

Gas Sensing Properties of Pure and Co Surface Modified Nanocrystalline SmFeO₃ Thick Films

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In present work, nanocrystalline SmFeO₃ perovskite oxide powder was prepared by sol-gel method. Thick films of SmFeO₃ were fabricated onto a glass substrate by screen printing technique and heated at 500 °C for 30 min. As-prepared pure nanocrystalline SmFeO₃ thick films were dipped into 0.1 M aqueous solution of cobalt chloride for different intervals of time. Microstructure and surface morphology of both pure and Co surface modified SmFeO₃ thick films were investigated by energy dispersive X-ray analysis (EDAX) and field effect scanning electron microscopy (FE-SEM) techniques. The FE-SEM micrograph reveals the porous nature of thick films. EDAX analysis showed that both pure and Co modified thick films are oxygen deficient. Gas sensing performance of these films was tested for different gases. The highest response and selectivity was recorded to 50 ppm NH₃ gas at 200 °C for SmFeO₃ thick film dipped into cobalt chloride solution for 3 min. The effect of cobalt doping and its dipping time on microstructure, surface morphology and gas sensing properties of pure SmFeO₃ thick film was discussed.

Keywords: SmFeO₃, Surface modification, Perovskite, Gas sensor.

INTRODUCTION

Recently, perovskites of type ABO₃ (A: rare earth, B: transition metal) have attracted a great deal of attention due to their variable chemical and physical properties. They have wide range of applications including solid oxide fuel cell [1], catalysis [2], photoluminescence [3] and gas sensors [4-7]. Their properties such as ionic and electronic conductivity, chemical stability can be tuned for particular application by partial substitution at A-site and/or the B-site. SmFeO₃ is one of the rare earth orthoferrite extensively studied as chemical gas sensor material. Its conductivity increases with exposure to oxidizing gases and decreases with the exposure to reducing gases. Due to p-type semiconductivity, SmFeO₃ have been typically studied for detection of oxidizing gases such as ozone, oxygen and NO₂ [8-11]. But under reducing conditions, SmFeO₃ was reported to be chemically unstable due to phase separation of Sm₂O₃ and Fe₂O₃ [12]. Further, at low temperature very poor response was recorded for these sensors under both oxidizing and reducing conditions due to their very low electrical conductivity.

Ammonia is colourless gas and easily reacts with water to form ammonium hydroxide which is highly irritating. Common sources of ammonia are refrigerant gas, pesticides, explosives, dyes, *etc.* Hence most of the people are exposed to ammonia. From breathing, swallowing or skin contact, ammonia enters into human body and reacts with water to form ammonium hydroxide which is very corrosive and damage body cells [13]. Therefore detection of ammonia is essential. In present work, a pure SmFeO₃ based gas sensor is fabricated to test its performance for the detection of ammonia. The sensor responds to ammonia gas but showed poor sensitivity at small temperature due to low electrical conductivity. Therefore, it is evident that to use SmFeO₃ based gas sensor for the detection of reducing gases like ammonia, there is a need to improve its electrical conductivity.

Generally conductivity is related to the oxygen vacancies presents on the surface. Formation of oxygen vacancies increases by increasing temperature and by incorporating additives [14]. But high working temperature has adverse effect on the stability of a sensor. Therefore, incorporating additives to base material

can be effective and also practical way. Incorporation of additives to base material can be achieved either by doping or dipping method. Cobalt, being reducible element, is expected to induce more oxygen vacancies in SmFeO_3 . Co doped SmFeO_3 has been reported for its improved electrical conductivity especially to ozone and NO_2 [15]. However, for reducing gases, issue of chemical stability may arise because Co-O bond is weaker than Fe-O bond. Furthermore, high specific surface area and small crystallite size are essential requirements since they directly affect the gas sensing properties. Number of techniques like co-precipitation method, sol-gel method and hydrothermal method have been adopted to increase the specific surface area and to decrease crystallite size [16,17]. Among these methods, sol-gel method is simple, low cost synthesis route that requires lower calcination temperature to obtain single phase perovskite.

In this work, Co surface modification of as-prepared pure SmFeO_3 thick films was achieved by dipping technique. The Co surface modified SmFeO_3 based sensors were examined as ammonia sensor.

EXPERIMENTAL

Powder preparation: In present study, as-synthesized SmFeO_3 powder was prepared by sol-gel method. Stoichiometric high purity powders of samarium nitrate [$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$], iron nitrate [$\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$] and citric acid monohydrate were mixed in the ratio 1:1:1. The mixture was grounded in agate mortar for 30 min. The mixture was then dissolved in ethylene glycol solution under constant stirring at 75 °C for 2 h. This yields a sole which was then dried into a gel. The gel was dried in oven at 110 °C for 12 h and finally calcined at 800 °C for 4 h to form SmFeO_3 powder.

Thick film preparation: SmFeO_3 powder was screen printed on a glass substrate in the desired pattern using the procedure reported elsewhere [18,19]. The fine powder of SmFeO_3 is thoroughly mixed with a solution of ethyl cellulose (temporary binder) in a mixture of organic solvents such as α -terpineol, 2-butoxy ethanol and 2-butoxyethyl acetate. The ratio of inorganic to organic part was kept at 75:25. To obtain thick coherent paste with proper viscosity, the mixture was continuously grinded in the mortar and pestle. The as-prepared thixotropic paste was then screen printed on glass substrate in desire pattern manually by using squeegee. These thick films were allowed to dry in air and then fired at 500 °C for 30 min in muffle furnace to remove binder and other temporary ingredients.

Surface modification of thick films: As-prepared thick films were dipped into 0.1 M aqueous solution of cobalt chloride for 1, 3 and 5 min. After drying, these films were heating at 550 °C for 30 min. These surface modified films were termed as Co-modified films.

Characterization: To determine crystal structure, crystallite size and lattice parameters, X-ray diffraction analysis was carried out by PW 3050 diffractometer using $\text{CuK}\alpha$ radiation of wavelength of 1.54 Å. The scans were recorded in the range $2\theta = 10^\circ$ to 99° at a scan rate of 0.02 °/s. Crystalline phase was determined by using powder diffraction file database (JCPDS card no. 39-1490). To study the surface morphology and elemental analysis of samples, FE-SEM images and EDS spectra of samples

were recorded by JSM-7610F, JEOL Japan, operated at 15 kV unit.

Gas sensing measurements: Gas sensing tests were carried out using static gas sensing set up. As-prepared SmFeO_3 thick films with ohmic contacts are the sensor elements. Sensing element was directly kept on a heater in gas chamber and exposed to different gases. By using sensitive digital multimeter, electrical resistance of sensor element was measured before and after its exposure to test gas at different operating temperatures and different concentrations of test gas.

RESULTS AND DISCUSSION

Structural properties: The X-ray diffraction pattern of as-prepared SmFeO_3 powder sample is shown in Fig. 1. Crystal structure of as-synthesized nanocrystalline SmFeO_3 powder has been discussed in our earlier publication [20]. The observed peaks in XRD pattern were consistent with the standard JCPDS card no. 39-1490 indicating the perovskite phase with orthorhombic symmetry and $Pnma$ space group for prepared powder (62). Sharp peaks in XRD pattern suggested crystallinity of the sample. Absence of any impurity peak confirmed the purity of sample. Lattice constants a, b and c were found to be 5.604, 7.704 and 5.397 Å, respectively. The Debye-Scherrer's formula, $D = 0.89\lambda/\beta\cos\theta$; where λ is wavelength X-ray, θ is diffraction angle and β is true half-peak width, was applied to calculate the average crystallite size and estimated as 50.08 nm.

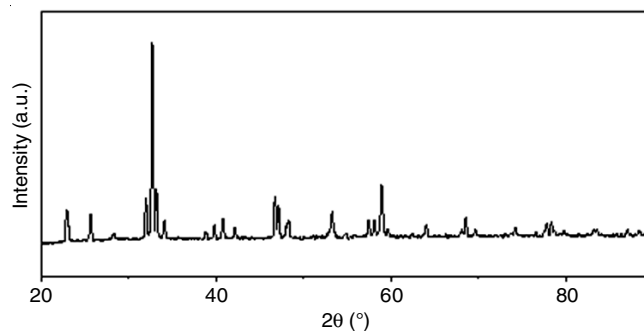


Fig. 1. X-ray diffraction pattern of pure powder SmFeO_3

Morphological study: To investigate surface morphology of fabricated thick films, the FE-SEM technique was employed. Fig. 2 depicts the FE-SEM micrographs of pure and Co-modified nanocrystalline SmFeO_3 thick films prepared at 500 °C for 30 min. The micrograph for pure SmFeO_3 consists of large numbers of grains indicating that film is porous. The grain size was found in the range of 50-70 nm. Particles are irregular in shape with some particles agglomerated containing very fine particles indicating the high porosity. The smaller particles distributed around the larger grains were observed in all three micrographs for Co-modified SmFeO_3 thick films. The smaller particles may be attributed as CoO_2 grains and the modified thick film appears to be comparatively highly porous that favours the adsorption and desorption mechanism.

EDX studies: The quantitative analysis of both pure and Co-modified thick films was carried out using energy dispersive spectrometer and can be seen in Fig. 3. The wt.% of Sm, O, Fe and Co is presented in Table-1. All the samples were observed

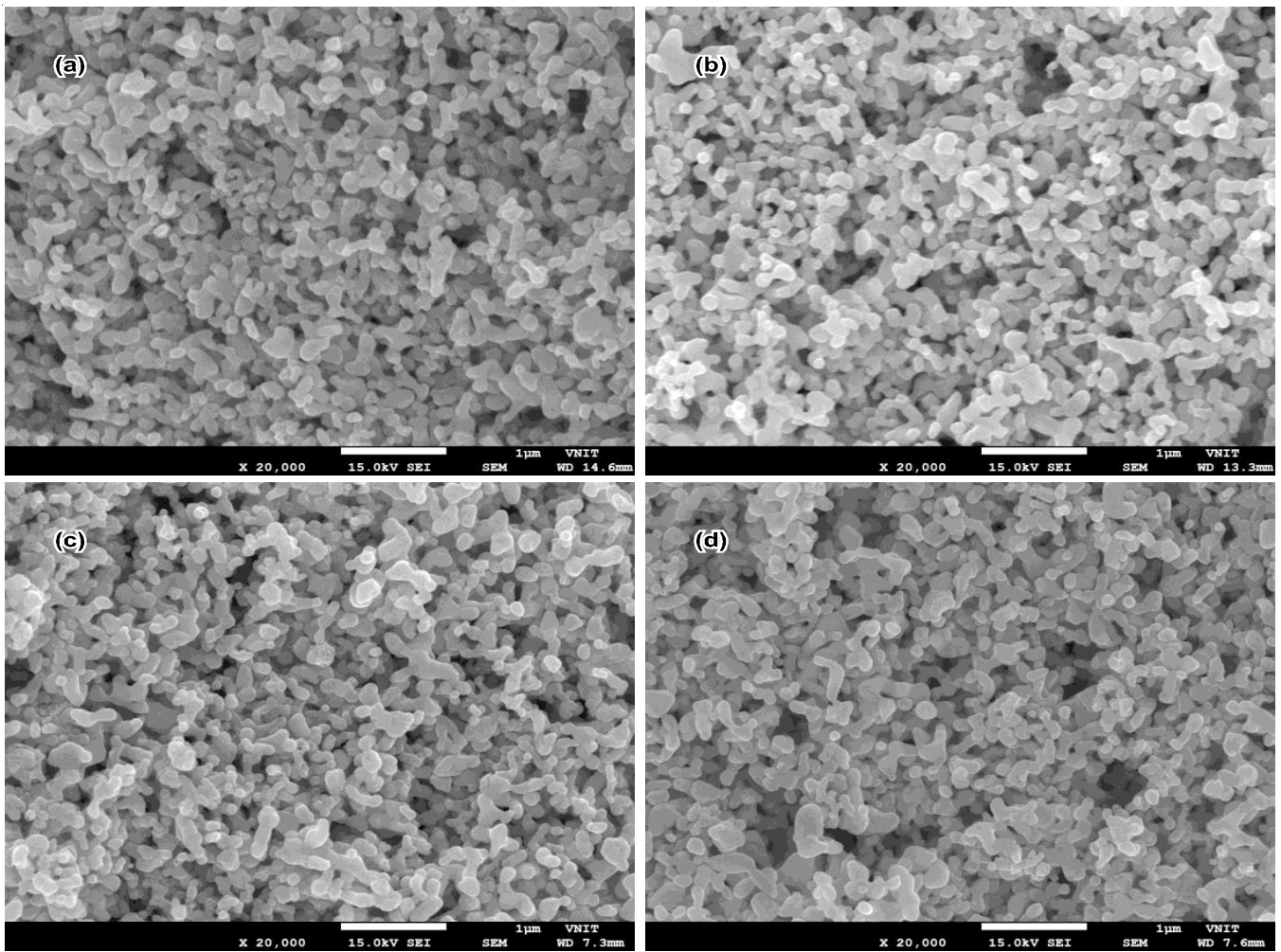


Fig. 2. FE-SEM images of (a) pure SmFeO₃, (b) Co-modified SmFeO₃ (dipped for 1 min), (c) Co-modified SmFeO₃ (dipped for 3 min) and (d) Co-modified SmFeO₃ (dipped for 5 min)

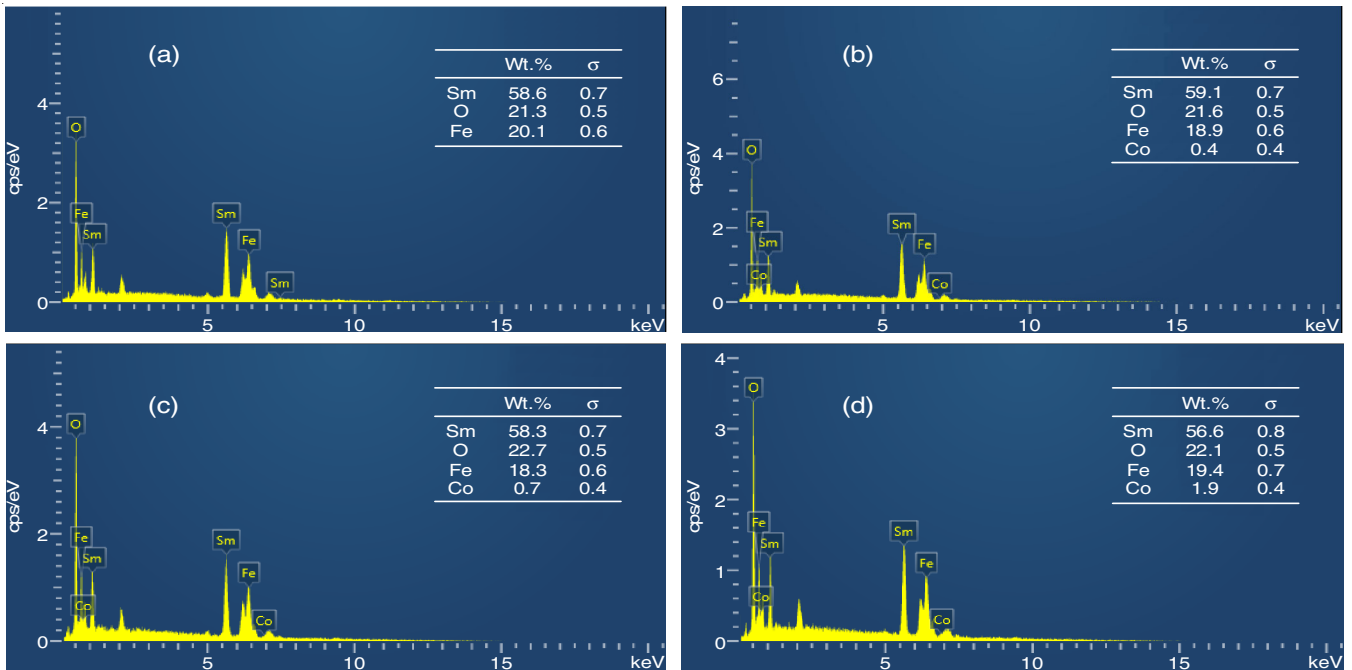


Fig. 3. EDAX images of (a) pure SmFeO₃, (b) Co-modified SmFeO₃ (dipped for 1 min), (c) Co-modified SmFeO₃ (dipped for 3 min) and (d) Co-modified SmFeO₃ (dipped for 5 min)

Material (wt.%)	Dipping time (min)			
	0	1	3	5
Sm	58.6	59.1	58.3	56.6
O	21.3	21.6	22.7	22.1
Fe	20.1	18.9	18.3	19.4
Co	0	0.4	0.7	1.9

to be oxygen deficient, however, the weight percentage of Co increases with dipping time.

Gas sensing properties: Sensitivity is defined as the ratio of change in conductance of the sample on exposure to gas to the original conductance in air [21]. The conductivities of sensor were measured before and after exposure to target gas and sensitivity is determined directly using eqn. 1:

$$S = \frac{G_g - G_a}{G_a} \quad (1)$$

where G_a is conductance in air and G_g is conductance in target gas.

Gas response and operating temperature: Firstly, the sensitivity of pure SmFeO_3 thick film to liquid petroleum gas (LPG), carbon dioxide, ammonia, ethanol, hydrogen, chlorine and hydrogen sulfide was measured at various operating temperatures ranging from 28 to 400 °C. Maximum sensitivity ($S = 2.07$) was recorded to 50 ppm NH_3 gas at 200 °C. Variation of sensitivity to 50 ppm NH_3 gas with the operating temperatures is illustrated in Fig. 4. Sensitivity increases with increasing operating temperature, attains its maximum at 200 °C and then decreases with further increase in operating temperature. Thus, the optimum operating temperature for pure SmFeO_3 sensor to 50 ppm ammonia gas is 200 °C.

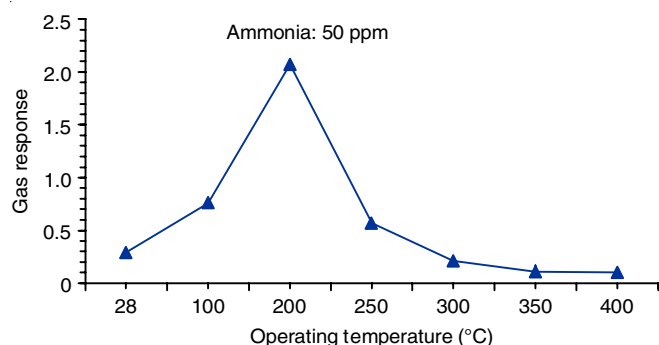


Fig. 4. Variation of sensitivity to 50 ppm ammonia with operating temperature for pure SmFeO_3

Fig. 5 depicts the variation in sensitivity with operating temperature of pure SmFeO_3 thick film and Co-modified SmFeO_3 films (dipping times 1, 3 and 5 min) to 50 ppm NH_3 gas. It has been observed for all samples that sensitivity increases with increasing operating temperature, attains its maximum at 200 °C and then decreases with further increase in operating temperature. It is clear from Fig. 5 that the optimum operating temperature to NH_3 gas is almost same (200 °C) for pure as well as all Co-modified SmFeO_3 films. But pure sample showed weak response ($S = 2.07$) while Co-modified sample (dipping time

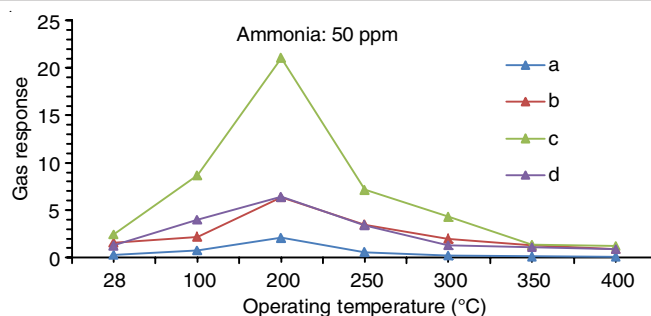


Fig. 5. Variation of sensitivity to 50 ppm ammonia with operating temperature for (a) pure SmFeO_3 , (b) Co-modified SmFeO_3 (dipped for 1 min), (c) Co-modified SmFeO_3 (dipped for 3 min) and (d) Co-modified SmFeO_3 (dipped for 5 min)

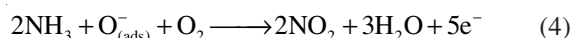
3 min) showed maximum response ($S = 21.07$) to 50 ppm NH_3 gas at 200 °C. Thus, the Co surface modified SmFeO_3 thick film (dipping time 3 min) was observed to be more sensitive than pure SmFeO_3 thick film towards NH_3 .

The sensitivity is related to change in resistance of sensor when exposed to air and target gas. When is exposed to air, oxygen species are adsorbed on the surface by extracting electrons from conduction band due to its strong affinity to oxygen. The possible electron transfer processes are given in eqns. 2 and 3 [22]:



This results in the formation of hole accumulation layer on the surface and resistance of film decreases (base line resistance). Chemisorbed oxygen may exist in molecular form (O_2^-) below 150 °C and in atomic form (O^- or O^{2-}) above 150 °C. After exposure to reducing gas, gas molecules interact with active sites on film surface and trapped electrons are released back to material. As a result, hole accumulation layer becomes thin due to decrease in hole concentration and resistance of sensor increases.

The chemical reaction involved in pure SmFeO_3 thick film sensor to sense NH_3 gas is depicted in eqn. 4 [23]:



NH_3 molecule has lone pair of electron and donates the unpaired electron to metal ion of base material which has unfilled orbit. The coordinated NH_3 molecule then react with adsorbed oxygen and return back the trapped electron to base material thereby increasing sensor resistance.

Oxygen deficiency and defect density that leads to increase chemisorptions are generally responsible for the sensitivity of SmFeO_3 thick film sensor to NH_3 . In the Co-modified samples, cobalt ions exists in mixed-valance state Co^{2+} and Co^{3+} where Co^{2+} deliver one electron during electron transfer [17]. Thus, Co misfits act as oxygen deficiency to improve chemisorptions. This not only decreased base line resistance in air but also increases sensor resistance when exposed to NH_3 .

Gas response and gas concentration: For Co-modified SmFeO_3 thick film (dipping time 3 min), variation of sensitivity with NH_3 gas concentration at optimum temperature of 200 °C can be seen in Fig. 6. Sensor is insensitive to NH_3 gas up to 20

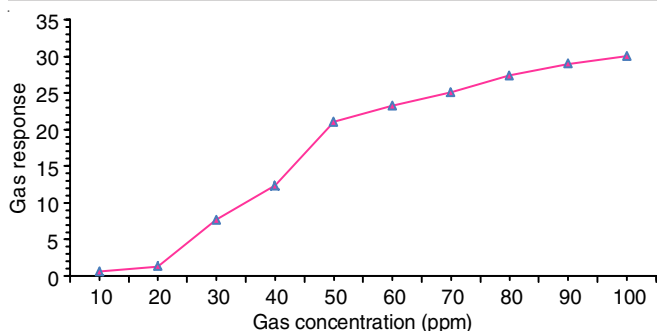


Fig. 6. Variation of ammonia gas response with concentration for Co-modified SmFeO₃ thick film (dipping 3 min)

ppm concentration. This low concentration region between 0 ppm to 20 ppm on characteristics curve is called cut off region. After 20 ppm, nearly linear increase in gas response with concentration was observed up to 50 ppm. This region of characteristics curve is active region of sensor where rate of increase of response is large. Beyond 50 ppm, rise of response is almost steady.

The reason for sensor being insensitive in cut off region is too low gas molecules exposed on the surface so that very low electrons are returned back to the material when exposed to NH₃ gas. But in active region, optimum number of gas molecules exposed on the sensor surface forming a monolayer on the film surface. They may react with maximum number of chemisorbed oxygen species on the film surface thereby enhancing gas response. If gas concentration is increased beyond active region, excess gas molecules will not be able to reach active sites of film and hence response remains saturated.

Gas response and dipping time: Fig. 7 depicts variation of gas response to NH₃ gas for Co-modified SmFeO₃ thick film dipped for different time intervals. The response to NH₃ gas goes on increasing with increasing dipping time and decreases further. The maximum response was recorded for film dipped for 3 min. indicating that the amount of Co (0.7 wt.%) introduced on SmFeO₃ surface would be optimum to improve adsorption mechanism. The highest response may be due to more cobalt misfits available for oxygen to be adsorbed while the decrease in response may be the result of insufficient number of misfits available on the surface [15]. In case of film dipped for 3 min, cobalt misfits would be optimum and would disperse uniformly throughout the complete film surface. This amount would be sufficient to promote the catalytic reaction effectively. As a result initial resistance of film is very small in air. Moreover, final resistance after exposure to ammonia becomes very large. This leads to largest sensitivity to ammonia. On the other hand, for dipping time smaller than optimum, cobalt misfits would be minimum and their dispersion would be poor. Due to this, initial resistance would be comparatively larger and hence response would be smaller. For dipping time larger than optimum, the number of cobalt misfits would be larger. This would mask and prevent gas to reach base material. This amount might not promote the reaction more effectively resulting in comparatively low response.

Selectivity of Co-modified SmFeO₃ thick film: Selectivity of sensor is its ability to respond to a certain gas in the presence of other gases. Fig. 8 shows the bar diagram representing the

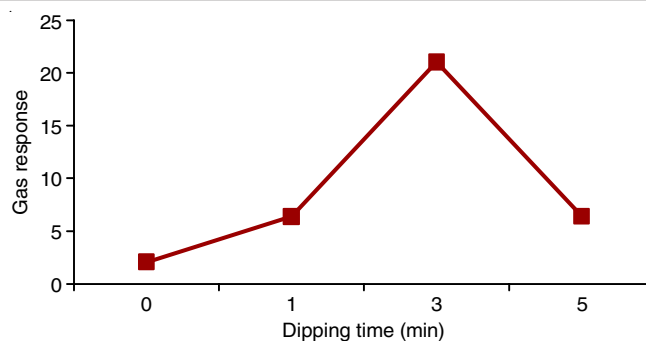


Fig. 7. Variation of gas response with dipping time of film

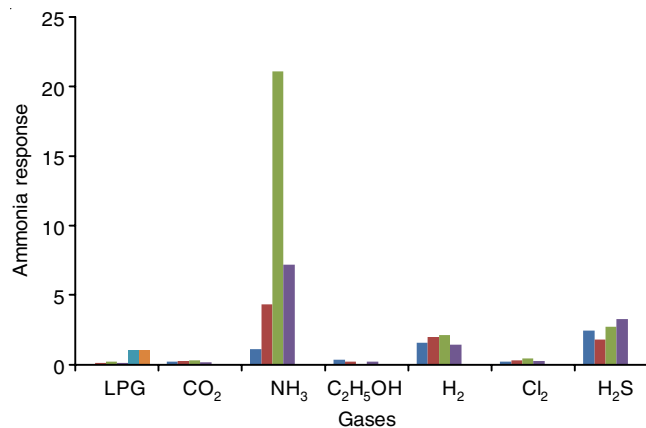


Fig. 8. Selectivity of Co-modified SmFeO₃ sensor (dipping time 3 min) operated at 200 °C

selectivity of Co modified SmFeO₃ sensor (dipping time 3 min) operated at 200 °C to LPG, NH₃, CO₂, C₂H₅OH, H₂, Cl₂ and H₂S gases.

The response to NH₃ gas at 200 °C is 21.07, which is much higher than those to LPG, CO₂, C₂H₅OH, H₂, Cl₂ and H₂S gases which are 0.21, 0.33, 0.03, 2.11, 0.46 and 2.69, respectively. The selectivity β is equal to S_1/S_2 where S_1 and S_2 represent response to NH₃ and other gases, respectively. For present sensor, β is higher than 5, which are generally required. The high selectivity to NH₃ may be attributed to surface modification (cobaltation) of SmFeO₃ films.

Response and recovery time of sensor: Response time is the time required for sensor to attain 80 % of maximum change in resistance on exposure to the target gas. Recovery time is defined as time taken by sensor to get back 80 % of original resistance in air. Fig. 9 depicts the response and recovery profiles of the most sensitive Co-modified thick film dipped for 3 min to 50 ppm NH₃ gas at 200 °C. When NH₃ gas was introduced, resistance of sensor increased and the response time was 15 s. After NH₃ gas was removed, resistance decreased rapidly and the recovery time was 30 s. Thus, Co-modified thick film dipped for 3 min exhibits a good response and recovery property.

Stability of sensor: In order to study the stability of Co-modified thick film dipped for 3 min, its resistance at 200 °C was continuously measured for 90 days. The results are graphically illustrated in Fig. 10. It is concluded that the resistance of sensor was almost stable, henceforth, developed sensor has good stability and durability.

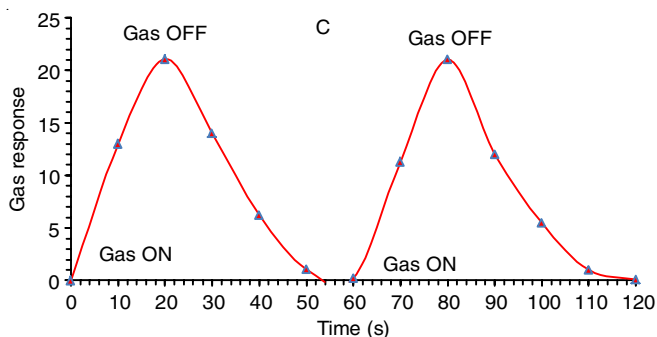


Fig. 9. Response and recovery profiles of Co-modified SmFeO_3 thick film dipped for 3 min

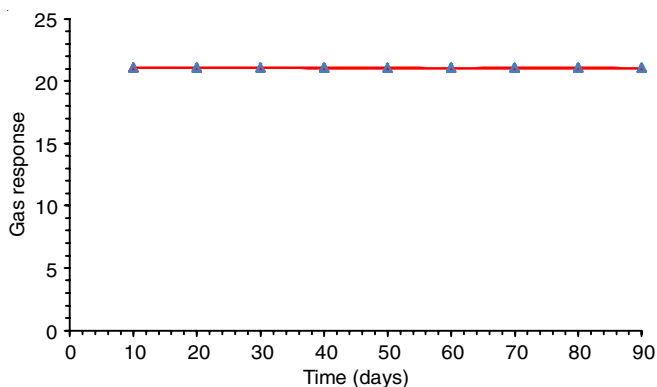


Fig. 10. Stability of Co-modified SmFeO_3 sensor dipped for 3 min

Conclusion

Pure SmFeO_3 thick film showed poor response to NH_3 gas at 200°C . In order to improve its ammonia gas response, SmFeO_3 thick films were surface modified by dipping them into 0.1 M aqueous solution of cobalt chloride for 1, 3 and 5 min. All the Co-modified SmFeO_3 thick films showed better response to ammonia gas at 200°C . Among them, Co-modified SmFeO_3 thick film dipped for 3 min has highest sensitivity to NH_3 gas at 200°C and sensitivity increases with concentration in active region 20 to 50 ppm. Moreover, it was selective to ammonia suppressing the response to LPG, CO_2 , $\text{C}_2\text{H}_5\text{OH}$, H_2 , Cl_2 and H_2S gases. Thus surface modification of SmFeO_3 thick film with Co by dipping technique seems to be effective in improving sensing performance to ammonia gas.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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Areas of Partnership by College Library with other agencies

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Abstract:

The article focuses on definition, need, importance, pre-requisite of partnership. It also focuses on the areas where college library partnership could be developed. The author provides suitable example for college library partnership.

Keywords: PARTNERSHIP, LIBRARY, PARTNERSHIP IN LIBRARY SERVICE

Introduction:

According to Ranganathan's Fifth Law "Library is a growing organism" gives new challenges for the librarians in the development and improvement of services by acting as information managers, consulting information engineers, reference managers, information disseminators and as a teacher. On the other hand libraries has to face the problem of information control due to information explosion, increasing demands of users, limited funds, limited staff, limited infrastructure and so on. These problems can be overcome through partnership.

What is Partnership?

A partnership is an association of two or more persons / organization called as partners. It is an organizational form that shared risks and benefits and is also a potential future state of unity.

Partners may have a partnership agreement or declaration of partnership and in some jurisdictions such agreements may be registered and available for public inspection.

As library is a service oriented organization or system, partnership of library and information science teacher and librarian and college libraries with other agencies will be different from the above; as in this partnership we have to create a culture of complete commitment to building fair, effective and mutually beneficial outcome in learning environment.

Definition of Partnership:-

1. Local Government Management Board :-

A partnership is an agreement between two or more partners to work together to achieve common aims.

2. UK Department of International Development :-

A partnership involves an agreement to work together to fulfill aims or undertake a specific task by committing resources and sharing as well as the benefits.

Need and Importance of Partnership in LIS profession:-

1. To increase the use of library resources.
2. Optimum use of library funds.
3. To identify the areas where cooperation is needed in library.
4. To solve the staffing problem of academic libraries as well as LIS schools (By Internship Programme).
5. To identify user needs (Teachers, Students, or any other)
6. To increase the image of library and library science professionals.

7. To improve the quality of library science education at every level.
8. To develop awareness and understanding of information sources and role of the teacher and librarian for professional development.
9. To maintain an innovative approach to new information technology and techniques and to contribute to their development in the information profession.
10. To manage the personnel, financial and other resources of the library with efficiency and through an entrepreneurial approach.
11. To Promote the Research and Development work.
12. Development of several repackaged and information consolidation products for use by academics and in their consultation work and services.

Essential Things / Pre-requisites for Library Partnership:-

1. Two or more than two persons / organizations are essential.
2. Organizations / persons have same / common objectives.
3. They must work on same platform.
4. Agreement must be signed in partnership.
5. Equal investment, authority and responsibility.

Areas where Partnership can be developed by College Library with other agencies:-

1. College Library with LIS School.
2. College Library with other College Library.
3. College Library with other Departments of College.
4. College Library with Public Library.
5. College Library with School Library.
6. College Library with Information Centre.
7. College Library with Library Networks.
8. College Library with Book Sellers/Publishers.
9. College Library with Local Peoples.
10. College Library with NGO's.

1. College Library with LIS School:-

Examples.

- a) Sharing of Librarians experience with students through working as a Contributory teacher in LIS School. (Librarians will get in continuous touch with the advances in Library and Information Science where as students will get the lesson on library working)
- b) Working of Students of LIS School in College Library through Internship Programme. (Librarian can get done the extra work in terms of Classification, Cataloguing, Stamping, Labeling etc. where as librarian can help in Curriculum development by finding out the lacunas in the working of students).
- c) Working of qualified unemployed students in College Library. (In this type of partnership librarian may solve the problem of un-trained library staff, the students will help to do the work like Creating Databases, Indexing, Abstracting, Library Automation, Management of E-resources and so on, where as the students will get a chance to work in full-fledged library, chance to handle various library software and electronic equipments.

2. College Library with other College Library :-

Example.

Here partnership can be developed in Collection Development, Use of Manpower, Website Development, Library Automation, Information Products and in terms of library services i.e. Book lending service, Information service, Reference service etc.

3. College Library with other Departments of College :-

Example.

Partnership with NSS department by using their students may help to extend the library services in rural areas, which may be act as best and healthy extension activity of the library.

4. College Library with Public Library:-

Example.

Partnership between them can extend their services using their time schedule, resources and places i.e. the users of both libraries can get library services at both places and in the time schedule of both libraries i.e. in Morning, Afternoon and Evening.

5. College Library with School Library:-

Example.

Partnership with School Library through User Education Programme may get aware the students about the library activities, collection and services which may help them in maximum utilization of library resources and which may help to increase the admission of college and ultimately the craze of the college.

6. College Library with Information Centre:-

Example.

If a College Library is rich in collection, partnership with Information Centers for various services like Document delivery service, Indexing services and other various services may help the college library to fulfill the needs of the users where as the college library may act as the nodal centre for the Information Centers.

7. College Library with Library Networks:-

Example.

Partnership with INFLIBNET (Information Library Network) may provide online access to the database of collection of all college and university library, the database is created on the basis of merging and updating of the data of individual college library.

8. College Library with Book Sellers/Publishers:-

Example.

In this partnership Book Sellers / Publishers may arrange Book Exhibition in the college premises which helps the users to get aware of new books or sources, while publisher may get business from that.

9. College Library with Local Peoples:-

Example.

Partnership may form to develop various schemes on cooperative basis. For example, Book Bank Scheme on the basis of "Donate one book to Book Bank and take long life use of all books comes under scheme of Book Bank" in such scheme the user has to donate only one book to the library and can use all the books available under that scheme in the library. Such a scheme may provide chance to the users to have a permanent membership of library and the library have a chance to increase the collection and the use of collection.

10. College Library with NGOs:-

Example.

The college libraries in the tribal area may develop partnership with various NGO's, to provide library services to them and get continuous update information about the social, economical and educational status of the tribal population.

Conclusion:

In such a way in the present assignment few areas with examples are discussed but libraries can establish partnership with any agency at any place for any purpose to fulfill the requirements of library and to extend the services of library.

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Documentation for Revised NAAC Assessment & Accreditation Process

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Abstract:

Being NAAC coordinator and has experience of three NAAC cycles, the author of the article tries to define various sections of the institute for documentation. He also defines in short responsibilities of various administration sections and according to that documentation of same sections. He also focuses the important things that should be considered at the time of documentation.

Keywords : NAAC, DOCUMENTATION, SOP, ADMINISTRATIVE, ACADEMIC

Introduction:

NAAC Assessment and Accreditation Process is going to be more transparent and effective, hence it acts as powerful tool or mechanism for quality enhancement in higher education rather than Assessment and Accreditation Process.

NAAC continues with its focus on quality culture of the institution in terms of Quality Initiatives, Quality Sustenance and Quality Enhancement, as reflected in its vision, organization, operations and the processes. These can be ascertained either by on site observations and/or through the facts and figures about the various aspects of institutional functioning.

There is vast difference between the new transparent mechanism and old mechanism of Accreditation and Assessment Process. The new mechanism was first launch on July 2017, there after slight changes were made in 19th March 2019, 16th December 2019, 4th February 2020 and currently the guidelines of January 2022 are in force for Assessment and Accreditation Process.

In Institutional view point NAAC Assessment & Accreditation Process is based on the Academic and Administrative Audit. Academic and Administrative audit is based on quantitative and qualitative measures. The quantitative measures deals with volume of figures related to budget, programme conducted, activities conducted, involvements, etc. and qualitative measures deals with quality of programme conducted, activities conducted, involvements etc.

The Academic activities are always depends upon the Administrative support. In short, Academic and Administrative activities are two sides of a one coin. Academic audit involves evaluation of all activities related to teaching, learning, evaluation and research, while Administrative audit involves Governance, Leadership, Infrastructural Facilities, and Student Support Facilities.

Revised Assessment and Accreditation Framework 2022:

- The Revised Assessment and Accreditation (A&A) Framework was launched actually in July 2017.
- It represents an explicit paradigm shift making it ICT enabled, objective, transparent, scalable and robust.
- The shift is from qualitative peer judgment to data based quantitative indicator evaluation with Increased objectivity and transparency towards extensive use of ICT, confirming scalability and robustness in terms of simplification of the process, drastic reduction in number of questions, size of the report, visit days, and so on
- Introducing pre-qualifier for peer team visit, as 25% of system generated score

- Introducing *System Generated Scores* (SGS) with combination of online evaluation (about 70%) and peer judgment (about 30%)
- Introducing the element of third party verification and validation of data (DVV) in providing appropriate differences in the metrics, weightages and benchmarks to universities, autonomous colleges and affiliated/constituent colleges in revising several metrics to bring in enhanced participation of students and alumni in the assessment process
- Also introduced Online Student Satisfaction Survey for participation of students in the assessment process
- So the result of Assessment and Accreditation process is depends on Online Evaluation, Peer Team Report and Student Satisfaction Survey.
- At present Distribution of Metrics and Key Indicators across Criteria is as

Type of HEIs	Affiliated/Constituent Colleges
Criteria	7
Key Indicators (KIs)	32
Qualitative Metrics (Q _i M)	21
Quantitative Metrics (Q _n M)	34
Total Metrics (Q_iM + Q_nM)	55

Documentation for Revised NAAC Assessment & Accreditation Process

Documents required in NAAC Assessment and Accreditation Process are same as per the old Assessment and Accreditation process, but in the new process, NAAC introduced use of ICT for document verification and validation. Because of the use of ICT, institutes are bound to change the physical structure and style of the documentation. With this, to be update, timeliness, alertness, digitization of documents and use of ICT are the key factors required for documentation.

Required Initiatives in Documentation for NAAC:

NAAC is going to be very specific in documentation and the council itself providing specific directions for overall documentation of the institution, for that NAAC on its website has specifically provided Standard Operating Procedure (SOP) and perfect & exact list of document required for Data Verification and Validation. In the new process, NAAC also introduced Institutional SWOC analysis (Strength, Weakness, Opportunity and Challenge).

Institutes can categorize documentation in two parts

I. **Administrative:** it can again categorized as..

1. Establishment Section
2. Admission Section
3. Account Section
4. Student Support Facility Section
5. Laboratory and Library Facilities

II. **Academic:** it can again categorized as..

1. Curricular Aspects
2. Teaching-Learning and Evaluation
3. Research, Innovations and Extension
4. Infrastructure and Learning Resources
5. Student Support and Progression
6. Governance, Leadership and Management
7. Institutional Values and Best Practices

I. **Administrative Documentation:**

While considering the administrative documentation we have to know the role of non-teaching staff in NAAC accreditation process, we have to consider the jobs and responsibility of

the staff. As per the jobs and responsibility, we can identify the role of non-teaching staff in keeping records, filing and responsibilities in NAAC accreditation process

Jobs and Responsibilities of non-teaching staff:

- Working as stakeholder of quantitative data related to Institution, which involves Accounts, Stock, Institutional Progress and Students & Staff related Data.
- Repackaging and Consolidation of data as per need and provide it to all stakeholders as per requirement.
- Availability and installation of physical support facilities
- Work as a centre for all kind of support facilities required to staff and students
- Periodic Administrative Audit

1. Establishment Section:

Role of Establishment Section:

2. Procedural conduct of all activities related to Appointment of Teaching and Non-teaching staff.
3. Procedural conduct of all activities related to Promotions of Teaching and Non-teaching staff.
4. Procedural conduct of all activities related to Pay Fixcesion
5. Procedural conduct related to College Development Committee, Staff Council and other committees formed related to administrative work

Documentation in Establishment Section:

- **Appointment related** : Roster, Government Resolutions, University Ordinances, UGC regulations, Government Permissions, Advertisement, Committee Details, Interview, Proposal for salary and Maintenance of Service Book.
- **Promotion Related** : API files, Confidential Report, Committee Details, Report Keeping and other related documents keeping
- **Pay Fixcision** : Government Resolutions, University Ordinances, UGC regulations, Formats of Pay fixcesion, Approval of University, Joint Director and Senior Account Officer and other relevant documents
- **College Development Committee and other** : Notices, Minutes of meeting, Work Orders related to decisions and other related documents
- Statistical data related to all the above activities

2. Admission Section :

Role of Students Admission and Exam section:

- Admission, Enrolment, Submission of Exam form with Fees,
- Distribution of I Card, Conduct of Examination, and Submission of Account details to University
- Display of results, distribution of mark sheet and TC, students grievances about exam if any

Documentation in Admission Section

- Faculty wise, Category-wise, Year wise, Class wise Statistical data of admitted students
- All files related to admission, enrolment, exam and result
- Statistical data of result and Data of Students progression,
- Separate files related to the activities of this section

3. Account Section:

Role of Accounts and Audit section :

- Budgeting, Tendering, Purchasing, Stock updating, Receipt and payments, Yearly Audit
- Fees Collection, Printing and purchase of Stationary, Clearance,
- Construction, Maintenance, Up gradation of all kinds of physical facilities
- Augmentation of ICT, Teaching Facilities, Learning Resources and Infrastructural Facilities etc.

Documentation in Account Section:

- All kinds of files related to budget, tenders, purchase, receipt and payments and audited statements
- Students Fees, Dues and Clearance
- Stock book of permanent assets and consumable items,
- Statistical data in the form of tabulation related to incremental development of Permanent Assets, ICT equipments, Teaching Facilities and other infrastructural facilities.

4. Student Support Facility Section:

Role Students Support Facilities Section:

- This section mainly involves Scholarship, Free ship, Awards, Hostel, Canteen, Cooperative Store
- Applications to various schemes, Guidelines regarding schemes and their documentation,
- Outside Participation of students in various events etc.
Support to students for applying online for various schemes, activities and exams

Documentation of Student Support Facility Section:

- Category wise, Scheme wise, Gender wise, Statistical data about scholarship and free ship
- Application Forms, Related Documents, Government Resolutions, Grievances regarding scholarship and free ship
- Details about Awards, Hostel Facilities and grievances. Details about Canteen, Cooperative Store, various student support facilities etc.

5. Laboratory and Library Facilities:

Role of Laboratory and Library Facilities:

- The non-teaching staff involves in laboratory and library is always supportive to the students and teachers in terms of curricular activities
- The persons in laboratory always engage in accessioning and organizing laboratories, equipments, chemicals etc.
- The non-teaching staff in laboratory has to continuously update the stock book of recurring and non recurring assets of laboratories .
- The non-teaching staff in library is continuously engage in arranging books in proper way, classification, cataloguing, stamping, labeling and processing of books
- Cleaning of library and library reading material, making available reading material, online services, other various library services,

Documentation of Laboratory and Library Facilities

- Accessioning and updating stock book of laboratory consumable and non consumable items
- Records of students and teachers demands regarding laboratory and library
- Statistical data about library resources, use of library and various library services
- Details about book binding, write off etc.

Important Factors Considered while documentation of Administrative Section:

1. Automation of administrative section which helps to generate various reports, statistical tables, graphs and to find documents as and when required
2. E-governance in administrative work which helps all the stake holders to do their work without any restriction of time and space, 24/7 and with transparency
3. Digitization, Preservation and Searching system for valuable documents
4. Use of advanced techniques like Google drive for documentation
5. Video Shooting, Scanning, Still Photograph and ICT facilities has important role in documentation
6. Use of E-mail & Social media for communication and transfer of document, which helps to saves time, paper, distance and space. This initiative also helps to keep transparency in job responsibility and authority, quality in work with quantity.
7. Maximum use of Institutional Website for display information, promotion and implementation of various activities

II. Academic Documentation of Institute and departments should be according to the seven criterion given by NAAC:

1. Curricular Aspects:

Includes documents related to University Academic Plan, Institutional Academic Plan, Departmental Academic Plan, Workload Distribution, Syllabus Distribution, Institutional and Departmental Time Table

2. Teaching-Learning and Evaluation:

Includes documents related to Unit Test, Common Test, University Exam, Assignment, GD, Seminar, Practical Work, Statistics of Result, etc.

3. Research, Innovations and Extension:

Includes Documentation related to Research Publications, Research Projects, Innovative Work carried out, Extension work

4. Infrastructure and Learning Resources:

Includes documents related to infrastructure and learning resources available (Audio/Video, Online Presentations, etc.) its online use and use in resource sharing if any,

5. Student Support and Progression:

Includes documentation related to activities conducted for students supports and progression. (Academic and over all progress of each student should be maintained)

6. Governance, Leadership and Management:

Documents related to Vision& Mission, Core Values, Institutional Plan of Action, Deployment Documents, Professional Ethics, Code of Conducts, Organogram of the Institute, Various Committees, their objectives, responsibilities and minutes

7. Institutional Values and Best Practices:

Documents related to best practices conducted by institutes in prescribed format given by NAAC. Other activities conducted in support of Vision and Mission of the institutes.

