MAHISHADAL RAJ COLLEGE

SESSION: 2022-2023

Total number of PUBLICATIONS in Journals: 41 (SCI/SCIE/SCOPUS-indexed/UGC care-listed: 22)

Faculty of Science

Journals (SCI/SCIE/SCOPUS/UGC-indexed)

1. Sova Pal, Prasenjit Pramanik, Ajoy Kumar Maiti, and **Manas Kumar Maiti**. "Multi-dimensional transportation problems in multiple environments: a simulation based heuristic approach." *Soft Computing* 27, (2023): 11603-11628, https://doi.org/10.1007/s00500-023-08204-x, Electronic ISSN: 1433-7479, Print ISSN: 1432-7643.
2. Indadul Khan, Krishnendu Basuli, and **Manas Kumar Maiti**. "Multi-objective covering salesman problem: a decomposition approach using grey wolf optimization." *Knowledge and Information Systems* 65, no. 1 (2023): 281-339, https://doi.org/10.1007/s10115-022-01752-y, Electronic ISSN: 0219-3116, Print ISSN: 0219-1377.
3. Indadul Khan, Prasanta Dutta, **Manas Kumar Maiti**, and Krishnendu Basuli. "A perturbation based modified BAT algorithm for priority based covering salesman problem." *Journal of Intelligent & Fuzzy Systems* Preprint (2023): 1-25, In press, DOI: 10.3233/JIFS-220396, ISSN online: 1875-8967.
4. Pravash Kumar Giri, **Manas Kumar Maiti**, and Manoranjan Maiti. "Profit maximization fuzzy 4D-TP with budget constraint for breakable substitute items: a swarm based optimization approach." OPSEARCH (2023): 1-45, https://doi.org/10.1007/s12597-023-00621-8, Electronic ISSN: 0975-0320, Print ISSN: 0030-3887.
5. Rituparna Mondal, Prasenjit Pramanik, Ranjan Kumar Jana, and **Manas Kumar Maiti**. "Credit policy for an inventory model of a deteriorating item having variable demand considering default risk." *Scientia Iranica* (2022), In press, Print ISSN: 1026-3098, Online ISSN: 2345-3605.
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9. Priti Deb, **Anwesha Mukherjee**, Debashis De, and Soumya K. Ghosh. “IoBT: beamforming design in internet of things.” The Journal of Supercomputing, (2023): 1-20, 2023, https://doi.org/10.1007/s11227-023-05307-y, Electronic ISSN: 1573-0484, Print ISSN: 0920-8542.
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20. Anupam Maity, Madhumita Mondal, Bidisha Maiti Mondal, Chandrasekhar SM, **Moumita Das**, and Ranajit Kumar Khalua, “Chemical Analysis Of Avocado (Persea Americana) Powder,” Journal of Survey in Fisheries Sciences 10, no. 1 (2023): 16850-16852, ISSN: 2368-7487.
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25. **Anwesha Mukherjee**, Somnath Bera, and **Tanushree Dey**. "Edge computing-based Internet of Things for Crop Productivity Prediction." Journal of Mahishadal Raj College 3, no. 1 (2023): 1-17, https://mahishadalrajcollege.com/wp-content/uploads/2023/03/Edge-computing-based-Internet-of-Things-for-Crop-Productivity-Prediction.pdf, ISSN: 2349-9257.
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Faculty of Humanities & Social Science

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36. **Barun Kumar Ghosh**, Bharatiya Nari ebong Samajik Poribarton : Ekti Bishleshan, May 2023, PP- 29-34, Ebong Prantik, Volume -10, ISSN – 2582-3841(Online), Print – 2348 – 487X, Published by Dr. Ashis Roy.
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39. অ□না সেনাপতি, "মনসংহিতা ও অথশা র দিশায় W17 সচেতনতা", Journal of Mahishadal Raj College 3, no. 1 (2023): 140-153, https://mahishadalrajcollege.com/wp-content/uploads/2023/03/মনসংহিতা-ও-অথশা র-দিশায়-W17-সচেতনতা.pdf.pdf, ISSN: 2349-9257.
40. Somnath Bhattacharya and **Soumita Bhattacharya**. "To Study the Relationship between Emotional Intelligence and Learning Style among Adolecent School Students of Paschim Medinipur District." Journal of Mahishadal Raj College 3, no. 1 (2023): 67-78, https://mahishadalrajcollege.com/wp-content/uploads/2023/03/To-Study-the-Relationship-between-Em otional-Intelligence-and-Learning-Style-among-Adolecent-School-Students-of-Paschim-Medinipur-Dis trict.pdf, ISSN: 2349-9257.

Faculty of Commerce

Journals (Peer-reviewed)

41. **Santu Charan Das**. "A Study on Financial Performance of Cement Industry with Special Reference to Ambuja Cement Limited." Journal of Mahishadal Raj College 3, no. 1 (2023): 57-66, https://mahishadalrajcollege.com/wp-content/uploads/2023/03/A-Study-on-Financial-Performance-of-Cement-Industry-with-Special-Reference-to-Ambuja-Cement-Limited.pdf, ISSN: 2349-9257.

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SOFT COMPUTING IN DECISION MAKING AND IN MODELING IN ECONOMICS

Multi-dimensional transportation problems in multiple environments: a simulation based heuristic approach

Sova Pal[1] · Prasenjit Pramanik[2] · Ajoy Kumar Maiti[3] · Manas Kumar Maiti[4]

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Abstract

Here, a general methodology is proposed to formulate and solve any multidimensional balanced/unbalanced, constrained/unconstrained transportation problems(TP) in different environments(crisp/fuzzy/rough). To understand the general model easily, here, at first, a multi-item 5-dimensional fixed charge profit maximization TP under budget and time constraint is presented. A potential solution of the problem is coded as a permutation of the different cells of the allocation matrix. A general decoding rule is proposed to determine the actual allocation from this coded solution. A heuristic approach is applied on a set of randomly generated coded solution of the target problem to determine the marketing decision. Applying swap operations on the coded solutions, the perturbation rules of the heuristic Particle Swarm Optimization(PSO) are modified to solve the problem. In a particular case, the problem is analysed as a bi-criteria decision making problem with the maximization of the total profit as well as the minimization of the total shipment time under a budget constraint. The bi-criteria TP is formulated as a single objective optimisation problem using a proposed rule and the same heuristic is run for a finite number of times to determine the pareto optimal front. To formulate the problem in the fuzzy(rough) environment an approach is proposed using credibility(trust) measure of fuzzy(rough) events. Proper fuzzy(rough) simulation algorithms are also proposed to solve the problem for any type of fuzzy(rough) estimation. Using this approach no crisp equivalent of any imprecise parameters is used for the marketing decision. Due the unavailability of the test data in the literature, different hypothetical data sets are used for the illustration of the models.

Keywords Multi-dimensional profit maximization transportation problem · Imprecise environment · Swap sequence based PSO · Fuzzy simulation · Rough simulation

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1 Introduction

Most of the supply chain systems involves transportation operations where the company purchases different items at different depots (sources) of the company distributed over the country. The items are then transported to different outlets/franchises (demand points) using various conveyances, e.g., motor vehicles, cargo flights, goods trains etc., through different routes. Costs and times for the shipment of the units of different items from different depots to the different outlets through different vehicles through different routes are different and known. This type of transportation problem belongs to 5-dimensional transportation problem (TP). This is generalization of 2-dimensional(basic) (Hitchcock 1941; Schell 1955) TP and 3-dimensional(solid) (Haley 1962) TP. Initial impetus on multi-index TP was made by Haley (1962). But he analysed the model for three indexes, i.e., for solid transportation problem (STP). After that, extensive research

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REGULAR PAPER

Multi-objective covering salesman problem: a decomposition approach using grey wolf optimization

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Abstract

In this study, the basic grey wolf optimization (GWO) algorithm is modified along with K-bit exchange, K-opt operation, and integrated with the structure of multi-objective evolutionary algorithm with decomposition approach (MOEA/D) to solve multi-objective covering salesman problem(MOCSP). The algorithm is named a "multi-objective evolutionary algorithm with decomposition using Grey Wolf optimization (MOEA/D-GWO)." The K-opt operation with $K = 3$ and $K = 4$ is used to generate the initial solution set. The GWO algorithm is modified with a set of newly introduced perturbation rules. A two-stage updating mechanism has been introduced to improve the quality of a potential solution. The first sage of the process is done by the modified GWO algorithm, and in the second stage, a perturbation technique using K-bits exchange operation is applied. The MOEA/D-GWO algorithm is a two-phase algorithm where in the first phase, the clustering/grouping of cities is done, and in the next phase one city from each cluster/group is selected to search pareto-optimal Hamiltonian cycles in such a way that each cycle maintains the pre-define covering distance. Here, for the first time a heuristic approach is proposed for MOCSP. Different sizes of standard benchmark MOCSP test instances are used to test the performance of the MOEA/D-GWO algorithm. The instances are generated from TSPLIB. Different traditional multi-objective optimization algorithms, like NSGA-II, SPEA2, MOEA/D, MR-ABCWCD, SMPSO, SR4-MOEA/D for MOOP, have been modified according to MOCSP and implemented to compare the efficiency of the proposed approach. Nine standard well-known performance metrics/indicators have been used to analyse the performance of the MOEA/D-GWO algorithm for MOCSP. Differ-

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A perturbation based modified BAT algorithm for priority based covering salesman problem

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Abstract. In this study, Bat algorithm (BA) is modified along with K-opt operation and one newly proposed perturbation approach to solve the well known covering salesman problem (CSP). Here, along with the restriction of the radial distances of the unvisited cities from the visited cities another restriction is imposed where a priority is given to some cities for the inclusion in the tour, i.e., some clusters to be created where the prioritised cities must be the visiting cities and the corresponding CSP is named as Prioritised CSP (PCSP). In the algorithm, 3-opt and 4-opt operations are used for two different purposes. The 4-opt operation is applied for generating an initial solution set of CSP for the BA and the 3-opt operation generates some perturbed solutions of a solution. A new perturbation approach is proposed for generating neighbour solutions of a potential solution where the exchange of some cities in the tour is made and is named as K-bit exchange operation. The proposed solution approach for the CSP and PCSP is named as the modified BA embedded with K-bit exchange and K-opt operation (MBAKEKO). It is a two-stage algorithm where in the first stage of the algorithm the clustering of the cities is done with respect to a fixed visiting city of each cluster in such a manner that the distances of the other cities of the cluster must lie with in the fixed covering distance of the problem and in the second stage the BA is applied to find the minimum cost Hamiltonian circuit by passing through the visiting cities of the clusters. MBAKEKO is tested with a set of benchmark test problems with significantly large sizes from the TSPLIB. To measure the performance of MBAKEKO, its results are compared with the results of different well-known approaches for CSPs available in the literature. It is observed from the comparison studies that MBAKEKO searches the minimum cost tour for any of the considered instances compared to all other well-known algorithms in the literature. It can be concluded from the numerical studies that the performance of MBAKEKO is better with respect to the state-of-the-art algorithms available in the literature.

