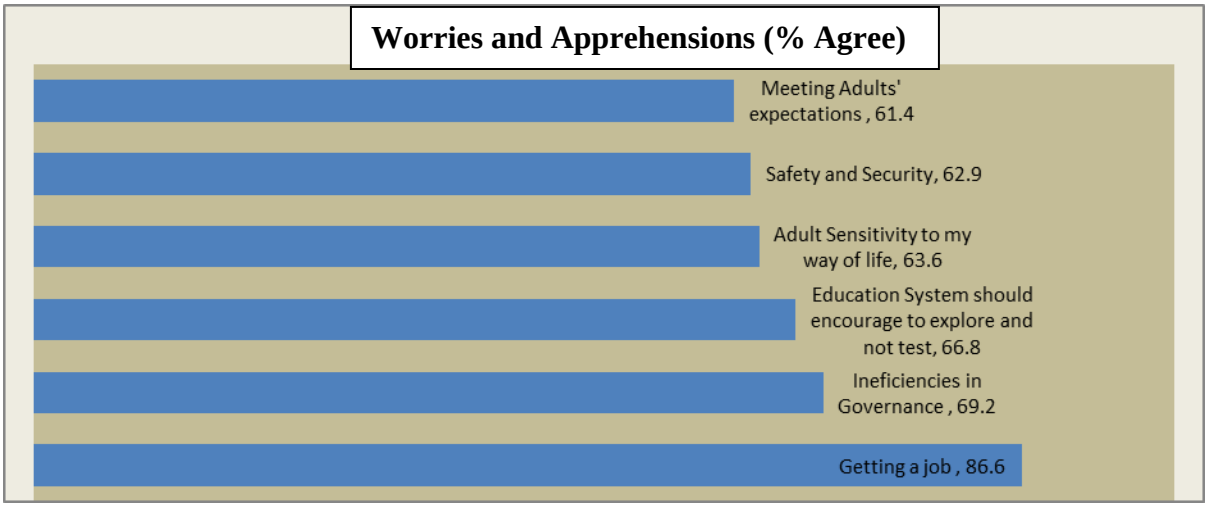
(1) How do youth perceive youth-adult relationships? Do they feel alienated in the present system and if so, what are their causes?
(2) What constitutes empowerment for youth?
(3) What are the fears and apprehensions of youth?
(4) How far educational institutions are able to meet their expectations?
(5) What are youth willing to do to enhance their self-esteem and life choices?

2.Findings:

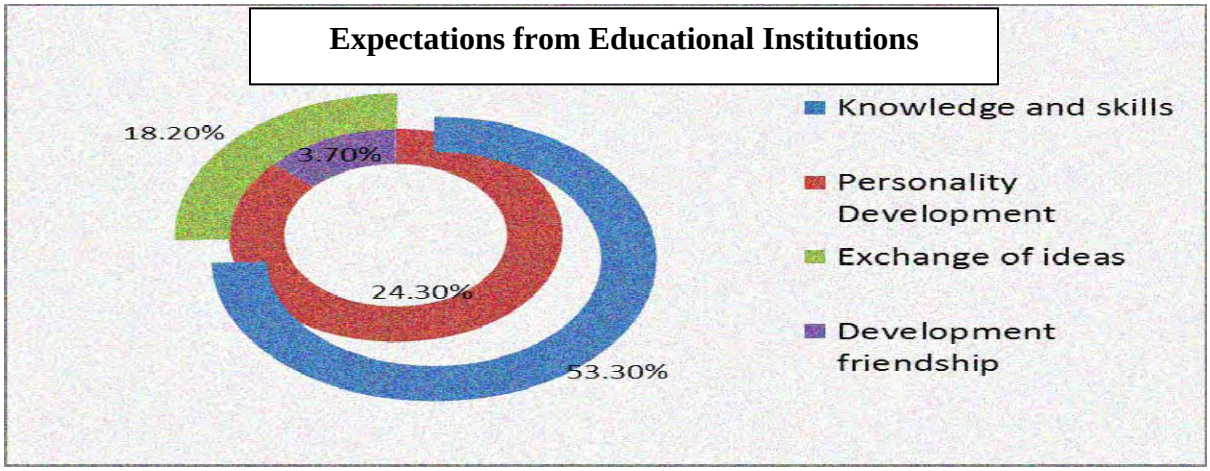
- ✓ The survey was conducted on random basis across colleges in rural and urban areas and a total 1221 responses were collected from which 49% of respondents come from the economic background of family income less than Rs. 3 lakh/p.a.
- ✓ The charts below convey youth's perception of Empowerment and Barriers:

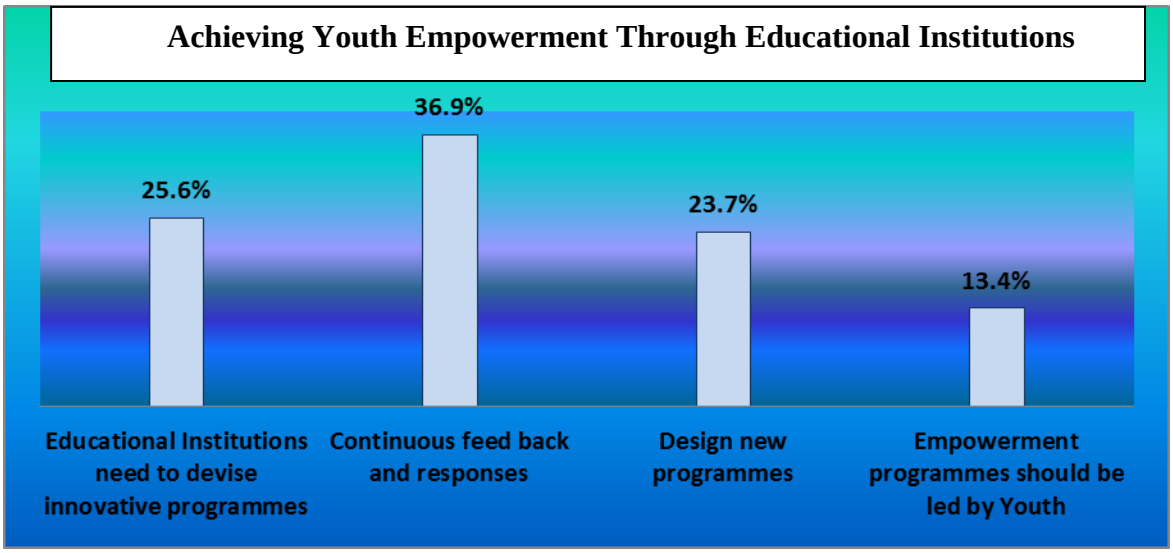

What is Empowerment?
Economic Success and Money
49%
Developing Networks
49%
Getitng educational qualifications
53%
Voting in an election
56%
Getting respect and trust of adults
62%
Ability to influence decisions and change system
67%
Accepting responsibility for one's own action
68%
Availability of choices in life
68%
Freedom to express
70%
Active participation in decision making
72%


Barriers to Empowerment
13.40%
19.00%
11.60%
20.60%
35.50%
Adult Attitude
Lack of Opportunities
Lack of Awareness
Lack of Resources
Lack of Education and Skills



- ✓ Self-belief in their skills does not necessarily mean that youth are averse to seek advice and guidance from adults to make up for the lack of experience. Nearly 65% of respondents agree that they need advice and support of adults in performing their tasks, even though this inclination is significantly lower amongst youth coming from city environment where only 57% youth agree to seek advice from adults compared to 74% of their rural counterparts.
- ✓ An interesting aspect of the research was that even while being amenable to the advice of their elders nearly 87% of rural youth agree that that they wield more influence in deciding the course of their life and career options Contrary to conventional stereotypes, youth from cities were not found to be as assertive in their choices of career as the survey reveals that only 65% of urban respondents remain dependent upon counselling and guidance from their elders or peers.
- ✓ Less than 30% of all respondents believe that political clout is an important parameter to force others to accept their view point; but compared to 32% rural youth agreeing to the importance of these, only 26% youth in cities believe these to be important aspect of influencing others.





- ✓ 70% of youth responded to motivation for participating in college activities to self-development across economic groups and rural urban divide. A combination of top two priorities reveals that youth in rural areas would like to work for social issues and for the differently abled and those in urban areas would like to work against corruption and for the weaker section.
- ✓ 32.5% of differently abled youth want aids to help them overcome their limitation and 25.5% want society to address their specific need. 63% feel infrastructure support is very important to them and 51% feel economic support is very important.

In the perspective of the research it is concluded that the concept of empowerment is largely perceived in a uniform manner by youth across economic groups and gender. Youth in rural areas have slightly different approach which is primarily due to difference in awareness level and opportunities. Youth have projected lack of awareness and opportunities as barriers to their empowerment. This is primarily due to the difficulty they are facing in handling the information blast experienced by them in the age of information technology. Youth while desiring freedom continue to look up to adults for guidance and desire their trust and appreciation. Educational institutions are expected to guide and help students explore knowledge. Youth want to be active members of educational institutions and society and are enthusiastic of participating in the process of decision making. Differently abled youth want opportunities to be equal members of society. Step in this direction would be, not sympathy, but understanding of their specific needs. They don't want help but technology and infrastructural aids to enable them to cope with their different abilities.

3. Learning for Students:

- ✓ The team of young students learnt the value of constructive participation in research project and learned software like SPSS. They also realized the nuances involved in the process of research project and were oriented towards a more participatory model of learning.
- ✓ Their empowerment paved way for other students too who decided to participate in such opportunities that will come along in future, thus allowing them space for role-models for the juniors and peers who saw the benefit of moving away from instructional method towards a way of learning where teachers are merely guides.
- ✓ Students understanding of the functioning of college prepared them for jobs in the markets and made them aware of the fact that future of today's education lies in the strengthening of its ties with industry. It demonstrated the importance of vocational courses that can help them bridge the gap between education and employability.

- ✓ They were made aware of importance of popular cultural avenues like *Antardhwani*, created especially as a platform for youth to showcase their talent and realize their aspirations. The need for such cultural platforms was impressed upon them as these platforms help them build their confidence and bring them in contact with like-minded people.

4. Benefits to College:

- ✓ One of the fallout of this project was a student internship programme started by college administration where students were given in-house training by allowing them participation in actual administrative working of the institution.
- ✓ The institution made a small step towards bridging the gap between education and employability and helped prepare the students for markets outside.
- ✓ Teachers within the institution were presented with a model where guiding students took precedence over instructional model of teaching practiced in classrooms.
- ✓ The institution realized its potential as a space that can be utilized by the students to fulfil their inherent promise by doing creative work and also allowing them exposure to the processes of a research project.

5. Benefits to Society:

- ✓ The project attempted to create a realization among the adults of society and policy-makers within educational institutions that youth are in the centre and cannot continue to be told to wait for their turn.
- ✓ By bringing out the issue of trust-deficit between the adults and youth, the project stressed the need for opportunities and platforms that need to be evolved wherein youth and adult work together towards a common goal.
- ✓ The project also indicated the need to renegotiate certain stereotypes among the adults like the one which believed that the ideas and the actions of youth should be looked upon with suspect and considered impractical.

6. Further Plans/ Suggestions:

- ✓ Trust deficit between youth and adult needs to be addressed immediately so that youth gets the space and the freedom to express them-selves and exercise their choice.
- ✓ Opportunities and platforms need to be evolved wherein youth and adult work together towards a common goal.
- ✓ Society and educational institutions have to realise that youth are in the centre and they cannot continued to be told to wait for their turn.
- ✓ Youth needs acceptance and guidance to learn to participate constructively in all that is happening around them. It is imperative that a congenial environment is provided to them where they can realise their potential.
- ✓ Some stereotypes need to be renegotiated. The ideas and the actions of the young should not always be looked upon with suspect and considered impractical.
- ✓ To help build rapport between student and teachers participatory ventures and opportunities of working closely and exploring together should be provided.
- ✓ A need is being felt to move away from instructing youth to guiding them. Education should help youth understand themselves, the society and environment around them. Educational institutions need to provide platforms where emphasis is not only on content education but training young minds to think and form opinions of their own.
- ✓ Students involvement in the functioning of colleges should be encouraged and in house internship for students in their own educational institutions will not only provide skill but the understanding of administrative nuances will bring about co-operation between students and administration.

S.G.T.B. KHALSA COLLEGE

Project Title: Role of nano-crystals in energy harvesting and biomedical applications
Project Code : SGTB-101

Title page of published paper in Solid State Communication with students of project.

1. Objective (150 words):
The project was initiated with the objectives:

- To train and develop among students appreciation of the importance of nanoscience and technological materials for development in energy and biomedicine.
- To give exposure to young undergraduate students various research lab working on frontier areas of topic within the city and country.
- To synthesize nano-crystals of important materials with the involvement of the students.
- To characterize them for structural, electrical, optical, magnetic and ferro and piezoelectric properties using high tech equipments.
- Develop research culture at undergraduate level in college. In the process, students would work on solar cells made-up of nano-particles and possible bio-medical features would be investigated.

2. Final Findings (300 words):
Based on the works done by the students, we published a article in a peer reviewed international journal- Solid State Communications (Impact Factor 1.6045). The conclusions made in the paper are essentially the conclusions of this project: Thin nano-crystalline films of SnS were fabricated on glass substrates kept at room temperature. These films were also annealed. Samples whose thicknesses were greater than 270nm were found to be nano-crystalline, while those with thicknesses less than 270nm were amorphous in nature. Most of the samples were oriented and had the same crystalline structure. Only structurally identical samples were considered in the study, (namely identical lattice parameters) were selected for comparing their refractive indices. Study showed that the film's refractive index is explainable using the single oscillator model and is directly proportional to grain size. The results stand different from a recent report. The grain size in that report was not in nano-regime thus possibly explaining their inference that variation in refractive index was related to grain packing density. Preliminary investigation to solar cells of SnS thin films were made and the results are encouraging.

3. Learning for Students (200 words):

The students have immensely benefited from their participation in this project work. Basically, they got a flavor of working in a professional research problem and trained in a frontier area of research in Physics/ Material Science. Their learning process can be divided into three intervals:

(A) Obtain an understanding on Nano-technology, its relevance to science and society at large. The challenges in working in this area. During this period they met with scientist and academicians from National Research Labs and Universities.

(B) They learnt to work with various equipments which are usually out of bound for them and not available in under-graduate studies. They learnt importance of data integrity, archiving. Comparing results with literature and arranging data to understand scheme of things.

(C) They learnt to professionally present their work in poster form, power point presentation and paper writing. All these were done in a hands-on approach.
One hopes that with such exposure, some of the participants would out for research as their chosen career.

4. Benefits to College (100 words):
The project has been of immense benefit for the college for not only assisting it in procuring equipment useful for student engaged in non-routine experiments. These are equipments which are not of regular use in under-grad practical classes, however, if available in the institute can help to quench the inquisitive queries of students.

It has also assisted the college to develop a pool of teachers who gives it visibility in terms of national and international publication and media attention. Students have also taken note that the college is doing more then class-room teaching and inquiries of being a part of projects have increased.

5. Benefits to Society (100 words):
Tangible if not directly visible benefits have been made by this project to the society at large. Ten students have been given exposure to the rigors of research where even if they do not end up in research or academics, they would have an appreciation as to how to rise the right questions and investigate the answer. The logical approach of analysis would be useful in any professional environment.

On the other front, while the investigation into solar cells is still premature, as more work would be done, we are sure, we would be in a position to contribute important inputs into solar cells created of SnS thin films. Solar energy, as an source of clean renewable energy is well established and need no further introduction.

6.Further Plans (100 words):

The investigators plan to systematically study the influence of grain size and refractive index extra on the performance of the SnS thin film solar cells. We would like to embed quantum dots into the SnS film matrix and then study the changes in the performance of the solar cells. Also, worth investigating is quantum dots of CuInS2 (CIS). CIS is one of the most promising ternary semiconductor material for application in opto-electronics. It has a small direct band gap of 1.5 eV matching well with the solar spectrum, high absorption coefficient ~5x10 5 cm^{-1}, high photo-conductivity, low toxicity and high environmental and electronic stability. Although progress has been done in growing CIS quantum dots (QDs) by chemical route and understanding the optical properties of polymer-QD composites, their electrical and structural properties have not received attention so far. In the proposed project we aim to study various aspects of interaction between polymer (poly 3hexylthiophene-P3HT) and CIS QDs to grow high efficiency photo-active layers.

S.G.T.B. KHALSA COLLEGE

Project Title: Conceptualizing Women Sports in the context of Sports Economics and Marketing of Sport in India: Performance Study of Gender based athletes in respect of their Advertising& Promotion Value.

Project Code: SGTB-102

Project Team at work

1.Objective (150 words):

The reward structure for sporting performance of athletes is not simply restricted to prize money and benefits awarded by federation or corporate sponsored events. It also extends to the Advertising & Promotional [A&P] Value of athletes which is complex to compute, but vitally important to understand to help decide what is the contracted value to pay to such athletes when they associate or endorse brands or their product lines to increase sales revenue for-profit companies.

This assumption accounts for the first set of facts, namely, the prize money and benefits awarded by federation or corporate sponsored events after an athlete achieves a level of performance in a particular competitive sporting event, and is globally or regionally visible to viewers, listeners, and readers. This assumption also accounts for the second set of facts, namely, the association or endorsement by performing athletes of brands or their product lines to increase sales revenue for-profit companies, in exchange for a sum of money.

It is this second set of a fact that is taken to be true for the purpose of investigation and testing, the theory of WHY a particular athlete is paid a higher or lower that the other, and HOW the computing of Advertising & Promotional [A&P] Value allows that distinction of pay to be decided by the Marketing Departments of Companies, and Advertising & Promotion Agencies.

However, by testing this theory, it brings us to the unexplored area of research for female participation in sport, and the reward structure that is available to performing athletes such as Ms. Saina Nehwal and Ms. Mary Kom, before for-profit companies who are looking to increase sales revenue of their product lines, without gender bias in their decision making to brand associate, but rather the preference of one in favour of the other, because of their differential A&P Value.

The marketing economics of sporting icons like Ms. Saina Nehwal, and Ms. Mary Kom, also leads us to believe at this stage that they serve as role models for the female gender class in society who were previously, and to some extent currently discriminated, because of the prevailing legacy reward systems of prize money and benefits awarded by federation or public corporate, in the form of restricted employment.

2.Final Findings (300 words):

Sport is a vital and universally recognized yardstick to measure the nation's well being. In an unprecedented inter-disciplinary research on Sports Economics we have come up with the finding that the sportspersons can change social stereotypes and help society accept change.

Taking the case study of Saina Nehwal who hails from Haryana, we discovered in the course of our research study that the acceptibilty of female participation in sports in the rural part of Haryana is being engineered to the extent of parents who want their female child to play outdoor sports in the hope that they emulate Saina Nehwal's achievements, is not seen as before.

In our research study, we preferred to narrow down our approach to this broad topic of female emancipation to the impact of Saina Nehwal in the racquet sport of Badminton, and society in India, specific to state of Haryana, from where she hails from. Sporting Performance of Saina Nehwal has been combined with a correlative increase in her endorsement value in sponsorship of celebrity sportspersons, whether male or female, and gender preferences of sponsors when it come to Advertising & Promotions.

The findings of the research thus far, are Firstly, the A&P Value of Sports Persons is, regardless of Gender, varies, because the perception of Public, Advertisers, Managers, and Agents, differs from market to market. The closed-ended questions are aimed at Professional Players, Federation Officials, Marketing Department of Companies, Advertising & Promotion Agencies, Sports Management Companies, and General Public helped us to assess and find out the commercial popularity of Sporting Icons.

SECONDLY, the factors identified in potential adolescents such as Ms Saina Nehwal who were accurately conceptualized as junior athletes with the potential to become players of National and International grade. This identification process is a result of the support of family, coach and institution to which the player belongs to that is combined with the individual's performance at each grade or level. Predisposition to react in a certain way on the part of family, coach and Institution determines the success or failure of players, especially girls or women to achieve success at the National or International Level. The barriers to entry and its subsequent opening by the family of Ms. Saina Nehwal is a case study today serves as a roadmap for administrators of sport across the country, who are empowered to sanction the development of sports persons from the age of adolescence age group to their adulthood.

THIRDLY, the development of sports persons is not just restricted to the sporting performance of athletes, but includes the overlying commercial benefits from Marketing Department of Companies, Advertising & Promotion Agencies, and Sports Management Companies, who see A&P Value in such visibly popular athletes, before the viewing, listening and reading general public, such as the cases cited of Ms. Saina Nehwal and Ms. Mary Kom. The principal reason for their success lies in the stable family life they enjoy which allows them to absorb and revel in the pressure that is associated with high performance sport and product marketing. After assessing the foundation for development that comes from a stable family life, it allows these athletes to face their external environment with full confidence and capability.

FOURTHLY, because of the tangible and intangible benefit the sponsor's receive from their investment in terms of brand visibility, and increase in revenue sales, gender bias is greatly reduced. There is however, an socio-economic bias that results between the haves and have-nots, who manage to or unable to secure the commercial benefits of endorsement contracts, This is where the Performance Graph and Personal Traits of our principal subject, Ms. Saina Nehwal, reveals how facial and physiological beauty, sporting performance, and stable family life that allows them to honour contractual commitments in endorsement and association obligations set out with corporate, combine to bring out the above difference. The Project examines the personality of Ms. SAINA NEHWAL, that is, her characteristics that make her socially appealing, and her ACCEPTABILITY to the sports federation, viewing, listening & reading public, advertising agency, advertiser in terms of their Corporate Brand Image & Product Association, SPORTS AGENT, and EVENT ORGANIZERS & HOSTS, that is unique about a person, the characteristics that distinguish her from other people, and the principal reason of differentiation of Corporate Marketing Strategy from a Company's Competitors, on the basis of the following factors:

1)Attitude
2)Interest
3)Behavioral Pattern
4)Emotional Response
5)Social Role.

Year	No. Of Participants	Qualified	Boys	Girls
2010	5162	1606	88%	12%
2011	8265	4996	81.8%	18.92%
2012	24953	5000	78%	22%
2013	32070	5000	71.5%	28.5%

FIFTHLY, the visible popularity and achievement of Ms. Saina Nehwal and Ms. Mary Kom, allows them to be treated as role models for society, especially for the girl child, and help combat female infanticide reflected in skewed male to female sex ratios, gender inequality at the work place and employment, and coercion, duress and undue influence at each stage of their life from birth to adulthood. We have traced the '*Saina Effect'* on school girls of Haryana where the number of school girls in sports increased after her success in 2010. In 2010 Haryana government started SPAT (Sports and Physical Activity Test) to motivate school children in sports. Ultimately, 1,606 players were selected for the scholarship, training and elementary competitions. Out of the total selected students, 88 per cent of the qualifiers were boys and 12 per cent were girls. In SPAT 2013 over 11 lakh children participated, out of which 5,000 qualified for SPAT scholarship and among these, 28.5 per cent are girls and 71.5 per cent are boys. We can underline the rapid increase in girls' participation in sports.

Co-Joining of play performance & acceptable personality – Formula for celebrity endorsement contracts

The Project examines the PLAY PERFORMANCE of Ms. SAINA NEHWAL, and her accomplishment in career ranking as an International Badminton Player, and her Medal Record as a Badminton Professional Player, and sports representative of India.

Sports Performance of Ms. Saina Nehwal [17 March 1990-Till Date]

1. Career Best Ranking: 02 [2nd December 2010/14th March 2013]
2. Medal Record
   2012 Olympic Games: BRONZE
   2010 Asian Championships: BRONZE
   2010 Commonwealth Games: GOLD
   2008 World Junior Championship: GOLD
3. Tournament won
   3.1 BWF SUPER SERIES
   Indonesia Super Series Premier: 2009, 2010 & 2012
   Singapore Super Series: 2010
   Denmark Open Super Series Premier: 2012
   Hong Kong Super Series: 2010

   3.2 BWF GRAND PRIX GOLD and SUPER SERIES
   Swiss Open Grand Prix Gold: 2011 & 2012
   Thailand Open Grand Prix Gold: 2012
   Indian Open Grand Prix Gold: 2009 & 2010

In India, the players such as SAINA NEHWAL representing the country, or a league franchise, in sports such as BADMINTON are employed to brand build a company's image, because of the perception they create of the brand in the mind of the consumer, by their association, and visibility, when they participate at sports events, that is Federation endorsed, company co-sponsored, and rights-held broadcasted. Therefore, Saina Nehwal's PRODUCT ASSOCIATION with JAIPRAKASH ASSOCIATES, BHARTI AIRTEL, PROCTOR & GAMBLE, and NISSIN FOODS HOLDINGS COMPANY LTD. has effectively enhanced the BRAND IMAGE of these companies with a twin-fold objective, that is, Consumers frequently buy the company's product not only for its functional characteristics but also because they want to be identified with the image associated with the brand. In 2009 after she had won the Indonesia Open and received the Arjuna Award, there were not companies queuing up to seek her endorsements for their products. That fortunately changed for her with the five wins in 2010.

Advertisement Agency representatives while being interviewed in our research study spoke about Brand-Fit of Saina Nehwal to the A&P activities of corporate like Tata Group and Raymonds. They associate her sporting image with someone they can trust, and someone with integrity. She comes across during interaction as a person with a quite demeanor, sincere and not flamboyant. They think of her as being ambitious without being arrogant. Brands that have chosen her as their model say they chose her for the fact that she is now one of India's foremost sporting icons and denitely number one when it comes to a women sports player.The consensus on Saina also is that she does not show off her success.The badminton fraternity admits it has helped that Saina Nehwal is seen on Television and on the covers of glossy magazines.Given the fact that badminton is not as glamourous a sport as tennis is promoted to be, it helps that the game now has an icon in India.The consensus on the street is that badminton has gained from Saina Nehwal's endorsements more than Saina Nehwal as a person herself.

3. CLINICAL EXPERIENCES & INTERNSHIPS FOR STUDENTS

We hope this study will be helpful in the academic programme to prepare the curriculum in professional fields of study such as Sports Management Education that often require clinical experiences and internships, wherein, in these programs, students spend time at a Federation, Sports Management Company, Event Organizer and Host Company, in the company, and association of Athletes, Coaches, Agents, Managers, and Federation Staff & Officials to observe the work of a professional in the field, and in some cases the student may participate in the work as an aide. The co-joining of practical work experience with theoretical study in an academic environment with dedicated faculty networking to bring resources for the growth of students in their Academic Programme are principal reasons why the College benefits from such Project Work.

4. Benefits to College (100 words):

This was the first time when SGTB Khalsa College was awarded a research project in the Social Sciences field. Students were selected from five streams of study, and enjoyed the benefit of inter-disciplinary approach to research. They went to the field for the very first time for data collection, and analysis back at the college. Moreover, they interacted with international players, coaches, agents, managers, federation staff & officials, and enhanced their know how by attending seminars on sports organized by bodies such as FICCI & CII.

5. Benefits to Society (100 words):

The objective of the research project is to focus on the inequalities between male and female in the social systems of India. The survey is in TWO PARTS. The first part is the commercial differences that show the secondary position of professional women athletes in Prize Money Earnings and Advertising & Promotion Values. It is important to understand why Advertisers perceive professional

men athletes to have greater commercial value that their female counterparts. This has been debated in detail in the Racquet Sport of Tennis and differences in Earnings are now also being extended to disparity in pay of lower ranked players in Grand Slam Events within the same sex gender. The second part is an analysis of gender differences that often show a disadvantaged and weaker position of women and girls in social, political, economic, legal, educational and physical issues. This is why interventions are required to focus on correcting these imbalances by specifically targeting players such as Ms. Saina Nehwal and Ms. Mary Kom whose sporting performance at the international level has converted their image into that of global celebrities. More importantly, the research will display how women and girls could rise financially in sport and come to be elevated to an equal stature in the rigid family hierarchy as is commonly found in India.

5. Further Plans (100 words):

To create general awareness, and possession of information, facts, ideas, truths, and principles regarding the operations of sports federations, viewers, listeners and readers, advertisement agencies, sports agents, and event managers, that together make-up the industry of sport, which at the same time has an ECONOMIC & SOCIAL IMPACT ON SOCIETY, which in this research explores GENDER INEQUALITY, but has the potential of exploring, and redressing other inequalities of a economic, or, and social nature. It is the endeavour of this Project Team to make future application before this commissioning body to carry forward its initiative to research & study Sports, and its impact of Society.

S.G.T.B. KHALSA COLLEGE

Project Title: Fluorescent Powder Compositions for Developing Latent Fingerprints

Project Code: SGTB-103

A fingerprint developed on a knife after keeping it immersed in drain water for 12 hours

1.Objective (150 words):

To prepare fluorescent powder compositions for detecting fingerprints which -
(a)are non-toxic and cost-effective.
(b)can develop weak, chance and fragmented fingerprints.
(c)can develop fingerprints on both absorbent and non-absorbent surfaces.
(d)can develop persistent fingerprints on unusual and difficult surfaces.
(e) can develop fresh, as well as old fingerprints.

2.Final Findings (300 words):

During the course of the innovation project, we have prepared a multipurpose fingerprint detecting composition which is not surface-specific, that is, may be used on a broad spectrum of articles that are most commonly found at crime scenes.

The composition prepared by us has a wide range of applications. It can detect fingerprints on a legion of items, absorbent (for example, paper, wood) and non-absorbent (for example glass, plastic); white and multicoloured; & smooth and rough.

The composition also detects fingerprints on that crime scene evidence which has been accidently or deliberately wetted.

Alternately a suspect may commit a crime and thereafter throw the weapon in an aquatic body like river or stream. The novel composition works on such items as well, provided they are recovered within a span of 12 hours.

It is also possible that the criminal may want to recover his weapon after the hue and cry subsides. In that case, he may bury the weapon in soil rather than throwing it in a river. If the weapon is recovered by the police within 12 hours after the crime has been committed, the new composition successfully develops good quality fingerprints on the evidence.

There is yet another way by which a suspect may despoil the crime scene: By setting it on fire. High temperature and deposition of soot interferes with detection of fingerprints. Initially it proved difficult for us to carry out this type of experiment because it is not permissible to light a fire in College premises. However, we overcame this problem by creating a mock arson site. We

placed the evidence (floor tiles or utensils) in an oven (a common equipment in chemistry labs), adjusted the temperature to about 250 degree Celsius (normally encountered at arson sites) and placed a few newspapers in the oven to generate soot. The novel composition developed excellent quality fingerprints.

There are a good number of methods by which fingerprints may be detected on compact disks (CDs). However, most of the times, the data stored in the CD cannot be retrieved after the prints have been developed. The new composition detects fingerprints on CDs without despoiling the stored data. In case of rewritable CDs, more files may be added after detection.

The composition is indigenous, non-toxic and cost-effective. It is fluorescent in nature and hence assists in detecting weak, faint fingerprints that are commonly found at crime sites.

3.Learning for Students (200 words):

Those students, who got enrolled as team members of the innovation project, acquired a first-hand experience in research methodologies. From building of hypothesis and literature survey to experimentation and quality assessment they learnt how an idea may be translated into a technology. They were asked to come up with a technique of fingerprints detection which, in time to come, would assist the law enforcement agencies to solve crime cases in a scientific manner. They were successful in propounding a composition which can lift fingerprints not only on articles removed from conventional crime scenes, but also from those sites which have been accidently or deliberately despoiled. An Indian Patent entitled, *A composition for developing latent impression marks and process for preparing the same* was filed by the University of Delhi on this endeavor. The UG students are listed as inventors in this patent application. This addition to their profile will go a long way to build up their careers. Moreover, if the patent gets commercialized, the students will get a share of royalty.

4.Benefits to College (100 words):

The equipment and consumables procured during the course of the innovation project have been passed on to the Forensic Science Unit of our College. This Unit runs a Post-Graduate Diploma in Forensic Science. The resources acquired by virtue of the innovation project will henceforth be used by the students of Forensic Science. At the final presentation on the outcome of the innovation project, we had invited officers from Delhi Police, Military Police and Delhi State Fingerprint Bureau for a critical assessment of our research work. These user departments are now well aware of the academic and research activities being undertaken at our institute in the field of forensic science. In fact, they are now requesting our College to run periodic training courses for their personnel.

5.Benefits to Society (100 words):

The technology developed by us will assist the forensic scientists across the nation to solve crime cases scientifically. It offers the following advantages.

a. The composition prepared by us for detecting fingerprints is first of its kind. Conventional compositions are surface specific, that is, they work only on one type of item. The novel composition has broad-based applications. It can detect fingerprints on a broad spectrum of articles, including absorbent and non-absorbent; white and multicoloured; & smooth and rough.
b. Conventional compositions do not work on those crime scene evidence which have been deliberately or accidently despoiled. The novel reagent can lift fingerprints on those crime scenes that have been washed out by water. It also works on articles (read weapons) that have been thrown in quatic systems or have been buried under soil by the suspect after committing the crime.

c. Most police personnel are from non-science background and often face problem while choosing the correct fingerprint detecting composition for specific crime scene evidence. With a single composition at hand, this problem will be averted.

6.Further Plans (100 words):

We wish to involve our UG students in our next innovation project entitled, *Identification of Weapon Holders in Crime Cases*.

The weapons used in crime cases, including revolvers, pistols, swords, daggers and rods, are generally made up of iron or an alloy of iron. It is hypothesized that during commission of a crime, nanoparticles of iron are transferred from the weapon to the palm of the suspect. The fatty acid constituent of palm's sweat transforms the transferred iron to iron(II) ions. The latter form stable, intensely colored, chelates with a number of complexing agents. In this project, it is proposed to synthesize ligands belonging to triazine functional group for identification of weapon holders. When these complexing reagents are sprayed on the hands of a person who had earlier held a weapon, a colored, iron(II) chelate will be precipitated, thus identifying the suspect.

In cases where a suspect murders a victim, and before fleeing the scene of crime places the weapon in the hands of the dead person, to make it appear like suicide, a colored precipitate will not appear since sweating ceases immediately after death. It will thus be possible to make a distinction between a suicide and a homicide.

SHRI RAM COLLEGE OF COMMERCE

Project Title: PROJECT AAHAAR

Project Code: SRCC- 101

The girls at the certificate distribution ceremony after completion of culinary training at the Taj Mahal Hotel

1.Objective (150 words):

Project Aahaar, reclaiming life the culinary way, is an initiative to empower commercially exploited women to become self-sufficient entrepreneurs, by providing them with basic culinary training and access to demand avenues to market their acquired skills. Training in accounting, kitchen management and environment awareness is also provided, so as to give them a holistic development.

These women are from an economically backward background, and have been victims of harassment and exploitation in the past. By providing them with a skill-set in order to help them earn an alternative livelihood, we seek to open windows of opportunity for such underprivileged women, helping them gain economic independence. This will bolster their dignity and self-esteem, and give them an impetus to stand on their own feet.

2.Final Findings (300 words):

Project Aahaar aims to rehabilitate underprivileged and commercially exploited women by providing them with culinary training and enabling them to market their acquired skills in order to transform them into entrepreneurs in the culinary business.

We realised that one thing which every woman knew was how to cook and hence we made 'Bulk Indian Cooking' the centre of our business model. Initially we worked with four women from a shelter home in Nirmal Chhaya Complex, New Delhi. These women were trained in bulk Indian cooking at the Taj Mahal Hotel, Mansingh Road, New Delhi and they have started cooking for the inmates of the shelter home.

As we moved on to expand our project, we felt the need to introduce manufacturing of a product as our new business model for sustainability as well as profitability. Our proposed model is to engage our target community in a dry-food products (such as “badiyan”, “moogodi”, “papad”) manufacturing business. The production needs to take place in an open space and we will require a terrace to sun-dry the food products.

We carried out a preliminary demand assessment and identified Khari Baoli, a wholesale groceries market in Old Delhi, as one of our major demand avenues.
We contacted various organizations including Indo-Global Social Service Society (IGSSS) for identification of a community. We have also found a trainer who shall also be one of our major customers once the production process begins.

IGSSS maintains over 100 shelter homes in Delhi. We were put in touch with 5 women living at one such shelter near Bangla Sahib Gurudwara in CP. But, after having spent a considerable amount of time with the women and understanding their problems, we realised that due to their instability, it would not be feasible to go ahead with this community for our business model.

In this entire process, the most important thing that we have learnt is that it is necessary to build a strong bond of trust with the community and to inculcate a feeling of independence in them.

3.Learning for Students (200 words):
Project Aahaar helps us apply our textbook curriculum of economics and business in real-life situations by using concepts like cost-profit analysis, adaptability and sustainability of business models, etc. Functioning as social entrepreneurs, we learn to frame a successful business model and to face the challenges involved in its implementation. We discuss project related details with top companies and leaders of successful ventures. This has provided us with immense exposure and great insight into the corporate world. These mentorship sessions help us to gain from the experience of extremely reputed people. Also, our interaction with the communities involved gives us a lesson in public dealing and prepares us to take on bigger leadership roles. Interaction with the community also broadens our horizon and makes us sensitive towards the society.