Important Factors Considered while documentation of Academic Sections:

1. Common file format, report writing style, numbering and indexing should be maintained
2. API based assessment procedure for individuals should be used
3. NAAC criterion based assessment system for institute should be established
4. Report writing should be involved Title, Objectives, Date, Venue, Gests, Key Speakers, Key Participation, Number of Beneficiaries, Output and Summary in short about programme followed by proofs like Photographs, Registration and Feedback
5. Digitization, Preservation and Searching system for valuable documents
6. Use of advanced techniques like Google Drive for documentation and Google Class Room or other Learning Management System for Teaching Learning process
7. Video Shooting, Scanning, Still Photograph and ICT facilities has important role in documentation
8. Use of E-mail & Social media for communication and transfer of document, which helps to saves time, paper, distance and space. This initiative also helps to keep transparency in job responsibility and authority, quality in work with quantity.
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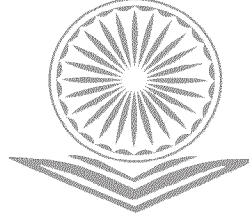
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2. Empowerment of Tribal Women in Melghat Region: Problems & Prospects

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Abstract

In the present research article the author tries to focus on the problems in Tribal Women Empowerment in the Melghat Region. He has discussed the status of Tribal in India, Tribal Women in India and Tribal Women in Melghat Region. He has also focus on the Policies Regarding Empowerment of Tribal, Development and Employment Programmes for Tribal, Major impediment for Tribal Women and Resistance in Development of Tribal Women in Melghat Region. According to this he has suggested some basic remedies to avoid the problems in Empowerment of Tribal Women in Melghat Region.

Introduction

Women plays the role of nucleus in human society, as she gives birth to child, gives attention towards the development of child and plays vital role in man's life as a life partner. As a life partner of man she plays a vital role in sharing of views, sharing of sorrow, sharing of wisdom, as a partner for sex, as status in society and other various things.

Beside these women are facing the basic problems like Health, Food and Education. The Tribal Women has their own problems with these basic problems, because of their culture, living standard, economic condition and lack of education. So the empowerment of Tribal Women requires special attention by the society.

The author has tried to focus on the scenario related to problems of Tribal Women in India and especially in the Melghat Region and provides some remedies.

Definition of the Empowerment

Empowerment Refers to increasing the spiritual, political, social, or economic strength of individuals and communities. It often involves the empowered developing confidence in their own capacities.

Status of Tribal in India

The population of tribal communities scheduled in the Constitution of India and known as Scheduled Tribes (STs) was 8.43 crore (1 crore = 10 million) as per 2001 census and accounts for 8.2% of the total population. 4.26 crores are men and 4.17 crores are women, accounting for 8.01% and 8.40% respectively. They are scattered over all the states/UTs, except Punjab, Haryana, Delhi and the UTs of Pondicherry and Chandigarh.

They have lived as isolated entities for centuries, largely untouched by the society around them. This seclusion has been responsible for the slower growth, dissimilar pattern of their socio-economic and cultural development and inability to negotiate and cope with the consequences of their involuntary integration into mainstream society and economy. Tribals continue to be socio-economically backward.

Status of Tribal Women in India

The status of women in a society is a significant reflection of the level of social justice in that society. Women's status is often described in terms of their level of income, employment, education, health and fertility as well as their roles within the family, the community and society. In tribal communities, the role of women is substantial and crucial. They constitute about half the total population but in tribal society women are more important than in other social groups, because they work harder and the family economy and management depends on them. Even after industrialization and the resultant commercialization swamped the tribal economy, women continued to play a significant role. Collection of minor forest produce is done mostly by women and children. Many also work as labourers in industries, households and construction, contributing to their family income. Despite exploitation by contractors and managers, tribals are more sincere and honest than non-tribals. However, tribal women face problems and challenges in getting a sustainable livelihood and a decent life due to environmental degradation and the interference of outsiders. The strategy for tribal development, and specially women, needs improvement, betterment, development and upliftment to effect their empowerment. Tribal women have adjusted themselves to live a traditional life style in the local environment and follow occupations based on natural resources. Undoubtedly, the programmes, oriented towards the empowerment of tribals, particularly women, have improved their socio-economic conditions and status. However, there are wide variations across regions and tribes in terms of work participation, sex ratio, economic productivity and social life. The impact of development

planning needs to be evaluated in terms of desired and unanticipated consequences. The development process should be perceived as an involvement and reorganization mechanism of not only the socio-economic system but the entire eco-system.

Policies Regarding Empowerment of Tribal

1. Tribal Sub-Plan Strategy

The tribal sub plan was adopted for the first time at the beginning of the 5th Five Year Plan in 1974-75. It applies, at present, to 21 states and two Union Territories where tribal constitute a sizeable population and provides for the allocation of funds in proportion to the tribal population in the country by each of the concerned central ministries/departments in proportion to the tribal population of that state.

2. PESA

The Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA) came into force on 24th December, 1996 with the objective of safeguarding and preserving the traditions and customs of people living in scheduled areas, their social, religious and cultural identities and traditional management practices of community resources.

3. State/UT Minor Forest Produce Act 2005

The tribal are in need of forest-based sustainable livelihoods for which ownership of forest resources and management of the ecology are crucial. The Government of India has come out with the Minor Forest Produce Act (MFPA) 2005 whereby forest dependent communities should be endowed with collection, processing and trade in minor forest produce on the principle of "Share and Care".

Development and Employment Programmes for Tribal

The Government has implemented various programmes which encourage tribal to take up new ventures. The assistance for the poor households of SCs/STs under the major programmes is as follows:

1. National Rural Employment Guarantee Act (NAREGA)
2. Sampoorna Grameen Rozgar Yojana (SGRY)
3. Swarnjayanti Gram Swarozgar Yojana (SGSY)
4. Indira Awas Yojana (IAY)
5. National Rural Health Mission (2005- 2012)

Major Impediment for Tribal Women

The tribal women suffer both by the state machineries as well as tribal customary practices. They continue to live with the various discriminations. Rigid practices that aim to control their mobility, sexuality and reproductive capacity with in the different cultural practices of the hundreds of tribes. There is no effort to identity the discriminatory (or) anti women practices of the 683 tribal communities in India in the name of non-interference policy, to provide succor and redressal to the suffering women.

Livelihood

Because of globalization and development projects and entry of MNCs engaged in mining and industries, the displacement of Adivasi/Tribal people from their own land is on the rise. Since 1990, 55.19% of the internally displaced are tribal. The RR Policy is state specific and at times, project specific and do not provide comprehensive package for rehabilitation. Though provision for some compensation is there, the livelihood issue is not addressed at all. This has been leading to mass migration of tribal families to unknown destinations in search of livelihood issue is not addressed at all. This has been leading to mass migration of tribal families to unknown destinations in search of livelihoods for survival. Due to lack of literacy and skills, thousands of migrant young women become exposed to labour exploitation and trafficking.

Alcoholism

According to civil society studies, 60% of earnings among the adivasi families are wasted on alcohol, which is also a cause of the increasing domestic violence and violation of women's human rights. The Beverage Policy of some states has become instrumental in increasing violence against women, especially tribal women, marginalizing from their natural resources and their livelihood assets.

Food Security

Threat to food security due to the commercialization of agriculture and change in pattern of cropping is palpable. And food for local consumption is not on priority agenda of government. There is also no assurance of good returns of the Commercial Crops. The PDs is also not effective. And owing to import of skilled labourers to work in large commercial agricultural farms in the tribal areas, the unemployment amongst tribal women is also on the increase.

Health

The lack of infrastructure in the health sector in the tribal dominated areas is still there. Whatever facilities are there are beyond the reach of the poor tribal. Traditional health practice is also eroding owing to the depletion of forest and its degradation due to various mega projects. The practitioners of traditional healers are not appreciated for their knowledge and wisdom. The privatization of health sector has made the government delivery system slacken down further on the one hand and also made the services inaccessible and unaffordable to the poor tribal. Certain practice (traditional) during reproductive period also plays negative impact on the health of tribal women. Nutrition status is also sliding down further because of the depletion of foods from the forests.

Control over Resources

Tribal Communities and their community ownership of land is highly disturbed due to privatization of tribal land and BENAAMI transfer of tribal land with the collusion of some greedy tribal. Government's priority for development in national interest at the expense of the rights of the tribal over their own resources is leading to a complex problem situation; where by women in these communities are put at the crossroads to suffer in various ways.

Conflict Situation

The tribal people's political aspirations to 'Self-determination' and assertion to have full control over their resources have led to the armed conflict situation in north east India, which is dominantly a tribal region. The militant up springs among many tribes in different states of the region has seen thousands and thousands of women being molested, jailed, abducted, raped, killed, widowed, deserted, impoverished to destitution, charged for sheltering terrorists etc., this perhaps is just an indicator of the GOI's high insensitivity to the cultural and economic tensions. The recent announcement of the Prime Minister of India for a Review Committee of the AFSPA is a welcome step towards ameliorating the sufferings of the people.

Violence in the Lives of the Tribal

Industrialization in the tribal areas is causing increased alcoholism resulting in more violence against women. The infiltration of non-tribal into tribal areas also adding to the woos of the tribal women, loss of livelihood is compelling the tribal people, especially the tribal women to migrate and thus migration and trafficking is increasing.

Religious Codes and Norms & Practices of Cults and Communities

Religious conversions and reconversions of the tribal by the dominant / majority established religions at the expense of the faiths and beliefs of the tribal are eroding the religio-cultural base of the tribal.

Tribal Women in Melghat Region

The Tribal Women in Melghat Region suffers from all the above obstacles. The Geography of Melghat Region itself is a big hurdle in the empowerment of tribal women. The region is of Hilly & Wide Forest Area, having variety of Wildlife, Heavy Rain Fall and less agriculture land. These factors also affect the overall development of Tribal in this region.

Besides this the tribal society in this region is women centred, all the economic powers are belongs to women, and women have freedom to choose their life partner.

Resistance in Development of Tribal Women in Mleghat Region

1. The Corruption in Government System - Corruption in government system affects the proper implementation and maximum benefit of the schemes and facilities available for tribal.
2. Lack of Affection about Tribal by NGO - Most of the NGO's are working for Tribal without affection. They have to complete their target only for craze and show.
3. Laziness in the Tribal - The schemes to uplift the tribal are running from long duration which creates laziness in the tribal. The government has no powerful feedback mechanism. No target oriented plans of development.
4. Unwilling to accept new things - The tribal in this region are happy with their traditional life, they are not ready to accept the new things, ideas, concepts etc. as other society does. With this there are various small factors affecting the development of the tribal in Melghat region and these are nothing but the factors affecting the Empowerment of Women in this region.
5. Lack of basic facilities - The Melghat Region is still suffering from the basic facilities like food, health and education which cause the big problems like malnutrition.
6. Language Problem - The Melghat tribes has their own communication language in verbal form only and not in the written form which creates problem to communicate with other communities and to spread education among the tribes.

Suggestions/ Recommendations

The problems of tribal women and tribal are largely common. Suggestions and recommendations to strengthen and empower tribal as well as tribal women are:

1. Try to stop the corruption in the government system, and maximum benefit of the scheme.
2. Short terms plans of government should be implemented for empowerment of women.
3. Right to have forest food products.
4. Small scale industries related to forest food products.
5. Special Food Package for pregnant women to avoid malnutrition
6. Compulsory basic education to women
7. Promote the diversification of agriculture and non-farm sectors to create job opportunities. Train tribal women in kitchen gardening, childcare, food preservation, handicrafts and other house based activities.
8. Form and stabilize tribal women's co-operatives to take up dairy, sericulture, fisheries, handicrafts, horticulture agri-food processing and post harvest technologies
9. Undertake research and extension to improve current practices, increase output and incomes and eliminate adverse ecological effects.
10. As per the PESA 1996, the Gram Sabha enjoys the authority to decide the natural resources which include non-timber forest produce (NTFP). The monopoly restrictions over NTFP should be immediately removed while ensuring social protection through provision of support prices to tribal who should be allowed to collect, process, transport and market the NTFP.
11. Teach tribal children in their mother tongue at least at primary level. Prepare textbooks in tribal languages.
12. To prevent teacher absenteeism in tribal areas, give preference to local and tribal teachers from local panchayats, and place the teaching and non-teaching staff of primary schools under the control of the village management committee.
13. Devise new systems to improve the access of tribal to modern healthcare.
14. There should be a system to uplift the knowledge of tribes about forest, medicinal plants and the various botanical and zoological creatures in Melghat region.

15. Discourage the migration of tribal women to urban areas, to take low paid, domestic and mental work by providing an enabling regulatory framework.
16. Train tribal women to take up their responsibilities and sensitize the Gram Sabha about the new provisions.
17. Inform all Gram Sabha members, including tribal women, of the functions, responsibilities and powers of Gram Sabhas. These strategies would empower tribal women and bring them into mainstream development.

Conclusion

Tribal women play a major role in the development of tribal society of Melghat Region. But kind attention should be given by the government system towards policies regarding health, education and food which are basic one.

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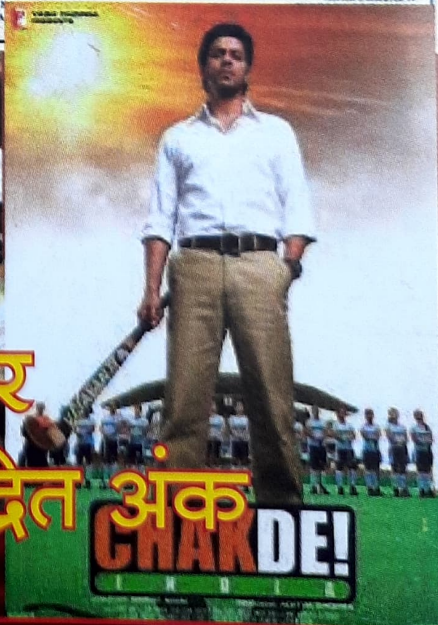
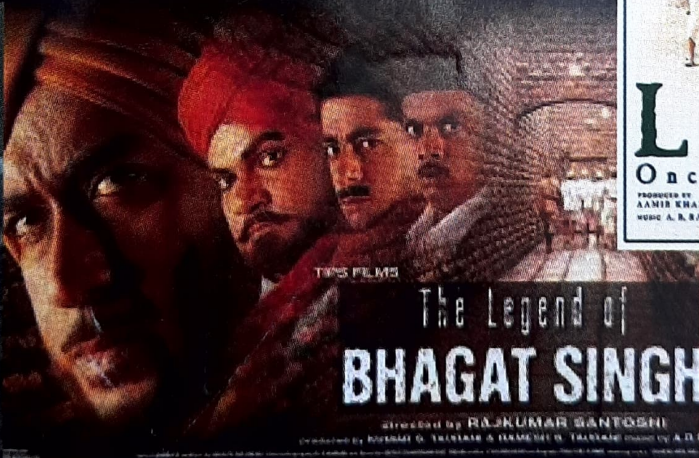
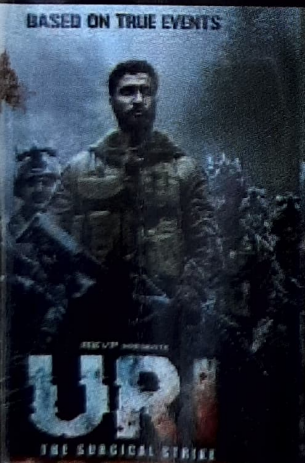
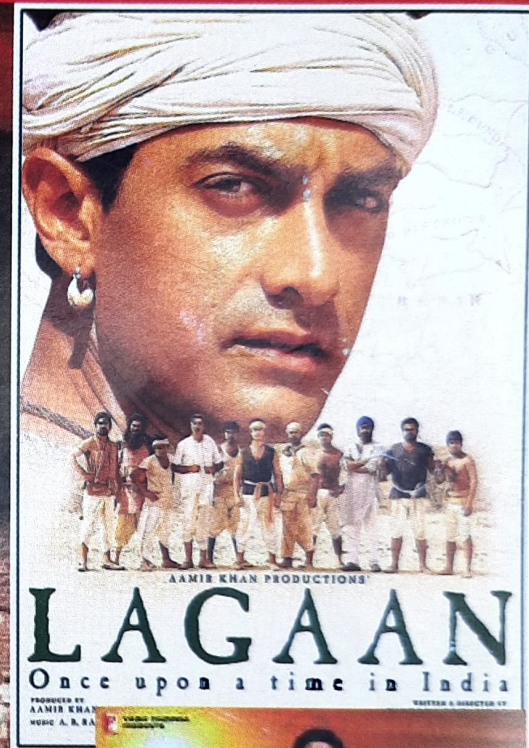
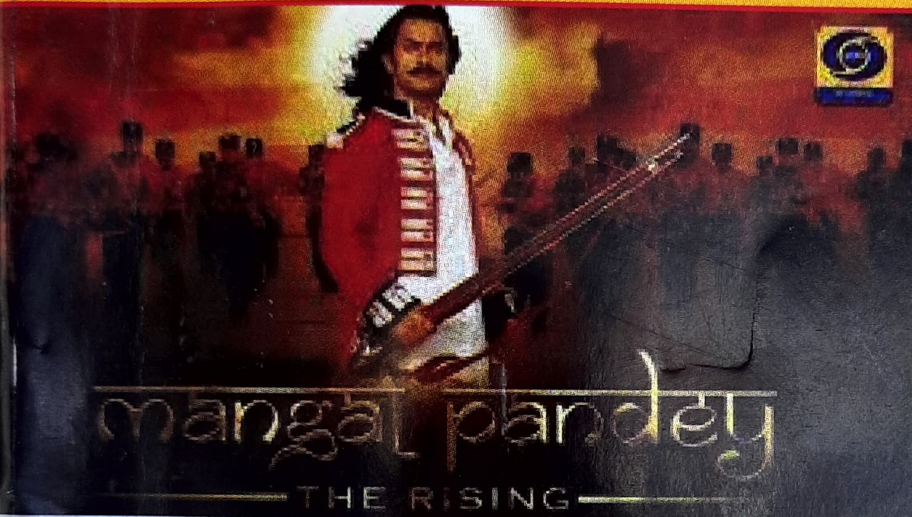
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सामीचीन

(साहित्य-समाज-संस्कृति और राजनीति के खुले मंच की अर्द्ध वार्षिक-अव्यावसायिक पत्रिका)

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डॉ. परशुराम शुक्ल के बाल साहित्य में राष्ट्रीय चेतना

प्रा. आनंद र. बक्षी

बाल-साहित्य के अर्थ की गवेषणा करने पर स्पष्ट होता है कि बच्चों से सम्बन्ध रखने वाला साहित्य ही बाल साहित्य है पर यह ऐसा साहित्य भी होता है जो समाज और देश के भावी स्वरूप की नींव निर्धारित करता है क्योंकि बालक ही देश का भावी निर्माता होता है। इस दृष्टि से बाल साहित्य का अर्थ गाम्भीर्य और भी बढ़ जाता है। राष्ट्रधर्म की भावना को बाल साहित्य में सर्वोपरि महत्व दिया गया है क्योंकि बालकों का मन मस्तिष्क स्थायी रूप से प्रभाव ग्रहण करता है। बाल अवस्था के संस्कार उसको जीवन भर मार्गदर्शन देते हैं। डॉ. शुचिता सेठ ने लिखा है- 'राष्ट्रीयता और देश प्रेम सर्वोपरि तत्व हैं। इनके प्रभाव से देश के लिए व्यक्ति सब कुछ न्योछावर करने को उद्यत हो जाता है।' स्वामी विवेकानन्द का एक उदाहरण इसी प्रकार का है। जब वे जापान भ्रमण पर गए तो एक जापानी से कहा कि यदि मैं गौतम बुद्ध को अपशब्द कहूँ तो तुम क्या करोगे?' वह व्यक्ति बोला- 'मैं आपका सर धड़ से अलग कर दूँगा।' विवेकानन्द ने कहा- 'और यदि गौतम बुद्ध जापान को अपशब्द कहें तो?' इस पर उस जापानी ने कहा- 'मैं गौतमबुद्ध का सर धड़ से अलग कर दूँगा।' इसका तात्पर्य यह हुआ कि राष्ट्रीयता सर्वोपरि है। राष्ट्र स्वयं में एक धर्म है।

स्पष्ट है कि राष्ट्र और राष्ट्रीयता सर्वोपरि हैं। राष्ट्र के प्रति समर्पण की भावना प्रत्येक नागरिक के हृदय में होनी चाहिए। इसकी याद कवि-साहित्यकार अपनी रचनाओं के माध्यम से दिलाते रहते हैं। बच्चों के हृदय में राष्ट्रीयता और मानवता की भावना जागृत और पुष्ट करने के लिए बाल साहित्यकारों ने पर्याप्त मात्रा में बालगीत, कहानी, बाल नाटक तथा बाल उपन्यास लिखे हैं। नवजागरण काल में जब राष्ट्रीय विचारधारा की लहर चल रही थी, अधिकांश कवियों ने राष्ट्रीय गीत लिखकर बच्चों और बड़ों के हृदय में राष्ट्र-रक्षा तथा राष्ट्रीयता के भाव जागृत करने का प्रयास किया है।

डॉ. परशुराम शुक्ल वर्तमान युग के श्रेष्ठ बाल साहित्यकार हैं। आपने बाल साहित्य की सभी विधाओं में लेखनी चलाई है। आपने अपनी रचनाओं में बाल-मनोविज्ञान एवं युवा पीढ़ी को दी जानेवाली शिक्षा का अद्भुत समन्वय किया है। आपकी कहानियाँ, कविताएँ, आलेख समय-समय पर पत्र-पत्रिकाओं में प्रकाशित होते रहते हैं।

राष्ट्रभक्ति और देशप्रेम मूलतः एक ही है। राष्ट्र और देश विभिन्न जातियों, धर्मों और संस्कृतियों के लोगों का संगम होता है। भारतवर्ष एक ऐसा ही विशाल देश है जिसमें अनेकता में एकता और अखण्डता के दर्शन होते हैं। भारत में निवास करने वाले सभी धर्मों, जातियों, संस्कृतियों, संप्रदायों के लोग अपने राष्ट्र के प्रति प्रेम और भक्ति का भाव रखते हैं। डॉ. शुचिता सेठ ने लिखा है - 'भारत अनेक धर्मों और संस्कृतियों के समन्वय वाला देश है। इसकी राष्ट्रीयता समन्वयवादी विचारधारा वाली है। देशभक्ति और राष्ट्रप्रेम का तात्पर्य राष्ट्र के सभी निवासियों के प्रति अभेद व्यवहार है। अपने देश की अस्मिता की रक्षा के लिए समय-समय पर देशभक्तों ने क्रान्तियाँ की हैं। आत्मबलिदान दिये हैं। डॉ. शुक्ल ने अपनी रचनाओं में राष्ट्रीयता और देशभक्ति के प्रेरक भावों का समावेश किया है। भारतीय स्वतंत्रता के पूर्व देशभक्ति के तराने गाए

गए, जिनसे प्रेरणा प्राप्त कर समूचा जनमानस जाग्रत हो गया था, परन्तु आजादी प्राप्त हो जाने के बाद वह जच्चा कुछ कम हो गया।²

डॉ. परशुराम शुक्ल ने बच्चों को राष्ट्रप्रेम और देशभक्ति की शिक्षा दिए जाने पर बल दिया है। डॉ. शुक्ल ने देशभक्ति और देशप्रेम के नाम पर व्यापार करने वाले राजनेताओं की कड़ी निन्दा की है। 'बाल सतसई' पुस्तक में डॉ. शुक्ल ने लिखा है- 'बचपन से ही दीजिए, देशभक्ति का ज्ञान। देशभक्त बच्चे अगर, होगा देश महान। बच्चों के आदर्श हैं, बापू, नेहरू, बोस। देशप्रेम सम्मुख जिन्हें, रहा न कुछ भी होश।। जहाँ राष्ट्रभाषा नहीं, गुँगा है वह देश।/दूब मरो सब शर्म से, बच्चों का आदेश।।'³

इन बोहों में राष्ट्रप्रेम और देशभक्ति की प्रेरणा दी गई है। महात्मा गाँधी की जीवन शैली राष्ट्रीयता का प्रतीक बन गई है। लगभग सभी बाल साहित्यकारों ने राष्ट्र निर्माण की प्रेरणा देने के लिए बाल साहित्य में गाँधी सहित तमाम राष्ट्र निर्माताओं को लक्ष्य कर कविताएँ और गीत लिखे हैं। डॉ. परशुराम शुक्ल ने देश का मान बढ़ाने वाले कवियों, कलाकारों और देशभक्तों को अपने बाल गीतों में स्थान दिया है-

'भारत माता के चरणों में, शीश झुकाते हैं।।

शस्य श्यामला भूमि हमारी, देव भूमि कहलाती है।

इसकी महिमा गाते गाते, जिह्वा नहीं अघाती है।

धर्म अनेक दिये हों जिसने, हम उसके गुण गाते हैं। शीश...

ईश्वर ने भी मानव बनकर, इस धरती पर जन्म लिया।

कंस और रावण से पापी, दुष्टों का संहार किया।

राम, कृष्ण, गीतम, नानक सब, भारत के गुण गाते हैं। शीश...

कालिदास से लेकर मुझ तक, सबने इसका रूप सजाया।

लेकर नाम शारदा माँ का, भारत माँ का मान बढ़ाया।

सूर और तुलसी से कवि भी, वैभव गीत सुनाते हैं। शीश...

वीर भगतसिंह विस्मिल जैसे, भारत माता के सपुत्र हैं।

सीमाओं पर लड़ने वाले, सब भारत के देवदूत हैं।

प्राणों की बलि देकर अपने अपना ध्वज फहराते हैं।

भारत माता के चरणों में, शीश झुकाते हैं।'⁴

वर्तमान युग प्रजातंत्र का युग है। धीरे- धीरे समाज और राजनीति के मानदण्ड बदल रहे हैं, परन्तु बच्चे राष्ट्र के जिस स्वरूप को प्रेम करते हैं, उसकी एक झलक एक गीत में इस प्रकार देखने को मिलती है -

'सब कुछ करने की आजादी, इनको नया विधान चाहिए।/

बदल सके जो इनकी किस्मत, इनको वह भगवान चाहिए।

घर-घर बच्चों की हो पूजा, ऐसा हिन्दुस्तान चाहिए।'⁵

डॉ. परशुराम शुक्ल ने पद्य एवं गद्य दोनों ही विधाओं में लिखी गई रचनाओं में राष्ट्रभक्ति और देशप्रेम की प्रेरणा बालकों को दी है। इनकी बाल कहानियों में भी राष्ट्रप्रेम और देश भक्ति की चेतना के प्रसंग हैं। मोघिया लोक कथाएँ की जीवन डोरी लोक कथा में अपने देश और अपनी भूमि के प्रति प्रेम और भक्ति का भाव दर्शाया गया

है। भारतीय वीरांगनाएँ में संग्रहीत जीवनीपरक कथाओं में बत्तीस वीर नारियों के चरित्र चित्रित किए गए हैं। इन वीरांगनाओं के बलिदानी चरित्रों से प्रेरणा मिलती है कि पुरुष ही नहीं बल्कि नारियों के हृदय में भी राष्ट्रप्रेम तथा देशभक्ति की भावना होती है। डॉ. शुक्ल ने भारतीय वीरांगनाएँ में वीरांगना पद्या से लेकर महारानी लक्ष्मीबाई तक के जीवन चरित्र राष्ट्रप्रेम तथा देशभक्ति से परिपूर्ण बतलाए हैं तथा देशभक्त नारियों को राष्ट्र के लिए समर्पित भावनावाला प्रदर्शित किया है। राष्ट्र प्रेम और देशभक्ति की प्रेरणावाला यह बाल साहित्य बच्चों को देश के लिए समर्पित नागरिक बनने की प्रेरणा देता है। डॉ. शुक्ल के बाल साहित्य में राष्ट्र के प्रति भक्ति का भाव प्रयत्न है।

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बाल साहित्य में दलित चेतना

प्रा. डॉ. आनंद र. बक्षी

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भारत में सामाजिक वैषम्य और जातिगत भेदभाव की स्थिति सदियों पुरानी है। ब्राह्मण, क्षत्रिय, वैश्य और शूद्र के रूप में मानव चार वर्णों में बाँटा हुआ है। इन वर्णों में जातियाँ और उपजातियाँ हैं। इनमें ऊँच-नीच, छोटे-बड़े का भेद समाज में कटुता का कारण बना हुआ है।

डॉ. सीताकिशोर ने सामाजिक वैषम्य और दलित चेतना के विषय में 'पानी पानीदार है' दोहा संग्रह में अनेक दोहे दिए हैं। कुछ यहाँ प्रस्तुत किए जा रहे हैं—

“पिटत और बोलत नहीं, सचमुच बहुत गरीब।
करकें रहत लिहाज के, दिल के बहुत करीब।।
जाति बहुत हैं, वर्ग हैं, हैं उपवर्ग अनेक।
पर सममुच में आदमी, ढूँढ़ें मिलत न एक।।”⁹¹

उपर्युक्त दोहों में डॉ. सीताकिशोर ने समाज में दलित वर्ग की हीन दशा का चित्रण करने के साथ वर्ग चेतना जागृत होने का भी सफल चित्रण किया है। अब दलित मानी जानेवाली जातियाँ भी समाज में बराबरी का दर्जा प्राप्त कर रही हैं। संविधान में सामाजिक समानता का जो हक दिया गया है, उसके अनुसार अब जागृति आई है और स्थिति में काफी सुधार भी हुआ है।

बाल साहित्यकारों ने अपनी रचनाओं के माध्यम से दलित चेतना जागृत करने की प्रेरणा दी है। अवधकिशोर सक्सैना ने एक बाल कविता में कहा है—

“हम नवयुग के हैं रखबारे।
देश जाति पर तन मन वारे।।
मानवता है जाति हमारी,
भारत माँ हम सबको प्यारी।।”⁹²

इस प्रकार की बाल कविताओं से सामाजिक समानता की गहरी समझ, चेतना और जागरण की भावना की पुष्टि होती है। हिन्दी के प्रसिद्ध कवि सोहनलाल द्विवेदी ने नए युग की नवीन सामाजिक व्यवस्था को नव चेतना एवं नव मर्यादा की प्रेरणा देनेवाली बाल कविताएँ लिखीं। एक उदाहरण इस प्रकार है—

“बड़ी जाति में होने से ही,
बड़ा न कोई हो पाता।
जब तक नहीं बड़े गुण लाता,
नहीं बड़े गुण अपनाता।।”⁹³

व्यक्ति में बड़े गुण, ऊँची शिक्षा, सामाजिक सौहार्द की भावना हो तभी वह बड़ा कहलाने योग्य है। जाति न छोटी होती है, न बड़ी। सबसे बड़ी जाति मानव जाति है। इस प्रकार के भावोंवाली बाल कविताएँ बच्चों के मानस पटल पर गहरा प्रभाव छोड़ती हैं।

विद्याप्रकाश कुलश्रेष्ठ ने समता और समरसता की विचारधारा को बल प्रदान करनेवाली कविताएँ लिखीं हैं। गाँधी और नेहरू के सपनों के भारत की तस्वीर सामने लानेवाली ऐसी ही एक कविता की कुछ पंक्तियाँ निम्नानुसार हैं—

“जाति पतित तुम उसे उबारो,
अपनी भूलें शीघ्र सुधारो।
मानव मानवता न बिसारो,
यही संदेशादलाई होली।।”⁹⁴

भारतीय त्यौहार सामाजिक समता और सौहार्द की विचारधारा को पोषित करते हैं। उपर्युक्त उदाहरण में 'होली' के अवसर पर दलितों के उद्धार के कार्यों को बढ़ावा देने की प्रेरणा है। मानव समाज में भेद और ऊँच-नीच की पारम्परिक भावना को मिटाने तथा नवीन समतावादी समाज की



स्थापना का सपना साकार करने की बात कही गई है। गौरीशंकर उपाध्याय 'सरल' ने भी गाँधीवादी चेतना को समर्थन देते हुए लिखा है—

“गाँधी बाबा बहुत बड़े, आजादी के लिए लड़े।

दलितों के ये पोषक थे, वर्ग भेद विरोधक थे।।

ये हरिजन उद्धारक थे, वतन समाज सुधारक थे।।”⁹⁵

महात्मा गाँधी के जीवनादर्शों की स्मृति कराते हुए 'सरल' ने दलित चेतना जागृत करनेवाली बातें उपर्युक्त उदाहरण में कहीं हैं।

इसी प्रकार वर्तमान युग के शीर्षस्थ बाल साहित्यकार परशुराम शुक्ल ने अपने काव्य में दलित चेतना को जाग्रत करने की प्रेरणा दी है—

“बच्चे नहीं अलापते, छुआछूत का राग।

जगवाले उनमें भरें, विषम घृणा की आग।।

जाति धर्म सब भूलकर, करें परस्पर प्यार।

बच्चों का संदेश यह, मानवता का सार।।

ऊँच नीच की भावना, से बढ़ता अज्ञान।

ईश्वर के बंदे सभी, जग में एक समान।।”⁹⁶

उपर्युक्त दोहों में परशुराम शुक्ल ने बच्चों के विचारों के माध्यम से दलित चेतना जाग्रत करने की बात कही है। बच्चों के हृदय में ऊँच—नीच की भावना नहीं होती। कौन सी जाति ऊँची है, कौन सी नीची है, इससे बालकों को कोई मतलब नहीं होता। बच्चों का हृदय सच्चा समतावादी होता है। बच्चों का संदेश उपर्युक्त दोहों में स्पष्ट है कि जाति और धर्म की भावना को भूल कर सभी मनुष्यों को समान रूप से प्यार करना चाहिए।

निष्कर्षतः कहा जा सकता है कि हिन्दी बाल साहित्य में दलित चेतना सम्बन्धी रचनाएँ बहुत से बाल साहित्यकारों ने लिखी हैं।

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A Study of Students' Absenteeism in Higher Education of a Tribal Area of Maharashtra

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Abstract

One of the problems that the majority of higher education institutions (HEIs) face today is student attendance. Many colleges and universities have policies requiring students to attend class. In higher education system, it is believed that attendance has a favorable impact on academic success, notwithstanding the various restrictions. One of the causes of academic failure is considered to be absenteeism from class lectures. Being physically present for class does not constitute being actively engaged in the work and activities of the class. Absences may be authorized, unauthorized or caused by extenuating circumstances. In this present study, an attempt has been made to identify the factors which cause students' absenteeism in a higher education institute of a tribal area. In order to do this, a survey was conducted using a questionnaire.

Keywords

Students' absenteeism, higher education, tribal area

Introduction

The attitude of students skipping courses has spread throughout higher education and is a big source of worry higher education institutes. It has been determined that such absences have detrimental effects on both students and the institutes. Academic performance is a measure of how well a student or institution has met its educational objectives. It is frequently assessed by testing or ongoing evaluation. Learning achievement preceded consistent attendance in class. Students must be in class regularly in order to profit from the educational programme. Fewer opportunities exist for irregular students to study. As a result, their academic potential is limited. Therefore, regular attendance in class is given top attention. When students miss class, they lose out on important learning and the advantages of the specific examples that teachers employ to simplify complex ideas. Student absenteeism can be attributed to a variety of circumstances. In practically all Indian institutions and colleges, attendance of 75% is required; failing to do so might result in a student receiving a failing mark or even failure.

Review of Literature

Tripathi Archana (2022) carried out a study to examine the factors which are responsible for students' absenteeism in higher education in the district of Champawat in Uttarakhand. The factors identified were lack of desire and motivation, availability of substandard material in the market, defected and wrongful evaluation system etc. Lukkarinen Anna, Paula Koivukangas and Seppala Tomi (2016) in their investigation showed the relationship between class attendance and student performance. Ancheta Ruel F., Daniel Deny and Ahmad Reshma (2021) explained the effect of class attendance on academic performance of students. Khanal Shanti Prasad (2019) examined the irregular

attendance of university students at class and its relation to their academic achievement. He formulated a hypothesis that there is significance relationship between attendance of the students of the class and their academic performance. Kousalya P., Ravindranath V., and Vizayakumar K. (2006) in their study illustrated the application of analytical hierarchy process (AHP) in the context of student absenteeism in engineering colleges. Clores Michael A. (2009) in his qualitative research study on school absenteeism among college students discussed pedagogical, psychological and socio-cultural implications based on the findings. Srivastava Meenakshi(2018) conducted a study to identify factors that cause students discontent with the classroom learning environment . Lucey Siobhan and Grydaki Maria (2022) examined the effect of implementing an incentive scheme on seminar and performance. Khan Mohammed Shamim(2021) conducted a research to investigate the causes and remedies of students absentee. The identified major factors responsible for students' absenteeism were as students' financial crisis, distant residence, unsafe public transport, sometimes teacher absenteeism and a lacking in the education policy. Muir Jenny (2009) in the research showed that tendency for students who attend classes more regularly to gain better marks, especially if they are weaker or if they have the potential for a top mark, although it is not clear cut. Akkus Murat and Cinkir Sakir (2022) evaluated the status of student absenteeism, its impacts on educational environments and the relevant policies available.

Aim of Study

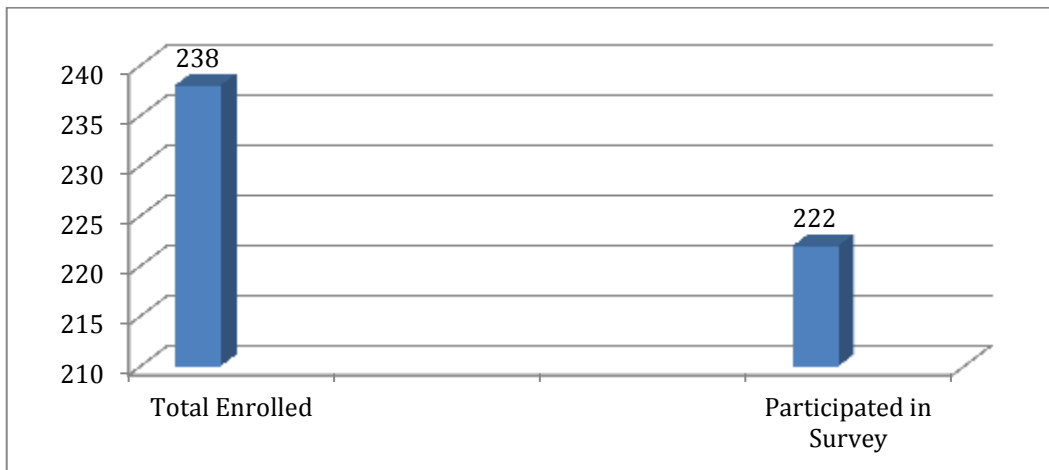
Arts, Science and Commerce College, Chikhaldara run by Sipna Shikshan Prasarak Mandal, Amravati, was established in the year 1996 with the aim of achieving holistic development of the people of Melghat, a remote, hilly and tribal area

of Maharashtra. The vast area of Melghat is about 4000 sq. km. formed mainly by two talukas Chikhaldara and Dharni, partly Anjangaon Surji and Achalpur talukas of Amravati district and partly Akot taluka of Akola district. The area is predominantly tribal and educationally as well as economically backward. The main social problems here are superstition, unemployment, malnutrition, migration, educational dropout etc. It is very important to increase the GER of this area in overcoming such problems. Most of the students in the college come from this area. Absenteeism can cause their academic performance. In today's higher education, student involvement and attendance in class are crucial factors. Class attendance has been found to be a significant predictor of academic results in several earlier studies: Attending more classes, results in better final grades for students. For this, it was proposed to carry out a systematic study to identify the factors causing students' absenteeism.

Study Objective

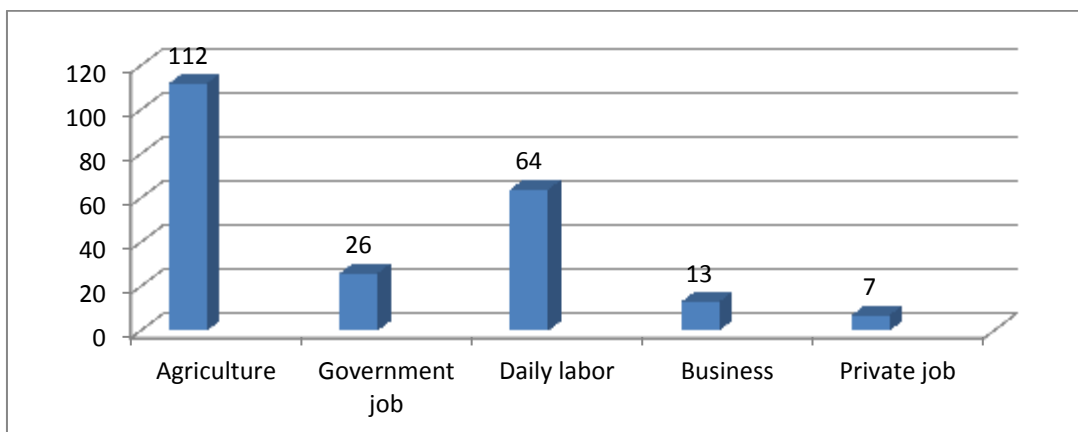
Data Analysis and Interpretation

Students enrolled in college and participating in the survey



The total number of students enrolled in the science stream is 238 out of which 222 (93.27%) students have participated in the survey.

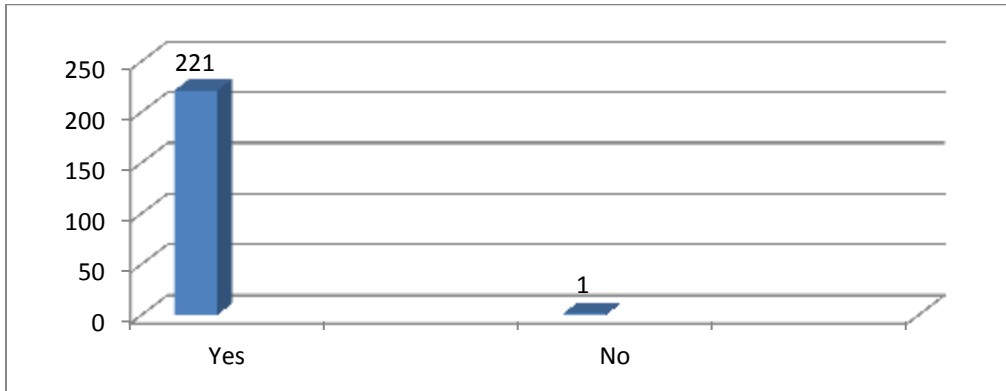
Main means of household income



Out of total 222 respondents 112 (50.45%) of the respondents has agriculture as their main source of family income. There are 26 (11.71%) students who said that the main source of family income is government job. While 64(28.82%) students responded that daily wage is the main

source of their income of the family. 13 (5.75%) students indicated that the primary source of family income is a private job. From this we can see that the main source of income for most of the students' families is agriculture and daily labor.

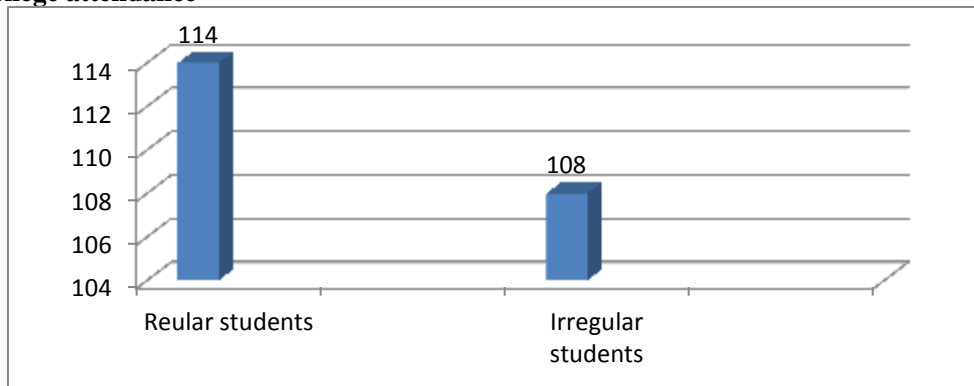
Willingness to pursue higher education



221 (99.54%) students wanted to pursue higher education while only 1 (0.45%) didn't want to pursue higher education. This demonstrates that

the number of students who want to pursue higher education is large while the number of students who do not want to pursue higher education is negligible.

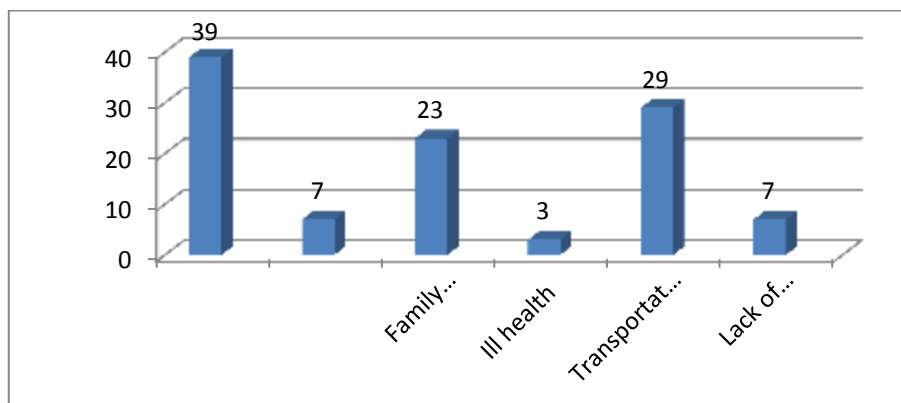
Students' college attendance



When trying to know the attendance of the students in the college, 114 (51.35%) students expressed that they come regularly to the college while 108(48.65 %) students expressed that they are

irregular. This shows that the percent of regular students is slightly higher than the irregular students.

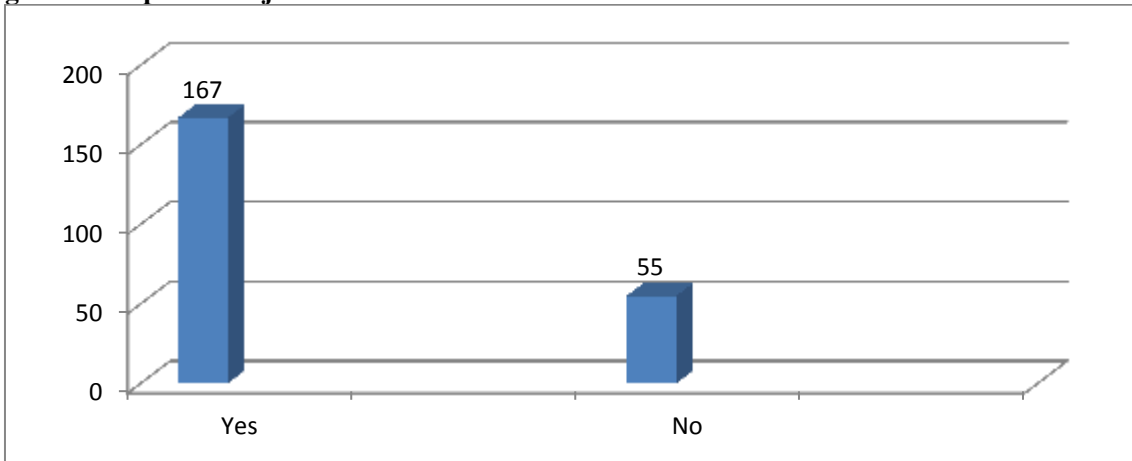
Reasons for absenteeism in college



On knowing the reasons for this, 39(36.11%) students remain absent due to poor economic conditions. 07(6.48%) students remain absent due to not getting admission in the hostel. 23(21.29%) students are absent due to family

responsibilities. 03(2.77%) students remain absent due to ill health. 29(26.85%) students are absent due to transportation (accessibility) problem, 07(6.48%) students are absent due to lack of accommodation

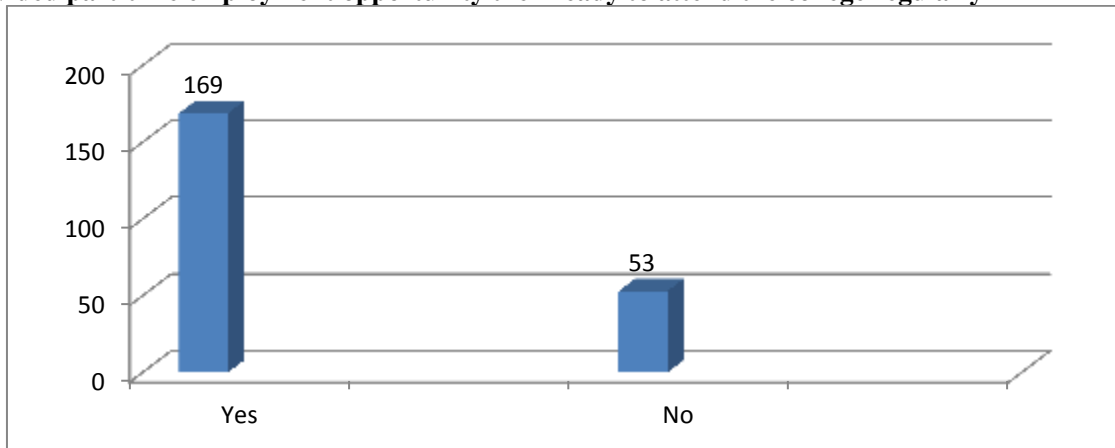
Willingness to do part-time job



Are the students willing to do employment if they get part time employment? Knowing this, 167 (75.22%) students were willing to do this job

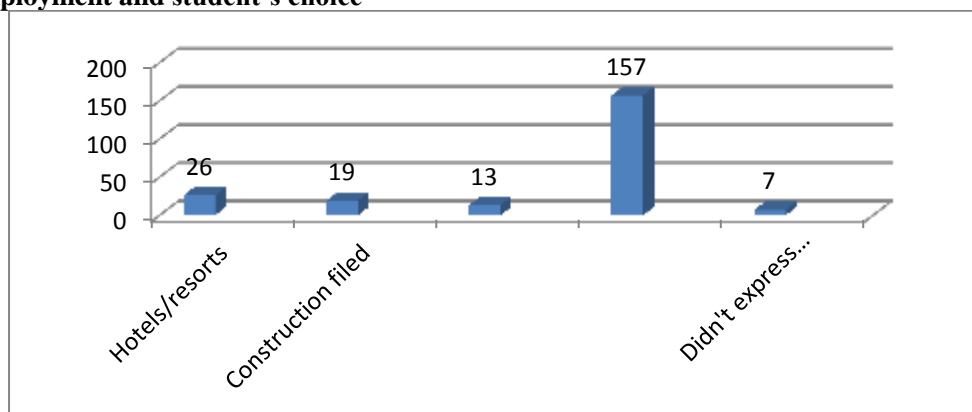
while unwilling to employ, the number was 55 (24.77%).