Keywords: Combinatorial optimization, covering salesmen problem, priority based covering salesman problem, K-bit exchange operation, K-opt, Bat Algorithm

1. Introduction

The covering salesman problem (CSP) [2] is a complete weighted graph where the vertices are analogous to the cities, the edges are analogous to the connecting path between the corresponding cities, and the weights are analogous to the travel cost or

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APPLICATION ARTICLE

Profit maximization fuzzy 4D-TP with budget constraint for breakable substitute items: a swarm based optimization approach

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Abstract

The concept of breakable substitute items and budget constraints is to be used in decision-making problems. For demonstration, a fixed charge multi-item four-dimensional transportation problem (4D-TP) with budget constraint as profit maximization, the problem for breakable substitute items is considered under a fuzzy environment. The items are purchased from distinct depots at different prices. The different types of breakable substitute items are supplied to separate destination points from a distinct type of supply points with a different type or capacity of vehicles via a different road. The parameters of the transportation problem like direct transportation charges, fixed charges, market prices, procuring costs, sources of origins, requirements at destination points, conveyance's volume, or size are assumed to be deterministic or imprecise. Budget restrictions are applied on-demand points where the available budget amounts are fuzzy. Requirement restrictions at destinations are on the number of items having some minimum demands for each substitutable item. The imprecise constraints are reduced to equivalent deterministic constraints using credibility measures. The reduced fuzzy optimization problem under deterministic constraints is solved by swap-based particle swarm optimization (SPSO) and credibility-based genetic algorithm (CBGA), where a comparison of fuzzy objectives is made using the credibility measure of fuzzy events. For deterministic objectives, the same SPSO algorithm is used, where a simple comparison makes a comparison of an objective of deterministic numbers. The obtained results are compared using CBGA and SPSO for 4D-TP. As a particular demonstration, the results of solid transportation problems (3D-TPs) and conventional transportation problems (2D-TPs) are also presented in this paper. Statistical analysis is demonstrated to analogize the algorithms.

Keywords Fuzzy 4D-TP · Budget constraints · Breakable substitute items · Credibility measure · SPSO.

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CREDIT POLICY FOR AN INVENTORY MODEL OF A DETERIORATING ITEM HAVING VARIABLE DEMAND CONSIDERING DEFAULT RISK

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Abstract. In this study, a supplier-retailer-customer supply chain has been proposed for a deteriorating item with expiration time and dynamic deterioration rate. Here, the supplier adopt full credit policy for the retailer to enhance the retailer's order volume. This facility influences the retailer to provide some partial credit opportunity to the customers to boost the demand. For this credit policy, the retailer always faces a risk due to defaulters, which is termed as default credit risk. The default credit risk is considered in more realistic manner, which depends on the customers' partial credit period and credit amount. The market demand is influenced by customers' credit amount, customers' credit period and retail price of the item. Optimal decision is searched by maximizing the average profit of the system. For the search process, an artificial bee colony algorithm is implemented, tested and used. Illustration of the model is done with some hypothetical examples.

Key words : Expiration time; Dynamic deterioration; Credit policy; Credit amount; Default credit risk.

1. Introduction

In any supply chain, among different parameters, market demand is the key factor as revenue of the system fully comes from the sell revenue of the item. This phenomenon influences both the supplier and retailer to adopt different promotional activities to improve their sales. Trade credit is one of the important strategies to improve the demand of each player involved in the system. To increase the retailer's order size, the supplier offers a credit period to the retailer. This opportunity promotes the retailer to adopt some credit policy for his/her customers. Pioneering work in this direction was made by Goyal[1] incorporating credit policy. Afterwards, there are several research works done incorporating full credit policy[2, 3, 4, 5, 6, 7] and partial credit policy[8, 9, 10, 11, 12, 13].

Though credit policy is a good promotional tool for the enhancement of the market demand of any item, any credit policy involves credit risk. In fact, in any business transaction under trade credit policy, there are some business bonding between the supplier and the retailer, but there is no such bonding between the retailer and the customers. In reality customers are floating in nature and so some of the customers normally do not follow business ethics and move to another shop without paying the credit amount. For that, researchers developed their models[8, 12] considering partial credit policy in retailer-customers level to decrease the default credit risk. However, partial credit policy is an excellent attempt to decrease the credit risk, but still it is very critical to draw the optimal decision for the decision maker(DM) as the number of defaulters is not known. To overcome this difficulty, Pramanik *et al.*[14] considered a percentage of total customers as defaulters. But in reality, it is impossible to predict the amount of defaulters at the beginning. So it is more appropriate to consider the default credit risk as a function of customers' credit period and credit amount as the number of defaulters increases/decreases with customers credit amount and credit period proportionally. According to the authors best knowledge, there is only one article[15], considered the default risk as a function of customers' credit period. But number of defaulters may vary with the customers' credit amount also. So default risk must be a function of credit amount and the

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APPLICATION ARTICLE

Optimal production run in an imperfect production process with maintenance under warranty and product insurance

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Abstract

In the business world, product warranty and insurance plays an important role by increasing the demand of the product to maximizing the average profit or minimizing the average cost in a manufacturing system. Also, the customers' demand depends on several factors, viz. quality, selling price, payment strategies, warranty and insurance of the product. This paper develops an imperfect production inventory model with preventive machine maintenance, rework, warranty and insurance coverage on the accidentally damaged part(s) of the product. The concerned production system can randomly shift from an in-control state to an out-of-control state at any time during a production run, and the time elapsed while the production process stays in the in-control state is assumed to be exponentially distributed. The rates of producing reworkable defective items in the in-control state and out-control states are different. The demand rate of the customers is considered as the product's selling price and warranty period dependent. To attract customers and increase the demand for the product, the manufacturer offers an insurance policy on the damageable part(s) of the product within the warranty period. The main aim of this study is to find the optimal production time, selling price for the different warranty periods of the product, which maximizes the profit per unit business period. To examine the validity of the proposed model, two numerical examples are considered and solved with the help of MATHEMATICA software. Finally, the effects of warranty and insurance policies on the products are analyzed, based on the numerical examples.

Keywords Imperfect production · Reworked · Machine maintenance · Warranty · Insurance policy

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ORIGINAL PAPER

Two-mode difference-squeezing in CARS and CAHRS processes

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Abstract: In this manuscript, we studied two-mode difference-squeezing in coherent anti-Stokes Raman scattering (CARS) and coherent anti-Stokes hyper Raman scattering (CAHRS) processes. We established that for uncorrelated modes, the difference (higher-order) squeezing of the fundamental and Stokes fields can be turned into the normal squeezing of the anti-Stokes field. We showed that the second-order (amplitude-squared) squeezing and the fourth-order (amplitude fourth-power) squeezing of the fundamental (pump) mode are directly converted into the normal squeezing of the anti-Stokes mode in CARS and CAHRS processes, respectively. We investigated that the difference-squeezing responds nonlinearly to the number of pump photons and found it greater in the CAHRS process than in the CARS process. We established the concept of detection of difference-squeezing and normal squeezing in these processes. It is inferred that difference-squeezing exists only in certain domains of pump photons. We demonstrated that the multi-photon absorption approach is ideal for the generation of optimal squeezed light, which results in a larger reduction of noise in any optical system.

Keywords: Squeezed states; Second-order squeezing; Amplitude-squared; Fourth-order (amplitude fourth-power) squeezing; Difference-squeezing; CARS; CAHRS; Multi-photon process; Photon number operator

1. Introduction

Squeezing of the electromagnetic field [1] is a special feature of non-classical states of light. It has sparked considerable interest in the possibility of reducing the quantum noise of an optical signal below the vacuum limit [2, 3], with potential applications in optical telecommunication [4, 5], quantum cryptography [6, 7], and the development of techniques for performing higher-order correlation measurements [8–13]. In their past research, Prakash and Mishra have looked into higher-order squeezing as a way to improve the performance of a number of optical devices and networks [14–16]. Mishra et al. [17] and Yadav et al. [18] have studied the enhancement of higher-order squeezing with different parameters using beam splitters. Garcia Fernandez et al. [19] as well as Mishra et al. [20] have investigated higher-order nonclassical states in single-mode and their utility in detecting nonclassical light. Apart from the present work, we [21, 22] have worked out in earlier times the possibilities of co-existence of the higher-order squeezing with lower-order squeezing in pumps, Stokes and anti-Stokes modes, up to the interaction of second-order coupling of the field in CARS and CAHRS processes. Later, Kumar et al. [23] reported the existence of nonclassical nature and enumerated total noise in CARS and CAHRS processes up to first-order Hamiltonian interaction. In addition to the possibilities for the enhanced sensitivity of the measurements, there are several higher-order versions like higher-order amplitude squeezing, sum-squeezing, difference-squeezing, higher-order antibunching, and entanglement that fulfil various aspects of quantum optics [24, 25]. Out of these things, sum-and difference-squeezing is a multi-mode non-classical state of light that was first proposed by Hillery [26]. In the past few decades, many people have been able to get sum-and-difference-squeezing states both theoretically and experimentally in a number of nonlinear optical processes [27–31]. To generalize, three modes [32] as well as an arbitrary number of modes for sum and

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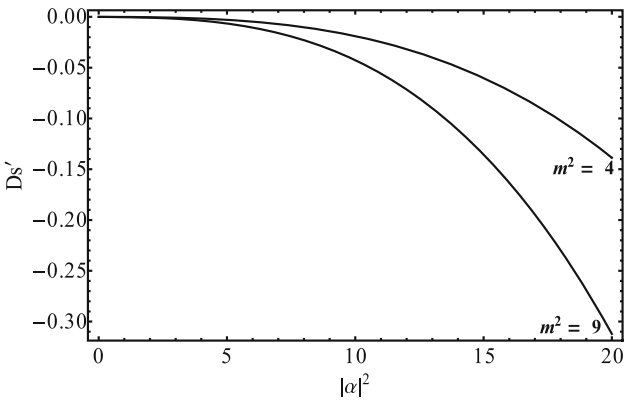

Fig. 8 Variation of the squeezing ($D_{S'}$) in the anti-Stokes mode with $|\alpha|^2$ in degenerate CAHRS process

pump photons $|\alpha|^2$ increases. This confirms that the squeezed states are associated with the large number of pump photons [42, 43]. It also showed that the higher-order squeezing is directly associated with the coupling of the field and interaction time.