4.Benefits to College (100 words):
In the process of achieving academic excellence, it is the prerogative of every academic institution to inculcate in its students the zeal to unleash society's full potential by opening up new pathways for the marginalized and disadvantaged communities. Project Aahaar, in its endeavor to uplift the lives of underprivileged women, is well aligned with the aforementioned objective of the college. In addition to this, the project gives an edge to SRCC over other institutes of business and economics by facilitating practical application of classroom learning. An initiative by the students of Shri Ram College of Commerce, it also earns appreciation for the college in the field of social entrepreneurship.

5. Benefits to Society (100 words):
In our initial model at Children Home for Girls, Nirmal Chhaya, 4 girls were trained in bulk Indian cooking. They are now cooking healthy and nutritious food, under the supervision of the existing cooks, for the 350 other inmates and get remunerated by the Government. A health check-up camp was also conducted here to review the health status of over 300 girls.
We were also involved with a community at the IGSSS Shelter Home, Gurudwara Bangla Sahib, where we had conducted a counseling session and health check-up for five women. These women also underwent literacy training for a month.
These models aim at empowering the communities by making them financially independent and self-confident. The tremendous media coverage received by our project creates the much needed awareness about the cause.

6. Further Plans (100 words):
(a) Plans regarding the existing model of a community kitchen at the shelter home in Nirmal Chhaya Complex:

The girls have now started cooking under the supervision of the existing cooks of the shelter home's kitchen, for which they will be remunerated. A monthly stipend of Rs.3000 for each girl has been approved by the Department of Women and Child Development, Govt. of Delhi. The stipend will be transferred to their respective bank accounts, which will be opened shortly. The setting up of an "Aahaar Trust Fund", as proposed in the previous report, has been kept on hold for the time being, until the bank accounts are in place.

(b) We are currently in touch with a Delhi based NGO regarding the identification of a community for the new model of a dry food products manufacturing business.

Once the community is identified, the women will be provided with the requisite training for 2-3 days before undertaking the production process. Their soft skills will be strengthened for overall personality development. They will also be provided with financial and literacy training to make them aware of the concept of savings and money management.

SRI AUROBINDO COLLEGE

Project Title: GREEN BANKING & SUSTAINABLE DEVELOPMENT: THE NEED OF TODAY

Project Code: SAC(101)

GREEN BANK "Green bank is a bank for which green is not just the colour, it is the commitment to conserve and save the environment", Dr Namita Rajput

1) OBJECTIVE OF THE PROJECT

Climate change is a noteworthy concern because of its drastic and looming effects, owing to which economists have recognized that there are financial rewards from controlling climate change and developing a low carbon economy. Green banking refers to how environmentally friendly your bank is and how committed to green and ethical policies they are. Banks can provide an important leadership role for this economic transformation that will provide new opportunities in financing and investment policies. In this endeavour compliance with the principles of integrity , impartiality , reliability , transparency, social banks are expected to ethically trail their operations in responsibility and controlling money laundering.The objective of this project is to highlight the Green Banking initiatives being taken by the Indian banking sector in terms of awarness, pursuance, energy efficiency, financial inclusion , Rural green practices, corporate social responsibility and sustainable development in relation with best international practices and also to give some suggestions as to how, passing of more mandates,legislations and proactive role of RBI can take India to a new paradigm for making a greener tomorrow.

2. FINAL FINDINGS :

The impulse of going green is moving at a faster rate and is not a Zero sum game, i.e the things which are good for environment are good for business also.Green banking gives environmental benefits and helps in reducing carbon foot prints.Going green is a wonderful and judicious combination of operational improvements and technology and changing clients habits along with inculcating a shared vision regarding saving the planet. The results of this study will have deep implications for Indian banks, policy makers (RBI), to environmentalists, social organisatons,Government of India, Ministry of finance and international strategic alliances , joint ventures etc.

The survey findings are as follows:

1. Prepardness of Indian banks on environmental and sustainable concerns.	Very slow in response to global peers
1. Awarness and Implementation of enviromental initiatives	There is 100% awarness of green issues, 93% of banks indicated the implementating enviromental initiatives
2. Initiatives of offerings of Green Products and services:	90% proclaim that they have been able to undertake initiatives.

3. Does your org have any enhanced and special criteria in evaluation of a project with clean energy/low carbon footprints/environment friendly?	100% Yes
4. Does a statement or objective of organisation in any policy or program reflecting a commitment to green and sustainable issues which is in public domain affects the image and reputation of the organisation ?State your agreement.	

Type of Bank	agreement	Percent	Cumulative Percent
Private	Agree	45.5	45.5
	Strongly Agree	54.5	100.0
	Total	100.0	
Public	Agree	48.1	48.1
	Strongly Agree	51.9	100.0
	Total	100.0	
Foreign	Agree	65.4	65.4
	Strongly Agree	34.6	100.0
	Total	100.0	

5. Does your organisation have sustainability benchmarks in evaluation of investment/lending programmes?	100% yes
6. International Initiatives	Awareness level 100% in case of Public,Private and foreign sector banks relating to international frameworks and initiatives.
7. International Initiatives	Participation level
UNEP-FI	3.7% Public sector, 9.1% Private sector 53.4% Foreign bank
Climate Principles	14.8% Public sector, 22.7%Private sector 11.54% Foreign bank
Equator Principles	100% No for Public sector banks, Private sector banks, 65% Noforeign sector banks
UN Global Compact	100% No Public sector banks , 100% No Private sector banks, 97% No foreign sector banks
Carbon Disclosure Project	11.1% Public sector banks,18.2% Private sector banks, 26.9% foreign sector banks.

8. Aggregate of awareness and participation level in international protocols and parameters

Awareness and implementation level

International protocols	Responses		Percent of Cases
	N	Percent	
UNEP FI	75	17.6%	100.0%
The Climate Principles	75	17.6%	100.0%
Equator Principles	75	17.6%	100.0%
UN Global Compact	75	17.6%	100.0%
Carbon Disclosure Project	75	17.6%	100.0%
Participating parameters UNEP FI	15	3.5%	20.0%
The Climate Principles	12	2.8%	16.0%
Equator Principles	9	2.1%	12.0%
UN Global Compact	2	.5%	2.7%
Carbon Disclosure Project	14	3.3%	18.7%

9. Agreement on internal drivers (agreement yes/ no)

Increase in the value of shareholder	100% yes	Yes
Social Pressure from the Investors to Invest in the Socially Responsible Manner.	100% yes	Yes
Changing Board Room Agenda	100% no	No
Percieved/Benefits and Profitability	100% yes	Yes
Marketing benefits by way of Brand Building and Reputations	100% yes	Yes
Detention & Attraction of Employees	100% no	No

10. Most significant internal drivers

	Levene Statistic	Sig.	F		Sig.	Statist
Increase in the value of shareholder	3.260	.001	1.218		3.360	.040
Social Pressure from the Investors to Invest in the Socially Responsible Manner.	3.360	.002	1.118		.332	1.154
Changing Board Room Agenda	1.513	.227	4.828		1.513	2.332
Percieved/Benefits and Profitability	3.513	.003	1.828		.011	5.621
Marketing benefits by way of Brand Building and Reputations	2.043	.004	1.231		.590	.539
Detention & Attraction of Employees	1.435	.245	3.224		.417	.786

11. Agreement on external drivers

External Drivers	Percent of Cases
Regulation of the Government	41.3%
Social Responsibility	100.0%
Environmental benefits and Opportunity	100.0%
Increase in Eco-Centeric consumers	5.3%
Pressure groups/popular movements in the society	100.0%
Others	2.7%

12. Important external driver

	Levene Statistic	Sig.	F	Sig.	Statist
Regulation of the Government	1.435	.245	3.224	.046	3.703
Social Responsibility	3.360	.040	1.118	.332	1.154
Environmental benefits and Opportunity	4.984	.009	2.773	.069	2.332
Increase in Eco-Centric consumers	1.513	.227	4.828	.011	5.621
Pressure groups/popular movements in the society	2.043	.137	.531	.590	.539
Others	3.834	.026	.886	.417	.786

14. Policies relating to specific issues of climate change ,energy efficiency and waste management

Public sector bank	Private sector bank	Foreign sector bank
100% yes	100% yes	100% yes

15. Most important important policy of energy efficiency and waste management strategy followed by your organization which will help in reducing carbon footprints in the organization?

	Levene Statistic	Sig.	F	Sig.	Welch
Purchasing	4.965	.010	2.132	.126	1.786
Educating	6.658	.002	1.589	.211	1.566
Recycling	.365	.002	2.14	.298	1.230
Transport	.504	.606	1.964	.148	1.918
Energy	2.188	.119	2.158	.123	1.996

16. State your agreement on employee engagement practices in your organization to address the issues of climate change.

	Levene Statistic	Sig.	F	Sig.	Welch
Training	1.084	.344	1.8	.169	1.816
Performance and Reorganization Objectives	1.556	.218	.30	.741	.292

Intranet sites	1.054	.354	1.92	.153	1.873
Internet	2.659	.077	1.24	.294	1.371
Internal communication	3.389	.039	1.70	.190	1.575

19. State your agreement on the statement that pursuance of green initiatives and sustainable development has impacted financial performance positively?

(The results exhibit that there is 100% agreement on impact of green banking and financial performance for all category of banks)

Type of Bank		Valid %	Cumulative%
Private	Agree	50.0	50.0
	Strongly Agree	50.0	100.0
	Total	100.0	
Public	Agree	59.3	59.3
	Strongly Agree	40.7	100.0
	Total	100.0	
Foreign	Agree	23.1	23.1
	Strongly Agree	76.9	100.0
	Total	100.0	

17. Major gaps:

The Main Gaps Identified by the Indian Banks requiring directives from regulatory bodies:

1. Awareness and consciousness on sustainability issues, international guidelines and frameworks.
2. Sustainability reporting - formal frameworks and lucid and clear policies pertinent for banks operating in India.
3. Training and development of relevant skills within bank employees so that they can use in core banking operations.
4. Clear policies are required to altering the present management systems to incorporate sustainability issues.
5. Formal information sharing and dissemination platforms need to be defined properly.
6. Guidance / workshops / training programmes for banks are necessary on CSR focus areas.
7.There could be an international strategic programme in terms of funding these climate change programmes like IMF along with Indian banks like low Cost Green Fund, this will help the developing countries counter the issue of sustainable development and making green economy. As there is a broad agreement that an effective response to climate change will require new investments and other expenditure on a massive scale. These international cooperation in this regard will surely help the developing economies to combat the environmental challenges.

19. State your agreement on the statement that pursuance of green initiatives and sustainable development has impacted financial performance positively?

Levene Statistic	Sig
7.274	0.01

There is almost 100% agreement on the fact that if green initiatives are pursued by the banks it is surely going to affect the financial performance of organisations positively

20.Major suggestions

1.To address each of these gaps, Reserve Bank of India should come out with constructive and productive policy recommendations to facilitate and assist the evolution from the existing conventional business models towards comprehensive and sustainable practices to realize the goal of sustainable

	economic development and will decarbonize the economy. 2.Government of India can also play a proactive role with a special role assigned to Ministry Of Finance in enhancing the speed of reforms to combat the issues of climate change and decarbonize the economy. 3.When we speak on sustainability in the context of banks,it refers to the philosophy that underpins a value system which acknowledges the need for banks to not only respond to and ensure that their employees,investors and customers benefit,but also focus on resource optimization in internal operations (local hiring and green procurement) social value creation and proactive steps towards enabling financial inclusion,responsible growth and mitigation of environment issues.International funding focussing on financial needs is the need of today,which could facilitate progress towards a binding global agreement on reducing green house gas emissions and allow developing countries to begin scaling up their climate change responses without delay. 4. Help customers shape their own banking experiences by improving how they provide information and advice, recruiting online affinity groups and by developing flexible loyalty programs. 5.Develop models around customer needs by reprioritizing spending, including increasing the use of low-cost digital models and using more innovative technology. 6.Launching a scheme along the lines described above would require a strong political effort upfronting by all partcipating countries.The potential payoffs will be enormous. 7.Once created,the Green Fund could provide a unified resource mobilization framework whch will be capable of meeting the financial needs for decades to come.This will bring world closer to help developing countries to begin scaling up their adaptations and mitigation efforts sooner (perhaps years sooner) than might otherwise be possible,to the benefit of the entire world.

GREEN BANKING IN RRBS IN INDIA A SNAP SHOT

RRBS	GREEN AND SUSTAINABLE INITIATIVES
1) Andhra Pragathi Grameena Bank(Syndicate Bank)	• Subsidy-cum-Refinance scheme for installation of Solar Off-Grid (photovotaic and thermal) • Decentralized applications under Jawaharlal Nehru national solar mission (JNNSM).
2) Chaitanya Godavari Grameena Bank(Andhra Bank)	• Bank has established 'Women Development Cell' at Head Office in Sep'2004 and the Cell is functioning as per the guidelines of NABARD to achieve the objectives of women empowerment through SHGs and credit flow to women • Financial Inclusion
3)Deccan Grameena Bank(State Bank Of Hyderabad)	• Core Banking Solutions will enable our customers to transact from anywhere & any branch. • National Electronic Funds Transfer (NEFT) facility is made available at all our Branches

	to enable customers to remit their funds to any bank/any branch in the country. • SMS alerts are being sent to customers for all transactions exceeding Rs.2,500/- as a security measure.
4)Saptagiri Grameena Bank(Indian Bank)	• The Bank achieved 100% Core Banking • Rewarded as Best Bank for SHG Finance in Chittoor district for all the years, since inception of the scheme • Fully Computerised RRB in the state of Andhra Pradesh.
5)Assam Grameena Vikash Bank(United Bank Of India)	• RTGS and NEFT enable • Remittance facility to all over India
6)Langpi Dehangi Rural Bank(Sbi)	• Financial inclusion • Self Help Groups
7)Arunachal Pradesh Rural Bank(Sbi)	• Fund transfer from and to any bank all over India though National Electronic Fund (NEFT) • Formation, monitoring and credit linkage of "Self-Help-Group" • Financial inclusion by opening of no-frill accounts in rural areas though existing and opening of new branches.
8)Madhya Bihar Grameen Bank(Punjab National Bank)	• SMS Alerts Facilitity
9)Uttar Bihar Grameen Bank(Central Bank Of India)	• Financial Inclusion : Sunhara Sapna • Account Portability facility
10)Durg-Rajnandgaon Gramin Bank(Dena Bank)	• Core Banking Solution (CBS) • Account Portability Facility • RTGS / NEFT facility • Mahila shakti scheme • SHG Bank Linkage
11)Dena Gujrat Gramin Bank(Dena Bank)	• ATM facility available at Bhiloda and Meghraj Branches in Sabarkantha district
12)Himachal Gramin Bank(Pnb)	• Self Help Group microfinance
13)Ellaquai Dehati Bank(Sbi)	• Scooty Loan for girls and working women
14)J&K Grameen Bank(J&K Bank Ltd)	• Anywhere Banking Facility available • Account Portability available • Bank 100% CBS compliant
15)Jharkhand Gramin Bank(Bank Of India)	• Jharkhand Gramin Bank has embarked on an ambitious technological initiative, named Gram SHAKTI, that is, introduction and implementation of Core Banking Solution in our branches. • RTGS/ NEFT remittances throughout India • Internet Banking • Issuance of ATM cards which can be used at any of ATMs located in India
16)Vananchal Gramin Bank(Sbi)	• NEFT Facility (Fund Transfer) • Account Portability Facility • Solar Power Equipments Finance-
17)Pragathi Gramin Bank(Canara Bank)	• 30 brand new ATMs / Cash Dispensers (CDs) were installed on 13-03-2013. • Joint Liability Groups • Financial Literacy
18)Visveshvaraya Grameena Bank(Vijaya Bank)	• providing credit and strong, stable and sustainable support to rural activities through personalized dedicated service with modern technology • A Technologically Driven Organisation with Sustainable Viability

19)South Malabar Gramin Bank(Canara Bank)	• Micro finance and lending to self help groups
20)Vidharbha Kshetriya Gramin Bank(Central Bank Of India)	• Gram Ujala (Solar Home Lighting System)
21)Maharashtra Gramin Bank(Bank Of Maharashtra)	• Farmers Short Message Information Services
22)Wainganga Krishna Gramin Bank(Bank Of Maharashtra)	• Swapan purti • Prakash kiran • NSTFDC Under micro credit • All the 71 Branches of the Bank are working on CBS (Core Banking Solution). • Internet Banking
23)Punjab Gramin Bank(Punjab National Bank)	• All 180 branches on the CBS network and now going to provide ICT based Financial Inclusion services to its deep resided unreached & poor people. • Awarded SKOCH FI 2011 award by the Skoch Foundation (INDIA) for Micro credit facility.
24)Pallavan Grama Bank(Indian Bank)	• The bank has introduced Indian Bank co-branded ATM cards for its customers on 29.11.2010 thus became the first RRB issuing co-branded ATM cards in the country enabling their customers to utilize 1128 Indian Bank ATMs across the country. The bank has so far issued 32,424 cards. • SMS Alerts • Solar Powered Green Branch • Introduction of Money Transfer Facility • NEFT Facility
25)Pandyan Grama Bank(Indian Overseas Bank)	• Micro Credit(Winner of Best performance award from NABARD) • Recognized as a Model Institution by NABARD for hosting Exposure visits on SHGs and JLGs.
26)Tripura Gramin Bank(United Bank Of India)	• National Rural Financial Inclusion Plan (NRFIP)
27)Prathama Bank(Syndicate Bank)	• Pioneer in the field of Micro Finance. The Bank has developed its own model of micro finance i.e. Prathama Model. It has been widely appreciated and recognized by NABARD, GOI and other international forums. The Bank has promoted largest number of SHGs, JLGs and Farmers' Clubs in the state of UP; • National Pioneer in the field of promotion of Solar Home Lighting. Bank's efforts have been recognized and the Bank has been awarded INDIA POWER AWARDS for the years 2008-09, 2009-10 & 2010-11; • Commitments fulfilled towards Financial Inclusion by providing ICT based banking facilities in all villages identified for financial inclusion as per the Government of India guidelines.
28)Paschim Banga Gramin Bank(Uco Bank)	• All 219 Branches are under CBS. • CPSMS compliant. • PBGB on boards National Automated Clearing House (NACH). • NEFT facility • ATM Debit Card is in the pipeline. • 530 villages having population over 2000 have been identified for Financial Inclusion

3. LEARNING FOR STUDENTS (200 WORDS):

- Innovation is ideally suited to be a starting point for project-based learning. Project-based learning is an instructional scheme in which students learn number of range of skills and subject matter in the process of creating their own projects. Sometimes, these projects are close to real-world problems, students work in groups and bring their own experiences, abilities, learning styles and perspectives to the project, so they become lifelong learners.

- In the course of developing a project, students decide on an approach by gathering and evaluating data from a variety of print, multimedia or Internet sources. They analyze and synthesize the information they have gathered and -- in a cooperative effort -- they determine the direction the project will take and is very inspiring for the students.
- Students have gained procedural as well as conceptual understanding based on the pattern of the survey, and have gained hands-on skills and experience, improved their communication skills, problem-solving, critical thinking, visualizing, decision-making and reasoning and have also learned how to write clear and concise reports on investigations using statistical tools like spreadsheets, use of data bases. They also develop enhanced interpersonal and communication skills, time management, setting benchmarks, conflict recognition and its resolution ,continuous problem correction mechanism, taking initiatives, engages in active listening, Evaluates the overall progress of a group towards the achievement of objective of the project goal.

4. BENEFITS TO COLLEGE (100 WORDS):

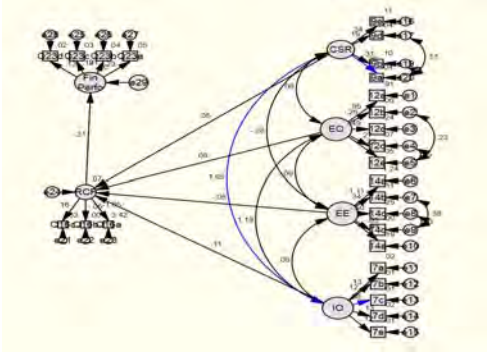
- Green banking will help in reducing the carbon foot prints of not only the bank but also of the college, and will put institution on environmentally sustainable path.
- Every green step taken today would go a long way in building a greener tomorrow. With initiation of these endeavours awareness and sensitivity towards environment has risen, owing to which all the teaching and non teaching staff of Sri Aurobindo College have adopted green strategies I.e. Internet banking, use of ATMs ,mobile banking etc.
- Under this project a mini hand handled paper recycling plant is installed in the college which will help in saving of trees and will be a role model for similar institutions to follow the foot prints.
- During this one year of the project lectures, seminars, research workshops have been arranged which has benefitted the teachers and students, which was otherwise not possible without the support of Delhi University grant.
- Students are the main part of the college have got the maximum mileage in terms of knowledge, presentations, arranging seminars, increasing analytical capacity and research aptitude which is commendable and beyond class room teaching. Students have to be continuously encouraged in such issues as their evolvement is essential as they have to take a steering position and save the earth. Innovative projects are path breaking and are instrumental in shifting gears from conventional teaching to most required mode which is close to reality.

5. BENEFITS TO SOCIETY (100 WORDS):

- "Green Banking" is mutually beneficial to the banks, industries and the economy. It ensures the greening of the industries but also assist in recuperating the asset quality of the banks.
- Internationally, there is a growing concern about the role of banking and institutional investors for environmentally responsible/socially responsible investment projects. Banking institutions are more effective towards achieving this goal for the kind of intermediary role they play in any economy and for their potential reach to the number of investors.
- It is of importance to the banking sector to pursue definite environmental evaluation of the projects before financing which helps in saving the environment.
- The banking sector influences the economic growth and development in terms of both quality and quantity, there by changing the nature of economic growth. Banking sector is one of the major sources of financing investment for commercial projects which is one of the most important economic activities for economic growth. Therefore, banking sector can play a crucial role in promoting environmentally sustainable and socially responsible investment.

6. FURTHER PLANS (100 WORDS):

Moving to a thriving low carbon economy can impel innovation and improvement, boost output and create new jobs which are highly paid. Banks can provide important leadership for the required economic transformation that will provide new opportunities for financing and investment policies as well as portfolio management for the creation of a strong and successful low carbon economy. In this study awareness, pursuance, implementation level of green banking, lending norms and international framework participation is gauged along with the comparison of international peers. Owing to its benefits which are proved in international studies a research can be conducted to empirically test a sustainable (Green) model which can lead to increased profitability using panel data of Indian banking sector. This model can be a bench mark, that if we move on the green path we will not only be able to save the carbon foot prints but it will also help in increasing profits.



The following model is desired in Indian conditions and can be taken for further research scope, i.e. internal operations, employee engagement, external operations and CSR activities can lead to reduction in carbon footprints which can help in increasing profits.

SRI AUROBINDO COLLEGE

Project Title: Enviornmental Crisis- Green Economic Solution

Project Code: SAC-102

Annexure-1

Functional Bio Gas Plant Fabricated By project team

Hon. Vice-Chancellor, Director South Campus with VIP guest (HRD Ministry)at our stall at Antardhwani

Project investigator at Talwadi, Nasik

1. Objective:

The study was undertaken with the primary objective of finding out the feasibility of using various non conventional resources of energy with special emphasis on biogas. Field work was conducted in the form of basic questionnaire at the first and at the second level. The team developed a concept using the finding of the first level and then showed the concept to the respondents and got their feedback on various issues related to usage of biogas in daily life. The study also dealt with the various applications of Bio-CNG. This was done by way of literature survey and by conducting trips to various institutions and agencies where bio CNG is in use. Since the basic raw material used for biogas production is bio degradable garbage, garbage segregation at various levels was studied by the team. Another important objective of the project was to create awareness amongst the masses & the college students about production of the biogas and its usage in various fields. The study also dealt with the economic viability of the Bio-CNG as a non conventional resource of energy. Inferences were drawn on the impact of non conventional resource of energy on economic development of the country.

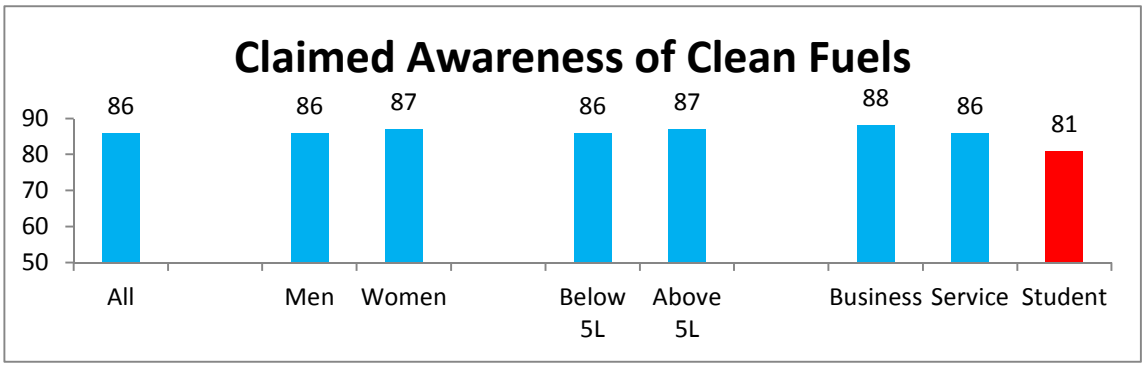
2. Final Findings:

The study of the responses so collected and analyzed throws an interesting feed back with regard to the understanding attitudes and characteristics of the target population on usage of clean fuel.

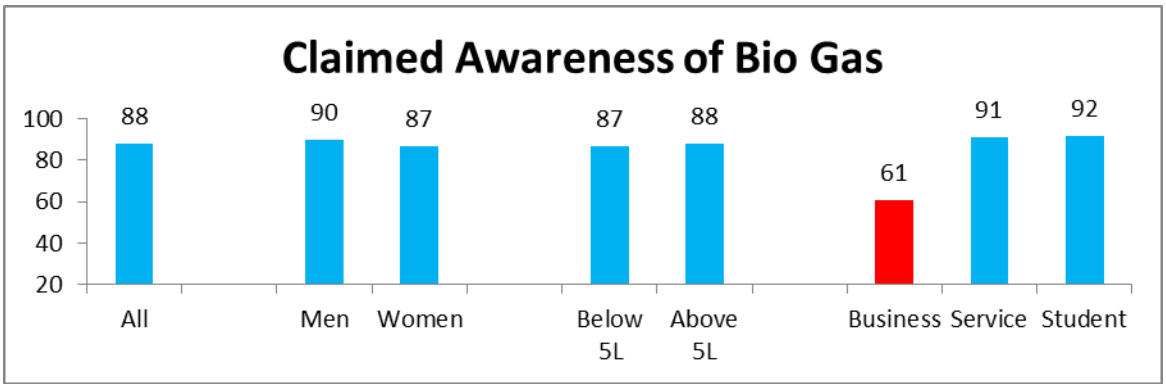
The key findings of Phase I are as follows:-

(i) Awareness of Clean Fuel

86% of the respondents claimed to be aware about clean fuels across irrespective of gender & income group. However the same is low amongst students.

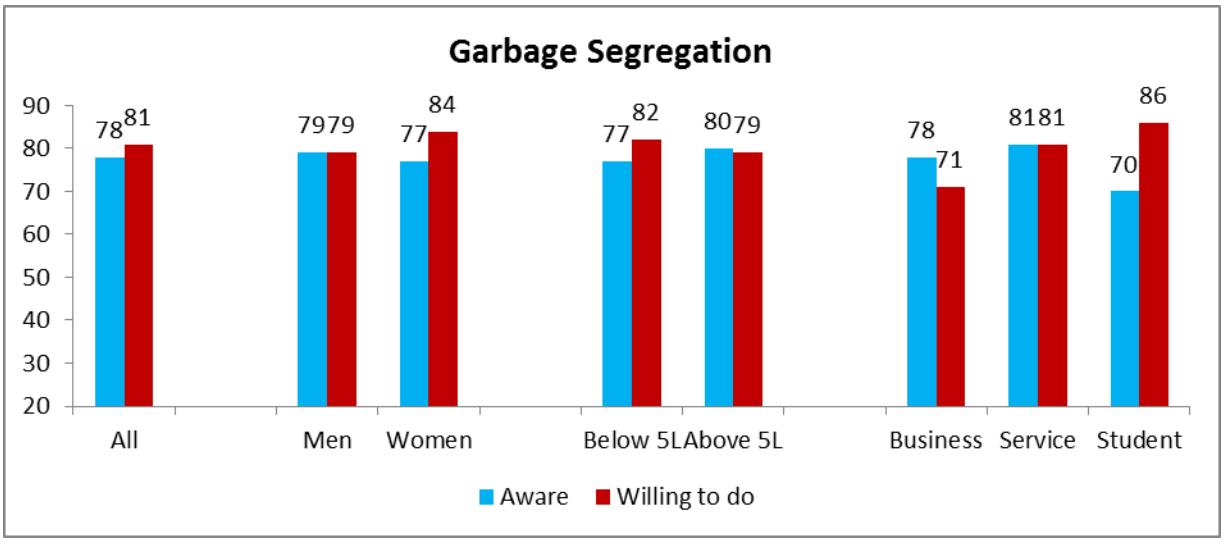


Further the total awareness of Bio Gas Fuel was about 88%, where 86% of those who are aware of bio gas fuel were also well acquainted with clean fuels. Also it is the businessmen/ shop owners who claimed to be aware of clean fuels but did not recognize Bio Gas to be a clean fuel.



(ii) Garbage Segregation

The questionnaire also covered issues regarding generation of domestic garbage and its management, thereof. The responses revealed that, 78% of the respondents were aware of garbage segregation techniques, while 81% were actually willing to do the same. Also 70% of the students were aware of garbage segregation methodology, but many more, about 86%, were willing to do it, while the business men were not too keen to participate in the garbage segregation as they felt that responsibility for segregation of garbage should rest with the Government or its nominated agencies.



Women were more willing to participate than men.

(iii) Advantages of Bio Gas & Willingness to Use it

The responses of the respondents with regard to their willingness to use bio gas revealed that the 72% of the target population who are ready to use it wish to do so, want to do it at the same cost as that of LPG consumption every month, i.e. about Rs.500. This willingness was higher for students (84%), who are keener to take the green initiatives, but are sadly not the true decision makers.

The responses further reveal that on provision of subsidy only 75% of the target population is willing to use bio gas fuel, which is higher amongst lower income group, who are more willing to use bio gas if subsidy is provided (79%).

The response of the respondents on the issues concerning the advantages of the bio-fuels / CNG has again brought out an interesting feedback wherein 11% of the respondents were not aware about the advantages of using bio-fuel; however this number was limited to 6% amongst the post graduates & businessmen.

The prime reason amongst various classes for not using biogas was the misconception that usage of this gas would cause a lot of unpleasant odour and that its calorific value would be very low, therefore, would take longer time to cook the same quantity than when cooked on LPG.

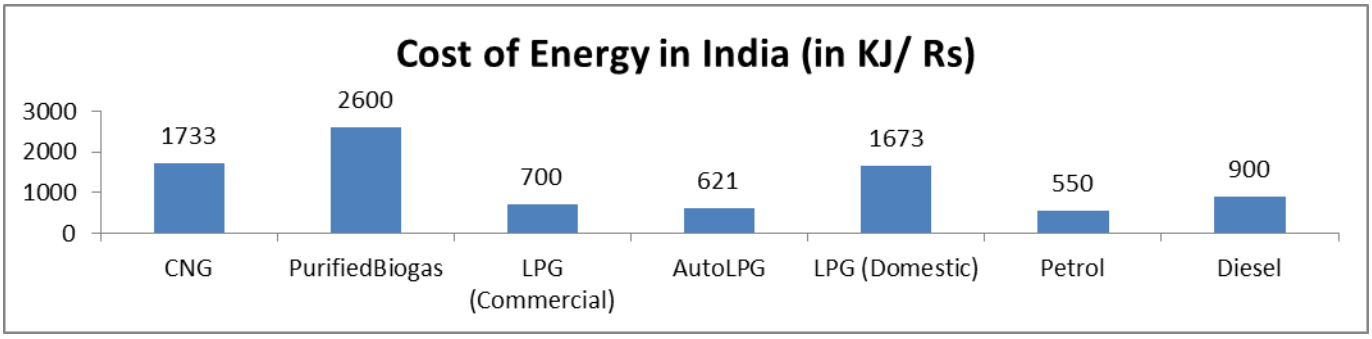
The secondary data by way of literature survey revealed that bio fuel is totally odourless and that the calorific value is the higher amongst the various fuels that are in use. The chart given below shows the composition of biogas and purified biogas.

Biogas & Biogas Purification- Biogas Purification refers to removal of the unwanted impurities (CO_2,H_2Setc) from the biogas	
Typical Biogas Composition:	Desired Purified Biogas Composition
• Methane:55–65% • -CO_2:35–45% • -H_2S:300–10000ppm(Depending on biomass) • -Moisture: Traces	• -Methane:92–97% • -CO_2:3–8% • -H_2S:<25ppm

	• -Moisture: Negligible

The secondary data shows that the purified biogas has better calorific value than other commercial fuels and is more cost efficient.

Fuel Cost Commercials: Purified Gas Vs Other Fuel	Calorific Value	Tariff/Rate/Cost	Cost of Energy
CNG	52000kJ/kg	Rs. 30.0/kg	1733 KJ/Rs.
Purified Biogas	52000 kJ/kg	Rs.20/kg *	2600 KJ/Rs.
LPG (Commercial)	46000kJ/kg	Rs. 65.7/kg	700kJ/Rs.
Auto LPG	46000 kJ/kg	Rs. 74.0/kg	621 kJ/Rs.
LPG (Domestic)	46000kJ/kg	Rs. 27.5/kg	1673 kJ/Rs.
Petrol	48000kJ/kg	Rs. 65.5/ltr	550kJ/Rs.
Diesel	44800 kJ/kg	Rs. 41.3/ltr	900 /Rs.



The study also reveals that in view of non standardization of bio fuel parameters, the target users are often doubtful about its efficiency / effectiveness vis-à-vis the existing fuel i.e. LPG. People often suspect that extensive use of bio CNG may adversely affect their utility equipment whether it's a generator, motor car or cooking equipment etc. Therefore, it is incumbent on the part of the Government, NGOs etc. to jointly initiate a sustained media drive to educate and sensitize the population at large about the advantages of using bio fuels on one side and on the other standardize the fuel and to notify its safest and most effective use so as to harness the advantages of using bio fuels toward a greener and cleaner future.

3. Learning for Students:

Students learnt the various techniques needed for research work, literature survey and sampling methods etc. Students from humanities and commerce background got an insight into the practical working of the plant where as science students learnt various techniques like stratified random sampling methods, statistical tools like regression and factor analysis and cluster analysis etc. The various workshops and seminars were conducted while working on the project. Students got to organise the events and create awareness amongst the masses about the renewable resources of energy. Since the biogas plant has been installed in the college premises, students from all faculties can see the practical working of the plant. Students learnt about the advantages of using green fuel which would create lesser pollution and subsequently less green house effect. Students were enlightened how the climate change can affect the living in the long run and if correct measures are not taken at this time, the future generations may have to

depend on oxygen masks. Optimum utilization of material resources is the need of the day so that sustainable development takes place and resources are made available for the future generations. Lastly but most importantly students developed leadership qualities and the project work inculcated a team spirit in them, especially during Antardhwani they shared a camaraderie with the students of other colleges. It gave them a sense of achievement which encouraged other students to get associated with the project work.

4.Benefits to College:

With due permission from the University and College authorities the college project team has got biogas plant of capacity one cubic-meter installed in the college premises and a plant capacity of 0.2 cubic-meter was fabricated by the project team. This plant runs on bio degradable waste generated from the college canteen, the biogas generated from this plant provides fuel to the staffroom kitchenette. This is the first step towards making the college a zero emission zone. The slurry generated from this plant is used as organic manure in the college lawns and garden. The biogas generated by the plant installed in the college will be saving at least one LPG Cylinder in a month. This economic benefit is also coupled with the benefit of using a green fuel i.e. it will help in reducing the pollution levels.

5. Benefits to Society:

Various workshops were conducted during the project tenure in the college and neighboring areas to create awareness about the manifold applications and benefits of biogas amongst the masses. Students explained the importance of going green and effects of green house gases, climate change and harmful effects. Two seminars were conducted in the college premises which was well attended by RWA members, faculty members of various colleges and Universities and media persons. Brochures & Pamphlets were distributed to those present and to residents of nearby localities. Those who attended the seminars were impressed with the plant installed and fabricated in the college premises and were eager to get the same installed in their localities. The same got a coverage in DOOR DARSHAN which was beneficial not only for the nearby localities but to the community at large.