If provided part-time employment opportunity then ready to attend the college regularly



169(76.12%) students expressed their reaction that they will attend college regularly if part-time employment is provided to them in Chikhaldara and nearby areas.

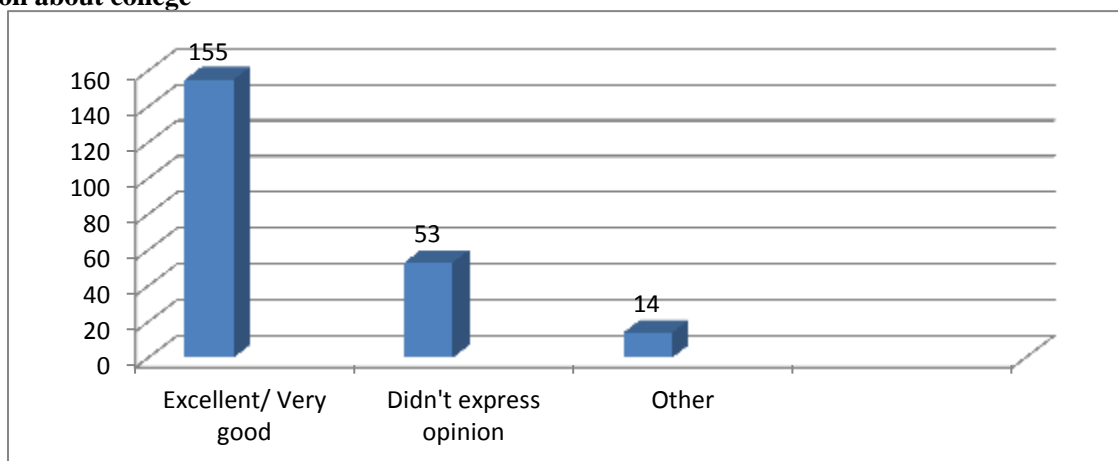
Fields of employment and student's choice



Many students mentioned their interest to do part time jobs. Considering the field of temporary employment opportunities available in Chikhaldara and trying to know in which field the students want to do part time job, 157(70.72%) means most of the students were interested to work in government/semi-government offices The number

of those who were willing to work in hotels, resorts was 26(11.71%) The number of students willing to work in construction field was 19 (12.05%). The number of students who were willing to work in different shops, private offices, NGOs etc. was 13(5.85%). The number of students who didn't express any kind of reaction is 7(3.15%).

Opinion about college



155(69.81%) students responded that the college is excellent/ very good when their opinions were asked about the college. The number of students who did not express any opinion about the college is 53(23.87%). While expressing their opinions in this context, the teachers in the college are good, the college has many facilities for students and the college premises are good.

Conclusion

On the basis of striking findings from this research, the conclusive remarks may be expressed in the following way.

Agriculture and daily wage labor is the main source of income for most of the students' families. 99.54% of students desire to pursue higher education. Percent of regular students is slightly higher than the irregular students. Financial situation, daily work and family responsibilities, lack of transportation are the major reasons for student absenteeism in college.75.22% of the admitted students are willing to take up employment. In the field of employment, most 70 % students preferred part-time employment in government and semi-government offices. Majority of the students expressed their opinion that the college is excellent/ very good and the teachers, staff and facilities of the college are also very good.

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ANALYSIS OF NUTRITIONAL AND CHEMICAL PROPERTIES OF MELGHAT HONEY FOR QUALITY CHARACTERISTICS

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ABSTRACT

In this study, the Melghat honey samples were analyzed for their nutritional and chemical properties. The samples were collected from four different locations in Melghat in the year 2019. A number of factors such as carbohydrates, energy, sugar profile, protein, HMF, acidity, iron, calcium, and sodium were detected. The data was compared to published data and specifications given in the Bureau of Indian Standards (BIS) manual. The data confirmed that the honey samples from Melghat fell into the category of special grade as specified by BIS. It is concluded that the Melghat honey is of outstanding value, with good healing and antimicrobial properties. It is very less susceptible to fermentation, very pure, and unadulterated. There is a requirement for more studies to discover the assortment of properties of Melghat honey for its commercialization.

Keywords: Amravati, Chemical, Chikhaldara, Honey, Melghat, Nutritional properties

INTRODUCTION

Melghat is a tribal region positioned in the laps of the Satpuda hills with huge forests. It is a collective area of the Sanctuary of Wan and Melghat as well as Gugamal National Park that lies in two tehsils of Amravati district *i.e.*, Chikhaldara and Dharni (Bhoyar *et al.*, 2018). Malnutrition amongst children is the most severe crisis in this region. Nutritional quality of food is the most important parameter of its choice because human health and its maintenance are precisely dependent on its quality. Thus, the problem of malnutrition can only be overcome by consuming nutritional

food. Honey is among the most important forest products of Melghat. Almost all the honey produced in the Melghat is generated by the wild honey bees. Due to the magnificent biodiversity of the Melghat woods, a supportive atmosphere is present for the nurture of honey bees (KVIC, 2019).

Honey is an ancient medicine used for good health and longevity (Khupse *et al.*, 2017). Melghat honey has been used extensively by tribals for centuries as a food and medicine, so it must be of high quality. There was a lot of research carried out worldwide to explore the various properties of

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honey, but no work was found regarding the analysis of Melghat honey. In this study, an attempt was made to explore the chemical and nutritional properties of Melghat honey. The honey from the Melghat may be proven as one of the premier quality and it may get global recognition.

MATERIALS AND METHODS

The study was conducted in the year 2019. Honey samples were collected from four dissimilar locations of the Melghat forest (H1, H2, H3, and H4) and stored with due precautions. The samples were prepared as per the FSSAI (2015). Most of the chemical and nutritional parameters prescribed by the agencies working for the standardization of honey, such as carbohydrates, total sugars, reducing sugars (glucose and fructose), non-reducing sugar (sucrose), proteins, free acidity, hydroxymethylfurfural (HMF), and minerals (sodium, iron, and calcium), were included for the quality evaluation of Melghat honey. Sugars

and HMF were determined by using the methods given in BIS (1994-2000), while free acidity was measured as IHC (2009). Proteins and calcium were estimated as per Ranganna (2007). Similarly, iron and sodium were estimated by following the methods in FSSAI (2016).

RESULTS AND DISCUSSION

Carbohydrates and energy

About 95% of the dry matter of honey is in the shape of carbohydrates, which are mostly in the form of sugars and most of the properties of honey are related to its sugar profile (Bogdanov *et al.*, 2008). The values were found to be ranging from 78.12% to 80.50% with a standard deviation (SD) of 0.93. Honey is regarded as an instant source of energy due to the presence of rapidly digestible glucose and fructose. The energy values were ranging from 314.72 to 325.24 Kcal 100 g⁻¹ (Table 1).

Table 1. Carbohydrate and sugar profile of Honey samples

S No.	Properties	Honey samples				Mean	SD
		H1	H2	H3	H4		
1	Total carbohydrates (g 100g ⁻¹)	80.24	79.32	80.50	78.12	79.545	0.93
2	Energy value (K cal 100g ⁻¹)	325.24	320.88	324.8	314.72	321.41	4.22
3	Total sugar (g 100g ⁻¹)	79.54	74.96	79.27	74.67	77.11	2.30
4	Sucrose (g 100g ⁻¹)	3.36	2.62	4.24	2.96	3.295	0.61
5	Total Reducing Sugars (g 100g ⁻¹)	76.18	72.34	75.03	71.71	73.815	1.85
6	Glucose (g 100g ⁻¹)	36.92	35.47	35.12	35.76	35.818	0.68
7	Fructose (g 100g ⁻¹)	38.13	35.93	39.12	34.84	37.005	1.70
8	Fructose : Glucose Ratio	1.03	1.01	1.11	0.97	1.03	0.05
9	Glucose : Water Ratio	2.00	1.87	1.86	1.88	1.903	0.05

Table 2. Other characteristics and nutrients of Honey samples

S No.	Properties	Honey samples				Mean	SD
		H1	H2	H3	H4		
1	Total Protein (Mass %)	1.07	0.90	0.70	0.56	0.81	0.19
2	Free Acidity (Meq kg ⁻¹)	21.21	27.12	20.03	32.17	25.13	4.87
3	HMF (mg kg ⁻¹)	29.73	08.10	12.56	37.86	22.06	12.18
4	Iron (mg 100g ⁻¹)	1.05	0.68	1.84	1.73	1.33	0.48
5	Calcium (mg 100g ⁻¹)	11.7	1.38	5.40	6.65	6.28	3.68
6	Sodium (mg 100g ⁻¹)	33.82	5.29	17.04	21.34	19.37	10.20

Total sugars (TS)

Total sugars ranged between 74.67 and 79.54 g 100 g⁻¹. It encompasses both reducing and non-reducing sugars. It was reported that honey is a saturated solution of at least 22-25 different sugars (e.g. maltose, rhamnose, maltotriose, iso-maltose, turanose, maltotetraose, etc.) among which glucose and fructose are predominant (Abeshu and Gelata, 2016). Among the honey sample, H1 recorded highest TS of 79.54%, followed by H3 (79.27%), H2 (74.96%), and H4 (74.67%). No limit was specified by BIS for the content of total sugars, but it appeared to be at an optimum level. The current data is in accordance with Shobham *et al.* (2017) (78.0-88.0%), Krishnasree and Mary (2015) (65.21%), and Manukumar *et al.* (2013) (64.88-73.08 %).

Sucrose (non-reducing sugar)

The sucrose of the samples was ranging from 2.62 to 4.24%. Among the sample, H3 was highest in sucrose (4.24%), followed by H1 (3.36%), H4 (2.96%), and H2 (2.62%). The values were within the range specified by the Bureau of Indian Standards (BIS) (maximum

5%), thus falling into the category of special grade (BIS, 1994-2000). Shobham *et al.* (2017) suggested that the higher the sucrose content, the greater the chances of adulteration (an indication of the added sugar). It also indicates that the honey is under-ripened due to incomplete inversion of sugar. Thus, all the honey samples under examination were neither adulterated nor under-ripened. Lots of researchers investigated honey samples and found the sucrose content similar to that reported by Amabye (2017) (1.01-2.57%) and Atul *et al.* (2018) (0.74-3.95%).

Total reducing sugars (TRS)

Dextrose and levulose (*i.e.* glucose and fructose) are the key and largest reducing sugars of honey. Total reducing sugar, glucose, and fructose ranged from 71.71 to 76.18%, 35.12 to 36.92%, and 34.84 to 39.12% respectively. The values were within the BIS ranges for special grade honey. Boussaid *et al.* (2018) (67.56-74.31%) and Atul *et al.* (2018) (64.91-71.39%) found similar data.

Fructose to glucose (f/g) ratio

The f/g ratio was greater than 1 in the samples H1, H2, and H3, while it was 0.97

(close to one) for sample H4. As per the BIS, there should be a minimum of 1 for special grade honey. Thus, all the samples are of special grade. Boussaid *et al.* (2018) reported that honey with a higher amount of fructose is sweeter and has fewer tendencies of granulation than the higher glucose honey. If glucose is present in a higher amount, it crystallizes fast with low water content. The f/g ratio depends upon its floral source, so it is also used as one of the criteria for the identification of the floral source of honey (Bogdanov, 2011; Chin and Sowndhararajan, 2019; Da-Silva *et al.*, 2016). The results were in accordance with the study carried out by Gairola *et al.* (2013) (1.03-1.08).

Glucose to water ratio (g/w ratio)

As per Kavapurayil *et al.* (2014) the granulation tendency and the granulation index can be detected with the help of the f/g ratio. It is also important for forecasting the granulation tendency of honey, as at low water levels the process of crystallization of glucose is initiated. There are no specifications given for the g/w ratio by any authorized agency. However, Gairola *et al.* (2013) and Sohaimy *et al.* (2015) demonstrated that honey with a g/w ratio less than 1.7 is non-granulating, whereas honey with a g/w ratio greater than 2.1 is susceptible to rapid granulation. The studies by Bogoviku and Gedeshi (2015), Kavapurayil *et al.* (2014), and Almasi and Basavarajappa (2019) affirmed that the varying amount of sugars in honey depends upon reasons such as the sugar profile of the nectar, the enzymes present, crops in the area of collection, climatic conditions, storage, as well as geographical location. Sugars influence an

assortment of honey properties such as density, stickiness, and viscosity. The hygroscopic nature of honey, responsible for its wound healing capacity, is due to its sugar profile.

As revealed by Shobham *et al.* (2017), Amabye (2017), Abeshu and Gelata (2016), Da-Silva *et al.* (2016), and Bogoviku and Gedeshi (2015), the sugars make honey an instant source of energy and immune to spoilage by preventing the growth of microorganisms. H_2O_2 formed during the oxidation of sugars is responsible for many of the therapeutic properties of honey. As suggested by Krishnasree and Mary (2015) honey can be used in bakery products instead of sugar. In addition, it serves as a functional food for enhancement of flavor, colour, and shelf life.

Other characteristics and nutrients

Other than moisture and sugars, many other nutrients are also present in honey in small amounts and influence the quality and properties of honey significantly. In this study, some important parameters such as total protein, free acidity, hydroxymethylfurfural (HMF), sodium, iron, and calcium were detected.

Total protein

Proteins were found in the Melghat honey in a very diminutive amount (SD 0.19). The maximum amount of protein was found in the sample H1 (1.07%), followed by H2 (0.9%), H3 (0.7%), and H4 (0.56%) (Table 2). The considerable amount of protein indicates the good quality of honey. The results were similar to the values reported by Amabye (2017)

(0.46-1.04%) and Atul *et al.* (2018) (0.16–0.70%). Almasi and Basavarajappa (2019) (2.56-3.82%) and Sohaimy *et al.* (2015) (1.69-4.67%) got the results towards the higher side. Boussaid *et al.* (2018) found that the differences in the protein content are due to factors like type of nectar, plant of origin, amount and quality of pollen, and type of bee. Initially in the nectar, proteins are present in a very tiny amount but are added to the honey through the pollen, enzymes secreted by the bees, and microorganisms. Bogdanov, (2011) postulated that the diastase enzyme activity of honey is used as an indication of the freshness of honey. It was indicated that analysis of pollen protein might be useful for the identification of the source and naturalness of honey.

Acidity

As per Atul *et al.* (2018) and Manukumar *et al.* (2013), honey is always acidic in nature and the acidity is due to the presence of various organic acids as well as inorganic ions, e.g. phosphate. Sereia *et al.* (2017) suggested that it is also due to the production of gluconic acid as a result of the action of the glucose oxidase enzyme on glucose. The free acidities of the honey samples in this study ranged from 20.03 to 32.17. All values were well below the maximum value prescribed by Agmark (2008) (less than 40 meq kg⁻¹). The results were significantly analogous with the studies done by Chin and Sowndhararajan (2019), (7.8-42.7 meq/kg), and Atul *et al.* (2018), (14.17-40.17 meq kg⁻¹).

Manukumar *et al.* (2013) stated that the reason for the acidic nature of honey is due to the process of fermentation. Shobham *et al.* (2017) stated that the season of harvesting

the honey also affects its acidity. It was reported that low acidity is an indication of the absence of fermentation, thus the freshness of honey. Boussaid *et al.* (2018) and Abeshu and Gelata (2016) added that the low acidity supports the therapeutic properties of honey. According to Bogdanov (2011), Balos *et al.* (2018), and Da-Silva *et al.* (2016), the acidity of honey influences the taste and flavor as well as some physical properties of honey.

Hydroxymethylfurfural (HMF)

Hydroxymethylfurfural (HMF) is a cyclic aldehyde compound produced by the degradation of sugars through the non-enzymatic browning reaction. Some minerals and acids are also responsible for the reaction. A significant amount of HMF was found in the honey samples under examination (8.10-37.86 mg kg⁻¹) (Table 2). Though there was a significant difference found in their values, the HMF content was comfortably within the range specified by the standard agencies (maximum 80 mg kg⁻¹) (BIS, 1994-2002; Agmark, 2008). HMF and the color of honey are related to each other. The darker honey samples had higher HMF as compared to the light-colored samples. The other properties did not show any significant relationship with the HMF. According to Bogdanov (2011), HMF is almost non-existent in honey at first but forms during prolonged storage. There are more chances of the formation of HMF in more acidic honeys. HMF is the cause of cytotoxicity in the skin, mucous membranes, and upper respiratory tract. It might be responsible for mutagenicity, carcinogenicity, etc. On the other hand, it is reported to have beneficial properties as it has antiallergic, anti-sickling, anti-hyperuricemic,

anti-inflammatory, and antioxidative potential. Shapla *et al.* (2018) and Da-Silva *et al.* (2016) revealed that the formation of HMF in honey is affected by to the storage temperature, f/g ratio, water activity, pH, acidity, etc. The use of a metallic container and thermal stress are also responsible for the formation of HMF.

The results of Manukumar *et al.* (2013) (1.75-27.87), Gairola *et al.* (2013) (13.8-36.86), and Harun *et al.* (2017) (1.07-30.69) were found to be analogous to the current data. The data by Bogoviku and Gedeshi (2015) (6-17.1) and Krishnasree and Mary (2015) (30.01) were also compared.

Minerals

Amabye (2017) mentioned that plenty of minerals such as calcium, sodium, iron, potassium, magnesium, phosphorous, manganese, copper, nickel, zinc, iodine, etc. are found in honey in lesser amounts but are useful for assessing the floral source of honey because the mineral content is significantly dependent on the floral source and geographical location. In the present study, minerals such as iron, sodium, and calcium were detected. Dhahir and Hemed (2015) and Da-Silva *et al.* (2016) disclosed that the floral basis of the nectar from which the honey is made and the geological location have a remarkable effect on its mineral profile. The dark-colored honey contains a higher concentration of minerals than the lighter honey. The wrong handling of honey also affects the mineral content, which is of anthropogenic origin. The honey from polluted areas is found to have a higher concentration of minerals.

The iron was found in a very diminutive amount in the Melghat honey samples (0.68 to 1.84 mg kg⁻¹) and had a similarity with the findings of Boussaid *et al.* (2018) (0.83-3.54 mg kg⁻¹) and Almasi and Basavarajappa (2019) (0.1-1.46 mg kg⁻¹). Pande and Jude (2019) confirmed the presence of iron in the honey qualitatively. No authorised body specified the iron content, but the values are similar to those suggested by Abeshu and Gelata (2016) in their research (1.0-3.4 mg kg⁻¹).

The calcium content of the Melghat honey samples ranged between 1.38 and 11.7 mg kg⁻¹. Pande and Jude (2019) confirmed the presence of calcium in honey qualitatively. The values were concurrent with the data by Almasi and Basavarajappa (2019) (0.61-12.97 mg kg⁻¹) and Abeshu and Gelata (2016) (4-30 mg kg⁻¹). Boussaid *et al.* (2018) (113.85-221.07 mg kg⁻¹) obtained higher calcium values.

Sodium was found in the range of 5.29 to 33.82 mg kg⁻¹ with SD 10.20 in the Melghat honey. Pande and Jude (2019) also confirmed the presence of sodium in their honey samples qualitatively. The values reported by Abeshu and Gelata (2016) (0.6-40 mg kg⁻¹), Boussaid *et al.* (2018) (251.34-521.22 mg kg⁻¹) and Almasi and Basavarajappa (2019) (0.25-6.31 mg kg⁻¹) are given in the brackets.

CONCLUSIONS

The honey samples that were examined were found to be of excellent quality. All the parameters were found well within the limits specified by various regulatory agencies. Furthermore, the results showed that all the honey samples from Melghat fell into the

special grade as per the specifications of honey given by the Bureau of Indian Standards (BIS). From the data, it can also be postulated that the Melghat honey samples must have good therapeutic properties. It is suggested that there is a need for more research to explore the properties of Melghat honey for its branding.

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ANALYSIS OF KUTKI (*Panicum sumatrense*) FROM MELGHAT FOR ITS PHYSICO-CHEMICAL, FUNCTIONAL AND NUTRITIONAL PROPERTIES

Kshitij Shah¹ and P.A. Pawar²

ABSTRACT

Kutki or little millet *Panicum sumatrense* is a kind of minor millet extensively grown in Melghat province. It is a native crop of India. The minor millets can grow in insignificant environmental situations where the other major cereals such as wheat, rice, maize, etc, proved to be unsuccessful to grow. It can be termed the bio-energy crop because of its short duration as well as high yield of biomass production. Despite the remarkable benefits, there is very little research work carried out to explore the properties of Kutki. In the current study, Kutki is analyzed for the determination of its physicochemical and functional properties. The Kutki grains were procured from the local market in the year 2019. Physicochemical parameters such as moisture, ash, total carbohydrates, total fats, protein, energy, dietary fibers, monounsaturated, saturated, and poly-unsaturated fats, sodium, calcium, iron, and some functional properties such as dry and soaked grain weight and volume (1000 grains), dry and soaked bulk densities, hydration capacity and index, swelling capacity and index, etc. were also determined. The data obtained showed that the Kutki from Melghat is of excellent quality. The functional properties showed that it can be utilized for various product making and value addition. It is suggested that there is a great need to study more regarding the properties of Kutki from Melghat and its utilization for different products.

(Key words: Melghat, Kutki, *Panicum sumatrense*, little millet, Chikhaldara, Amravati)

INTRODUCTION

Melghat

Melghat is a gigantic forest tract and tribal region spread over Dharni and Chikhaldara tehsils located in the laps of the Maikal ranges of Satpuda hills. It is the part of Amravati district of Maharashtra state and has a combined area of two Sanctuaries named Melghat and Wan as well as Gugamal National Park.

Chikhaldara is a hill station at a height of about 1100 meters above sea level. It is a gigantic forest area with an exclusive and representative ecosystem with rich biodiversity and varied habitats. Schedule tribes including Nihal, Korku, and Gond are the predominant inhabitant of the Melghat, while Balai, Gaoli, and Gaolan are the other most important tribes (Bhoyar *et al.*, 2018; Anonymous, 2015).

Malnutrition among kids is the most rigorous problem in the region. Poverty and consumption of a diet with low nutrition are some of the very important grounds for malnutrition (Singh and Singh, 2008).

Little millet

Millets are some of the oldest crops cultivated by humanity since 8000 BC. Millets are having excellent nutritional potential but due to the lack of awareness are

not used by the people extensively. Millets are sturdy, drought and adverse climate-resistant also resistant to pests and diseases, of medium duration, required low labor cost (Anonymous, 2013). Owing to C₄ plants they are more eco-friendly. On account of their nutritional and therapeutic potential, they are known as the Nutri-cereals. As well, their phytochemical richness makes them functional food. Because of it, they are helpful for food security and in the reduction of malnutrition (Sarita and Singh, 2016). In spite of these benefits, the cultivation of millets is now decreasing constantly due to various reasons.

Little millet (*Panicum sumatrense*) is a kind of minor millet extensively grown in Melghat province. Kutki is a Hindi/ Marathi or local language name of this foremost crop. It is the native crop of India. The minor millets have a capacity to grow in insignificant environmental situations in which the other major cereals such as wheat, rice, maize, etc, proved to be unsuccessful to grow. They are also called the bioenergy crop because of their short duration as well as high yield of biomass production (Hemalatha *et al.*, 2006).

Regardless of its nutritional supremacy, very less work was done on the properties of millets and the literary documentation is more scrappy and poorer than other popular cereals like wheat, rice, etc. Its consumption as a portion of food is restricted to tribal populations which are

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the traditional consumers. The scenario might be due to the non-availability of the products that are ready to eat and friendly to consumers.

It was observed that very little research was done on little millet especially, of the Melghat. The research on Kutki may open the new dimensions of study and nutrition and be found beneficial for the progress of the region as well as the people. In the current study, Kutki from Melghat was studied for its physicochemical and functional properties.

MATERIALS AND METHODS

The Kutki grains were procured from the local market in the year 2019. The refractions were removed from the grains. Refractions may be defined as the materials present in the grains. These materials are different from normal food grains in many dimensions. Refractions include other food grains, broken grains as well as grains that are damaged, etc. The refractions were identified as per the definitions mentioned in the Regulation of the Food Safety and Standard Authority of India (FSSAI) manual (Anonymous, 2016).

Kutki is analyzed for the determination of its physicochemical and functional properties. The methods published in the standard journals were used for the analysis. Grain weight, grain volume, bulk density, hydration capacity, and swelling capacity were measured as suggested by Kamatar *et al.*(2013) and Reddy *et al.*(2019). Moisture content was determined by using the method given in the FSSAI manual (Anonymous, 2016). Ash, protein, total fat, dietary fibers, and calcium were estimated by following the methods by Ranganna, (2007). While sodium and iron were determined as per the FSSAI manual (Anonymous, 2016) and total carbohydrates were calculated as per the standard method (Anonymous, 2007).

RESULTS AND DISCUSSION

The results obtained are presented in Table 1 and 2.

The weight of 1000 grains of Kutki was measured as 3.91 grams and its volume was 4.12 ml. Thus the bulk density of dry grains of little millet was 0.95 g ml⁻¹. The grain dimensions affect strongly the 1000 grain weight. As per Reddy *et al.*(2019) the 1000 grain weight is a very important characteristic of cereals and millets as it helps in designing and performing the plenty of unit operations such as cleaning and grading. It is especially helpful during the execution of threshing operations where the particular sizes of screens are essential used for the separation of the grains from other unwanted materials.

Table 1. Physical and functional properties of Kutki

S.N.	Physical/Functional parameters	Values obtained
1	Dry grain weight in gram (1000 grains)	3.91
2	Dry grain volume in ml (1000 grains)	4.12
3	Bulk density of dry grains (g ml ⁻¹)	0.95
4	Weight of 1000 grains in gram (Soaked)	4.5
5	Volume of 1000 grains in ml (Soaked)	4.76
6	Bulk density of soaked grains (g ml ⁻¹)	0.94
7	Hydration capacity (g)	0.59
8	Hydration Index	15.09
9	Swelling capacity (ml 100 g ⁻¹)	0.64
10	Swelling Index	15.53
11	Moisture (mass %)	11.25
12	Total Ash (mass %)	1.06

Table 2. Nutritional and chemical composition of Kutki

S.N.	Nutritional/Chemical Parameter	Values obtained
1	Total carbohydrates (mass %)	73.65
2	Total fat (mass %)	4.05
3	Total proteins (mass %)	9.99
4	Energy (Kcal 100 g ⁻¹)	371.01
5	Dietary fibers (mass %)	6.03
6	Monounsaturated fats (mass %)	0.79
7	Saturated fats (mass %)	0.63
8	Poly unsaturated fats (mass %)	2.59
9	Ash content (mass %)	1.06
10	Sodium (mg 100 g ⁻¹)	12.45
11	Calcium (mg 100 g ⁻¹)	4.18
12	Iron (mg 100 g ⁻¹)	5.23

In a similar way, the dimensions of soaked grains were measured. The weight of 1000 soaked grains was observed as 4.5 grams, while its volume was 4.76 ml. There was a similar increase was found in the weight and volume of grains after soaking which resulted in the similarity of the bulk density of dry and soaked grains. The bulk density of soaked grains was calculated as 0.94 g ml⁻¹ similar to the dry grain density which was 0.95 g ml⁻¹ in this case.

The hydration capacity and hydration index were calculated for the grains. The hydration capacity was obtained to have a value of 0.59, while the hydration index

was 15.09. As well as swelling capacity and swelling index were also calculated and got the values of 0.64 ml and 15.53 respectively for the Kutki grains under examination.

As suggested by Reddy *et al.* (2019) the knowledge about these water-related functional properties could be useful in the contribution to the quality of the value-added products, both in the preservation and processing as the addition of water i.e. hydration or wetting of the grains is one of the most important steps involved in the manufacturing of value-added and extruded products such as noodles, pasta, bakery items, ready to eat materials, etc. The interaction between water and flour particles is responsible for the formation of dough or other mixes. The values said that little millet might be appropriate for large-scale use in the manufacturing of certain processed products.

The moisture content of little millet was found at the level of 11.25 % and the ash content was 1.06 %. The values of moisture and ash are well in accordance with the values estimated by Reddy *et al.* (2019) i.e. 11.53% and 1.26% respectively.

There were 73.65 % of total carbohydrates found in the Kutki sample. Total carbohydrates are the material that is remained after deducting the amount of moisture, protein, fat, and ash. The carbohydrates present in the little millet are mostly in the form of starch followed by dietary fibers as well as other mono and disaccharides in minute amounts. The energy value of Kutki was found to be 371.01 Kcal 100 g⁻¹. Since the content of carbohydrates, proteins, and fats are at a significant level in the Kutki, it is an excellent source of food energy and proved to be one of the cheapest sources of energy.

As mentioned by Padulosi *et al.* (2015) it was given in the report by WHO that nutritionally little millet is more advantageous than rice since it has a low glycemic index than rice. The complex carbohydrates contained in the little millet release glucose during the digestion at a quite slower rate which is found to be beneficial for diabetic patients since the level of satiety of millet is better than other cereals. According to Bhat *et al.* (2018) high content of fibers in the millets gives additional support in preventing diabetes by lowering the rate of digestion. Thus, the consumption of little millet is beneficial over rice.

The dietary fiber content of the Kutki was found to be 6.03 %, which is a good level compared to other cereals and millets. The moisture content of the Kutki sample was measured as 11.25% while the amount of total fat was 4.05%.

The amount of saturated fats was observed as 0.63%, that of monounsaturated fat was 0.79%, and polyunsaturated fats were observed to have a level of 2.59%. The polyunsaturated fats that are good for health were in the highest amount on the other hand less beneficial saturated fats were observed at a very low level. As revealed by Jaybhaye *et al.* (2014) and Kamatar *et al.* (2013) the excellently beneficial fat profile of little millet makes them

preventive agents against various fat-related clinical disorders such as hyperlipidemia, obesity, cardiovascular diseases, etc.

A total amount of 9.99% of proteins was found in the Kutki under examination. It is a good amount as compared to other cereals and millets. The total ash content of Kutki was 1.06%, which shows that it has a significant amount of minerals in it. The minerals were found as sodium- 12.45 mg 100 g⁻¹, calcium- 4.18 mg 100 g⁻¹, and iron- 5.23 mg 100 g⁻¹.

The values obtained were in accordance with the data given by Sivakumar *et al.* (2006) (8%), while was some what lower than Kajuna (2001) (13.4%) for FAO of UN and Rao *et al.* (2018) (10.1%). It can be postulated from the observation that the Kutki from the Melghat is of good quality.

There is a need for the implementation of modern methods of cultivation and cropping to enhance the yield and overall quality of the Kutki in this region. The crop might not only be proved as a remedy for the problem of malnutrition due to its splendid nutritional quality but also could be helpful in the conservation of the environment. It is said that this crop is an agent that can withdraw environmental carbon, hence helpful to deduct the burden of GHG (Green House Gases) (Anonymous, 2013).

The little millet might be helpful in the prevention of several clinical disorders such as diabetes, high blood pressure, cardiac-related problems, and many more. It is a gluten-free crop that is proved to be a gift for celiac patients. The anti acidic nature of millets might help in the detoxification of the body.

As declared by Anonymous, n.d. and Himanshu *et al.* (2018) consumption of millets might reduce gastrointestinal tract-related diseases like colon cancer or gastric ulcer. The problems of gasses, constipation, etc. can be solved by using millets regularly in food. It is also beneficial in the treatment of respiratory disorders such as asthma and the optimization of the capacity of the liver, kidney, and overall immune system. The phytochemicals, nutraceuticals, and antioxidants present in the millets are capable of maintaining good health. It also can serve as a probiotic.

It can be concluded that the Kutki (little millet) grown in Melghat was of excellent quality. It is superior in nutrition and medicinal properties than the other popular cereals and millets. The functional properties shows that it can be utilized for making various value added products and it can sustain the rigorous mechanical operations during its processing. It can be said that for the preparation of various products such as infant foods, snacks, flakes, instant mixes, etc, on a large scale, Kutki might be proved as a popular and suitable food ingredient. There is a need for more research work and implementation of modern methods of cultivation and cropping in order to enhance the yield and overall quality of the Kutki in this region.

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DETECTION OF PHYSICAL PROPERTIES OF HONEY FROM DIFFERENT LOCATIONS OF MELGHAT REGION OF AMRAVATI DISTRICT, MAHARASHTRA

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ABSTRACT

Melghat honey is an insect product made by wild honey bees *Apis dorsata*, and *Apis cerana indica*. It is obtained from natural combs from the Melghat forest. Melghat is a prime producer of wild honey but the honey is not analyzed to date. The study was carried out to determine the physical characteristics of Melghat honey. Honey samples were collected from four different locations of Melghat during the year 2019 and the physical parameters such as color, pH, specific gravity, moisture, ash, and optical density were detected. The consequences of adulteration if any in the samples were detected by applying Feihe's test. The results were checked based on the specification given by the Bureau of Indian Standards (BIS). It was found that the honey samples had excellent physical properties with all the specifications within the limits specified by the BIS. Thus, the samples fall in the special grade category as per the specifications of BIS. It is concluded that the Melghat honey is of excellent quality with good therapeutic properties and antimicrobial potential. It might be very less susceptible to fermentation and is very fresh and pure without adulteration. There is a need for more research to explore the various properties of Melghat honey for its commercialization.

(Key words: Melghat, wild, honey, *Apis dorsata*, *Apis cerana indica*)

INTRODUCTION

Honey is a crucial and especially natural substance obtained from the hives of the honey bee. It is one of the highly nutritious natural produce generated by the bees from the nectar of the flowers. The nectar is collected and transformed by them into the golden liquid i.e. honey. Looking back to human history it is found that honey might be considered a prime substance used as a sweetener by ancient man. Khupse *et al.* (2017) mentioned that honey is a wonderful medicine acknowledged by Ayurveda and its regular consumption is helpful for health and strength.

Honey is a wonder food, its nutritional value is very limited; honeys are mostly sugars-fructose and glucose, with some sucrose. Some types provide minute amount of B complex and C vitamins. Honey does contain some antioxidants, however, mostly polyphenols. Some new studies are looking into the antimicrobial and wound-healing properties of honey. (Schularz Joe and Fran Benkott, 2008)

Though honey has been recognized and used by the people for years the researchers diverted very recently towards its study. The overall increase in the consumption of honey throughout the world may be the reason behind the interest of researchers. People are now fascinated more and more by the consumption of natural foods like honey due to their numerous nutritional and health-enhancing properties (Shah, 2021).

Honey is readily and abundantly available in the Melghat forest region and is one of the prime jungle products collected by the tribal people from the hives of wild honey bees *Apis dorsata* and *Apis cerana indica*. Melghat is a tribal and forest area located in the Amravati District of the state of Maharashtra. It is reported that at all times of the year, there are ample flowers available in the Melghat forest for the nourishment of bees thus the honey must be full of excellent medicinal and nutritional properties (Shah, 2022; Anonymous, 2019).

There is very little research found on the analysis of the Melghat honey. Perhaps it can be assumed that the Melghat honey is still untouched from the research point of view. Here the attempt was made to explore the properties of Melghat honey, which may be helpful in developing the brand Melghat. The physical properties of honey are very important as the honey is commercially graded mostly according to its physical properties (Anonymous, 1994-2000).

Our inborn for sweet foods led stone Age humans to forage for the sweetness of honey. Although bees were first domesticated in artificial hives in Egypt and India about 4,500 years ago, it wasn't until about A.D. 1000 that beekeepers began to understand the interplay between bees and flowers that is required to produce honey. (Schularz Joe and Fran Benkott, 2008).

MATERIALS AND METHODS

Collection of samples

Different wild honey samples were purchased from the local honey collectors of the Melghat forest. Different locations were selected for the honey collection. The honey samples are supposed to be produced by the wild species of honey bees i.e. *Apis dorsata* and *Apis cerana indica*. The honey samples were prepared for analysis (Anonymous, 2015).

All the important physical properties, as prescribed by the agencies working for the standardization of honey were included for the evaluation of the quality of the Melghat honey. The physical attributes were determined by using the standard procedures as given in the manual published by the Bureau of Indian Standards (Anonymous, 1994-2000). The BIS manual is for describing standard specifications for the extracted honey in the Indian context. Color, pH,

specific gravity, moisture, ash content, optical density, and Fiehe's test were the physical parameters studied.

RESULTS AND DISCUSSION

The results obtained are given in Tables 1 and 2. Here H_1 , H_2 , H_3 , and H_4 represent the honey samples with different locations. SD stands for standard deviation.

Color

The colors of liquid honey were found in a variety of ranges right from very light to dark. Krell, (1996), and Da-Silva *et al.* (2016) observed the variations in the color of honey, it might be due to an assortment of properties and content such as climatic and agricultural conditions, floral source, techniques and methods used for its processing, storage temperature and time, water and ash content, optical density, and composition. Shobham *et al.* (2017) mentioned that the color of honey depends on the minerals and pigments present.

Table 1. Physical properties of Melghat honey (A)

Honey	Samples	Physical parameters							
		Color	Fiehe's test	pH	mean	SD	Specific Gravity	mean	SD
H_1	1	A	Negative	4.38	4.32	0.04	1.45	1.42	0.03
	2	A	Positive	4.33			1.43		
	3	LA	Negative	4.27			1.41		
	4	A	Negative	4.30			1.38		
H_2	1	LA	Negative	3.88	3.98	0.08	1.40	1.40	0.02
	2	LA	Negative	3.94			1.42		
	3	LA	Positive	4.08			1.37		
	4	ELA	Negative	4.02			1.41		
H_3	1	LA	Negative	4.36	4.61	0.27	1.44	1.41	0.02
	2	ELA	Negative	5.07			1.42		
	3	LA	Negative	4.46			1.38		
	4	LA	Negative	4.56			1.41		
H_4	1	DA	Positive	3.93	3.71	0.20	1.42	1.39	0.02
	2	A	Negative	3.72			1.38		
	3	DA	Negative	3.78			1.37		
	4	DA	Positive	3.39			1.39		

Table 2. Physical properties of Melghat honey (B)

Honeys	Samples	Physical parameters								
		Moisture	mean	SD	Ash	mean	SD	Optical Density	Mean	SD
H_1	1	18.38	18.4	0.15	0.39	0.29	0.11	0.22	0.24	0.04
	2	18.24			0.35			0.26		
	3	18.65			0.11			0.29		
	4	18.33			0.31			0.19		
H_2	1	18.35	19.00	0.64	BLQ	0.04	0.05	0.20	0.19	0.03
	2	18.45			0.10			0.19		
	3	19.89			BLQ			0.15		
	4	19.32			0.08			0.23		
H_3	1	19.51	18.80	0.45	0.15	0.08	0.08	0.19	0.15	0.03
	2	18.59			BLQ			0.12		
	3	18.79			0.17			0.16		
	4	18.29			BLQ			0.13		
H_4	1	18.88	19.04	0.42	0.14	0.22	0.09	0.29	0.28	0.03
	2	19.68			0.17			0.25		
	3	18.51			0.19			0.26		
	4	19.09			0.38			0.32		

White and Doner (1980) studied the relationship between color and flavor of honey and found that dark-colored honeys were intense in flavour, while mild-flavored honeys were light in color.

It was observed that the honey samples examined in the current study were ranging from light to dark amber in color. The colors were categorized as DA (dark amber), A (Amber), LA (light amber), and ELA (extra light amber). Extremely light color samples were hardly present in the present set. The honey samples from the same locations were having a similarity in color patterns. Specific gravity (SG) and optical density (OD) were found concerning their color i.e. the values of specific gravity were slightly lower in the light-colored samples than in the darker once. Optical density also tended towards its lower values in the light-colored honey samples. Other properties of the honey samples did not show any significant relationship with color. The results were supported by Sohaimy and Almasi as they found similar color range (Sohaimy *et al.*, 2015; Almasi and Basavarajappa, 2019).

Fiehe's test

Fiehe's test was employed for all the honey samples under study. It is a test used for the detection of the presence of hydroxymethylfurfural in the given honey sample. It is primarily used as an indication of adulteration. Since almost all samples with some exceptions showed a negative result of Fiehe's test, the samples were found to exhibit no adulteration as per the guidelines given by the Bureau of Indian Standards (Anonymous, 1994-2000) for grading honey.

It was reported that the positive result of Fiehe's test does not always confirm adulteration; it might be due to ageing, or the presence of impurities that appeared during the handling, extraction, processing, and storage of honey (Kavapurayil *et al.*, 2014). The Fiehe's test found negative for the samples studied by Borges *et al.* (2019) and Aljohar *et al.* (2018).

pH

The basic or acidic characteristics of any honey sample can be revealed from its pH value. All the previously published literature says that the nature of honey is always acidic. The locational variations or the differences in the botanical sources cannot change the nature of honey from acidic to basic (Atul *et al.*, 2018; Manukumar *et al.*, 2013).

The pH of the Melghat honey samples was ranging between 3.39 and 5.07. There were significant similarities found in the pH of honeys belonging to the same locations. The low pH values of the Melghat honey samples show that these honeys might have the potential to fight strongly against microorganisms as well as with high stability and shelf life. Melghat honey might have tremendous medicinal and therapeutic potential.

The present values were found in accordance with many previous studies. The pH values obtained by different scientists are given in the bracket i.e. Chin and Sown dhararajan (2019) (pH 3.17- 5.85); Harun *et al.* (2017) (pH

4.32); Gebru (2015) (pH 2.99- 4.45). The honey samples from Nigeria, Tunisia, Serbia, Istanbul, Ethiopia, Iran, and China were analyzed in the above studies. Sohaimy *et al.* (2015) analyzed the Yemeni, Egyptian, Alexandrian, Kashmiri, and Saudi honey samples and stated that the potential of honey against microorganisms and its flavor is related to the pH.

Bogdanov *et al.* (2004) and Shobham *et al.* (2017) reported that the low pH of honey is mainly due to the organic acids as well as phosphates and chloride ions. In addition, the formation of HMF, floral origin, and pollens, storage parameters (temperature and humidity), and consequences of adulteration also affect the acidity (Pande and Jude, 2019; Sohaimy *et al.*, 2015). Dimins *et al.* (2006) stated that the pH of honey determines its quality, as the shelf life of honey is strongly dependent upon its pH.

Specific gravity (relative density)

The relative density of honey reflects the amount of sugar and moisture present in it. Here in this study, the values of specific gravity were lying between 1.37 and 1.45. The values of location one honey samples were on the higher side, while location four honey samples were at the bottom of the table. There was a significant relationship found between pH and specific gravity, while the latter was in the inverse relationship with the water content. The variation in the values of the specific gravities of different honey samples might be due to the difference in their composition especially the content of moisture and sugar.

The values were similar to Atul *et al.* (2018) (1.39- 1.42), who assessed the Indian honey samples and mentioned that the specific gravity of honey depends on its moisture content. Almasi and Basavarajappa (2019) studied honey and got values (1.39 to 1.42) similar to the current data. The values obtained by Kavapurayil *et al.* (2014) were in some lower range (1.30 to 1.42).

No value of specific gravity obtained in this study was below the standard value given by BIS (Anonymous, 1994-2000). All the honey samples from the Melghat might be recognized as graded honey samples as per the limit set by BIS. According to it the minimum specific gravity of honey must be above 1.37 for its grading.

The variation in the specific gravity values might be due to the difference in the water content as well as the overall composition of honey samples.

Moisture

As per Krell (1996) water, the second most bulk-forming agent in the honey, and solvent dissolving all the other constituents, is one of the most crucial parameters regarding the quality of honey. Here the water contents were ranging between 18.24% and 19.89% i.e. below 20%. Thus, all the samples were fall in the special grade as specified by the BIS and the EU (Anonymous, 1994-2000; Dimins *et al.*, 2006). With few exceptions, there was an inverse relationship found between the specific gravity and moisture.

The results were appeared to be contemporaneous with the results drawn by Pande and Jude (2019), (18% -

19.4%); Gebru (2015) (17 - 23 %); Bogoviku and Gedeshi (2015) (14.3 - 21%); Kavapurayil *et al.* (2014) (22.6 - 26.2%); Manukumar *et al.* (2013) (15.69 – 17.23%) and Harun *et al.* (2017) (16.31 %). Sohaimy *et al.* (2015) investigated honey samples from Egypt (moisture 18.32%), Saudi (15.64%), Yemen (16.28 %), and Kashmir (14.73%).

Gebru (2015), Bogoviku and Gedeshi (2015), Kavapurayil *et al.* (2014), Manukumar *et al.* (2013), Almasi and Basavarajappa (2019) confirmed that the water in honey may vary greatly depending upon numerous factors such as storage conditions (temperature and humidity), stage of ripening and maturation of honey, climatic conditions during harvesting, botanical origin, environmental and locational factors, types and the condition of hives, and types and implementation of methods of handling and processing etc.

The moisture in honey is an important criterion for its grading and determination of its level of maturity (under ripened honey has more moisture). As per the opinion of Dimins *et al.* (2006), Da-Silva *et al.* (2016) and Manzoor *et al.* (2013) many physical parameters of honey, like color, taste, flavor, viscosity, relative density, and solubility are strongly affected by its water content.

As the moisture content of the inspected honey samples was much low, it can be said that the Melghat honeys would have a high shelf life with excellent quality and a remarkable potential to fight against micro organisms. The susceptibility of these honey samples for fermentation and granulation must be quite low, as low moisture prevents the growth of yeast and mold as well as crystallization of sugars (Amabye, 2017; White and Doner, 1980; Bogdanov *et al.* 2004).

The honey samples in the current study were having moisture values absolutely within the range and can be considered as special grade honey as per the BIS standards and could be got the premium value in the honey market.