A comparison between Figs. 5 and 6 shows greater noise reduction in the fourth-order (amplitude fourth-power) squeezing in the CAHRS process than the second-order squeezing in the CARS process, having the same number of photons. Hence, fourth-order (amplitude fourth-power) will produce more pronounced squeezed laser light than second-order.

Now taking $|gt|^2 = 10^{-6}$ and draw Figs. 7 and 8 of Eqs. (44) and (74) respectively by D_S and $D_{S'}$ with $|\alpha|^2$ having Stokes mode as constant value $m^2 = 4$ and 9 (arbitrary value taken).

Figures 7 and 8 show that the squeezing increases with the increase in the number of pump photons $|\alpha|^2$ as well as with the increase in the constant value of Stokes mode. It is also inferred that squeezing occurs more in the CAHRS process than in the corresponding CARS process.

6. Conclusions

In this manuscript, we observed that difference-squeezing of optical fields can be converted into normal squeezing in degenerate CARS and CAHRS processes. It is shown that the difference-squeezing responds nonlinearly to the pump photons and is found to be dependent on the coupling of the field and short interaction time. It is found that the squeezing increases with the increase in the number of pump photons as well as with the increase in the constant value of the Stokes mode. It is shown that squeezing is more pronounced in the stimulated process than in the spontaneous process having the same number of photons. This also confirms that the squeezed states are associated with a large number of photons [42, 43].

It is found that when the number of pump photons is increasing, the degree of difference-squeezing gets more negative until a critical value of pump photon is reached, but subsequently, it decreases and finally disappears. Hence, difference-squeezing exists only in certain domains of pump photons. It is found that there is greater noise reduction in fourth-order (amplitude fourth-power) squeezing in the CAHRS process than in the second-order (amplitude-squared) squeezing in the CARS process, having the same number of photons. Hence, the fourth-order (amplitude fourth-power) of the field amplitude results in more pronounced squeezed laser light than the second-order. It is inferred that difference-squeezing is more prominent in the CAHRS process than in the CARS process.

When an amplitude-squared (second-order) squeezing or fourth-order (amplitude fourth-power) squeezing in the fundamental mode propagates through a nonlinear medium, then normal squeezing will be generated in the anti-Stokes mode of the degenerate CARS process or CAHRS process, respectively. Thus, it is inferred that a process that absorbs more multiphotons produces the best squeezed light.

Difference-squeezing, second-order (amplitude-squared) squeezing, and fourth-order (amplitude fourth-power) squeezing are the family of higher-order squeezing effects. A nonlinear interaction that relates the relevant quadratic variable to the amplitude of a mode can turn each member of the family into a normal (lower-order) squeezing. As a result, this family of higher-order squeezing effects may be used to generate squeezing in CARS and CAHRS. They are also of greater fundamental relevance since they are all direct expressions of the electromagnetic field's quantum–mechanical nature. These findings suggest that processes with higher-order nonlinearity are more suitable for the generation of optimum squeezed light, and the results also suggest ways of selecting suitable processes for obtaining greater noise reduction in optical systems, which can be useful in high-quality optical telecommunication [44].

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Review

Insight on the choice of sensitizers/dyes for dye sensitized solar cells: A review

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ABSTRACT

In this review, a discussion on renewable sources of energy with clear focus on solar cell applications is presented. Especially, possible future directions for development of dye-sensitized solar cells (DSSCs) are discussed. Dye-sensitized solar cells have become an important topic of research due to its high importance in energy conversion. Current DSSCs are based on metal dye sensitizers, metal-free organic dyes or natural dyes. They have been extensively studied due to their low cost, simple preparation methodology, low toxicity, and ease of production. Still there is a need to find more abundant DSSC materials that at the same time exhibit long-term stability. Computational studies have been an important ally for developing/designing new dye sensitizers. They are reviewed here with a special emphasis on the benefit of such studies. The conceptual understanding of development and working principle of photoactive DSSC materials is the primary feature of the review followed by examples of studies on different dye sensitizers using scarce to abundant metal based dyes and metal free organic dyes with donor-π-acceptor geometries for both n- and p-type DSSCs. The proper choice of organic dyes including donor, spacer, or acceptor is discussed and a prospective on dual donor based dyes is presented.

1. Introduction

With the increase in the population and the advancement of the civilization, the demand of energy is escalating, raising major concerns for the adverse effects of conventional energy sources like natural gas, coal, fossil fuels etc. on the environment of the earth. Furthermore, the fast depletion of the natural resources like fossil fuels reserves is also an important motivation for many researchers worldwide to search for alternative and renewable sources of energy associated with no or low pollution of the environment.

Renewable energy sources are sustainable and can be regarded to provide an endless source of energy. In recent years, a growing amount of important household demands such as electricity, air and water heating/cooling, transportation and rural (off-grid) energy services are being provided in many countries based on renewable energy sources. The most popular renewable energies are.

a. Solar Energy
b. Wind energy
c. Hydro energy
d. Tidal energy
e. Geothermal energy
f. Biomass energy

According to a report of REN21 (Renewable Energy Policy Network for the 21st Century) in the years 2017, a total of 19.3% of the total energy consumed in the human population was provided from renewable energy sources for the year 2015–2016. The total contribution is divided into 8.9% from traditional biomass; 4.2% from geothermal and solar energy sources, 3.9% from hydroelectricity and the remaining 2.2% from wind, solar, geothermal. Investments and jobs associated with renewable energy are increasing every year, and the efficiency of its generation is also increasing along with a decrease in the cost. Out of the five different renewable systems as given in Fig. 1, the most abundant and freely and globally available source of energy is the sun providing solar energy. With respect to the other energies one can note

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IoBT: beamforming design in internet of things

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Abstract

Non-orthogonal multiple access (NOMA) is a key concept of the sixth generation (6G) mobile network. In the 6G paradigm, NOMA is a significant energy and spectral efficiency technique, especially in the indoor region, to maintain the quality of service. multiple input multiple outputs (MIMO) base station serves as the main base station due to massive connectivity. In MIMO, spatial modulation (SM) gives a huge data rate and reduces inter-antenna interference. Beamforming permits a proficient intercell interference organization for short-distance data transmission. The prime concept in NOMA is to provide various end users with the same resource block based on a time frame, spreading code, or subcarrier successive interference cancellation. In this article, we propose a power-efficient 6G NOMA-beamforming-based spectrum allocation scheme for the Internet of Things (IoT) devices in the indoor region. MIMO with SM transmits the signal to indoor next-generation node B (gNB). It is a 3GPP-complaint implementation of 5G/beyond 5G base stations. Various IoT devices are connected with those gNBs and share the communication resources. In this paper, we propose an IoT device-interoperability scheme based on the requirements of the IoT devices aiming at improving the network performance. The simulation results show that the proposed model diminishes power consumption and improves signal-to-interferences-plus-noise ratio.

Keywords NOMA · Beamforming · 6G · Spectral efficiency · SINR · Power consumption

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Mobi-Sense: mobility-aware sensor-fog paradigm for mission-critical applications using network coding and steganography

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Abstract

Mission-critical applications refer to the real-time applications, which require fast and secure service provisioning, such as defense sector and disaster management. This paper proposes a delay-aware and secure service provisioning model for such types of applications. As a use-case, we have considered the defense sector, which is a vital sector for a country's all-round well-being including security, safety, society, and economy. In the conventional sensor-cloud model, the sensor data is stored and processed in the cloud. However, the sensor nodes have small coverage and the use of the long distant cloud servers increases the delay. Therefore, the conventional sensor-cloud model may not be efficient for defense application. Moreover, data hiding for security purposes is another important aspect of this field. To address these challenges, this paper proposes a mobility-aware sensor-fog paradigm for mission-critical applications based on network coding and steganography, referred to as *Mobi-Sense*. In Mobi-Sense, steganography is used for hiding the data during transmission. The theoretical results demonstrate that Mobi-Sense outperforms the existing frameworks with respect to delay and power consumption by $\sim (40-80)\%$. The simulation results present that Mobi-Sense reduces the delay by $\sim (18-40)\%$ than the conventional sensor-cloud framework for mission-critical applications. An optimal path finding algorithm based on deep learning has been deployed in the context of disaster scenario. The experimental analysis shows that the proposed optimal path finding method achieves precision and accuracy above 90%. This is observed that our proposed modules have outperformed existing baselines in terms of accuracy, delay, and power consumption.

Keywords Mission-critical · Sensor-fog · Delay-aware · Power-aware · Data hiding · Path extraction

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E-CropReco: a dew-edge-based multi-parametric crop recommendation framework for internet of agricultural things

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Abstract
Crop productivity prediction and recommendation is a significant research area of smart agriculture. This paper proposes an Internet of Things (IoT) framework based on dew computing, edge computing, and federated learning, where soil parameters, environmental parameters, and weather data are analysed to predict the crop productivity of a land, and then recommend suitable crop for the land. The dew layer preprocesses and accumulates the received sensor data, and forwards to the edge server. The edge server analyses the sensor data and the weather data, and then sends the result to the cloud along with the model characteristics and to the mobile device. The proposed framework is simulated in iFogSim. The theoretical analysis shows that the proposed framework has reduced the delay by 60–70% approximately and power consumption by 70–80% approximately than the conventional sensor-cloud framework. We also observe that the proposed framework has reduced the delay by 12–35% approximately and power consumption by 30–50% approximately than the edge-cloud framework. We compare four machine learning algorithms based on their performance in data analysis in terms of precision, recall, accuracy, and F-score. We observe that each classifier obtains more than 95% prediction accuracy. An Android application is also proposed for crop recommendation.

Keywords Crop recommendation · Dew computing · Edge computing · Internet of agricultural things

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S.I. : LOW RESOURCE MACHINE LEARNING ALGORITHMS (LR-MLA)

IoHMT: a probabilistic event-sensitive music analytics framework for low resource internet of humanitarian musical things

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Abstract
The procreative statistical framework of musical note structures produces a crucial role in multimedia music classification and reconstruction strategies. Another significant thing for harmonious music composition is the rhythmic structures that transform musical performances into harmonic forms. Intelligent music computing paradigms try to establish human–machine interaction phenomena for systematic music generations, compositions, and reconstructions. In the emergent internet era, musical composition and reconstruction schema are largely dependent on the IoT-based paradigm where human beings can arrange musical compositions through musical things, such as, remotely arranged singing and musical instruments, smart rhythmic behaviours, and intelligent auto-tuning systems. Although it can possess substantial success, computers yet struggle with comprehending several facets of computational musicology, that are challenging in formal characterization. Moreover, most of the success is achieved for chord-based standardized western music compositions, whereas melodic Indian music is composed through single-note structures. Low resource music computing is in dire need of tools and resources to overcome the resource barrier such that probabilistic and intelligent IoT-based music formations can deliver more widespread benefits. This paper illustrates (a) computational music speculation and associated characteristics to standardize what human beings can assimilate, recall, and reconstruct musical items for sustaining intangible cultural heritage; (b) a stochastic model along with probabilistic context-free music grammar to afford a syntactic outline of musical note arrangements; (c) state transition analysis; (d) Petri net-based complex music composition framework along with the simulation-based reachability and system efficiency for evaluating the effectiveness of event-driven music schema; (e) a systematized case study on low resource Internet of Music Things for humanistic care computing, that we have named as the Internet of Humanitarian Musical Things (IoHMT).