6.Further Plans:

A biogas plant of higher capacity i.e. 10 cubic-meters can be commissioned in the college which will cater to the fuel needs of Chemistry lab and other science laboratories. A lot of LPG can be saved this way and most importantly the college will take a step towards being a zero emission zone. Slurry is obtained as a by product in the manufacturing process of biogas. Slurry so obtained is used as organic manure in the college garden and lawns. Comparative study can be made for the use of this organic manure in contrast to the fertilizers available. The slurry can also be used in the field of hydroponics (Soilless cultivation of plants). Hydrophone is a subset of hydro culture and is a method of growing plants using natural nutrient solutions in water without soil.

SRI AUROBINDO COLLEGE (EVENING)

Project Title: Strengthening Psychological Capital for Sportsperson

Project Code: SACE-101

Sushil Kumar, 2 times Olympic Medalist in Wrestling, with Dr.Mahesh Darolia and Mr.Pragyendu.

1.Objective (150 words):

The innovative project titled "Strengthening Psychological Capital for Sportsperson" aimed at exploring how psychological capital will influence performance and well-being of sportspersons. Psychological capital is a higher order construct comprising of hope, optimism, self-efficacy and resilience. The performance of sportsperson playing both individual as well as team events is very important and psychological capital has the potential for influencing the performance. In competitive sports (individual or team) well-being is of paramount importance which may provide the shield to see through the thick and thin of life. Keeping in mind these general frame-works, following are its specific objectives:

Psychological capital dimensions of self-efficacy, hope, optimism and resilience will influence well-being and performance of sports person.

The above relationship will differ across three sports events chosen for the present study.

2.Final Findings (300 words):

The project entitled "Strengthening Psychological Capital for Sports Persons" aimed at exploring how Psychological capital would contribute to performance as well as well-being of sports persons playing both individual games (Athletics, Boxing, Wrestling, Swimming) and team games (Cricket, Volley ball, Handball, Basket-ball, Water Polo). 153 participants belong to individual events while 147 were from team events. Suitable Psychometric tools having adequate level of reliability on the current sample have been established. Obtained data were analyzed using regression analysis in which Psychological capital was put as the predictor while performance indicators as well as indices of well-being were treated as criteria variables. Performance indices were developed by the present research team with thorough interactions with some of the key players in various games. Data were analyzed as a whole and also across events (Individual as well as Team) (Results are attached with the report for the kind perusal of the experts). In total there were eight performance indicators which were used in the present study. Performance indices which were significantly predicted by Psychological capital in the individual sports events were Learning & training, Team work, Process orientation, adaptability, communication, time management. In the team events Adaptability and Quality management were the only two performance indicators which emerged as significant criteria influenced by psychological capital. Combining the two (as a whole), Learning & Training, process orientation, adaptability, communication and time management were some of the important performance criteria emerged significant as predicted by Psy cap. The above description clearly shows that psychological capital is more influential in predicting individual sports events than team

events. This is in sync with the conceptualization of Psychological capital as the individual capacity to excel in various domains of life. This kind of conceptualization is quite common in the mainstream psychology literature as the onus is on the individual/human agency. Well-being is another construct which was used in the present research as how psychological capital influenced it. There are two conceptualization of Wellbeing in Psychology known as hedonic and eudemonic framework. While the first one focuses on current state of life as what gives pleasure in the current condition and the latter is deeper as it focuses on the meaning/goal of life. Keeping these two frameworks in the mind two indices corresponding the two were life satisfaction and psychological wellbeing. In both indices psychological capital emerged as the very significant predictor as the values of R square ranged from (.14 to .20) for life satisfaction and .20 to .29 for psychological well-being for individual, team sports events and as a whole.

3. Learning for Students (200 words):

As per the university guidelines 10 undergraduate students were selected for carrying out the field work and understanding the basic nuances of research. 5 workshops were conducted by the experts in the field such as Prof. G. Misra, Prof. Anand Prakash, Prof. N.K. Chaddha and Prof. M.G Shehnawaz from the field of psychology and some workshops were conducted by experts like Prof. Rakam Singh Sandhu, Prof. Lalit and Prof. Ashok Singh from the field of sports. The idea was to develop sensitivity and the skills required to conceptualize, choosing appropriate tools, doing field work and the skills to balance the demands of psychology and the sports. For young students the idea of sports is only about playing, fun, endorsements etc., with all this training and awareness, students realized that sports is like any other profession/career and the players also undergo highs and lows of success and failure. A subject like psychology has great potentials to provide the value to the growing field of sports.

For almost all the student volunteers, this was the first chance to step out of their home (on an academic voyage) and visit various sports institutions all over the country. Students have visited Bhiwani Boxing Club, Sports Centre of ONGC at Dehradun, Sports Authority of India, Bhiwani, Sonepat and Bangalore, Special Training Centre, LNCP Thiruvananthapuram, HSDC, Panchkula (Haryana), National Swimming Camp and UT Admin Stadium Chandigarh, National Swimming Championship, Pune, Jawaharlal Nehru Stadium Delhi, Indira Gandhi Stadium Delhi, Chattrasal Stadium Delhi, Hanuman Akhada Delhi, Indira Gandhi Institute of Physical Education and Sports Sciences, Delhi Etc. Student volunteer got the chance to interact and interview great sports persons of various fields such as Gautam Gambhir (Cricket), Sushil Kumar (Two times Olympic Medalist, Wrestling), Dinko Singh (Gold Medalist, Common Wealth Games, Boxing), L. Lakra (Gold Medalist, Asian Games, Boxing), Yogeshwar Dutt (Olympic Bronze medalist, Wrestling), Richa Mishra (Five times national Champion, Swimming), Sandeep Sehajwal (Olympian and National Champion, Swimming), Makhaya Jones (Olympian 4*400m Hurdle Race, Athlete), Suba Rao (Best smasher, Volleyball), Karim (Asian Best Basketball Player) etc. These exposures have definitely enhanced the self-confidence of the student volunteers. The sports persons mentioned above are the national heroes and these students would not have got chance in their life time perhaps to interact individually, listening to their life stories, their journey, struggles, set-backs, success, expectations, etc. as well as sharing meals with them. For many student volunteers these were the experiences of their life time and in these interactions they have seen actual ‘psychology in action’.

Student volunteers have attended as well as presented academic papers in various national as well as international conferences in the past one year. ..This has given them the exposure to meet national as well as international Psychologists and interact with them outside the formal classrooms.

During this period, the students who were a part of the research project participated in the following International/National Seminars and also presented their papers:

"International seminar on Trauma" organized by Jamia Milia Islamia.

International Seminar on Career Development organized by "India Career Development Association", New Delhi.

"National Seminar on Gerontology" organized by University of Delhi South Campus.

"National Seminar on Sports Psychology" organized by Indira Gandhi Institute of Physical Education and Sports, New Delhi.

National Seminar on Positive Psychology, organized by Kashi Vidyapeeth, Varanasi.

One of the students, Tanushree Mehra published a paper titled "Role of Psychological Capital in Sports" in the journal……

4. Benefits to College (100 words):

This was the first project of its kind in Sri Aurobindo College and benefited the college immensely. The students became oriented to research work and are now keen to learn more about interdisciplinary research. The research work has benefitted the students of physical education also and these students were able to bag medals in All India Inter-University Tournaments. As mentioned above, many workshops and a one day seminar was organized from the budget of the project. Great Psychologists and sports experts visited college on a regular interval in the past one year. Good international academic books were purchased and would be donated to the college Library after the completion of the project. As the various academic as well as field visits were carried out for the entire year, a positive and vibrant climate was visible for the past one year. As mentioned above psychological capital emerged as the significant predictor of individual sports event especially, this can be used to develop a competitive sports culture in the college.

5. Benefits to Society (100 words):

Psychological capital is one of the important ingredients of positive psychology which aims to identify and strengthen human capability and potentials. There is another important contribution of positive psychology i.e., inculcation of positive emotions which broaden our attention/thought/action repertoire unlike negative emotions which narrows these. The findings of the present research can be utilized to nullify the influence of negativity which pervades us, not only in the everyday life but also in the lives of sports person. For example: When the project started Gautam Gambhir was one of the faces of Indian cricket team, but now he is not a part of the team. Another example is that of Sushil Kumar who won two consecutive Olympic medals (and the only Indian) in wrestling and now Wrestling won't be a part of Olympics. The findings of the present study and the findings of the Positive psychology as such can be used to help these great stars of the Indian sports. The findings of the present research can be extrapolated in the life as such while getting admission, failure of not getting admission in the desired course/college, relationship issues with class mates, teachers, parents etc. can also be seen from the lens of psychological capital. Optimism and hope as two dimensions of psychological capital can help people in general to navigate their life in a more meaningful manner. If they encounter failure, resilience as another component would help them bounce back and resume their life with same energy and vigor.

6. Further Plans (100 words):

The present project was of an exploratory nature as the construct of psychological capital was linked to performance and well-being of the sports person for the first time. Results showed that psychological

capital influence performance and well-being significantly. However, the mechanism through which it happened could not be explored. In future the linkages through which psychological capital influence performance and well-being need to be explored. For example, the mediating/moderating role of social support and personality affect the importance of sports as a career, influence of coaches, sports federation etc. The future researches may also try to create a pool of character strengths, values, personality; psychological capital scores (optimism, hope, self-efficacy, resilience) on the basis of the most successful sports person of the country so that the next generation of sports person could be trained to achieve success.

SRI VENKATESWARA COLLEGE

Project Title: Survey of Trees in Delhi Region and Screening of Selected Medicinal Plants for Anti-cancer Activity

Project Code: SVC-101

Figure 1. Representation of activities during the investigation.

1. Objective

Trees are the key organisms for stabilization of our environment. In the last few years Delhi has witnessed extreme changes in the land use pattern due to urbanization. The comparison of the current forest cover assessment with the previous assessment (Satellite data of FSI October, 2006) shows a loss of 0.38 km^2 forest cover of Delhi. This loss is mainly attributed to the felling of trees for developmental purposes. Medicinal trees have long been associated with maintaining good health and curing ailments. Due to negligible side-effects and cost effectiveness, 75% of the world's population relies on herbal remedies, however only 15 % of all known plant species are screened for their medicinal value.With aforementioned facts, three main objectives of the project had been designed: to survey tree species in Delhi; to prepare the crude extract from various parts (such as root, bark, stem, leaves, flowers, etc.) of selected medicinal plants using various solvents; and to evaluate these crude extracts for anti-cancer activity against certain cancer cells. Additionally, antibacterial activity was also investigated in some selected plants by the Disc Diffusion method.

2. Final Findings

In our literature survey, the old and recent lists of tree species were compared. The old list was prepared from The Flora of Delhi by J. K. Maheshwari (1963) and recent list was prepared from book Trees of Delhi: A Field Guide by Pradip Krishen (2006) & thesis "Trees of Delhi" by Dr Anand Sonkar (2009). The older literature mentioned 178 species of trees belonging to 46 families, while the two recent sources of literature contain a total of 384 species belonging to 77 families. Additionally, comparing the old and recent lists provided information on the number of tree species which have disappeared or have been introduced, on a local level, during this time period. Out of the 381 tree species currently present in Delhi region, 219 species from 65 families have been introduced during the past 50 years. Some examples of the cultivated species are *Santalum album*, introduced from southern India, *Spathodea*

campanulata from tropical Africa, *Persea americana* from the Carribean, *Terminalia catappa* and *Syzygium jambos* from Malaysia, and *Shorea robusta* from Nepal (Mukherjee, 1988; ICRAF, 2006; Pant and Sharma, 2010). Meanwhile, 13 tree species from 10 families were found to have locally disappeared within these 50 years. Reasons for loss in forest cover are mainly urbanisation and development. Other reasons might exist but they are not known or lack evidence In addition, out of 381 recently reported tree species, 256 species have been found to be medicinal and a detailed table of these medicinal trees has been prepared stating their medicinal properties.

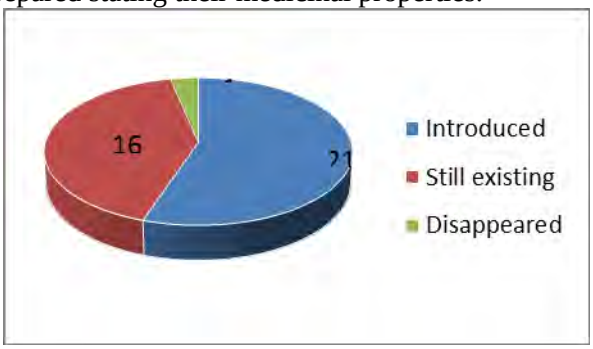


Figure 2. Composition of tree species since the past 50 years

Interestingly, encouraging results have been observed in the preliminary investigation on anti-cancer activity of selected medicinal plants *viz. Cressa critica* and *Holarrhena antidysenterica*. However, experiments are going on and final results are under progress. Besides, the extract of *Ficus elastica, Albizia saman* and *Caryota urens* were investigated for antibacterial assay and significant activity has been observed. Three review articles have been published in esteemed peer reviewed international journals, which enabled the team members to update the recent advances in the area.

3. Learning for Students

Since, the project is inter-disciplinary involving both chemistry and biology, students from various courses Botany, Chemistry, Biological Sciences and Life-Sciences were benefitted. During the literature survey and preparation of list of plant, students have learnt new computational tools by the means of managing, analyzing and drawing conclusions from the data. For the collection of plants for the preparation of crude extracts students visited several medicinal gardens. For the purpose, a visit to Kangra Herbs at Himachal Pradesh was organized in the month of September 2012 and during this, students could learn how to identifying trees using Taxonomic Keys etc. For extraction, students were trained to use Soxhlet Apparatus. While preparing tables of medicinal plants, students consulted several books and online databases such as Pubmed etc. For the same purpose, students also visited Central Science Library (CSL), Delhi University, North Campus to enhance their learning experience. While performing antibacterial assay, students learnt how to culture pathogenic bacteria with important precautions and investigate the action of plant extracts. Hence students learnt significant aspects of Microbiology.

One of the several important achievements of students was to publish three review articles in the journals of international repute. The team members were expertised to several sensitive experimental techniques such as MTT assay including culture of cell lines as well.

4. Benefits to College

The innovative project has given marvelous scope to discover the talents of undergraduate students and subsequently building a bridge between classroom concepts and hands-on. Besides, this opportunity proved to be a scientific stimulation for the faculty members. A three day national symposium on

"Recent Trends in Innovative Research at Undergraduation: Science and Society" was organized by Sri Venkateswara College from 28th February-2nd March, 2013. The Symposium was sponsored by Department of Biotechnology (Govt. of India) and University of Delhi.

5. Benefits to Society

Our investigation presents the current status of floral diversity in Delhi region. Medicinal plants have long been associated with maintaining good health and curing ailments. Furthermore, new antibiotics are needed to be invented due to resistance development in microbes, which is less seen in herbal medicines. In our study, we have found two plants having Anti-bacterial properties.

Meanwhile, cancer is a major global concern as it is prevalent in both developing and developed countries. The current procedure for the treatment of cancer is associated with several harmful side effects. Hence, present research on medicinal plants against cancer is an important step towards finding a better cure for this deadly disease, as screening of the medicinal plants/ plant parts is a primary step for the formulation of any herbal drug.

6. Further Plans

The recent literatures pertaining information on flora of Delhi indicated the disappearance of 13 trees species. The investigation of anticancer activity of selected medicinal plants is under way. However, the preliminary results are encouraging. It is planned to isolate the active molecules present in the crude extracts of the plant materials followed by their analytical and spectroscopic characterization.

Publications

JOURNAL OF PHARMACY RESEARCH 6 (2013) 488–492

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.elsevier.com/locate/jopr

Review Article

Evaluation of phytochemical and pharmacological aspects of *Holarrhena antidysenterica* (Wall.): A comprehensive review

Snehadri Sinha [a], *Aishwarye Sharma* [b], *P. Hemalatha Reddy* [c], *Brijesh Rathi* [d], *N.V.S.R.K. Prasad* [b], *Amit Vashishtha* [e,*]

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[c] *Department of Biochemistry, Sri Venkateswara College, University of Delhi (South Campus), Dhaula Kuan, New Delhi 110021, India*
[d] *Department of Chemistry, Sri Venkateswara College, University of Delhi (South Campus), Dhaula Kuan, New Delhi 110021, India*
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JOURNAL OF PHARMACY RESEARCH 6 (2013) 224–229

Available online at www.sciencedirect.com

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Review Article

A review on *Schleichera oleosa*: Pharmacological and environmental aspects

Harsh Bhatia [a,d], *Jaspreet Kaur* [a,d], *Shreya Nandi* [a,d], *Vinita Gurnani* [a,d], *Anushua Chowdhury* [a], *P. Hemalatha Reddy* [b], *Amit Vashishtha* [c], *Brijesh Rathi* [a,*]

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Drug Invention Today
ISSN: 0975-7619
Review Article
www.ditonline.info

Versatile Applications of *Bryonia laciniosa*: A Herbal Drug

Harsh Bhatia[1], Jaspreet Kaur[1], Monika[1], Shreya Nandi[1], Vinita Gurnani[1], Ram Kishan[2], Amit Vashishtha[3], B. Rupini[4] , Brijesh Rathi[1]*

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Abstracts

- "Survey of Trees in Delhi and Screening of Selected Medicinal Plants for Anti-Cancer Activity" presented an oral talk in the National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society (RTIRUGSS) during 28th February to 2nd March, 2013 Sri Venkateswara College, Delhi University, New Delhi. Aishwarye Sharma, Snehadri Sinha, Shruti Sharma, Brijesh Rathi, Amit Vashishtha and NVSRK Prasad.

- "Survey of Trees in Delhi" in the proceedings of National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society (RTIRUGSS) during 28th February to 2nd March, 2013 Sri Venkateswara College, Delhi University, New Delhi. Snehadri Sinha, Aishwarye Sharma, Shruti Sharma, Brijesh Rathi, NVSRK Prasad, Amit Vashishtha.

- "Survey of Trees in Delhi and Screening of Selected Medicinal Plants for Anti-Cancer Activity" in the proceedings of "Antardhwani" during 22-24 February, at North Campus, University of Delhi, New Delhi. Aishwarye Sharma, Snehadri Sinha, Shruti Sharma, Brijesh Rathi, Amit Vashishtha.

SRI VENKATESWARA COLLEGE

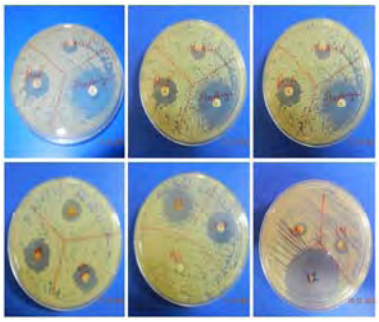
Project Title: Screening of Cyanobacteria for Compounds with Antimicrobial activity and to explore their Biosynthesis and Regulation by Heterochromatin

Project Code: SVC-102



yanobacterial sample collection sites





bioactive molecules

1. Objectives:

Cyanobacteria constitute a un ique group of oxygenic photosynthetic bacteria especially photosynthetic oxygen-evolving proarchconservate i.e., cyanobacteria with their ability to produce unparallel array of secondary metabolites and also for the presence of gene that produce them. Cyanobacterial bioactive secondary metabolites including alkaloids, isoprenoids, polyketides and non–ribosomal peptides. and populate diverse habitats throughout the world. Their potential as a good source of new therapeutic lead compounds has been realized during the last two decades. Another advantage of cyanobacteria as a microbial source for drug discovery lies in the economy of their cultivation compared with other microorganisms, as they require only simple inorganic nutrients for growth. Thus, it seems that the cyanobacteria have the potential for expanded utilization in drug discovery. Various studies have focused on the typically encountered environmental factors (temperature, light, nitrogen, iron, phosphate)

predators, and other microorganisms that may influence changes in the production of secondary metabolites. It has been identified by recent research that presence of several ncRNAs (cyanobacterial functional RNA or Yfr) in several cyanobacteria regulated stress response. In response to regulated changes in gene expression, central and secondary metabolisms are redirected to cope with the undesired effects of the hostile situation. This is achieved by up-regulating the synthesis of proteins and metabolites.

The present work has two objectives:

i) Screening the cyanobacteria for antimicrobial activity, and

ii) To study the relation between bioactive molecule production under stressed environment and stress regulating non-coding RNAs.

2. Final Findings :

Cyanobacterial samples were collected from different places including Delhi (Hauz khash, Indiagate, Satyaniketan, Nazafgarh, Ranikhera) and NCR (Manesar, Noida) were screened for antimicrobial activity. Purified strain Anabaena (by curtsey of Bitotech department, AMITY) along with Microcystis collected from Johad used for rest of the experiment. The Isolated strains were cultured in BG11 and CHU-10 medium at 28 °C under continuous irradiance with periodic shaking Subsequent to identification of antibacterial activity of *Anabaena* and *Microcystis,* it was imperative to determine the exact cell age as secondary metabolite (intracellular) production is a function of age estimated by growth behavior of cyanobacterial strain on the basis Protein estimation and specific growth rate was calculated according to Kartz and Mayer Photoautotrophic growth was compared at different temperatures (35 and 28°C). The best growth we have seen at 28°C and this temperature was selected for cyanobacterial growth. . Because the production of bioactive molecules is a factor of age. In the present context, also cyanobacterial biomass at 30 d old was processed for antibacterial bioassay. Since secondary metabolites are produced in the pre-stationary phase/stationary phase, it was imperative to harvest the cyanobacterial biomass for intracellular biomolecule at selected time. Extracts from cyanobacterial biomass at 30 d, produced larger inhibition zones, reflecting that the duration was optimal for procuring the intracellular metabolites. During preliminary findings for solvent potential it was observed that methanolic extract had more bactericidal property than DMSO and water. Bioassay for antibacterial property of methanolic extracts using both pathogenic (*Escherichia coli*) and non-pathogenic (*Enterobactar aerogenes*) bacteria were done and observed that *Anabaena* collected from water tank (Manesar) showed two times more baericidal activity than purified one against *E. aerogenes*. *Microcystis* from Manesar and Ranikhera johad expressed maximum activity while same genus from RaniKhera Devali and Huaz Khas pond did not showed any effect on *E. aerogenes*. the intracellular methanolic extract from same genus collected from different habitats didn't show same activity against bacteria, suggesting that may be the production of bioactive molecules is niche and species specific. Against pathogenic bacteria (*E. coli*) maximum potential showed by purified Anabaena (AMITY) while lowest by *Oscillatoria* (Satyaniketan). We have also studied stress response of cyanobacterial Biomass under nitrate, phosphate & sodium chloride by adding mentioned component in culture media of cyanobacteria. We observed there were significant effects on biomass under different concentration of stress. The cyanobacterial biomass (stressed) were collected but expression level of proteins will be examine along with interaction of regulating non-coding RNA under different stress condition in coming year. Because of time constraint we are unable to achieve our aim.

3. Learning for Students :

Being under graduate students didn't had any knowledge or experience of research field, which they all earned by doing this project. They started learning from basics, knowing about cyanobacteria, collecting samples, etc.. We learned that such tiny particles can be of great significance.

- While doing our work students got to see and use different instruments which till now they have just read in books.

- Learning of different techniques for example how to do SDS PAGE ,operating rotatory evaporator, laminar flow, autoclave, growth chamber etc.
- Precautions during handling hazardous chemicals and sensitive microorganisms.
- Field experience to do research work
- . During this project they had read a lot about different work going in the related field and develop a habit to read the journals, research articles, etc. which is going to be very helpful in future.
- Learn how to study antimicrobial activity of cyanobacterial compounds (secondary metabolites) against pathogenic and non-pathogenic bacteria
- How to correlate our observation with the previous research work and already verified theories and principles
- Experience of writing report, research articles, review articles for publications.
- Increase curiosity to know things more and more
- They also got experience to organize symposium, and also got to visit few places and learn about their work in the field of research and biology.
- During organizing seminar , conference , symposium antardhawani we got a chance to interact with professors, scientist and other students of other projects and share great experience about their work and benefits from the projects for society through all the research work carried out by different colleges of university from which they get new ideas and developed their confident.
- At the time of conferences they pointed out weak points and also what they are able to do more research simultaneously with some more hard work.
- We all learned something new, something different, and something out of our textbooks which was the greatest experience.
- The best thing we learnt from this project was to work together, to work in a team as one. Need of coordination and support of each every person from lab assistant to faculty and support from university to carry out any research work

4.Benefits to College :

- The college was also benefited a lot from this project. Innovative project provide a platform to all colleges to show that they good enough to give education only but also prepare students for future research work.
- When research work got it done by students, across several new techniques for which new instruments are required which are beneficial for other academic purposes and also labs are get modified for research work without any compensation in quality for other students .
- Research work and their related publication is a great additive to achievements for any college or university as after graduation it is carried in almost every university. By this project our college also became a prominent name in the field of research
- Our college got to organize a national symposium which was of great success.
- Due to these projects our college made changes in the labs and teaching methods.
- The quality and quantity work carried out by colleges helps not individually but also university in attaining rank in INDIA.

5. Benefits to Society :

- These cyanobacterias are present everywhere and in ample amount; these creatures can survive the adverse conditions.
- Many genera of cyanobacteria can be used directly as biofertilizer for example *Anabaena* and *Nostoc* which reduce the dependence on fertilizers and ultimately save environment.

- Secondary metabolites obtained from cyanobacteria used as antimicrobial compounds which can be used for so many purposes like for making drug, biocides.
- We can do mass production of particular useful compound on identification
- During screening we found any species or genera whose handling and mass production is cost effective can serve as model organism for further research work and many biotechnology applications.
- Some cyanobacteria produce toxins, called cyanotoxins which can be toxic and dangerous to humans as well as other animals and marine life in general. Several cases of human poisoning have been documented but a lack of knowledge prevents an accurate assessment of the risks.
- Recent studies suggest that significant exposure to high levels of some species of cyanobacteria producing toxins such as β-Methylamino-L-alanine can cause amyotrophic lateral sclerosis. The Lake Mascoma ALS cluster and Gulf War veteran's cluster are two notable examples.Screening of cyanobacteria from various sites helps in idenfication of such water bodies, if exist than we can inform to concerned department of government for proper solution

6.Further Plans :

- We can extend our research work at the genetics level and study experession of non coding regions of genome not only under different salt stress conditions but also under the influence of nano particles.
- We can also study that the mass production of the strain we identified is possible or not and also calculate is it cost effective.
- We can also culture the strain of cyanbacteria from which biodiesel production is possible
- We can also find out the species which can be used as dietary supplements.
- Try to find out the strain which helps in bioremediation.
- We can try to find out the species from which we get raw material for making biodegradable plastic
- Try to find out the species which can be used in catalytor of vehicles to reduce air pollution
- We can try to find out anticancer compounds and compounds effective in increasing immunity especially in HIV infected persons

Publications and Poster Presentation

i) Screening of cyanobacterial strain from Delhi and NCR for antibacterial potential.
Sachin Chauhan, Pooja Dabas, Indu Malik, Naveen Kumar, Sonam Kumari, Ashu Vats, Shweta Tripathi, Krishan Jakhad, Hitesh Agrawal, NVSRK Prasad, KV Giri, Deepali* (to be Communicate…)

ii) Bioactive compounds from cyanobacteria : "A review"
Shweta Tripathi, Pooja Dabas, Sachin Chauhan, Naveen Kumar, Indu Malik, , Sonam Kumari, Ashu Vats, Krishan Jakhad, Hitesh Agrawal, NVSRK Prasad, KV Giri, Deepali*
(Communicated….)

Abstracts:

i) Cyanobacteria: Identification of different strains from Delhi and NCR

Pooja Dabas , Sonam Kumari, Shweta Tripathi, Naveen Kumar, Indu Malik, Sachin Chauhan, Ashu Vats, Krishan Jakhad, Hitesh Agrawal, Manoj Kumar Gautam, NVSRK Prasad , KV Giri, Deepali*, RECENT TRENDS IN INNOVATIVE RESEARCH AT UNDERGRADUATION: SCIENCE AND SOCIETY 28 Feb - 2 March 2013, Sri Venkateswara College, University of Delhi , New Delhi-110021.

ii) Extraction and Bioassay of antimicrobial compound from isolated strains of Cyanobacteria.

Pooja Dabas, Sonam Kumari, Shweta Tripathi, Naveen Kumar, Indu Malik, Sachin Chauhan, Ashu Vats, Krishan Jakhad , Hitesh Agrawal, Manoj Kumar Gautam, NVSRK Prasad, KV Giri, Deepali[*],[*], RECENT TRENDS IN INNOVATIVE RESEARCH AT UNDERGRADUATION: SCIENCE AND SOCIETY, 28 Feb - 2 March 2013, Sri Venkateswara College, University of Delhi , New Delhi-110021

iii) Environmental and age factor controls the biomolecule production

Pooja Dabas, Sonam Kumari, Shweta Tripathi, Naveen Kumar, Indu Malik, Sachin Chauhan, Ashu Vats, Krishan Jakhad , Hitesh Agrawal, Manoj Kumar Gautam, NVSRK Prasad, KV Giri, Deepali[*], [*], RECENT TRENDS IN INNOVATIVE RESEARCH AT UNDERGRADUATION: SCIENCE AND SOCIETY , 28 Feb - 2 March 2013, Sri Venkateswara College, University of Delhi , New Delhi-110021.

SRI VENKATESWARA COLLEGE

Project Title: Comparative Anti-oxidant Profiling of Various Indian Rice Cultivars in Response to Salinity Stress

Project Code: SVC -103

Project team at work in JNU Laboratory, field study at Dhramasala, H.P., Rice cultivation in hilly areas of Dharamshala, H.P.

1.Objective (150 words):

Salinity in soil or water is of increasing importance to agriculture because it causes a stress condition to crop plants. Particularly for rice (*Oryza sativa* L.), a species native to swamps and freshwater marshes, secondary Stalinization is becoming an increasingly serious production constraint (Akbar and Ponnam peruma, 1980). Because of the inherent sensitivity of rice plant to salt stress (Francois and Mass, 1994), there has been a great interest in developing varieties that are resistant to salinity. Defining salt tolerance, however, is quite difficult because of the complex nature of salt stress and the wide range of plant responses.

Present proposal was designed to determine the effect of salt-stress on anti-oxidant enzyme activities, electrolyte leakage and Na^+/K^+ content of various Indian rice cultivars. In the present study, comparative effects of salt-stress have been investigated for rice [Indian cultivars] by considering anti-oxidant responses of young seedlings together with biochemical and physiological analyses like proline, chlorophyll estimation, electrical conductivity and Na^+/K^+ content. Results from this study have supplied information on the possible involvement of different anti-oxidative enzymes under salt-stress. Understanding the biochemical and physiological basis of salinity could help in selection and improvement of rice, which is an agronomically important plant.

2.Final Findings (300 words):

Oryza sativa L. is one of the most important crops all over the world and is considered to be the primary staple food for half of world's population. Extensive research is being carried out worldwide for further improvement of rice cultivars to adapt according to the environment with high yield. Rice plant is known to be a glycophyte hence susceptible to salt stress. Exploring the physiological and biochemical mechanism of salinity could be helpful in the selection of rice cultivar for the agriculturists as well as breeders. There are few reports where salt tolerance mechanism in rice cultivars has been studied but these varieties have not been studied so far. Our preliminary findings indicate that there were substantial differences between the morphological, biochemical and physiological parameters of all Indian varieties studied. Salt sensitive varieties exhibited high Na^+ accumulation, and increased activity of antioxidant

enzymes like superoxide dismutase, glutathione reductase, catalase, peroxidise and proline as compared to salt tolerant varieties. In order to see the effect of salt stress in rice, various rice cultivars, *Pusa sugandha*, HBL24, IR 64 and Pokkali etc have been selected for this study. The present study indicated that salinity stress caused significant changes in morphological parameters including decreased root length, shoot length and fresh weight and activity of antioxidant enzymes in different varieties of *Oryza sativa*.L. Significant enhancement was detected in activities of all 4 enzymes as compared to control or Untreated plants. But there were substantial differences in Enzyme activity when compared between different varieties.

Rice cultivars viz., PB-1, Pusa Sugandha, HBL-24, Parmal, CSR 30, PNR-162, Pusa-44 were screened for salt stress to measure electrolyte leakage and Na^+ / K content. . Among these varieties we found that CSR 30 and HBL were semi-tolerant while rest were sensitive to salt stress because in these two varieties the Na+/K+ concentration were higher as compared to other and very similar to that of controlled samples. In case of electrolyte leakage, it was found that the change in the electrolyte leakage in these two varieties were very less as compared to the sensitive varieties. In case of sensitive varieties the sodium uptake was high as compared to the semi-tolerant varieties.

This suggest that Plants of Variety *Pokkali* also known to be a Salt tolerant variety exhibited highest adaptive potential under salinity stress as evident by the changes in growth parameters and antioxidant defense mechanism as compared to other varieties. The above findings will be beneficial for agriculturists and biotechnologists to select the appropriate variety, either to be grown or genetically engineered.

3.Learning for Students (200 words):

Benefits

The project has brought research temper to the college teaching environment which contributes to the innovation and pedagogical skills which allow students to engage and expand their knowledge of frontiers of modern research at an early stage. The collaboration with JNU has been an asset to the college and students, getting exposure to hi-tech research. Funds allocated for field visits were particularly helpful in giving exposure to the students which helped them in learning the various aspects of rice cultivations. They observed that rice grows differently in different climatic conditions. There is classic change in the vegetation as one goes from the plains to mountainous areas. There are various practices of rice cultivation in the hilly areas. There are two main ecosystems under which rice is cultivated- irrigation ecosystem and rain fed upland ecosystem. They studied about various hybrid varieties of rice like pokkali. IR64, parwmal, HBL-24 etc, collected seed samples from their trip to Dharamshala and IARI, pusa road. The seedlings were grown using the technique of hydroponics and were tested for various morphological parameters like root length, shoot length. They learnt about various enzyme assays and the effects of salt stress on them. Other benefits of the project include equipment handling, gaining the experience of working in laboratories and doing some research work, preparing and maintaining data books, the importance of team work and dedication. Working in the project not only helped them in gaining experience in the field of research work but also helped enhanced their knowledge and other soft skills which would benefit them in the future.

4.Benefits to College (100 words):

Introduction of projects has enabled the application of classroom concepts realistically into a project. The college garnered extramural fundings and reputation through this project. This project published its papers in journals and represented the college in symposiums. The college organized its own National Symposium this year where in many colleges participated and showcased their work. As the project demanded, new equipments were installed in our lab which made the tasks easier to perform and also improved college's infrastructure. The project reduced the barrier between a mentor and a student. Thanks

to the Innovation Project the college now constitutes a faculty which is stimulated, disciplined and who have the ability to reinvigorate one's career and promote lifelong learning for students.

5.Benefits to Society (100 words):
This project has cogitated deeply on raising awareness about a major problem the staple food of India is facing which is salinity. If the farmers are made aware of the correct classification between a salt sensitive rice variety and a salt tolerant rice variety, they can improve their farming techniques yielding better productivity. The plant biotechnologists can savor the taste of research by following a reliable data and conceptualizing a way to convert a salt sensitive rice variety to a salt tolerant rice variety which will be of much profit to the agriculture and economic world. The Indian society would benefit from it because with the growing population the net rice productivity of the country will increase hence stepping closer to solving food crisis.

6.Further Plans (100 words):
Due to time constraint, only few varieties have been screened for salinity Stress. The project further plans to screen more varieties with already standardized protocols. The best screened varieties (salt tolerant as well as salt sensitive) can be used to further analyze at the molecular level. Due to salt-stress the structure of chromatin changes in cells undergoing plant cell death (PCD). In some forms of PCD, fragmentation of the DNA between nucleosomes takes place. These cells could be assayed for DNA fragmentation using TdT-mediated dUTP nick-end labelling (TUNEL) assay, which incorporates florescent nucleotides where DNA is nicked. Extent of DNA damage could be measured using this type of florescence microscopy in salt tolerant and salt-sensitive varieties.
Transgenic approach can easily be applied to salt-sensitive varieties of rice and one can compare the transgenic plants with the controlled ones to understand the complete mechanism of up regulation of various anti-oxidant genes involved in salt-stress.

7. Publications and Abstracts:
Research Article
"Role of antioxidant enzymes in response to salt stress in Indian rice cultivars". Vinita Sindhi, Manisha jain, Deepti Josula, Deepti Rana, Pooja Bisht, Kameshwar Sharma YVR*, Nandita Narayansamy, Pragya Gahlot, Prasad NVSRK, Neeti Mehla and Ashwani Pareek. *(Communicated in Plant Science ref no. PSL-S-13-00501).*
Review Article
Antioxidant response of plants under abiotic stress – A Review. Vinita Sindhi, Deepti Josula, Pooja Bisht, Kameshwar Sharma, Nandita Narayansamy, Prasad Neti, Ashwani Pareek, Neeti Mehla*. (Communicated in Journal of Physiology and Biochemistry ref no. JPBY- S- 13-00279).