Ash content

Ash content of any food item is an important quality parameter, especially for honey. Many factors such as the floral origin of honey, types of pollen, etc, affect the ash content of honey.

The ash content of the Melghat honey was found within the limit specified by the BIS. The ash content of the samples was laid below 0.39%. The low ash content of the Melghat honey samples might be an indication of fresh honey without adulteration.

The variations in the ash value of honey samples might be an upshot of ample reasons. It was reported that the minerals mostly affect the ash value of honey. The type of soil within the area influences the mineral of honey. The ash content was also related to the color and electrical conductivity of honey. The higher value of ash was generally

observed in the darker colored and strong-flavored honey. As per the findings of Da-Silva *et al.* (2016) and Amabye (2017) the higher range of organic residues and trace elements also affect the ash content. Atul *et al.* (2018) stated that the ash content of honey can be used for the investigation of its botanical origin in the case of single-flower honey as well as to differentiate between the blossom and honeydew honey. The high ash content in honey is an indication of its adulteration, so owing to low ash content, the honey samples investigated in this study, were must be free from adulteration (Bogoviku and Gedeshi, 2015). The data on ash content obtained in this study was significant in accordance with Gebru (2015) (0.09-0.30%); Harun *et al.* (2017) (0.30%); and Atul *et al.* (2018) (0.09-0.49%).

Optical density

The optical density of a substance is determined by using a spectrophotometer. It is measured in terms of absorbance of light and it is a logarithm of the ratio of the falling light intensity to the intensity of transmitted light. The turbidity due to any objectionable matter, the freshness of the honey, and its color can be detected by using this tool.

It was revealed from the results that the optical densities were ranging between 0.12 and 0.32 and within the limit of BIS (max 0.3). Significant similarities were observed in the values of optical densities for the honey samples collected from identical locations with very infinitesimal variations. The optical densities were appeared to be following its color and moisture content.

As stated by White and Doner (1980), Kavapurayil *et al.* (2014), Shobham *et al.* (2017) the slight variations in the optical densities of honey samples might be due to the differences in the color shades and the colors of the honeys may vary due to numerous factors such as the overall composition of honey, differences in the climate of geographical location as well as during harvesting, floral origin and storage conditions. The results obtained by Almasi and Basavarajappa (2019) (1.28 to 1.55) and Manzoor *et al.* (2013) (1.05 to 1.06) were much higher than the current data.

From the above study, it is concluded that the physical properties of the Melghat honey samples were found in line with previously published data. All the samples fall in the special grade category as specified by the Bureau of Indian Standards and they are of excellent quality with good therapeutic properties and antimicrobial potential. These samples might have very less possibility of fermentation as well as they must be very fresh and pure without adulteration. There is a need for more research to explore the various physico-chemical, nutritional and therapeutic properties of Melghat honey for its commercialization.

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An Investigation of Plant Growth and Nutrient Content by the Effect of Metal Ion and Their Complexes in Cassia Tora (Tarota) Plant

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Abstract

In the present study Cassia Torawere taken as experimental plant in order to study effect of heavy metals and their complexes of (1S-cis)- 4- (3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine on to improve the yield of economically important plant. Cassia tora Linn. (Family: Leguminosae) is well known plant widely distributed in India. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value. The seeds were immersed in Mg (II), ions, ligand and its complexes to study the germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants were studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Tarota plant treated with Sartraline, complex and metal Mg(II). Nitrogen and protein contents are found higher in the treated plants as compared to control.

Key words -Sartraline, Mg (II), Plant, Chlorophyll, Nitrogen, Protein.

Introduction:

India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture.^{1,2}

Metals are acting a beneficial role for plant growth, development, and productivity at an optimum concentration in the form of the essential micronutrient³. To grow and complete the life cycle plants use the essential micronutrients⁴. The plant takes these essential heavy metals like iron, zinc, copper, and manganese from the soil due to concentration gradients and selective uptake of these metals⁵. These ions enthusiastically affected the function of many enzymes and cellular metabolism. These metals also play a prominent role in the synthesis of protein, nucleic acids, photosynthetic pigment, and it also take part in the structural and functional integrity of cell membranes⁶. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and their development. Manganese (Mn) is an essential plant mineral nutrient, playing a key role in several physiological processes, particularly photosynthesis.

Some of heavy metals (Fe, Cu and Zn) are essential for plants⁷. Oxines and Gibberlines are the growth promoting hormones.⁸⁻¹⁰ Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent.

Since (1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine has intense biological activities, antidepressant, selective competitive inhibitor. Sertraline inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Mg (II), with (1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand over control solution on germination, survival seedlings height etc, on Tarota plant in order to make suggestion whether complex, metal and ligands can be used as a plant growth regulator. Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

The solution of Mg (II) in the form of nitrate and (1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine of the concentration of 0.01 M was prepared in double distilled water. The applications of complex, metal, ligand solution is studied by dissolving it in proper solvent at 3.60, 7.00 and

10.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then ground and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour. Passioura J.B.¹¹ has studied on soil structure and plant growth. Many soils contain continuous macrospores that provided niches for the roots to grow in. The presence of such macrospores increases the extent of the root system, Soil structure not only affect the ability of root to grow and to supply the leaves with water and nutrients it also induces them to send hormonal signals that slow the growth of shoot.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc., to improve the crop yield. Amongst several economical important plants *Tarota* is selected as a plant system.

1. 100 healthy seeds of *Tarota* were taken 3.5 and 7.00 pH for about two hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal ion, complex solution on growth of *Tarota (Cassia tora) species* plants was studied at different pH (3.5 and 7.00).
3. Effect of ligand, metal Mg (II), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Cassia tora* plants were studied.
4. Chlorophyll content in fresh leaves were determined by spectrophotometric method given by Jahagirdar¹².

Parameters:

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3 days and survival was noted after 10 days. After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived *Tarota* plants were measured.

Table 1.1-Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Cassia tora* Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 2&1/2 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	Width of young leaf (cm)
Tarota Test System	Water (Control)	3.5	60.00	60.00	23.072	8.621	14.450	0.590	1.65
		7.0	66.66	66.66	23.62	8.84	14.78	0.5981	1.620
	Ligand	3.5	73.33	73.33	22.984	8.718	14.603	0.5970	1.761
		7.0	80.00	86.66	25.24	9.14	16.08	0.5440	1.841
	Complex	3.5	60.00	60.00	23.614	8.712	14.702	0.5925	1.421
		7.0	73.33	80.00	24.49	9.07	15.41	0.5885	1.490
	Metal	3.5	80.00	73.33	23.881	8.804	15.077	0.584	1.850
		7.0	30.00	93.33	27.71	8.22	14.44	0.5692	1.843

Table 1.2- Estimation of Chlorophyll for *Cassia tora* Plants System

Sr.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit. x 10 ⁻³	Chlorophyll 'a' gm/lit. x 10 ⁻³	Chlorophyll 'b' gm/lit. x 10 ⁻³
1	Control	Tarota	5.125	3.714	1.754
2	Ligand		6.725	5.921	2.028
3	Complex		6.873	4.659	2.316
4	Metal		7.413	6.354	2.292

Table 1.3 - Estimate of Total Nitrogen and Proteins in Leaf Powder of *Cassia tora*

Sr. No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Hydrogen	
1		Control	7.35	38.18	6.85	38.657

2	Tarota	Ligand	7.87	37.23	6.78	39.213
3		Complex	8.11	35.54	6.67	39.443
4		Metal	8.32	33.76	6.39	39.574

Results And Discussion:

Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table 1.1 clearly indicates that average root length in (1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine, complex, Mg (II), at all pH increases over control.

Chlorophyll control / chlorophyll pigment were found affected in Tarotaplant by the treatments. Total chlorophyll was found to be higher in Tarota.

Percentage of nitrogen and proteins were found affected in leaves of Tarota by the treatment of (1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine, complex, Mg (II). It is observed that percentage of nitrogen and protein are higher than that of control.

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The Study of Seed Germination, Seedling and Early Plant Growth by the Effect of Metal Ion and Their Complexes in *Plumbago Zeylanica* (Chitrak) Plant

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Abstract

This work investigates the usefulness of 3-(2-methoxyphenoxy)-1,2-propanediol as an alternate fertilizer by field experiments on growing *Plumbago Zeylanica*. Separate field experiments using 3-(2-methoxyphenoxy)-1,2-propanediol and original soil compare the effectiveness of different products for agronomic applications. Attempt has been made with the impact of heavy metals and their complexes of 3-(2-methoxyphenoxy)-1,2-propanediol on to improve the yield of economically important plant *Plumbago Zeylanica* (Chitrak). The seeds were immersed in Co (II), ligand and its complexes to study the seed germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants, are studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of *Plumbago Zeylanica* (Chitrak). Plant treated with 3-(2-methoxyphenoxy)-1,2-propanediol, complex and metal Co (II). Nitrogen and protein contents are found higher in the treated plants as - Complex > 3-(2-methoxyphenoxy)-1,2-propanediol > Co (II).

Key words - 3-(2-methoxyphenoxy)-1,2-propanediol, Co (II), Plant, Seed Germination of Chitrak, Chlorophyll

Introduction:

Plant growth regulators are organic compounds, other than nutrients, that produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts, modify plant physiological process. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program undergo designed specifically to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture [1-2]. One of the important contributions of the 19th century experimental plant physiology to agriculture was to discover that soil fertility and adding several nutrients to the soil could increase crop yields. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic feature of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years and more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing.

The complexes of transition metals with bi-allyl thiourea are prepared and their herbicidal and plant growth regulating activities are tested with wheat and cucumbers by Daverski et al [3]. Complexes of Piperidine-2-Carboxylic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators [4]. The Complexes of rare earth with peptides showed the herbicidal and plant growth regularity activity with wheat and barley plant [5].

Since 3-(2-methoxyphenoxy)-1,2-propanediol has intense biological activities, anti-inflammatory, antipyretic and analgesic activities, 3-(2-methoxyphenoxy)-1,2-propanediol inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Co (II), with 3-(2-methoxyphenoxy)-1,2-propanediol and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand and control solution on germination, survival seedlings height etc, on *Plumbago Zeylanica* (Chitrak) plant in order to make suggestion whether complex metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

Seed of *Plumbago Zeylanica* Species were collected from forest department Akot. Various seed characteristic like seed size, Shape, color and weight of seed/gm. would be observed. Seed shape - oblong, Seed coat- Hard, Seed color- reddish brown, no. of seeds/gm- 47.9 and Seed size- 5-6mm. The solution of Co (II) in the form of nitrate and 3-(2-methoxyphenoxy)-1,2-propanediol of the concentration of 0.01 M was prepared in

double distilled water. The applications of complex, metal, ligand solution are studied by dissolving it in proper solvent at 4, 7.00 and 9.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grind and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical and medicinally important plants *Plumbago Zeylanica* (Chitrak) is selected as a plant system.

1. 20 gm healthy seeds of *Plumbago Zeylanica* (Chitrak) were taken 4.0, 7.00 and 9.5 pH for about three hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, during 14 August 2021 to 30 Sept.2021; the wooden tray was kept under atmospheric pressure at room temperature.

2. Effect of ligand, metal Co (II), complex on percentage of nitrogen, protein and chlorophyll in the leaves of *Plumbago Zeylanica* (Chitrak) plant. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method given by Jahagirdar^[21].

Parameters:

Soil pH of soil sample was measured by taking extract of mixture of soil water with pH-meter. Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3½ days and survival were noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1
Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Plumbago Zeylanica* (Chitrak) Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 3½ days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	Width of young leaf (cm)
<i>Plumbago Zeylanica</i> (Chitrak). Test System	Water (Control)	4.0	73.00	72.00	21.084	7.552	13.478	0.5603	3.25
		7.0	78.66	76.66	22.569	7.256	13.698	0.5415	3.27
	Ligand	4.0	75.66	75.33	21.964	7.698	13.852	0.5557	3.87
		7.0	82.00	81.66	24.214	7.963	15.108	0.5270	3.63
	Complex	4.0	76.00	76.00	22.458	8.748	13.563	0.6449	3.56
		7.0	79.66	78.00	23.569	8.986	14.231	0.6314	3.89
	Metal	4.0	82.00	79.33	21.483	8.698	14.125	0.6157	3.12
		7.0	50.00	91.33	26.586	9.025	14.244	0.6336	3.56

Table 2
Estimation of Chlorophyll for *Plumbago Zeylanica* (Chitrak) Plants System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10 ⁻³	Chlorophyll 'a' gm/lit.x 10 ⁻³	Chlorophyll 'b' gm/lit.x10 ⁻³
1	Control	<i>Plumbago Zeylanica</i> (Chitrak).	4.986	3.714	1.754
2	Ligand		5.725	4.821	1.018
3	Complex		5.782	3.560	1.215
4	Metal		6.312	5.255	1.196

Table 3
Estimation of Total Nitrogen and Proteins in Leaf Powder of *Plumbago Zeylanica* (Chitrak)

S.No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Nitrogen	
1		Control	6.58	55.28	7.52	44.562

2	Plumbago	Ligand	6.90	56.22	7.34	42.816
3	Zeylanica	Complex	7.26	54.28	7.12	46.195
4	(Chitrak).	Metal	6.02	52.78	7.01	41.406

Results And Discussion:

Seed of the target species were taken to study the germination behavior under the influence pre-treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root length in 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co(II), at all pH increase over is seen that in complex, Co(II), showed decrease in shoot length control. But in case of Plumbago Zeylanica (Chitrak) plant system shoot length increases in 3-(2-methoxyphenoxy)-1,2-propanediol, complex and Co(II), and all pH over control.

Chlorophyll pigment / chlorophyll control were found affected in Plumbago Zeylanica (Chitrak) plant by the treatments. Total chlorophyll was found to be higher in Plumbago Zeylanica (Chitrak). Total chlorophyll content in 3-(2-methoxyphenoxy)-1,2-propanediol and complex is higher than in metal and control treatment in both plant systems.

Percentage of nitrogen and proteins were found affected in leaves of Plumbago Zeylanica (Chitrak) by the treatment of 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co (II). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex > 3-(2-methoxyphenoxy)-1,2-propanediol > H₂O > Co (II).

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❖ विद्यावार्ता या आंतरविद्याशाखीय बहुभाषिक त्रैमासिकात व्यक्त झालेल्या मतांशी मालक, प्रकाशक, मुद्रक, संपादक सहमत असतीलच असे नाही. न्यायक्षेत्र:बीड



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Study of Solute-Solvent Interaction in a Different Medium at 303 K Temperature by Ultrasonic Technique

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ABSTRACT :

The basic parameters like velocity (u), density (ρ) and viscosity (η) can be measured by experimental procedures using bicapillary pyknometer, Ostwald viscometer Ultrasonic Interferometer. From these parameters various thermodynamical and acoustical parameters such as adiabatic compressibility (β_s), apparent molar compressibility (ϕ_k), apparent molar volume (ϕ_v) specific acoustic impedance (Z), Solvation number (S_n), Intermolecular free length (L_f), have been estimated using standard relations by observed values of Ultrasonic velocities, densities and viscosities in the wide range of concentrations at 303K, temperatures for Acetone+water and Methanol +water Binary system. The solvent-solvent interactions are studied on the basis of increase or decrease in ultrasonic velocity, density, viscosity and other derived acoustical parameters in terms of structure making and structure breaking tendencies of various solvent molecules. The results are interpreted in terms of molecular interactions occurring in these solutions.

Keywords: Ultrasonic velocity, solute-solvent interaction, basic parameters

Introduction :

The study of solute-solvent interactions has been of intense activity in the recent past in all branches of chemistry and in other parallel disciplines

as well. Various experimental methods have been employed to explore the information from the study of such interactions. Experimental data of thermodynamics, acoustic and transport properties of solutions are of great importance to get insight into such intermolecular forces. Several workers¹⁻² have successfully used ultrasonic velocity and its related thermodynamic properties to study intermolecular interactions in binary systems. Ultrasonic waves provide valuable information about the molecular interaction in pure liquids³, aqueous solutions⁴, liquid mixtures⁵ and also provide valuable information about the structure of solids⁶.

In continuation of these investigations, the present paper reports acoustical properties of the anti-psychotic drug Prochlorperazine Maleate in different solvents.

The acoustic properties of this drug have been studied in 20% Dioxane-water and 20% DMF-water solutions at 303 K.

Experimental

Ultrasonic velocity measurements were made by using an ultrasonic interferometer (Mittal Enterprises, New Delhi) at a frequency of 2MHz with a tolerance of $\pm 0.005\%$.

Solvents dioxane and dimethyl formamide used in the present work were of AR grade and were purified and dried by standard procedure before use. Densities, viscosities and ultrasonic velocities were measured at 303 K over a wide range of composition. Densities were determined by using bicapillary pycnometer. The viscosities were measured by precalibrated Ostwald type viscometer with an accuracy of about $\pm 0.1\%$. Binary system is studied at 303K with different concentrations of the system such as 0.02 mole, 0.04 mole, 0.06 mole, 0.08 mole, and 0.1 mole. All the measurements were carried out at 303 K.

Theory

Acoustic parameters such as adiabatic compressibility (β_s), apparent molar volume (ϕ_v), apparent molar compressibility (ϕ_k), intermolecular free length (L_f), specific acoustic impedance (Z), Limiting apparent molar volume (ϕ_v^0), Limiting

apparent molar compressibility (ϕ_k^0) were determined from the experimental data of density (ρ) and ultrasound velocity (u) of pure solvent and solutions, using

following standard equations⁷.

Adiabatic compressibility	$\beta_s = 1/u^2 \rho_s$	-----1
Apparent molar volume	$\phi_v = 10^3(\rho_s - \rho)/m - \rho_s + M/\rho_s$	-----2
Apparent molar compressibility	$\phi_k = 10^3(\rho_s \beta_s - \rho \beta)/m - \rho_s \beta_s + \beta_s M/\rho_s$	-----3
Intermolecular free length	$L_f = K(\beta_s)^{1/2}$	-----4
Specific acoustic impedance	$Z = \rho \cdot u$	-----5
Limiting apparent molar volume	$\phi_v^0 = \phi_v^0 + S_v C^{1/2}$	-----6
Limiting apparent molar compressibility	$\phi_k^0 = \phi_k^0 + S_k C^{1/2}$	-----7

Table no.1
Ultrasonic Velocity(u), Density (ρ) and Viscosity (η) of drug in 1, 4 Dioxane and DMF at 303K

Solvents	Conc. mol.dm ³	Ultrasonic Velocity(u) m/s	Density ρ, Kg m ⁻³	Viscosity x 10 ⁻³ Nsm ⁻²
20% Dioxane-Water Medium	0.02	1368.3	1029.07	1.15066
	0.04	1374.1	1029.10	1.15523
	0.06	1383.4	1029.63	1.15748
	0.08	1388.9	1030.04	1.15815
	0.1	1397.5	1030.15	1.15471
20% DMF-Water Medium	0.02	1437.2	950.22	0.83912
	0.04	1460.3	956.83	0.83978
	0.06	1478.1	967.15	0.84132
	0.08	1481.2	976.28	0.84428
	0.1	1484.6	983.35	0.84856

Table no.2
Some acoustical parameters with concentration of the drug in 1, 4 Dioxane and DMF at 303 K

Solvents	Conc. mol. dm ⁻³	$\beta_s \times 10^{10} \text{ Pa}^{-1}$	$\phi_v \times 10^3 \text{ m}^3 \text{ mol}^{-1}$	$\phi_k \times 10^{14} \text{ m}^3 \text{ mol}^{-1} \text{ Pa}^{-1}$	$L_f \times 10^{11} \text{ (m)}$	$Z \times 10^3 \text{ Kg m}^{-2} \text{ sec}^{-1}$
20% Dioxane-Water Medium	0.02	3.9488	-62.3	-62.8204	4.8511	16.2595
	0.04	3.9472	-7.19	-56.6014	4.7024	16.2936
	0.06	3.9336	4.82	-30.7532	4.5927	16.3273
	0.08	3.9258	13.9	-24.6438	4.3831	16.3679
	0.1	3.9105	14.7	-11.6717	4.3692	16.4250
20% DMF-Water Medium	0.02	4.8218	11.83	292.708	4.9709	14.6379
	0.04	4.8049	19.06	288.683	4.8632	14.6694
	0.06	4.7993	20.23	198.406	4.7575	14.7016
	0.08	4.7801	22.54	143.164	4.6652	14.7419
	0.1	4.7686	24.07	111.356	4.4364	14.7661

Table-3
Limiting values of δ_v and δ_k
along with slope (S_v & S_k) for CPZ in different
medium at 303K temperature

Temp. T (K)	Medium	Parameters			
		$\phi_v^0 \times 10^{-3}$ m ³ mol ⁻¹	$\phi_k^0 \times 10^{-10}$ m ³ mol ⁻¹ pa ⁻¹	$S_v \times 10^{-3}$ m ³ mol ⁻¹ dm ³	$S_k \times 10^{-11}$ m ³ mol ⁻¹ dm ³ pa ⁻¹
	20%D-W	-96.28	-104.6	331.7	354.6
	20%DMF-W	7.162	631.4	69.56	-1851.0

Results and discussion:

Ultrasonic velocity, density and viscosity for the 20% Dioxane-water and 20% DMF-water have been listed in table 1. It is seen from the data that density (ρ), ultrasonic velocity (u) and viscosity (η) increases with increase in concentration the two systems. The increase in ultrasonic velocity is due to decrease in intermolecular free length (L_f) as shown in table 2. This suggests that there is a strong interaction between drug and solvent molecule. Adiabatic compressibility (β_s) is a measure of intermolecular association or repulsion calculated from the measured ultrasonic velocity (u) and density (ρ). Adiabatic compressibility is found to decrease with increase in concentration⁸. Since adiabatic compressibility is inversely related to the product of density and ultrasonic velocity based on this the compressibility is expected to decrease which has observed in the present case. The decrease in adiabatic compressibility with increase in concentration confirms the presence of solvent-solvent interactions through dipole-dipole interactions between Dioxane+Water and DMF+Water. When the sound waves travels through the solution, certain part of it travels through the medium and rest gets reflected by the ion i.e. restriction for flow of sound velocity by the ions. The character that determines the restriction movement of sound waves is known as acoustic impedance (Z). It has been found that acoustic impedance increases with increase in concentration. The apparent molar compressibility (ϕ_k) explains the solute-solvent and solute-solute interactions in

solution and was calculated by using the equation no. 3. The apparent molar volume (ϕ_v) is defined as the change in volume of solution for the added one mole of a particular component at constant temperature and pressure. It is thermodynamic property which helps in elucidating solvation behavior of electrolyte in solution. Apparent molar volume was evaluated from the density of solution and solvent.

It is evident from the table 3 that ϕ_k^0 values are negative for 20% Dioxane-water but for 20%DMF-water ϕ_k^0 values are positive. The negative ϕ_k^0 values suggest solute-solvent interaction whereas positive values are due to solute-solute interaction, is further confirmed by ϕ_v^0 values which are positive for 20% DMF-water and negative for 20% Dioxane-water for the drug. S_v is a measure of solute-solvent interaction. It is observed from the table 3 that S_v values are higher in 20% Dioxane-water and low in 20% DMF-water solution. This confirms that in 20% DMF-water solution solute-solute interactions and in 20% Dioxane-water solute-solvent interaction predominate.

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An Ultrasonic Study of 3-(2-Methoxyphenoxy)-1, 2-Propanediol in Different Binary Mixtures of Solvent At 308 K.

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ABSTRACT :

The ultrasonic velocity, density, viscosity and absorption have been measured for solutions of 3-(2-methoxyphenoxy)-1, 2-propanediol are presented at 308K. By taking measurements of 3-(2-methoxyphenoxy)-1, 2-propanediol at the concentration range is 0.002 to 0.01 mol dm⁻³ of each solution. The ultrasonic velocity, density and viscosity have been measured at 2MHz for the aqueous solutions of (i) 3-(2-methoxyphenoxy)-1, 2-propanediol + Acetone solvent (ii) 3-(2-methoxyphenoxy)-1, 2-propanediol + Ethanol solvents, at different concentrations at 308K. The acoustical parameters such as adiabatic compressibility (β), intermolecular free length (L_f), and acoustical impedance have been computed. The aim of the study is to increase the solubility, stability of the drugs by the formation of complexation. These properties are attributed to solute-solvent interactions through hydrogen bonding, molecular association, Solvent-solvent interaction etc. The results are interpreted in terms of molecular interactions occurring in these solutions.

Introduction :

In recent years acoustic and

thermodynamic behavior in many binary liquid mixtures has been analyzed by several researchers more than 5 decades. The analysis has been adequately employed in understanding the nature of molecular interactions in pure liquids and liquid mixtures.

Ultrasonic propagation parameters yield valuable information regarding the behaviors of liquid systems, because intramolecular and intermolecular association, dipolar interactions, complex formation and related structural changes affect the compressibility of the system which in turn produces corresponding variations in the ultrasonic velocity. The acoustical and thermodynamical parameters obtained in ultrasonic study show that the ion solvation is accompanied by the destruction or enhancement of the solvent structure¹⁻⁴. Excess thermodynamic properties of liquid mixtures are of great interest to conveniently design industrial processes and also to provide useful information on the molecular interactions required for optimizing thermodynamic models⁵. When two or more liquids are mixed there occur some changes in physical and thermodynamic properties because of free volume change, change in energy and change in molecular orientations. Derived thermodynamic and acoustical parameters like internal pressure, free volume and acoustic impedance are of considerable interest in understanding the intermolecular orientations in binary liquid mixtures⁶⁻⁸. Excess thermodynamic properties of mixtures are useful in the study of molecular orientations and arrangements⁹⁻¹⁰.

The scientific investigation in the field of ultrasound velocity measurement in 3-(2-methoxyphenoxy)-1, 2-propanediol drug solution in various solvent systems is presented. This drug is used to treat coughs and congestion caused by the common cold, bronchitis, and other breathing illnesses. The acoustic properties of 3-(2-methoxyphenoxy)-1, 2-propanediol have been studied in 20% Acetone-water and 20% Ethanol-water solutions at 308K.

Experimental :

All the studied chemicals which were purchased from S.D. fine chemicals Mumbai, India, with on purity of 99.6% were used as such without further purification solvents acetone and ethanol used in the present work were of AR grade. Densities, viscosities and ultrasonic velocities were measured at 308 K over a wide range of composition. The densities were determined by using specific gravity bottle by relative measurement method with accuracy $\pm 1 \times 10^{-5}$ gm./cm³. The viscosities were measured by precalibrated Ostwald type viscometer. Ultrasonic velocity measurements were made by using an ultrasonic interferometer (Mittal Enterprises, New Delhi) at a frequency of 2MHz with a tolerance of $\pm 0.005\%$. All the measurements were carried out at 308 K.

Acoustic parameters-

Acoustic parameters such as apparent molar compressibility (ϕ_k), apparent molar volume (ϕ_v), adiabatic compressibility (β_s), specific acoustic impedance (Z), intermolecular free length (L_f), Limiting apparent molar volume (ϕ_v^0) Limiting apparent molar compressibility (ϕ_k^0) were determined using following relations.

- Ultrasonic velocity $u = \lambda \nu$ _____ 1
- Adiabatic compressibility $\beta_s = 1/u^2 \rho_s$ _____ 2
- Apparent molar volume $\phi_v = 10^3(\rho_0 - \rho_s)/m - \rho_0 \rho_s + M/\rho_0$ _____ 3
- Apparent molar compressibility $\phi_k = 10^3(\rho_0 \beta_s - \rho_s \beta_0)/m - \rho_s \rho_0 + \beta_s M/\rho_s$ _____ 4
- Intermolecular free length $L_f = K(\beta_s)^{1/2}$ _____ 5
- Specific acoustic impedance $Z = \rho_s u$ _____ 6
- Limiting apparent molar volume $\phi_v^0 = \phi_v + S_v C^{1/2}$ _____ 7
- Limiting apparent molar compressibility $\phi_k^0 = \phi_k + S_k^{1/2}$ _____ 8

Table no.1

Experimental Data of Density, Ultrasonic Velocity and Viscosity of 3-(2-methoxyphenoxy)-1,2-propanediol in different solvent at 308K

Solvent	Conc. mol.dm ⁻³	Density ρ Kg m ⁻³	Ultrasonic Velocity (u) m/s	Viscosity (10 ⁻³ Nm ⁻²)
20% Acetone-Water Medium	0.01	1001.21	1472.8	1.08654
	0.008	1001.07	1470.6	1.06841
	0.006	1000.58	1468.1	1.04872
	0.004	1000.31	1466.3	1.03856
	0.002	1000.08	1464.5	1.06623
20% Ethanol-Water Medium	0.01	951.2	1516.3	0.95861
	0.008	950.8	1514.3	0.95316
	0.006	949.9	1512.9	0.95211
	0.004	949.1	1511.1	0.95101
	0.002	948.7	1509.8	0.94986

Table no.2

Variation of some acoustical parameters with concentration of 3-(2-methoxyphenoxy)-1,2-propanediol in different solvents at 308 K

Solvents	Conc. mol.dm ⁻³	$\beta_s \times 10^{-11}$ m ² Pa ⁻¹	$\phi_v \times 10^3$ m ³ mol ⁻¹	$\phi_k \times 10^{14}$ m ³ mol ⁻¹ Pa ⁻¹	$L_f \times 10^{11}$ (m)	$Z \times 10^3$ Kg m ⁻² sec ⁻¹
20% Acetone-Water Medium	0.01	4.605	0.99308	90.6286	1.2939	14.74582
	0.008	4.619	1.24135	83.0413	1.2960	14.72173
	0.006	4.637	1.65514	72.7957	1.2985	14.68955
	0.004	4.650	2.48272	65.7912	1.3003	14.66754
	0.002	4.662	4.96545	58.9575	1.3020	14.64617
20% Ethanol-Water Medium	0.01	4.573	0.99308	120.8666	1.2894	14.42304
	0.008	4.585	1.24135	124.7388	1.2912	14.39986
	0.006	4.599	1.65514	129.9393	1.2932	14.37103
	0.004	4.614	2.48272	132.5278	1.2953	14.34185
	0.002	4.624	4.96545	129.9747	1.2967	14.32347

Table-3

Limiting values of δ_v and δ_k along with slope (S_v & S_k) for 3-(2-methoxyphenoxy)-1,2-propanediol in different medium at 308K temperature

Temp. T (K)	Medium	Parameters			
		$\phi_v^0 \times 10^{-5}$ m ³ mol ⁻¹	$\phi_k^0 \times 10^{14}$ m ³ mol ⁻¹ Pa ⁻¹	$S_v \times 10^{-3}$ m ³ mol ^{-1/2} Pa ^{-1/2}	$S_k \times 10^{14}$ m ³ mol ^{-1/2} Pa ^{-1/2}
308K	20% Acetone-W	12.258	-23.33	623.1	185.3
	20% Ethanol-W	11.698	521.2	46.22	-1258.1

Table-4

A and B, coefficient values at 308K in different medium for 3-(2-methoxyphenoxy)-1,2-propanediol

Medium	Coefficient	Temp 308 K
20% Acetone-Water medium	A	0.532
	B	-0.112
20% Ethanol-Water medium	A	0.486
	B	-0.115

Results and discussion:

Table 1 shows that ultrasonic velocity (u), density (ρ), and viscosity (η) increases with increase in concentration for all systems. The increase in ultrasonic velocity is due to decrease in intermolecular free length (L_f) as shown in table 2. This suggests that there is a strong interaction between 3-(2-methoxyphenoxy)-1,2-propanediol and solvent molecule. Adiabatic compressibility (β_s) is a measure of intermolecular association or repulsion calculated from the measured ultrasonic velocity (u) and density (ρ). Adiabatic compressibility is found to decrease with increase in concentration. Since adiabatic

compressibility is inversely related to the product of density and ultrasonic velocity based on this the compressibility is expected to decrease which has observed in the present case. When the sound waves travels through the solution, certain part of it travels through the medium and rest gets reflected by the ion¹¹ i.e. restriction for flow of sound velocity by the ions. The character that determines the restriction movement of sound waves is known as acoustic impedance (Z). It has been found that acoustic impedance increases with increase in concentration. The apparent molar compressibility (ϕ_k) explains the solute-solvent and solute-solute interactions in solution and was calculated by using the equation no. 4. The apparent molar volume (ϕ_v) is defined as the change in volume of solution for the added one mole of a particular component at constant temperature and pressure. It is thermodynamic property which helps in elucidating solvation behavior of electrolyte in solution. Apparent molar volume was evaluated from the density of solution and solvent.

It is evident from the table 3 that ϕ_k^0 values are negative for 20% Acetone-water and for 20% Ethanol-water ϕ_k^0 values are positive. The negative ϕ_k^0 values are suggest solute-solvent interaction whereas positive values are due to solute-solute interaction, is further confirmed by ϕ_v^0 values which are positive for both solution 20% Ethanol-water and for 20% Acetone-water of the drug. S_v is a measure of solute-solvent interaction. It is observed from the table 3 that S_v values are higher in 20% Acetone-water and low in 20% Ethanol-water solution. This confirms that in 20% Ethanol-water solution solute-solute interactions and in 20% Acetone-water solute-solvent interaction predominate.

The viscosity B-Co-efficient has been derived from Jones-Dole equation

$$(c > 0.1m)\eta_r - 1 / C^{1/2} = A + B C^{1/2}$$

Where η_r is the relative viscosity. A and B are the characteristics of the solute and solvent.

A is Falkenhagen coefficient represent the contributor from solute-solute interaction and B is Jones Dole coefficient known to depend on the size of the solute particle and on the interaction between solute and solvent.

They were obtained by a least-squares treatment as intercept and slope of the linear plot of $\eta_r - 1 / C^{1/2}$ Vs $C^{1/2}$. The graph for each system given linear straight line showing validity of Jones-Dole equation. The slope of straight line gives value of B co-efficient.

The viscosity A coefficient represent the ion-ion interactions and negative values have shown some physical significance. However negative A values have also been reported to be in other solvents in some studies.¹²⁻¹³

The large and small value of 'A' shows the stronger and weaker solute-solute interactions respectively. When solute is introduced into solvent of organic-water mixture it will interfere with the ordered structure of water in the solutes co-sphere. As only one solute is present so such variation in the values of A can be explained.

In the present study viscosity of liquid solutions increases with increase in concentration of drugs solution in 20% Acetone-water 20% ethanol-water mixture. The increase in viscosity with increase in concentration may be attributed to the increase in solute solvent interactions.

Viscosity B coefficients have been established to arise from ion-solvent interactions and are responsible for introducing order or disorder in the structure of the solvent.. Solute with negative B Coefficient is characterized as structure breakers indicating weak solute-solvent interactions. Such type of results is also shown by Reddy et al.¹⁴⁻¹⁶

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
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The Influence of Ligand and Their Complexes on Germination of Seed and Plant Growth Profile on *Chenopodium Album*

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Abstract

Chenopodium album (L.), Chandan Batwa (Bathua) is a fast-growing weedy annual plant in the genus *Chenopodium*. This weedy plant has various medicinal applications. This work investigates the usefulness of Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine (Promethazine) as an alternate fertilizer by field experiments on growing Bathua plant. Plant *Chenopodium album* were studied with the impact of heavy metal ion and their complexes on to improve the yield of plant profile. The seeds were immersed in ligands, its complexes and Nd (III) ion, to study the germination and growth pattern and certain physiological processes. Effect of Promethazine ligand, complex and metal ion solution on growth, determination of percentage of chlorophyll in the leaves of *Chenopodium album* plant system were studied. The data indicates the changes in growth pattern, chlorophyll content and increased germinations in all seed treatments was observed in the experimental plants.

Key words: *Chenopodium album* (L.), Promethazine

INTRODUCTION:

Chenopodium album is one of the most widely distributed species of weeds in the world found in India, South Africa and Australia. The plant is commonly called Bathua and found usually in the winter season, also used as vegetable. The plant contains various phytochemicals like saponins, flavonoids, glycosides, fixed oils, gums and tannins, etc. Pharmacological studies reported that the plant possess various activities such as anticancer, hepatoprotective, antioxidant, antibacterial, anti-inflammatory, etc.

Chenopodium album L. (family: *Chenopodiaceae*) is herbaceous plant. The plant and their parts are useful in curing cough, anorexia, piles, dysentery and diarrhea and kills small worms¹.

The plant has its medicinal property mainly in seeds and leaves. Leaves are rich in nitrogen, a considerable amount of albuminoids and potash salts². Seeds of *Chenopodium album* includes alkaloids, Saponins, glycosides, fixed oils and tannins³.

Studies carried out in different parts of the world indicate that *C. album* is a rich source of nutrients, antioxidants and important dietary elements⁴.

Seed germination behavior is important for horticulture and agriculture⁵⁻⁶. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing. Vegetables play an important role in human nutrition. During recent years, the interest in vegetable production has increased rapidly as a result of greater appreciation of the food value of vegetables. The findings of scientific study and their wide application in the field have enhanced this interest to a great extent among growers and consumers alike. Vegetables are a complex group of plants with diverse forms of edible parts like fruits, leaves, stem, roots, tubers, bulbs etc. They are the best sources of calories, natural vitamins, minerals, proteins, dietary fiber and are therefore essential to tackle the problem of malnutrition and improve quality of life. Vegetables are to play a significant role in supplying a balanced diet.

The information about the role of metal complexes in biological systems, their concentration and presence in different equilibria is of immense importance. Greshon et al.⁷⁻⁸ reported that the activity of metal

chelates is considerably increased as compared to that of the free metal and the ligand alone on their complexation. The observation of antifungal and antibacterial activities of complexes show that they are more active as compared to free ligand and metal involved.⁹⁻¹¹

The use of rare earth elements in agriculture to promote the growth of plants is well known.¹²⁻¹⁵ Metal containing complexes of lactams, imidazoles and benzimidazole and their biological activity have been studied by Kukalenko et al.¹⁶

Tzortzakis N.G. et al.¹⁷ studied the effect of pre-sowing treatment on seed germination by applying various organic compounds. Amani Abdel-Latif¹⁸ studied the effect of methyl tert-butyl ether on growth of shoot and root elongation in Maize plant.

Since Promethazine, (Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine) has intense biological activities, antihistaminic, sedative properties and inhibits the activity of the enzymes. The current study is concerned with the process of seed germination of medicinally important Bathua plant of Chikhaldara, Amravati district, Maharashtra, India and in particular with the effect of Ligand and their Complexes on the germination process on Chenopodium album plant and reported the biological application of binary complexes of Nd (III), with Promethazine drug by comparison with pure ligand, metal and control solution.

Also, the percentage of chlorophyll content in the leaves of Chenopodium album plant are carried out at room temperature.

EXPERIMENTAL METHODS AND MATERIAL

To determine the germination behavior of fresh seeds of Chenopodium album Species were collected from Aladoh, Tq. Chikhaldara, Amravati district, Maharashtra. Various seed characteristic like seed size, shape, color and weight of seed/gm would be observed. Seeds were surface-sterilized in a warm water bath to reduce the risk of fungal growth. Thereafter, seeds were chilled in cold distilled water, evenly spread on a piece of germination paper and dried overnight. The solution of Nd (III) in the form of nitrate and Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine of the concentration of 0.01 M was prepared in double distilled water. The applications of ligand, metal and complex solution is studied by dissolving it in proper solvent at different pH and at constant ionic strength of 0.01 M KNO₃ solution. Fertilized soil was collected from agricultural land. It was then grinding and filtered. This soil was filled in two wooden trays and tray was moistened with water. Dried seeds sowing was done in the soil after one and half hour.

EXPERIMENTS PERFORMED

The literature survey reveals that, the organic compound affects the plant growth and yield also. The nitrogen is one of the important nutrients for plant growth. Several references indicate that, if the seeds are soaked in solution containing nitrogen in organic form, they affect the seed germination, i.e. root and shoot elongation. Various chemicals are used in agriculture as an ingredient of various fertilizers to improve the crop yield. Amongst several economical and medicinally important plants Chenopodium album (Bathua) is selected for study.

1. Healthy seeds of Chenopodium album (Bathua) were taken and soaked in 3.5 and 7.00 pH solution for about two hours. These soaked seeds were taken out of each solution and sowed in the wooden tray in a row, during winter and then the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Nd (III), complex on percentage chlorophyll content in the leaves of Chenopodium album plant were studied. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method.

PARAMETERS

The important uses of Bathua (Chenopodium album) species in daily life is persuasive to study its response against metal ion, ligand and its complex regarding to physiological processes, particularly germination is a vital process for the growth of plants. Therefore, this plant is selected.

Plants growth is decided on the basis of parameters such as percentage of germination survival, seedling height, shoot length, root length, (root length / shoot length) and thickness of young leaf having high values compared to control system. The germination was noted after 15 days in bathua plant species. After noting

the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measured.

Table 1
Effect of Ligand, Metal ion and Complex on Germination. on *Chenopodium album* (Bathua)

Test System	Effect of	pH	Parameters						
			%Germination after 15 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	Width of young leaf (cm)
Chenopodium album (Bathua)	Water (Control)	3.5	77.00	83.00	7.08	4.552	9.478	0.4802	3.89
		7.0	82.00	86.00	8.56	4.656	9.698	0.4800	3.97
	Ligand	3.5	88.33	86.33	9.64	6.698	10.852	0.6172	5.87
		7.0	83.66	91.66	7.21	7.963	11.108	0.7168	5.63
	Metal	3.5	78.66	77.66	8.45	3.748	8.563	0.4376	3.96
		7.0	80.66	84.00	9.56	3.986	9.231	0.4318	4.09
	Complex	3.5	79.00	78.33	6.48	4.698	9.125	0.5148	4.12
		7.0	65.66	89.66	6.58	4.025	9.244	0.4354	4.56

Table 2
Estimation of Chlorophyll for *Chenopodium album* (Bathua) Plant System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10 ⁻³	Chlorophyll 'a' gm/lit.x 10 ⁻³	Chlorophyll 'b' gm/lit.x10 ⁻³
1	Control	Chenopodium album (Bathua)	5.986	4.014	1.568
2	Ligand		7.789	6.021	1.649
3	Metal		5.383	4.362	1.433
4	Complex		6.784	4.356	1.104

ligand

RESULTS AND DISCUSSION:

Seed of the target species were taken to study the germination behavior under the influence pre-treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical. The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root and shoot length in ligand Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine increased at all pH than control.

Chlorophyll pigment / chlorophyll control were found affected in *Chenopodium album* (Bathua) plant by the treatments. Total chlorophyll was found to be higher in *Chenopodium album* (Bathua). Total chlorophyll content in Dimethyl [1-(10-H phenothiazin-10-yl) propan-2-yl] amine and complex are higher than in metal and control treatment in targeted plant system.

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वर्ष-४० / अंक-२८ / एप्रिल, २०२३



३२ वें राष्ट्रीय अधिवेशन विशेषांक

संपादक
डॉ. राहुल भगत

कार्यकारी संपादक
डॉ. अर्जुन जाधव

मराठी समाजशास्त्र परिषदेचे मुखपत्र

**समाजशास्त्र संशोधन पत्रिका या वार्षिक नियतकालिकाचे स्वामित्व व इतर बाबी विषयीचे निवेदन
(नियतकालिकांच्या नोंदणी संबंधी नियम ८ प्रमाणे)**

: प्रकाशन स्थळ :

मराठी समाजशास्त्र परिषद, ३२ वें राष्ट्रीय अधिवेशन, दत्ताजीराव कदम कला, विज्ञान आणि वाणिज्य महाविद्यालय,
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राष्ट्रीयत्व : भारतीय

पत्ता : समाजशास्त्र विभाग, दत्ताजीराव कदम कला, विज्ञान आणि वाणिज्य महाविद्यालय, इचलकरंजी, जि.कोल्हापूर.

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पत्ता : द्वारा - समाजशास्त्र विभाग, सेठ नरसिंगदास मोर कला, वाणिज्य व श्रीमती गोदावरी देवी सराफ विज्ञान
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संपादकाचे नाव : डॉ.राहुल जनार्धन भगत, संपादक.

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मालकाचे नाव : मराठी समाजशास्त्र परिषद.

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मी डॉ.राहुल जनार्धन भगत असे जाहीर करतो की, वर दिलेला तपशील माझ्या माहितीप्रमाणे व समजुतीप्रमाणे
खरा आहे.

डॉ.राहुल जनार्धन भगत
प्रकाशक.



समाजशास्त्र संशोधन पत्रिका

मराठी समाजशास्त्र परिषदेचे मुखपत्र

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संपर्क पत्ता:

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मराठी समाजशास्त्र परिषदेच्या आजीव सदस्यांना अंक विनामूल्य.

सूचना: या अंकातील लेखकांनी व्यक्त केलेली मते ही त्या-त्या लेखकांची आहेत. या मतांशी मराठी समाजशास्त्र परिषद अथवा संपादक मंडळ तसेच प्रकाशक, मुद्रक सहमत असेलच असे नाही.



समाजशास्त्र संशोधन पत्रिका

मराठी समाजशास्त्र परिषदेचे मुखपत्र

वर्ष ४० - अंक २८ - एप्रिल, २०२३ (अधिवेशन विशेषांक)

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- डॉ. संपत काळे, टाटा समाजविज्ञान संस्था, तुळजापूर जि. उस्मानावाद.
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६३.	अंधश्रद्धा निर्मूलन चळवळ : वैज्ञानिक दृष्टिकोन	डॉ. संतोष गोविंद गांगर्डे	३०८-३११
६४.	भारतीय नागरिकांची सामाजिक व राजकीय कर्तव्ये एक समाजशास्त्रीय सिंहावलोकन	डॉ. प्रदीप एच. गजभिये	३१२-३१५
६५.	राष्ट्राच्या विकासाकरिता संविधानातील समतेच्या मूल्याची आवश्यकता	डॉ. माधुरी झाडे	३१६-३२०
६६.	कोविड-१९ लॉकडाऊनचा भारतीय महिलांच्यावर झालेल्या सायबर हिंसाचाराचा समाजशास्त्रीय अभ्यास	प्रा. राजेंद्र पुंडलिक पवार	३२१-३२९

शेतकरी चळवळी व वर्तमान कृषी व्यवस्था

{विशेष संदर्भ: महाराष्ट्रातील सन १९८० ते १९९० दरम्यान प्रमुख आंदोलने}

*डॉ. एच. यु. पेटकर.

राष्ट्रीय समाजव्यवस्थेचा अभ्यास करित असताना भारत हा कृषीप्रधान देश आहे यासोबतच भारतीय समाजव्यवस्थेचा प्रमुख गाभा हा कृषी व्यवस्थेशी निगडीत आहे असे आपण अनेकदा भाषणात, वर्तमानपत्रात तसेच मासिकांमध्ये ऐकत, वाचत असतो. आजही ६० टक्क्यापेक्षा अधिक जनता ही ग्रामीण भागात राहते व शेती तसेच शेतीशी निगडित व्यवसाय करतात; परंतु अजुनही त्यांच्या जीवनमानामध्ये परिवर्तन झालेले दिसून येत नाही. भौतिक घटकांमध्ये थोड्याफार प्रमाणात बदल झालेले दिसून येतात परंतु आर्थिक व्यवस्था अजुनही वेताचीच असलेली दिसून येते. याकरिता वेगवेगळे घटक कारणीभूत आहेत सोबतच शासनाची धोरणे धोरणे सुद्धा कारणीभूत आहेत.