Keywords Computational musicology · Music automata · Music composition and reconstruction · Petri Nets · Markov model · Reachability · Low resource environment · Internet of music things

1 Introduction

Musical performances such as one of the intangible heritages in entertainment that, regardless of its pervasive existence in the human ethos, remain mostly insusceptible to comprehensive understanding. The statistical and structural pattern recognition strategies are already active in the context of musical heritage conservancy and manipulation. Although, the specific issue is that the music information confined in the digital music representation is not laid back to extract musical background through the conventional paradigms [1]. With the advancements in computational paradigms, some novel music composition and reconstruction frameworks have been illustrated. Researchers have often visualized that music projects a handy affinity to mathematical analysis and

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MCG: Mobility-Aware Computation Offloading in Edge Using Weighted Majority Game

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***Abstract*—Edge computing plays a pivotal role in computation offloading at low latency. However, selecting the appropriate node to offload a computation is a challenge, especially when the user node is mobile. The problem can be stated as follows: (i) a mobile device has to offload a computation, and the user is moving, (ii) a set of edge/fog devices is available nearby the mobile device, then to select the suitable device to offload the computation. To address the challenge, this paper proposes an end-to-end mobility-aware computation offloading framework, MCG, which consists of: (i) a novel mobility prediction module that finds the user mobility pattern, (ii) selection of a set of edge/fog devices based on the predicted mobility and user's current location, (iii) selection of the high majority device from the set of edge/fog devices based on the resource availability and present load of the devices, and (iv) offloading the computation to the selected high majority device. The experimental results demonstrate that MCG outperforms existing mobility prediction modules in terms of accuracy, precision, and recall measures. The theoretical analysis and experimental results illustrate that MCG reduces the latency and power consumption of mobile device during offloading compared to existing offloading strategies.**

***Index Terms*—Computation offloading, Game theory, Latency-aware, Low power, Mobility analytics.**

I. Introduction

THE explosive increase in the usage of smartphones for accessing resource exhaustive applications has raised different challenges, e.g. limited battery, increase in latency, high power consumption, etc. To deal with them, mobile cloud computing (MCC) comes [1], [2]. To overcome the problem of resource limitation of the mobile devices, the offloading of data and computation has been introduced, where mobile devices store their data and execute their computations inside the cloud, cloudlet, etc. [1], [3]. In computation offloading, a node requests another node to execute its computation. After execution, the serving node sends the result to the requesting node. However, offloading computation from a mobile device to the remote cloud increases delay, and to overcome this problem edge and fog devices can be used [4], [5], [6]. Now, a situation may arise where multiple edge/fog devices are available in the vicinity of the mobile device. In such a scenario, the selection of the suitable edge/fog device for "green" offloading of the computation at low latency is a challenge because user mobility can affect network connectivity. Here, the term "green" refers to low power consumption.

Motivating scenario: Let a mobile device (say, D) has to offload a computation, and a set edge/fog devices is available nearby (say, $F_{pre} = \{F_1, F_2, F_3, F_4, F_5\}$) (refer to Fig. 1). Although, F_1 is the nearest one with respect to the present location of the mobile user (say, u), as he moves he goes out of the coverage of F_1. In such a case, offloading the computation to F_1 may not be fruitful. As a solution to this problem, the prediction of the destination and the probable path to be followed by u is highly desirable. Consequently, the edge/fog devices in the predicted path can be detected. Let in the present scenario, u is currently at location A and his destination is location B. The probable path to be followed by u to reach B is marked in blue colour in Fig. 1. The set of edge/fog devices in the predicted path is $F_{nex} = \{F_3, F_4, F_5, F_6, F_7, F_8\}$ (refer to Fig. 1). In this scenario, offloading to a device, which is presently nearby as well as present in the predicted path may be better compared to selecting the presently nearest device to offload the computation. Now, if more than one device belong to the set $(F_{nex} \cap F_{pre})$, (here, $\{F_3, F_4, F_5\}$), then finding the suitable device among them to offload the computation is a challenge. The use of game theory can provide a solution to this problem. Now, another situation may also arise, where D gets disconnected from the serving edge/fog device due to mobility. In such a case, prediction of the next location and delivery of the result to D through the probable connecting edge/fog node, can be fruitful. For instance, D offloads computation to F_3, and gets disconnected before getting the result. When the result is ready to deliver, D is not present in the coverage of F_3. In such a case, F_3 sends the result to the cloud that forwards the result to the nearby connecting edge/fog device (say, F_5) of u after predicting his next location, and F_5 sends the result to D when it gets connected. Based on the discussed scenario, we can state that the objective of this work is *to select the suitable edge/fog device for offloading a particular*

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while using MCG. Consequently, the power consumption of the requesting mobile device during the entire period is calculated. We have observed in Section V-B that the proposed mobility analytics module has good prediction accuracy, precision, and recall. By using the mobility module, we are predicting the user's probable visiting path. Based on the predicted path and present location of the user, the edge/fog devices are chosen. From these edge/fog devices, the underloaded one as well as fulfilling maximum satisfying resource requirements, is selected as the high majority device. The requested code is offloaded to the high majority device. The MCG not only considers user mobility, but also the resource availability and current load of the participating edge/fog devices. Considering all these parameters the suitable edge/fog device for offloading a computation is selected and offloading takes place to that device, which results in the better performance of MCG than the existing offloading approaches.

VI. Conclusion

Computation offloading from a mobile device at low power consumption and low latency is a promising research area. In this paper, we propose a method for computation offloading at the edge/fog device based on mobility analytics and weighted majority game theory. Based on the user movement path and the current location of the user, a set of edge/fog devices are chosen. The current loads and resource availability of the chosen edge/fog devices are considered as parameters in the weighted majority game. The underloaded device fulfilling maximum satisfying resource requirements for the requested computation is selected as the high majority device for offloading the computation. The experimental results show that the proposed mobility analytics module has more than 90% accuracy, and it outperforms the existing mobility prediction methods in terms of accuracy, precision, and recall measures. The theoretical and experimental results demonstrate that the proposed offloading method decreases the latency and power consumption of mobile device during offloading than the existing offloading schemes. In future, we wish to apply the proposed method in various domains such as mobility-based healthcare, and other time-critical applications.

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RESEARCH ARTICLE

WILEY

STOPPAGE: Spatio-temporal data driven cloud-fog-edge computing framework for pandemic monitoring and management

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Abstract

Several global health incidents and evidences show the increasing likelihood of pandemics (large-scale outbreaks of infectious disease), which has adversely affected all aspects of human lives. It is essential to develop an analytics framework by extracting and incorporating the knowledge of heterogeneous data-sources to deliver insights for enhancing preparedness to combat the pandemic. Specifically, *human mobility, travel history*, and other *transport statistics* have significantly impact on the spread of any infectious disease. This article proposes a spatio-temporal knowledge mining framework, named ***STOPPAGE***, to model the impact of human mobility and other contextual information over the large geographic areas in different temporal scales. The framework has two key modules: (i) *spatio-temporal data and computing infrastructure* using fog/edge based architecture; and (ii) *spatio-temporal data analytics* module to efficiently extract knowledge from heterogeneous data sources. We created a *pandemic-knowledge graph* to discover correlations among mobility information and disease spread, a deep learning architecture to predict the next hotspot zones. Further, we provide necessary support in home-health monitoring utilizing Femtolet and fog/edge based solutions. The experimental evaluations on real-life datasets related to COVID-19 in India illustrate the efficacy of the proposed methods. STOPPAGE outperforms the existing works and baseline methods in terms of accuracy by ≈(18–21)% in predicting hotspots and reduces the power consumption of the smartphone significantly. The scalability study yields that the STOPPAGE framework is flexible enough to analyze a huge amount of spatio-temporal datasets and reduces the delay in predicting health status compared to the existing studies.

KEYWORDS

COVID-19, deep learning, healthcare, Internet of Spatial Things (IoST), knowledge graph, pandemic, spatio-temporal data

Abbreviations: IoST, Internet of Spatial Things; IoT, Internet of Things; PKG, pandemic-knowledge graph; QoS, quality of service.

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REVIEW ARTICLE

Biofactors WILEY

Melatonin mediated activation of MAP kinase pathway may reduce DNA damage stress in plants: A review

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Abstract

Melatonin is an important biomolecule found in diverse groups of organisms. Under different abiotic stresses, the synthesis of melatonin is markedly increased suggesting pivotal roles of melatonin in plants enduring stresses. Being an endogenous signaling molecule with antioxidant activity, melatonin alters many physiological responses and is found to be involved in regulating DNA damage responses. However, the molecular mechanisms of melatonin in response to DNA damage have not yet been studied. The present review aims to provide insights into the molecular mechanisms of melatonin in response to DNA damage in plants. We propose that the MAP kinase pathway is involved in regulating melatonin dependent response of plants under DNA damage stress. Where melatonin might activate MAPK via H_2O_2 or Ca^{2+} dependent pathways. The activated MAPK in turn might phosphorylate and activate SOG1 and repressor type MYBs to mitigate DNA damage under abiotic stress.