Abstracts
"Comparative Antioxidant Profiling of Various Indian Rice Cultivars in Response to Salinity Stress" in National Conference on Redefining Science Teaching: Future of Education in the proceedings of "during 7-9th March, 2013 at University of Delhi South Campus, Organized by Acharya Narendra Dev College, University of Delhi, Delhi.
Vinita Sindhi, Deepika Arora, Manisha Jain, Deepti Josula, Mahesh Singh, Pankaj Chuadhary, Neeti Mehla, and Kameshwar Sharma YVR*.

Differential response of Indian rice cultivars to salt stress with reference to osmoprotectants and antioxidant enzymes" presented an oral talk in the National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society (RTIRUGSS) during 28th February to 2nd March, 2013

Sri Venkateswara College, Delhi University, New Delhi, India PP.13. Manisha Jain Vinita Sindhi, Deepika Arora, Pankaj Chaudhary, Mahesh Singh, Deepti Josula, Pragya Gahlot, Kameshwar Sharma, Nandita Narayansamy, NVSRK Prasad, Ashwani Pareek, Neeti Mehla*

"Statistical and spatial analysis of Rice cropping pattern in India" in the proceedings National Conference on Redefining Science Teaching: Future of Education "during 7-9th March, 2013 at University of Delhi South Campus, Organized by Acharya Narendra Dev College, University of Delhi, Delhi. Pooja Bisht, Twinkle Sethi, Deepti Rana, Vartika Gupta, Pragya Gahlot, Kameshwar Sharma, Nandita Narayansamy, NVSRK Prasad, Ashwani Pareek, Neeti Mehla*

"Comparative Antioxidant Profiling of Various Indian Rice Cultivars in Response to Salinity Stress", in the proceedings of Antardhwani during 22-24 February, at North Campus, University of Delhi, Delhi. Manisha Jain Vinita Sindhi, Deepika Arora, Pankaj Chaudhary, Mahesh Singh, Deepti Josula, Pragya Gahlot, Kameshwar Sharma, Nandita Narayansamy, NVSRK Prasad, Ashwani Pareek, Neeti Mehla*

"Statistical and spatial analysis of Rice cropping pattern in India" in the proceedings of National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society (RTIRUGSS) during 28th February to 2nd March, 2013 Sri Venkateswara College, Delhi University, New Delhi, India. Pooja Bisht, Twinkle Sethi, Deepti Rana, Vartika Gupta, Pragya Gahlot, Kameshwar Sharma, Nandita Narayansamy, NVSRK Prasad, Ashwani Pareek, Neeti Mehla*

"Study of Na+ / K+ ratio and electrolytic leakage as responses of various rice (Oryza sativa) varieties to salinity stress" in the proceedings of National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society (RTIRUGSS) during 28th February to 2nd March, 2013 Sri Venkateswara College, Delhi University, New Delhi, India. Mangleswar Singh, Priyanka Hooda, Pragya Gahlot, Neeti Mehla, Kamesh Sharma, Nandita Narayansamy, NVSRK Prasad and Ashwani Pareek

SRI VENKATESHWARA COLLEGE

Project Title: Screening of Indian population for possible polymorphisms in candidate genes of extracellular matrix proteins that could lead to Disc degeneration leading to Herniation

Project Code: SVC-104

Students visited NIPER in chandigarh to get hands on training.

1. Project summary

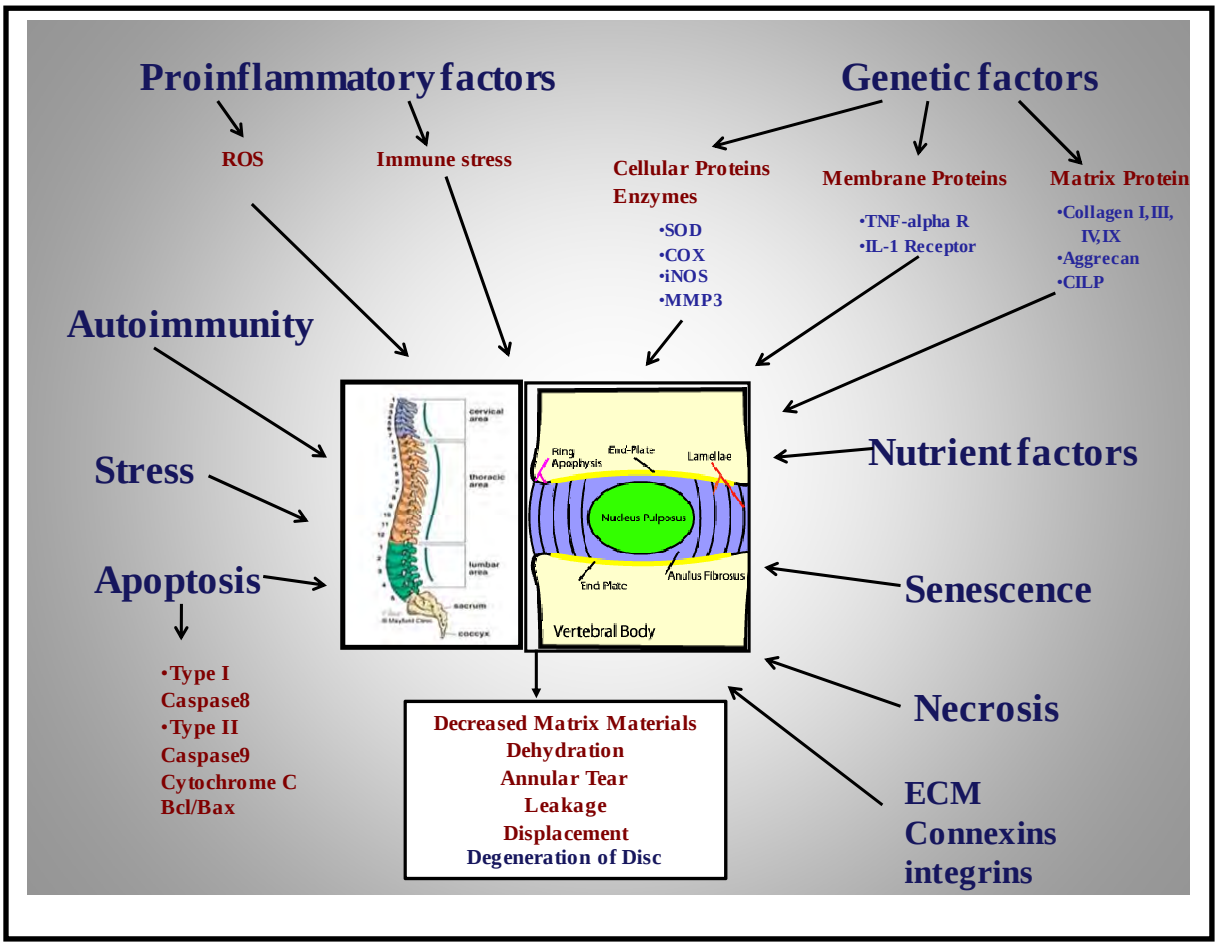
Basic science research has demonstrated that the intervertebral disc is largely an avascular tissue occupied by inadequately characterized cells in an extensive extracellular matrix network. The central gelatinous nucleus pulposus is contained within the more collagenous anulus fibrosus laterally and the cartilage end plates inferiorly and superiorly. The annulus consists of concentric rings or lamellae, with fibers in the outer lamellae continuing into the longitudinal ligaments and vertebral bodies. This arrangement allows the discs to facilitate movement and flexibility within what would be an otherwise rigid spine. Biochemically, the important constituents of the disc are collagen fibers, elastin fibers, aggrecan, glycoaminoglycans and other associate adhesion proteins like integrins and connexins.

Lumbar disc degeneration occurs commonly in humans. There are a variety of factors that contribute to this condition. The disc itself is an active tissue that contains significant mechanisms for self-repair. The strength of the lumbar disc is related to the fluid and proteoglycan content of the disc.

The proposed study will aim at understanding the importance of ECM and cell adhesion molecules in disc cell integrity. The genetic variants will help us identify populations groups which can be susceptible to disc degeneration (if any) .The study also aims in understanding stress related factors associated with disc degeneration which could be an underlying cause for oxidative stress by checking levels of TNF-alpha, IL-6 and IL-1 in the plasma.

The biochemical events that occur with the 'aging spine' and in particular, the role of inflammatory mediators in intervertebral disc degeneration have not been studied assertively Screening the normal and the diseased population for the presence of polymorphic variants of collagen and to assess the association of apoptotic induced disc herniation in relation to pro-inflammatory stress condition could be a new beginning to the therapeutic interventions for spinal disc problems.

Aim: The screen the Indian populations for possible polymorphisms in candidate genes of extracellular matrix proteins that could lead to Disc herniation"



A model showing the multifactorial pathophysiology of disc degeneration; factors may behave independently as initiators or promoters or both.

1. Objective :

(i) To study genetic polymorphisms in matrix protein
- collagen IX,
- fibronectin,
- aggrecan

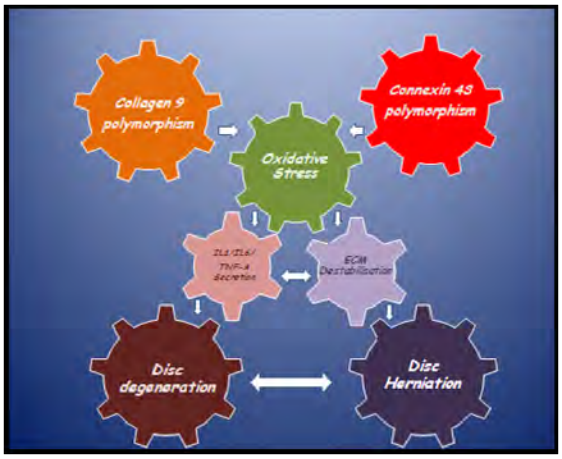
cell adhesion proteins
- connexins
- integrins.

(ii) To study role of gap junction proteins connexin by checking their levels in herniated disc samples and compare with control samples.

(iii) To check levels of TNF-alpha, IL-6 and IL-1 in disc lysates and plasma

(iv) Epidemilogical survey to check prevelance of LBP in Delhi-Indian population

2. Final Findings : SUMMARY



Model showing the influence of genetic factors on the stress induced pathophysiology of *Disc Herniation*

- The histopathological study with intervertebral disc showed very loosely packed ECM with chondrocytes and fibroblasts.(Annexure-1)

- The PCR protocols for all the selected exonic regions were standardized ,Samples amplified and sequenced for col9a1,col9a2,col9a3,connexin43,integrin beta1 and fibronectin (Annexure-1

- Col9a1 samples for exon 29-(col9a1 and col9a2 triple helical site from aa 418-756) have been amplified and sequenced with diseased samples showing heterozygous variants at amino acid position 621 from glutamine to arginine(Change allele: cag to cgg) where as healthy samples did not show any variations (Annexure-2)

- Col9a2 was amplified for exon 19 and sequenced -heterozygous variants at amino acid position 336 from glutamine to Arginine were identified in diseased samples-(Change allele: CAG to CGG) where as healthy samples did not show any variations

- COL9A3 exon 5 was amplified and sequenced – no variants at position amino acid 103 arginine to glutamine was identified in diseased samples-change allele is CGG-CAG)

- Connexin43 exon 2 was amplified and sequenced - variant at position 362 CGA-CAA (Arg –Gln) and 376 CGG-CAG (arginine –gluramine) The SNP at amino acid 362 and 376 which is the binding site for connexon hexamers. We assume this variant could be hindering the hexamerisation process of gap junction proteins leading to disc degeneration.

- Fibronectin exon 9 and 29 were amplified and sequenced , no variation was identified.

- Integrin α1β 1-EXON 6 Samples were amplified and sequenced and no variants were identified.

- Aggrecan samples were also amplified and most of the samples had 13 tandem repeat numbers of amplicon 775 bp for both healthy and diseased

- The levels of IL-6 and IL-1β in plasma as well as in the disc lysates was elevated significantly in the diseased samples compared to the healthy samples($p<0.0118$). There was no statistical correlation between the levels of TNF-alpha between the 2 groups

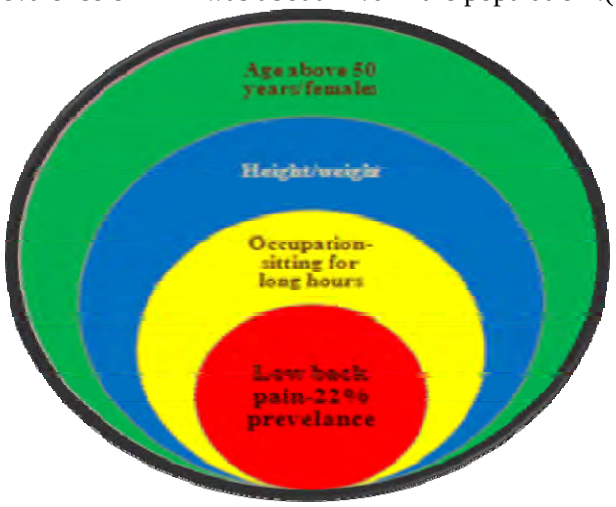
- Connexin 43 levels were very high in diseased samples ($p <0.0008$) possibly showing that they are not getting incorporated into the membrane due to polymorphic variants at the site of Arg phosphorylation(Annexure-3)

- Two hundred and eighty five respondents (66(36%) males and 119 (64%) females) participated in the study through a questionnaire(Annexure-6)

- LBP was more prevalent among females (76%) than the males (63%).Majority of the sample i.e. 170(92%) people neither had a family history of back pain nor an injury was the cause.

- In the observed sample, 53 individuals (29%) do not have any LBP problem, whereas around 45(25%) suffers from mild pain and 9(0.048%) of them have a severe problem.

- Chi square analysis showed the statistical correlation between the groups having LBP.The prevalence of LBP was about 22% in the population .(Annexure-



4)
Conclusion

Low back pain has become prevelent in the present population with an estimated rate of 22%.This could also be progressing to Disc degeneration leading to herniation. The lumbar discs most often affected by degeneration that leads to herniation are L4-5 and L5-S1, most probably

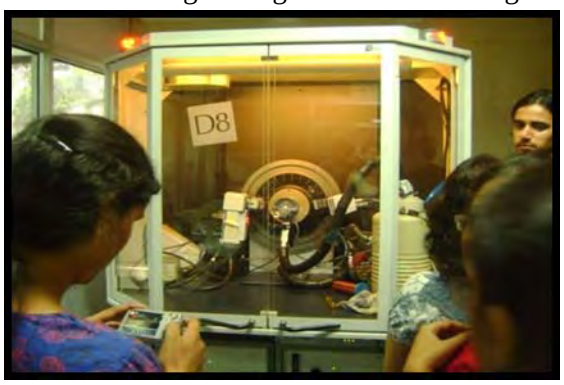
because of a combination of longstanding degeneration and a subsequent change in the ability of the disc to resist applied stress. Genetic factors identified could be triggering factors for the IVD degeneration. Among the 5 candidate genes screened, Connexin 43 and Col9 showed variation that positively correlated to disc herniation. Connexin 43 PCR patterns can be used as a marker to identify Disc hernaition in patients reporting with severe LBP. Similarly, IL-6 levels in blood could be used to identify the stages of Disc Degeneration/herniation. This study has been the first initiative to start basic science research in Disc degeneration in India.

3.Learning for Students :

(i) Students got the opportunity to attend brain tumor and Intervertebral disc removal surgeries with the Mentor Dr.Sandeep Vaishya at Fortis Hospital

(ii) Students Attended the International Asia Pacific Orthopaedic Association Conference 2012(APOA) at the Asoka Hotel 4th to 6th October 2012 with the mentor Dr.S.Rajasekaran and got an opportunity to listen to lectures on new developments in the field of spine.

(iii) Students visited NIPER in Chandigarh to get hands on training on latest instruments



(iv) Students attended Anthardhwani to show case their Innovative talents at North Campus University of Delhi

v) Students presented posters in "*National Symposium On Recent Trends In Innovative Research At Undergraduation: Science And Society"*

(vi) Students won 1st prize for oral presentation

4.Benefits to College :

The innovative projects opened up channels for research at undergraduate level which was a good extension of their curriculum

- Teachers were able to demonstrate subject knowledge by applying 'classroom concepts' to a 'real' project.
- College got an added opportunity to set up good CIF facility.
- Multi disciplinary approaches to research were beneficiary for the teachers as well as students.
- Teachers who were ambitious to pursue research with teaching got an opportunity to show case their talents.

5. Benefits to Society :

- ❖ Low back pain (LBP) is global is a global health problem leading to a considerable loss of working days and impacting significantly on National Health Service.
- ❖ The cause of LBP is not known, but it is intervertebral disc (IVD) and the age related degenerative changes that occur within it that have been most frequently associated with LBP. Work activities involving bending, twisting, frequent heavy lifting, awkward static posture and psychological stress are regarded as factors for predisposition to back injuries.
- ❖ This innovative project is a report of study conducted to survey the prevalence and risk factors for low back pain amongst a cross section of individuals including students, housewives, working and retired people.
- ❖ Genetic studies have shown that some hereditary factors of ECM proteins can also be a cause of Intervertebral disc disease (IDD) leading to intervertebral disc (IVD) herniation.These gene PCR patterns can be a marker for the disease.

6.Further Plans :

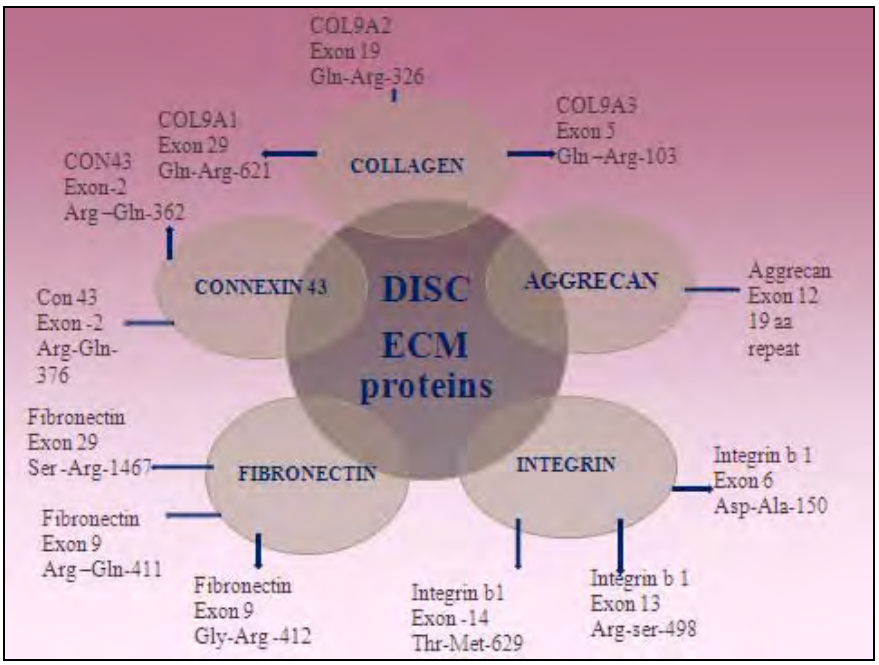
- ➢ Understanding the biochemical and genetical basis of disc degeneration could open up new channels for diagnosis, drug intervention and cytokine therapies.
- ➢ Genetic variants of Connexin 43 and collagen IX could be used as a marker for the disease as is HLAB27 Allele for Ankylosing spondylosis.

- This study could also be a start to develop new strategies like stem cell research which will replace excised nucleus pulposus from the herniated disc or supplement the collagen matrix to strengthen stability or develop drugs which could inhibit apoptosis and inflammation at the initial stages.
- The study can be extended to families to get a better picture of the disorder and compare it with other varieties of disc degenerative disorders.

Annexure-1

1.ECM Binding Studies

Binding/attachment sites identified , Exonic regions selected and Primers designed

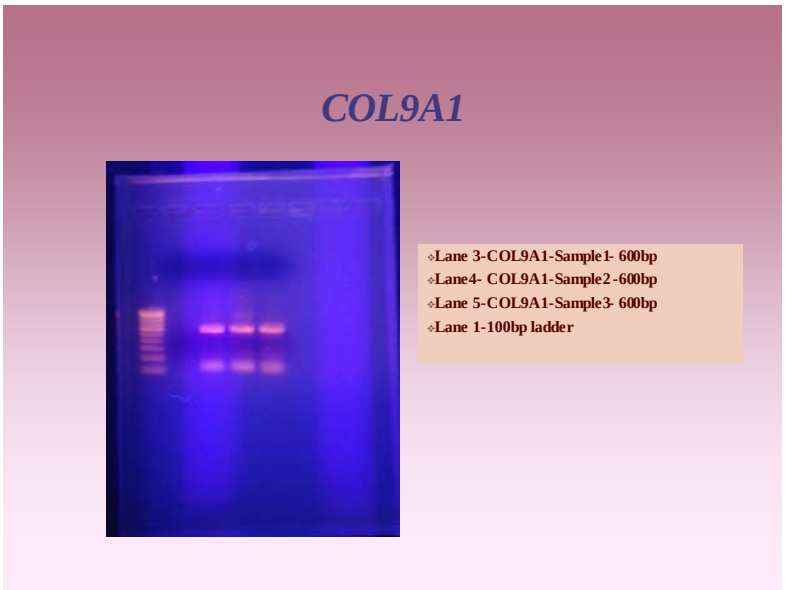


2.Tissue staining with Gomori Trichrome

The histopathological study with intervertebral disc showed very loosely packed ECM with chondrocytes and fibroblasts.

Annexure-2-Sequencing Results

PCR protocol and Sequencing-Collagen-IX



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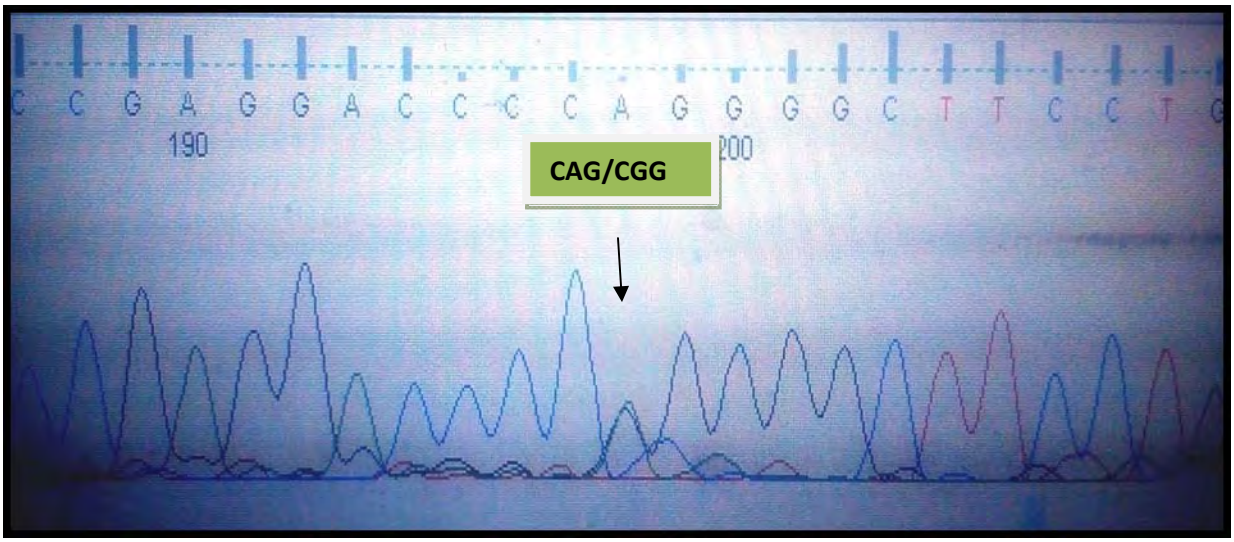
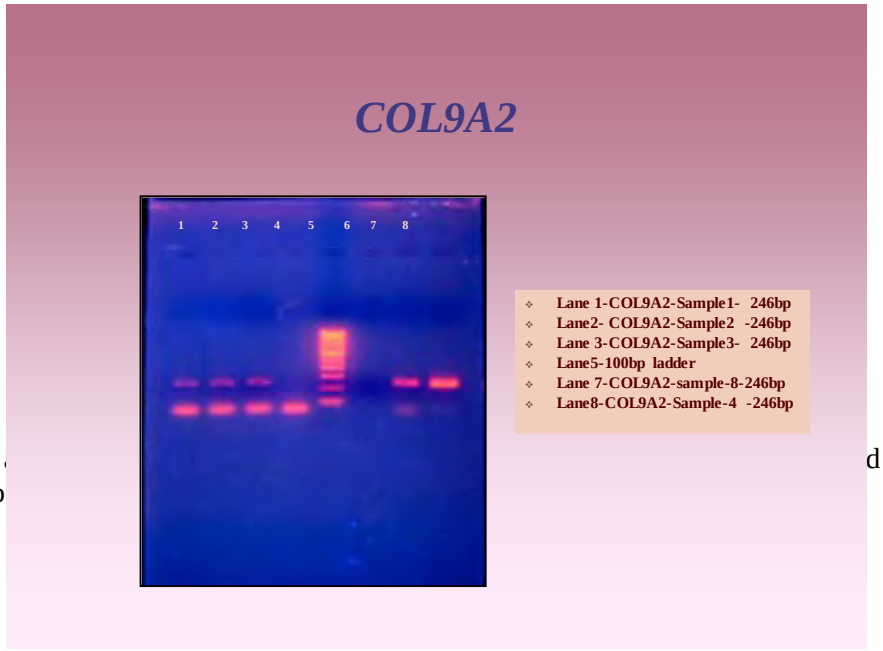
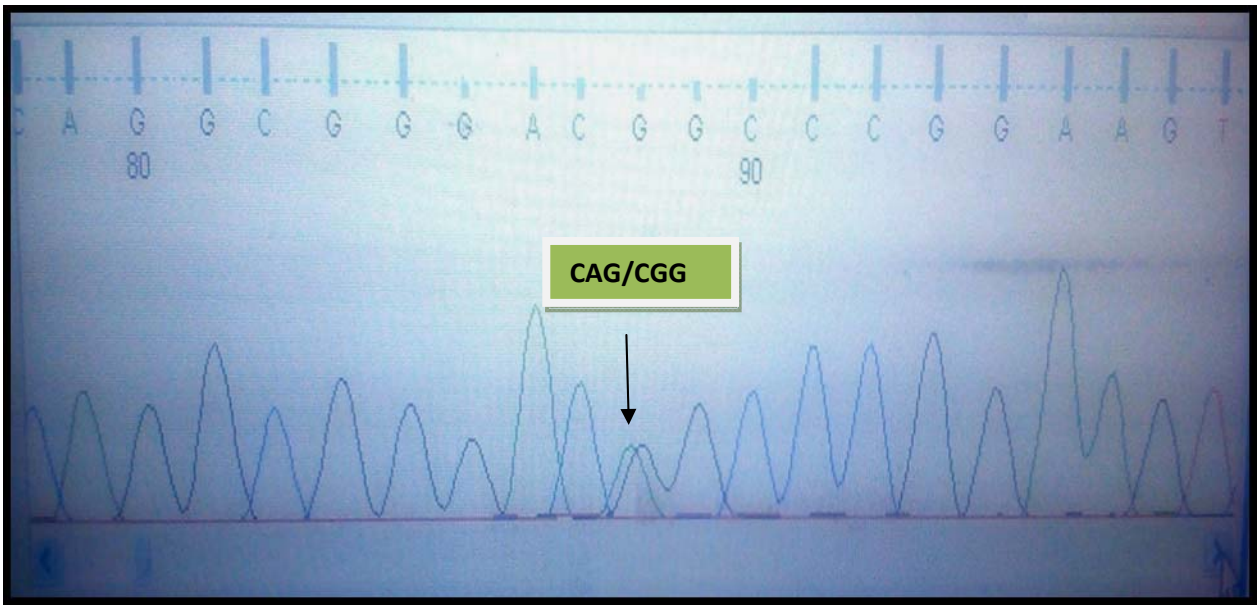
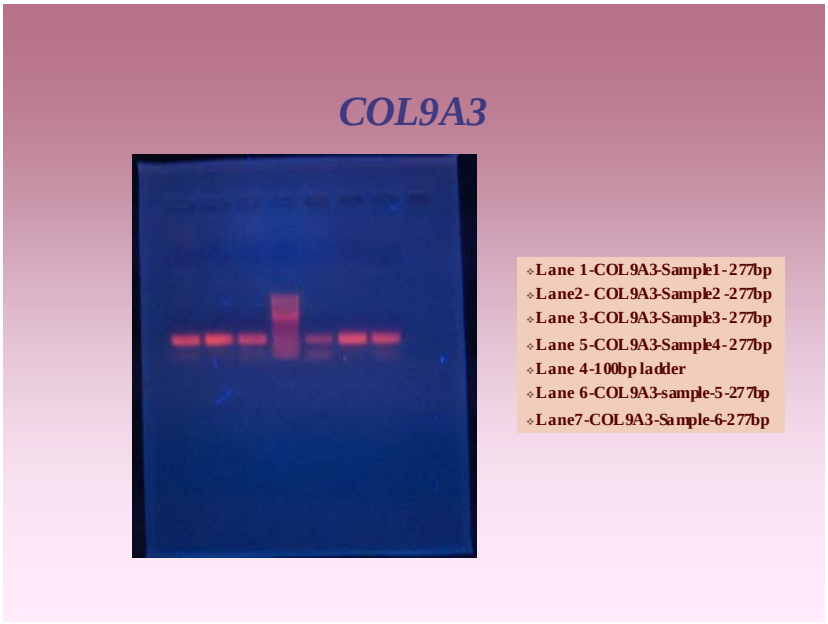


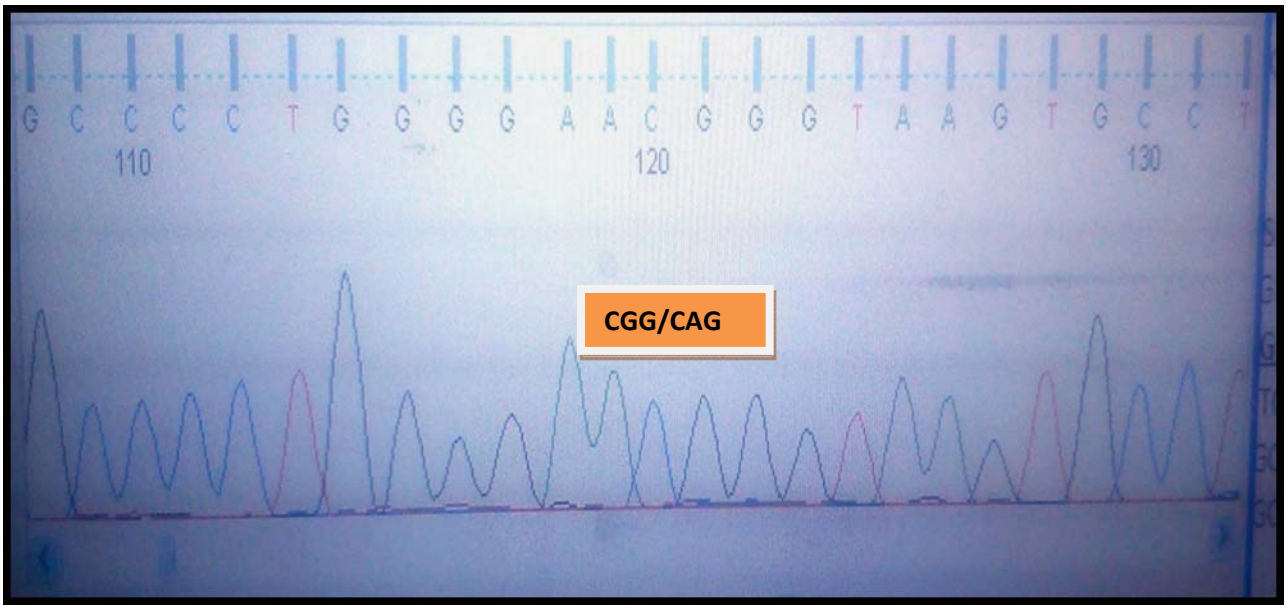


Col9a2 was d position 336 from glutamine to

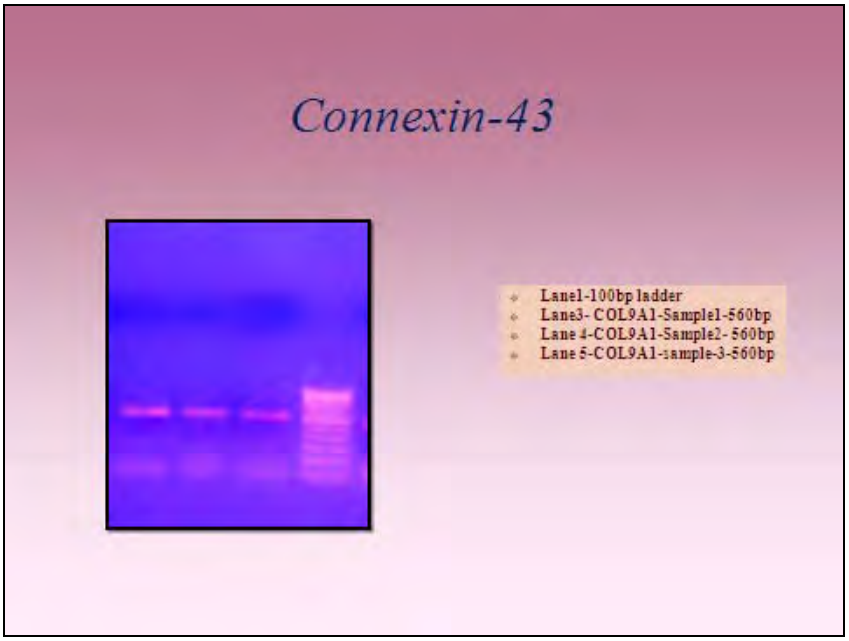




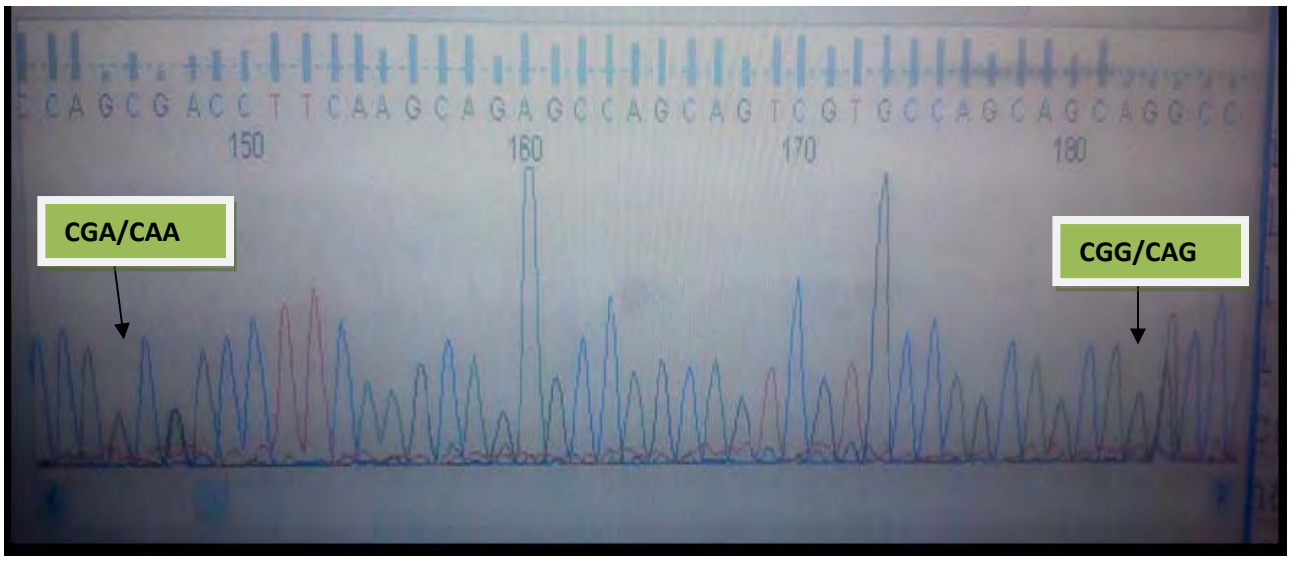
COL9A3 exon 5 was amplified and sequenced – no variants at position amino acid 103 arginine to glutamine was identified-change allele is CGG-CAG



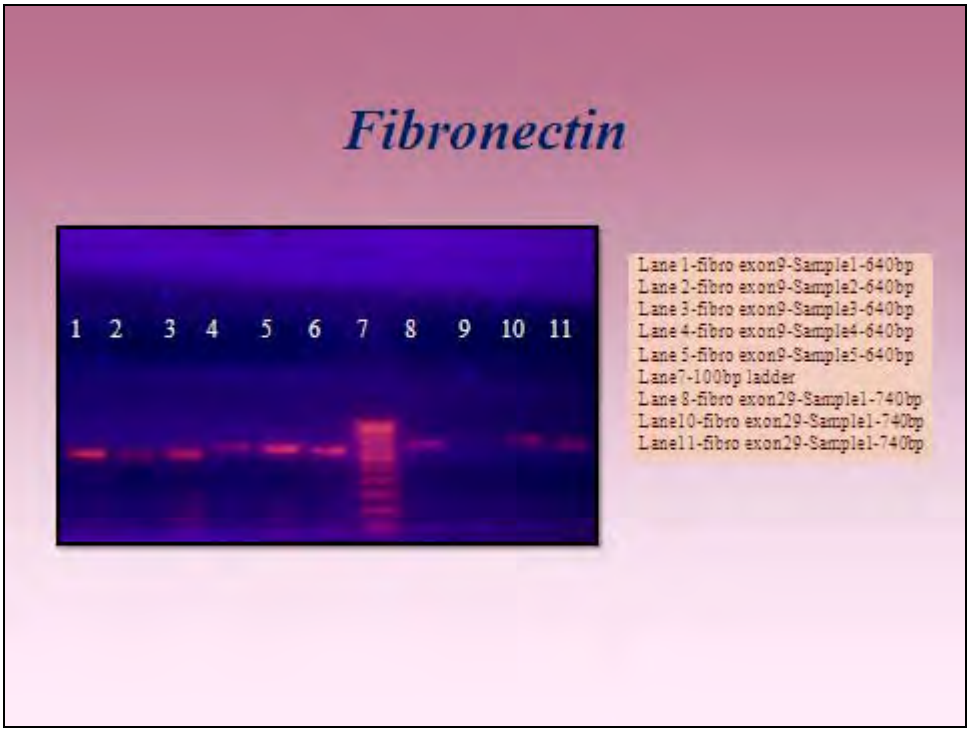
Connexin-43



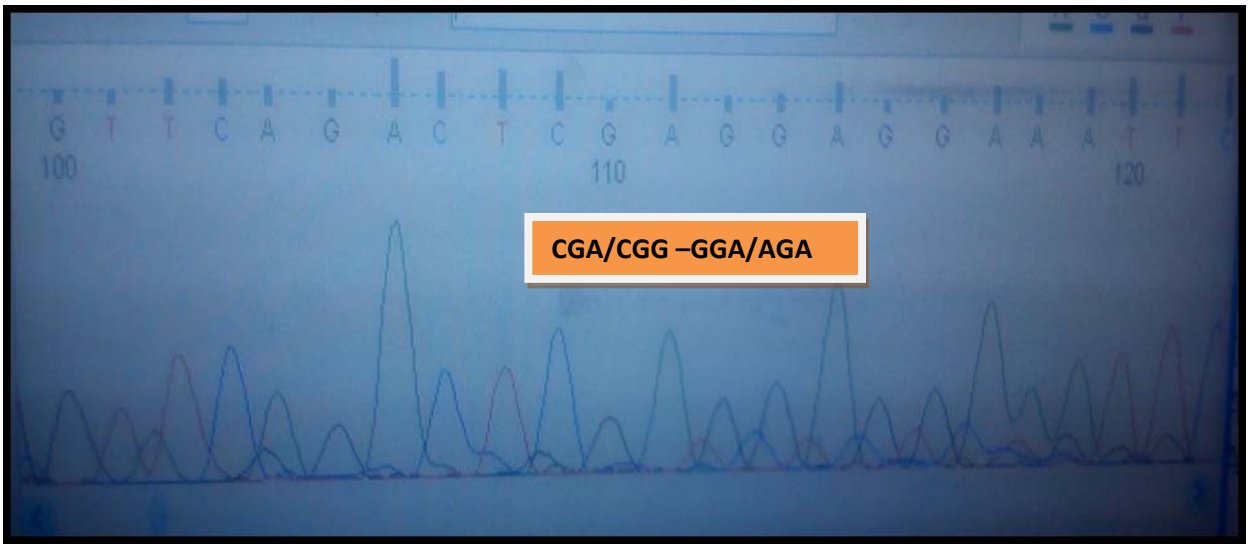
Connexin43 with variant at position 362 CGA-CAA (Arg –Gln) and 376 CGG-CAG (arginine – gluramine) The SNP at amino acid 362 and 376 which is the binding site for connexon hexamers. The SNP at amino acid 362 and 376 which is the binding site for connexon hexamers. We assume this variant could be hindering the hexamerisation process of gap junction proteins leading to disc degeneration.