डॉ. वावासाहेव आंबेडकरांनी भारतीय कृषी व्यवस्थाविषयी आपली अभ्यासपूर्ण भूमिका विशद केली. त्यांच्या मते शेती व्यवसाय हा मानवी जीवनामध्ये सर्वात महत्त्वाचा व्यवसाय आहे. तो प्राथमिक व सर्वात असा प्राचीन व्यवसाय आहे. मानवाला जीवंत राहण्याकरिता ज्या ज्या घटकाची गरज आहे त्या प्राथमिक गरजांची पूर्तता या व्यवसायामधून केली जाते. यासोबतच शेतीच्या व्यवसायाशी संबंधित पुरक व्यवसाय उदा. दुग्धपालन, मासेमारी, कुक्कुटपालन, शिकार खनिज प्राप्ती करून मानव आपल्या भौतिक गरजांची पूर्तता करित असतो. म्हणून हे ही घटक त्यांच्या जगण्याकरिता साधने ठरतात. मानवाला आवश्यक असणाऱ्या प्राथमिक गरजांची पूर्तता उदा. अन्नधान्याचे उत्पादन शेती व्यवसायामधून करण्यात येते. त्यामुळे शेती व्यवसाय हा सर्वात महत्त्वाचा उद्योग असल्याचे मत 'स्माल होल्डी इन इंडिया' या निबंधात डॉ. वावासाहेव आंबेडकरांनी मांडले.

सामाजिक चळवळ म्हणजे काय? याबाबत सामाजिक विचारवंतांमध्ये एकमत असलेले दिसून येत नाही. तरीदेखील १९ व्या शतकाच्या सुरुवातीला युरोपमध्ये 'सोशल मुव्हमेंट' हा शब्द फार मोठ्या प्रमाणात वापरण्यात आला. तो सामाजिक परिवर्तनाचा काळ होता. शोषित वर्गाच्या उध्दारासाठी काम करणाऱ्या राजकीय व्यक्तींनी नवीन समाजव्यवस्था अस्तित्वात आणण्यासाठी व त्या अनुषंगाने ध्येय-धोरणे आणि आर्थिक संबंध बदलविण्यासाठी जे कार्य केले त्या संदर्भात हा शब्द वापरण्यात आला. इ.स. १९५०च्या सुरुवातीला काही विचारवंतांनी 'सामाजिक चळवळ' या शब्दाची व्याख्या करण्याचा प्रयत्न केला. त्यात पॉल विलकिन्सन ह्यांचे नाव घ्यावे लागते. तसेच हा शब्द प्रथम वापरणाऱ्या रुडॉल्फ हेल्ड, वील स्मेलसर आणि जॉन विल्सन ह्यांची नावे घ्यावी लागतील.

एखाद्या गटाचा समुहाचा किंवा विशिष्ट प्रसंगांना सरकारी दडपशाहीच्या विरोधात लोकांनी केलेल्या प्रतिकारांचाही सामाजिक चळवळ म्हणून उल्लेख केला जातो परंतु जोपर्यंत हा प्रतिकार एखाद्या व्यक्तीचा किंवा काही व्यक्तींचाच असतो तोपर्यंत त्या प्रतिकाराला 'सामाजिकचळवळ' म्हणता येणार नाही असे मत स्कॉट यांनी मांडले.

डेव्हीड वॅलीच्या मते, सामाजिकचळवळ हा 'वेकायदेशीर सामाजिक निषेध' आहे. मात्र ज्यांना समाजात बदल घडवून आणावयाचा आहे त्यांच्या दृष्टीने या कृती कायदेशीरच असतात.

हर्वर्ट ब्लूमर यांच्या मते, "सामाजिक चळवळ हा समूहाने केलेला असा प्रयत्न असतो की, ज्यामुळे जीवनाला एक नवीन दिशा प्राप्त होते"

लॅंग आणि लॅंग यांच्या मते, "सामाजिक चळवळ अशा एका व्यापक आधारावर असते की ज्याचा मुख्य उद्देश प्रस्थापीत सामाजिक व्यवस्थेतील मूलभूत स्वरूपावर प्रभाव टाकून त्यास नवीन स्वरूप प्रदान करणे"

टर्नर आणि विलयन यांच्या मते, "एखाद्या सामाजात किंवा मानवी समूहात लोक सामुहिकरित्या आणि सातत्याने अशी कृती करित राहतात की, जी समाजात विरोध आणि परिवर्तन यांना चालना देते, तिला सामाजिक चळवळ म्हटले जाते"

वरील सर्व व्याख्यांवरून आपल्या असे निदर्शनास येते की, प्रस्थापित व्यवस्थेचे जेव्हा समाजातील विशिष्ट समूहाच्या दृष्टिकोनातून अधिकांश दोष आढळून येते किंवा त्या समूहाच्या प्रगतिला मारक ठरते तेव्हा त्या व्यवस्थेमध्ये परिवर्तन घडवून आणण्याच्या दृष्टीने केलेले सामुहिक प्रयत्न म्हणजे सामाजिक चळवळ अशी सामान्यपणे आपण व्याख्या करू शकतो. महाराष्ट्रातील शेतकरी चळवळीचा इतिहास पाहत असताना त्यांची वैचारिक पार्श्वभूमी आपणास महात्मा

ज्योतिराव फुले यांनी लिहिलेल्या 'शेतकऱ्यांचा असूड' या पुस्तकात दिसून येते. हे पुस्तक महात्मा फुल्यांनी १८८३ मध्ये लिहिले. या पुस्तकामध्ये महात्मा फुल्यांनी शेतकऱ्यांची आर्थिक पिढवणूक / शोषण आणि सावकार, शासकीय धोरणे, सरंजामदार ह्यांच्याकडून होणारे अमानुष शोषण यांचे विस्तृत वर्णन केले आहे. महात्मा फुल्यांनी कर्जात जन्मणाऱ्या जगणाऱ्या आणि मरणाऱ्या शेतकऱ्यांची परिस्थिती सुधारण्याकरिता वैज्ञानिक दृष्टिकोन देऊन त्याचा विकास साधण्याची कल्पना त्यांनी मांडली.

स्वातंत्र्यानंतरच्या कालखंडामध्ये भारतात शेतकऱ्यांची अनेक आंदोलने झालेली दिसून येतात. अशा अनेक आंदोलनामध्ये प्रामुख्याने डाव्या पक्षाचा व साम्यवादी पक्षाचा मोठ्या प्रमाणात पुढाकार असलेला दिसून येतो. यामध्ये विशेषत्वाने बंगालमधील तेभाग आंदोलन, तेलंगणामधील शेतकरी उठाव आणि वारली आदिवासींचे आंदोलन यांचा उल्लेख येतो. नंतरच्या काळामध्ये जमिनदारी निर्मूलन, कमाल जमीन धारण कायदा, कसेल त्याची जमिन या तत्त्वावर कुळ कायदे हे एकामागून एक संमत झाले. महाराष्ट्रामध्ये सन १९८० ते ९० च्या दरम्यान अनेक आंदोलने झाली ही आंदोलने 'शेतकरी संघटना' यांनी केलीत. या आंदोलनांना बऱ्यापैकी यश देखील मिळाले. या आंदोलनाचा अभ्यास संशोधनकर्त्यांनी संशोधन पेपरमध्ये केला आहे. संशोधनकर्ताहा एका शेतकरी कार्यकर्त्याची मुलगा आहे. त्याने हे आंदोलने लहानपणापासूनच वधितले आहे. तसेच आज तो प्राध्यापक म्हणून मागील बावीस वर्षांपासून कार्यरत आहे. आजही शेतकऱ्यांची स्थिती व महाराष्ट्रामध्ये १९८० ते १९९० च्या दरम्यान झालेली आंदोलने यांचा अभ्यास करण्याकरिता त्याने 'महाराष्ट्रातील शेतकरी चळवळी व आधुनिक कृषी व्यवस्था' या विषयाची निवड केली आहे.

संशोधनाचे उद्देश

- १) महाराष्ट्रामध्ये सन १९८० ते १९९० च्या दरम्यान झालेल्या आंदोलनाचे अध्ययनकरणे.
- २) या आंदोलनाचे स्वरूप जाणून घेणे.
- ३) आंदोलनाची फलश्रुती जाणून घेणे.
- ४) वर्तमान कृषी व्यवस्थेविषयी माहिती जाणून घेणे.

गृहीतकृत्ये

- १) महाराष्ट्रामध्ये १९८० ते १९९० च्या दरम्यान शेतकरी संघटनेने मोठ्या प्रमाणात आंदोलने केलीत.
- २) या आंदोलनामुळे मुख्यतः नगदी पिक घेणाऱ्या शेतकऱ्यांना फायदा झाला.
- ३) वर्तमान कृषी व्यवस्था व सरकारी कायदे शेतकऱ्यांवर आघात करणारे आहेत.

कांदा आंदोलन (मार्च १९८०)

चाकणच्या बाजारामध्ये कांद्याचे भाव एकदम गडगडले त्यामुळे शेतकरी संघटनेने १ मार्च १९८० ला रास्ता रोको आंदोलन केले. १० मार्चला शेतकऱ्यांनी आपआपल्या बैलवंडीद्वारे चाकण येथे पुणे-नाशिक महामार्ग बंद करण्याचा सत्याग्रह सुरु केला या आंदोलनामध्ये खूप मोठ्या संख्येने शेतकरी सहभागी झाले होते. शेवटी १५ मार्च ला शामनाने नाफेड या सरकारी खरेदी विक्री संस्थेतर्फे कांदा खरेदी करणार अशी घोषणा केली. यासोबतच या आंदोलनातील बहुतांश मागण्या मान्य झाल्यामुळे शेतकरी संघटनेने आंदोलन मागे घेतले. परंतु एप्रिल महिन्यामध्ये शासनाने कांदा खरेदी बंद केल्यामुळे शेतकऱ्यांनी परत आंदोलन केले त्यामुळे शासनाने कांदा खरेदीची घोषणा केली त्यामुळे आंदोलन मागे घेण्यात आले.

ऊस आंदोलन (ऑगस्ट ते नोव्हेंबर १९८०)

ऊसाला ३०० रुपये प्रतिटन भाव मिळावा याकरिता नाशिक जिल्ह्यातील निफाड तालुक्यातील ऊस उत्पादकांनी शेतकरी संघटनेच्या नेतृत्वाखाली आंदोलनाची तयारी केली. यामध्ये गळतीच्या हंगामात साखर कारखानदारांना ऊस न देण्याचा ठराव करण्यात आला. साखर कारखाना महासंघाचे माधवराव बोरले यांनी शेतकऱ्यांच्या या मागणीला पाठिंबा दर्शविला. पण इतर कारखान्यांनी मात्र सरकारच्या माध्यमातून दडपण आणण्याचा प्रयत्न सुरु केला. यामध्ये ऊसाच्या पिकासाठी आवश्यक पाणीपुरवठा व विजपुरवठा बंद केला तेव्हा १० नोव्हेंबरला नाशिक-धुळे-अहमदनगर जिल्ह्यातील शेतकऱ्यांनी 'रास्ता रोको' आंदोलन सुरु केले. तसेच खेरवाडी येथे 'रेल रोको' आंदोलन सुरु केले. ही आंदोलने अतिशय शांततामय मार्गाने चालू असतानाच पोलीसांनी १० नोव्हेंबरला शेतकऱ्यांवर लाठीमार व गोळीबार केला. यामध्ये दोन शेतकऱ्यांचा मृत्यू झाला. शेतकरी नेत्यासह अनेकांना अटक झाली. शेतकरी नेते शरद जोशी यांनी तुरुंगात आंदोलन सुरु केले. २० नोव्हेंबरला विदर्भातील शेतकऱ्यांनी एक दिवस चक्का जाम आंदोलन करून ऊस उत्पादक शेतकऱ्यांच्या आंदोलनाला पाठिंबा दर्शविला यामध्ये हजारो शेतकऱ्यांनी अटक करवून

घेतली. शरद जोशींनी २४ नोव्हेंबरला उपोषण मोडले व २७ नोव्हेंबरला महाराष्ट्राच्या मुख्यमंत्र्यांनी ऊमाना ३०० रु. प्रति क्विंटल भाव देण्याची घोषणा केली.

दूध आंदोलन (जून १९८२)

धुळयामध्ये आयोजित करण्यात आलेल्या शेतकरी संघटनेच्या मेळाव्यामध्ये २२ एप्रिल १९८२ ला दूध आंदोलनाची घोषणा करण्यात आली. यामोवतच शेतकरी विरोधी असलेल्या शासकीय धोरणाम हानून पाडण्याकरिता 'कर्जमुक्ती' व 'स्वदेशी' या चळवळी हाती घेण्याचे ठरविले. संघटनेच्या मागणीनुसार दुधाचे भाव वाढवून मिळणार नाही असे शासनाकडून उत्तर मिळताच २८ जून १९८२ ला दूध आंदोलन सुरु करण्यात आले. मात्र नाशिक, पुणे, धुळे, सांगली, सातारा इत्यादी जिल्ह्यामध्ये थोडाफार प्रतिसाद वगळता इतरत्र मात्र या आंदोलनाला प्रतिमाद मिळाला नाही त्यामुळे हे आंदोलन फसले. शेतकरी संघटनेने हे मान्य करित आंदोलन मागे घेतले व त्यानंतर धुळे जिल्ह्यामध्ये मे १९८२ मध्ये या आंदोलनाच्या दुसऱ्या टप्प्याला सुरुवात झाली. दुधाच्या भावात वाढ न करण्याच्या शासनाच्या धोरणाचा निषेध करून शासनाचा विरोध असूनही धुळे जिल्हाधिकारी कार्यालयावर गाई गुरासह मोर्चा नेण्यात आला. पोलीसांनी या मोर्चावर जबर लाठीहल्ला करून ते आंदोलन उधळून लावले.

कापूस आंदोलन (नोव्हेंबर-डिसेंबर १९८६)

२३ नोव्हेंबर १९८६ रोजी शेतकरी संघटनेने कापूस उत्पादकांचे आंदोलन सुरु केले. यामध्ये विदर्भातील नागपूर, चंद्रपूर, वर्धा, अमरावती, यवतमाळ, अकोला, बुलडाणा या जिल्ह्यात आणि मराठवाड्यामध्ये परभणी व नांदेड या जिल्ह्यामध्ये शेतकरी संघटनेने 'रास्ता रोको' आंदोलन केले. या आंदोलनात खुप मोठ्या प्रमाणात शेतकऱ्यांचा सहभाग असताना देखील शांततेत पार पडले त्यापुढच्या टप्प्यात कृत्रीम धाग्याची वस्त्र घालणाऱ्या प्रवाशांना अडविणे व त्यांच्या कापडावर संघटनेचा शिक्का मारणे असा कार्यक्रम आखण्यात आला तसेच रेल रोकोचाही निर्णय घेण्यात आला. त्यामुळे ८ ते १० हजार शेतकऱ्यांना अटक देखील करण्यात आली. सरकारने हे आंदोलन संपविण्याचे आटोकाट प्रयत्न केले. कापूस उत्पादकांचा पुढचा टप्पा कृत्रीम धाग्याच्या वस्त्राची खरेदी विक्रीपासून परावृत्त करण्याकरिता दुकानांसमोर पिकेटिंग करणे हा होता. परंतु हे आंदोलन सुरु होण्यापूर्वीच शासनाने शेतकरी मागत असलेली कापसाची किंमत मान्य केली तसेच एकाधिकार कापूस खरेदी योजना व निर्यातवाढ यासंबंधिच्या संघटनेच्या मागण्या मान्य केल्या.

कर्जमुक्ती आंदोलन (१९८८-८९)

शेतकऱ्यांच्या शेतीमालाला योग्य भाव मिळत नसल्याने शेतकऱ्यांची लुट होते. अशा तुटीचा धंदा करण्यासाठी सरकार जे कर्ज देते त्याची परतफेड करणे शेतकऱ्यांना जवळपास अशक्य आहे म्हणून शेतकऱ्यांना या कर्जातून मुक्त करावे असा दृष्टिकोन कर्जमुक्ती आंदोलनामागे होता. हे आंदोलन रस्त्यावर उतरून लढायचे नव्हते तर ते न्यायालयात लढायचे होते. शेतकरी संघटनेने गावोगावी शेतकऱ्यांना कर्जमुक्तीचे अर्ज वाढून ते भरून घेऊन न्यायालयामध्ये दाखल केले व कर्जवसुलीवर स्थगिती आणली. ही न्यायालयीन लढाई वऱ्याच दीर्घकाळपर्यंत चालली दरम्यान केंद्र सरकारने व नंतर राज्य सरकारनी कर्जमाफीची योजना मंजूर केली.

महाराष्ट्रामध्ये १९८० ते १९९० च्या दरम्यान याव्यतिरिक्त तंवाखू आंदोलनाची देखील सुरुवात झाली तसेच शेतकरी संघटनेने अनेक मेळावे, परिषदांचे देखील आयोजन केलीत व यामधूनच वेगवेगळ्या आंदोलनांना दिशा मिळत गेली. वरील आंदोलनापैकी दुध आंदोलन वगळता सर्व आंदोलने ही यशस्वी झालीत याचे श्रेय वऱ्या अर्थाने शेतकरी संघटनेच्या एकजुटीला व एकात्मतेला जाते.

आधुनिक कृषी व्यवस्था :

सर्व राजकीय, सामाजिक कार्यकर्त्यांच्या भाषणामध्ये सातत्याने भारत हा कृषीप्रधान देश आहे असे शब्द आपल्या कानावर पडतात. परंतु याच राजकीय व्यवस्थेने आपल्या कृषीप्रधान देशातील कृषी व्यवस्थेकरिता काय केले याचा विचारही तेवढाच महत्त्वाचा आहे. जर कृषीप्रधान देशासाठी शेती करणाऱ्या शेतकऱ्यांची स्थिती ही चांगली असावयास हवी होती. त्यांचे जीवनमान उंचावयास पाहिजे होते परंतु मात्र परिस्थिती फार वेगळी आहे. मागील २०-२५ वर्षात तर शेतकऱ्यांची स्थिती अतिशय खालावलेली असून मराठवाडा, विदर्भातील अनेक शेतकऱ्यांवर आत्महत्या करण्याची वेळ आली आणि त्या आत्महत्यांमध्ये सतत वाढ होताना दिसून येत आहे. शेतीसंदर्भात शासकीय पातळीवर कोणतेही सरकार गंभीर असल्याचे दिसून येत नाही. जागतिकीकरण, मुक्त अर्थव्यवस्था, जागतिक व्यापार संघटना यांचेही भारतीय कृषी अर्थव्यवस्थेवर गंभीर परिणाम झाले.

१९९७ पासून जागतिक पातळीवर भारताची ओळख ही कापूस आयातदार देश म्हणून होऊ लागली. आपल्या देशातील पंचविस हजार कापूस उत्पादकांना दरवर्षी सरासरी ३ अब्ज डॉलरपेक्षा अधिक अनुदान देणाऱ्या अमेरिकेतून कापूस भारतात येणार असेल तर या विषयामध्ये भारतीय कापूस उत्पादक शेतकऱ्यांचा निभाव कसा लागणार व कापसात असलेली जागतिक मंदी मोठ्या प्रमाणात अनुदानीत कापूस आयात होणार अशा परिस्थितीत भारतीय शेतकऱ्यांना कोणत्याही प्रकारचे संरक्षण नाही या कचाट्यामध्ये तो कसा तग धरणार ? साधारणतः १५ वर्षांपूर्वी ५० ते ६० टन गव्हाची आयात केल्या गेली. गव्हावरचे आयात शुल्क हटविण्यात आले. गव्हाच्या आयातीचे मुक्त परवाने देण्यात आले. देशात दरवर्षी सरासरी ५० ते ६० लाख टन खाद्यतेलाची आयात होते त्याकरिता पंधरा हजार कोटी रुपयाचे परकीय चलन मोजल्या जाते. डाळीच्या आयातीतही मोठ्या प्रमाणात वाढ होत आहे. उलट मक्याचे भाव थोडेबहुत वाढल्याबरोबर मक्यावर निर्यातबंदी लादल्या जाते. कांदा महाग झाल्याबरोबर 'कांद्याने आणले डोळ्यात पाणी' म्हणून हाकाटी होते. चीन व पाकिस्तानमधून तात्काळ कांदा आयात केला जातो. परंतु कांदा जेव्हा स्वस्त होतो तेव्हा कोणाच्याच डोळ्यात पाणी येत नाही.

भारत हा कृषीप्रधान देश आहे असे आपण सगळेजण म्हणत असतो परंतु स्वातंत्र्याच्या ७५ वर्षांनंतर कर्मचाऱ्यांकरिता सातवा वेतन आयोग येतो परंतु शेतकऱ्यांसाठी एकच राष्ट्रीय शेतकरी आयोग आणि त्यांच्याही शिफारशीला केराची टोपली दाखविली जाते.

आज भारतीय शेतीवर चारही दिशांनी मारा होताना दिसतो आहे तो थोपविण्याकरिता आम्ही प्रयत्न करीत नाही तर त्यावर वरपांगी मलमपट्टी करण्याचे काम करतो. आजही शेतकऱ्यांच्या जीवावर येईपर्यंत आम्ही त्यांच्याकडे दुर्लक्ष करतो व त्यानंतर उलट्या बोंबा मारणे चालू करतो. (उदा. व्यसनाधिनता, कर्जवाजारीपणा, मुलीचे लग्न, सामाजिक प्रतिष्ठा इत्यादी) यामुळे शेतकरी आत्महत्या करतो. परंतु अनेक वर्षांपासून ठोस पावले उचलली नाहीत तर उलट नवनवीन कायदे करून त्यांना फसविण्याचेच प्रयत्न करीत आहोत. आजची आमच्या शासनाची निती ही शेतकरी विरोधी असून भांडवलशाही धार्जिने असल्याचे दिसून येते. त्यामुळेच आज आमच्या शेती व्यवसायावर फार मोठी संकटे येत आहेत.

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प्रत्यक्ष विदेशी गुंतवणूकीचा महाराष्ट्राच्या अर्थव्यवस्थेवर झालेला परिणाम

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प्रस्तावना

भारतात महाराष्ट्र राज्य प्रगतिशील राज्य म्हणून ओळखले जाते. महाराष्ट्र राज्य हे भारतात औद्योगिकीकरणात प्रथम क्रमांकाचे राज्य आहे. परकीय गुंतवणूकदार व देशांतर्गत गुंतवणूकदारांनी महाराष्ट्रात गुंतवणूक करण्यास नेहमीच प्राधान्य दिले आहे. १९९१ च्या भारताच्या नवीन औद्योगिक धोरणामुळे भारतात जागतिकीकरण, उदारीकरण व खाजगीकरणाला उत्तेजन मिळाले. त्यानंतर उदार औद्योगिक धोरणाला उदार व्यापार धोरणाची जोड मिळाली. या सगळ्यांचा परिणाम भारताच्या अर्थव्यवस्थेवर झाला आहे. तसाच तो महाराष्ट्राच्या औद्योगिक क्षेत्रावर देखील झाला आहे. अधिक प्रमाणात गुंतवणूक आकर्षित करण्यासाठी भारतात १९९१ नंतर राज्याराज्यांमध्ये स्पर्धा सुरू झाली आहे. परकीय गुंतवणूक आकर्षित करण्यासाठी पायाभूत सुविधा उपलब्ध असणे महत्त्वाचे आहे. पायाभूत सुविधांवर (धोरणात्मक, संस्थात्मक, भौतिक आणि वित्तीय) प्रत्यक्ष विदेशी गुंतवणूकीचा प्रवाह अवलंबून आहे.

भारतात सर्वाधिक औद्योगिकीकरण, कर देणारे व प्रत्यक्ष विदेशी गुंतवणूक होणारे राज्य म्हणून महाराष्ट्राला ओळखले जाते. महाराष्ट्रात जून २००७ पर्यंत भारतातील एकूण प्रत्यक्ष विदेशी गुंतवणूकीच्या २४.३८ टक्के गुंतवणूक महाराष्ट्रात झाली आहे. ही गुंतवणूक इतर राज्यांपेक्षा सर्वाधिक आहे.

१९९१ नंतर महाराष्ट्राचा सकल अंतर्गत उत्पादितांमध्ये वाढ झाली आहे. १९९३-९४ मध्ये (निव्वळ सकल उत्पादन चालू किंमतीनुसार) महाराष्ट्राचे उत्पन्न १,०१,७६७ कोटी रु. होते. २००४-०५ या वर्षी हे उत्पन्न ३,२८,४५० कोटी रु. झाले. या १० वर्षात महाराष्ट्राच्या सकल अंतर्गत उत्पादितांमध्ये जवळपास तीनपट वाढ झाली आहे. महाराष्ट्रात दरडोई उत्पन्न चालू किंमतीनुसार १९९२-९३ मध्ये १२,१८३ रु होते.

२००४-०५ मध्ये ते ३२,१७० रु. झाले आहे. या वर्षात महाराष्ट्राच्या दरडोई उत्पन्नामध्ये अडीच पट वाढ झाली आहे.

भारतात सर्वात प्रगतिशील राज्या म्हणून महाराष्ट्राची राज्याची वेगळी अशी ओळख आहे. अनेक क्षेत्रांमध्ये महाराष्ट्र राज्याने मोठ्या प्रमाणात प्रगती केली आहे. औद्योगिक क्षेत्रात प्रथम क्रमांकाचे महाराष्ट्र राज्य आहे. भारतातील एकूण उद्योगांपैकी सर्वात जास्त उद्योग महाराष्ट्र राज्यात स्थापना झाले आहे. त्याचप्रमाणे भारतातील २३ शेअर बाजारापैकी महाराष्ट्रातील मुंबई शेअर बाजारात सर्वाधिक आर्थिक उलाढाल होते. यांचा अर्थ महाराष्ट्र राज्य हे प्रगतिशील राज्य आहे. यामध्ये कोणतेही दुमत नाही.

भारतात होणाऱ्या प्रत्यक्ष विदेशी गुंतवणूकीमध्ये राज्यनिहाय सर्वाधिक गुंतवणूक महाराष्ट्र राज्यात झालेली आहे. प्रत्यक्ष विदेशी गुंतवणूकीला आकर्षित करणारे महाराष्ट्र राज्य प्रथम क्रमांकाचे आहे. यामुळे महाराष्ट्र राज्यात औद्योगिकीकरणाला मोठ्या प्रमाणात चालना मिळाली आहे. कोणत्याही राज्याचा औद्योगिकीकरणाशिवाय आर्थिक विकास होऊ शकत नाही. म्हणून महाराष्ट्राचा जो आज आर्थिक विकास झाला आहे त्याचे श्रेय औद्योगिकीकरणाला द्यावे लागते.

परकीय गुंतवणूकदारांना आकर्षित करण्यासाठी राज्यात चांगल्या प्रकारची पायाभूत सुविधा उपलब्ध करावी लागते. महाराष्ट्र राज्यात ही पायाभूत सुविधा उपलब्ध असल्यामुळे परकीय गुंतवणूकदार महाराष्ट्राकडे आकर्षित झाले आहे. औद्योगिक विकास हा बऱ्यास अंशी पायाभूत सुविधा (रस्ते, पाणीपुरवठा, संदेशवहन व कच्चा माल इ.) वर अवलंबून असतो. महाराष्ट्र राज्याने पायाभूत सुविधांवर अधिक प्रमाणात लक्ष केंद्रित केले आहे. जुलै २००७ पर्यंत महाराष्ट्रात प्रत्यक्ष विदेशी गुंतवणूकीच्या ३,९८२ प्रस्तावातून ७०,८५६ कोटी रु. गुंतवणूक अपेक्षित आहे. भारतातील एकूण प्रत्यक्ष विदेशी गुंतवणूकीच्या २० टक्के गुंतवणूक ही एकट्या

महाराष्ट्र राज्यात झाली आहे. त्यामुळे अधिक प्रमाणात परकीय गुंतवणूक झाल्यामुळे याचा परिणाम महाराष्ट्राच्या अर्थव्यवस्थेवर झाला आहे. मोठ्या प्रमाणात प्रत्यक्ष विदेशी गुंतवणूक झाल्यामुळे रोजगार, निर्यात राज्याचा संकल अंतर्गत उत्पादितांचा दर आणि उत्पादन घटकांवर त्याचा परिणाम झाला आहे. खालील तक्त्यात तक्ता क्र. ४.१६ मध्ये उपलब्ध झालेल्या आकडेवारी नुसार प्रत्यक्ष विदेशी गुंतवणूकीमुळे महाराष्ट्राच्या निर्यातीमध्ये कशी वाढ झाली आहे. याचे विवेचन करण्यात आले आहे.

तक्ता क्र. ४.१६

वर्षानिहाय महाराष्ट्रातून होणारी निर्यात (रु. लाखांमध्ये)

वर्ष	महाराष्ट्रातून होणारी निर्यात	भारतातील एकूण निर्यात
१९८८-१९९६ ते १९९९-२००५	१,६४,९४९	६,५९,६१३
२००५-२००६	५०,६२७	२,०२,५०९
२००६-२००७	६६,९३,७६०	१,६७,०३,८८०
२००७-२००८	६३,१९,७४९	२,५२,७८,९९७
२००८-२००९	७३,३४,१६९	२,९३,३६,६७५
२०१०-२०११	१,८०,९३,९५८	३,६१,८७,९१६
२०११-२०१२	१,१३,६९,९९९	४,५४,७९,९९७
एकूण	५,००,२७,२११	१५,३८,४९,५८७
टक्केवारी	३५%	१००%

Source: MVIRDC Wrlld Trade Centre, Mumbai.

वरील तक्त्यावरून महाराष्ट्रातून २००५-२०१२ कालावधीत वर्षानिहाय किती निर्यात झाली याचे विवेचन करण्यात आले आहे. महाराष्ट्रातून होणाऱ्या निर्यातीमध्ये प्रत्यक्ष विदेशी गुंतवणूक केलेल्या निर्यातीचादेखील समावेश आहे. वरील २००५-२०१२ या १० वर्षांच्या कालावधीचा विचार केल्यास असे दिसून की, भारतातून एकूण होणाऱ्या निर्यातीचा जवळपास ३५ टक्के निर्यात एकट्या महाराष्ट्र राज्यातून केली जाते. त्यामुळे भारताचा निर्यातीमध्ये महाराष्ट्राचे योगदान अत्यंत महत्त्वपूर्ण आहे.

महाराष्ट्रातून २००५ ते २०१२ कालावधीत ५,००,२७,२११ लाख रु. निर्यात करण्यात आलेले आहे. त्यामुळे निर्यातीमध्ये वाढ घडवून आणण्यामध्ये प्रत्यक्ष विदेशी गुंतवणूकीचे योगदानदेखील महत्वाचे आहे. वरील विश्लेषणावरून असे दिसून येते की, भारतात महाराष्ट्र राज्य हे निर्यातीमध्ये प्रथम क्रमांकाचे राज्य आहे.

भारतातील राज्यनिहाय निर्यातीविषयी कामगिरी खालील तक्त्यात तक्ता क्र. ४.१७ मध्ये उपलब्ध आकडेवारी नुसार दर्शविली आहे. ही आकडेवारी २००६-०७ या आर्थिक वर्षातील आहे.

तक्ता क्र. ४.१७

भारतात राज्यनिहाय निर्यातीची कामगिरी

(२००६-०७)

अ. क्र	राज्य	२००६-०७ (US \$ मिलियन)	हिस्सा (%)	वृद्धीदर (%)
१	महाराष्ट्र	३६,१४३	२८.६	१३.०
२	गुजरात	२४,२०९	१९.२	६६.१
३	तामिळनाडू	१३,०९७	१०.४	२९.४
४	कर्नाटक	१२,६७६	१०.०	१३.८
५	आंध्र प्रदेश	५,४७९	४.३	३५.९
६	दिल्ली	४,८८०	३.९	७.२
७	पश्चिम बंगाल	४,०११	३.२	१२.६
८	हरियाणा	३,७९२	३.०	१६.१
९	उत्तर प्रदेश	३,६३२	२.९	७.२
१०	राजस्थान	३,३५६	२.७	२०.३
११	केरळ	२,२९३	१.८	१६.१
१२	पंजाब	२,१४८	१.७	८.९
१३	मध्य प्रदेश	१,९९३	१.६	२५.०
१४	ओरिसा	१,९७१	१.६	३५.५
	एकूण	१,२६,३६०	१००.०	२२.६

Source: Economic Survey of India, 2007-2008

वरील तक्त्यामध्ये भारतात राज्यनिहाय निर्यातीचे प्रमाण किती आहे. याचे विश्लेषण दिले आहे. २००६-०७ एक वर्षाची आकडेवारी दिली आहे. सर्वाधिक निर्यात महाराष्ट्र राज्यातून (३६,१४३, US \$ Milion) झाली आहे. एकूण निर्यातीचे हे प्रमाण २८.६ टक्के आहे. त्याचप्रमाणे महाराष्ट्राचा निर्यातीचा वृद्धीदर १३.० टक्के आहे. निर्यातीमध्ये प्रथम पाच राज्यांमध्ये महाराष्ट्र २८.६ टक्के, गुजरात १९.२ टक्के, तामिळनाडू १०.४ टक्के, कर्नाटक १०.० टक्के आणि आंध्रप्रदेश ४.३ टक्के सर्वात कमी निर्यात ओरिसा राज्यातून १,९७१ US \$ मिलियन डॉलर झाली आहे. २००६-०७ या वर्षात एकूण १,२६,३६० US \$ मिलियन निर्यात भारतातून झाली आहे. या निर्यातीमध्ये प्रत्यक्ष विदेशी गुंतवणूकीमुळे देखील निर्यातीमध्ये वाढ झाली. त्यामुळे निर्यातीमध्ये प्रत्यक्ष विदेशी गुंतवणूकीचे योगदान नाही असे म्हणता येणार नाही. म्हणून भारतात व महाराष्ट्र राज्यावर

प्रत्यक्ष विदेशी गुंतवणूकीचा सकारात्मक परिणाम झाला आहे. हे वरील विश्लेषणावरून दिसून येते.

महाराष्ट्राच्या निर्यातीवर प्रत्यक्ष विदेशी गुंतवणूकीचा काही प्रमाणात प्रभाव झाला आहे. निर्यातीनंतर महाराष्ट्राच्या निव्वळ उत्पादनाची स्थिती २००४-०५ ते २०११-१२ या कालखंडात कशी होती याचे विश्लेषण खालील तक्त्यामध्ये दिले आहे. या निव्वळ अंतर्गत उत्पादितामध्ये प्रत्यक्ष विदेशी गुंतवणूकीपासून उत्पादित झालेल्या उत्पादनाचा देखील समावेश होतो. खालिल तक्त्यात तक्ता क्रं ४.१८ मध्ये उपलब्ध झालेल्या आकडेवारी नुसार महाराष्ट्राचे निव्वळ अंतर्गत उत्पादन दर्शविले आहे.

तक्ता क्र. ४.१८

महाराष्ट्राचे निव्वळ अंतर्गत उत्पादन (चालू किंमतीला)
(कोटी रू. मध्ये)

वर्ष	निव्वळ अंतर्गत उत्पादन
१९९९-२००४	५९,३२५
२००४-०५	१,१६,५०७
२००५-०६	१,४०,७३०
२००६-०७	१,५८,६८३
२००७-०८	१,१७,६१७
२००८-०९	१,९०,७४६
२००९-१०	२,१६,६८४
२०१०-११	२,१३,०४०
२०११-१२	२,४१,८७७

Source-Indian Public Finance Statistics -2011-2012.

वरील तक्त्यामध्ये महाराष्ट्र राज्याचे निव्वळ अंतर्गत उत्पादन चालू किंमतीला दर्शविले आहे. १९९९ ते २००४ या कालावधीत ५९३२५ कोटी रु. होते. २०११-२०१२ मध्ये २,४१,८७७ कोटी रु. झाले आहे. या १०-११ वर्षात महाराष्ट्र राज्याच्या निव्वळ अंतर्गत उत्पादितामध्ये ४ पटीनी वाढ झाली आहे. १९९९ नंतर भारतात प्रत्यक्ष विदेशी गुंतवणूकीला प्रोत्साहन देण्यात आले आहे. त्यामुळे महाराष्ट्रातदेखील प्रत्यक्ष विदेशी गुंतवणूकीचे प्रमाण वाढले. त्यामुळे महाराष्ट्राच्या एकूण अंतर्गत उत्पादनांमध्ये वाढ झाली आहे, याचा अर्थ प्रत्यक्षपणे प्रत्यक्ष विदेशी गुंतवणूकीचा महाराष्ट्राच्या निव्वळ अंतर्गत उत्पादितावर देखील परिणाम झालेला आहे. म्हणूनच महाराष्ट्राच्या उत्पादनांमध्ये वाढ झाली आहे.

महाराष्ट्रात प्रत्यक्ष विदेशी गुंतवणूक व इतर स्वरूपाच्या गुंतवणूकीमुळे मोठ्या प्रमाणात गुंतवणूक

झाली आहे. अशा विविध स्वरूपाच्या गुंतवणूकीमुळे महाराष्ट्रात मोठ्या प्रमाणात उत्पादनात वाढ झाली आहे. तसेच गुंतवणूकीत वाढ झाल्यामुळे महाराष्ट्र राज्यात मोठ्या प्रमाणात रोजगारात वाढ झाली आहे. महाराष्ट्राच्या आर्थिक विकासामध्ये विविध स्वरूपाच्या गुंतवणूकीचे योगदान अत्यंत महत्त्वाचे आहे.

देशाचा आर्थिक विकास करण्यासाठी भांडवल संचय करण्यासाठी गुंतवणूक महत्त्वाची आहे. गुंतवणूकीत वाढ झाल्यास रोजगारात वाढ होते. रोजगार वाढल्यामुळे उत्पादनात वाढ होते. उत्पादन वाढीमुळे देशाचे उत्पन्न, दरडोई उत्पन्न, राहणीमानाचा दर्जा अशा प्रकारे देशामध्ये विकासाची प्रक्रिया सुरू होते. म्हणून देशाच्या विकासामध्ये गुंतवणूकीस अनन्य साधारण महत्त्व आहे.

महाराष्ट्रात परकीय गुंतवणूक प्रस्ताव आणि रोजगार :

महाराष्ट्र राज्य हे औद्योगिक क्षेत्रात भारतातील प्रथम क्रमांकाचे राज्य मानले जाते. अनेक विदेशी व अंतर्गत गुंतवणूकदारांनी महाराष्ट्रात गुंतवणूकीला प्राधान्य दिले आहे. गुंतवणूक झाल्यामुळे महाराष्ट्रात औद्योगिकीकरणाचे प्रमाण वाढले आहे. औद्योगिकीकरणामुळे महाराष्ट्रात रोजगारांच्या संधी देखील मोठ्या प्रमाणात उपलब्ध झाल्या आहेत. महाराष्ट्रात १९९९ पासून ते आजपर्यंत वेगवेगळ्या स्वरूपाची गुंतवणूक झाली आहे. यामध्ये प्रत्यक्ष विदेशी गुंतवणूक, औद्योगिक संयोजक पत्रिका इत्यादी मार्फत मोठ्या प्रमाणात गुंतवणूक झाली आहे. खालील तक्त्यामध्ये वरील विविध स्वरूपाच्या गुंतवणूक प्रस्तावांची संख्या व रोजगार निर्मिती किती झाली आहेत. या विषयी विवरण दिले आहे. आणि रोजगार निर्मिती किती झाली हे एकत्रित देण्यात आले आहे. खालिल तक्त्यात तक्ता क्रं ४.१९ उपलब्ध माहितीच्या आधारे मध्ये महाराष्ट्र इंडस्ट्रियल एंटरप्रेन्योर्स मेमोरेंडम यामध्ये होणारी गुंतवणूक व रोजगार दर्शविलेला आहे.

तक्ता क्र. ४१९

महाराष्ट्र इंडस्ट्रियल एंटरप्रेन्योर्स मेमोरेंडम यामध्ये
होणारी गुंतवणूक व रोजगार (ऑगस्ट १९९६ ते जुलै
२०१२) (रूपये कोटीमध्ये)

वर्ष	मंजूर प्रस्ताव	गुंतवणूक	श्रोजगार
१९९६-९७	८१०	२०६९३	१५०५३१
१९९७-९८	१०४६	२२८१६	१७८२८४
१९९८-९९	१६१६	१९७५३	२२९६४६
१९९९-२०	११९६	२३३७३	१६०३३८
२०००-०१	१२७४	२३९५३	२१०३५०
२००१-०२	१०२९	१९९२७	१२९८१६
२००२-०३	८२९	१३४०६	८४५३७
२००३-०४	१५३७	४६०६७	२९१५११
२००४-०५	१३७६	५७९९५	१५०४५७
२००५-०६	११००	१५८०३	१२०१७१
२००६-०७	११८२	१३८७७	१००६३३
२००७-०८	१०५५	२२७६१	७५०१६
२००८-०९	१०४६	१०४०६	१२४९५०
२००९-१०	१००३	१५३५५	९४२१०
२०१०-११	९५३	२८६६८	१२०१६९
२०११-१२	९४५	१०५१९३	२७६१७९
एकूण	१८०५१	४६००५६	२५०६७९८

Source: IDM For Month of Oct. 2007, SIA Statistics, New Delhi.

Not – IEMs-Industrial Entrepreneurs Memorandums

LOI – Letter of Intent

EOUs-Export Oriented Units

वरील तक्त्यामध्ये महाराष्ट्रात महाराष्ट्र इंडस्ट्रियल एंटरप्रेन्योर्स मेमोरेंडम यामध्ये झालेली गुंतवणूक आणि रोजगार निर्मिती दर्शविली आहे. महाराष्ट्रात १९९६-९७ यावर्षी सर्व प्रकारच्या गुंतवणूक माध्यमातून ८१० प्रस्ताव मंजूर झाले आहेत. या प्रस्तावामध्ये २०६९० कोटी रु. गुंतवणूक अपेक्षित आहे. या गुंतवणूकीमध्ये १५०५३१ रोजगार निर्मिती होईल अशी अपेक्षा आहे. २०११-१२ या वर्षात या गुंतवणूकीचे ९४५ प्रस्ताव मंजूर झाले आहेत. यातून १०५१९३ कोटी रु. गुंतवणूक होणार आहे. तसेच २७६१७९ लोकांना रोजगार मिळेल अशी अपेक्षा आहे. या १७ वर्षात (१९९६-२०१२) विविध स्वरूपाच्या गुंतवणूकीचे एकूण १८०५१ प्रस्ताव आतापर्यंत मंजूर झाले आहेत. या प्रस्तावांमधून ४६००५६ कोटी रु. गुंतवणूक महाराष्ट्रात होणे अपेक्षित आहे. या गुंतवणूकीमुळे २५०६७९८ लाख लोकांना रोजगार उपलब्ध होणार आहे. मागील १७ वर्षात महाराष्ट्रात मोठ्या प्रमाणात गुंतवणूक झाली आहे. गुंतवणूकीच्या

परिणामामुळे मोठ्या प्रमाणात रोजगाराची संधी निर्माण झाल्या आहेत. या विविध स्वरूपाच्या गुंतवणूकीमध्ये प्रत्यक्ष विदेशी गुंतवणूकीचा देखील समावेश आहे. त्यामुळे महाराष्ट्रात रोजगार निर्माण करण्यामागे प्रत्यक्ष विदेशी गुंतवणूकीचे योगदान देखील महत्त्वाचे आहे. म्हणून प्रत्यक्ष विदेशी गुंतवणूकीचा परिणाम महाराष्ट्राच्या उत्पादन आणि रोजगारावर झाला आहे. असे वरील तक्त्यावरून दिसून येते.

महाराष्ट्रात १९९६-२०१२ या १७ वर्षांच्या कालखंडात एकूण गुंतवणूकीचे १८०५१ प्रस्ताव मंजूर झाले आहेत. या एकूण प्रस्तावांपैकी ९९५३ गुंतवणूक प्रस्तावांवर संध्या अंमलबजावणी सुरू आहे. या ९९५३ गुंतवणूक प्रस्तावांमध्ये ३१९५०९ कोटी रु. गुंतवणूक झालेली आहे. याचा अर्थ एकूण प्रस्तावांपैकी ५० टक्के गुंतवणूक प्रस्तावांची संध्या अंमलबजावणी सुरू आहे. १८०५१ मंजूर प्रस्तावावरील ४६००५६ कोटी रु. गुंतवणूक झाली आहे. एकूण गुंतवणूकीच्या ७० टक्के गुंतवणूक आतापर्यंत करण्यात आली आहे. त्याचप्रमाणे प्रत्यक्षात उत्पादनाची प्रक्रिया सुरू केलेल्या प्रस्तावांची संख्या ८०९८ आहे. यामध्ये १४०५३७ कोटी रु. गुंतवणूक झालेली आहे. या ८०९८ गुंतवणूकीच्या प्रस्तावांमध्ये ६३५८८९ लाख लोकांना प्रत्यक्षात रोजगार उपलब्ध झाला आहे एकूण रोजगारापैकी (२५०६७९८) २५ टक्के रोजगार संध्या विविध स्वरूपाच्या गुंतवणूकीमुळे निर्माण झाला आहे.

थोडक्यात, प्रत्यक्ष विदेशी गुंतवणूकीमध्ये १९९१ नंतर भारतीय अर्थव्यवस्था खुली केल्यामुळे सकारात्मक परिणाम झाला आहे. भारतातील निर्यात, सकल देशांगत उत्पादनाचा वृद्धीदर, रोजगार व उत्पादन आदीमध्ये प्रत्यक्ष विदेशी गुंतवणूकीमध्ये चांगला परिणाम झाला आहे. भारतात महाराष्ट्र राज्यात सर्वाधिक प्रत्यक्ष विदेशी गुंतवणूक होत असल्यामुळे महाराष्ट्राच्या अर्थव्यवस्थेवर देखील चांगला परिणाम झाला आहे. महाराष्ट्राच्या निर्यात, भांडवली गुंतवणूकीत, रोजगार, उत्पादन व सकल देशांगत उत्पादन वृद्धीदर यामध्ये मोठ्या प्रमाणात वाढ झाली आहे. त्यामुळे प्रत्यक्ष विदेशी गुंतवणूकीचा महाराष्ट्राच्या अर्थव्यवस्थेवर सकारात्मक परिणाम झाला आहे. UNCTAD, WORLD investment report २०१२ नुसार जगामध्ये देशाचा प्रत्यक्ष विदेशी गुंतवणूकीच्या बाबतीत तिसरा क्रमांक लागतो लागतो तर महाराष्ट्राचा देशामध्ये प्रथम क्रमांक लागतो. देशांमध्ये व राज्यामध्ये

२०१० ते २०११ या कालावधीत विदेशी गुंतवणूकीमध्ये उत्पादन क्षेत्राला जास्त महत्व देण्यात आले.

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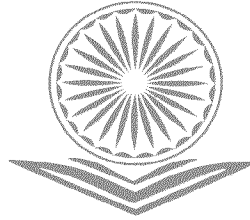
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प्रस्तावना

अमरावती जिल्ह्याच्या पायथ्याशी वसलेले क्षेत्र म्हणजे मेळघाट, धारणी व चिखलदरा दोन तालुके मिळून मेळघाट तयार झाला. येथील 60 टक्के पेक्षा अधिक भुभाग वनसंपदांनी व्यापलेला आहे. मेळघाटमध्ये 80 टक्के लोकं कोरकु जमातीचे असून येथे गवळी, गवलान, गोंड, भिलाला, बलई, मालविय, मुसलमान आदी लोक वास्तव्यास आहेत. तसेच येथील जास्तीत जास्ती शेती कोरडवाहु आहे. शेतीचे काम अंदाजे सहा महिने असते व उर्वरित दिवसात मेळघाट व मेळघाटच्या बाहेर रोजगार शोधण्यासाठी लोकांना बाहेर निघावे लागते.