KEYWORDS

abiotic stress, antioxidant, cyclin-CDK, DNA damage, MAP kinase, melatonin, MYBs, SOG1

1 | INTRODUCTION

A number of biomolecules are produced by plants in response to external stimuli, regulating different physiological responses. Melatonin (MET) or N-acetyl-5-methoxy tryptamine is such a biomolecule that is widely distributed in both plants and animals.[1] The presence of melatonin in diverse groups of organisms indicates the conserved nature of its biosynthetic pathway in different organisms. In both plants and animals, MET is biosynthesized from the amino acid tryptophan (trp) in a tryptophan-tryptamine-serotonin dependent pathway.[1–3] Serotonin, the precursor of MET, is acetylated to N-acetylserotonin which is then methylated to produce MET by serotonin N-acetyl transferase (SNAT) and acetyl serotonin methyl transferase (ASMT) or Caffeic acid O-methyl transferase (COMT), respectively. Serotonin may also form 5-methoxy tryptamine by ASMT/COMT. Finally, SNAT catalyzes the formation of MET from 5-methoxy tryptamine. These SNAT and ASMT are the key enzymes over-expression of which in plants are known to be associated with increased stress tolerance.[4–7]

Different plant species have been reported to produce melatonin (MET) with quantitative variations from

Abbreviations: Act-MYBs, activator MYBs; ASMT, acetyl serotonin methyl transferase; ATM, ataxia telangiectasia mutated; ATR, ataxia telangiectasia and Rad3 related; CHK1, checkpoint-1 kinase; CHK2, checkpoint-2 kinase; CKI, CDK inhibitor (CKI); COMT, caffeic acid O-methyl transferase; DSB, double stranded DNA breaks; HR, homologous recombination; MAPK, mitogen activated protein kinase; MDA, malondialdehyde; MET, melatonin; Rep-MYBs, repressor MYBs; SMR, SIAMESE-related; SNAT, serotonin N-Acetyl transferase; SOG1, suppressor of gamma response 1.

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High doses of nano-polystyrene aggravate the oxidative stress, DNA damage, and the cell death in onions

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ABSTRACT

Plastic pollution has been reported to negatively impact global biodiversity and ecosystem health. However, the molecular mechanisms of nano-plastics in plants are unidentified, especially their negative impacts on genomic stability. This study for the first time showed that nano-polystyrene leads to cell death in plants by subjugating the cellular antioxidant defence mechanisms through the aggravated production of ROS, which in turn could induce the DNA damage impairing the genetic regulation of the corresponding DNA repair pathway. To validate the proposed hypothesis, the DNA damage potential of nano-polystyrene and the expression levels of key genetic regulators of the DNA damage repair pathway (such as - *CYCA/B, CDKA, SOG1, MYB* transcription factors, and *RAD51*) have been assessed in onion roots after 72 h exposure with three ecologically relevant concentrations (25, 50, and 100 μg ml^{-1}) of 100 nm nano-polystyrene. In addition, imbalance in redox homeostasis (oxidative stress), cell viability, and nuclear aberrations such as – the frequency of micronucleus and bi-nucleate cells that are directly linked to the DNA damages have been checked to point out the cause and effect of nano-polystyrene-induced DNA damage. Results showed a significant increase in oxidative stress in each treatment concentrations of nano-polystyrene. However, ROS generated at 100 μg ml^{-1} nano-polystyrene dose subdues the antioxidant defence system and induces cell death. These observations may be ascribed to the accumulation damaged DNA and the down-regulation of repair pathway-associated genes, as observed in this treatment group. Conversely, the observed DNA damage and the reduced expressions of genes would be a mere consequence of reduced cellular viability.

1. Introduction

Plastics are ubiquitously distributed in the environment due to their increasing global production with 367 Mt tons in the year - 2020, excluding recycled plastics (https://plasticseurope.org/wp-content/uploads/2021/12/Plastics-the-Facts-2021-web final.pdf). Among different plastic polymers, polystyrene (PS) is widely used in packaging, construction/building, fishing industries, electrical & electronic equipment, inner liner for fridges, eyeglasses frames, etc. (Boyle and Örmeci, 2020; https://plasticseurope.org/wp-content/uploads/2021/12/Plastics-the-Facts-2021-web-final.pdf). Besides, PS is used in manufacturing coffee cups, and plates with a high rate of environmental disposal at the end of their uses. Polystyrene may represent one of the dominant plastic polymers in the environment and is synthesised from styrene monomers – an "anticipated human carcinogen" and the un-polymerized residual styrene molecules can leach out of PS (Boyle and Örmeci, 2020).

In the terrestrial system, the abundance of microplastics (MPs) is 4–23 times higher than in the aquatic system (Horton et al., 2017). The annual emission of microplastics to European soils and North American soils through sludge application and other agricultural practices has been estimated to be 63 to 430 and 44 to 300 million tons, respectively (Nizzetto et al., 2016). Vollertsen and Hansen, 2017 quantified the mass concentration of microplastics in farmland soils with a maximum value of 224.3 mg kg^{-1} of soil. The concentration micro-plastics in highly contaminated soils may range from 0.03% to 6.7% (w/w) in industrial areas (Pflugmacher et al., 2021). Therefore, micro/nano-plastics – an emerging global threat, may severely impact the plants health. The negative impacts of nano-plastics on biota are more severe than microplastics due to their small size (Boyle and Örmeci, 2020).

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Physico-chemical analysis of newly prepared prebiotic chocolates by using Galacto Oligosaccharides (GOS)

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Abstract

In India, chocolate is very famous mood freshening sweet food product specially for children. But high consumption of chocolate may be harmful for human health, because most of the chocolates contain high fat. This research has been done to increase the health benefits of chocolate by using cocoa and Galacto Oligosaccharides (GOS). Many researchers have shown their research that GOS is very beneficial for human health such as it helps to lower down the cholesterol levels in the blood, to prevent colon cancer, and helps to improve mineral absorption in human body. Basically, GOS is a type of prebiotic e.g., food for probiotic bacteria. Prebiotics are non-digestible ingredients that benefit the host by boosting the growth and activity of one or a few bacterial species that are already present in the colon. It was also studied by many researchers that cocoa powder contains a lot of caffeine, flavanols, which are polyphenolic compounds. Flavanols, particularly epicatechin monomer and oligomer cocoa flavanols have been linked to a number of health advantages, including boosting nitric oxide synthase, enhancing blood flow and arterial flexibility, lowering blood pressure and platelet aggregation, and reducing inflammation. The main objectives of this research are to develop the formulation of prebiotic chocolate and to evaluate the physicochemical parameters of the newly prepared chocolate. After physico-chemical analysis of carbohydrate, fat, crude fibre and p^H, it was found that both the newly prepared prebiotic enriched chocolates (T_1 and T_2) were significantly different ($p \leq 0.01$) from control (T_0) and after analysis of protein content, it was also found that both the newly prepared prebiotic enriched chocolates (T_1 and T_2) were insignificantly different ($p \leq 0.01$) from control (T_0).

Keywords: Cocoa, flavanols, Galacto Oligosaccharides, prebiotics, probiotic bacteria, polyphenolic compounds.

1. INTRODUCTION:

1.1. Background and History of the chocolates

The Mayans were most likely the first people in South America to cultivate the cocoa plant, according to the history of chocolate. Chocolate, according to the Mayans, was a cocoa drink made with hot water and often flavored with cinnamon and pepper. "Drink of the Gods" was the name of the drink. Chocolate, derived from the seeds of the cocoa tree, was once thought to be the 'Food of Gods' **(Verna, 2013)**. The scientific name Theobroma cacao for the cocoa tree was derived from the Greek terms "theo" which means God and "broma" which means food, as a result of this link. T.L. **(Dillinger *et al*., 2000)**. The term cocoa refers to the least processed and most natural form of the bean. The solid chocolate industry originated in the 19th

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Modal data-based simple statistical analysis as an effective petrogenetic indicator: a study from Kadavur gabbro-anorthosite complex, Tamil Nadu, southern India

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Field and petrographic studies on the Neoproterozoic Kadavur intrusive complex (10°35′N, 78°11′E) (located in the Southern Granulite Terrane of the Indian shield) reveal three distinct types: (i) earliest phase of deformed schistose gabbro-anorthosite; (ii) most dominant layered gabbro-anorthosite, and (iii) locally developed pegmatoidal gabbro-anorthosite. A simple modal data-based statistical analysis of layered gabbro-anorthosite type yields highly significant or significant correlation coefficients for different mineralogical parameters and strongly supports differentiation from a common magma. Typical dispositions of the mineralogical parameters (as depicted by isopleths patterns) suggest maintenance of a magmatic lineage in varying hydration ambience that developed several petrographic variants within the layered type.

Keywords: Gabbro-anorthosite, isopleths map, mineralogical parameters, modal data, statistical analysis.

MODAL analysis studies on gabbro-anorthosites have been useful to classify and characterize such rocks. For example, Ashwal[1] worked out the genesis of the Mount Marcy anorthosite massif (Adirondacks, New York, USA) with a particular focus on anorthositic rocks associated with the high-grade terrain[2,3]. Even for the Apollo-11 samples, modal analyses helped ascertain the heterogeneity in the lunar highland series[4]. However, in recent times, such modal analysis-based approaches for gabbro-anorthosites are lacking. In reality, modal data of igneous rocks represent the actual mineralogical composition and help in accurate nomenclature. Nowadays, however, the emphasis has shifted to other domains, presumably because of the availability of major, trace and isotopic data[5,6]. Even in this scenario, in the recent past, modal data-based studies have helped resolve the long-standing controversy related to the accretion of gabbroic lower crust at the ridge axis[7]. In this context of the intrusive gabbro-anorthosite complex near Kadavur (10°35′N, 78°11′E), southern India (Figure 1), the present study performs statistical analyses of several mineralogical parameters to present a cogent petrogenetic history. The Kadavur complex was initially reported from the Southern Granulite Terrane (SGT) of the Indian shield (Figure 1 *a*)[8,9]. However, during 1980s, the region (hosting the Kadavur complex) was known as the Eastern Ghats Belt[10]. Early studies on the Kadavur complex suggest that: (i) the intrusion represents a funnel-shaped concordant body and (ii) the complex bears geological similarities with the Adirondack mountains[11]. However, later studies have argued against the similarities between the Kadavur complex and intrusive rocks in the Adirondack region[12]; on the contrary, it was compared with early Archean, layered gabbro-anorthosite complex. It has been suggested that the Kadavur complex manifests multiple phases of magmatism with corresponding mappable attributes[13,14]. Recent workers suggest a tholeiitic parentage and an inferred age of ~810 Ma for the anorthositic intrusions[15,16]. However, it is unclear whether the complex is a product of differentiation from common parent magma or corresponds to discrete and separate magmatic pulses. Hence, this study attempts to resolve this issue with the help of statistical analyses of modal data and relevant correlation characteristics amongst mineralogical parameters.