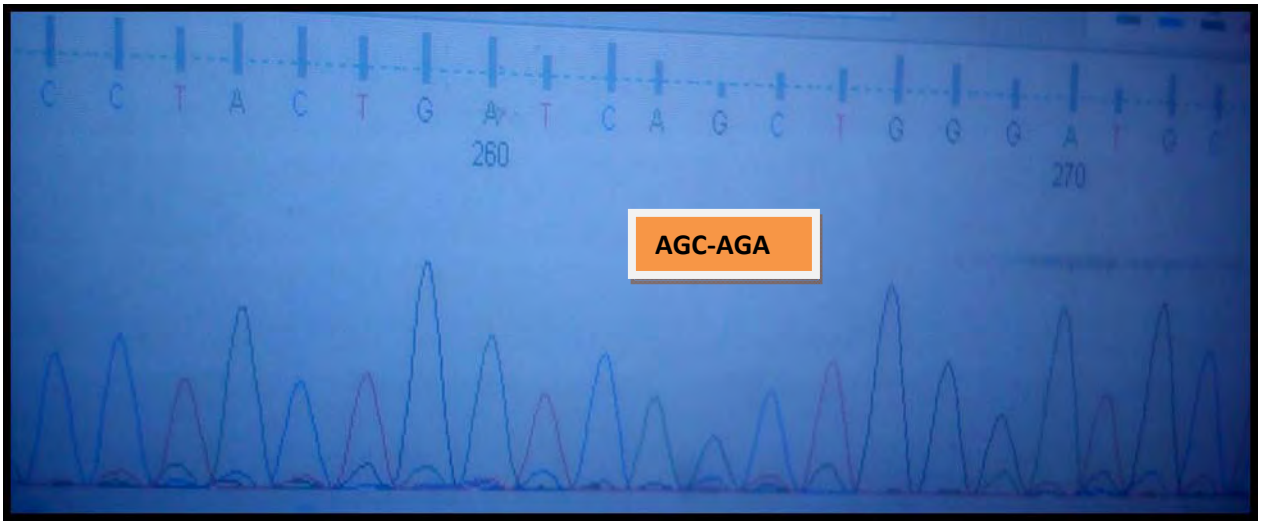
Fibronectin



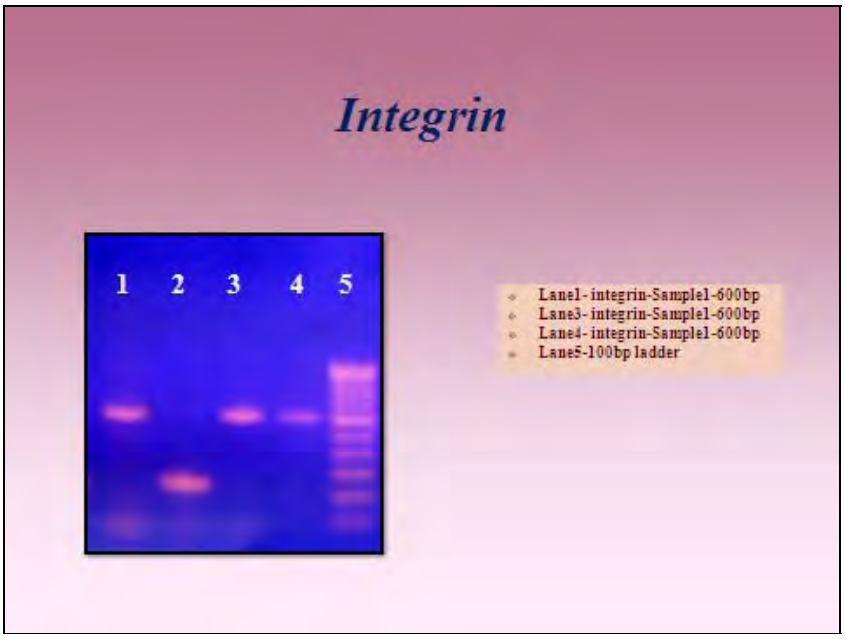
Fibronectin exon 9 and 29 were amplified and sequenced , no variation was identified.
411-ARGININE to GLUTAMINE CGA -CGG
412-GLYCINE to ARGININE GGA-AGA
416-ASPARAGINE to SERINE AAT-AGT



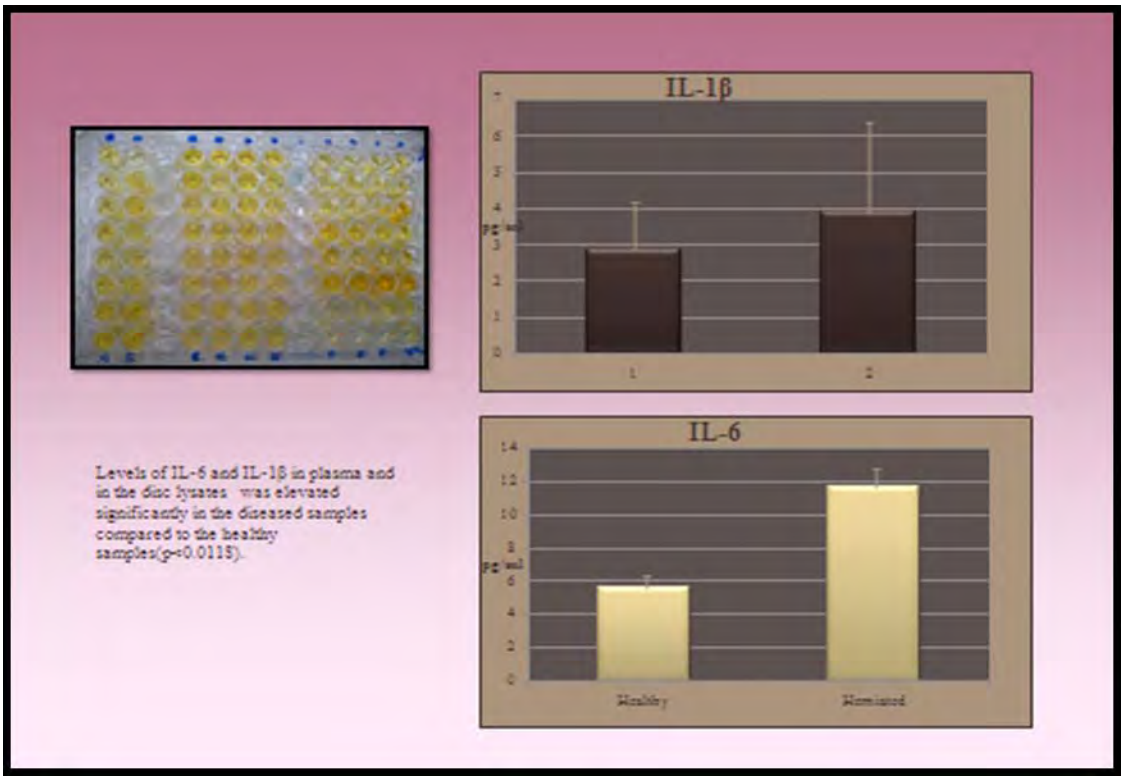
Fibronectin exon 29-SNP Rs 11687611 Position of SNP 56154-AGC TO AGA 1467 S TO R –Serine to Arginine

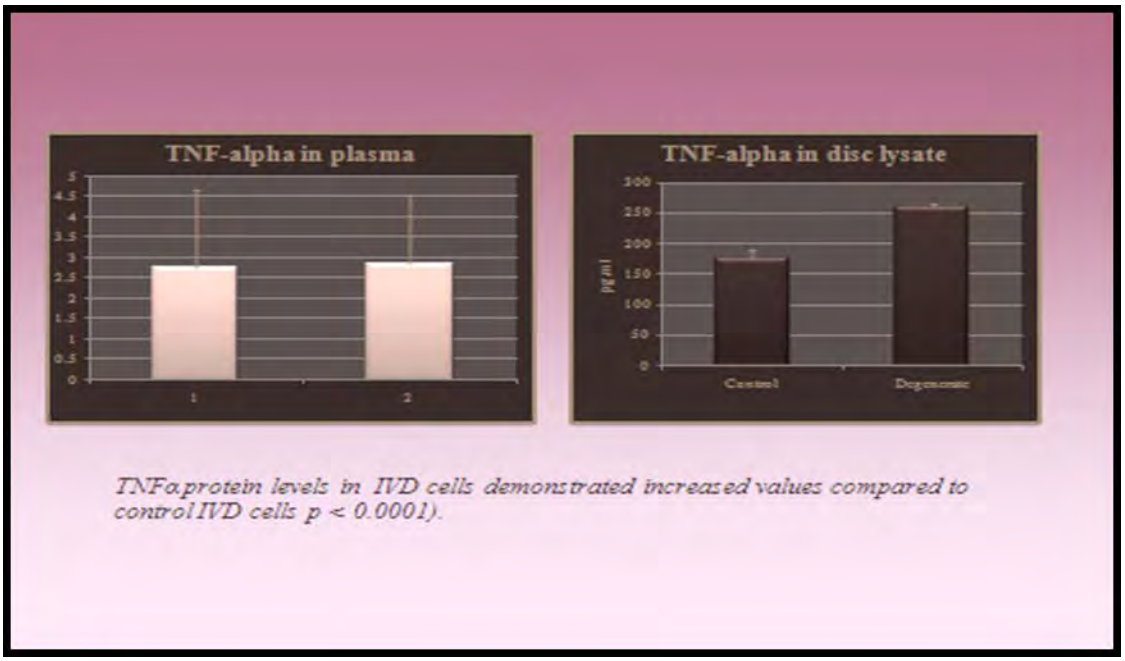


Integrin α1β 1-EXON 6 Samples were amplified and sequenced and no variants were identified.
Aggrecan samples were also amplified and most of the samples had 13 tandem repeat numbers of amplicon 775 bp



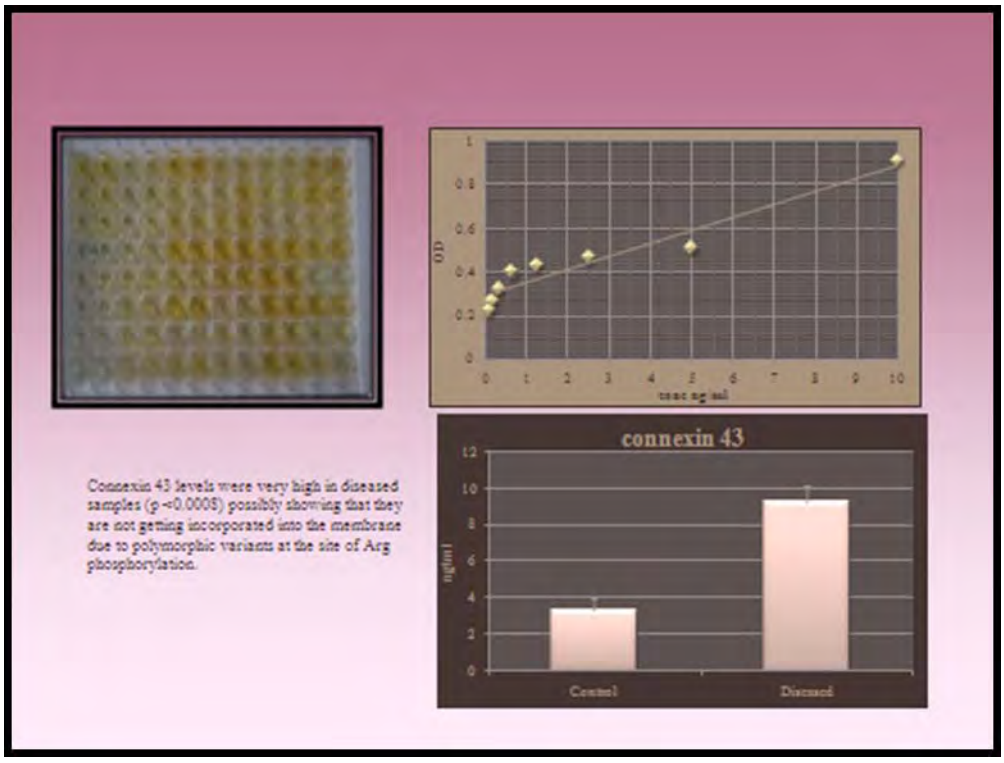
Annexure-3-ELISA





The levels of IL-6 and IL-1β in plasma as well as in the disc lysates was elevated significantly in the diseased samples compared to the healthy samples ($p<0.0118$). There was no statistical correlation between the levels of TNF-alpha between the 2 groups.

ELISA-Connexin 43



Annexure-4-Statistical data

Two hundred and five respondents (66(36%) males and 119 (64%) females) participated in the study. LBP was more prevalent among females (76%) than the males (63%).Majority of the sample i.e. 170(92%) people neither had a family history of back pain nor an injury was the cause. The highest prevalence was reported by retired people (100%) followed by housewives (80%) and students (69%). In the observed sample, 53 individuals (29%) do not have any LBP problem, whereas around 45(25%) suffers from mild pain and 9(0.048%) of them have a severe problem. 108(59%) of them feel the pain is during working hours. Amongst the people of age 60 and above i.e. 14(88%) of them experience more pain as compared to children of age below 20, also the ones with an average height of 5-6feets and weight 50-60 and 90-100 are the amongst the most sufferers.17 (.09%) people think that the LBP is due to effect of treatments, whereas 37(0.2%) believe that it is due to medical condition. Generally people prefer taking rest or applying heat as the best cure for this problem, others take medicines, try yoga massage or some spray or gel. In case the situation goes worse 86(47%) will try and manage on their own whereas 68(37%) will consult a doctor, a practitioner or a physiotherapist. In the sample 60(45%)of them feel that treatment has provided a lot of relief whereas 20(16%)of them did not feel any betterment in their condition.

We use chi square and graph plot techniques to come to the conclusion.

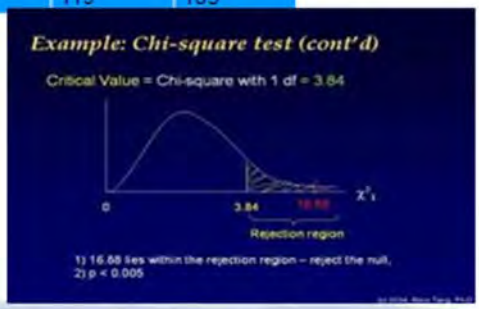
Chi square helps us to test whether a given attribute is associated with having back pain or not.

	Males	Females	Total
Have Back Pain	42	90	132
No Back Pain	24	29	53
Total	66	119	185

$$X^2 = \sum \frac{(o-e)^2}{e}$$

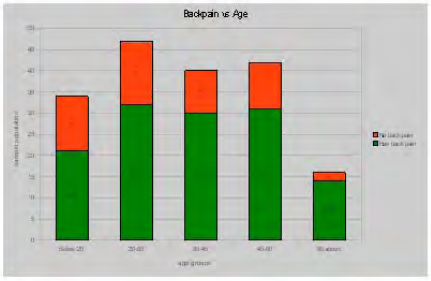
where

X^2 is Chi-squared,
Σ stands for summation,
o is the observed values, and
e is the expected values.



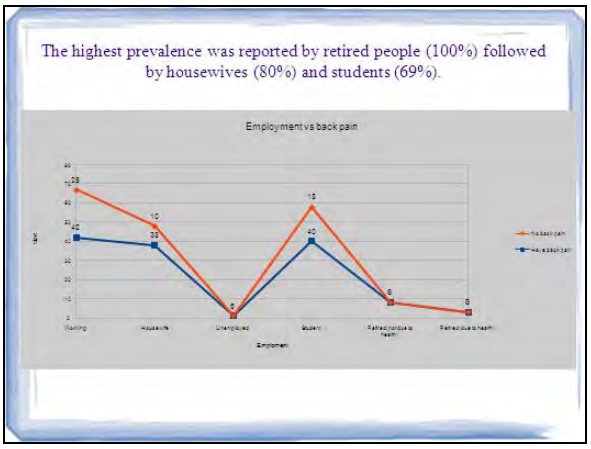
Dependence of Backpain on Age

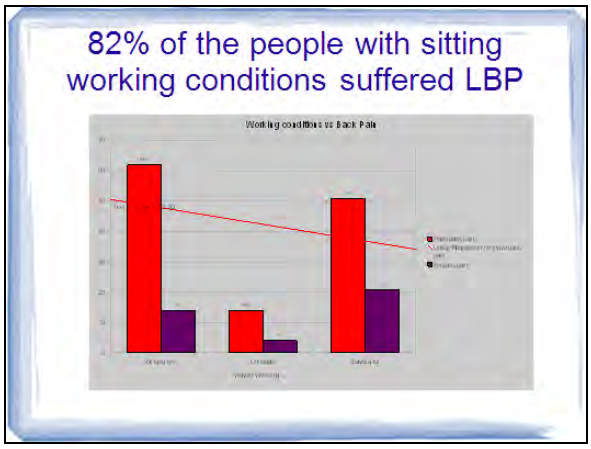
It becomes clear from the bar chart of age 60 and above i.e. 14(88%) of them experience more pain followed by the age group 30-45

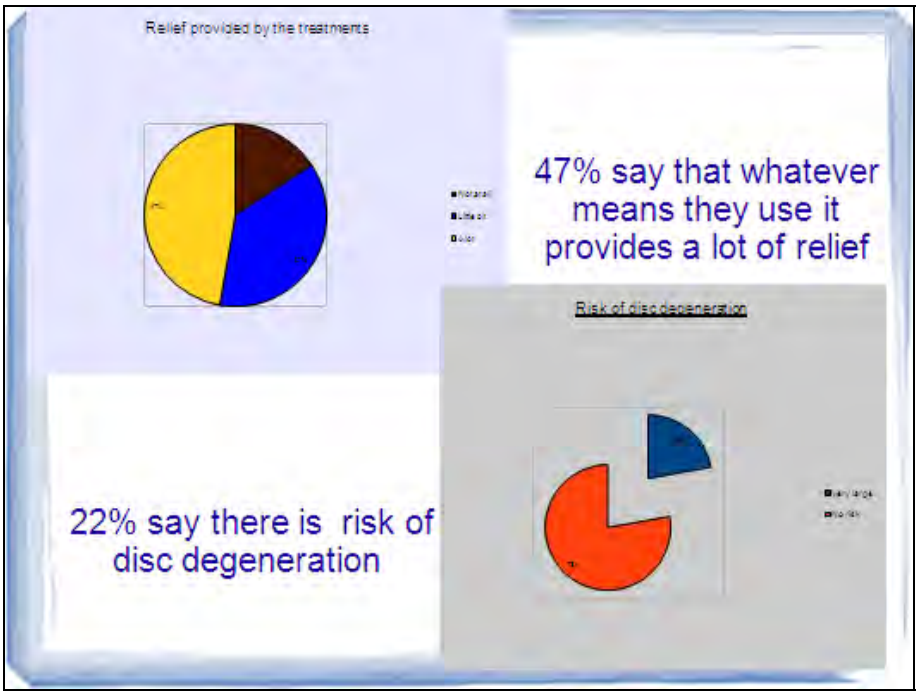


Gender vs Backpain

It was found that backpain is more prevelant in females







Annexure-6

QUESTIONNAIRE

NAME: 1. Date of birth (dd/mm/yyyy):	
2. Sex:	☐ Male ☐ Female
3. Your height in cm:	
4. Your body mass in kg:	
5. Employment situation:	Currently working Student

	Unemployed – due to health issues Housewife Retired not due to health reasons Retired due to health reasons

Part II: questions about general health

6. Have you suffered pain on your low back :

☐ Yes ☐

If yes how intense is it?

Very mild
Mild
Moderate
Severe
Very severe

7. In general, would you say your health is:

Excellent Very good Good Fair Poor

8. Were you an athlete?

Yes No

9. When did you start experiencing back pain?

Many years back
Few years back
Months back
Recently
Hereditary

10. If hereditary could you tell the family history of back pain?

_____

11. Is any major injury (such as from a car accident), a minor injury(such as a fall from a low height) cause of your back pain?

Yes No

12. During the past weeks, have you had any of the following problems with your work or other regular activities as a result of your physical health?

a) Cut down on the amount of time you spent on work or other activities?	Yes No
b) Accomplished less than you would like?	Yes No
c) Had difficulty performing the work or other activities? (for example it took extra effort)	Yes No

13. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all A little bit Moderately Quite a bit Extremely

14. Does your work require long sitting hours?

Yes No

If *YES* please specify how many hours _____

15. Does your work require lifting loads?
Yes No

16. Do you travel lot?
Yes No

If *YES*
What is the mode of transportation?
Cycle Motorcycle Bus Car

What is the condition of roads ?
Good Bad

17. How often would you say that you have experienced pain episodes, on average,during the past 3 months?
Never
Occassionally
Always

18. In your view, how large is the risk that your current pain may become
No risk Very large risk

19. Physical activity makes my pain worse (eg.driving,carrying heavy baggages,working on a laptop)
Yes No

20. An increase in pain is an indication that I should stop what I am doing until the pain decreases.
Yes No

21. I can walk for an hour.
Yes No

22. I can do ordinary household chores.
Yes No

23. I can sleep at night.
Can't do it because of pain problem
Can do it without pain being a problem

24. Roughly how many days in the last six months have you been kept from your usual activities because of pain?

0 / no days
1-6 days
7-14 days
15-30 days
31 days or more

25. What kinds of things make your pain feel better?(eg.heat,medicines,rest etc)

_____

26. When your pain was at its worst did you (check all relevant boxes):
    Self manage (treat your self, including taking non prescription pain relief)
    Consult a physiotherapist
    Consult a doctor
    Consult other practitioner (osteopath, reflexologist, acupuncture, massage etc please state below)
    _____ (please state)
27. How much relief have pain treatments or medications provided?
    No Complete Relief
    Little bit
    A lot of relief
28. If you take pain medication, how many hours does it take before the pain returns?
    Pain medication doesn't help at all.
    One hour.
    Two hours.
    Three hours.
    Four hours
    5-12 hours
    I do not take medication
29. Circle the appropriate answer for each item.
    I believe my pain is due to:

Yes	No	1. The effects of treatment (for example, medication, surgery, radiation, prosthetic device).
Yes	No	2. My primary disease (meaning the disease currently being treated and evaluated).
Yes	No	3. A medial condition unrelated to primary disease (for example, arthritis).

Date
Place
Signature

Annexure-7

Consent Form for research study

Title of Project:

"Screening of Indian population for possible polymorphisms in candidate genes of extracellular matrix proteins that could lead to disc degeneration leading to herniation."

I _____have been provided by the investigators, with a copy of the Patient Information sheet for taking part in the project entitled "Screening of Indian population for possible polymorphisms in candidate genes of extracellular matrix proteins that could lead to disc degeneration leading to herniation"

and the work proposed to be carried out has also been explained to my satisfaction.

I hereby give my consent to be enrolled in the study.

Signature of the Patient Signature of the Researcher

Patient Information Sheet

You are being requested to take part in a study entitled "Screening of Indian population for possible polymorphisms in candidate genes of extracellular matrix proteins that could lead to disc degeneration leading to herniation."

The goal of this study is to select patients with lumbar disc degeneration visiting the Fortis Hospital under the care of Dr. Sandeep Vaishya.

The objectives of the proposed work is

(i) To study genetic polymorphism in matrix protein
fibronectin
collagen IX
aggrecan
cell adhesion proteins
connexins
integrins

(ii) To study role of gap junction proteins connexin and integrins by checking there levels in herniated disc samples and compare them with control samples.
(iii) To check levels of IL-6 and IL-1 in disc lysates.

Sample Material Required:

(i) 5 ml of venous blood collected with 0.2%EDTA (pre operative)

(ii) Disc sample collected in saline (post operative)

Voluntary participation:

Your participation in the project is voluntary. You can withdraw from the project at any time, and this will not affect your subsequent medical treatment or relationship with the treating physician.

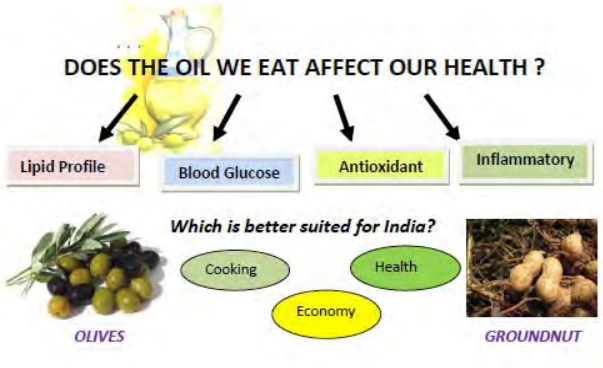
Risks (if any) to the patient:

There are no additional risks and side effects expected by volunteering for the project, as the blood sample required for the project is part of the blood sample required for conducting serology tests prior to surgery. If you have any queries, your attending doctor will also be able to assist you. We assure of total confidentiality of the data and your name will not be disclosed. You are free to withdraw from the study at any time and your withdrawal will not interfere with the standard of your therapy. For further information you may contact

SRI VENKATESWARA COLLEGE

Project Title: To study the Nutritional and Socio economic viability of consuming Olive oil vs Groundnut oil in the Indian context.

Project Code: SVC 105



GROUNDNUT OIL : OLIVE OIL'S INDIGENOUS COUNTERPART

Introduction:

The consumption of olive oil in India of late has increased. This is largely because of a change in eating habits and an influence from the Western countries that promotes olive oil as a healthy oil. It has been reported in literature that phenolic compounds in olive oil have potentially beneficial biological effects resulting from their antimicrobial, antioxidant and anti-inflammatory activities and the fatty acid composition of Olive oil has been shown to have a positive effect on certain physiological parameters, such as plasma lipoproteins, oxidative damage, inflammatory markers, platelet and cellular function.

Groundnut, is one of the most important cash crops of our country. It is a low-priced commodity and a valuable source of all the nutrients. Groundnut is the largest oilseed in India in terms of production and India is the second largest producer of groundnuts. Groundnut oil is also widely used in many parts of India for cooking. In fact, it plays a pivotal role in the oilseed economy of India. Studies have shown that both groundnut oil and olive oil have high MUFA as well as an adequate level of essential fatty acids and that both are beneficial for cardiovascular health. Studies in diabetic rats has shown that groundnut oil consumption has slightly but significantly decreased the blood glucose, HbA1c, lipid peroxidation, and lipid profile in serum and increased antioxidant.

The climatic conditions in India is most suited for growing groundnuts rather than olives which is largely grown in Mediterranean regions and in higher altitudes

According to studies by the American Peanut Council Peanut/groundnut oil is nutritionally similar to olive oil in the proportions of fatty acids it contains, being high in monounsaturated fatty acids and low in saturated fatty acids. Groundnut oil reportedly has a convenient oxidative stability, higher smoking point as compared to olive oil and has been considered as a premium cooking and frying oil as compared to olive oil. From the above observations groundnut oil seems to be a more appropriate oil for Indian style cooking which involves deep frying.

Keeping these under consideration, the present study proposes to analyse and study the nutritional and socioeconomic viability of consumption, usage and promotion of groundnut oil as compared to the olive oil in the Indian scenario.

1.Objective (150 words):

- To analyze the composition of olive oil (Extra virgin ,Virgin & Pomace) and ground nut oil with respect to fatty acid composition and antioxidants levels (Flavanoids, polyphenols, Vitamin E and A)
- To analyze biochemical parameters like lipid profile, blood glucose, liver function efficiency, antioxidant status (Thiobarbituric acid reactive substances/lipid peroxides & antioxidant enzymes) and inflammatory properties (nitric oxide) in blood samples collected from populations who have consumed olive oil /groundnut oil as a staple oil for at least 1 yr.
- Statistical analyses for each of the investigated biochemical parameters.
- To assess the social relevance of consumption of olive/groundnut oil in Indian population by studying the macro trends in edible oil consumption and production and the microeconomic determinants of edible oil consumption.
- Devise policy actions to promote consumption and production of groundnut.

Final Findings (300 words):

2.ECONOMIC ASPECT

Findings

- Shift in consumption from groundnut to soybean and palm oil between 1972 and 2004. Combination of shift in demand and government policy has led to reduced growth rate of groundnut production. Olive can't be grown profitably In India.(Annexure1)
- The Indian Olive Association uses indirect advertising through experts and the theory of 'social truths', doing away with free riding while promoting health and taste aspects of Olive Oil. (Annexure2)
- The survey suggests that while health benefits pull in consumers, sustaining regular consumers also requires a low taste cost.(Annexure 5A &Annexure3)

BIOCHEMICAL ASPECT

OIL ANALYSIS

Findings:

Different brands of various types of olive oils [Extra Virgin Olive oil(EVO),Virgin Olive Oil (VO),Pomace Olive Oil and Mixed Olive Oils] as well as Groundnut oil(GNO) were purchased from the market and analysed for Fatty acid profile,antioxidant level (polyphenols,flavanoids,vitamin E&A levels), acid value and peroxide values.

- The acid value and the peroxide value of EVO was found to be higher though not significant as compared to that of pomace.GNO has comparable values to pomace. (Annexure 4-Fig 1 and 2)
- As reported in literature EVO showes a higher content of both polyphenols and flavanoids as compared to that of all other types of olive oil as well as GNO (Annexure 4-Fig3 and 4)
- Comparing Pomace Olive oil(an olive oil type that has been marketed for Indian cooking) with GNO we find that the levels of polyphenols and flavanoids are comparable.
- There was no significant difference in the Vitamin E levels in all the brands of oils tested however , Vitamin A levels detected only in GNO as compared to that of olive oil (Annexure 4-Fig 5 and Fig 6)

- As reported in literature different types of olive oil have higher percentage of MUFA where as it is lower but not significantly different in GNO (Annexure 4-Fig7)
- However, the Essential fatty acid levels in GNO is significantly higher ($p< 0.001$) as compared to that of olive oil.This gives a better ω6: ω3 ratio for GNO as compared to that of olive pomace. (Annexure 4-Fig7)

BLOOD ANALYSIS

Findings:

- A large population was screened using an elaborate questionnaire(Annexure 5 A). Consent forms (Annexure 5B) were filled and collected from subjects who fitted into the ideal sample criteria (who have been consuming olive/groundnut oil for the past one year) and were shortlisted for blood collection.
- Sample size was determined using statistical analysis (Annexure 5C) and validated using paired t test.
- Blood samples were collected and analyzed for blood glucose (Annexure6-Fig1), liver function efficiency[SGOT&SGPT (Annexure6-Fig2),Bilirubin (Annexure6-Fig3)] and lipid profile (Annexure6-Fig4)
- Samples were also analysed for antioxidant status /antioxidant enzyme levels[Catalase(Annexure6-Fig5),Glutathione reductase (Annexure6-Fig6), lipid peroxidation levels(Annexure6-Fig7)] and for inflammatory properties [Nitric oxide levels(Annexure6-Fig8)]
- Preliminary analysis in the samples collected shows that the parameters analyzed are comparable for olive and groundnut oil consumers.
  Conclusion:

  As reported in literature EVO has a lower shelf life as is seen by higher acid and peroxide value which indicate a higher percentage of free fatty acids as well as unsaturation, both of which predisposes the oils to oxidative rancidity. Further as reported the higher antioxidant levels as seen by the polyphenol and flavanoid levels reaffirm that consumption of EVO has health benifit .

  However the focus of this study is Olive Pomace which is marketed in India as better suited for Indian style of cooking. Comparing Pomace with Groundnut oil we found the two to be comparable with respect to acid value , peroxide value , polyphenol and flavanoid levels. In fact Vitamin A levels ,essential fatty acid levels and ω6: ω3 ratio shows Groundnut oil to be a better oil than Olive Pomace. Also the blood analysis of individuals who have been consuming olive oil for 1 year and groundnut oil for 1 year are comparable with respect to all the blood parameters analysed. Hence the study suggests the promotion and usage of indigenously available groundnut oil as opposed to the much hyped and imported Olive Pomace oil.

  The economic survey carried out suggests that users of cheaper oils are ready to pay for the health benefits that groundnut promises. While the users of the more expensive olive oil are willing to shift to a more economic grounut oil provided it shows the same health benefit as olive oil. Also the climate and soil conditions are suitable for large scale production of groundnut in India. Investment with regard to irrigation facilities and an increase in minimum support price can incentivize the producers. Government must work towards encouraging groundnut consumption as it will benefit both the consumers and producers. This will also reduce the dependence on imports. A government funded ad campaign and incentives for private enterprise in this sector will be steps in the right direction

3. Learning for Students (200 words):

1) FREQUENT INTERACTIONS AND GUIDANCE FROM THE MENTOR

The mentor in discussion with the students and faculty at Sri Venkateswara college

2) EDUCATIONAL TRIP TO NIPER AND IMTECH IN CHANDIGARH

Students got an opportunity to visit new scientific institutes, learn about sophisticated instruments and interact with some of the known names of science society.