स्थानिक मनुष्यशक्ती व स्थानिक कच्च्यामालाच्या आधारावर ग्रामिण भारतात बांबूपासून रोजगाराची उपलब्धता होऊ शकते. समाजाला समृद्ध करण्याच्या दृष्टिने कारागीराची सन्मानाने समाजात पुनस्थापना करण्याचा प्रयत्न संस्थेच्यावतीने करण्यात येत आहे. संस्थेचे पंजीकरण 'पंजीकरण क्रमांक एम.ए.एच.3994/97' सन 1997 मध्ये यवतमाळ, महाराष्ट्र येथे झाले. मेळघाट अमरावती जिल्ह्याचा विपुल संपदा असणारा निसर्ग सौंदर्ययुक्त पहाड प्रदेश. मेळघाटात कोरकू, गोंड, निहाल आदिवासी यांचे प्रमाण 80 टक्के आहे. त्यांचे जीवन परंपरागत शेती व जंगल हयावर निर्भर आहे. सन 1993 मध्ये मेळघाट हे देशाच्या प्रसिध्दीत आले ते पावसाळ्यात होणा-या बालमृत्यू व कुपोषणामुळे येथील उपलब्ध बांबूच्या आधारावर रोजगार निर्माण करण्याचे कार्य संस्था सन 1995 पासून करत आहे. महिलांना त्यांच्या गावात त्यांच्या घरी रोजगार मिळवून देणे हे संस्थेचे प्रमुख लक्ष्य आहे.

मेळघाटात लोकांना रोजगाराची अत्यंत गरज आहे. येथे उद्योग धंदे नसल्याने येथील युवक हजारोच्या संख्येने शहराकडे रोजगाराकरीता धावतात. संपूर्ण बांबू केंद्राने 1995 पासून बांबूउत्पादन द्वारे विविध वस्तुची निर्मिती करून रोजगाराचा पाया रचला आहे. संस्थेला बांबूपासून येथील स्थानिक युवक-युवतींना रोजगार मिळवून देण्यास यश मिळाले आहे. आजपर्यंत शासकीय-निमशासकीय संस्थांच्या सहकार्याने देशभरातून 5000 च्या वर युवक/युवतींना प्रशिक्षण दिले आहे. स्थानिक पातळीवर यांना सहकार्य करून यांच्या रोजगाराची वाढ करण्यात आली. तसेच वेळोवेळी कौशल्यवृद्धीचे प्रशिक्षण देवून त्यांच्या कला कृतीत वाढ केली जाते. नवनविन डीझाईन विकसीत करण्यात मदत केली जाते. आज संस्थेजवळ बांबुवरील डिझाईन विकसीत करणारी तज्ञांची चमु आहे. आय.आय.टी. मुंबई, व्ही. एन.आय.टी. नागपूर अशा देशभरतील टेक्नीकल संस्थंच्या सहभाग नियमित मिळत आहे. आजही मेळघाटात बरेचसे युवक/युवतींना प्रशिक्षणाची गरज आहे. व त्यासाठी संस्था आपली मोलाची भुमिका

बजावत आहे.संस्थेच्या कार्याने मेळघाटात मोठया प्रमाणात स्थानिक आदिवासी युवक-युवतींना रोजगार मिळवून देण्यास संस्थेला यश मिळाले आहे.

संपुर्ण बांबू केंद्र,लवादा संस्था मेळघाट मधिल अनेक कनिष्ठ व वरीष्ट महाविद्यालया मध्ये विद्यार्थ्यांना बांबू उत्पादनाचे प्रशिक्षण देत आहे.संस्थेने मागिल वर्षा पासुन कला,विज्ञाण व वाणिज्य महाविद्यालय,चिखलदरा मध्ये उधोजगता विकास केंद्र,व वाणिज्य विभागा मार्फत चालवल्या जाण्या-या शिका व कमवा या उपक्रमा अतर्गत महाविद्यालयातील अनेक विद्यार्थ्यांना प्रशिक्षण दिले आहे.

संस्थेचे ध्येय

1. भारतवर्षात विपुल प्रमाणात बांबू लागवड करणे ,
2. कारागिरीचा उपयोग करून त्याच्या गुणाला मान्यता देण्याचे कार्य करणे
3. पर्यावरणाला सुरक्षित ठेवून रोजगाराची संधी उपलब्ध करुण देणे.
4. स्वाभिमान,स्वावलंबन,उद्यमिता, सुजनशिलताचे सहयोगाने करोडो भारतवासीयांना मदत करणे.
5. बांबू कारागीर व बांबू कारागीरी यांना न्याय मिळवून देणे.

ध्येय प्राप्तीकरिता संस्थेचे खालील उद्देश आहेत

1. भारतवर्षा मध्ये वनभुमी तसेच गैरवनभुमीवर बांबूची लागवड वाढविणे व बांबूची उत्पादकता वाढविणे
2. बांबू कारीगर व बांबू उत्पादक जेथे जेथे आहेत व जिथे निर्माण होण्याची शक्यता आहे तिथे अधिक गतीने कार्य करणे.
3. बांबूच्या उपयुक्त जाती, प्रजातीचा परिचय करणे, त्यांना प्रसिध्द देणे व त्यांचे उपयोग वाढविणे व लागवड करणे.
4. बांबूचे उपयोग वाढवून तेप्रचारीत करणे याकरीता बांबू एक अभियांत्रिकी साधनाच्या रूपात उपयोगात आणणे. बांबूचा वास्तुशास्त्रामध्ये उपयोग करणे.
5. बांबू कारागिरी क्षेत्रात नियमित डिझाईन विकासाची प्रक्रिया क्रियान्वित करणे, कार्यक्रमाद्वारे व कार्यद्वारे कारागिरांच्या कारागिरामध्ये गुणवत्ता आणणे व त्याची कुशलता वाढविणे.
6. संशोधनाचे माध्यमातून बांबूसोबत अन्य कक्षमालाचा उपयोग करून वस्तु निर्मिती करणे व उपयोगिता वाढविणे, चर्म, माती, लाकूड, वनात उपलब्ध धातु, कपडा इत्यादी.
7. औजार व मशिनरी विकसित करणे, जिग, फिक्चर, मोल्ड, विकसीत करणे, बांबूी सुरक्षा वाढविणे व तांत्रिकतेचा उपयोग करणे, सुक्ष्म रूपातील बासांच्या गुणांचा अभ्यास व संशोधन करणे.
8. बांबूशी प्रत्यक्ष वा अप्रत्यक्ष संबंधित कार्य व कार्यक्रमांना आयोजित करणे (संशोधन सोबत) जसे वनीकरण, पाणलोट क्षेत्र विकास (वॉटर शेड), महिला सक्षमीकरण, सांस्कृतिक कार्यक्रम, आदिवासी कल्याण व सामाजिक तसेच आर्थिक विकास कार्यक्रम क्रियावित करणे.
9. बांबू कारागिरीला शैक्षणिक मान्यता प्राप्त करून देणे. कारागिरांच्या सामाजिक, आर्थिक विकासाकरिता प्रदर्शनी, यात्रा यांचे आयोजन करणे, कच्चा मालाला आधुनिक रूप प्राप्त करून देणे.
10. बांबूशी प्रत्यक्ष वा अप्रत्यक्ष संबंधित कार्य व कार्यक्रमांना आयोजित करणे.(संशोधन सोबत)

संस्थेच्या कार्यक्षेत्रात येणा-या गावाची माहिती

अ.क्र.	गव	कुटुंबसंख्या	तालुका, जिल्हा
1	कोठा	260	धारणी,अमरावती
2	जंबू	235	धारणी,अमरावती
3	बोथरा	263	धारणी,अमरावती
4	कोट	80	धारणी,अमरावती
5	सोसोखेडा	95	धारणी,अमरावती
6	नंदुरी	550	धारणी,अमरावती
7	वरा	301	धारणी,अमरावती
8	चिखली	406	चिखलदरा, जि.अमरावती
9	पाठकवू	68	चिखलदरा, जि.अमरावती
10	राक्षा	46	चिखलदरा, जि.अमरावती
11	तारूबांदा	148	धारणी,अमरावती
12	अढाव	110	धारणी,अमरावती
13	वेसरपूर	190	चिखलदरा, जि.अमरावती
14	भिरोजा	115	चिखलदरा, जि.अमरावती
15	वेली	180	चिखलदरा, जि.अमरावती
16	श्रौरा	84	धारणी,अमरावती
17	मांगीया	211	धारणी,अमरावती
18	थपली	70	चिखलदरा, जि.अमरावती
19	ळरिसाल	84	धारणी,अमरावती
20	फॉ. मालूर	115	धारणी,अमरावती
21	तांगडा	214	धारणी,अमरावती
22	चौराकुंड	80	धारणी,अमरावती
23	चौपन	80	धारणी,अमरावती
24	खोपनार	51	धारणी,अमरावती
25	पोटीलावा	151	धारणी,अमरावती
26	बेरी	140	धारणी,अमरावती
27	चित्री	80	धारणी,अमरावती
28	लवादा	287	धारणी,अमरावती
29	राणमालर	302	धारणी,अमरावती
30	घोटा	167	धारणी,अमरावती
31	भलोरी	150	धारणी,अमरावती
32	बेडदाबल्ला	325	धारणी,अमरावती
33	दिदम्दा	180	धारणी,अमरावती
34	बोड	168	धारणी,अमरावती
35	छुनी	278	धारणी,अमरावती
36	चापोली	115	धारणी,अमरावती

संशोधन पध्दती

संपूर्ण बांबू केंद्राचे आदिवासी युवक व युवतींना बांबूउत्पादना द्वारे रोजगार निर्मितीतील योगदानाचे व्यक्ति अध्ययन या संशोधन विषयाच्या अध्ययनासाठी संपूर्ण बांबू केंद्राच्या परिक्षेत्रात एकूण 36 गावे असून, त्यातूनच

अध्ययनासाठी लॉटरी पध्दतीने गावाची निवड केलेली आहे. प्रत्येकगावातुन 5 असे 10 गावातुन 50 युवक व युवतीची नमुना म्हणुन अध्ययनासाठी निवड करण्यात आली आहे. अध्ययनासाठी लॉटरी पध्दतीने निवडलेली गावे पुढीलप्रमाणे आहेत. 1.लवादा 2.चित्री 3.घोटा 4.राणामालुर 5.कोठा 6.बोरी 7. पोटीलावा 8. भोंडीलावा 9.सेमाडोह 10. पीली

नमुना निवडीचा तक्ता

अंक	एकुण गावे	लॉटरी पध्दतीने निवडलेली गावे	प्रत्येक गावातुन निवडलेला नमुना संख्या	एकुण नमुना म्हणून निवडलेल्या युवक व युवतीची संख्या
01	36	10	05	50

संशोधनाचे उद्देश

प्रस्तुत संशोधनाचे उद्देश पुढील प्रमाणे आहेत.

1. संस्थेच्या कार्याचा आढावा घेणे व मेळघाटातील बांबू हस्तकला उद्योगातील महत्वाच समस्या शोधणे
2. आदिवासी युवक व युवतींना बांबुदारे निर्मित हस्तकला वस्तूंच्या माध्यमातून निर्माण होण-या रोजगार निर्मितीचे विश्लेषण करणे.
3. संस्थेच्या कार्यातून आदिवासी बांधवांच्या आर्थिक व सामाजिक स्थितीत झालेल्या बदलांचा अभ्यास करणे.

संशोधनाची गृहितके

संशोधनाची गृहितके पुढीलप्रमाणे आहेत.

1. संस्थेच्या कार्यामुळे आदिवासी युवक व युवतींना मोठया प्रमाणात रोजगार निर्माण झाला.
2. मेळघाट परिसरामध्ये संस्थेच्या कार्याचा मोठया प्रमाणावर विस्तार झाला.
3. संस्थेच्या कार्यामुळे आदिवासी युवक व युवतीमध्ये स्वावलंबनाची वृत्ती निर्माण झाली.
4. संस्थेच्या कार्यामुळे आदिवासींचा सामाजिक व आर्थिक विकास झाला.

संशोधनाचा कालावधी

संशोधन करीत असतांना कालावधी निश्चित करणे आवश्यक असते. कारण संशोधन करीत असतांना त्या काळातील माहिती विचारात घ्यावी लागते. त्यामुळे संशोधन कार्य सुलभ होते व निर्माण झालेल्या समस्यांवर दोष लवकर लक्षात येतात. प्रस्तुत विषय " संपूर्ण बांबू केंद्र, लवादा ता.धारणी जि.अमरावती या सेवाभावी संस्थेचे आदिवासी युवक व युवतींना बांबूउत्पादना द्वारे रोजगार निर्मितीतील योगदानाचे विश्लेषणात्मक अध्ययन "या संस्थेचे आदिवासी युवक व युवतींना बांबूउत्पादनाद्वारे रोजगारनिर्मितीतील योगदानाबद्दल संबंधीत संशोधनासाठी 5 वर्षांचा म्हणजे 2012-2017 हा कालावधी निवडण्यात आला आहे.

तथ्य संकलन

या संशोधनात विश्लेषणात्मक पध्दतीची निवड केलेली आहे. या अहवालात तथ्य संशोधन करणे हे सोपे काम नव्हे तथ्य संकलन करतांना अनेक अडचणींना तोंड द्यावे अनेकदा अपमान सहन करावा लागतो. स्थुलमानाने तथ्य संकलनाच्या दोन पध्दती आहेत ते पुढीलप्रमाणे

- अ) प्राथमिक पध्दत
- ब) द्वितीयक पध्दत

संस्थेचे विविध कार्य व योजना

संस्थेचे विविध कार्य व योजना खालील प्रमाणे आहेत ज्या माध्यमातून संस्था मोठया प्रमाणात मेळघाटमधील आदिवासी युवक व युवतींना रोजगार निर्मिण करून देण्यात मोलाची भुमिका बजावत आहे.

बांबू हस्तशिल्प प्रशिक्षण

संस्थेच्यामाध्यमातून बांबू हस्तकला प्रशिक्षणाचे कार्य प्रत्येकवर्षी मोठयाप्रमाणत सुरु आहे. संस्थेच्यावतीने महाराष्ट्र लघुउद्योग विकस महामंडळ मर्यादित अमरावती (MSSIDC) च्या सहयोगाने बांबू हस्तकला प्रशिक्षणाचे मोठया प्रमाणावर आयोजित करण्यात येते. या प्रशिक्षणात मेळघाटातील आदिवासी युवक युवती मोठया प्रमानात प्रशिक्षणार्थी म्हणुन सहभाग होतात. या प्रशिक्षणात प्रशिक्षणार्थींना प्रशिक्षणानंतर औजार कीट चे वाटप करण्यात येते. अन्य संस्थातील कारीगरांकरीता प्रशिक्षण नियमितपणे संपूर्ण बांबू केंद्राने आयोजित केले आहे. अन्य ठिकाणी जावून कारीगरांना प्रशिक्षण देखाचे कार्य केले आहे. महाराष्ट्रातील ठाणे येथे आदिवासी भगात नियमित प्रशिक्षणाचे कार्य स्वयंसेवी संस्था मार्फत सुरु आहे. लवादा येथील प्रशिक्षण केंद्रात यवतमाळ, नांदेड व भंडारा, मंडला मध्यप्रदेश येथील प्रशिक्षणार्थींनी बांबू हस्तकला व रंगकलेचे प्रशिक्षण प्राप्त केले आहे. विविध संस्थातून विद्यार्थी लवाद्याल्या प्रशिक्षण अभ्यासासाठी येत असतात संस्थेच्या वतीने बांबू हस्तकला प्रशिक्षण पुर्णपणे मोफत देण्यात येते.

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संस्थेद्वारेदेण्यात येणारे प्रशिक्षण कार्य – 3 दिवस ते 2 वर्षापर्यंतचे प्रशिक्षण उपलब्ध असते.

- बांबू परिचय 1-3 दिवस
- बांबू परिचय 2-7 दिवस
- बांबू परिचय 3 दिवस-1 महिना
- प्रशिक्षक प्रशिक्षण – 1 महिना
- मास्टर टेनर प्रशिक्षण – 2 वर्ष

विद्यार्थी भेटी

विविध संस्थांच्या शालेय, कॉलेजच्या विद्यार्थींनी संपूर्ण बांबू केंद्राला भेट देवून कार्याचे स्वरूप समजून घेतले आहे. या विद्यार्थींमध्ये शालेय विद्यार्थी, इंजिनियरिंग आर्कीटेक्ट, समाजकार्य या विषयांच्या विद्यार्थ्यांचा समावेश आहे.

डिजाईन विकसन

संपूर्ण बांबू केंद्राने बांबूचे विविध डिजाईन विकसीत केले आहे. सामाजिक वनीकरण विभाग अमरावती यांच्या सहयोगाने डिझायनर फॉर संपूर्ण बांबू केन्द्र, या प्रकल्पा अंतर्गत दोन डिजायर नियुक्त करण्यात आले . संस्थेने गृहनिर्माणाचे व हस्तकलेचे डिजाईन त्यांच्या सहयोगाने विकसीत केले आहे.

नविन संकल्पना बांबू बाथरूम

आदिवासी महिलांच्या आरोग्याचा विचार करता संपूर्ण बांबू केन्द्राने बांबूपासून बाथरूमचा पर्याय समोर आणला आहे. संपूर्ण स्वच्छता अभियानांचा विचार करता तसेच पर्यावरणपूरक बाथरूममुळे महिलांच्या स्वच्छता आरोग्य व आहाराचाही प्रश्न सोडविता येणे शक्य आहे कारण आंगोळीसाठी पाणी घरी आणल्याच जाते याच सांडपाण्यावर परसबागेत भाजीपाला मिळवण्याचेही कार्य होवू शकेल. अशी पर्यावरणपूरक बाथरूम डिजाईन संस्थेने तयार केले आहे. बांबूचे एकूण 26 बाथरूम आजपर्यंत संस्थेने गुजराथ व मध्यप्रदेश व महाराष्ट्रात तयार करून दिली आहेत.

बांबू लागवड

संपूर्ण केंद्राच्या वतीने बांबू लागवडीचा उपक्रम मेळघाटमध्ये मोठ्या प्रमानात राबविण्यात आला. टाटा ट्रस्टच्या सहकार्याने राबविण्यात आलेल्या प्रकल्प ऑगस्ट 2015 मध्ये पूर्ण झाला. या कार्यात एकूण 20 हजार पेक्षा जास्त बांबूची लागवड तयार करण्यात आली आहे. दोन नर्सरीमध्ये संस्थेने 18 बांबूच्या विविध जातीची रोपे तयार करून जोपसली आहे. येथूनच नियमितपणे आदिवासी शेतकऱ्यांना लागवडीसाठी रोपे उपलब्ध होतात. बांबू शिवाय कोयलारी, कडुलिंग, या झाडांची रोपे ही नर्सरीत तयार करून लागवड करण्यात आली आहेत.

महिला सक्षमीकरण

महिलांच्या सक्षमीकरणांसाठी महिलांनी उद्योग करण्यावर भर देण्यात आले. याद्वारेच विस्थापनाचा प्रश्न ही कमी होवू शकेल. असा या मागचा विचार आहे. याच विचाराने यावर्षात महिलांच्या उद्योगांच्या दृष्टिने विविध आकाराच्या जुन्या कपड्यांच्या पिशव्या शिवून देण्याचे कार्य महिला करीत आहेत. याशिवाय बटाट्याचा किस, चिवडा व उन्हाळी वळवणाचे पदार्थ ही करण्यात आले आहेत. महिलांच्या आरोग्य व आहाराचे परसबागेतून भाजीपाला मिळावेत याकरीता अंकूर सीडसच्या सहयोगाने बी-बीयाणेचे वाटप करण्यात आले आहे. बांबू व कोयलारीच्या झाडांची लागवड महिलांच्या द्वारे करण्यात आली आहे.

आरण्यक बाल प्रकल्प

संस्थेच्या वतीने मालूर, घोटा, चित्री, केठा व लवादा या 5 गावातील निवडक 10 ते 14 वयोगटातील बालक/बालकांचे एक संस्कृती संस्कार शिबीर आयोजित करण्यात येते. हे शिबीर 10 ते 14 वयोगटातील बालका साठी आयोजित करण्यात येते. याच मुलांचे नियमितपणे दोन दिवसीय व्यक्तीमत्व विकास शिबीर दर महिन्याला आयोजित केले जाते. संस्थाअश्याप्रकारचे शिबीर लवादा केन्द्रावर आयोजित करते ज्याद्वारे आदिवासी मुला मुली मध्ये स्वावलंबनाची वृत्तीनिर्मण करण्यात येते.

सिपना शोध शिबीर

प्रत्येक वर्षी नियमितपणे दिनांक 25 डिसेंबर ते 31 डिसेंबर या कालावधीत सिपना शोध शिबीराचे आयोजन करण्यात येते. याचे आयोजन "ग्रामज्ञानपीठ" कोठा येथे करण्यात येते. त्यात 15 ते 51 वर्ष वयाचे शिबीरार्थी सहभागी होत असतात. सिपना शोध शिबीराच्या माध्यमातून जन, पशु, नभ, जल, वन, भूसंपदांचा अभ्यास करण्यात येते. त्यानंतर शेवटच्या दिवशी प्रस्तुतीकरण करण्यात येते ज्या मध्ये. उदा. हिरोशीमा, नागासाकी वरील हल्यानंतरची आपातकालीन परिस्थिती प्रस्तुतीकरणातून दाखविण्यात येते. पर्यावरण व आधुनिकता यातील संतुलन दर्शविणारी प्रस्तुती, आहारावर अध्ययन, तर जनसंपदेची संस्कृती प्रस्तुतीकरण इत्यादी. जलसंपदेचे बांबूचा नळ

तयार करून प्रात्याक्षिक करून दाखविने, नभ संपदेत आकाश दर्शन करण्याकरीता एका घराच्या छातावर ग्रहांच्या ता-यांच्या दिशेने बांबूचे पार्श्व बसविने.

कारीगर पंचायत

संस्थेने कारीगीरांना नियमित व वेळेवर बास उपलब्ध व्हावा याकरीता कारीगर पंचायतची स्थापना केली आहे. कारीगरांच्या बुरुड वहीचे नूतनीकरण तसेच बांबू लागवडीसाठी प्रोत्साहन देउन त्यांना प्रशिक्षित करण्यात आले. संस्थेच्यावतीने कारीगरांना बांस उपलब्ध करून दिला जातो.

ग्रामज्ञानपीठ

संस्थेच्या वतीने भारतीय संस्कृतीच्या संरक्षण, संवर्धनासाठी ग्रामज्ञानपीठची स्थापना कोटा यागावी लोकसहभागाने करण्यात आली आहे. या ठिकाणी बांबू, लोहार, कुंभार, पाथरवट, कृषी, हातमाग, सुतारकाम व लोककला या परंपरागत विज्ञान व कलांच्या गुरुकुलाची निर्मिती करण्यात आली आहे. मेळघाटातील संस्कृती रक्षण व कारीगरी आधारित उद्योगांचे पुनःजिवन या करीता कोटा येथे ग्रामज्ञानपीठाची स्थापना करण्यात आली आहे. या आठ एकराच्या परिसरात 9 गुरुकुल स्थापन करण्यात आले.

बांबू गृहनिर्माण

बांबूच्या द्वारे संस्थेने आजपर्यंत 1600 पेक्षा जास्त घरे बांधण्याचे कार्य केले आहे. यातील उल्लेखनीय कार्य गुजरातमध्ये कच्छच्या भुकंपानंतर केले आहे. प्रशिक्षित आदिवासी युवकांचे गृहनिर्माण बचत गट घर बांधणीचे कार्य करित आहेत. संस्था राष्ट्रीय बांबू मिशनमध्ये सक्रिय सहभागी आहे.

बांबूशिवाय अन्य क्षेत्रात संस्थेने केलेले उल्लेखनीय कार्य

- धारणी व चिखलदरा तालुक्यामध्ये 252 स्वयंसहायता समुहांची स्थापना.
- कोशीश संस्थेच्या द्वारे 29 गावामध्ये गाव सहभागी सुक्ष्म नियोजनाचे कार्यात सहभाग व रोजगार
- हमी योजनेच्या प्रचार व पसाराचे कार्य.
- आदिम जमाती सेवक संघाच्या मदतीने 27 गावामध्ये पाळणाघराचे संचलन
- मेळघाटाच्या 94 गावांमध्ये कारीगर पंचायतची स्थापना

संस्थेच्या भविष्यकालीन योजना पुढील प्रमाणे आहेत.

- 1000 प्रशिक्षित पूर्णवेळ कार्य करणा-या कारागिरांचा चमु उभारणे (450 झाले आहेत) मेळघाटात
- किमान 20 उद्योग शाळा (उत्पादन केंद्र, प्रत्येक केंद्रात किमान 5 युवक/युवती कार्य करतील) स्थापना करणे.
- बांबू संग्रहालयाची स्थापना करणे.
- बांबू हस्तशिल्प चल प्रशिक्षण केंद्र बनविणे (वाहनामध्ये प्रशिक्षणची व्यवस्था)
- अन्य नैसर्गिक संसाधनांचा रोजगाराच्या निर्मितीसाठी उपयोग करणे.

संपुर्ण बांबू केंद्राकडे उपलब्ध असलेले हस्तचलत मशीन

- थिकनेस साईझर, विडथनेस साईझर, स्प्लिटींगमशीन, मोल्डींग मशीन, विकसित औजार संच, जिग आणि मोल्डींग संच (आय.आय.टी. मुंबई द्वारे विकसित)

- स्मोक चेंबर (बांबू सुरक्षा विधीकरीता)
- बांबूच्या छोटया छोटया निरूपयोगी तुकडयापासून कोळसा बनविण्याचे यंत्र-टिम्पेंट टॅक 32.5 20 फूट.
- बांबूचे विकसित 100 प्रकारचे वेगवेगळे डिझाईन.

बांबूवरील तज्ञांचे साहित्य

- आठ एकर परिसरांत बांबू लागवड व नर्सरीचे प्रशिक्षण उपलब्ध
- प्रदिर्घ अनुभवी तज्ञ व कार्यकर्त्यांचा (10 सदस्य)
- कुशल कारागिरांच चमु (150 कारीगर) वैज्ञानिकांचा चमु (10 सदस्य) संस्थेद्वारा प्रशिक्षित लाभार्थ्यांनी त्यांचे गावामध्ये उत्पादन केन्द्र सुरू केले आहे. अशा 19 उद्योगशाळा मेळघाटमध्ये नियमितपणे उत्पादनाचे कार्य करीत आहे.

वेणुशिलपी औद्योगिक सहकारी संस्था

संस्थेच्यावतीने उद्योगशाळांनी उत्पादित केलेल्या मालाची विक्रीव्यवस्था होण्याचे दृष्टिने 1997 साली 'वेणुशिलपी' औद्योगिक सहकारी संस्थेची स्थापना करण्यात आली आहे. गेल्या 19 वर्षांपासून ही संस्था नियमितपणे विक्रीचे कार्य करीत आहे. याशिवाय लवादा, चिखलदरा, सेमाडोह व नागपूर येथे नियमित विक्रीकेंद्रांची व्यवस्था करण्यात आली आहे. याशिवाय दरवर्षी 1 लाख राख्यांची निर्मिती व विक्रीची व्यवस्था स्वयंसेवी संस्था व स्वयंसेवकांद्वारे करून मोठयाप्रमानात आदिवासी युवक व युवतींना रोजगार निर्मिन करून देण्यात येतो.

तथ्य संकलन व तथ्य विश्लेषण

संस्थेने स्थानिक आदिवासी युवक/युवतींना प्रशिक्षण दिलेल्याची संख्या तक्त्या मध्ये

वयोगट	संस्थेने स्थानिक आदिवासी युवक/युवतींना प्रशिक्षण दिलेल्याची संख्या	
	युवक	युवती
१५ ते २०	३७०	२१०
२० ते २५	२२६०	१०६०
२५ ते ३०	११३०	१८०
३० ते ३५	४३०	१३५
एकुण	४१९०	१५८५

गृहितकृत्य पडताळणी

१. संस्थेच्या कार्यामुळे आदिवासी युवक व युवतींना मोठया प्रमाणात रोजगार निर्माण झाला हे गृहितकृत्य सत्य असून हे संस्थेच्या कार्यामुळे आपल्याला दिसून येते ,संस्थेच्यामाध्यमातून बांबू हस्तकला प्रशिक्षणाचे कार्य प्रत्येकवर्षी मोठयाप्रमाणत सुरू आहे. संस्थेच्यावतीने महाराष्ट्र लघुउद्योग विकस महामंडळ मर्यादित अमरावती (MSSIDC) च्या सहयोगाने बांबू हस्तकला प्रशिक्षणाचे मोठया प्रमाणावर आयोजित करण्यात येते. या प्रशिक्षणात मेळघाटातील आदिवासी युवक युवती मोठया प्रमानात प्रशिक्षणार्थी म्हणून सहभाग होतात. या प्रशिक्षणात प्रशिक्षणार्थींना प्रशिक्षणानंतर औजार कीट चे वाटप करण्यात येते. अन्य संस्थातील कारीगरांकरीता प्रशिक्षण नियमितपणे संपूर्ण बांबू केंद्राने आयोजित केले आहे. अन्य ठिकाणी जावून कारीगरांना प्रशिक्षण देखाचे कार्य केले आहे. महाराष्ट्रातील ठाणे येथे आदिवासी भगात नियमित

- प्रशिक्षणाचे कार्य स्वयंसेवी संस्था मार्फत सुरु आहे या वरून वरील गृहीतकृत्य सत्य असल्याचे स्पष्ट होते.
२. मेळघाट परिसरामध्ये संस्थेच्या कार्याचा मोठया प्रमाणावर विस्तार झाला.हे गृहितकृत्य सत्य असुन संपुर्ण बांबू केंद्राने 1995 पासून बांबूउत्पादन द्वारे विविध वस्तुची निर्मिती करुन रोजगाराचा पाया रचला आहे. संस्थेला बांबूपासुन येथील स्थानिक युवक-युवतींना रोजगार मिळवून देण्यास यश मिळाले आहे. आजपर्यंत शासकीय-निमशासकीय संस्थांच्या सहकार्याने देशभरातून 5000 च्या वर युवक/युवतींना प्रशिक्षण दिले आहे. संपुर्ण बांबू केंद्राकडे आठ एकर परिसरांत बांबू लागवड व नर्सरीचे प्रशिक्षण उपलब्ध असुन संस्थेकडे प्रदिर्घ अनुभवी तज्ञ व कार्यकर्त्यांचा (10 सदस्य) टिम आहे.संस्थेकडे कुशल कारागिरांच चमु (150 कारीगर) व वैज्ञानिकांचा चमु ज्या मध्ये (10 सदस्य) आहेत निरंतर संस्थेच्या कार्यात उपलब्ध असतात. संस्थेद्वारा प्रशिक्षित लाभार्थ्यांनी त्यांचे गावामध्ये उत्पादन केन्द्र सुरु केले आहे. अशा 19 उद्योगशाळा मेळघाटमध्ये नियमितपणे उत्पादनाचे कार्य करीत आहे.या वरून वरील गृहीतकृत्य सत्य असल्याचे स्पष्ट होते.
 ३. संस्थेच्या कार्यामुळे आदिवासी युवक व युवतीमध्ये स्वावलंबनाची वृत्ती निर्माण झाली. हे गृहितकृत्य सत्य असुन संस्थेच्यावतीने उद्योगशाळांनी उत्पादित केलेल्या मालाची विक्रीव्यवस्था होण्याचे दृष्टिने 1997 साली 'वेणुशिलपी' औद्योगिक सहकारी संस्थेची स्थापना करण्यात आली आहे. गेल्या 19 वर्षांपासून ही संस्था नियमितपणे विक्रीचे कार्य करीत आहे. याशिवाय लवादा, चिखलदरा, सेमाडोह व नागपूर येथे नियमित विक्रीकेंद्रची व्यवस्था करण्यात आली आहे. याशिवाय दरवर्षी 1 लाख राख्यांची निर्मिती व विक्रीची व्यवस्था स्वयंसेवी संस्था व स्वयंसेवकांद्वारे करुन मोठयाप्रमानात आदिवासी युवक व युवतींना रोजगार निर्मिती करुन देण्यात येतो.
 ४. संस्थेच्या कार्यामुळे आदिवासीचा सामाजिक व आर्थिक विकास झाला.हे गृहितकृत्य सत्य असुन संस्थेच्या कार्यामुळे मेळघाट परिसरामध्ये मोठया प्रमाणात आदिवासी युवक व युवतींना प्रशिक्षण प्राप्त झाले व त्यामुळे मेळघाट परिसरामध्ये आदिवासी युवक व युवतींना रोजगार प्राप्त झाला त्याचे उत्पन्न वाढण्यास मदत झाली व त्यामुळे आदिवासीचा सामाजिक व आर्थिक विकास झाला.

सारांश व निष्कर्ष

1. "संपूर्ण बांबू केंद्राचे आदिवासी युवक व युवतींना बांबूउत्पादना द्वारे रोजगार निर्मितीतील योगदानाचे विश्लेषणात्मक अध्ययन" या विषयावर व्यष्टि अध्ययन करतांना प्राथमिक व दुय्यम तथ्य संकलन पध्दतीचा अवलंब करुन प्रश्नावली, मुलाखात, निरीक्षण व विविध प्रलेखाच्या माध्यमातुन माहिती मिळविण्यात आली व त्या माहितीचे विश्लेषण करुन खालील सारांश काढण्यात आलेले आहेत.
 - संस्थेला बांबूउत्पादना पासुन येथील स्थानिक युवक-युवतींना रोजगार मिळवून देण्यास यश मिळाले आहे.
 - संस्थेच्या कार्यामुळे मेळघाट मधिल आदिवासी बांधवाच्या आर्थिक स्थितीत सुधारणा झाली आहे.
 - संपूर्ण बांबू केंद्राच्या कार्याचा आलेख दिवसेंदिवस वाढत आहे व संस्था निरंतर प्रगती करित आहे.

- संस्थेच्या कार्यामुळे स्थानिक आदिवासी युवक व युवतीचे बाहेर कामासाठी जण्याचे प्रमाण कमी झाले.
- धारणी व चिखलदरा तालुक्यामध्ये 252 स्वयंसहायता समुहांची स्थापना करून आदिवासीना आर्थिक आधार देण्याचा संस्थेने कार्य केले आहे.
- संस्थेच्या व्दारा 29 गावामध्ये गाव सहभागी सुक्ष्म नियोजनाचे कार्यात सहभाग व रोजगार हमी योजनेच्या प्रचार व पसाराचे कार्य मोठया प्रमाणार केल्या जात आहे.
- संस्थेने आदिम जमाती सेवक संघाच्या मदतीने 27 गावामध्ये पाळणाघराचे संचलन करत आहे.
- मेळघाटच्या 94 गावांमध्ये कारीगर पंचायतची स्थापना करून आदिवासीच्या समस्या सोडवण्याचे कार्य केले आहे
- संस्थेच्या कार्यामुळे आदिवासी युवक व युवतीमध्ये स्वावलंबनाची वृत्ती निर्माण झाली. संस्थेच्यावतीने उद्योगशाळांनी उत्पादित केलेल्या मालाची विक्रीव्यवस्था होण्याचे दृष्टिने 1997 साली 'वेणुशिलपी' औद्योगिक सहकारी संस्थेची स्थापना करण्यात आली आहे. त्या मुळे उत्पादित केलेल्या मालाला बाजारपेठ मिळणे सोपे झाले.
- संस्थेच्या वतीने भारतीय संस्कृतीच्या संरक्षण, संवर्धनासाठी ग्रामज्ञानपीठची स्थापना कोठा यागावी लोकसहभागाने करण्यात आली . या ठिकाणी बांबू, लोहार, कुंभार, पाथरवट, कृषी, हातमाग, सुतारकाम व लोककला या परंपरागत विज्ञान व कलांच्या गुरूकुलाची निर्मिती करण्यात आली आहे. मेळघाटातील संस्कृती रक्षण व कारीगरी आधारीत उद्योगांचे पुनःजिवन या करीता संस्था कार्य करत करत आहे.

संदर्भ ग्रंथसुची

१. संपूर्ण बांबू केन्द्र वार्षिक अहवाल २०१५/२०१६.
२. सुनील देशपांडे मेळघाटातील वेणुपुत्र – सुनील कुहीकर.
३. बास कारीगरी – अभ्यास पुस्तिका संपूर्ण बांबू केन्द्र, मु.लवादा, पो.दुणी, ता.धारणी, जी. अमरावती.
४. मेळघाटची रानफुले – डॉ.सौ.निरूपमा देशपांडे.

प्रधानमंत्री उज्ज्वला योजनेचे मेळघाटातील आदिवासी महिलांच्या आर्थिक सक्षमीकरणात योगदान

Prof. Dr. Shivcharan L Kottewar

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कला, विज्ञान व वाणिज्य महाविद्यालय, चिखलदरा, जी.अमरावती, महाराष्ट्र

प्रस्तावना

भारतातील ग्रामीण कुटुंबांसाठी स्वच्छ स्वयंपाक इंधनाची उपलब्धता हे एक मोठे आव्हान आहे. या समस्येचा सामना प्रामुख्याने स्त्रिया आणि मुलांना करावा लागतो हे सत्य आहे. घरांमध्ये अशुद्ध इंधन जाळल्यामुळे धुरापासुन होणा-या दुष्परीनामामळे महिला व मुलांचे आरोग्यरक्षण करण्यासाठी त्यांना स्वच्छ स्वयंपाकाचे इंधन उपलब्ध करून देण्यासाठी मोफत एल.पी.जी कनेक्शन देण्यासाठी केंद्र सरकारने 'खी पदकींद ए ठमीजंत श्रममअंदष ए टॅगलाइनसह माननीय पंतप्रधान श्री नरेंद्र मोदी यांच्या नेतृत्वाखाली 1 मे 2016 रोजी 'प्रधानमंत्री उज्ज्वला योजना', चढल्द ही सामाजिक कल्याणकारी योजना सुरु केली आहे.या योजनेत धूरमुक्त ग्रामीण भारताची संकल्पना आहे आणि 2019 पर्यंत संपूर्ण राष्ट्राला सवलतीच्या स्च्छ कनेक्शन देऊन पाच कोटी कुटुंबांना विशेषतरु दारिर्दरेषेखालील महिलांना ःढल्द लाभ मिळवून देण्याचे उद्दिष्ट आहे. योजनेमुळे स्च्छ चा वापर वाढेल आणि आरोग्य, विकार, वायू प्रदूषण आणि जंगलतोड कमी करण्यास मदत होईल. प्रधानमंत्री उज्ज्वला योजना ही नरेंद्र मोदी सरकारची एक महत्त्वाकांक्षी सामाजिक कल्याण योजना आहे. पंतप्रधान उज्ज्वला योजनेंतर्गत, देशातील बीपीएल कुटुंबांना एलपीजी कनेक्शन प्रदान करण्याचे सरकारचे उद्दिष्ट आहे. ग्रामीण भारतात वापरल्या जाणाऱ्या अशुद्ध स्वयंपाकाच्या इंधनाच्या जागी स्वच्छ आणि अधिक कार्यक्षम एलपीजी वापरणे हे या योजनेचे उद्दिष्ट आहे. बीपीएल कुटुंबातील पात्र महिला उमेदवार या योजनेसाठी अर्ज करू शकतात.

भारत हा विकसनशील देश आहे. भारतीय लोकसंख्येचा मोठा भाग ग्रामीण आणि आदिवासी भागात राहतो जिथे लोक पायाभूत सुविधा, रस्ते, पिण्यायोग्य पाणी, वीज, आरोग्य आणि स्वच्छता यासारख्या मूलभूत सुविधांपासून वंचित आहेत. आर्थिक विकासासाठी शाश्वत नियोजनाची आखणी करणे आवश्यक आहे. सरकारने स्वातंत्र्योत्तर काळात देशासाठी योग्य नियोजन आणि अंमलबजावणीची व्यवस्था विकसित करण्याचा प्रयत्न केला. असे आढळून आले आहे की भारतातील आदिवासी आणि ग्रामीण भाग अजूनही विकासाधीन आणि दुर्गम आहेत. विशेषतः आदिवासी (आदिवासी) शोषित, दडपले जातात. मूलभूत हक्क आणि सुविधांबाबत त्यांना माहिती नाही. सरकारी संस्था आणि स्वयंसेवी संस्था आदिवासींना शिक्षण, आर्थिक विकास आणि प्रदेशाच्या सर्वांगीण विकासासाठी पटवून देण्यात अयशस्वी ठरल्या. याचा परिणाम म्हणजे सामाजिक विषमता आणि असंख्य सामाजिक समस्या. मेळघाट हा अनुसूचित जमातीचा परिसर आहे. मेळघाट ही अशी पडीक जमीन आहे जिथे या सर्व सामाजिक, आर्थिक, शैक्षणिक आणि राजकीय समस्या आहेत. मेळघाटचा मोठा भाग व्याघ्र प्रकल्प आणि जंगलाच्या बफर झोनने व्यापलेला आहे. कोरकू, गोंड, गवळी, बलाई, निहाल, रथ्या आणि गवळण या प्रदेशातील प्रमुख जमाती आहेत. मेळघाटातील एकूण लोकसंख्येमध्ये 80 टक्के या जमातींचा समावेश आहे. वनविभागाने आदिवासींच्या परंपरेने अवलंबून असलेल्या नैसर्गिक मुळे, फळे आणि औषधी वनस्पतींवर प्रवेश करण्यास मनाई केली. दळणवळण, वीज, पायाभूत सुविधा या मूलभूत सुविधांपासून मेळघाट वंचित आहे. या भागातील शालेय शिक्षण पद्धती स्थानिक जीवनशैली आणि बोलीभाषेशी जुळत नाही. सरकारी संस्था आणि स्वयंसेवी संस्थांनी या समस्यांवर तोडगा काढण्याचा चांगला प्रयत्न केला पण आदिवासींच्या अडथळ्यामुळे मोठा अडथळा निर्माण झाला आहे. मेळघाटातील सामाजिक समस्यांमुळे रोजगारासाठी स्थलांतर झाले आहे. अपुर्या शिक्षणामुळे रोजगाराची परिस्थिती बिकट झाली आहे.

प्रधानमंत्री उज्ज्वला योजना ही नरेंद्र मोदी सरकारची 1 मे 2016 रोजी उत्तर प्रदेशातील बलिया येथून सुरु करण्यात आलेली महत्वाकांक्षी सामाजिक कल्याण योजना आहे. पंतप्रधान उज्ज्वला योजनेंतर्गत देशातील बीपीएल कुटुंबांना एलपीजी कनेक्शन देण्याचे सरकारचे उद्दिष्ट आहे. ग्रामीण भारतात वापरल्या जाणाऱ्या अस्वच्छ स्वयंपाकाच्या इंधनाच्या जागी स्वच्छ आणि अधिक कार्यक्षम रूग्ळ (लिव्हिफाईड पेट्रोलियम गॅस) या योजनेचा उद्देश आहे. उज्ज्वला योजनेचे उद्दिष्ट देशभरातील बीपीएल (दारिद्र्य रेषेखालील) कुटुंबातील महिलांच्या नावावर 5 कोटी एलपीजी कनेक्शन उपलब्ध करून देण्याचे आहे. या योजनेंतर्गत देशभरातील बीपीएल कुटुंबांना 5 कोटी एलपीजी कनेक्शन वितरित करण्याचे लक्ष्य सरकारने ठेवले आहे. या योजनेची पुढिल उद्दिष्टे आहेत त्या मध्ये महिलांचे सक्षमीकरण आणि त्यांच्या आरोग्याचे रक्षण करणे, जीवाश्म इंधनावर आधारित स्वयंपाकाशी संबंधित गंभीर आरोग्य धोके कमी करणे, स्वयंपाकाच्या अशुद्ध इंधनामुळे भारतात होणाऱ्या मृत्यूंची संख्या कमी करणे, जीवाश्म इंधन जाळून घरातील वायू प्रदूषणामुळे होणाऱ्या तीव्र श्वसनाच्या आजारांपासून लहान मुलांना रोखणे.

बीपीएल कुटुंबातील पात्र महिला उमेदवार या योजनेसाठी अर्ज करू शकतात. इच्छुक उमेदवारांनी 2 पानांचा अर्ज भरावा आणि फॉर्मसोबत आवश्यक कागदपत्रे जोडावीत. अर्ज भरण्यासाठी मूळ तपशील जसे की नाव, संपर्क तपशील, जन धन/बँक खाते क्रमांक, आधार कार्ड क्रमांक इत्यादी आवश्यक आहेत. सरकारने यापूर्वीच रु. 2016-17 पासून पुढिल 3 आर्थिक वर्षासाठी उज्ज्वला योजनेच्या अंमलबजावणीसाठी 8000 कोटी ची सरकारच्या वतीने करण्यात आली होती. सरकार ने संपूर्ण देशात 2018-19 पर्यंत सुमारे 7 कोटी 19 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले व महाराष्ट्रात सुमारे 41 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले. त्याच बरोबर सरकार ने 2019-20 पर्यंत 8 कोटी 02 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले व महाराष्ट्रात सुमारे 44 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले व सरकार ने 2020-21 पर्यंत सुमारे 8 कोटी 44 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले व महाराष्ट्रात सुमारे 41 लाख बीपीएल कुटुंबांना एलपीजी कनेक्शन वितरित केले. त्याच बरोबर भारत सरकारच्या डपदपेजतल व िच्चजतवसमनउ ंदक छंजनतंस ळें मंत्रालयाने जाहीर केलेल्या आकडेवारी नुसार 24 नोव्हेंबर 2022 पर्यंत अमरावती जील्हात 1,52,200 गॅस कनेक्शनचे या योजने अंतर्गत वाटप करण्यात आले. सरकारने प्रधानमंत्री उज्ज्वला योजना 01.05.2016 रोजी सुरु केली तेव्हा गरीब घरातील 5 कोटी महिलांना डिपॉझिट फ्री एलपीजी कनेक्शन प्रदान करणे हा या योजनेचा मुख्य उद्देश होता व त्यानंतर, उद्दिष्ट 8 कोटी पर्यंत वाढविण्यात आले जे 1 एप्रिल 2021 पर्यंत गाठले गेले. 'गिळ-इट-अप' मोहिमेद्वारे एलपीजी सबसिडीमध्ये बचत केलेले पैसे वापरून ही योजना लागू केली जाईल. ही योजना पेट्रोलियम आणि नैसर्गिक वायू मंत्रालयाद्वारे लागू केली जाईल. इतिहासात पहिल्यांदाच पेट्रोलियम आणि नैसर्गिक वायू मंत्रालय अशी प्रभावी कल्याणकारी योजना राबवत आहे ज्याचा फायदा सर्वात गरीब कुटुंबातील करोडो महिलांना होईल. ही योजना आर्थिक वर्ष 2016-17, 2017-18 आणि 2018-19 या तीन वर्षांमध्ये लागू करण्यात आली व त्या नंतर उज्ज्वला योजना 2.0 ची सुरुवात पंतप्रधान नरेंद्र मोदी यांनी 10 ऑगस्ट 2021 रोजी उत्तर प्रदेशातील महोबा जिल्ह्यातून केली. ज्याद्वारे 1 कोटी अतिरिक्त एलपीजी कनेक्शन देण्याचे लक्ष्य ठेवण्यात आले. याशिवाय एलपीजी कनेक्शन देण्याबरोबरच प्रथम रिफिल आणि स्टोव्ह मोफत देण्याचा निर्णयही घेण्यात आला. या योजनेच्या दुसऱ्या टप्प्यात 1 डिसेंबर 2021 पर्यंत एकूण 80.5 लाख जोडण्या देण्यात आल्या आहेत.कमी उत्पन्न असलेल्या कुटुंबांना डिपॉझिट-मुक्त एलपीजी कनेक्शन प्रदान करणे हे या योजनेचे उद्दिष्ट आहे. उज्ज्वला 2.0 अंतर्गत, डिपॉझिट फ्री एलपीजीसह कनेक्शन, फर्स्ट रिफिल आणि हॉटप्लेट लाभार्थ्यांना मोफत दिले जाते. या योजनेअंतर्गत, स्थलांतरितांना शिधापत्रिका किंवा पत्त्याचा पुरावा सादर करण्याची आवश्यकता नाही ज्यासाठी स्वयं-घोषणा आहे 'कुटुंब घोषणा' आणि 'पत्त्याचा पुरावा' या दोन्हीसाठी पुरेसे आहे. उज्ज्वला 2.0 हे साध्य करण्यात मदत करते. महाराष्ट्रातील पीएम उज्ज्वला योजनेंतर्गत जारी केलेल्या कनेक्शनची संख्या 2018 ते 2021 या कालावधीत 1 कोटी 29 लाख ऐवढी आहे. अमरावती जील्हामधील मेळघाटचा मोठा भाग व्याघ्र प्रकल्प आणि जंगलाच्या बफर झोनने व्यापलेला आहे जिथे या सर्व सामाजिक, आर्थिक, शैक्षणिक आणि राजकीय समस्या आहेत. मेळघाट हा अनुसूचित जमातीचा प्रदेश असून त्यात उच्च शिक्षणाचे प्रमाण कमी आहे. केंद्रशासनाने देशातील बीपीएल धारक कुटुंब व अतिदुर्गम गावांमधील बीपीएल कुटुंबांना एलपीजी कनेक्शन देण्यासाठी उज्ज्वला योजना जाहीर केली आहे. मेळघाट हा आदिवासी भाग असून बहुतांश आदिवासी लोकसंख्येपैकी 80 लोक बीपीएल अंतर्गत आहेत. हा अभ्यास 2016-17 ते 2020 व 2021 या वर्षांशी संबंधित आहे. या मध्ये प्रामुख्याने पुढिल उद्दिष्टाचा समावेश आहे महिलांच्या

आरोग्यावर जीवाश्म इंधनामुळे होणारे परिणाम, अस्वच्छ जीवाश्म इंधनामुळे होणाऱ्या मृत्यूंची संख्या, जीवाश्म जाळल्यामुळे होणारे पर्यावरण प्रदूषण, महिलांच्या राहणीमानाचा आणि जीवनशैलीचा अभ्यास करणे, महिलांना त्यांच्या सक्षमीकरणासाठी प्रेरित करणे व प्रधानमंत्री उज्वला योजनेद्वारे ग्रामीण भागातील दारिद्र्य रेषेखालील लोकांना झालेल्या आर्थिक फायदयाचा अभ्यास करणे. या योजनेद्वारे मेळघाट भागातील दारिद्र्य रेषेखालील महिलांना होणा-या फायद्यांचा अभ्यास करणे हे सध्याच्या संशोधनाचे उद्दिष्ट आहे.