The present work involves field studies, petrographic analyses and detailed statistical studies on modal variables that help throw light on the petrogenesis of the Kadavur

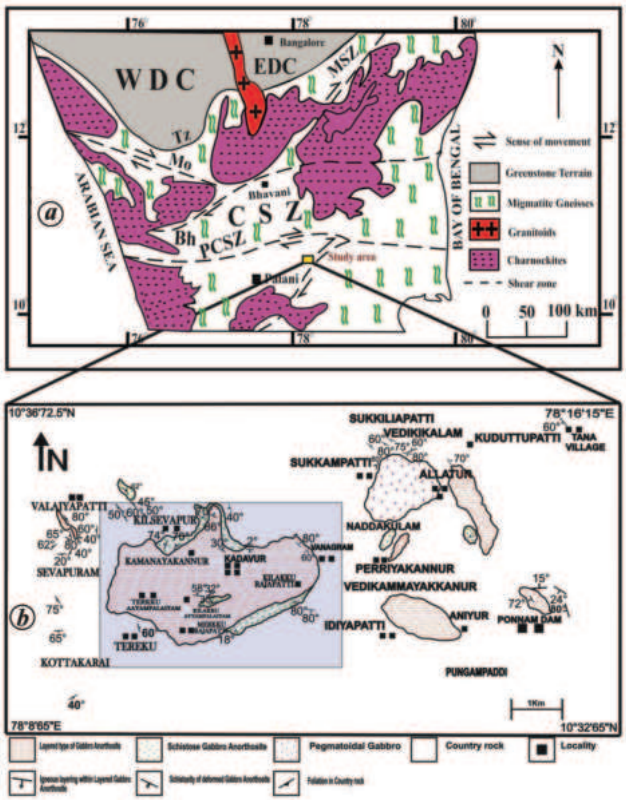

Figure 1. ***a***, Location of the study area (Kadavur complex) within the regional tectonic frame of the Southern Granulite Terrane[9]. The complex falls within the branch-out portions of the Palaghat–Cauvery shear zone[8]. ***b***, Geological map of the Kadavur complex (by the present authors). Shaded portion represents the area where isopleths maps for different mineralogical parameters were constructed.

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Petrogenetic implications of mineral chemistry and mode-based statistical studies of Sholayar alkaline syenite complex, Southern Granulite Terrane, India

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A recent petrological study on the lesser-known Sholayar alkaline syenite complex (10°17′59.9″N: 076°47′26.3″E) accommodated in the high-grade rocks of the Southern Granulite Terrane reveals the presence of three distinct petrographic types namely leuco syenite, melanofelsic syenite and mela syenite. The syenites, in general, have the following constituent minerals, namely alkali feldspar ($Or_{76.8}Ab_{23.2}$–$Or_{93.4}Ab_{6.6}$), plagioclase ($An_{4.1}$–$An_{17.3}$), calcic amphibole (edenitic hornblende/ferroparg-asitic hornblende), quad pyroxene (diopside–hedenbergite), biotite and opaque minerals (magnetite and ilmenite). Mode-based statistical studies indicate that a highly significant correlation exists among certain mineralogical parameters including quartz%, total feldspar%, colour index, alteration index and hydration index. Isopleth plots of these parameters strongly suggest maintenance of a magmatic regime throughout, with increasing water content towards the end stage of crystallization. Several geothermo-barometric methods point to shallow to moderate level emplacement (∼9–23 km) of the alkaline/sub-alkaline syenite magma which was facilitated by a 'hydration event'. The steep change in water gradients (in localized pockets) of the syenite intrusives has been corroborated by textural evidences.

Keywords. Mineral chemistry; geothermobarometry; equilibration depth; mode-based statistics; Sholayar Complex; mineralogical parameters.

1. Introduction

The mineral chemistry of syenites and associated rocks has received attention (though limited in number) by petrologists for long. For the Klokken syenite(-gabbro) complex, south Greenland based on mineral-chemical evaluation, it has been documented (Parsons 1981) that the less fractionated members of syenite probably crystallized with PH_2O less than P_{total} at temperature greater than 870°C where as more fractionated syenite had PH_2O similar to P_{total} with a different range of crystallization-temperature. For this complex, the fO_2 condition of ambient melt could also be successfully evaluated by Parsons (1981). Mineral chemistry-based similar approach for the Mboutou

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Genetic variation in natural population of *Mystus gulio*

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Abstract: *Long-whiskered catfish, Mystus gulio is one of the important estuarine as well as freshwater fish. It was distributed large geographical area. Due to its delicious taste, it is very popular in eastern India and Bangladesh. Genetic variation was estimated among 29 sequences of three populations of* Mystus gulio *i.e., Tamilnadu (*n = *15), Bangladesh (*n = *13), and West Bengal (n = 2) using COI gene sequencing.In population 1, the total alignment length was 696 base pairs (including sites with gaps /missing data) containing 577 monomorphic and 45 polymorphic sites with eight haplotypes. In population 2, COI sequence total alignment length was 846 base pairs (including sites with gaps /missing data) containing 487 monomorphic and 21 polymorphic sites with nine haplotypes.Haplotype diversity (Hd) and nucleotide diversity (π) of population 1 were 0.8901±0.063 and 0.02043±0.0062 respectively. Haplotype diversity (Hd) and nucleotide diversity (π) of population 2 were 0.8718±0.052 and 0.01023±0.0025 respectively. Genetic distances among the three populations were varying from 0.00 to 7.3%. The results of haplotype networks can help in conservation decisions and management of the fishery of this species.*

Keywords**:** *Mystus gulio, COI, population structure, genetic diversity*

1. Introduction:

Mystus gulio is also known as the long-whiskered catfish. It was reported that this fish dwells predominantly in brackish water but can also be found in freshwater (Talwar and Jhingran, 1991). It was documented that they were also found in beels, haors, canals, oxbow lakes, rivers and estuaries of Bangladesh (Shafi and Quddus, 2001). It has been reported that this fish is distributed in India, Sri Lanka, Indonesia, Bangladesh, Java, Pakistan, Nepal, Myanmar and Malaysia (Day, 1878; Talwar and Jhingran, 1991; Roberts, 1993; Jhingran, 1997; Kottelat, 2001; Senarathne and Pathiratne, 2007; Weber and de Beaufort, 1913). Due to its delicious taste, it is very popular in eastern India and Bangladesh (Tripathi, 1996; Sarker et al., 2002). This fish is also reported as an ornamental fish (Ng, 2010; Gupta and Banerjee, 2014).

Analysis of genetic variability has been helpful for the proper conservation and management of any natural population (Mukhopadhyay and Bhattarcharjee, 2014). Measurement of

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The mechanism of rearrangement process in styrene based iodohydrin via deiodination pathway

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Abstract: *Deiodination of styrene based vicinal iodohydrins with the hypobromous acid derived from acid activated bromate/bromide couple and simultaneous 1,2 migration of a phenyl group or hydrogen atom has been reported. The semipinacol rearrangements observed with styrene based vicinal iodohydrins are however dependent on the substrates examined. DFT study has been performed to investigate the semipinacol rearrangement processes of styrene based vicinal iodohydrins. The preference for the phenyl migration in 2-iodo-1-phenylethanol (1a) and in other substrates 2a was predicted with B3LYP/6-31G* level of theory in both ground state and transition state calculations. The dramatic difference in the preference of migration of hydrogen atom of 3a was predicted with DFT calculations in agreement with the observed results. It is to note that the (RS) configuration of 3a showed the hydrogen migration is preferred over the phenyl migration. The preference of hydrogen migration over phenyl migration in this case is due to the intramolecular hydrogen bonding interaction between the hydroxyl group and the carbonyl oxygen of the ester moiety. However, the (RR) configuration of 3a showed the phenyl migration as observed with substrates 1a-2a. The DFT calculations shed the light on the importance of the configuration of substrates to achieve the desired products in such cases.*

Keywords: *semipinacol rearrangement; iodohydrin; DFT calculations; migratory aptitude*

1. Introduction:

The pinacol-pinacolone rearrangement is an important acid catalyzed process in organic synthesis.[1] It is used for the preparation of aldehydes or ketones from the rearrangement of vicinal-diols. This rearrangement process involves the formation of carbocations.[1] The structure, stability of such carbocations is important for the formation of rearranged products.[2] The formation of carbocation in the rearrangement process can compete with the migratory aptitudes of the groups. In general, it is found that the migratory aptitude is in the order Ph > Me_3C > $MeCH_2$ > Me > H. However, in the rearrangement of the compound 2-methyl-1,1-diphenylpropanediol [$Ph_2C(OH)C(OH)Me_2$], the less prior migratory aptitude methyl group migrates compared to the phenyl group, because the reaction is governed by the formation of more stable initial carbocation.[3] The disadvantages of this rearrangement process are the excess of Lewis acids required for the completion of the reaction,[4] poor regio- and dia-stereoselectivity and unpredictable side reactions.[5] To

configuration of **3a** showed that the hydrogen migration is preferred over the phenyl migration in both the ground state and transition state calculations.

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Edge computing-based Internet of Things for Crop Productivity Prediction

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Abstract: *Internet of Things (IoT) has become the key component of designing smart systems. In conventional IoT systems, the use of remote cloud servers for data storage and processing increases the service latency. As a solution, this paper focuses on the use of edge computing in IoT. The edge computing-based IoT architecture is illustrated in this paper. The edge device is used for pre-processing the collected sensor data. The pre-processed data is sent to the cloud for further analysis and storage. For data analysis, we use logistic regression in this paper. The simulation results present that the edge computing-based IoT system reduces the latency by approximately 55% than the cloud-only IoT system. As a case study, we have considered crop productivity prediction based on the soil, weather, and crop related dataset. The experimental results demonstrate that the logistic regression achieves the average accuracy of approximately 90%. Using edge computing, the response time is also reduced by approximately 67% than the cloud-only IoT system.*

Keywords: *Edge computing, low latency, logistic regression, data analysis, Internet of Things.*

1. Introduction:

In the world of contemporary wireless telecommunications, Internet of Things (IoT) is gaining ground quickly. IoT combines a number of technologies, including embedded systems, pervasive computing, actuators, ambient intelligence, sensors, communication technologies, etc. [1, 2]. It is an integration of various devices which communicate, sense, and interact with their internal and external states via the embedded system. It has emerged as a trend for next-generation technologies and the entire business spectrum with extended benefits such as increased connection of end devices, systems, and services. IoT provides appropriate solutions for a wide range of real-time applications, including smart health care, smart cities, smart retail, smart transport, and smart agriculture [3]. Along with the facilities of IoT, cloud computing is introduced in the field of modern research. In cloud computing, dynamically scalable and frequently virtualized resources are supplied through the Internet as a service. The enormous storage, processing, and service capabilities of cloud computing, combined with the information collection capability in IoT, create a network between people

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Field Relation and Petrographic Implication of Kadavur Complex, Southern Granulite Terrane, Tamil Nadu, India

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Abstract: *The Precambrian (~810Ma) gabbro-anorthosite Kadavur complex (10˚35΄N:78˚11΄E), Karur district, Tamil Nadu occurs as intrusive within the country rocks comprising quartzite, granitic gneiss and migmatites belonging to the Southern Granulite Terrain (SGT). The detailed field investigations reveal that Kadavur complex consists of three well defined types: i) earlier deformation-controlled schistose (remnant) gabbro-anorthosite, ii) well defined layered gabbro-anorthosite and iii) lensoid pegmatoidal gabbro-anorthosite. Petrography of the layered gabbro-anorthosite type (as per IUGS classification) indicates several petrographic variants namely gabbro-norite, noritic-gabbro, gabbro, anorthositic norite, anorthosite, norite and anorthoitic gabbro, leucogabbro and rarely melagabbro and pyroxene hornblende gabbro norite.*