Students at NIPER at IMTECH along with the faculty

3) PARTICIPATION IN ORAL AND POSTER PRESENTATIONS IN NATIONAL CONFERENCES

Participation in conferences instilled a sense of self confidence and enabled the students to present their ideas and work independently



Ist prize in oral presentation in National3rd Prize in Poster presentation Conference organized by ANDC. National Conference organized by SVC

4)PARTICIPATION IN ‘ANTARDWANI 2013

Interaction with Prof. Dinesh Singh,*Vice Chancellor,University of DelhI* students showcase their innovative talent at ANTARDHWANI Feb-2013

5)EXTENSION BEYOND THE CURRICULUM

The project -a new experience to students which taught them team work,organizing ideas andexecuting them and interaction and working with students from other disciplines.

Students getting the questionnaires filled and also working in lab

4. Benefits to College (100 words):

- The innovative projects opened up channels for research at undergraduate level which was a good extension of their curriculum
- Teachers were able to demonstrate subject knowledge by applying 'classroom concepts' to a 'real' project.
- College got an added opportunity to set up good Central Instrumentation Facility.
- Multi disciplinary approaches to research were beneficiary for the students as well as teachers

5. Benefits to Society (100 words):
   A healthy oil is the one which is low on saturated fat, high on mono unsaturated fatty acids(MUFA),PUFA balanced between saturated fats and MUFA and a good n6:n3 ratio. According to studies by the American Peanut Council, groundnut oil is nutritionally similar to olive oil and have comparable health benefits to that of olive oil. In India a large percentage of the population cannot afford the expensive olive oil that is largely imported. Also the climatic conditions in India are also not favourable for the cultivation of olives that is largely grown in

Medittterenean countries as compared to the groundnut which is extensively cultivated in India. Moreover olive oil lacks parameters like high smoke point which makes it an inappropriate choice for Indian style cooking which involves deep frying. Amongst these pomace olive oil is been marketed keeping in view their higher smoke point(due to refinement) compared to other olive oils so that it becomes the most suited for Indian cuisine. The present study shows that the constituents that contribute to the health benefits associated with olive oil consumption are significantly less in much promoted/hyped olive pomace than groundnut oil .This data also supports the usage of the economically available and indigenously cultivated groundnut oil in India as compared to the western society influenced Olive oil. Thus it would be advantageous for the Indian population to use olive oil (Extra Virgin and Virgin oils) for non cooking purposes only, as in salads and use groundnut oil rather than olive pomace particularly for Indian cooking which involves deep frying. From the economic point of view an expansion of the market for groundnut will shift the demand away from imports. This will augment the incomes of the domestic producers as well as make us less susceptible to external price shocks.

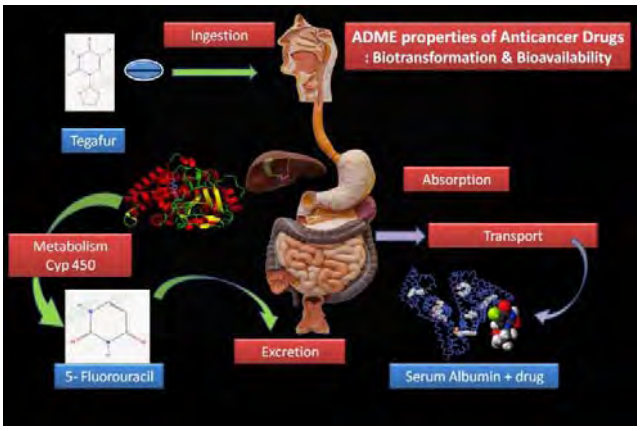
6. Further Plans (100 words):

- The study needs to be extended to larger populations to have a better understanding of the health benefits attributed by groundnut/olive oil
- To devise a comprehensive marketing strategy for the promotion of the health benefits of groundnut oil

SRI VENKATESWARA COLLEGE

Project Title: Purification and characterization of Cytochrome P450 from liver for the study of P450 interaction with anticancer drug molecules

Project Code: SVC -106



Various aspects of drug metabolism in the body

1. Objective :

The study of ADME/T properties characterize drug molecules in terms of their absorption, modification transport presents a challenging area of research in the discovery of novel drugs. When a drug is administered to the body it encounters the problems of stability, chemical modification and retention before being transported to the target site. The complications posed by the interaction between drug-drug and drug with serum proteins loss of activity are a hurdle that a novel molecule must traverse before being a successful therapeutic drug. The project aims to provide the students an insight into the various aspects of drug metabolism in the human body and the approaches to different steps of drug design and synthesis. Serum proteins play important role in bioavailability aspect of drugs by facilitating binding and transport of drugs after it has either been administered orally or intravenously. The activation/deactivation of drug involves interaction with cytochrome

p450 (CYP) proteins. Bioavailability and metabolism studies of drug molecules play a pivotal role in the design of novel drugs. In this study, existing FDA approved anticancer drugs were evaluated for their ADMET properties with the hope to design new anticancer drugs.

The objective of this project is to study:

Interaction of the CYP protein with drug molecule
Chemical modification of drug by CYP
Sequestration of Drug molecule by BSA
Design and synthesis of anticancer flavanoid molecule and their evaluation.
Inactivation of CYP by drugs.

2.Final Findings:

The drugs were characterized spectroscopically and UV-visible spectra was obtain to determine the chromophores. (Fig 1)

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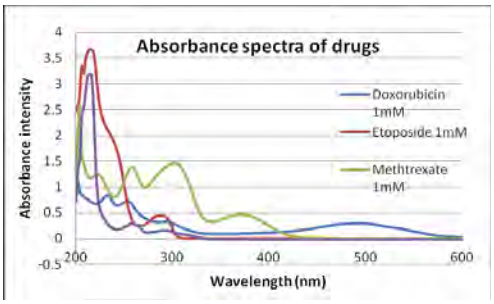


Fig 1. The absorbance spectra of Doxorubicin, Etoposide, Methotrexate and Vinblastin

The binding of the drug with BSA was studied using fluorescence spectroscopy. The binding of fluorescent probe ANS (Anilino Napthalene Sulphonic acid) to BSA (Bovine Serum albumin) was compared with the binding behaviors of the methotrexate, etoposide, vinblastin to estimate the affinity of these molecules to serum proteins. Vinblastin showed higher affinity as confirmed by absorbance spectroscopy (Fig 2).

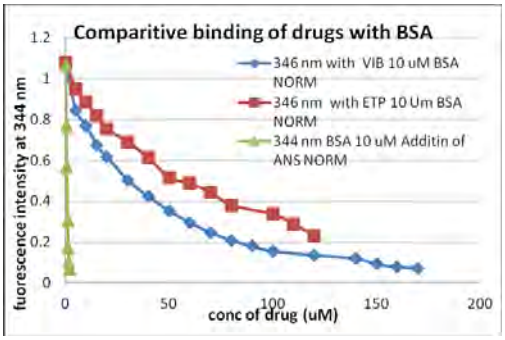
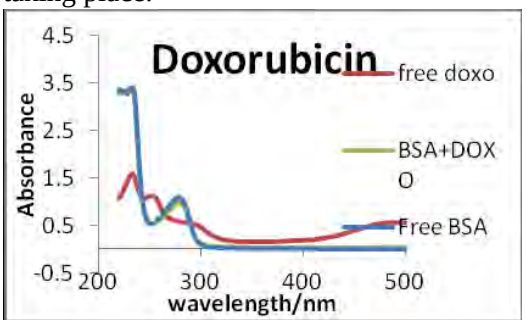


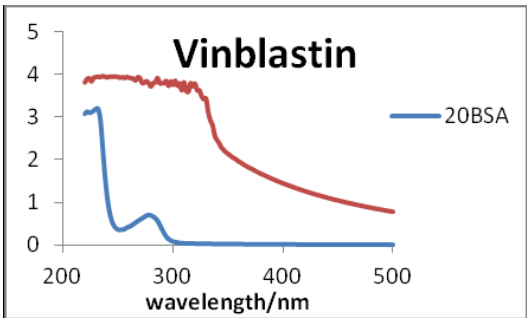
Fig 2. The quenching of BSA fluorescence with Vinblastin, Etoposide and ANS

Drug- Serum Protein binding studies

Determination of the Binding Constant (K binding)

Binding studies of the drugs were performed with three different BSA concentrations i.e. 20.(03mM), 30 and 40 mg/mL. (drug concentration 0.1 mM). As evident from the following graphs for a given concentration of drug, if the concentration of BSA is increased, the effect on the drug absorption spectra is less pronounced suggesting some interaction is
taking place.





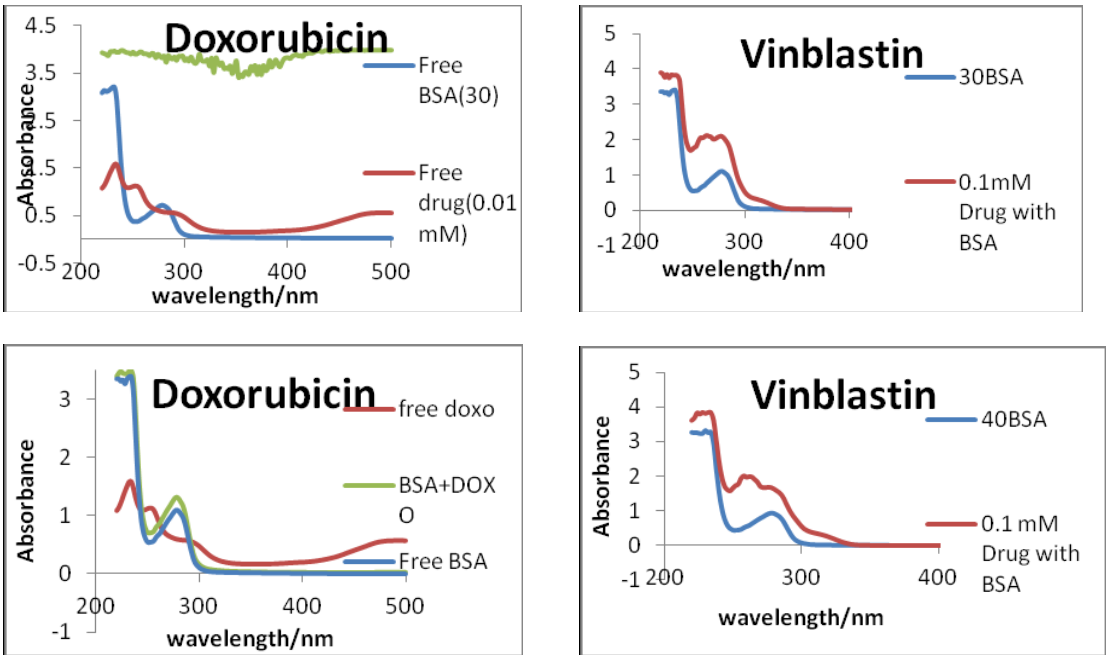
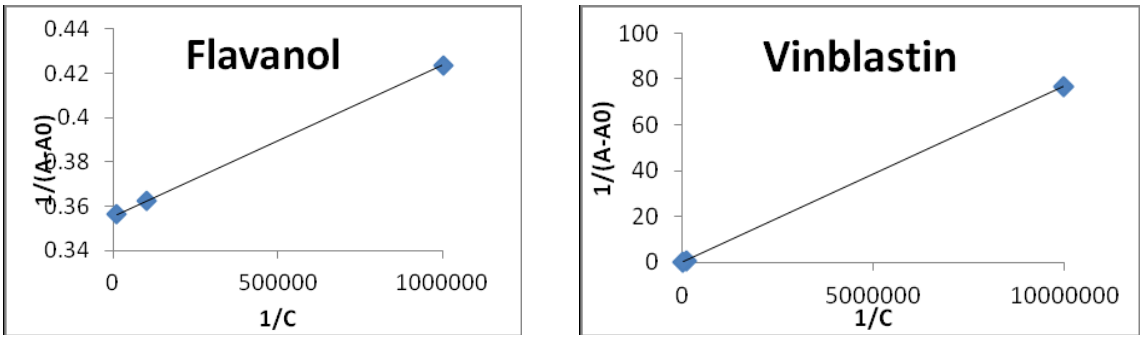


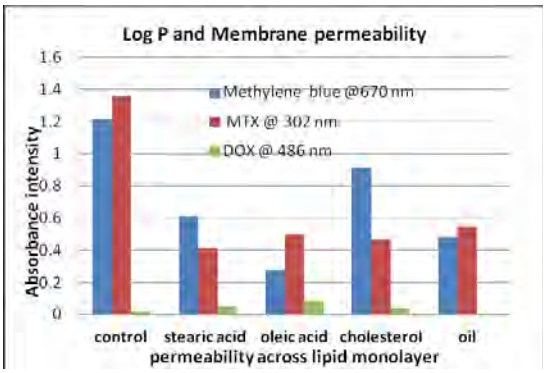
Fig 3. Spectroscopic study of BSA–drug interactions shows that increase in BSA concentration decreases the intensity of the drug.

The Estimation of binding constant by UV- visible spectroscopy was performed and free and bound drug with protein were studied. K binding for doxorubicin was found to be 16.70 × 104 M-1 and for vinblastin it has a value of 0.87 × 104. Binding constant for the prepared flavanol was found to be 5.07 × 106 implying weaker interaction (Fig 4).The flavanoid compounds were synthesized and compared to the existing anticancer molecules namely methotrexate, doxorubicin, vinblastin and etoposide on basis of ADMET guidelines. By comparison of these parameters we intend to predict the efficacy of the synthesized molecule.

Fig 4. Calculation of K binding



Experimental estimation of partition coefficient (Log P) is a very important parameter for solubility of the drug in blood. The solubility across various lipid monolayers composed of lipids like cholesterol, stearic acid and oleic acid and vegetables oils was evaluated. Methotrexate showed higher mobility across membrane and solubility in the aqueous front as compared to Doxorubicin. (Fig. 5)



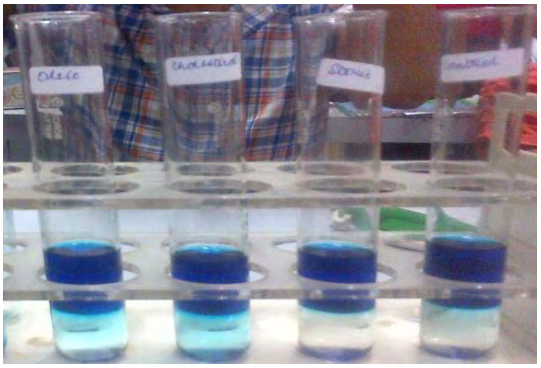


Fig 5. Experimental determination of Log P and estimation of membrane permeability

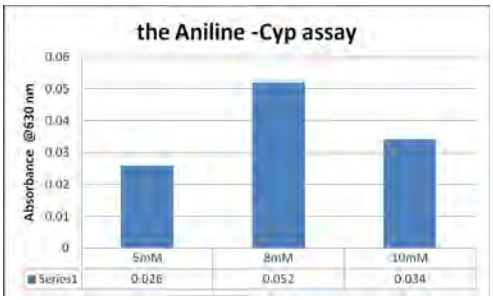


Fig 6. The enzyme activity of goat liver CYP with aniline as substrate

The enzyme assay was optimized with aniline as the substrate. Liver extract was assayed for simple transformation reactions with aniline and p-nitrophenol (fig 6). The analysis of the enzyme activity showed that the extract from particular goat liver sample was not rich in aniline metabolizing CYP2A and 1A.

Purification of CYP

The P450 was partially purified from Goat liver by ammonium sulfate precipitation and DEAE anion exchange chromatography. The interaction of drug with the crude and partially purified protein was performed by UV-visible spectrophotometery (fig 7-8).

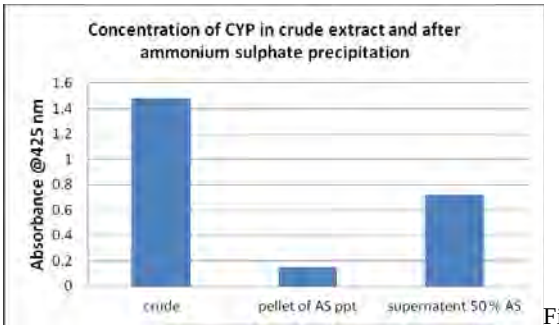


Fig 7. Partial purification Cytochrome P450 from goat liver

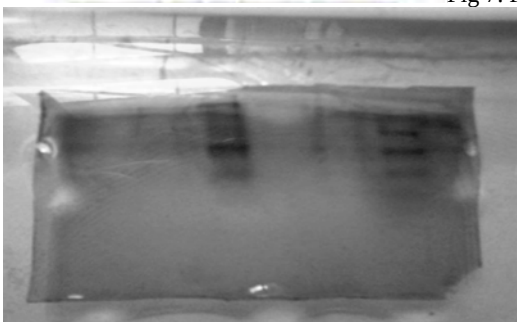


Fig 8. Elution profile of CYP by DEAE anion exchange chromatography and the SDS PAGE of various steps in purification

Inhibition of aniline hydolase activity of CYP by drugs

The data suggests that the drugs inhibit aniline metabolism, however it is known that aniline is substrate for CYP 2E1 while the other drugs are CYP 3A substrates, however in crude extract of liver we observed decrease in aniline hydrolase indicative of allosteric inhibition. Care was taken to add ethanol to the control in equivalent concentration as the drug solution.

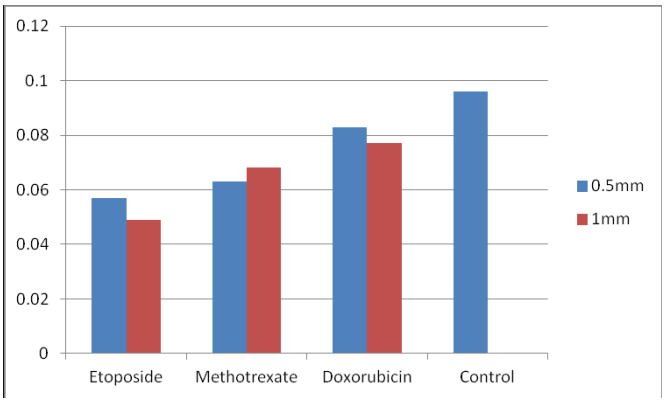


Fig 9: Suppression of aniline transforming capacity of the CYP by various drugs

Computational

Compilation of 60 known anticancer drugs with 2D structures was done. The structures of the drugs were downloaded from PDB or 3D structures of drugs were generated using Hyperchem (Molecular Modeling Software) (figure 9).the data was complied inaccordance with Lipnsky's rule. The Schrodinger suite Glide was being used for docking studies. The molecules were prepared by Geometry Optimization and Energy Minimization and were used for docking.(Figure 10)

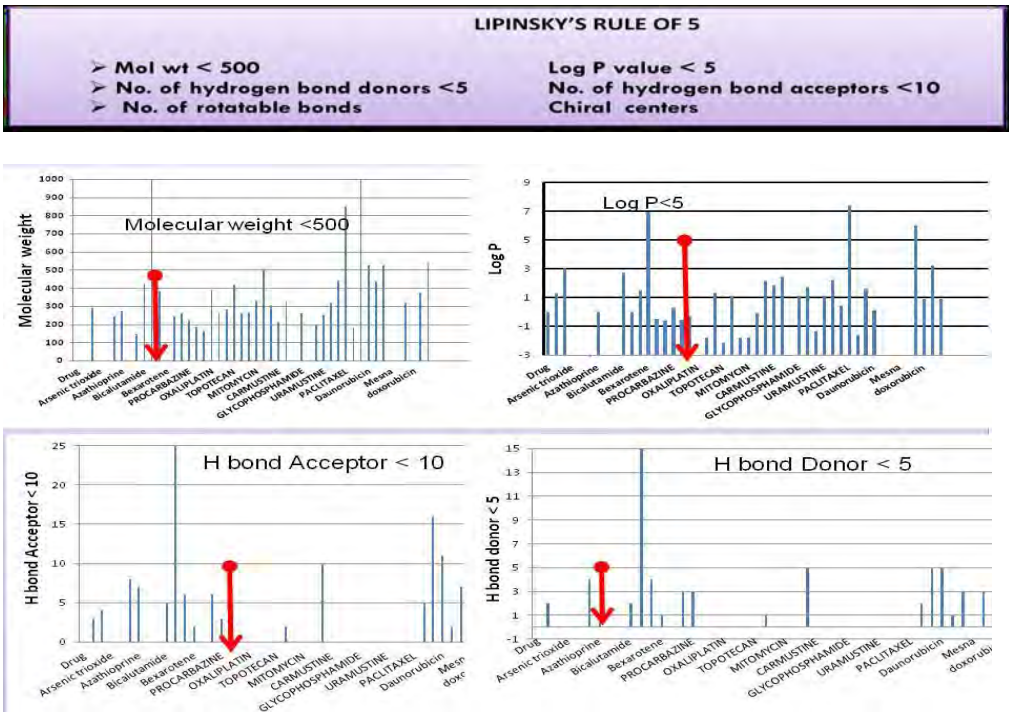
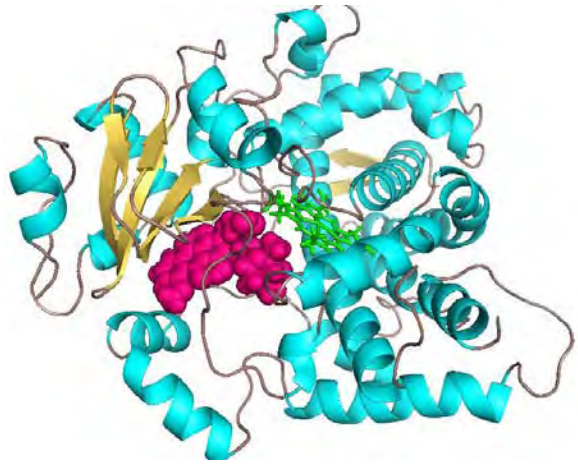


Fig 9. Computed parameters from Hyperchem -the Lipinsky's rule



Score	XpG	MGbsa Binding free energy
Doxorubicin	-9.346	-96.783
Etoposide	-5.992	-85.159
Methotrexate	-6.074	-79.730
Tegafur	-3,471	-3.7602

Fig 10. Docking of CYP 3A (PDB id- 1TQN) with Doxorubicin using Glide.

3.Learning for Students:

This project opens the horizons for undergraduate students to imagine and foresee themselves in the field of drug discovery both in research and industrial set-up. The project gave them exposure to Drug development and designing of therapeutics. They applied their knowledge of biochemistry to understand cancer metabolism. They came to know about specificity of drugs targets. They learnt to design experiments and organize their work. The aspects of biophysics and physical chemistry were introduced by encouraging them to experiment with the proteins using different techniques. They were able to appreciate different perspectives about same problem and also to interlink the different fields to make conclusive ideas. The importance of data accumulation, analysis and interpretation was given to the students by hands on approach. The students gathered multitude of aspects of research by interacting with faculty, scientist and research scholars at IIT (Delhi), IMTECH (Chandigarh) and NIPER (Mohali). This will give them considerable experience to be able to take pharmaceutical/ biochemistry research as a career. The participation at Antardhwani was a one of its kind of experience for the students. They interacted with of people all walks of life-young school students, faculty and parents to whom they communicated their work. The students with their knowledge and wit brought difficult fields of research to the understanding of the community.

The technical skills:

Spectroscopy –Uv vis and fluorescence were used as tool for drug protein interactions.

Physical chemistry -aspects of data analysis were discussed.

Protein purification-chromatography, SDS page, dialysis, assay characterization- using theoretical know how to solve problems faced during optimizations.

Computational tools- Glide, Autodock, Hyperchem, Marvin Sketch, exploring PDB.

Organic synthesis of flavanoid.

Exposure to advanced technologies and infrastructure by virtue of visits to research institutes such as IIT, IMTECH, NIPER and industry Sphaera pharma.

4.Benefits to College:

Exploring and forging Synergy between different departments along with cross pollination of ideas and concepts. The project was enthusiastically supported by college administration, different department's faculty members and staff.

Enabled platform for pioneering further research in this direction by assistance in development of infrastructure. Rejuvenation of the laboratory resources.

Faculty was mobilized and young researchers got a chance to try out newer topics of study. It gave new faculty confidence, resources and impetus to explore different areas of research and enhance their skills, all the while sharing with and enriching the students.

The students had the opportunity to familiarize themselves with advanced dimensions of research and to do research in house rather than going to other institutes for short durations. Here they were dedicated and secure in home institute and worked flexibly. They were in touch with their other friends in all other projects resonant exchange of ideas took place and spirit of excellence was renewed.

The college was able to raise the bench mark for research by compilation and publications in peer reviewed journals.

The college will be more keen to seek further support to take finding from this work to next level.

5.Benefits to Society (100 words):

CYP450 plays a pivotal role in clinical and pharmaceutical research especially that of cancer. The genes of CYP450 enzymes exhibit high degree of polymorphism. People of different races, geographic locations have a plethora of gene variants for a particular CYP450 enzyme. This will lead to decreased efficacy of

the drug or may even lead to build up the unmetabolised form to its toxic levels which may damage the liver, kidney and other organs involved in drug metabolism and clearance.

Hence for a molecule to be considered drug like or to even enter drug trials, it has to first pass the ”CYP 450 test”. Detailed study with CYP450 can contribute to the society in future by obliviating the need for high-end technologies. Hence generating opportunities for small enterprises to take up drug discovery and development.

Humanitarian aspect-

Reduced Costs of drugs

Absolute safety –side effects

Dosage efficacy-bioavailability

Inter individual variability –genetic polymorphism

6. Further Plans:

The one year in the project was useful to optimize very sensitive protocols to study drug interactions, transformation and metabolism. The parameters need to be fine tuned to make a authoritative hypothesis. The Computational drug design parameters will be correlated to the spectroscopic data with the number of drugs that we can study will add to the sensitivity, accuracy and applicability of the outcome. The study with various models of organisms and drugs need to be set in a frame work that can be a comprehensive tool for single and multi drug interactions in the animal.

SRI VENKATESHWARA COLLEGE

Project Title: An easy identification for pathogenic gamma/epsilon proteobacteria by exploring the internal features of their 16S rRNA gene

Project Code: SVC-107

बीमार होने से पहले ही चल जाएगा बीमारी का पता

सुविधा प्रोटियोबैक्टिरिया की पहचान के लिए डीयू में हो रहा है अध्ययन, श्री वेंकटेश्वर कॉलेज में शिक्षक व छात्र एक साल में प्रोजेक्ट करेंगे पूरा

शैलेंद्र सिंह | नई दिल्ली

पेटदर्द और उल्टी-दस्त से लेकर अल्सर व प्लेग जैसी जानलेवा बीमारियों की पहले ही चरण में पहचान अब मुमकिन होगी। दरअसल, दिल्ली विश्वविद्यालय के श्री वेंकटेश्वर कॉलेज में शिक्षक व छात्र कंप्यूटर के माध्यम से प्रोटियोबैक्टिरिया पर अध्ययन कर रहे हैं। विश्वविद्यालय के इनोवेशन प्रोजेक्ट्स के तहत मिले इस काम को यह टीम अगले एक साल में अंजाम देगी। टीम अपनी शुरुआती सफलताओं से बेहद उत्साहित है।

ऐसे होगी रोग की पहचान

बायोइन्फॉर्मेटिक्स आधारित इस प्रोजेक्ट से जुड़ी डॉ. मानसी वर्मा बताती हैं कि इस तकनीक के जरिए पैथोलॉजिकल लैब में स्टूल टेस्ट (मल परीक्षण) के दौरान रोगी के डीएनए अलग करके उसमें मौजूद प्रोटियोबैक्टिरिया के जीन 16S ह'ब्र को कन्जर्व्ड मोटिफ व इन-सिलिको रेस्ट्रिक्शन डाइजेशन पैटर्न के तहत जांचा जा सकता है। इन दोनों ही तकनीकों के माध्यम से यह पड़ताल संभव है कि कौन-सा प्रोटियोबैक्टिरिया रोगी के शरीर में विकसित हो रहा है और इस तरह प्रारंभिक चरण में ही उसकी पहचान हो सकती है।

किन बैक्टिरिया व बीमारियों पर चल रहा है काम

1. कैम्पाइलोबेक्टर गैस्ट्रोएंटराइटिस (डायरिया, दस्त आदि)
2. शिगेला डिसेंट्री (पेट से जुड़ी बीमारी)
3. यर्सिनिया (प्लेग)
4. हेलिकोबेक्टर गैस्ट्राइटिस (अल्सर)

मौजूदा व्यवस्था से कैसे बेहतर

अभी इस्तेमाल की जाने वाली जांच प्रक्रिया के तहत कई दिनों तक डॉक्टर से दवा लेने के बाद भी जब बीमार व्यक्ति को राहत नहीं मिलती है तो पैथोलॉजिकल जांच के जरिए रोग की पहचान की जाती है। लेकिन, जब तक जांच के नतीजे सामने आते हैं तब तक काफी देर हो चुकी होती है और बैक्टिरिया पूरी तरह फैल चुका होता है, जबकि नई तकनीक के जरिए पहले ही चरण में मल परीक्षण के जरिए विकसित होने वाले रोग की पहचान कर सकते हैं। यानी डॉक्टर को उपचार की सही दिशा मिलेगी और रोगी को जल्द राहत। प्रोजेक्ट से जुड़े डॉ. पीएस देवधर का कहना है कि इस तकनीक के विकसित होने से न केवल जांच में आसानी होगी बल्कि यह सस्ती भी पड़ेगी।

शिक्षक व स्टूडेंट सब हैं टीम में शामिल

प्रोजेक्ट में मेंटर की भूमिका में हैं डिपार्टमेंट ऑफ जूलॉजी के प्रो.रूपलाल। इनके अलावा विभाग के ही तीन सदस्य डॉ. मानसी वर्मा, डॉ. पीएस धनराज और देवदत्त पटेल और बायोकैमिस्ट्री की डॉ. अंजू कास्कर शामिल हैं। इस प्रोजेक्ट में रिसर्च के लिए छह छात्र जूलॉजी, तीन लाइफ साइंसेस और एक छात्र बायोलॉजिकल साइंस से शामिल हैं।

SVC-107 News in "Dianik Bhaskar" on 21st August, 2012.

1.Objective (150 words):

Gamma and epsilon proteobacteria represent the richest classes of phylum proteobacteria with more than 250 genera. As proteobacteria include various pathogenic strains such as the members of *Helicobacter*, *Salmonella*, *Campylobacter*, *Shigella* and many more, attempts will be made to provide easy identification of few of the important genera upto species level. Although genome based phylogeny has been conducted for γ-proteobacteria (Williams et al., 2010), yet a quick identification of the pathogenic strains is a vital need. For the robustness, the marker should be easily available. Hence, the present work will be based on the approaches to develop the methods for easy identification of certain pathogenic bacterial strains, specifically the members of proteobacteria. A quick view of Taxonomy Browser at NCBI clearly represents a large number of unclassified organisms under γ- proteobacteria and ε-proteobacteria. To conduct such studies, the following objectives have been taken:

- Estimation of the number of 16S rRNA gene sequences of the respective genera from the database.
- To construct phylogenetic trees of respective species of selected genera.
- Obtaining the consensus sequence of each species and then looking for species specific internal features.
- Assigning the 16S rRNA sequences of uncharacterized or unidentified strains to their respective groups.
- To explore the restriction pattern of 16S rRNA gene sequence to trace species specific characteristics.

GENERA	TOTAL NO. OF SPECIES	NO. OF SPECIES USED	TOTAL NO. OF SEQUENCES	NO. OF SEQUENCES USED
Campylobacter	28	16	428	384
Proteus	102	4	142	125
Yersinia	11	6	200	166

Helicobacter	45	10	361	264

2. Final Findings (300 words):

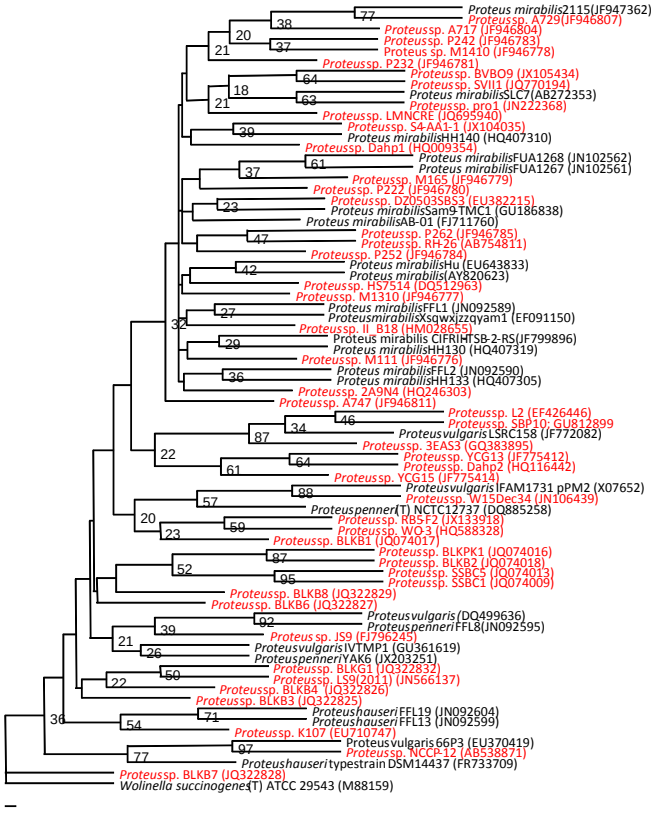
The phylogenetic analysis for all the 4 genera was performed. The validation and framework trees in each study revealed the following results:

- Most species present within each genus were found to show homogeneity, while some species displayed a heterogeneous nature.
- Out of the 16 species studied under *Campylobacter*, 12 species were found to be homogeneous in nature. Heterogeneity was observed between *C. jejuni* and *C. coli*, *C. upsaliensis* and *C. heleveticus.*
- 6 out of the 10 *Helicobacter* species studied showed homogeneity. *H. heilmannii* & *H. felis* and *H. bilis* & *H. cinaedi* were found to be heterogeneous.
- 6 species were studied under the *Yersinia* genus. *Y. ruckeri* and *Y. enterocolitica* were observed to have homogeneous nature. The genus showed high levels of heterogeneity. *Y. kristensenii*, *Y. intermedia* and *Y. pestis*, *Y. pseudotuberculosis* reflected a heterogeneous nature.
- The *Proteus* genus undertook 4 species for its study. *P. mirabilis* and *P. vulgaris* displayed homogeneous results whereas *P. penneri* and *P. hauseri* showed heterogeneous nature.

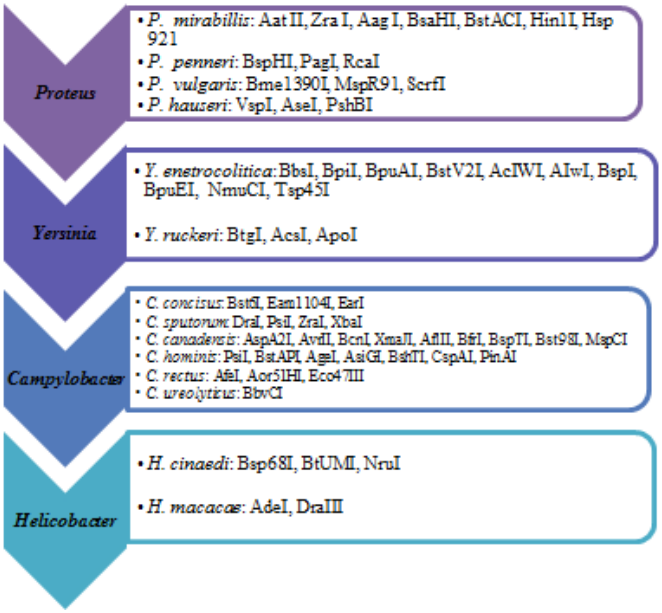
This study aims to classify the uncharacterized species in the database. The best classification by Phylogenetic analysis is provided by the genus *Proteus*. Phylogenetic tree given below represents that 33 out of 72 uncharacterized *Proteus* species were characterized by phylogenetic analysis. Neighbor-joining analysis with Kimura 2-parameter correction and bootstrap support was performed on the sequences of *Proteus* sp. (the different isolates can be segregated as *P. mirabilis*- 76, *P. vulgaris*- 27, *P. penneri*- 11, *P. hauseri*-14) along with 72 uncharacterized sequences.

Results of phylogenetic analysis were validated by studying restriction digestion patterns of all sequences under study.

With the help of the restriction digestion patterns obtained, species-specific marker enzymes could be discerned. But, marker enzymes could not be obtained for all the species under consideration, due to heterogeneous nature of some species in each genus. The marker enzymes obtained could be used as a means to validate the uncharacterized species characterized by phylogenetic analysis. Also, they proved to be an aid in characterization of some of the remaining uncharacterized sequences. However, marker enzymes could not be obtained for all the species under consideration, due to heterogeneous nature of some species in each genus. Nevertheless, framework analysis and restriction enzymes proved to be the robust tools for species identification.