प्रधानमंत्री उज्वला गॅस योजनेचे निकष / आवश्यकता आणि पात्रता:

२०११ च्या यादीमध्ये समाविष्ट असलेले सर्व लोक प्रधानमंत्री उज्वला गॅस योजनेचा लाभ घेऊ शकतील. याशिवाय, प्रधानमंत्री ग्रामीण आवास योजनेतील सर्व व कुटुंब अर्जदार, दारिद्र्यरेषेखालील कुटुंबे, अंत्योदय योजनेतर्गत समाविष्ट असलेले, वनवासी, सवर्ण कुटुंबांना प्रधानमंत्री उज्वला गॅस योजनेचे लाभ मिळतील.

- 1) सदरची गॅस कनेक्शन केवळ कुटुंब प्रमुख, प्रौढ महिलेच्या नावावर मंजूर केले जाईल.
- 2) अर्जदाराचे वय 18 वर्षे (केवळ महिला) असणे आवश्यक आहे.
- 3) एक सनदी धारक कुटुंब एक गॅस कनेक्शन घेण्यास पात्र असेल.

प्रधानमंत्री उज्वला गॅस योजनेची प्रक्रिया:

विभागामार्फत गॅस धारक शिधापत्रिका व बिगर गॅस धारक शिधापत्रिका यांची माहिती तयार करून तिघांचेही आधार कार्ड छप्प मार्फत जोडण्यात आले आहे. केवळ सदरची माहिती जिल्हाधिकार्यांना पाठवण्यात आली आहे. जिल्हाधिकारी सदरची माहिती अधिकृत शिधवताप दुकानदारांना पाठवली जाईल. जिल्हास्तरावर तेल कंपनीच्या नियुक्त अधिकार्याच्या सहकार्यासोबतच गॅस एजन्सी आणि त्यांना जोडल्या जाणाऱ्या शिधवाटप दुकानांची यादी गॅस एजन्सी तयार करणार आहे. तसेच शिधवाटप दुकानांमध्ये नवीन गॅस जोडण्यात अंतर्गत अर्ज दिले जाणार आहेत. शिधापत्रिका धारक जेव्हा अधिकृत शिधवताप दुकानात रॉकेल खरेदी करण्यासाठी येतात, त्यावेळी त्यांना गॅस कनेक्शनचा फॉर्म दुकानदाराकडून मिळवून घ्यावा लागतो. अन्यथा, परवानाधारक रॉकेल खरेदी करणार नसून, शासनाने दिलेल्या यादीच्या आधारे परवानाधारकाकडून गॅस कनेक्शन फॉर्म खरेदी करावा लागेल. प्रधानमंत्री उज्वला योजना आणि विस्तारित प्रधानमंत्री उज्वला योजना, उज्वला योजना 2.0 अंतर्गत पात्र असलेल्यांना केंद्र सरकारच्या योजनेअंतर्गत गॅस कनेक्शन उज्वला योजना मोफत गॅस सिलिंडर देण्यात येईल. उर्वरित पत्रकधारक कुटुंबांना राज्य योजनेतर्गत गॅस जोडणी दिली जाईल.

प्रधानमंत्री उज्वला गॅस योजनेसाठी आवश्यक कागदपत्रे:

सध्या राज्यात 52,000 रास्तभाव दुकाने आणि 2122 गॅस एजन्सी कार्यरत आहेत. तसेच लाभार्थ्यांकडून पुढिल कागदपत्रांच्या छायाप्रती घेतल्या जातील. 1) विहित नमुना अर्ज 2) शिधापत्रिका 3) कुटुंब प्रमुख महिला आणि कुटुंबातील इतर व्यक्तीचे आधार कार्ड 4) लाभार्थी (घरातील महिला प्रमुख) चे बँक तपशील. 5) आधार कार्ड. अर्ज व आवश्यक कागदपत्रे सादर केल्यानंतर शिधवताप दुकानदारामार्फत संबंधित गॅस एजन्सीला अर्ज दिला जाईल आणि गॅस एजन्सी कागदपत्रे तपासून शिधापत्रिका धारण करणाऱ्या कुटुंबांना तातडीने गॅस कनेक्शन मंजूर करेल. याशिवाय प्रधानमंत्री उज्वला योजनेचा लाभ घेण्यासाठी ऑफलाइन तसेच प्रधानमंत्री उज्वला योजनेच्या अधिकृत वेबसाइटवर जाऊन ऑनलाइन अर्ज करता येतो.

साहित्याचा आढावा संशोधन पध्यती, संशोधनाचे क्षेत्र, नमुना निवड व माहितीचे विश्लेषण : -

जिल्हांच्या अहवालातील किंमत निर्देशांक पुस्तके आणि विषयाशी संबंधित विविध वेबसाइट. सध्याच्या संशोधकाने हे प्रबंध आणि पुस्तके, वृत्तपत्रे आणि प्रश्नांचा सखोल अभ्यास करण्याचा प्रयत्न केला आहे. व्याप्ती आणि संशोधन पद्धती

या मध्ये मेळघाट विभागाच्या वास्तविक माहितीवर आधारित असून त्याचे संशोधन क्षेत्र महाराष्ट्रातील अमरावती जिल्ह्यातील तहसील चिदलदरा आणि धारणी क्षेत्र आहे .पीएम उज्वला योजनेच्या अंमलबजावणीद्वारे आदिवासी महिलांच्या विकासाची तपासणी करण्यासाठी यादृच्छिक नमुने आणि सर्वेक्षण पद्धती लागू करण्याचा प्रयत्न करतो . संशोधनासाठी मेळघाटातील निवडक गावांची या संशोधनासाठी निवड केली . माहिती संकलनासाठी प्राथमिक आणि दुय्यम दोन्ही स्रोतांचा वापर केला . निवडक गावांमधील लोकांशी संवाद आणि मुलाखतीद्वारे प्राथमिक डेटा गोळा केला. प्रश्नावली तयार केली. मुलाखती घेतल्या या संशोधनात दुय्यम डेटा वापरण्यात आला असून यामध्ये विविध पुस्तके, सर्वेक्षण, अहवाल, सरकारी रेकॉर्ड, वृत्तपत्रे यांचा वापर केला आहे .माहितीचे विश्लेषण करतांना संशोधनाची उद्दिष्टे लक्षात घेऊन विविध लोक, स्वयंसेवी संस्था आणि संस्थांमार्फत गोळा केलेली माहिती आणि तथ्ये यांचे विश्लेषण आणि अर्थ लावला गेला या मध्ये परस्परसंवाद, प्रश्नावली, फील्ड नोट्स, मुलाखती आणि अहवालांद्वारे गोळा केलेली तथ्ये आणि डेटाची सांख्यिकीय पद्धतीद्वारे छाननी केली.

निष्कर्ष :-

मेळघाटातील बहुतांश कुटुंब हे दारिद्र्य रेषेखाली स्वतःचे जीवन जगत आहेत.आर्थिक परिस्थिती गरीब असल्यामुळे त्यांना गॅस कनेक्शन घेणे शक्य नसते त्यामुळे ते चुलीवर जेवण बनवतात त्यामुळे जंगलतोड केली जाते तसेच चुलीवर जेवण बनवल्यामुळे वायू प्रदूषण मोठ्या प्रमाणात होतो त्यामुळे महिलांच्या आरोग्यावर त्या चुलीच्या धुराचा त्रास होतो व ते दम्या सारख्या आजारांना बळी पडतात त्याच बरोबर मेळघाट सारखा ज्या प्रदेशाचा मोठा भाग व्याघ्र प्रकल्प आणि जंगलाच्या बफर झोनने व्यापलेला आहे जिथे रोजगाराची साधने अल्प प्रमाणात उपलब्ध आहेत व मोठया प्रमाणात स्त्रियांना रोजगारासाठी वर्शातून चार, पाच महिने बाहेर गावी मजुरी साठी जावे लागते अशा भागात आदिवासी महिलांची आरोग्यस्थिती या योजनेमुळे सुधारण्यास मदत झाली. त्याच बरोबर मेळघाटातील बहुसंख्य आदिवासी महीला गरीब आणि निरक्षर आहेत व त्या मोठयाप्रमाणत जीवाश्म इंधनाच्या वापरकरतात वत्यामुळे पर्यावरण प्रदूशनमोठया प्रमाणात होते प्रधानमंत्री उज्वला गॅस योजनेमुळे प्रदूशन कमी होईल. बहुसंख्य महीला बेरोजगार आहेत आदिवासी महिलांचे राहणीमान जीवनशैली अतिशय गरीब आहे ते प्रधानमंत्री उज्वला गॅस योजनेमुळे सुधारेल त्यांना आपल्या उत्पन्नातला कमी भाग खर्च करावा लागेल व त्यांच्या बचतीत वाढ होईल व इतर सुविधा व आवश्यक वस्तुवर ते जास्त प्रमाणात खर्च करू शकतील त्याच बरोबर त्यांच्या उत्पन्नात वाढझाल्यास मेळघाटातील आदिवासींचा सामाजिक, आर्थिक आणि सांस्कृतिक वीकास होण्यास मदत होईल. मेळघाटातील आदिवासी (आदिवासी) महिलांच्या विकासासाठी . जागतिकीकरणाच्या परिस्थितीत प्रधानमंत्री उज्वला गॅस योजना उपयुक्त ठरेल. व मेळघाट आदिवासी महीलांच्या राहणीमानाचा आणि जीवनशैलीचा विकास करण्यात मदत होईल.

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13. Contribution of Self - Help Groups in Economic and Social Development of Tribal Women in Melghat

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Introduction

Melghat Tiger Reserve is located on the southern offshoot of the Satpura Hill Range in Central India, called Gavilgarh hill in the Indian state of Maharashtra. Melghat is the prime biodiversity repository of the state. Microfinancing helps women in overcoming from various social and economic bondage. It also helps women in realizing their fundamental rights, privileges and potential as equal members of society. The present study is on the assessment of Self Help Groups and their impact on tribal women in Melghat. It was undertaken to examine the performance of women SHG as well as its socio-economic impact on tribal women in Melghat. The inclusion of women in the decision-making process plays an important role as empowering women is one of the most vital aspects of inclusive and social justice reforms and policy measures for poverty alleviation and unemployment. The goal of addressing the problems of poverty and unemployment including social injustice that exists in our country cannot be achieved without taking women on the board towards the nation's progress. Nowadays these groups are formed in Melghat (Dharni and Chikhaldara) Taluka in Amaravati District but they need proper guidance and counselling for their empowerment. Self-Help Groups or in-short SHG is now a well-known concept. It is now almost two decades old. It is reported that the SHGs have a role in hastening a country's economic development. SHGs have now evolved as a movement. Mainly, members of the SHGs are an omen. Consequently, the participation of women in the country's economic development is increasing. They also play an important role in elevating the economic status of their families. This has led boost to the process of women's empowerment. Importance of study After independence major emphasis was placed on different development projects for rural and tribal areas including a special programme for women. So many programmes for women have been planned and also implemented such as 'Functional Literacy for Women', Indira Mahila Yojana, Rashtriya Mahila Kosh, and DWACRA for assisting women to achieve economic & social abilities through the acquisition of literacy and other necessary

skill and resources to develop the fullest potential of women of all rural areas, ensure their full and equal participation in building their role in the development process.

Objectives of Research

1. To study the socio-economic profile, impact and performance of the SHGs,
2. To measure the perceived attitude of the SHGs members towards the economic and social impact SHGs in Melghat Women.
3. To study social awareness and problems faced by the SHGs and measures to overcome them.
4. To find out the better ways for optimum uses of the scheme provided.
5. To elaborate the training and skill development programmes provided to SHGs are adequate.
6. To study the economic empowerment of the member. It includes Changes in the standard of living.

Hypothesis Of Research

This research design consists of several propositions which are subjected to testing and examination. The following hypothesis has been formulated after keeping in view the mentioned queries which indicated the significance of the present research study “SHG movement is not fully successful in women’s economical development in the area of Melghat (Dharni and Chikhaldara) Taluka in Amaravati District .’

1. “Lack of awareness among SHG’s women of Melghat (Dharni and Chikhaldara) Taluka in Amaravati District has resulted in non-use of most of the government training and skill development programmes”
2. “Government schemes for SHGs in Melghat (Dharni and Chikhaldara) Taluka in Amaravati District are inadequate and they are not reached all SHGs of the area”.
3. “Lack of technical knowledge of the business environment, SHG products face the marketing problems

Review of literature

Yunus (2000) in his paper on the empowerment of rural poor through Grameen bank elucidates that, poverty is not caused by the poor people themselves, but is a result of institutional and policies measure. **Simeen (2000)** studied the gender dimension of micro-credit programme participation and found out that, the household’s need for cash in terms of micro-

credit intervention, to solve their problems motivates people to join micro-credit programmes. **Rhyme (2001)** analysed how lending to the poor began, grew, and came of age in Bolivia and stated that microfinance is a kind of provision for financial services like bank loans, banking services and insurance to the weaker section of the community who are financially debarred to facilitate them to increase their income and living standards. **Aloysius (2002)** analyzed the impact of Self Help Groups on the social empowerment of women SHGs participants in Southern India and pointed out that, those SHGs participants which belonged to older SHGs were perceived as stronger on many social and economic parameters and found that their confidence level is reasonable higher as compared to members from groups which is newer in their existence. **Narayan (2002)** in his study on empowerment and poverty reduction, revealed that allocation of resources to local poor communities helps to empower them to gain control of their own social and economic affairs, improve governance as well as inclusiveness, capacity enhancement and increase the efficiency of local resource utilization for their benefit. **Rao (2002)** attempted to analyse the role of Self-Help Groups and DWCRA towards the economic and social empowerment of women in Andhra Pradesh and concluded that the socio-economic conditions of members of Self-Help Groups and DWCRA showed significant differences in many social and economic aspects. **Rupnawar and Upadhye (2015)** in their study evaluated the contribution of bank linkage programme in the economic empowerment of rural women in Maharashtra and found that women need to possess technical knowledge, skill and marketing linkage to set up enterprises there by gaining economic empowerment of women. And the website of the government of India Ministry of Rural Development (<https://nrlm.gov.in>) *National Rural Livelihoods Mission (NRLM)* was launched by the Ministry of Rural Development (MoRD), Government of India in June 2011.

Research Methodology

For the proposed study, both primary as well as secondary data shall be used. The primary data shall be collected through a well-structured questionnaire. The relevant secondary data shall be collected from journals periodicals, newspapers, the internet, Opinion, and interviews. For This dissertation, Researcher use the descriptive method.

Field of Study

In the present study, individuals and organizations related to the self-help group were referred to as the study population. It included women's unit as well as persons from women's self-help groups etc. 10 villages each of Chikhaldara and Dharani talukas of the Melghat division were selected as a study area.



National Rural Livelihoods Mission



NRLM HELP LINE
011 - 24122947
nrlm_nrfm(AT)nic(DOT)in

G1: SHGs Under NRLM

S.No	State Name	SHGs Type			Sub Total	Total Members
		New	Revised	Pre-Nrlm		
INDIA						
1	ANDHRA PRADESH	224653	0	600274	824527	8635286
2	ASSAM	136098	154635	38942	329675	3667571
3	BHAR	1000828	216	25988	1027033	11887699
4	CHHATTISGARH	191131	54553	4759	250423	2694659
5	GUJARAT	112295	82101	76097	270493	2692821
6	JHARKHAND	238958	11959	21168	277085	3326039
7	KARNATAKA	70758	13663	163997	248418	2957089
8	KERALA	107958	1074	144111	253743	3532241
9	MADHYA PRADESH	354401	57165	10643	422211	4710778
10	MAHARASHTRA	463898	104257	28056	596211	5937679
11	ODISHA	227130	161006	138902	527038	5431197
12	RAJASTHAN	243872	137	6478	250487	2770161
13	TAMIL NADU	161700	17787	136456	315963	3627519
14	TELANGANA	128024	1855	308216	438135	4596489
15	UTTAR PRADESH	599813	71852	13184	684849	7185061
16	WEST BENGAL	709545	33109	304974	1047628	10873179
Sub Total		4771043	76609	2022267	7779339	84254077

Economic and Social Development of Tribal Women in Melghat

According to the above table, 596211 women self-help groups have been established in Maharashtra with a total of 5937679 members. Savings in Maharashtra are seen to have been boosted to a great extent through this savings group and at the same time loans have been provided to members for business in return for savings resulting in employment generation in Maharashtra. It has helped in the social and economic development of the members.



National Rural Livelihoods Mission



NRLM HELP LINE
011 - 24122947
nrlm_nrfm(AT)nic(DOT)in

G1: SHGs members social category 4/11/16

STATE: MAHARASHTRA DISTRICT: AMRAVATI

S.No	Block Name	CategoryWise SHG				Sub Total	Minority CategoryWise Member				
		New	Revised	Pre-Nrlm	SC		ST	Minority	Others	Sub Total	PWD
1	ACHALPUR	1885	0	0	1885	3663	2766	681	11849	18559	593
2	AMRAVATI	1405	0	0	1405	3228	650	481	9246	13634	629
3	NANDGAON SURJI	1143	0	0	1143	2807	216	436	7473	10926	457
4	BHATKUL	1320	0	0	1320	3442	744	499	7837	12522	423
5	CHANDURBAZAR	1924	0	0	1924	4525	1348	560	12648	19081	620
6	CHANDUR RAILWAY	1145	0	0	1145	2340	804	302	7280	10731	489
7	CHIKHALDARA	858	0	0	858	878	6090	22	1047	8037	295
8	DARYAPUR	1481	0	0	1481	3913	558	492	9219	14382	328
9	DHARANGAON RAILWAY	1395	0	0	1395	2200	1003	237	9897	13337	298
10	DHARANI	883	0	0	883	429	6564	91	1285	8419	361
11	MORESBI	1702	0	0	1702	3092	2003	871	11767	17733	381
12	NANDGAON KHANDESHWAR	1388	0	0	1388	3226	743	431	9223	13623	414
13	TEOSA	1275	0	0	1275	1870	372	328	9933	12503	250
14	WARUD	1471	0	0	1471	2279	2649	358	9602	14879	393
Total		19275	0	0	19275	37942	26110	5293	118106	188251	6925

According to above table 19275 women self-help groups have been established in Amravati district with a total of 188151 members Talukawise SHG. Achalpur (1885), Amravati (1405), Ajangaon Surji (1143), Bhatkuli (1320), Chandur Bazaar (1924), Chandur Railway (1145) Chikhaldara (858) Daryapur (1481), Dhamangaon Railway (1395), Dharani (883), Morshi (1702), Nandgaon Khandeshwar (1388), Tivas (1275), Warud (1471).

National Rural Livelihoods Mission

G.P. SHGs Under NRLM

STATE: MAHARASHTRA DISTRICT: AMRAVATI BLOCK: CHIKHALDARA

S.No.	Gram Panchayat Name	SHG Type	Formed	Revival	Pre-Actn	Sub-Total	Total Members
1	ACHALPUR		4	1	1	6	217
2	AMRAVATI		2	1	1	4	272
3	AMRAVATI		2	1	1	4	48
4	AMRAVATI		2	1	1	4	20
5	AMRAVATI		2	1	1	4	120
6	AMRAVATI		2	1	1	4	120
7	AMRAVATI		2	1	1	4	120
8	AMRAVATI		2	1	1	4	120
9	AMRAVATI		2	1	1	4	120
10	AMRAVATI		2	1	1	4	120
11	AMRAVATI		2	1	1	4	120
12	AMRAVATI		2	1	1	4	120
13	AMRAVATI		2	1	1	4	120
14	AMRAVATI		2	1	1	4	120
15	AMRAVATI		2	1	1	4	120
16	AMRAVATI		2	1	1	4	120
17	AMRAVATI		2	1	1	4	120
18	AMRAVATI		2	1	1	4	120
19	AMRAVATI		2	1	1	4	120
20	AMRAVATI		2	1	1	4	120
21	AMRAVATI		2	1	1	4	120
22	AMRAVATI		2	1	1	4	120
23	AMRAVATI		2	1	1	4	120
24	AMRAVATI		2	1	1	4	120
25	AMRAVATI		2	1	1	4	120
26	AMRAVATI		2	1	1	4	120
27	AMRAVATI		2	1	1	4	120
28	AMRAVATI		2	1	1	4	120
29	AMRAVATI		2	1	1	4	120
30	AMRAVATI		2	1	1	4	120
31	AMRAVATI		2	1	1	4	120
32	AMRAVATI		2	1	1	4	120
33	AMRAVATI		2	1	1	4	120
34	AMRAVATI		2	1	1	4	120
35	AMRAVATI		2	1	1	4	120
36	AMRAVATI		2	1	1	4	120
37	AMRAVATI		2	1	1	4	120
38	AMRAVATI		2	1	1	4	120
39	AMRAVATI		2	1	1	4	120
40	AMRAVATI		2	1	1	4	120
41	AMRAVATI		2	1	1	4	120
42	AMRAVATI		2	1	1	4	120
43	AMRAVATI		2	1	1	4	120
44	AMRAVATI		2	1	1	4	120
45	AMRAVATI		2	1	1	4	120
46	AMRAVATI		2	1	1	4	120
47	AMRAVATI		2	1	1	4	120
48	AMRAVATI		2	1	1	4	120
49	AMRAVATI		2	1	1	4	120
50	AMRAVATI		2	1	1	4	120
51	AMRAVATI		2	1	1	4	120
52	AMRAVATI		2	1	1	4	120
53	AMRAVATI		2	1	1	4	120
54	AMRAVATI		2	1	1	4	120
55	AMRAVATI		2	1	1	4	120
56	AMRAVATI		2	1	1	4	120
57	AMRAVATI		2	1	1	4	120
58	AMRAVATI		2	1	1	4	120
59	AMRAVATI		2	1	1	4	120
60	AMRAVATI		2	1	1	4	120
61	AMRAVATI		2	1	1	4	120
62	AMRAVATI		2	1	1	4	120
63	AMRAVATI		2	1	1	4	120
64	AMRAVATI		2	1	1	4	120
65	AMRAVATI		2	1	1	4	120
66	AMRAVATI		2	1	1	4	120
67	AMRAVATI		2	1	1	4	120
68	AMRAVATI		2	1	1	4	120
69	AMRAVATI		2	1	1	4	120
70	AMRAVATI		2	1	1	4	120
71	AMRAVATI		2	1	1	4	120
72	AMRAVATI		2	1	1	4	120
73	AMRAVATI		2	1	1	4	120
74	AMRAVATI		2	1	1	4	120
75	AMRAVATI		2	1	1	4	120
76	AMRAVATI		2	1	1	4	120
77	AMRAVATI		2	1	1	4	120
78	AMRAVATI		2	1	1	4	120
79	AMRAVATI		2	1	1	4	120
80	AMRAVATI		2	1	1	4	120
81	AMRAVATI		2	1	1	4	120
82	AMRAVATI		2	1	1	4	120
83	AMRAVATI		2	1	1	4	120
84	AMRAVATI		2	1	1	4	120
85	AMRAVATI		2	1	1	4	120
86	AMRAVATI		2	1	1	4	120
87	AMRAVATI		2	1	1	4	120
88	AMRAVATI		2	1	1	4	120
89	AMRAVATI		2	1	1	4	120
90	AMRAVATI		2	1	1	4	120
91	AMRAVATI		2	1	1	4	120
92	AMRAVATI		2	1	1	4	120
93	AMRAVATI		2	1	1	4	120
94	AMRAVATI		2	1	1	4	120
95	AMRAVATI		2	1	1	4	120
96	AMRAVATI		2	1	1	4	120
97	AMRAVATI		2	1	1	4	120
98	AMRAVATI		2	1	1	4	120
99	AMRAVATI		2	1	1	4	120
100	AMRAVATI		2	1	1	4	120

This includes a total of 188151 members. Through the self-help group, the economy of district has been greatly boosted and women have been helped to get used to saving. At the same time, women have got a large amount of employment and due to this, their social and economic enhancement could be possible.

National Rural Livelihoods Mission

G.P. SHGs Under NRLM

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7	AMRAVATI		2	1	1	4	120
8	AMRAVATI		2	1	1	4	120
9	AMRAVATI		2	1	1	4	120
10	AMRAVATI		2	1	1	4	120
11	AMRAVATI		2	1	1	4	120
12	AMRAVATI		2	1	1	4	120
13	AMRAVATI		2	1	1	4	120
14	AMRAVATI		2	1	1	4	120
15	AMRAVATI		2	1	1	4	120
16	AMRAVATI		2	1	1	4	120
17	AMRAVATI		2	1	1	4	120
18	AMRAVATI		2	1	1	4	120
19	AMRAVATI		2	1	1	4	120
20	AMRAVATI		2	1	1	4	120
21	AMRAVATI		2	1	1	4	120
22	AMRAVATI		2	1	1	4	120
23	AMRAVATI		2	1	1	4	120
24	AMRAVATI		2	1	1	4	120
25	AMRAVATI		2	1	1	4	120
26	AMRAVATI		2	1	1	4	120
27	AMRAVATI		2	1	1	4	120
28	AMRAVATI		2	1	1	4	120
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96	AMRAVATI		2	1	1	4	120
97	AMRAVATI		2	1	1	4	120
98	AMRAVATI		2	1	1	4	120
99	AMRAVATI		2	1	1	4	120
100	AMRAVATI		2	1	1	4	120

According to the above table, 858 women's self-help groups have been established in Chikhaldara taluka with a total of 8037 members and 838 women's self-help groups have been

established in Dharni taluka with a total of 8094 members. Chikhaldara and Dharani, Fall in Amravati District Both are included in the Melghat region, women have been helped to get into the habit of saving through a self-help group. At the same time, women have got a great amount of employment resulting in, their social and economic development. In Chikhaldara taluka, a large number of women belonging to ST category are included in this self-help group, as these women do not have employment at the local level, they have got a means of getting employment through this group. Bank provides loans to these women with the help of savings at a low-interest rate and at the same time they are provided with various government schemes. Which combinedly produced satisfactory number of employment right at a local level.

Conclusion

From the above study, we can conclude that the Self Help Group in Melghat is a useful platform to increase the awareness of women in the areas of finance, employment, health, savings and banking awareness, financial security during emergencies etc. SHG helped in setting up of income-generating activities. At the same time, similar findings were observed in the study that the establishment of women's self-help groups did not significantly improve health status or awareness about health among women in Melghat. Self-help groups can play an important role in creating awareness about economic and social issues through group meetings, These SHGs can conduct specific capacity-building training on economic and social issues for women, and various productive skills are being developed among them, resulting in their economic and social development.

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Synthesis and study of structural properties of Cu doped polypyridine-PVAc composite films

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Abstract

Polypyridine and their composites are attractive materials for the use in existing and emerging technologies because of their light weight and low cost. In the present paper, I focused on the structural properties of Cu-doped polypyridine polyvinyl acetate supported composite films, wherein polyvinyl acetate (PVAc) as the host matrix. Polypyridine-PVAc composite thin films were synthesized by chemical oxidative polymerization method with the solvent methanol and Copper chloride (CuCl) as an oxidant as well as dopant. All films were characterized using X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and Fourier Transform Infrared (FTIR) spectroscopy.

X-RD spectra shows the sharp peaks in all prepared samples represents the crystalline nature of material, which is due the phases of polypyridine and CuCl (JCPDS data file No. 01-077-2383). Crystalline nature of the material is seen from the scanning electron micrographs which also reflected in the XRD spectra. The IR spectra of all samples shows peaks at 1444.72, 1437.17 and 1456.27 cm^{-1} and second peak at 1595.38, 1595.87 and 1595.09 cm^{-1} may assigned to typical polypyridine ring vibration.

Keywords: Composites, polypyridine, X-RD, SEM, FTIR

1. Introduction

The conductive polymer can be made by filling an insulation polymer matrix with conducting particles such as metal flakes or metalized fibers, by chemical or electrochemical synthesis method to produced intrinsically conductive polymers [1]. Pyridine based polymers have attracted much interest because of their oxidative stability and electron transport properties which make them promising candidates for polymer-based LED applications [2-3]. This paper deals with the synthesis and study of structural properties of all prepared Polypyridine-PVAc composite films. The structural study of all-composite films was carried out through X-RD, SEM & FTIR techniques.

2. Experimental

2.1 Materials

Chemically polymerized polypyridine films were obtained at room temperature by oxidative polymerization by using CuCl as oxidant. The monomer pyridine (E. Merck, Germany), Cu (I) Cl (AR grade), polyvinyl acetate (PVAc) (AR grade) used as a starting materials for the preparation of polypyridine-PVAc composite films.

2.2 Preparation of sample

For the preparation of Cu doped composite films a mixed solution of PVAc and methanol (10:90) was prepared. In order to make the homogeneous solution the mixture is stirred for 3 to 4 hours and kept overnight. In prepared homogeneous solution 1 Mole CuCl (0.8595 gm) was added (This process was exothermic.) and stirred about 30 minutes. Finally the monomer pyridine was added. The maximum yield was obtained by varying the concentration of pyridine monomer. Then in order to know the effect of oxidizing strength of CuCl, to form the conducting path, the concentration of CuCl was changed from 10 to 90 wt %. When monomer pyridine was added to the solution of PVAc, methanol and CuCl, a light green homogeneous solution was obtained. Glass plates (30 x 30 Cm^2) thoroughly clean with water and then with acetone, were used as a substrate. To achieve perfect leveling and uniformity in the thickness of the films the glass plate was leveled by using spirit level. Now the homogeneous solution was poured on the glass plate to prepared films of the composites.

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The whole assembly was placed in a dust free chamber maintained at constant temperature. In this way the Cu doped Polypyridine-PVAc composite films were prepared by isothermal evaporation technique [4]. After evaporation of solvent the thin films were formed, which were then washed with distilled water to remove the excess of CuCl.

2.3 X-Ray diffraction (X-RD)

The prepared polymer composite films were characterized by X-RD (Philips XPERT-PRO). The X-ray diffraction spectra of samples was recorded on X-ray diffractometer using CuKα (λ = 1.5406Å). The diffractogram was recorded in terms of 2θ in the range of 3 to 100° at room temperature.

2.4 Scanning Electron Microscopy (SEM)

Scanning electron microscopy is a convenient technique to study the microstructure of the thin films. Surface morphological study of optimized Polypyridine-PVAc composite films was done by using scanning electron microscope (JEOL-JSM- 6380A, analytical scanning electron microscope) operating with an accelerating voltage of 15 KV at VNIT, Nagpur. All samples were coated with platinum or gold prior to measurement by using sputtering unit (JEOL-JFC-1600 auto fine coater). Grain size of the films was determined from SEM photograph at different magnifications.

2.5 Fourier Transform Infrared Spectroscopy (FTIR)

Fourier transform infrared spectroscopy (FTIR) is the most widely used method for characterizing the molecular structure of polymers, because it provides a lot of information. The FTIR spectrum of all Polypyridine-PVAc composite films

was recorded on Perkin Elmer FTIR Spectrophotometer at room temperature in the wavelength range 4000 to 450 cm⁻¹ using KBr pellet.

3 Results and discussion

3.1 X-RD Spectra

The X-ray diffraction patterns of all PPy-PVAc composite films are shown in figure 1. In the present work XRD technique has been used to check the amorphous or crystalline nature of the samples. Sharp peaks in the samples represents the crystalline nature of material, which is due the phases of polypyridine and CuCl (JCPDS data file No. 01-077-2383). In all, samples the peaks are observed at 2θ = 16, 26, and 32° with d-values 5.41, 3.39 and 2.75 Å respectively, corresponding to (010), (200) and (020) planes due to the phases of polypyridine [5]. The peaks observed at 2θ = 33 and 47° are due to the CuCl phases corresponding to planes (200) and (220). The average crystallite size is estimated by using Scherrer's formula [6].

D = kλ/βcosθ (1)

Where D is the crystallite size of particle, λ = 1.54 Å being the X-ray wave length of CuKα and k is the shape factor which can be assigned to a value of 0.89 if the sample is unknown, θ is diffraction angle at maximum intensity of peak and β is the full width at half maxima of angle of diffraction in radians. The diffraction pattern of all samples shows a number of peaks at different 2θ values. The analysis of these single peaks supports towards its crystalline nature.

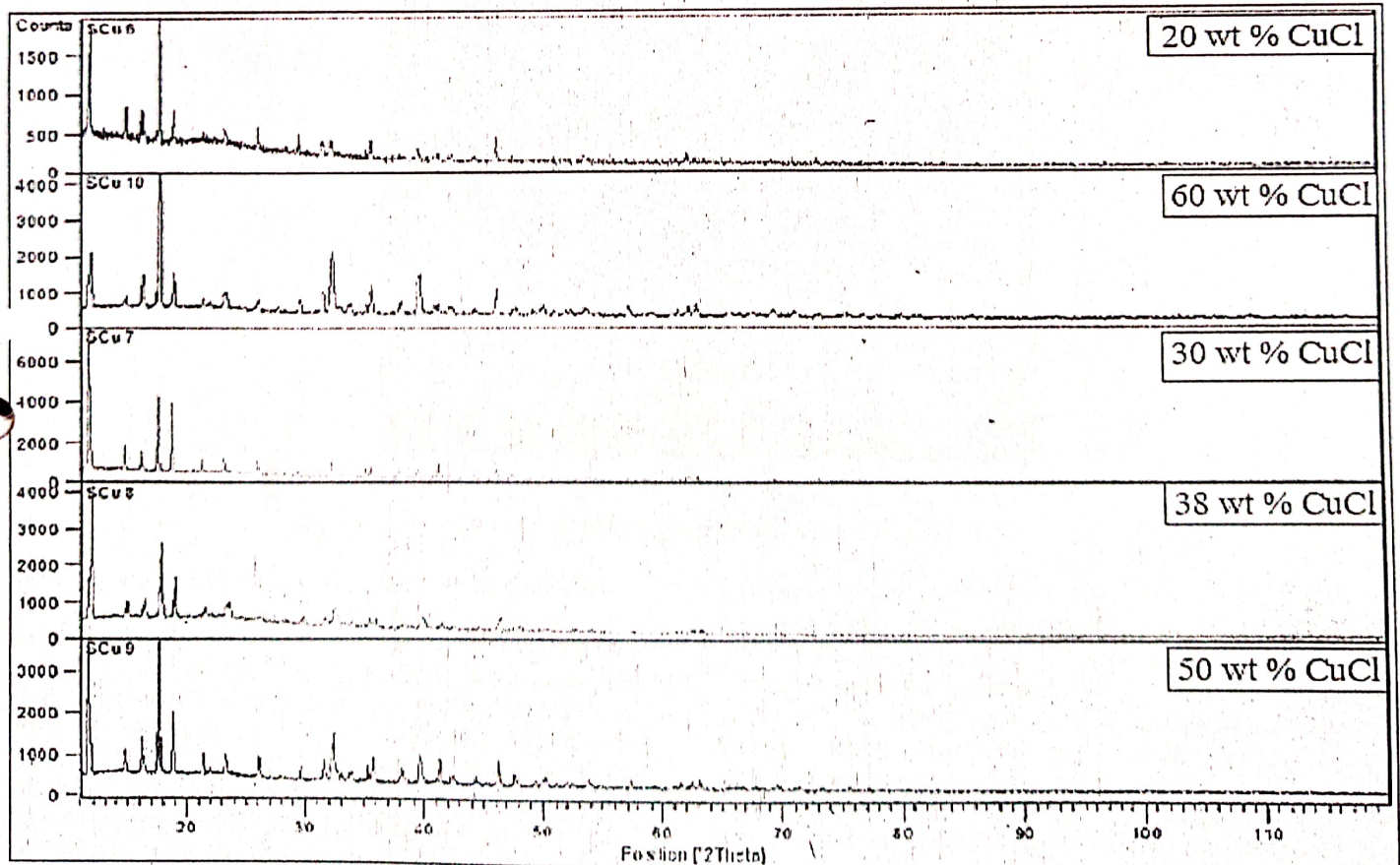


Fig 1: X-RD spectra for the samples

Table 1: Average crystallite size obtain from X-RD

Sample code	Max. peak intensity position 2θ	FWHM	$D = k\lambda/\beta\cos\theta$ (\AA)
SCu ₆	17.81	0.1224	22.66
SCu ₇	11.66	0.102	27.01
SCu ₈	11.95	0.1428	19.30
SCu ₉	17.69	0.1224	22.66

3.2 Scanning Electron Microscopy (SEM)

The surface morphology of Polypyridine-PVAc composite

films with different concentration of oxidizing agent was analyzed by SEM and the pictures are shown in figure 2(a), (b) and (c) respectively. It is seen that the crystals of CuCl amended in PPy-PVAc composite films. From SEM it is also clear the crystal density is less in figure 2(b) as compared to figures 2(a). The crystals size varies from ~ 3 to $5 \mu\text{m}$ in figure 2(a), while in figure 2(b) from ~ 1 to $2 \mu\text{m}$. However the more amorphous nature is seen in figure 2(c). The porous size varies from ~ 2 to $6 \mu\text{m}$.



Fig 2a): 30wt %

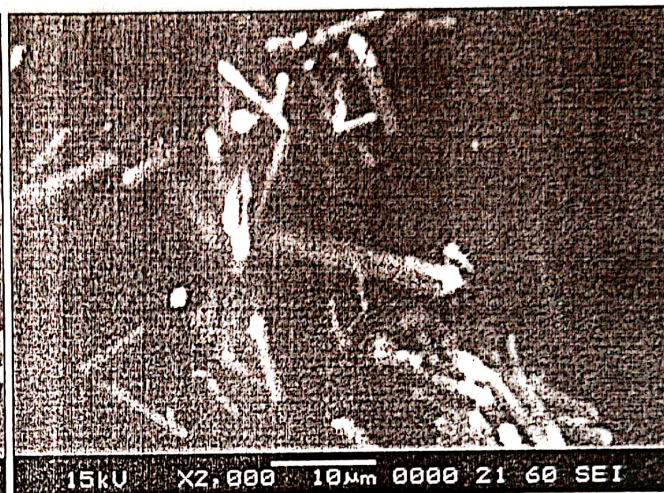


Fig 2b): 38wt %

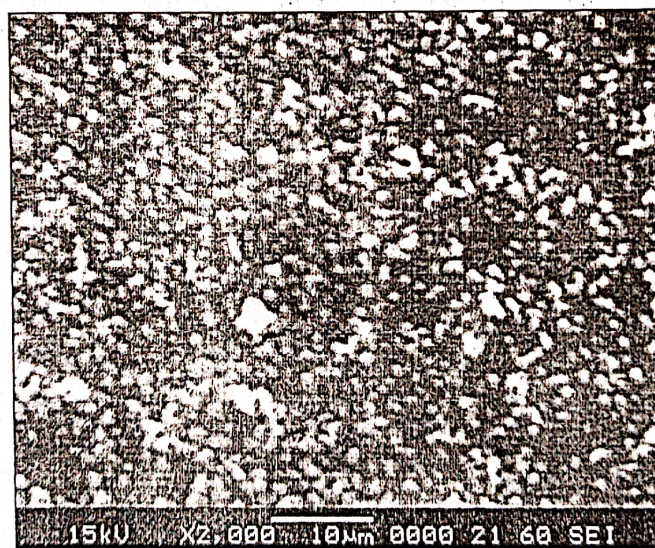


Fig 2c): 50wt %

Fig 2 (a-c): SEM photographs (CuCl as oxidizing agent)

3.3 Fourier Transform Infrared Spectroscopy (FTIR)

Fourier Transform Infrared Spectroscopy is the most widely used method for characterizing the molecular structure of polymers. By using IR spectroscopy it is possible to distinguish the different repeat unit structure that can arise from polymerization. In IR spectroscopy the energy associated with vibration of atoms in a molecule with respect to one another are quantized and absorption of electromagnetic radiation in the infrared region ($17 \lambda > 750 \mu\text{m}$, where λ is the wave length) gives rise transition between these different vibrational states. Absorption result from coupling of vibration with the oscillating electric field of the infrared radiation, and this interaction can occur only when vibration produces an oscillating dipole moment. Since

vibration atoms are linked together by chemical bonds it is usual to refer to the vibrations as bonds deformations of which the simplest types of stretching and bending. The infrared radiation is depend by its wave number and the common absorption occur in wave number range $4000-650 \text{ cm}^{-1}$ and for this reason IR spectra usually were recorded over this range [7].

Infrared spectra of Polypyridine-PVAc composite films are given in figure 3 and the corresponding absorption peak frequencies tabulated in table 2. The spectral studies of all prepared composite films show the number of absorption peaks. The peaks are sharp medium and broad. From FTIR spectra of all investigated films it is observed that the basic structure of the polymer composite is same though the

oxidizing agent is different and the oxidizing strength also different. An attempt is made to explain the structure of Polypyridine-PVAc composite with the help of infrared spectra.

The infrared spectra of sample SCu₇, SCu₈ and SCu₉ shows weak peak at 943.5, 944.73 and 943.17cm⁻¹ respectively which may be due to metal fillers in composite. In the aromatic C=C and C=N stretching region polypyridine exhibits a broad band at 1582 cm⁻¹ and sharp band at 1454 cm⁻¹. The IR spectra of all samples shows peaks at 1444.72,

1437.17 and 1456.27 cm⁻¹ and second peak at 1595.38, 1595.87 and 1595.09 cm⁻¹ for Cu₇, Cu₈ and Cu₉ samples respectively, may assigned to typical polypyridine ring vibration [8-9]. The bands at 1743.76, 1734.16 and 1745.75 cm⁻¹ for samples Cu₇, Cu₈ and Cu₉ may assigned to presence of PVAc. All samples shows two peaks at 2852 and 2920 cm⁻¹ may corresponds to symmetric and asymmetric C-H stretching. Thus the strong bands in the range 1745 to 943 cm⁻¹ confirmed the polymerization and conductive form of polymer composite.

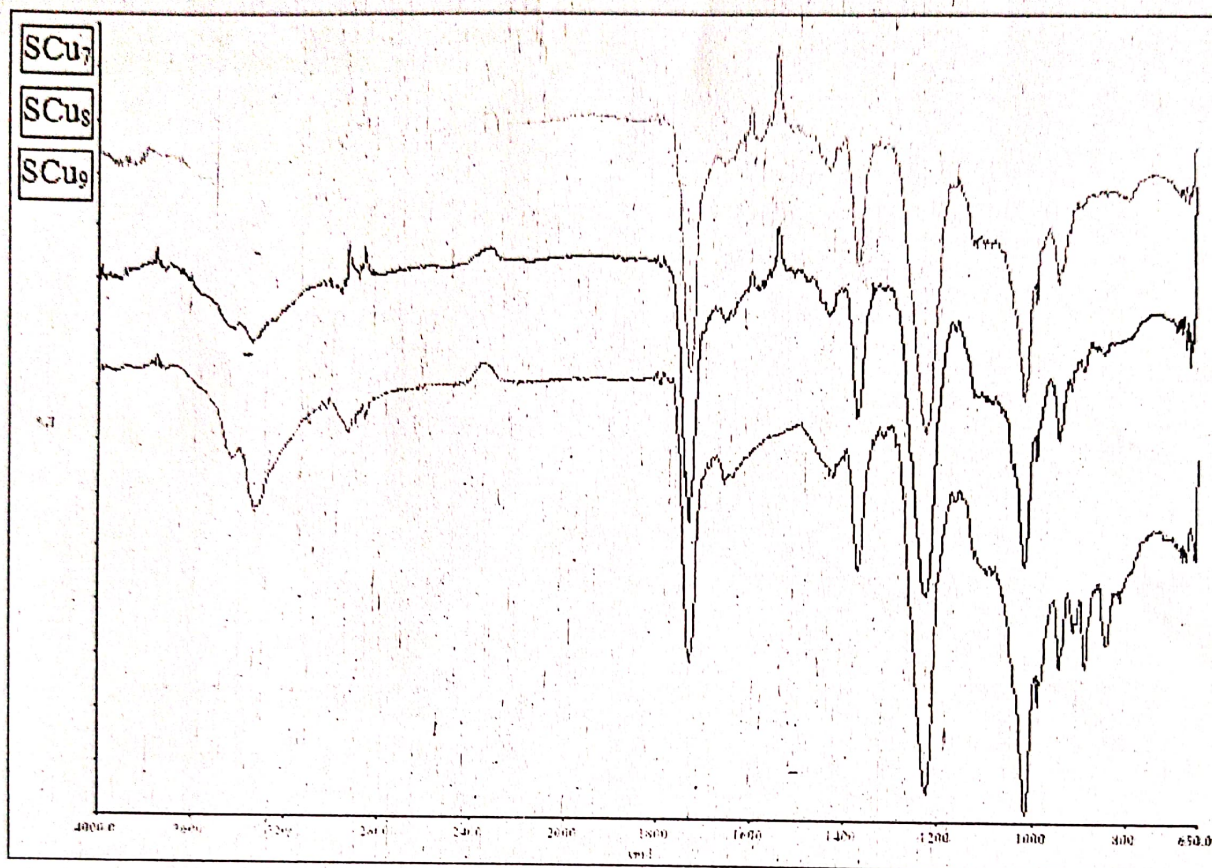


Fig 3: FTIR spectrums of PPy-PVAc composite films

Table 2: Experimental data from FTIR spectra

Sample code	Position of absorption maxlma. cm ⁻¹											
	943.5	1017.06	1225.90	1317.49	1444.72	1595.38	1743.76	2323.32	2856.06	2909.96	3451.3	
Cu ₇ (30wt %)	943.5	1017.06	1225.90	1317.49	1444.72	1595.38	1743.76	2323.32	2856.06	2909.96	3451.3	
Cu ₈ (30wt %)	944.7	665.8	1018.51	1221.62	1372.2	1437.17	1595.87	1734.16	2322.17	2855.77	2924.16	3447.94
Cu ₉ (30wt %)	943.1	1016.56	1226.19	1373.0	1456.27	1595.09	1745.75	2324.37	2857.17	2928.18	3442.7	

Conclusion

Characteristics study of Polypyridine-PVAc composite films has been made by analyzing the films with XRD, SEM and FTIR. From the XRD spectra of PPy-PVAc composite films, it is observed that very sharp peaks are observed in the XRD spectra of all samples these are due to phases of CuCl. Sharp reflection peaks are also observed in all samples due to the phases of PPy and PVAc. Appearance of the sharp peaks indicates the crystalline nature of the composite material. The average crystalline size is estimated by using the Scherer's formula.