Keywords: *SGT, Gabbro-anorthosite, Kadavur complex, Intrusive rock*

1. Introduction:

The terrestrial anorthosite bodies do not have voluminous and widespread distribution over the world. Their restricted occurrences include Lac-Saint Jean complex, Quebec (Buddinton 1939), Fiskenaesset, Greenland and Grenville of eastern Canadian Shield (Ashwal, 2000, 2010; Ashwal and Myers, 1994), layered Bushveld Complex or Stillwater Complex (Cawthorn, 1996) and Superior Province of Canada (Polat et al. 2018). Terrestrial anorthosite occurrences may be divided into the following five types [Ashwal (1993)] which are: a) Archean anorthosite plutons b) Proterozoic “massif-type” anorthosite plutons c) centimeter to 100m thick layers in layered mafic intrusions d) thin cumulate layers in ophiolites / oceanic crust and e) anorthosite xenoliths occuring in other rock types. So far as the Indian context is concerned, Southern Granulite Terrain (SGT) and Eastern Ghats Granulite Belts (EGB) are classical terrains of anorthosite occurrences of Precambrian time (Naqvi and Rogers, 1987; Radhakrishna, 1990, 1993). The common country rocks in the SGT accommodating the anorthosite represent high grade rocks (Ramakrishnan et al. 1978; Santosh et al.1992). In a recent review paper of the Southern Granulite Terrane, Santosh (2020) emphasized the important role of gabbro-anorthosite bodies in the sense that these bodies probably represent

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Social impact of climate change: The source of climate injustice

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Abstract: *Climate change is one of the biggest threats to the world today. The climate change has not only caused danger to ecosystem or bio-diversity but has great impact on social, economic and political life of the people. The climate change has affected the economy, livelihood, health, migration pattern, socio- cultural life of the people and the community. Here arises the question of injustice. The poor, marginalised, vulnerable and the weaker section of the people are the most sufferer of climate change impact through they are least responsible or not responsible for the climate change. Not only the weaker section of the population, the under developed and poor states and even developing states of the south are the main victims of the climate change and they demanded climate justice. The paper is deal with the social impact of climate change and its relation with climate justice.*

Introduction:

Climate change is one of the most significant threats facing the world today and it is the cause behind the biggest socio political and economic injustice of the contemporary world. From the late 60s of the last century, the human environment is one of the emerging issues in global politics. The problem of environmental pollution and global temperature rise have led to changes in the nature of global climate which lead to melting mountain glaciers, global sea levels rise, coastal erosion, increase in the intensity and frequency of extreme weather events. Such climate events result in impacts on socio- economic structure, human health, and political system and also affect vital systems, such as growing food and energy supplies. They may occur immediately following the event or have longer-term implications. Significantly, these calamities affect all the people irrespective of north south but those people who live in developing southern countries are the worst affected as they do not have the capacities to grapple or cope with the changes. The most vulnerable are often disproportionately impacted by the costs of addressing climate change. Thus, in the discussion on climate impact the question of justice is becoming the central notion. Injustice is in part due to the differential socio- political impacts of climate change and uneven patterns of social vulnerability. The impact of climate injustice is becoming hardest for vulnerable

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Super Foods for Liver Health: A Critical Review

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ABSTRACT: A special food category known as "Super foods" has emerged as a result of the advancement of food within nutrition. Superfoods are particular food items that are able to express numerous advantageous effects like mitigate multiple complications, this type of foods convey strong immunity, have chief compounds such as polysaccharides, polyphenols, essential fatty acids. Apart from that, it carries macro & microminerals in enough quantity. In modern community, super foods are substantial regard which is caused of enhanced health awareness of people. It is a functional food that protects against liver illness by helping the liver to detoxify. This critical review's goal is to analyse the effects of superfoods on liver detoxification from a scientific perspective.

Keywords: Superfoods, Brazil nuts, Hemp seeds, Garden cress seeds, Maca, Amla, Oats, Black rice, orange-coloured fruits & vegetables, tomato & pink grape fruits.

INTRODUCTION

For millions of years ago, with advanced study, foods &its constituent have positive influence on human health. People discrimination regarding foods has altered substantially. Aside from gratifying considerable requirement by adequate nutrition, consumer think that, foods have incredible power to maintain good health status by inhibiting ailments & increasing mental & physical health. This idea has remarkable point authorised by Hippocrates- 'Let food be thy medicine and medicine be thy food'. Foods that upgrade health status &decreases completely manifestation & also applicable for improving symptoms of disorders which is defined as 'Functional foods'. The expenditure of this term was proposed for first time before 30 years in Japan. Now it has been conceded all over the world. In modern community, super foods are the habitual term applied for functional foods. super foods are composed of antioxidant, polysaccharides, essential fatty acids. Moreover, super foods are considered as nutritious particularly as well as it is very much friendly to keep good wellbeing (Meyerding *et al*., 2018).

Super foods are considered as nutrient dense foods that promote good effects for establishing better health being, it also contains antioxidant which is functioned actively along with promote good bioavailability as it contains bioactive products. Moreover, superfoods establish good immunity. Noteworthy, Superfoods can be described as it constitutes all kind of natural sources of vitamin, minerals & other nutrients that helps for living healthy life with enormous health benefits (Jagdale *et al*., 2021). The phrase 'Super foods' was utilised for functional foods. it is contemplated to be an umbrella term for understanding the nature of foods. Furthermore, it's nutritional constituents provide advantageous effects for improving health condition (Lunn, 2006).

Additionally, superfoods are traditional food stuffs which escalates good functional properties through many processing applications than gene alteration (Hefferon, 2012). Super foods or functional foods promote healthy effects in body & stable macro or micro nutrients composition these are referred as functional foods which is processed negligibly & available in nature, also highlight that, distinct property

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Effect of diet and physiotherapy for reducing gout associated symptoms

Mainak Sur, Shalmali Ray, Anirban Pattanayak, Souvik Tewari and Prathiksa Pramanik

Abstract
Increased levels of uric acid in the blood cause gout, a chronic and progressive disease. This causes urate crystals to develop in our joints, which causes inflammation and encourages gout attacks. Gout, a form of arthritis, results in painful, joint stiffness and decrement of joint space. Strengthening of muscles along with the biomechanical correction as much as possible, also maintenance and improving the joint range of motion reducing joint pain, increasing the mobility which are the benefits of physiotherapy. The act of walking may be painful or challenging in some cases of acute or, chronic joint discomfort. There are four stages that gout can go through. Asymptomatic hyperuricemia is the first stage, followed by acute gout, inter-critical gout, and chronic tophaceous gout as the fourth stage. Complex carbohydrate, low protein, low fat (mainly from MUFA and PUFA), high fibre, suitable vitamins, minerals, and adequate hydration intake are recommended for patients who are having gout-related symptoms. On the other hand, physiotherapy is essential in the treatment of gout in addition to diet. In this review article, the effectiveness of diet and physiotherapy in reducing gout-related symptoms is reviewed.

Keywords: Arthritis, cryotherapy, diet, PUFA, MUFA, hydrotherapy

Introduction
An inflammatory arthritis known as gout develops when monosodium urate crystals accumulate in synovial joints (Beyl *et al*., 2016) [5]. It is a typical inflammatory arthritis whose prevalence has grown in recent years. Gout typically develops as a result of the interplay of risk factors from the environment, constitution, and genes. Men and older persons are more likely to experience it. The extent to which uric acid levels are raised over the saturation point as a result of urate crystal formation, which is mostly brought on by ineffective renal urate excretion, is a key determinant (Doherty, 2009) [9].
As stated in the definition of gout, it is "a disease characterized by recurrent episodes of violent arthritis associated with the presence of monosodium urate monohydrate crystals in the synovial fluid, and in many cases, the eventual appearance of gross uratic deposits (tophi) in and around the joints, in the kidneys, and in certain subcutaneous sites" (Kwan *et al*., 2013) [16].
Gout is a type of chronic and progressive disease occurred due to increased level of uric acid in the blood. This results formation of urate crystals in our joint, leading to inflammation and promotes gout attack. Gout may progress through four stages. First stage is asymptomatic hyperuricemia, second stage acute gout, third stage inter-critical gout, and fourth stage is chronic tophaceous gout (Nuki and Simkin, 2006) [17].
Bardin and Richette (2014) [2] reported that there are several factors that contribute gout attack. These are high protein rich diet, fructose rich drinking beverages, over weight/ obesity, diabetes, heart disease, hypertension, alcohol consumption, family history, certain drugs and medications, surgery, trauma, dehydration. The sign and symptoms of gout include intense joint pain, tenderness, swelling, redness, stiffness, burning sensation. Generally, gout attacks our big toe, but gradually the inflammation spreads heels, knees, ankles, fingers and elbows
The first gouty arthritis attack typically affects just one joint. The metatarsophalangeal (MTP) joint at the base of the big toe is where gout most frequently manifests itself. 90% of gout sufferers will eventually have discomfort in the MTP joint. Knee joints, ankle joints, heels, and mid-foot joints are additional joints that are frequently impacted. Gout can also occur in the elbows, wrists, and fingers less frequently (Roddy, 2011) [22].

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A short review on medicinal value of Indian blackberry (*Syzygium cumini* L.)

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Abstract

Indian blackberry, also known as Java plum, black plum, jambolan, or jamun, is a tropical evergreen tree in the *Myrtaceae* genus of flowering plants. It is mostly used for conventional treatment of diarrhoea, ulcers, inflammation, and diabetes mellitus. It is a good source of anthocyanin, which is useful against analgesic characteristics, and it has medicinal benefits. Additionally, it possesses antineoplastic, radioprotective, and chemopreventive qualities. The information about the therapeutic benefits of Indian blackberries for human health is briefly described in the current article.

Keywords: Indian blackberry, medicinal value, human health, chemo preventive qualities, ulcers, inflammation

Introduction

Syzygium cumini, a member of the *Myrtaceae* family, is also known as Eugenia cumini and Syzygium jamunum. Other names for Indian blackberry include Jambul, Black Plum, Java Plum, Jamblang, and Jamun (Tewari *et al*., 2021) [16, 17]. The tree only bears fruit once a year, and the taste of the berries is sweetish-sour. The ripe fruits are used to produce wine, squash, jellies, and health beverages. All components of the tree, but most significantly the seeds, are used to manage diabetes mellitus in connection with its nutritional usage. Jamun has antioxidant, anti-inflammatory, anti-HIV, an-tileishmanial and antifugal, nitric oxide scavenging, free radical scavenging, anorexigenic, gastroprotective, anti-ulcerogenic, and redio-protective effects (Baliga *et al*., 2011) [3].