Phylogenetic tree of 16S rDNA of the genus Proteus and their uncharacterized sequences.



Restriction Markers of four genera considered in present study.

3. Learning for Students (200 words):

It has been an extremely valuable and useful experience for the students. This truly innovative idea has given them an exposure to research and the hard work it entails, something that students only get an idea of at higher academic levels. The innovative project instituted by Delhi University has been learning process at all its steps from data gathering, to interpretation and analysis, literature browsing and paper writing. It has given students the confidence to work on a project and analyze the results that their work has generated. This project specifically, has shown the wonderful blend of information technology and biology. The students have learnt about biological databases, analysis of nucleotide and proteins sequence *in-silico* and phylogenetic relationships between organisms. The display of posters at International Symposium on "Structural and Functional Genomics" at Thanjavur, Tamil Nadu; at Antardhwani-Innovation Plaza (Delhi University Fest) and the National Symposium "National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society" conducted at the college gave students a chance to interact not only with their peers from around the country but also with eminent scientists and teachers from various field of science. All in all it has been an enriching experience and has promoted scientific thinking among students and has inspired them to further explore the magnificent field of bioinformatics. The students were very grateful to Delhi University for giving them this wonderful opportunity.

Meeting of Innovative Project students with Mentor Prof. Rup Lal at Molecular Biology Laboratory, North Campus.

Poster presentation at Sastra University, Thanjavur.


ASM virtual workshop organized by Innovative project team.

Innovative Project students at “Antardhwani Innovation Plaza”.

4. Benefits to College (100 words):

The project has created enthusiasm for science projects among students and many students are eager to work in more similar projects. Bioinformatics being a relatively new field of which students are not very aware. This project has not only increased the understanding of the subject but also instilled a passion to explore it. Also the college gained recognition by conducting “National Symposium on Recent Trends in Innovative Research at Undergraduation: Science and Society”, which was attended by eminent persons from various fields of science and students, from around the country. This gave a platform for exchange of scientific and innovative ideas. The innovative projects have also given the recognition to our college in research with seven innovative projects to its credit.

5. Benefits to Society (100 words):

As the innovative project SVC-107 deals with the bioinformatics of pathogenic bacteria, this project has made the identification of some dreadful pathogenic strains easier. The earlier strategies were time consuming and could not distinguish the close species easily. Our approach has not only helped to identify the pathogens at earlier stage of pathogenesis, but has also helped to overcome the database redundancy. Although at this stage, the comparative analysis part is not yet complete but we are sure that such robust techniques may be helpful in designing species specific kits.

6. Further Plans (100 words):

The present work was initiated with two main objectives:

a. To characterize the four pathogenic genera upto species level, and
b. To reduce redundancy in database.

So far, we have distinguished several sequences upto species level. The unique markers for the heterogeneous species are yet to be explored. For this purpose, several housekeeping genes will be analyzed from the database. So, the next target will be to identify the housekeeping genes from the database and to perform the phylogenetic analysis as well as restriction digestion on these sequences.
Also, we have identified several sequences which were not characterized earlier. Therefore, these sequences will be characterized in their specified groups to reduce redundancy in database.

7. Abstracts and publications

Abstracts

a) Menon, A., Gahlot, S., Patel, D. D., Lal, R., and Verma, M. "An effortless detection and identification of the uncharacterized strains of genus *Yersinia* via 16S rRNA gene sequences". Poster presented at "Structural and Functional Genomics" at Thanjavur, Tamil Nadu from 6-7th January, 2013.

b) Rai, A., Puri, A., Kaicker, A., Lal, R., and Verma, M. "An approach to characterize the pathogenic species of genus *Helicobacter* by analysing their 16s rRNA gene". Poster presented at "Structural and Functional Genomics" at Thanjavur, Tamil Nadu from 6-7th January, 2013.

c) Muralidharan, M., Ghosh, A., Singhvi, N., Dhanaraj, P. S., Lal, R., and Verma, M. "An approach to classify uncharacterized species of *Campylobacter* by exploring the internal features of housekeeping genes". Poster presented at "Structural and Functional Genomics" at Thanjavur, Tamil Nadu from 6-7th January, 2013.

d) Samarth, Kapuria, A., Patel, D. D., Dhanaraj, P. S., Lal, R., and Verma, M. "An easy identification of *Proteus* species for characterizing pathogenic strains and to record nonrepetitive data in the database". Poster presented at "Structural and Functional Genomics" at Thanjavur, Tamil Nadu from 6-7th January, 2013.

Publications

a) Ghosh, A., Muralidharan, M.S., Singhvi, N., Patel, D.D., Kaicker, A., Dhanaraj, P.S., Lal, R. and Verma, M. 2013. Easy Identification of genus *Campylobacter* up to species level using internal features of 16S rRNA gene sequences. (Manuscript under preparation).

b) Samarth, S., Kapuria, A., Patel, D.D., Kaicker, A., Dhanaraj, P.S., Lal, R. and Verma, M. 2013. An easy identification of pathogenic Proteus species and to record Non-repetitive data in the database. (Manuscript under preparation).

ST. STEPHEN'S COLLEGE

Project Title: Molecular Design, Synthesis, Characterization and Applications of Macrocyclic Compounds.

Project Code: SSC 101

Project SSC 101: Molecular Design, Synthesis, Characterization and Applications of Macrocyclic Compounds.
Project Seminar, April 2013
St. Stephen's College

1. Objective (150 words):

Hexa-peri-hexabenzocoronenes (HBCs) are a class of unique macrocyclic molecules which consists of fused aromatic rings. Besides synthetic challenges, correlations between the chemical structure of these macrocyclics and their electronic properties, as well as their packing behavior in the solid state, are a key concern. They consist of flat disc type cores which enable them to self-assemble into columnar mesophases. The packing behaviour of these discotic liquid crystals renders them well suited materials for study of electrical conductivity and their application as s semiconductors in various devices like organic light-emitting diodes (OLEDs) ,Field Effect Transistors etc. Theoretical studies on HBCs using different basis sets and different functions in DFT using Computational Chemistry Software TURBOMOLE have been explored. The effect of substituents on the various properties of HBC has been explored. As part of our experimental work, Hexaphenylbenzenes (HPBs) and HBCs, have been synthesized and characterized by spectroscopic methods. This forms the basis of our study of the molecules used in organic semiconductor devices having suitable electronic, optical and transport properties. The electronic and semiconducting properties of junctions formed between different metals and HBCs have been evaluated in order to make materials with tailor-made properties as OLEDs.

2. Final Findings (300 words):

The concept of aromaticity which was introduced in 1865 still continues to be of central importance for the rationalization of the structure, stability and reactivity of many molecules. So the local aromaticity of a series of benzenoid systems including the class of very large polynuclear aromatic hydrocarbons (VLPAHs) has been studied computationally. A study of representative molecular systems oligoacenes, phenacenes and circumacenes using different basis sets and different functions in DFT has been carried out using Computational Chemistry Software TURBOMOLE to determine the best basis set and function for this class of compounds. We have used the structural based measure, HOMA to verify the Clar's model of extra stability of benzenoid species after optimizing their structures. It has been found that the exchange-correlation functional B3LYP and the basis set 6311G** gives the best result keeping computational efficiency in mind when compared with the experimental values. The results of geometry optimization have been used to calculate the HOMA index for various rings in a PAH to study the

localization of the aromatic sextets present in the molecule and thus verifying Clar's sextet rule. The effect of substituents on the aromaticity of Hexa-peri-hexabenzocoronene (HBC), a class of VLPAHs, has also been explored. HOMA therefore gives us an idea of the relative stability, the effect of substituents and also the reactive sites within a molecule.

In organic molecule semiconductors, conductivity is known to occur via a hopping mechanism in which charge carriers jump between neighbouring molecules, often under the effect of an external applied field. The HOMO-LUMO gaps play a very important role in determining the electronic properties of the molecule. The macromolecules, Hexa-peri-hexabenzocoronenes (HBCs), have attracted research interest for their interesting nonlinear optical properties. We have studied HBCs using different basis sets and different functions in DFT using Computational Chemistry Software TURBOMOLE. Using DFT and time dependent DFT we have computed (i) vertical and adiabatic electron affinities and first ionization energies; (ii) quasiparticle correction to the HOMO- LUMO gap; (iii) molecular reorganization energies. We have started with the acenes and studied the variation of these properties as increasing number of carbon atoms or rings. Further we have studied these properties for substituted HBCs. Very high intrinsic charge carrier mobilities have been determined for these HBCs, which are about one order of magnitude higher than the one found for conjugated polymers. Theoretical studies have been made on the basic current-voltage properties of these semiconducting materials.

As part of the experimental work, synthesis of the precursor Hexaphenylbenzene (HPB) has been carried out by Diels-Alder and cyclotrimerization reactions. The macrocyclic molecule HBC has been synthesized optimizing the conditions for its synthesis by carrying out numerous experiments under varied conditions. The Synthesis of HBC has been attempted by three different methods and compared on the basis of ease of synthesis, yield, colour of the product, spectral data etc. Due to the extreme insolubility of the HBC in common solvents characterization has been attempted by UV/VIS spectroscopy and TG/DTA. We have come to the conclusion that oxidative cyclodehydrogenation using $AlCl_3$ and $CuCl_2$ is one of the best methods to prepare HBC. Some substituted HBCs have been synthesized and the precursors to others have been prepared and characterized. Thin films of the compound on glass substrate have been obtained by thermal evaporation. Junction analysis of the metal-organic layer has been carried out by studying current-voltage curves theoretically and experimentally with the final aim of making a semiconducting device with desired properties.

3. Learning for Students (200 words):

The project has indeed been a great learning experience. It has given our students a wonderful opportunity to delve into research of various journals and research papers and thereby expand their knowledge. It has given them an access to operate advanced instruments and implement laboratory techniques which they usually don't get access to in the normal course. Exposure to a different branch of chemistry i.e. Computational Chemistry has been very beneficial. With compulsory fixed hours, students learn time management and collaborative team management skills. Planning/Strategizing each step and thoughtful execution is the key for success. Stronger communication with teachers and project members helps in boosting their confidence. A number of presentations were made by the students participating in the project with topics ranging from quantum mechanics, computational methods used synthesis methods and applications. Drafting and presenting scholarly reports and posters as part of their project helps to hone their skills further. It has also provided them gave them an excellent exposure and knowledge of various analytical techniques like column chromatography, separation processes, use of rotary evaporator, TLC, UV-VIS spectroscopy, NMR and MALDI etc. which they wouldn't have learned at the undergraduate level otherwise. This experience has helped some of them to perform well in competitive entrance examinations like facing an almost eighty minute interview at IISER, Pune. The project has brought them in contact with a much more practical approach of Science and has inspired them to take up research in future.

4. Benefits to College (100 words):

Funding from Delhi University is very important for undergraduate research as it gives an additional encouragement to students to perform better. The college has gained in terms of infrastructure. Many equipment and instruments have been bought which can be used by future students. Students get to learn many new things which are beyond their syllabus. It also gave students an opportunity to improvise upon their presentation skills, gain confidence and develop their interest in research during the ANTARDHWANI 2013. It has also provided them with a platform to express and share their ideas. The departmental societies also saw an increase in participation from students during the events and students are now more confident about presenting their work, be it in any form, paper presentation or poster presentation.. The college gains in reputation as a hub not only for academic excellence but also for scientific research. This is turn creates an exciting and sustainable environment that attracts more and more deserving and bright students to the college which would spiral the college to greater heights.

5. Benefits to Society (100 words):

Ours is Science project based on experimental work. The findings of the project will contribute to the society in long run. It encourages students to take up research at higher lever. They get trained for future research activities. It encourages more and more teachers and students to take up research and contribute to society in different ways. It encourages the young to think and understand and expand their horizons, instead of following the rote pattern. There could be a probability that the corporate sector evinces a strong interest in our project and uses it on a production scale. The students involved could get into research and get into teaching or they could get into R&D departments of the corporate sector which would also contribute to the society. In future more such projects should be initiated because students get a wonderful platform to develop and learn research skills, time and project management and get aware of on-going research at International Levels.

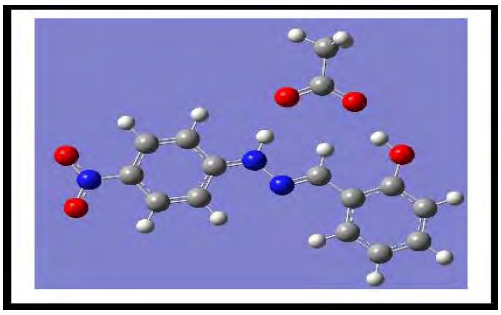
6. Further Plans (100 words):

A study of representative molecular systems oligoacenes, phenacenes, circumacenes Hexa-peri-hexabenzocoronene (HBC) and the effect of substituents on aromaticity has been carried out using different basis sets and different functions in DFT using Computational Chemistry Software TURBOMOLE. Further we have studied various properties for HBCs. The electronic and semiconducting properties of junctions formed between different metals and HBCs has been studied in order to make materials with desired semiconducting properties as OLEDs. This study is extremely important for studying further their applications in organic semiconductor devices having suitable electronic, optical and transport properties. The theoretical and experimental work done so far is to be published as one review article and one full paper in National and/or International journal of repute in near future.

ST. STEPHEN'S COLLEGE

Project Title: Development of new reagents for detection of anions in water

Project Code: SSC-102



CHEMOSENSING: Binding of acetate ion to o-hydroxybenzaldehye derivative.

1.Objective (150 words):

The central aim of this project is to develop innovative and universally applicable anion sensors by deploying principles of molecular recognition and molecular receptors. The anions selected for the study are the ones that are known to cause kidney disorder, brain damage, endocrine disruption, bone and skeletal cancers (excess fluoride) blue baby syndrome, stomach and gastrointestinal cancer (due to nitrate), uncontrolled algal growth (phosphate), skeletal muscle dystrophy and body malfunctioning (arsenate). The development of anion sensors would be extremely helpful in monitoring their concentrations in water, lakes and sewage plants. Several approaches can be used to achieve anion sensing. One can, for example, use the difference in basicity, hydrogen bond formation capabilities, structure of different anions etc. It has been previously established that calix[*n*]arenes and calix[*n*]pyrrole can be functionalized in a wide variety of positions to provide one or more of the desirable anion binding motifs. Some of these motifs are represented by simple functionalities like amide, urea, hydrazone and hydrazides. Therefore, the objective of the project was to design sensors based on calix[4]pyrrole, urea, thiourea and hydrazone derivatives.

2.Final Findings (300 words):

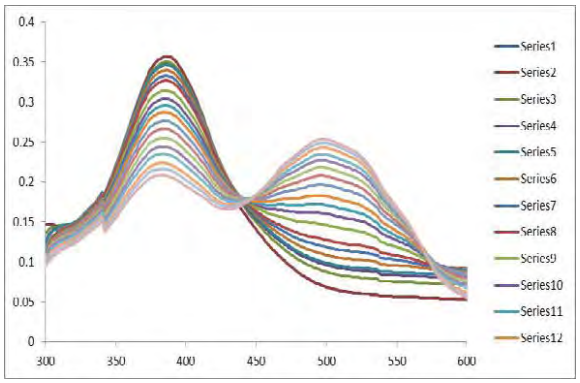
The students were divided in groups of two or three to carry out the experimental work. The students of group 1 (Hitaish, Rocky Chhikara and Charu Seth) have synthesized various Schiff's base receptors for anions. The students have synthesized three different Schiff's bases of anthraquinone, salicylaldehyde and *p*-nitrobenzaldehyle. Diformylated phenols derivatives were synthesized. The purity of the products was tested by TLC, melting point determinations and NMR, IR spectroscopies.

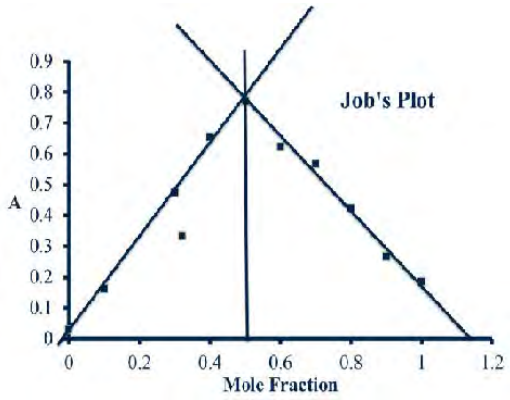
Figure 1. Solutions of anthraquinone derivative with different anions. Blue color was observed with fluoride ion.

Figure 2. Titration of a solution of o-hydroxybenzaldehyde derivative (1.5×10^{-5} M) with a solution of fluoride ion in THF (1×10^{-4} M).

Figure 3. Job's Plot of o-hydroxybenzaldehyde derivative in THF with Fluoride ions showing 1:1 complexation.

Figure 4. Detection of fluoride and acetate ions by receptor by o-hydroxybenzaldehyde derivative.





The receptors were evaluated for anion sensing through UV-Visible spectroscopy and colour change to naked eye. In case of o-hydroxybenzaldehyde derivatives, a colour change from yellow to pink was observed for acetate ion in THF. Different binding modes of acetate banding to salicyladehyde derivatives were calculated using density functional theory. It was observed that when two oxygens bind to two hydrogen to receptors through H-bonding. A faint pink colour was observed for fluoride ion. Anthraquinone derivative have shown colour change from yellow to blue in presence of fluoride ion. Sonam and Graima Duggal have synthesized urea and thiourea derivatives by reaction with various signaling units having nitro groups. The products were evaluated for purity by thin layer chromatography and melting point determination. It was observed that these derivatives also produce colour change with fluoride ion.

Figure 5. Addition of fluoride ion (1 equiv) in THF to solution of fluoride in THF 1 (left) and 2 (right) (1×10^{-4} M).

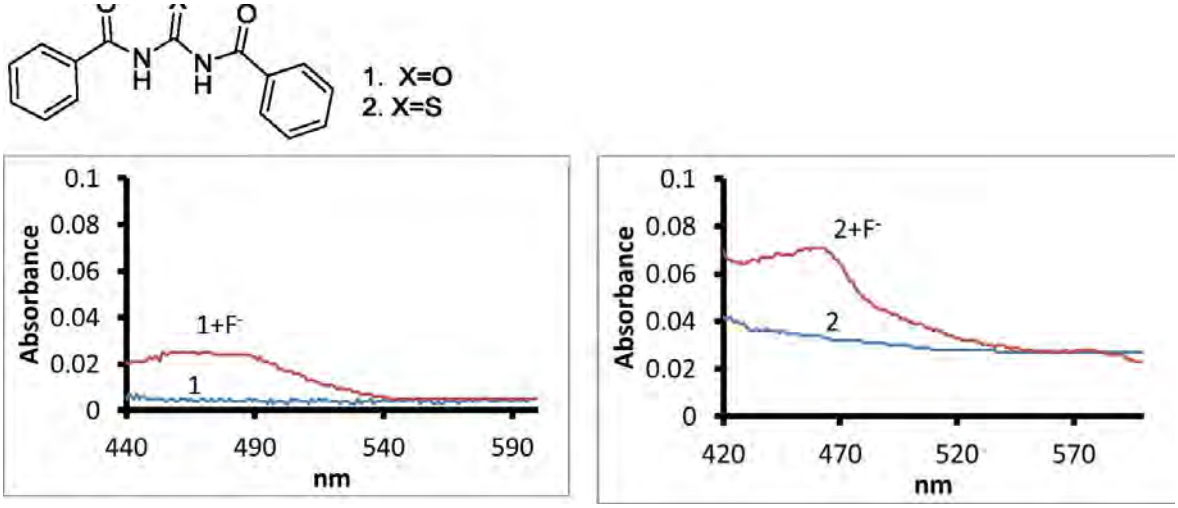
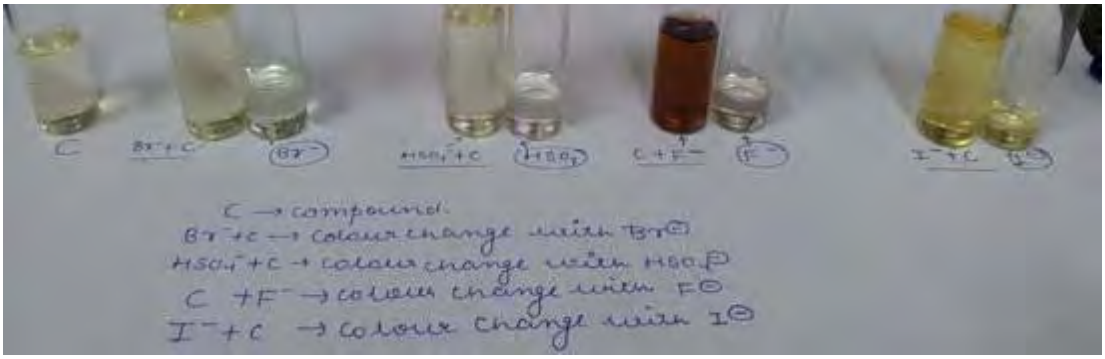


Figure 6. Detection of fluoride ion by thiourea based receptor 2.



Group III (Kalpana Malik and Shikha Choudhary) have synthesized various tweezers type receptors (Schiff's bases) with variety of spacer as shown in figure below.

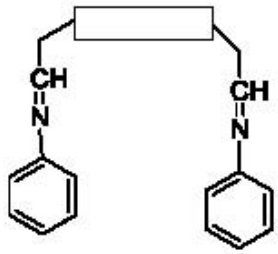
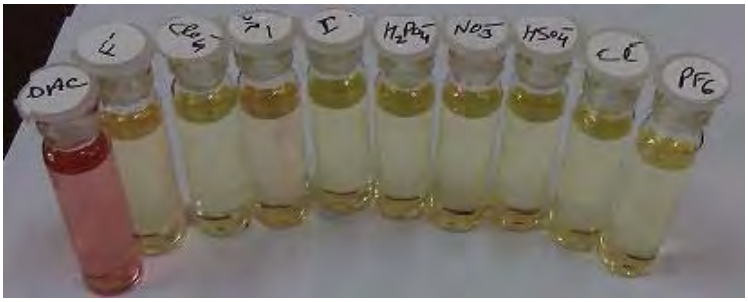


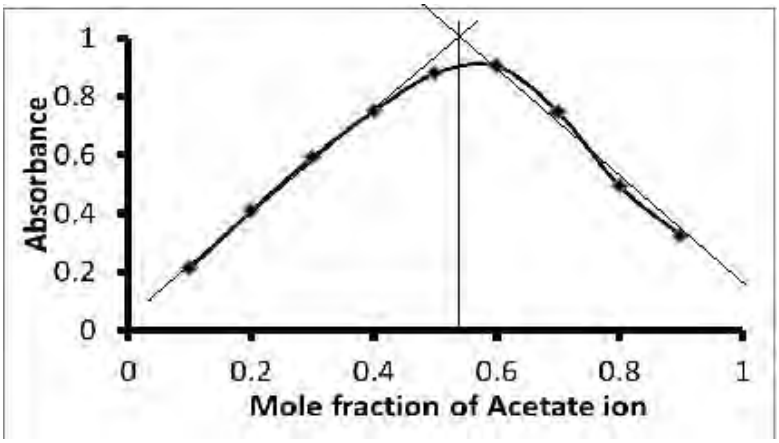
Figure 7. Structure of tweezers type receptor.

Figure 8. selective detection of acetate ion by tweezers type receptor.

Figure 8. Jobs plot of tweezers type of receptor with acetate ion showing 1:1 complexation.

The products were characterized by IR, NMR and HRMS. The products were evaluated for anion sensing properties through UV-visible spectroscopy and colour change through naked eye. It was observed these compounds can selectively recognize acetate ion with a colour change from yellow to pink in presence of THF. The intensity of colour however is dependent on the size of the cage and the functional group attached to the benzene ring. The group IV (Mohamin Khan, Seep Arora, Saumya Silori, Neha Singh) have synthesized calix[4]pyrrole and its chromogenic derivatives. The first reaction leads to a mixture of two components. The product was purified through column chromatography to yield a monosubstituted calix[4]pyrrole derivative which was characterized by mp, NMR and IR spectroscopy. The products were evaluated for anion sensing properties. The basic calix[4]pyrrole was able to recognize fluoride ion. However, the colour change was not prominent and therefore we decided to functionalize the calix[4]pyrrole architecture with diazo groups.



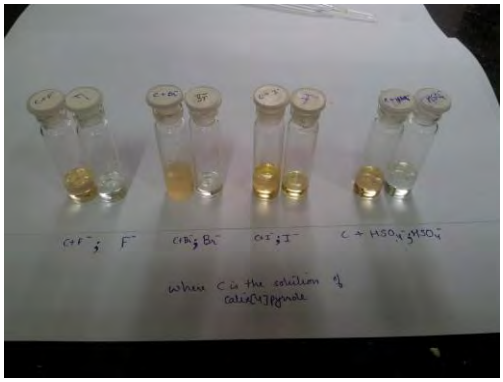


Solution of calix[4]pyrrole with various anions.

This group has also dialdehydes schiff's bases. The products have shown change in colour in presence of iodide, nitrate, fluoride and dihydrogen phosphate.

Figure 9. Change in colour observed for dialdehyde derivative (5×10^{-5} M) on addition of different anions in THF.

The group V (Mohamin Khan) is working on development of non-linear curve fitting methods for calculation of binding affinities of anions using UV-Vis data. He is using various curve fitting methods and mathematical and statistical softwares such as SSPS, Matlab and Mathematica to achieve the desired results. The group is able to develop 1:1 non linear binding analysis routine for analysis. The group 6 (Akash Mohan, Neha Lawrence) is involved with functionalization of calix[4]arene skeleton at methylene bridges. Calix[4]arene are known to selectively recognize anion after suitable functionalization. The upper rim and lower functionalization have been extensively studied. However, no reports have appeared in literature for functionalization of methylene bridge to achieve selective anion binding. The starting calix[4]arene was prepared and checked for purity by TLC and melting point determination. Further work to oxidize the methylene bridges is in progress.



In summary the project have made good progress in successfully designing and synthesizing receptors for anions such as fluoride, acetate, nitrate, dihydrogen phosphate and iodide ions. The results of these studies will be published shortly.

3.Learning for Students (200 words):
The undergraduate student benefitted immensely through this project as this is the first time they were exposed to research work. They participated enthusiastically in carrying out day to day activities of the project. The students under this project benefitted through hands on experience with varieties of instrument and techniques such as chromatography, spectroscopy, synthetic organic chemistry, computational chemistry etc. Students through this project carried out their worked independently and prepared several organic compounds which acted as sensors for fluoride, acetate, nitrate and iodide. It provided an opportunity for them to learn, understand and deepen their knowledge in Chemistry beyond their prescribed syllabus. Students were also encouraged to take part in various national and international conferences held in different parts of India which gave them an exposure to various research work going on around the world. The knowledge acquired through these conferences would help them to choose the right area for their further studies. Students also made a number of poster presentation of their work in these conferences which has helped improved their communication skills and scientific knowledge.

4. Benefits to College (100 words):
The project was beneficial to the college as it promoted the research culture in our college. The project was also useful in creating additional research infrastructure in our college. Through this project, we were exposed to interdisciplinary research environment and gained knowledge in other subjects. The research work carried out through this project also helped in developing newer laboratory teaching tools. Earlier students interested in research have to move to other university or institute in India. Now they can utilize their free time in research within the college. The tools and knowledge developed through the project can be utilized throughout the university and its colleges.

5. Benefits to Society (100 words):
India also has serious problem of anion toxicity, with fluorosis and gastro-enteritis affecting more than 25 million people. The presence of elevated level of fluoride was detected in groundwater sources used for drinking purpose in Rajasthan, Gujarat, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Assam. Rajasthan, Punjab and Madhya Pradesh are severely affected by higher level of nitrate. The project was focused on development of universally applicable sensors capable of recognizing toxic anions present in drinking water. We have developed various sensors which can detect anions such as fluoride, iodide, acetate and nitrate. These sensors can be utilized to monitor the presence of these anions. The research program is expected to generate significant data which could be used to build a platform for anion sensing technologies that would result in social benefits for populations living in high anion toxicity areas of India.
6.Further Plans (100 words):
This project seeks to explore and prepare suitable molecular receptors for recognition of anions. During the second phase of the project the best candidate ligands will be integrated with solid state devices to translate molecular receptors to prototype devices for deployment in the field and to elucidate how natural ground waters influence sensor performance. The sensors fabricated on conducting glass will be employed to allow on-site optical monitoring of anions. The conductivity of glass plate would be useful in regeneration of sensors (adsorbent material). The receptor-immobilized conducting glass based solid chemosensors will have significant advantages and can be utilized as adsorbent in heterogeneous solid–liquid phases. Such a miniaturized system could show high sensitivity, selectivity and reversibility for important anions polluting our environment.

ST. STEPHEN'S COLLEGE

Project Title: Improving the living conditions of the homeless in Delhi

Project Code: SSC 103

1. Students working on the rickshaw 2. and 3. Inauguration by the Chief Minister , 4. The rickshaw "Sukoon" displayed at "Antardhwani"

1. Objective:

The project addressed the issue of improving the living conditions of the homeless in Delhi. The problems faced by the homeless citizens range from inadequacies in the infrastructure of the shelters themselves to poor access to sanitation, food, health services, public distribution systems, etc. Surveys conducted earlier had found that the number of temporary and semi-permanent shelters (about 146) is not enough to house all the homeless people, particularly during winters, and there is partial/complete absence of basic civic amenities at most of the existing shelters. Also, the lack of available space for constructing new shelters at key locations - namely central and old Delhi areas, where the density of labourers and daily wagers is maximum, shifted focus towards developing mobile shelters. Regarding health, a major concern is malnutrition and/or illnesses, which result from dietary imbalance. Because of habituary compulsions and lack of awareness, many people consume food with a low nutritional value, which is readily and cheaply available close to their work-place. The problem of easy access to balanced food/ rations at affordable prices was addressed as well.

2. Final Findings:

This project brought together students and faculty members from the Physics and History Departments of St. Stephen's College. The students were divided broadly into three groups dealing with the following issues: development/improvement of existing/new shelters, food security, and health and sanitation.

The demographic survey data showed that around 30% of the homeless were rickshaw pullers and formed the single largest group among the homeless (based on employment). This, together with the fact that space for the construction of additional shelters is difficult to procure, led to the conclusion that it would be useful to convert a rickshaw into a mobile home. The first two prototypes were completed in collaboration with the team from Mother NGO (MNGO), St. Stephen's Hospital, and they had the following special features:

- A folding seat which can be opened into a bed 2.5' X 5.5' in size, to accommodate a sleeping adult.
- Expandable roof to protect the rickshaw puller from rain/direct sunlight.

- Sleeping bag and provision for mosquito net.
- A 30 Watt solar panel attached to the roof, which powers a small fan, LED front and rear lights, LED reading light, FM radio and mobile charger.
- Sturdy iron frame for increased mechanical strength.
- Straightened passenger seat, foot-hold, hand-rail for the safety of the passengers.
- Magazine and water bottle holders.
- Reflector panels at the rear for increased safety.
- Rear storage box.

These two prototypes were inaugurated by the Chief Minister of Delhi, Ms. Shiela Dixit, on 23rd October, 2012 and she named the rickshaw "Sukoon", and subsequent surveys/interactions with rickshaw pullers have indicated that the rickshaws have been well received. The broader scope of such a mobile shelter is on developing a model of community living that would combine housing, food distribution, sanitation and health care based on various types of mobile units, and thereby provide a holistic solution to the problem of homelessness in cities, where space is often difficult to procure.

The students working on food security visited MNGO and Stree Shakti to get inputs for preparing a model for food distribution to the various shelters. The concept of Jan Ahaar, a scheme of the Delhi Government to provide nutritious food at an affordable price of Rs. 15 to people with low income, was taken as the role model. Our visits to the shelters showed that in some cases, the concept of a community kitchen where the inmates prepare one meal a day, was working well. This also had a positive impact on improving the social life of the inmates, as well as turning the shelters into a home-away-from-home, instead of a place for sleeping in the night.

The group working on sanitation visited the office of Sulabh, to get a comparative estimate of various types of toilets (bio-toilets, regular toilets, mobile units, etc.) that can be installed across various shelter units. Since water scarcity is a common problem in most shelters, bio-toilets would be more suitable. However, the problem of a few people defecating in the open even with the availability of toilets cannot be completely eliminated. The cleaning of the shelters is done by some of the inmates, who are paid for the work done. In one of the shelters, the inmates have taken initiatives to plant aloe-vera, tulsi, etc., which can serve as a quick and effective cure for minor injuries and common ailments like colds. There are also regular weekly visits by a team of doctors to undertake treatment of patients, if any.

At most of the shelters that we visited, there were books, games, radio's and TV for the recreation of the inmates. Although the majority of the inmates were rickshaw pullers, labourers and daily wage workers, the few who were interested in studying further were able to do so as books were available. At the family shelters and shelters for children, the inmates were being imparted vocational training in sewing and in preparing various articles like bags, mats, etc. which would form a source of livelihood. Children go to the Municipal school, and are helped by older inmates and volunteers with their studies. Singing and dancing classes are also organized in some shelters for the benefit of these inmates.

3. Learning for Students:

Keeping in mind the importance of public engagement in carrying forward the initiative of the Government and other institutions, a conscious effort was made towards developing a practical strategy for sensitizing the youth towards the emotional and social insecurity felt by the homeless people due to lack of understanding and exclusion from the community at large. Students were encouraged to volunteer for imparting vocational training to the children living in these shelters. The interaction would help the students in gaining a different perspective about the problem of homelessness. A blanket collection drive was initiated by the students working in the project in January, wherein they co-ordinated the effort along with students in several colleges of Delhi University. Such activities were targeted at raising awareness levels among the youth across the University, towards the problem.

4. Benefits to College:

The project taught the students to think independently. It helped in raising the awareness level of the students and other members of the College towards the problem of homelessness. Since the role of volunteers who can help in ways like teaching the inmates, generating resources for helping the homeless people and caring about the less fortunate is of immense help, the involvement of the student community is of great importance.

In addition, the technical aspects of the project also provided the students exposure to hands-on work on real life problems, and learning to apply their knowledge in such areas. Most of the equipment acquired for the project, like the electronic equipment, vernier callipers, screw gauges, etc. would be utilized in the physics laboratory by the students to do the experiments prescribed in the University syllabus.

5. Benefits to Society:

The primary achievement of our project is the rickshaw itself, which would benefit rickshaw pullers, since it would provide them with a more dignified and comfortable existence. It would benefit society as a whole, since it is an eco-friendly and non-polluting mode of public transport.

The initiative taken by the students during the blanket collection drive is an example of how even small efforts lead to a difference for some people. In addition to this, a documentary prepared by the students, which was on display during "Antardhwani", as well as the one day Colloquium organized at St. Stephen's College, also served to draw people's attention to the problems faced by the "Homeless Citizens", a marginalized and neglected section of society.

6. Further Plans:

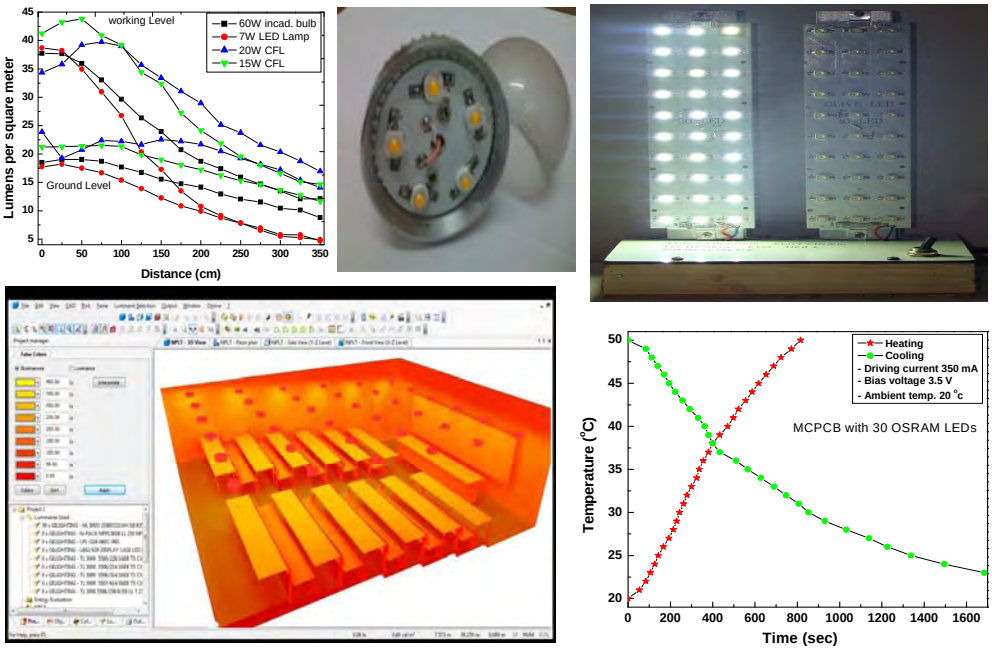
An advance version of this prototype of the rickshaw "Sukoon", which has improvements in the braking system, gear assembly, etc., for increased safety of the rickshaw puller and rider, is being currently developed. Further, work on microfinance schemes for making the purchase of the rickshaw simple and accessible needs to be undertaken to take the benefit to the end user. Options of making health and accident insurance available to the rickshaw pullers can be explored through this, and would be of immense help to them.