The surface morphology of Polypyridine-PVAc composite films with different concentration of oxidizing agent was analyzed by SEM. The crystalline nature of Polypyridine-PVAc composite films is due to dopant.

The spectral studies of all prepared composite films were shows the number of absorption peaks. The peaks are sharp, medium and broad. From FTIR spectra of all investigated

films it is observed that the basic structure of the polymer composite is same though the oxidizing strength changing. From the FTIR spectra it is observed that the sharp and medium peaks are seen in the range 678 to 1190 cm⁻¹ which may assigned to impurity and metal oxide present in the polymer composite material. The spectra of PPy-PVAc composite films display bands around 1606 and 1447 cm⁻¹ corresponding to aromatic C=C and C=N stretching region, which may associate to polypyridine ring vibrations. All samples shows two peaks at 2852 and 2920 cm⁻¹ which corresponds to symmetric and asymmetric C-H stretching. Thus the strong bands in the range 1015 to 1749 cm⁻¹ for all samples indicate the polymerization and conductive form of polymer composite.

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Synthesis of Reduced Graphene Oxide from Graphite Oxide using *Terminalia chebula* i.e. *Hirada* Seeds

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Abstract: Graphene is a rapidly rising star on the horizon of materials science and condensed-matter physics. Its extended honeycomb network is the basic building block of all other graphitic carbon allotropes of different dimensionality. Single basal plane of Graphite is called Graphene. Graphene is a 2D crystal made up of single atomic layer of carbon atoms arranged in honey comb structure making bonds with three neighbour atoms by sp^2 hybridization. The graphene was prepared by oxidizing purified natural graphite via modified Hummers method.

Keywords: *Terminalia chebula* i.e. *Hirada*, graphite flakes, composites, graphene.

1. INTRODUCTION

Graphene, a two-dimensional nanomaterial of single atom thickness, have received much attention in recent years because of its outstanding physical and chemical properties. Due to its exceptional electrical, mechanical and thermal properties, graphene and its chemically modified forms are acting as gifted materials in various fields such as sensors, field-effect transistors, energy-related, polymer composite and in biological applications [1-2]. From the last few years various synthesis methods of graphene have been developed such as chemical vapor deposition [3], micro-mechanical exfoliation of graphite [4], and chemical reduction of graphene oxide (GO) to graphene [5]. But the synthesis from graphene oxide by chemical reduction is considered to be prominent due to its low cost and large scale production. Numerous chemical reducing agents have been used for the synthesis of graphene such as NaBH_4 , hydroquinone and hydrazine [6-7]. The bulk usage of these chemicals is dangerous because of their explosive and hazardous nature.

The present research work has described a green facile synthesis of reduced graphene oxide by using naturally occurring molecules *Terminalia chebula* i.e. *Hirada* i.e. *Hirada* plant seeds and its subsequent stabilization with these molecules on the surface of the formed graphene sheets.

2. MATERIALS AND METHOD

2.1 Chemicals:

Graphite powder (100 mesh, 99.9995%), sodium nitrate (NaNO_3), hydrogen peroxide (H_2O_2 , 30%), potassium permanganate (KMnO_4), concentrated sulfuric acid (98%) along with all organic.

2.2 Preparation of plant seed extract:

Terminalia chebula i.e. *Hirada* (*T. chebula*) i.e. *Hirada* plant seeds were collected and washed with water and then dried under sunlight. 5 g of finely ground powder of *T. chebula* i.e. *Hirada* seeds was added to 250 mL of deionized water and heated at 90°C on water bath for 1 h, cooled and filtered through 0.2 μm cellulose nitrate membrane filter paper.

2.3 Preparation of graphene oxide (GO) reduced graphene oxide (RGO):

Chemical synthesis of graphene oxide was carried out from graphite flakes by the modified Hummers method [8]. Briefly, 0.5 g of graphite flakes and 0.5 g of sodium nitrate were added to 25 mL of 12.1 M H_2SO_4 (98%) and the mixture was magnetically stirred for 15 min in an ice bath. Then the reaction was continued by the slow addition of 5 g of KMnO_4 maintaining the temperature below 21 °C. Further, the mixture was constantly stirred at 40 °C for 90 min in water bath followed by the addition of 50 mL of double distilled water. The subsequent dark brown suspension formed was treated slowly with 5 mL of 30% H_2O_2 solution followed by dilution with 50 mL double distilled water. The resulting GO suspension was washed several times with 5% HCl followed by deionized water to remove excess of manganese salt until neutrality was reached. Finally, the purified GO was dried in oven at 50°C for 1 h. GO dispersion (1 mg GO/mL) was prepared by ultrasonication in an ultrasonic bath for about 2 h.

About 250 mL of GO solution was added to 250 mL aqueous extract of *T. chebula* i.e. *Hirada* seeds and mixed well by manual shaking. pH of the above solution was adjusted to 11 by using NH_4OH . The resulting suspension was refluxed on a water bath at 90°C for about 24 h. The completion of reduction of GO was confirmed by change in the color of GO from yellowish brown to black (also confirmed by UV-Vis analysis). A precipitate of reduced GO (TCG) settled down due to the loss of oxygen moieties present in graphene oxide after the reduction.

2.4 Characterization:

AFM analysis was carried out by using Multimode Scanning Probe Microscope for a thin film of TCG dispersion coated onto p-type Si (100) substrates. Scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) analysis were done by using a Carl Zeiss SEM instrument attached to EVOMA 15 (Oxford Instrument). The solid TCG powder was spread over the surface of carbon tape adhered on a metallic disk. Images were taken at diverse magnification for the sample surface. A simultaneous EDS spectrum was taken at selected areas on the TCG solid surface to get the surface atomic distribution. HPLC analysis was done using Perkin Elmer 200 series HPLC equipped with UV-Vis Detector ($\lambda = 192\text{--}700\text{ nm}$) and a 200 series pump. Mobile phase was prepared using 32% of acetonitrile and 0.1 M KCl at pH 3 (adjusted with dilute

HCl). Samples were prepared by mixing the extract with the mobile phase.

3. RESULTS AND DISCUSSION

The synthetic procedure involved in the preparation of graphene from graphene oxide is illustrated in Fig. 1, which is shown by the color change from brownish yellow to black. After the completion of reduction, reduced graphene oxide was settled down as precipitate, suggesting the loss of oxygen containing moieties present in the graphene oxide.

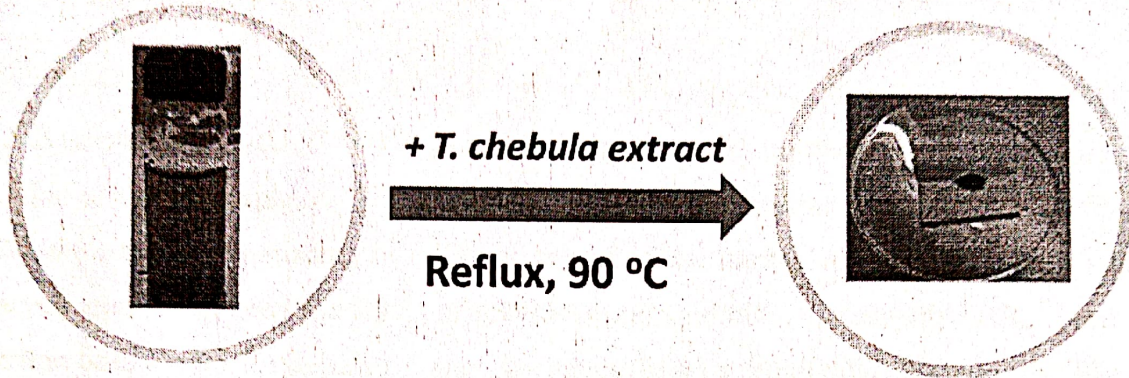


Fig. 1 Schematic illustration of *Terminalia chebula* i.e. *Hirada* mediated reduction of graphene oxide

The reduction process of graphene oxide was examined by taking the UV-Visible absorption spectra of RGO as a function of time. UV analysis has shown a maximum absorption peak of 232 nm of GO which was ascribed to the π - π transitions of the aromatic C-C bonds and a weak shoulder appeared at 300 nm due to n- π transitions of C=O bonds. Completion of reduction was confirmed by the establishment of new peak and a red shift of characteristic peak at 232 nm to 277 nm (Fig. 2 A), indicates the restoration of electronic conjugation of graphene sheets. The performance of reducing agent is estimated by the maximum red shift value observed [9]. For instance, *T. chebula* i.e. *Hirada* extract reduced graphene oxide has shown an absorption peak at 277 nm, which is higher than that of hydrazine and phenyl hydrazine reduced graphene (272 nm), indicating the efficient reducing ability of polyphenols present in *T. chebula* i.e. *Hirada* extracts. The typical broad shoulder appeared at 367 nm may be due to the presence of polyphenols that are attached on the surface of graphene nanosheets which prevents agglomeration of graphene [10-12].

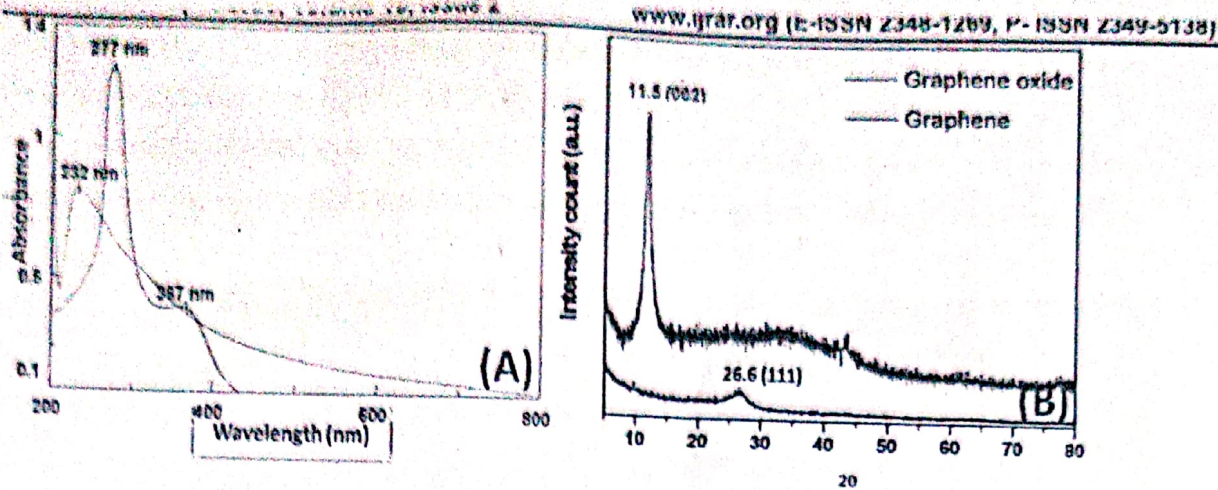
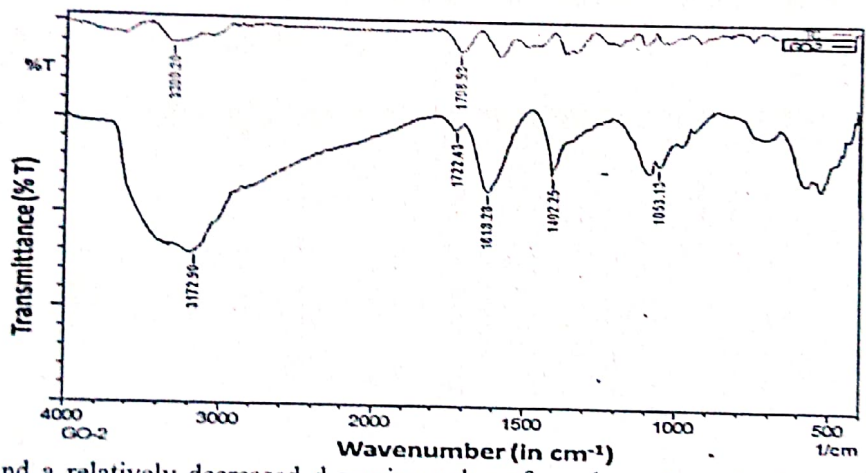


Fig. 2 (A) UV-Visible spectra of GO (green) and TCG (blue) (B) XRD patterns of GO (red) and TCG (blue)

Fig. 2 B shows the XRD diffractogram which approves *T. chebula* i.e. *Hirada* extract induced reduction of GO to graphene. The GO shows a single basal diffraction peak at 11.5° (002) with corresponding interlayer d-spacing of 0.80 nm, revealing the intercalation of water and other oxygen containing groups between the layers of graphite upon oxidation. Conversely, TCG formed after the reduction of GO with *T. chebula* i.e. *Hirada* extract shows a broad diffraction peak at 2θ of 27.7° from (111) crystal plane with corresponding d-spacing of 0.36 nm. The disappearance of peak



at 2θ of 11.5° and a relatively decreased d-spacing value of graphene formed when compared to GO, indicates the complete removal of oxygen containing groups in GO after reduction.

Fig. 3 FTIR spectra of GO (blue) and dried TCG (pink)

Further, FTIR spectroscopic studies of pure GO and TC reduced GO samples were performed to know the extent of reduction (Fig. 3). It is observed that GO shows a broad band in the range of $3100-3400\text{ cm}^{-1}$ corresponding to the O-H stretching vibrations. The absorption band around 1725 cm^{-1} is due to C=O stretch of carbonyl group and a band at 1620 cm^{-1} corresponds to the O-H bending and epoxide ring vibrations. The narrower absorption peak around 1051 cm^{-1} is due to the C-O stretching vibrational peak of carboxylic (COOH) groups present on the surface of graphene oxide. The absorption band at around 1400 cm^{-1} may be due to the presence

of tertiary alcohol (C–OH) group. The FTIR spectra of dried TCG shows a significant decrease in the intensities of absorption bands (O–H, C=O, C–O and tertiary C–OH bands) corresponding to the oxygen functionalities present in the graphene oxide, which establishes the deoxygenation and the results are similar to the results obtained from the graphene synthesized by using plant extracts [13].

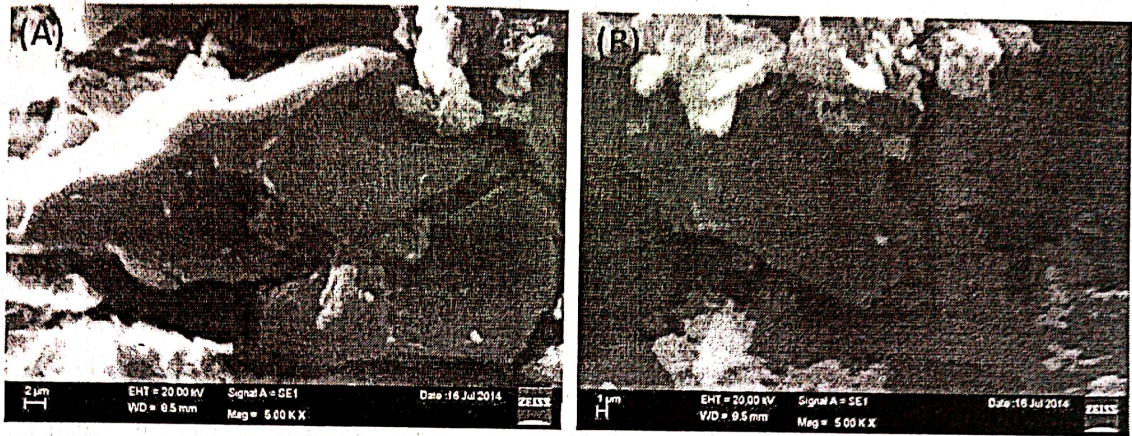


Fig. 4 SEM images of GO (A) and TCG (B)

The morphology of GO and TCG was investigated by SEM analysis. Fig.4A clearly shows the existence of stacked layers of solid GO with rough surface. However, the surface roughness of GO may be due to the oxidation of sheets. Compared to GO, the TCG also shows the layered structures with thin and lower height (Fig. 4B).

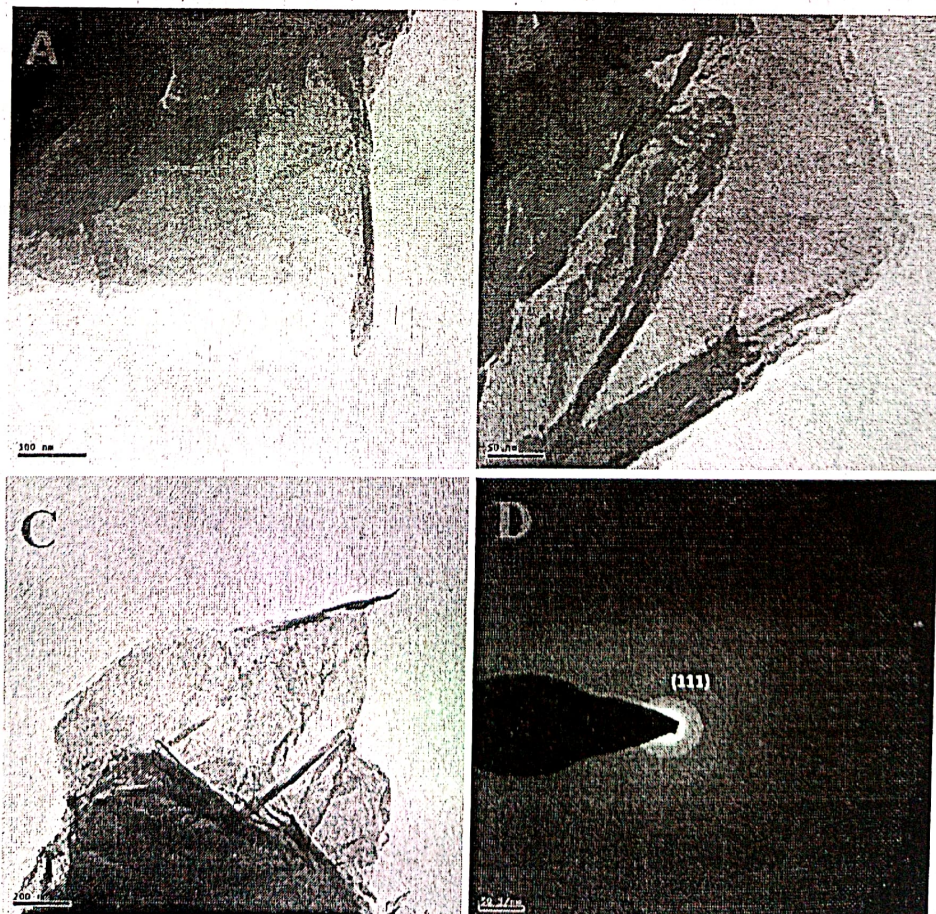


Fig. 5 HR-TEM images of TCG at different magnifications (A–C) and the SAED pattern (D)

HRTEM microscopic images of TCG (which are shown in Fig. 5A–C) show a transparent, silk like appearance of ultra thin graphene sheets after reduction. It is also shown that the edges of the suspended graphene films tend to fold back, permitting the cross-sectional view of the films. The selected area electron diffraction (SAED) pattern of graphene shows a typical sharp polycrystalline ring pattern composed of many diffraction spots (Fig. 5D), representing the loss of long range organization between the formed graphene nanosheets. Atomic force microscopic images are shown in Fig. 6. The thickness of the formed TCG sheets, obtained from the height profile is about 29 nm, indicating the few layered graphene formation.

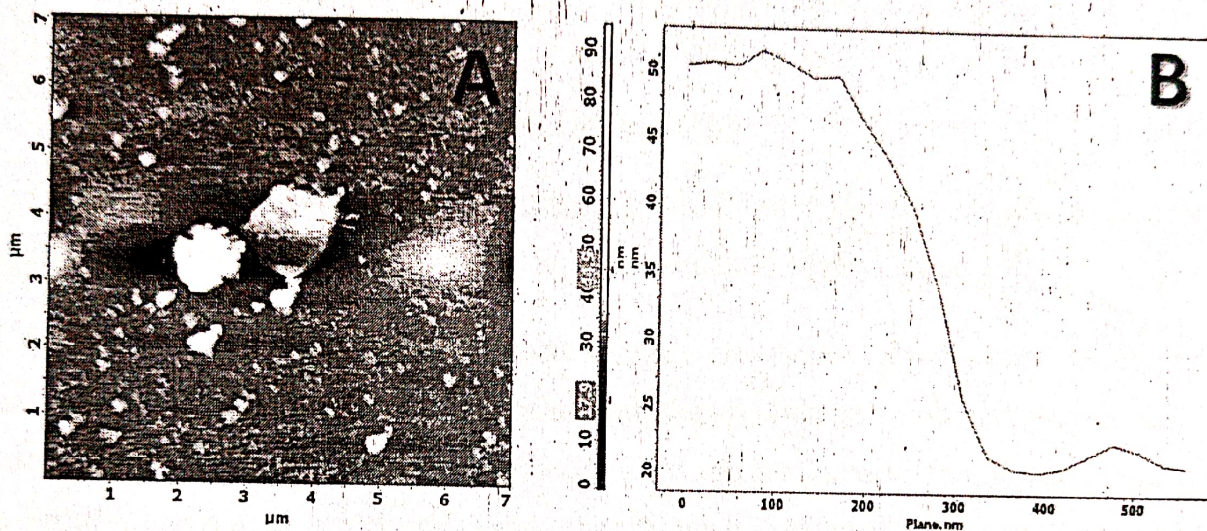


Fig. 6 AFM image (A) and corresponding height profile (B) of TCG

HPLC analysis was performed to know the polyphenolic constituents present in the aqueous extract of *T. chebula* i.e. *Hirada* seeds. Fig.7 shows the presence of four different phytochemicals in *T. chebula* i.e. *Hirada* aqueous extract namely, ascorbic acid, gallic acid, pyrogallol and methyl gallate which are known by comparing with the retention times of the respective standards under the same instrumental conditions. Further, the presence of gallic acid as major constituent in *T. chebula* i.e. *Hirada* extract indicates its predominant role in the reduction of GO to TCG.

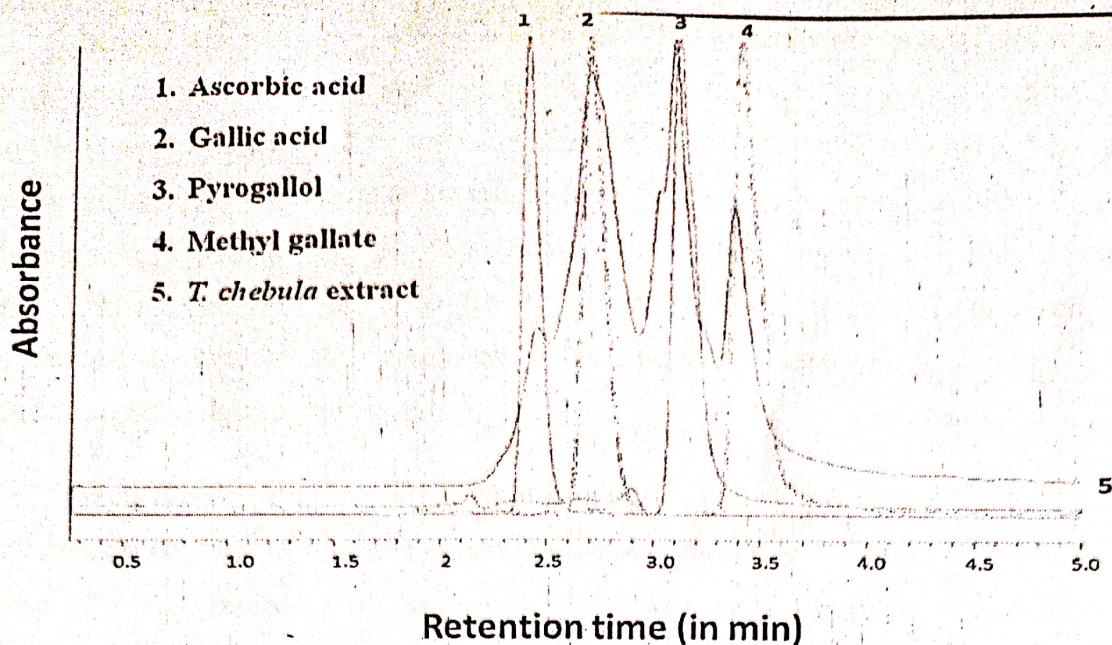


Fig. 7 (A) Overlay image of HPLC chromatograms of *T. chebula* i.e. *Hirada* extract and corresponding standards (Ascorbic acid, Gallic acid, Pyrogallol and Methyl gallate)

The surface of the GO contains different oxygen containing groups such as epoxide, hydroxyl, and carbonyl [14]. Under basic conditions both the epoxide and carbonyl groups may be converted into hydroxyl groups. *T. chebula* i.e. *Hirada* plant extract contains four different types of polyphenols namely, gallic acid, pyrogallol, ascorbic acid, methyl gallate, containing highly acidic hydrogen atoms, which easily disassociate to their anionic forms. The anionic forms of polyphenols react with the hydroxyl moiety of GO through a nucleophilic substitution 2 (SN₂) mechanisms resulting in the formation of intermediate 1. The intermediate 1 is transformed to intermediate 2 with the elimination of water molecule which finally forms *T. chebula* i.e. *Hirada* reduced graphene oxide.

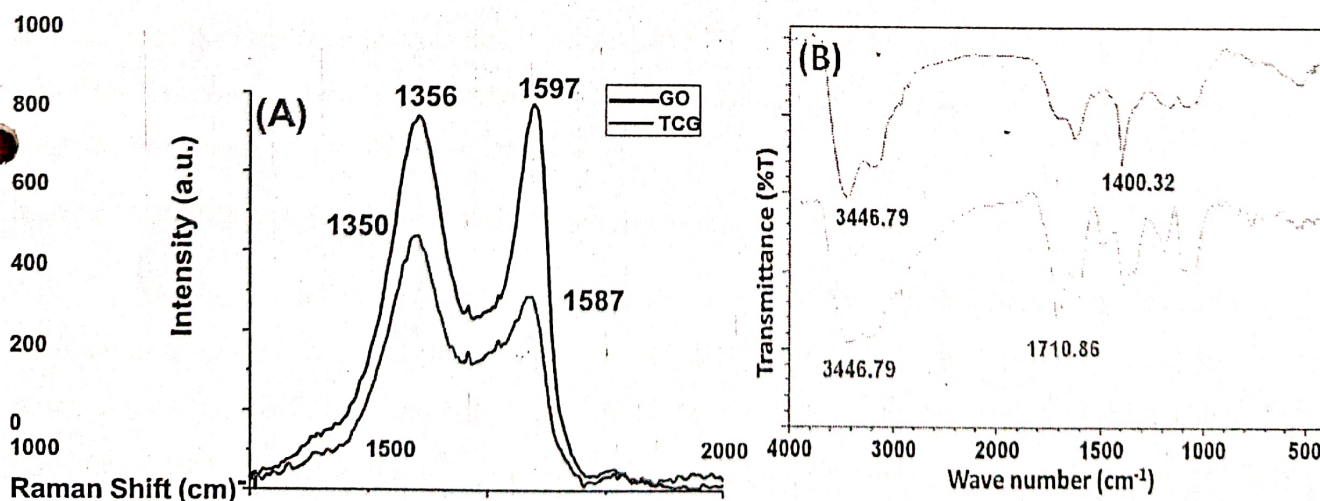


Fig. 8 (A) Raman spectra of GO (black) and TCG (red) (b) TCG (blue) (B) FTIR spectra of *T. chebula* i.e. *Hirada* leaf extract before reduction (green) and after reduction (red)

Raman spectroscopy analysis was carried out to know the size of sp² domains in the graphene structure containing both sp³ and sp² network. The ratio of I_D/I_G obtained for both GO and TCG were 1.49 and 2.65 respectively (Fig. 8A). The increase of I_D/I_G ratio after reduction may be due to the higher adsorption of the oxidized polyphenols on the graphene surface, thus increasing the surface sp³ domains. Fig. 8A also shows a shift of about 10 cm⁻¹ in G band of graphene oxide from 1597 cm⁻¹ to 1587 cm⁻¹ after reaction indicating a high degree of reduction. However, an increased I_D/I_G ratio of TCG compared to the GO further illustrates the formation of graphene crystalline domains after reduction [15].

From the UV-Vis data (Fig. 2A), it is confirmed that the presence of broad band at 365 nm indicates the presence of oxidized polyphenols on the surface of reduced graphene oxide, which are responsible for preventing the agglomeration of successive graphene sheets. Furthermore, the weight loss studies is performed to know the quantity of biomolecules present on the surface of graphene sheets. These studies are carried out by incubating 50 mg of *T. chebula* i.e. *Hirada* reduced graphene oxide in a hot furnace for about 2 h at 500°C and are observed a loss of 90% by weight after the incubation period.

In addition, FTIR spectra were taken for the dried water extract of *T. chebula* i.e. *Hirada* before and after the reduction of GO, to find out the molecular capping of the formed graphene sheets. Fig. 8B shows the presence of intense infrared bands at 3446, 1400 cm⁻¹ corresponding to O-H and C-O stretching of phenolic groups indicating the rich content of polyphenols in *T. chebula* i.e. *Hirada* extract. However, the reduced intensity of O-H stretching and the absence of C-O stretching vibrations at 1400 cm⁻¹ with the appearance of new vibrational band at 1710 cm⁻¹ (characteristics of ketone group) in the extract after the reduction further confirms the conversion of polyphenols into their quinone forms during the deoxygenation of GO. From these studies, it is assumed that the oxidized polyphenols interact with TCG sheets by π - π stacking interactions that generate electrostatic repulsions between the graphene layers resulting in the stabilization of individual graphene sheets. The π - π interactions between graphene sheets and the oxidized polyphenols.

The optical band gap of RGO was calculated from UV-Visible spectra by the following equation as $\alpha = c (h\nu - E_{\text{bulk}})^{1/2} / h\nu$, where $h\nu$ is the photon energy, α is absorption coefficient, c is a constant, and E_{bulk} is bulk 'band gap'. Fig. 9A shows the plot drawn between $h\nu$ versus $(\alpha h\nu)^2$ for the formed graphene, by using UV-Visible spectroscopy at the wavelength range from 200 nm to 2400 nm. The band gap is obtained by the extrapolation of a linear regression to the X-axis in the plot and the gap is found to be 3.75 eV.

Further to confirm the presence of oxygen containing groups, thermal stability of TCG was examined by TGA (Fig. 9B). Thermogram of as-synthesized TCG exhibits a weight loss of 14.5% below 200°C due to the loss of absorbed water, oxygen functionalities and the other

biomolecules present on the surface of graphene oxide. Subsequently, it has exhibited a large weight loss of 85% at 500°C, because of the pyrolysis of the remaining oxygen-containing groups and also due to the burning of the ring carbon. This higher weight loss at 500°C when compared to the graphene synthesized by using other green methods is clearly indicating the high accumulation of biomolecules on the surface of graphene oxide after reduction (15-16).

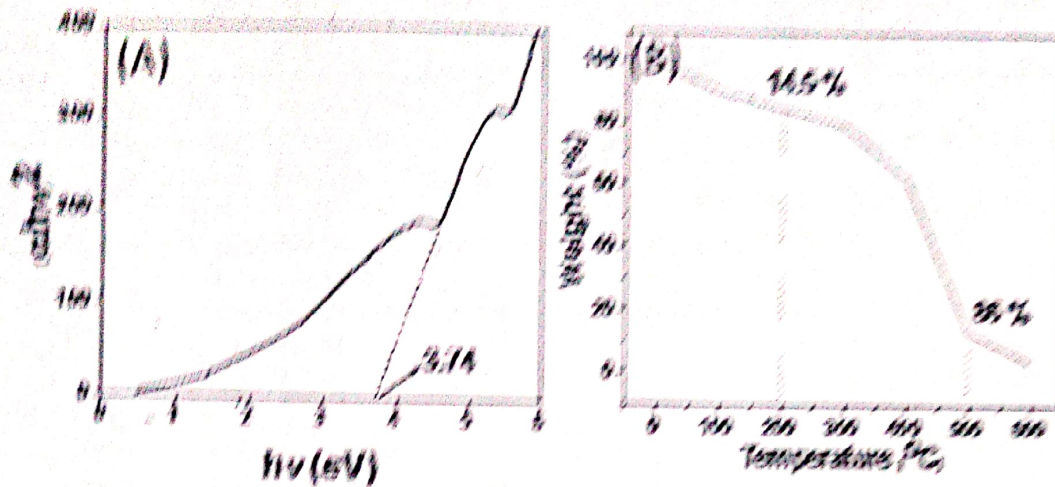


Fig. 9 (A) optical diffuse reflectance spectra of *T. chebulu* i.e. *Hirada* reduced graphene oxide (R) TCG thermogram of TCG

4. CONCLUSION

Facile green environmentally friendly one step synthetic methods for graphene are demonstrated using naturally occurring molecules *T. chebulu* i.e. *Hirada polyphenols* as both reducing and stabilizing agents. FTIR and HPLC analysis has confirmed that these molecules are responsible for the stabilization of the formed graphene nanosheets. The plausible mechanisms of reduction and stabilization of reduced graphene oxide using these molecules are discussed. Hence, these methods will be an important alternative to the traditional chemical reduction routes to avoid usage of hazardous chemicals and to fulfill the high demand of graphene in near future.

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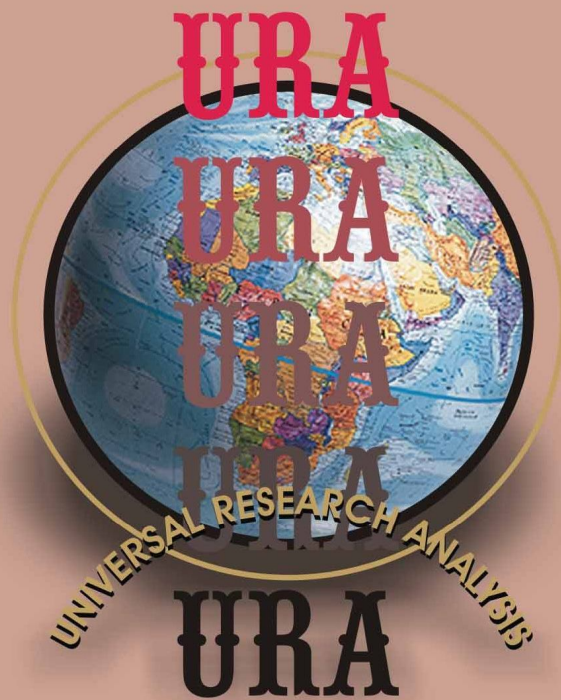


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8

ममता कालिया की कहानियों में स्त्री विमर्श

डॉ. संगीता जगताप

सहयोगी प्राध्यापक एवं हिन्दी विभागाध्यक्ष,
कला, विज्ञान एवं वाणिज्य महाविद्यालय,
चिखलदरा, महाराष्ट्र

Research Paper - Hindi

प्रस्तावना:-

हिन्दी साहित्य में महिला लेखन एक समृद्ध और सशक्त परम्परा है। महिलाओं की स्थिती और गति पुरुष वर्चस्व समाज में दयनीय रही है। लेकिन समाज और साहित्य में महिला हमेशा केंद्रित रही है। आज महिलाओंने बढकर साहित्यिक क्षेत्र में पदार्पण किया और अपनी कालजायी लेखनीसे अपना साहित्य को भी कालजायी बना दिया। महिला साहित्य करोंने समाज के साथ अपने वायमंय के माध्यमसे जो न्याय किया समाज का यह कर्तव्य है कि उनपर चिन्तन मनन करे।

आज हिन्दी साहित्य को महिला लेखन की देन अमूल्य है। आधुनिक काल में महिलाओं ने अपनी लेखनीसे साहित्य को महिला मंडित किया है। उपन्यास, कहानी, नाटक कविता आदि क्षेत्र में अभूतपूर्व योगदान अपनी लेखनी के माध्यम से महिलाओं की स्थिती और गति के साथ किया है।

भविष्य की स्त्री की स्थितियोंपर विचार करते हुए भूमण्डलीकरण, बाजार और उपनिवेश में स्त्री की जगह तलाशने का प्रयास वह अपने चिन्तन ग्रन्थ उपनिवेश में स्त्री मुक्ती कामना की दस वर्ताए बाजार के बीच बाजार के खिलाफ भूमण्डलीकरण और स्त्री के प्रश्न संस्कृति और राष्ट्र के माध्यमसे करती है। स्त्री की दृष्टि से वे उसका विश्लेषण ज्ञान के आश्रय से व्यवहारिक धरातलपर करती है। भारतीय स्त्री आंदोलन के इतिहास से यह पता चलता है कि १९ वी सदी से भारतीय स्त्रियों में अपनी उन्नती कि प्रबल आकांक्षा पैदा हो गयी थी। लेकिन राष्ट्रीय अंदोलनो में उसकी भागिदारी महात्मा गांधी की प्रेरणासे संभव हुई। इस प्रकार हम देखते है कि राष्ट्रीय आंदोलन में विस्तार के साथ साथ नारी के संघर्ष का विस्तार होता गया है। साथ ही नव जागृत स्त्रियाँ परिवार और समाज में अपने नए स्थान के लिए मचलने लगी।

जयशंकर प्रसादरजी मानवतावादी गुण बताते हुऐ कहाँ है की, "नारी तुम केवल श्रध्दा हो विश्वास रजत नग पत्र- तल में पीयूष धारसी बहा करो जीवन के सुंदर समत ल मे। प्रसादरने स्त्री

की महत्ता को यहाँ साकार किया है।"

हिन्दी साहित्य जगत में स्त्री विमर्श एक ऐसी चर्चित संकल्पना रही है। जो स्त्री जीवन एवं अस्तित्व को लेकर कई प्रश्न निर्माण करती है। स्त्री शब्द नारी का पर्याय वाची शब्द है। विमर्श का शाब्दिक अर्थ है विचार आलोचना परिक्षा जाँच परामर्श इत्यादि।

आधुनिक संदर्भ में स्त्री विमर्श का अर्थ है वर्तमान निश्चित सामाजिक संदर्भ में स्त्री जीवन के इर्द-जिर्द होता ऐसा विचार विनिमय कि जिस के द्वारा कोई मान्यता व्याख्या या तथ्य को भाषा के माध्यमसे साहित्य में प्रति बिंबित करना।

वैसे तो स्त्री जीवन का व्यथा और कथा को रचनात्मक धरात लपर मुखरित करने का प्रयास कई पुरुष एवं महिला रचना कारोंने किया है। साहित्य की अनुभूति के धरातलपर विचार करने पर प्रश्न उपस्थित होता है। स्त्री विमर्श की दृष्टि से आज किसका साहित्य श्रेष्ठ है। लेकिन आज नारी व्यथा को नारी की समझ सकती है। क्यों कि उस व्यथा को नारी ने भोज है परखा है जाना है। इसका अर्थ यह है की पुरुष लेखको द्वारा नारी पीडा को सशक्त से मुखरित नाही किया जा सकता। आज हम यह देखते हे की कई पुरुष लेखकों ने स्त्री जीवन की व्यथा और कथा को अपने साहित्य में व्यापकता से चित्रित किया है।

आज स्त्री जीवन की व्यथा कथा को विमर्श की दृष्टि से अनुशीलन करने पर जो लक्ष्य सामने आते है उनमें प्रमुख है। जैसे १. स्त्री, जीवन का संघर्ष २. स्त्री उत्थान ३. नारी अस्मिता एवं व्यक्तित्व की पहचान ४. स्त्री का स्वावलंबन एवं आत्मनिर्भरता इत्यादि आज महिला रचनाकारों की अभिव्यक्ति के वे आयाम जिसमें वर्तमान महिला सशक्तिकरण वर्ष की प्रासंगिकता बनती है। स्वातंत्र्योत्तर भारत का बदलता स्वरूप स्त्री संवेदना और दृष्टी के व्यापक क्षितिज व्यष्टि और समिष्ट जे जुड आधारभूत प्रश्न जीवन के स्वस्थ मूल्यों के प्रति चेतना ग्राम करबे और नगर के वैचारिक पक्ष स्त्री पुरुष संबंधो का बदलता स्वरूप मानवी मुल्यों की पुनप्रतिष्ठा सामाजिक यथार्थ और सृजनात्मक कौशल्य अदि प्रवृत्तियाँ आधुनिक की देन है।

आज महिला रचना कारोंने स्त्री पुरुष संबंधो का गहन और सूक्ष्म विश्लेषण किया है। कामकाजी स्त्री का जगत घर परिवार के अतिरिक्त व्यापक है। अतः महिला कहाबीकार भी कलम कामकाजी महिलाओं की जिंदगी भर भी फोकस हुई है।

ममता कालियाने साठोत्तरी युग की यथार्थवादी महिला साहित्यकारों में अलग स्थान प्राप्त किया है। इन्हे परिवार में साहित्यिक परिवेश सहज उपलब्ध हुआ है। ममता कालिया १९६० से निरन्तर लिख रही है। कहानी उपन्यास कविता और नाटक के आलावा संसार की रचना में ध्यान दिया है।

वैसे तो ममता कालिया का कहानी संसार हर महिला कहानीकार के संसार की तरह

विस्तृत न होकर सीमित है। लेखिका सामाजिक प्रतिबद्धता के नियम नहीं है। वे साथ को अपनी आँखों से देखने का अधिक विश्वास करते हैं। सातवे दशक की इस कहानी के अंदर लेखिका अपने ढंग से जूझता का संघर्ष करती दिखाई देती है।

निम्न मध्यवर्गीय संयुक्त परिवार का खाका सींचा है। ममता कालियाँने अपनी बहुचर्चित कहानी रायेवाली में इस कहानी के पीछे ममता का दृष्टिकोण भी उन्होंने स्पष्ट किया है। लेखिका कहती है कि हर कहानी के पीछे मेरे दिमाग में ज्यादा से ज्यादा यही रहा है, समाज का स्त्री के प्रति दृष्टि कोन क्या है, उपयोगिता वादी। लेखिका ने के बारे में कहाँ जाता है की महिला लेखिकाएँ स्त्री पुरुष संबंधों के चित्रण के सीमित दायर से बाहर नहीं जापाती ममता कालिमाने इस आरोप को मिध्य सिद्ध कर दिया है।

विवाहपूर्ण सैक्स संबंध को लेकर ममता कलिया ने दो जरूरी चेहरे कहानी लिखी है। जिसमें उन्होंने इस मान्यता को प्रतिपादित किया है की सामाजिक विषमताओ व परिस्थितियों के हाथ विवश होकर जब समयानुकूल कोई मनपसंद जीवन साथी नहीं मिल पाता तो दहेज की माँग तो निरंतर कचोटती है और विवाह नकर सकने की मजबूरी मे विवाहपूर्व काम संबंध की स्थिति पैदा हो जाती है। यहाँ पर ममता कालिया की कहानी कालसाडी की नायिका की तरह आज भी गृहिणी को आर्थिक विसंगतियों को सामना करना पडता है।

इस प्रकार संघर्ष सिर्फ घर के बहार की दुनिया में ही नहीं घर के अन्दर भी है। और गृहिणी उसे झेलती हे। मुक्ती पाने की आकांक्षा के साथ ही घर से बंधे रखते का मोह या निर्यात आज भी गृहिणी की वास्तविकता है।

आज की नौकरीपेशा नारी दोहरी मनस्थिती व दोहरे दायित्व में जी रही है। आज भी नौकरी पेशा नारी दोहरी मनस्थिती व दोहरे दायित्व में जी रही है। आज भी महत्वकांक्षी महिलाएँ अपनी प्रतिभा एवं शिक्षा का सद उपयोग करने के लिए या जीवन स्तर उंचा उठाने के लिए या बच्चे के भविष्य हेतु अर्थ जमा करने के लिए इस क्षेत्र में उतरती है। तो भी न चाहते हुए यह नौकरी उसकी जिंदगी का अनिवार्य हिस्सा बन जाती है। और वह भी इन समस्याओं से जुड जाती है। ममता कालिया की नितान्त जिती की भी नायिका इसीव्दान्द से ग्रस्त है।

ममता का लिया की कहानीयो में नारी की शोचनीय दशा चाहे घर में तो होया बाह्य का प्रमुख कारण पुरुष प्रधान समाज में पुरुष का नारी पर शोषण माना जाता है। किन्तु मुलतः देखा जाये तो सिर्फ पुरुष हो उत्तेरदायी नहीं है नारी भी इसमें सहभागी है। नारी स्वयं अपनी स्वभावगत ईर्ष्या के कारण नारी को विकसित होने का व्यक्तित्व को स्वतंत्रता का अधिकार नहीं चाहती अगर स्वयं वह आगे नहीं रहती तो परिवार के पुरुष को भटका कर नारी सें प्रतिशोध लेती है।

ममता कालिया की काहानियों की दुनिया पूरे मध्यवर्ग की स्त्री को केंद्र में रखकर जटिल

सामाजिक संरचना में स्त्री की स्थिति और नियति को परिभाषित करना चाहती है। आधुनिक नारी की मनःस्थिति परिवारिक जीवन में परिपारित कें संबंध आदि विषयो को ममता कालिया ने अपनी कहानियों में सूक्ष्म रूप से रेखांकित किया है। दोहरे नैतिक मानदंडों के कारण परिवार टूट से गये हैं। पतिपत्ति के रिश्तों में दरारे पडने लगी है। यौन संवेद और अहंभाव की प्रवृत्ति तीव्र रूप से बढ़ने लगी है। इन सभी तथ्यों को यथार्थ परक दृष्टिसे ममता कालिया ने अपनी कहानियों में शब्दबद्ध किया है।

निष्कर्ष-

कहा जा सकता है कि विविध धर्म रचनात्मक एवं चिंतनपरक लेखन के साथ साथ स्त्रीवादी-विचारों की दृष्टि से भी ममता कालिया हिन्दी लेखन में अपना स्थान महत्वपूर्ण रखती है।

साथ ही स्त्री विमर्श के परिप्रेष्य में ममता कालिया की कहानियाँ यथार्थवादी और युग बोध की हैं। उनकी कहानियों में नारी के दर्द भरी दस्तान तथा विविध समस्याओं का मार्मिक और सूक्ष्म चित्रण हुआ है। उनकी कथा समाज का जीता जागता दस्तवेज है। जिसमें जीवन का हर रंग शिद्धत के साथ धडकता है। उनकी कहानियाँ कडवे यथार्थ से सराबोर सत्य कथाओं सरखी है।

हिन्दी साहित्य में ममता कालिया कहैती है। कि भारतीय स्त्रीयों के मुल्यबोध और आदर्श का वर्णन हमारे साहित्य में भरा पडा है। यह आदर्श सदियों से भारतीय स्त्रियों की चेतना को संवारता आयो है। लेकिन भारत में आजादी के बाद बीसवी शताब्दी के उतसर्व्व में स्त्री चेतना में एक नया मोड आया है।

संदर्भ संकेत :-

- १) ममता कालियाँ नयी सदी भी पहचान श्रेष्ठ महिला कथाकार
- २) औरत अस्तितत्व और अस्मिता अरविंद जैन सांराश प्रकशन दिल्ली
- ३) हंस पत्रिका नव २००९ सम्पादकीय लेख
- ४) महिला रचना कारों के नारी पात्र सुधा अरोडा की पुस्तक में से संग्रहित
- ५) हिन्दी कहानियों में महिला कहानी कारों की भूमिका पृष्ठ ४-१३ तक
- ६) हिन्दी कहानी एक नई दृष्टि इन्द्रनाथ मदान