Work can also be done on the development of low-cost, self-contained houses using eco-friendly material. These would find widespread use as an integral part of town-planning, and be of immense benefit to society as a whole, keeping in mind the importance of environment friendly growth that is being adopted globally. In a country like India, which has a huge deficit in the housing sector, particularly for the economically weaker sections, this would be particularly relevant.

ST. STEPHENS COLLEGE

Project Title: On the Energy, Light Characteristics and Economic Feasibility of LED Luminaries

Project Code: SSC-104



Caption: (*Top Left*) *Comparative study of the Luminance data of LED light source with the conventional light sources. Lower left figure presents the simulation performed on the Dialux software for a lecture room using LED source.* (*Top right*) *Prototype of an alternating switching circuit for determining the optimized switching time between two panels* (*lower right*).

1. Objective :

Ever since human beings started understanding the importance of lightening for carrying out various activities – unrelenting quest for better and more efficient light sources kept escalating with the technological developments. The objective of this project is to trace the evolution of the lightening sources (and the related factors) due to technological innovations.

Studying, examining and analyzing the various parameters that any light source must exhibit for any particular activity and thus the associated material, environmental, economical and energy requirements are primarily focused on. The project aims toward studying different light sources, traditional (candle and gas lamp), conventional (incandescent, Flourescent tube, CFL) and the current semiconductor based LEDs based lamp, for parameters like average power consumption, average life span, efficacy, color rendering Index (CRI), Color Correlated Temperature (CCT), illuminance, light output, carbon credits, return on investment etc. Furthermore, the project aims towards developing a prototype light source based on LEDs.

2.Final Findings :

Various factors were studied with reference to energy requirement, economical accessibility, and environmental concern and they are discussed below:

Energy Requirement: It is obvious that our power production is far lower than the actual requirement, so the only way out is to develop light sources which have very high efficacy. Incandescent lamps, in this aspect, are very inefficient (efficiency only 15-20%) and that is why the market is taken-over by CFLs. But in the past few years the semiconductor technology led to the development of highly efficient light

sources called Light emitting diodes (LEDs). They consume very less power and have very high efficacy. As an example we have found out from the illuminance measurements of various sources that a 7W LED lamp is a best replacement for 60W bulb and 20W CFL at small angular separation from the source. For uniform light output the LED sources should be arranged in a matrix form (simulated with dialux software).

Economical Accessibility/Feasibility: Currently, LED lamps are comparatively costlier than CFL, but extremely expensive compared to incandescent lamp. But it was found from our cost benefit analysis study that if various factors like wattage, life span, price, warranty period, energy cost etc were taken into consideration then the annual total cost for using a LED bulb (7W) was around Rs 150 whereas it is Rs 217 and Rs 612 for CFL(15W) and incandescent bulb (60W) respectively. So, though the LED bulb looks expensive initially but in a longer run it is found to be a much cheaper option than other light sources.

Furthermore, a comparison of the running or maintenance cost (in Rs) for fluorescent tube (40 W) and a LED tube (18 W) - assuming present discount rate of 6.5 % - under the following two cases namely, (i) when the light sources are self financed and (ii) when they are taken at loan, yields interesting results, which are listed below:

(a) LED Lamps are cheaper by almost 50% in a longer run.
(b) An annual savings of around Rs.400 can be achieved per lamp.
(c) Longer life spans ensure lower annual item costs and exponential recovery.
(d) Easy recovery of initial installation cost in the warranty period itself.
Also a prototype lamp using low intensity LEDs was designed and an alternate switching mechanism is developed to enhanced life span and reduction of unnecessary weight of the LED luminaries.

Environmental concern: The mercury content in fluorescent tubes and CFLs is a major health and environmental concern. Moreover, their comparatively shorter life span (10,000 hrs) compared to LED lamps (50,000 hrs and more) and absence of appropriate disposal system i.e. collection mechanism of used lamps and their recycling, will cause increased waste production. In fact, the rated life of LED lamps at 50000 hrs do not reflect that it will be useless after this time, but it is mere indication of the fact that its luminosity is reduced to a lower value, say 70% of the initial value.

3. Learning for Students :

The interdisciplinary nature of this project is the best feature of this project as it allows the students from different disciplines to approach a problem from different perspectives. The project as a whole is a great opportunity to the students and the faculty members to engage in research activities along with the normal academic routine. The funding benefits the students, teachers and the department as a whole with new equipments and research facilities. Every student, involved in this project, gets an opportunity to learn - how to carry out research level activities, viz. data collection, measurements, and analysis, in a college environment along with their studies.
Furthermore, the project-work demands the students to think out-of-box like how to:
(i) Set-up or assemble their own experiments as per the requirement,
(ii) Find out various variables of the experiment for complete data collection and analysis,
(iii) The importance of accuracy of a measurement and resolution of an instrument etc.

In particular, the students learnt the basic physics of LED devices, the various materials used to construct them and the technology/methods used to produce white light. The driver (electronic) circuits (constant current and constant voltage) circuits were designed (using diodes, transistors and field effect transistors (FETs) and studied for LED luminaries. These hands-on skills gathered by students while working under this project is the most positive feature of this funding.

4.Benefits to College :
The first and the most important benefit to college is the creation of a vibrant research environment among faculty members and students. Both teachers and students are now working on something that is not at all related to the course or curriculum and that leads to a platform for more advance discussions. Initiating such a platform for teachers and students by this project, we think, is the most valuable contribution, among other things, of this funding.

Besides, the financial aid in the form of equipments and contingency helps the project investigators to purchase a whole lot of advance testing and measuring instruments. The students can use or take advantage of these facilities whenever required.

5.Benefits to Society :
The final objective of the various studies of this project should be to benefit individuals and the society at large, when we think for a longer period of time. The benefit is just not only in terms of monetary savings but also from health and environmental point of view, which we (especially the environmental aspect) care a very little. Even if the society is not worried about the monetary savings, the use of LED lamps can contribute, though indirectly, to the country the valuable carbon credits which is a something like next to blood donation. Also, it eases the pressure on the government for generating extra and additional power regularly.

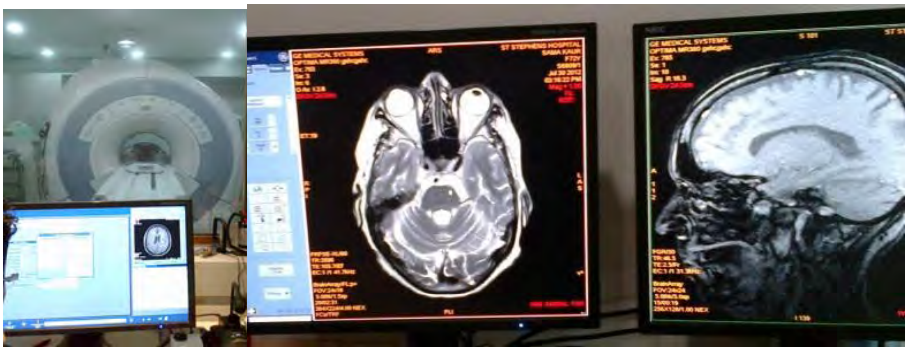
6.Further Plans :
We wish to work out on two specific aspect of the project, one is technological and the other is like a policy framework.

(a) Technological aspect: The prototype alternate switching mechanism that we have envisaged, designed and finally tested will be taken up to next level for manufacturing and testing. This part will be done in collaboration with the industry.
(b) Policy Framework: A policy framework based on a model named: Social Distribution System (SDS) for LED Lighting, will be under consideration. The salient features of this model are:

(a) High quantum of the subsidy makes it imperative to provide a model that is self sustainable.
(b) Working on a model in which the private company entering the project gets CSR benefits for the project.
(c) Better procurement mechanism for the investors that would reduce the initial procurement cost and hence the recovery period making the scheme profitable.
(d) Government Guarantee system to provide less time for recovery.

ST.STEPHEN'S COLLEGE

Project Title: Artifacts in Magnetic Resonance Imaging: Cause and Control
Project Code: SSC-105



MRImachineandMRIimageofScull

1. Objective (150 words):

Medical imaging is the technique and process used to create images of the human body or its parts and function thereof, for clinical purposes. As medical procedures seek to reveal, diagnose, or examine the onset and progress of a disease in medical sciences the imaging plays a crucial role. Artifacts are features of the image which do not correspond to the actual structure of the object, of which the image has been taken, which in our case is the human body. These artifacts can be mistaken to be pathologies and are liable to be misdiagnosed if left uncorrected. It is important to minimize artifacts in the image to get a proper diagnosis of the medical condition of a patient.

Over the last three decades, medical imaging techniques have evolved considerably. It is now possible to get images of moving parts of the body also. One of the major achievements in this area is Magnetic Resonance Imaging (MRI) sometimes referred to as Nuclear Magnetic Resonance Imaging (NMRI).

The primary study would be (i) understanding the process of "Magnetic Resonance Imaging (MRI)". (ii) The various types of artifacts in MRI (iii) The effects of these artifacts on diagnosis and medical treatment.

The main thrust of this project is to:

(i) Understand and recognize the nature of the artifacts through imaging cross sections utilizing MRI and study the effects of these artifacts.

(ii) Find means to control or suppress these artifacts.

2. Final Findings (300 words):

Essentially, we wanted to help the doctors by giving them an additional tool to work with, something that they could work with very easily and yet not as far-fetching as to replace the need for the doctor completely. At the onset, a brief description on the rational of the approach will be outlined. During the visits to the hospital for the MRI scans, it was seen that many times when there was some "pathology" detected in the scan, the doctors used to consult each other to ascertain whether the "pathology" was for real or was just an artifact. At times this was easy enough, at other times it wasn't and the patient would be called later for another scan. We want to reduce this loss of time in cases where the doctors aren't too sure about whether what they are seeing in their scan is an artifact or something more serious.

To that end we proposed that we will construct a probabilistic graphical model (PGM) based learning algorithm which will use about 1000 images or so of a particular part say, the brain, from database we have accumulated, and will continue to expand. These scans will look for characteristics common to all brain

scans that have no pathologies or artifacts and compare these characteristics with an incoming scan. The output will give us the probability of the incoming scan being a good one. The method itself can be used for any other part which has no pathologies or artifacts. A similar procedure can be adopted (with suitable modifications) for images with artifacts. The constant incoming stream of scans allows the model to continuously evolve and adapt leading to greater precision in prediction. The statistical nature of the result will also allow the doctor to decide what is a suitable threshold for diagnosis of the defect in the image as a pathology or an artifact.

However, there are caveats associated with this process. The process of creating PGMs for standard photographs in .jpeg format is a little involved but is well understood. On the other hand, when we consider MRI scans, we are really working with multiple slices of the scan and essentially the algorithm, at least in the form we have presented, will have to work on each of these slices for it to make any sensible prediction. This greatly increases the complexity of the problem since the construction of PGMs isn't as straightforward as standard image-processing techniques. Combine it with added complexity of comparing individual slices of each scan, and then we are looking at difficulties such as memory constraints and writing efficient code. Indeed searching for a suitable programming language is another aspect which will have a bearing on the efficacy of the process.

In conclusion, it was found that the existence of artifacts affects the medical images and in addition to the other methods like sequencing, the PGM based algorithm could be tried to suppress the artifacts.

3. Learning for Students (200 words):

The students have been introduced to various types of technologies like digital X-Ray, Fluoroscope, CT Scan and MRI. Noise and other types of artifacts in medical imaging have been observed and studied by the group. The primary study is on Magnetic Resonance Imaging (MRI). The various types of artifacts in MRI have been studied by them and some of these have been effectively demonstrated. The problems of these artifacts in diagnosis and medical treatment have been understood.

The students have grasped that the knowledge of MRI artifacts and noise producing factors is important for continuing production of high image quality.

Due to several visits to the hospital, the students have developed a sense of innovation and have become sensitized in developing innovative techniques to help the sick and suffering. They have understood the basics of medical imaging techniques and have therefore become more motivated to develop indigenous methods to overcome costly diagnostic procedures. It is expected that in the future they would develop indigenous procedures in the

field of medical imaging. It is also hoped that this introduction would inculcate in them the ability to develop prostheses and other appliances to be used in the medical field.

4. Benefits to College (100 words):

The interaction between the college and the hospital were enhanced and as proved useful in getting better medical attention. The awareness about medical procedures and other formalities were useful for those requiring treatment. Further the awareness between various medical imaging techniques was beneficial as one gets more aware of a particular imaging technique for a particular problem of disease.

5. Benefits to Society (100 words):

The students have been sensitized to the problems of the sick and suffering. They have become more conscious of the needs of the ailing members of the society. The project has opened the doors to motivate the students to develop cheaper indigenous techniques for medical imaging, which may be used for patient who cannot afford higher cost of MRI. Another benefit to the society is with reference to the suggested algorithm. If this can be successfully implemented, doubtful images can be flagged and the doctor can, then and there, retake those particular scans which saves patient's and doctor's diagnosis time.

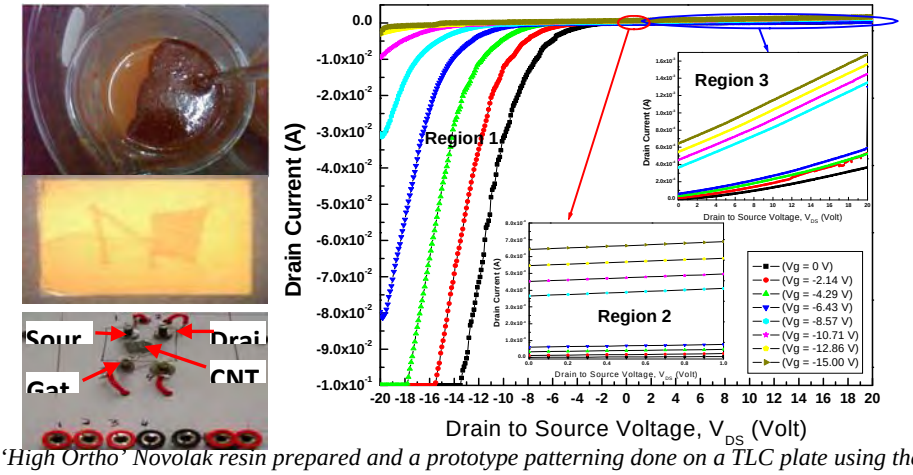
6. Further Plans (100 words):

There are some complexities in the processing of sliced images using the PGM. To get away from these complexities, we propose looking for some common aspects through the slices and encoding those properties as the one which constitute a good image, in the sense of the terminology introduced above. We hope that there may be some merit in this approach. As the first few steps in creating working PGMs we are taking an online course offered by Stanford University through the Coursera platform. Currently, we are working on creating PGMs for single images and getting to terms with the process.

ST. STEPHENS COLLEGE

Project Title: Devices based on Photo-Microlithography & Soluble Nanocarbon Materials

Project Code: SSC-106



Caption: (*Top Left*) *'High Ortho' Novolak resin prepared and a prototype patterning done on a TLC plate using the photoresist* (*prepared by blending with the photo-active compound* [*PAC*]), *after development.* (*Bottom Left*) *Photograph of the FET device using the derivatized carbon nanotubes* (*CNTs*). *The CNT adducts form a complex network between drain and gate electrodes. The figure (Right) represents the I-V characteristics of the CNT adduct-FET with three different regions which has immense technological significance.*

1. Objective :

Photoresists are the workhorses of the microelectronic industry for obtaining sub-micron or nanometer sized semiconductor components. But at the same time miniaturization brings unwanted phenomenon, like decrease in charge carrier mobility, charge leakage and other quantum-mechanical effects, which force industry to consider developing new materials and exploit their properties for device fabrication at such dimensions.

One of the objectives of this project was the characterization of Novolak resins required for blending with the photoactive compound (PAC) & the synthesis of photoresists for developing microelectronic circuit patterns at micron level.

Another objective of the project focused on preparation and characterization (using XRD, TEM, Raman Spectroscopy, etc) of soluble adducts of fullerenes, SWCNTs & MWCNTs by derivatization. The knowledge or information gained will then be applied for making device(s), like solar cells/ photovoltaics or other electronic device(s) after optimizing necessary parameters. The devices will then be characterized for properties like I-V, sensing, photoconductivity and performance analysis.

2.Final Findings:

Photoresists and Derivatization of CNTs:

A group of physics and chemistry students prepared "high ortho" Novolak resins using different Cresols using a two step procedure. The first step involved reaction with alkali, which was followed by the polymerization using oxalic acid as catalyst. This was followed by steam distillation to remove the excess cresols. Fractionation then yielded the required resin. This was then blended with the photoactive compound (PAC) to yield the photoresist. The photoresist was then coated on a plate and exposed through a mask, followed by aqueous alkaline development to give patterns. Such commercially available masks are very costly but the students prepared these using computer and laser printer very economically. CNTs are considered among the toughest and strongest materials known to man but these have low solubility

which hampers their large scale use. Most known procedures for derivatization involve strong oxidation with nitric acid, etc. which damages the side wall and decreases their useful electronic properties. A much better protocol was used here for the formation of soluble adducts by thermolysis with aryl azides. These adducts were then used for the fabrication and characterization of FETs, which is discussed below.

A FET device (bottom gate type) was fabricated using the derivatized soluble CNT adducts. The silicon dioxide layer (200 nm thick)/Si wafer (500 micron thick) was used as a substrate material. The SiO_2 layer acts as a dielectric for induced charges and isolate the gate (G) electrode from the drain (D) and source (S) electrodes. The active area consists of a network of CNTs drop-coated over the SiO_2 and the drain and source electrodes are patterned over it using photo-lithography process. The source and drain contacts are made up of Aluminum (Al) metal deposited using the in-house thermal evaporation facility developed in college as part of this project, whereas, the gate contact was made up of sputtered Platinum (Pt). The device was then characterized for its I-V characteristics (see the Figure above) which exhibits an interesting but a very complex behavior.

The device exhibits multiple regimes, due to the networked structure, which are generally exhibited by three different devices. The different characteristics were represented as three different regions (1, 2 and 3) in the above Fig. (Right). Region 1 represents the region where this device will work as a constant voltage source, like a Zener Diode. Interestingly, the gate breakdown voltage is variable and is decided by the applied gate voltage, which in case of Zener diode is controlled by doping and is fixed. Region 2 represents a region of constant current source at small gate voltages. This is analogous to transistor characteristics. Region 3 represents a region of constant resistance at higher gate voltages.

In essence, the device is multifunctional and possibly removes the distinction between active and passive devices, as it possesses features of both groups at different gate voltages.

3. Learning for Students:

The interdisciplinary nature of this project is the best feature of this project as it allows the students from different disciplines to approach a problem with different perspectives. The work included in this project is not taught in the current syllabus and both physics and chemistry students thus could comprehend the mutual dependence and importance of the respective subjects in relation to modern microelectronic industry and society. The project as a whole is a great opportunity to the students and the faculty members to indulge in research activities along with the normal academic routine. The funding benefits the students, teachers and the department as a whole with new equipments and research facilities. Every student, who was involved in this project, got the opportunity to learn how to carry out research level activities, viz. material deposition techniques, photolithography, device design, data collection, measurements, and analysis, in a college environment along with their studies.

Furthermore, the project-work required the students to think ‘out-of-the box’. The most positive feature is the hands on skills gathered by students while working under this project. They learnt to read, plan, meet, discuss with the teachers and get their ideas, plans vetted by the mentor.

4. Benefits to College :

The first and the most important benefit to college is the creation of a research oriented environment among faculty members and students. Both teachers and students are now working on something that is not restricted to the course or curriculum and provides a platform for advance discussions. Opening of such a platform for teachers and students by this project is missing and was much required.

Equipments, like the vacuum deposition set up, and other testing and measuring instruments are a permanent asset to the college contingency and both students and teachers can now use these facilities for advanced level testing and measurement.

5. Benefits to Society :

Though used by the entire electronic industry and defense establishments no photoresists are produced in our country and are entirely imported. Work done in this project can eventually decrease our dependence on import of such materials of strategic importance even for DRDO.

Carbon nanomaterials (fullerene and carbon nanotubes) are most promising materials for nanotechnology, photovoltaics and organic electronics. The soluble CNT adducts prepared show very interesting properties in devices fabricated (e. g. FETs). These are candidates for large scale use in solar cells and flexible electronics making them very economical and more convenient to use.

6. Further Plans :

We wish to make devices after printing microelectronic materials using these photoresists. Indigenous natural products like Cashew Nut Shell Liquid (SVE holds a national patent on it) for microelectronics could be most relevant for our country.

Further work on preparing devices like FETs using the soluble SWCNT adducts made by us could also be undertaken. Optimization of the various characteristics of the CNT-FET can be taken up to make them competitive with silicon based FETs. Further studies using other dielectric layer materials and their thickness, channel width, electrode materials, transport mechanism would also interest us for further work.

VIVEKANANDA COLLEGE

Project Title: Assessing and Improving the Quality of Fat used in College Canteens

Project Code: VC 101

1. Objectives:

- Analyze fat samples for their quality attributes such as iodine value, acid value, refractive index, saponification value, solid fat index, Reichert-Meissl Value, melting point, nutritional components, adulterants, smoking/flash/ fire point, adulteration, colour and flavor.
- Assess the quality of fat by comparing with standards.
- Identify factors contributing to deterioration of fat/maintenance of good quality.
- Develop need-based Information Education and Communication material
- Improve awareness status of canteen owners and workers with regards to use and maintenance of fat quality.

2. Final Findings:

A total number of forty college canteens were taken for the study on the basis of inclusion exclusion criteria. Fresh fat (group A), used fat (group B), fried food (group C) and non-fried food (group D) samples were collected in duplicate from each of the canteen. The samples were evaluated for 24 quality parameters (iodine value, acid value, refractive index, saponification value, solid fat index, Reichert-Meissl Value, melting point, nutritional components, adulterants, smoking/flash/ fire point, adulteration, colour and flavor) in order to assess their quality in terms of nutrition as well as safety. Presence of carbon was observed on tawa, karahi and oil in 67.5% (27), 72.5% (29) and 51.3% (20) canteens. Risk factors which hasten auto-oxidation (rancidity) in fat such as transparent containers (25%; 10) rust in containers (15%; 06), leakage in containers (5%; 02) and containers without lid (27.5; 11) were observed in several canteens. Smoke on the upper surface of fat and foam was observed during the frying process in 65% (26) and 47.5% (19) cases.

Analysis of fat and fat present in food samples further authenticated the deleterious effects of misuse of fat. The acid value of 40% (16), 90% (36), 80% (32) and 42.5% (17) of group A, B, C and D respectively was above the specifications; acid value of used oil being more than 400% above

specified standards. 2.5% (1), 100% (40), 97.5 (39) and 92.5% (37) samples of group A, B, C and D respectively did not meet specifications. The mean smoke point of used fat ($191.75^0C \pm 30.96^0C$) was significantly (p=0.000) lower than that of fresh fat ($266.66^0C \pm 50.37^0C$). Similarly the mean flash point of used fat ($178.50^0C \pm 91.89^0C$) was significantly (p=0.000) lower than that of fresh fat ($350.00^0C \pm 0.00^0C$). The results indicate the presence of harmful compounds formed during repeated prolonged heating of fat.

Samples were also analyzed for their nutritive value. The fatty acid composition indicated presence of trans fats in 45% (18), 50% (20), 37.5% (15) and 52.5% (21) group A, B, C and D samples. The mean trans fat content was 9.45±1.69%, 11.46±2.38%, 3.26±1.77% and 3.10±1.28% of the total MUFA present in samples of group A, B, C and D respectively. The saturated, mono-unsaturated and poly-unsaturated fatty acid composition indicated the fats were lower in PUFA's and MUFA's (separately) as compared to SFA's; the mean SFA content being 34.7±21.89%, 33.74±17.25%, 20.39±10.99 and 15.41±7.54% of total fat in samples of group A, B, C and D respectively.

To create awareness among canteen contractors, workers and general masses, need based interventions in the form of play, brochure, poster, workshop, interactions with canteen operators and information handouts to principals of various colleges were made.

3. Learning for Students:

The student participants have received the following benefits:

- Our under-graduate students received basic understanding regarding the fundamentals of research. They learnt the correct method of reviewing scientific literature (through visits to various libraries and web search; e-library), development/pretesting of tools/techniques, data collection and its analysis.
- Classes on use/application of programmes such as Excel, Power Point and web media helped them immensely.
- B.A program and Hindi Hon. Students received exposure to state-of-the art technology available in India for assessing quality of fat in food due to the collaboration of our college with FICCI-FRAC (Food Analysis and Research Center).
- During the development of Innovative "Fat Testing Kit" our Food Technology project students understood the importance of commitment, hard work and failures for achieving success.
- The students prepared a play to impart messages related to food safety. The play "Quality of Fat used in College Canteens" was enacted during the World Food Day celebrations at a workshop "Agricultural Co-operatives – Key to Feeding the World" organized by National Co-operative Union of India and Association of Food Scientists and Technologists (Oct. 2012).
- During Antardhwani, our students learnt about the work being carried out by their peers in other colleges which immensely enhanced their knowledge.
- The project facilitated participation of students in various scientific events such as:
    - Symposia 'Newer Health and Nutrition Challenges' organized by Nutrition Foundation of India, New Delhi (Nov, 2012).
    - International Conference 'Food Processing Value Chain Management and Food Safety (IFpvs), National Institute of Food Technology Entrepreneurship and Management (NIFTEM), MOFPI (Jan, 2013).
- Team approach and leadership qualities kindled in them.
- Students have gained skills and competency necessary for organizing scientific events such as the innovation project workshop and seminar held in March and July 2013 respectively.
- They learnt to work with their peers having diverse experience and subject knowledge.
- Enhanced interest, confidence and vision related to academic achievements and pursuit was observed in all student team members.

4. Benefits to College :

- The purchase of necessary equipment for the analysis food/fat samples during the project has been able to improve the overall facilities of the Food Technology laboratory. We are hopeful of using the equipment for further academic purposes.
- Consistent networking with experts from other organizations has helped to enhance the profile of our college.

5. Benefits to Society:

During the project, need based Information Education and Communication material was developed and peer reviewed. It was used for enhancing awareness among college canteen contractors, canteen workers, students, teachers, administrative staff as well as general public (such as that during world food day celebrations, Oct 2012). The recipients of this information shall acts as channels of communication for transmitting information related to good manufacturing practices (GMP). Such knowledge may bring changes in the attitude and practices of food handlers and food business operators. If such interventions are carried out at a large scale country wide, they can help to improve the quality of food provided by food service institutions and promote the sale of safe healthy food. It would thus help to reduce the existing rate of morbidity and mortality occurring due to the consumption of unsafe food having poor nutritional value.

6. Further Plans:

- Organize training programmes for all canteen operators associated with academic institutions especially University of Delhi. Such training programmes would be accompanied by problem solving sessions so as to ensure better adherence of canteen operators to messages related to GMP (Good Manufacturing Practices).
- Develop need specific Hazard Analysis Critical Control Point (HACCP) plan for each canteen and each dish/product prepared and sold by them. Help the canteen operators develop their own HACCP plan for the future.
- Develop guidelines for infrastructure of college canteens, purchase of ingredients/utensils/equipment, pre-preparation, preparation, sale of food as well as mandatory work conditions for the canteen workers.
- Assess the quality of fat in street foods, restaurants, hotels and other food service institutions.

ZAKIR HUSAIN DELHI COLLEGE

Project Title: Feasibility studies to improve quality of living and development of low cost efficient techniques to purify Potable water in villages: Case Study with reference to Villages of Ajmer (Rajasthan)

Project Code: ZH101

Dr. Swati Arora, Project Investigator is explaining to the local villagers about the significance of the work done by the college team under innovation project. The team of students and Faculty visited the Govardhanpura village in Ajmer district of Rajasthan and informed the villagers about the quality of potable water available and educated them about an economical way to purify impure water.

1. Objective (150 words):

About six villages of Ajmer district (Rajasthan, India) were chosen as the subject for the present project since this region face acute drinking water crisis during summer. During peak summer months, the sources of water dry up and the villagers are forced to collect water from unsafe sources. Samples were collected from various community sources of water and analysed for different toxic elements and other parameters. The adverse effects of these parameters and toxic elements on the health of local people were studied. Consequently, the main objective of this project was to devise an innovative technique and fabricate an economical unit to purify water, obtained from existing water bodies, for drinking purposes in villages preferably using local resources. In order to achieve this objective a very simple and realistic approach is adopted in this project. It is decided to use solar energy for making distillers for villages as sunlight is abundantly available in this region. A Multistage Distiller which can be integrated with a solar water heater and a water purifier has been developed in the project. The design of the multistage distiller is such that it can provide a substantial output of pure water without any costly input. Alternate arrangement is made to purify water in case there is no sun as in monsoon or winter season. These objectives were achieved in three phases spread over a period of one year (May 15, 2012 to May 15, 2013)

a. Survey of villages and collection of water samples (Phase I)
b. Chemical analysis of samples of water to identify and isolate toxic/hazardous chemicals (Phase I)
c. Development of low cost efficient techniques and devices to purify water (Phase I and II)
d. To develop community tanks to conserve water (Phase III)

2. Final Findings (300 words):

From the preliminary findings and analysis of water samples collected from different sources of water, it was observed that pH, salinity, hardness and Totally Dissolved Salts (TDS) are the primary area of concern. Hence, in order to remove the hardness as well as total dissolved salts

(TDS) from the water samples we performed a number of experiments in the college using innovative techniques. One such technique was based on distillation of water using solar energy. We designed and fabricated a single stage, double stage and a multistage distillation unit to increase the yield of distillation. The solar distiller works on the principle of heat and mass transfer. The multistage solar still consists of five identical stages made of glass tray and glass slide. Each stage of the still has a square glass tray of dimension 0.5 m x 0.5 m x 2 cm so that it can hold 2 to 3 litres of water. The glass tray is covered with a glass slide inclined at an angle of 10 degrees. The water vapours condense on the inclined glass panes and water droplets trickle down in a trough which is connected to a common distillate output. Height of each of the stage is 100-110 mm except for the first and fifth stage which is around 160 mm. The interior of the still was painted black using epoxy based spray paint to absorb and trap maximum heat The still is insulated using glass wool to avoid heat loss to surroundings. The top stage receives maximum solar radiation $Q_{H1.}$ Since this stage is coupled with a solar collector and receives an additional amount of heat $Q_{H2.}$ The top stage is filled with impure water from a single inlet. The solar energy absorbed by the water in the first stage increases the temperature of the water. The heated water is then transferred to the subsequent stages via a common thermally insulated pipe. The temperature of the brackish water in different stages increases and this results in the production of water vapours which condenses on the inside of the inclined surface of the glass slides and droplets flow under gravity towards the edge of the tray and collected in the trough and finally to collecting cylinder. The test rig is equipped with a set of PT-100 thermocouples to measure the temperature of the water in different stages. Thermocouples have also been used to measure the temperature of the glass slides on which the water condenses.

The distiller can be integrated with a solar water heater for the input supply of impure water. The distiller is also integrated with a purifier so that when there is no sun, during monsoon or winter season, water can be purified through membrane using solar panels and a battery to operate the pump. The Multistage Solar Water Distiller has been filed for an Indian patent by the Delhi University.

3. Learning for Students (200 words):

Innovation Project Scheme introduced by the Delhi University in 2012 was primarily meant to motivate undergraduate students towards research and encourage them to come up with innovative research ideas. In the due course students were expected to learn and know about the latest research methodologies under the guidance of faculty mentors. The research project undertaken by Zakir Husain Delhi College project has been quite successful in achieving this broad objective. The project fortunately provided the students a right platform to translate their ideas into practice and use the latest technologies to achieve the desired result. For the first time students travelled a long difficult journey to reach to the remote villages of Rajasthan, which were the subject of our research, and got a first hand knowledge about the actual problems being faced by the local people. They really got motivated to do something worthwhile to solve the problems being faced by the villagers, particularly drinking water problem, which was directly related to their health. They were surprised to found that the resources were quite limited and the local people were barely managing the basic necessities of life. Students surveyed the villages, interacted with the people and compiled a report. They also learnt how to collect, identify and code the samples, collected from different sources of water available in the villages, for further analysis. The students were also trained in analyzing the water samples, measure their chemical and physical properties and compare them with the actual standards provided by the government agencies. Based on the results obtained, students were trained in preparing a research paper for oral presentation in front of a learned audience. Eventually, four students were given the opportunity to give oral presentations of their work in National Seminar on Advances in Environmental Sciences organized by Him Science Congress Association at Shoolini University,

Solan, Himachal Pradesh on August 24-26, 2012. They also presented a poster of their work before the delegates.

The students also learnt a lot of research techniques other than that prescribed in their syllabi and handled different instruments. They also learnt about fabricating a test set-up to do their experiments in simulative and actual conditions.

Apart from this during the DU Antardhwani festival held on February 22-24, students met a lot of visitors (students, teachers, scientists, general public) in the Innovation plaza and were put up a lot of questions about their project. The students happily answered all their queries with a lot of confidence and it was a good learning experience for them. This kind of practical training and learning can only be obtained through such programmes which benefitted the students a lot.

4. Benefits to College (100 words):

The project has been extremely useful to the college on various accounts. Firstly, the students of the college got an immense exposure to the research methodologies, approach to solve a research problem, assembly and fabrication of a research test set up, generate a database of results for theoretical and experimental analysis. Secondly, the amount sanctioned in the equipment grant under the project was used to buy plenty of instruments like data acquisition and storage system for online data access from the test chamber, solar water heater, solar panels, TDS and pH meter and electrometer etc. The students were aware of these equipment but never had the opportunity to use them in actual practice. They got a practical knowledge about the working of these equipment during the course of the project. Since these equipment are now the central facility of the college any student can perform new experiments on these equipment and use them to enhance their knowledge. The college also got a complete well researched report that include complete database on how to generate purified water using solar energy in tough weather conditions. The data can be used to take up another challenging tasks to provide solutions to the similar problems faced in other areas.

The faculty also got immense opportunity to visit those areas where reaching on an individual basis would have been difficult. Reaching remote villages and getting first hand knowledge about the problems being faced by the local people was quite enriching experience for them. With a proper team of students the work could be organized in a proper fashion with minimum difficulties and the data generated was quite useful.

5. Benefits to Society (100 words):

It is always believed that science should be such that it should help society at large rather than confining the benefits of science only to the academic interests. The research problem chosen in the present research programme was purification of water for drinking purpose in rural areas using locally available renewable energy resources. Hence the outreach of the benefits was quite large. When the team of students and teachers reached six selected villages falling under Ajmer district jurisdiction, the local people got a platform to raise their concerns and they were happy to know that efforts are being made to take their concerns to next level. Samples were collected from different sources of water and the local people were educated about the presence and absence of toxic elements in the water they are drinking. They were also informed about what should be the limits of these elements in the drinking water and thirdly if there are certain problems with the water like high values of hardness and TDS or pH values how can they be controlled. They were also educated about the ways to purify water by using locally available abundant resources of renewable energy. The technique developed in the project, like solar water distillation, can be used to purify water and control its TDS values. During summers when the water level depletes and resources become limited then additional sources of water can be generated by purifying water from those sources, like handpumps or borewells, which are not used due to its excessive salinity.

6. Further Plans (100 words):

Water purification and filtration for drinking purpose is a very important and interdisciplinary area of research. It assumes paramount significance and requires meticulous research. The solar water distiller developed in the project will be integrated with a water purifier based on RO membrane. We are simultaneously working on developing innovative reusable bio-membranes for water filtration. It is a large scale project and requires systematic experimentation and development of new advanced nanomaterials. We are planning to take up the work on development of low cost bio-filters which can be reused and recycled. This bio-filter will consist of a RO membrane supported on a porous ceramic system. Work is in progress to make a sufficiently strong and porous ceramic support on which the membrane can be fixed. Mechanical, structural, morphological and electrical measurements are being done to ensure the exact pore size of the ceramic as well as the membrane so that micro, ultra and nanofiltration can be made possible using a monolithic unit.

INNOVATION PROJECTS IN NEWS

Almost fifty per cent retail outlets in the Capital are near garbage disposal mechanism, raising concerns over hygiene in these crowded places. A study conducted by the Delhi University has revealed this and noticed that in number of outlets water quality is also poor. The findings of the study revealed that the attitudes and practices need more attention on