Nutritional composition of Indian blackberries

Table 1: Nutritional composition of Indian Blackberry

Java Plum, raw - Nutritional value per 100 g	
Energy	60 kcal
Carbohydrates	15.56 g
Fat	0.23 g
Protein	0.72 g
Water	83.13 g
Vitamin A	3 IU
Thiamine (vit. B1)	0.006 mg (1%)
Riboflavin (vit. B2)	0.012 mg (1%)
Niacin (vit. B3)	0.260 mg (2%)
Pantothenic acid (B5)	0.160 mg (3%)
Vitamin B6	0.038 mg (3%)
Vitamin C	14.3 mg (17%)
Calcium	19 mg (2%)
Iron	0.19 mg (1%)
Magnesium	15 mg (4%)
Phosphorus	17 mg (2%)
Potassium	79 mg (2%)
Sodium	14 mg (1%)

Source: USDA Nutrient Database

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From *Bastuhara* to *Immigrati*: Resistance and Refugee Solidarity in Amitav Ghosh's *The Hungry Tide* and *Gun Island*

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Abstract
Refugees exist throughout human history, though it is after the British imperial collapse that the term 'refugee' finds currency in South Asia. This paper shows how refugee solidarity finds different expressions in the face of resistance and securitization in two of Amitav Ghosh's novels - from the state-sponsored genocide of refugees in the regime of a left-wing government in *The Hungry Tide*, to the right-wing resistance denying the entry of immigrants stranded on the Italian coastline of the Mediterranean in *Gun Island*. This paper also unfolds how politicization of issues like sheltering and socializing the refugees affects the idea of solidarity: the indifference of civic society to state-sponsored atrocities against the refugees in *The Hungry Tide* stands in contrast with the support extended to illegal immigrants by the human rights activists despite the opposition of "right-wing, anti-immigrant groups" in *Gun Island*. Finally, the paper reflects how, in this age of economic globalization, digital media appears more powerful than any doctrinaire ideology of the 'dispossessed' in managing refugees' solidarity.
Keywords: Refugees, immigrants, sociality, resistance, refugee solidarity

Introduction

> *"The refugee question is, of course, the most visible form of the current planetary crisis. Ten years ago if somebody had suggested that the movement of a relatively small number of people would fundamentally destabilize the political systems of Europe and North America nobody would have believed them–but that is exactly what has happened. But I think it is vital to point out that the current migrations cannot be reduced simply to "climate change"; they are the product of many interesting factors." - Amitav Ghosh*[2]

[2] In reply to a question put by Asis De (one of the authors of this article) in an interview, Amitav Ghosh's statement quoted above appears quite significant. For details, please see: *Amitav Ghosh's Culture Chromosome*, eds. Asis De and Alessandro Vescovi (Leiden and Boston: Brill, 2022), 336.

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রবীন্দ্র-দর্শন

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রবীন্দ্রনাথ এক বিশ্ব-বীক্ষা। তাঁর জীবনের সত্তার সঙ্গে মিশে আছে বিশ্ব-মনস্কতার ছাপ। তাঁর চিন্তন ও মনন কখনোই কেবল বাঙালিত্বের সীমার মধ্যে সীমাবদ্ধ ছিল না; এমনকী তাঁর চিন্তার আলোকজ্যোতি ভারতবর্ষের মাটি ছাড়িয়ে সমগ্র বিশ্বের মানব-কল্যাণে ছড়িয়ে পড়েছিল। তিনি ছিলেন এক বিশ্ব-মানবতাবাদী কবি। সারাজীবন তিনি বিশ্বের মানুষকে ভালোবেসেছেন, তাঁদের দুঃখে তাঁর অন্তরাত্মা কেঁদে উঠেছে। তাঁর লেখনীতে বিশ্বলোকের মঙ্গলবার্তা ধ্বনিত হয়েছে বলেই তিনি হয়ে উঠেছেন সকলের 'বিশ্বকবি'। তিনি কেবল একজন বিশ্বের শ্রেষ্ঠ কবি তা নন, বিশ্ববাসীর আশা-আকাঙ্ক্ষা ও প্রাণের সুরও তাঁর কাব্য-গীতির মধ্য দিয়ে বারে বারে বেজে উঠেছে। তাঁর এই বিশ্ব-মনস্কতা, বিশ্ব-মানব প্রেম, পরিপূর্ণ মনুষ্যত্ববোধ ও ঋষিকল্প চিন্তা-ভাবনার উৎস-মুখ নিহিত রয়েছে তাঁর জীবন-দর্শনের মধ্যে। তাঁর এই জীবন-দর্শনের ভিত একদিনে গড়ে ওঠেনি, তা গড়ে উঠেছে সমগ্র জীবন-চর্যার সাধনায়। রবীন্দ্র-জীবন-দর্শন বিশ্বাসের গভীর শিকড় থেকে উত্থিত। তাই সত্য-দর্শনই রবীন্দ্র- দর্শন।

রবীন্দ্রনাথের যে বিশ্ব-মানবিক জীবন-দর্শন, তা তাঁর অধ্যাত্ম-চেতনা থেকে উৎসারিত। আর তিনি এই অধ্যাত্ম-প্রেরণা পেয়েছেন তাঁর পিতা মহর্ষি দেবেন্দ্রনাথের কাছ থেকে এবং পরবর্তী কালে তা আরও বেশি গভীর ও ব্যাপ্তিলাভ করে উপনিষদ ও বৈষ্ণব-ভাবাদর্শের প্রভাবে। ঠাকুরবাড়ির পরিবেশ ও কালচার রবীন্দ্র-জীবন-দর্শন গঠনে বিশেষ ভূমিকা নিয়েছিল। দেবেন্দ্রনাথ জমিদার হয়েও তাঁর সন্তানদের বিলাসিতার মধ্য দিয়ে মানুষ করেননি। তাই সাধারণ মানুষদের মত কষ্ট-সহিষ্ণুতা আয়ত্ত করেছিলেন রবীন্দ্রনাথ। স্কুলের ধরা-বাধা নিয়মের পড়াশুনা না করলেও তার জন্য দেবেন্দ্রনাথ চিন্তিত হননি; কেননা বাড়িতে বিভিন্ন বিষয়ে নিয়মিত গৃহ-শিক্ষকের কাছে পড়াশোনা করতেন রবীন্দ্রনাথ। শুধু তাই নয়, শরীরকে ঠিক রাখার জন্য ভোরে উঠে ধুলো-কাদার মধ্যে খালি গায়ে কুস্তি শিখতে হত। এভাবেই রবীন্দ্রনাথের ছেলেবেলা কেটেছে ছন্দে-বাধা রুটিন ধরে।

দিয়ে তাঁর বিশ্ব-মনস্কতার মনোভাব দ্যোতিত হয়েছিল। আবার মানুষকে ভালোবাসার মধ্য দিয়েই তিনি ঈশ্বরকে পেতে চেয়েছিলেন,—'জীবে প্রেম করে যেইজন/সেইজন সেবিছে ঈশ্বর' – বিবেকানন্দের এই মর্মবাণী রবীন্দ্রনাথ নিজের জীবনে পালন করতেন। এভাবেই রবীন্দ্রনাথের পরিপূর্ণ মনুষ্যত্ববোধ, বিশ্ব-মানবতাবোধ ও অধ্যাত্ম-চিন্তা 'বড়ো আমি'র জগৎ থেকেই আলোর দ্যুতির মতো উৎসারিত হয়েছে। সারাজীবন 'বড়ো আমি'র সাধনা করেছিলেন বলেই তাঁর জীবনখানিও হয়ে উঠেছিল সুন্দর ও ছন্দোময়। এরূপ ছন্দোময় জীবন আয়ত্ত করেছিলেন বলেই তিনি একটাই জীবনে পাহাড় প্রমাণ সাহিত্য-নিদর্শন রাখতে পেরেছেন। তাঁর সাহিত্যসামগ্রী যেমন উৎকৃষ্ট, তেমনি তাঁর জীবন ও জীবন-দর্শনও মহিমময়।

রবীন্দ্রনাথ ছিলেন পুণ্য জ্যোতির্ময়স্বরূপ এক বিশ্বমনস্ক আন্তজার্তিক ব্যক্তিত্ব। তাঁর নশ্বরদেহ আর নেই; কিন্তু আছে তাঁর কীর্তি, আছে জীবন-দর্শন। তাঁর সাহিত্য আমাদের অবসাদ-ক্লিষ্ট মনের শান্তির উৎস, তাঁর জীবন-দর্শন আমাদের লক্ষ্যহীন অন্ধকার জীবনের আলোর দিশারী। দুঃখ-জর্জর হতাশাগ্রস্ত বাঙালিকে যথার্থ মনুষ্যত্ববোধে উত্তীর্ণ হতে প্রেরণা জাগাতে পারে রবীন্দ্র–দর্শন। কেননা রবীন্দ্রনাথ আমাদের দেখিয়েছেন—'কীভাবে আমরা বাঁচবো।' তিনি শিখিয়েছেন কীভাবে জীবনকে ছন্দোময় করে তুলতে হয়। তিনি আমাদের শিখিয়েছেন, কীভাবে মৃত্যু-শোককে ভুলে থাকতে হয়, কীভাবে নিরাসক্ত ও নির্লোভ হতে হয়, কীভাবে সঙ্কীর্ণ স্বার্থের ঊর্ধ্বে উঠে মানুষকে ভালোবাসতে হয়, কীভাবে ঈশ্বরের সাধনা করতে হয় এবং সর্বোপরি তিনি শিখিয়েছেন কীভাবে শান্তিতে ভালো থাকা যায়। তাই রবীন্দ্র-জীবন-দর্শনই হয়ে উঠুক আমাদের সকলের পাথেয়।

তথ্যসূত্র:

১ । ১ নং শ্লোক। ২০১২। ঈশোপনিষদ। তুলসী প্রকাশনী। পৃষ্ঠা ২১।

২ । রবীন্দ্রনাথ ঠাকুর। ১৩৯৫ বঙ্গাব্দ। 'মুক্তি' কবিতা। নৈবেদ্য। বিশ্বভারতী। পৃষ্ঠা ৩৮ ।

৩ । রবীন্দ্রনাথ ঠাকুর। ১৩৯৫ বঙ্গাব্দ। 'প্রাণ' কবিতা। কড়ি ও কোমল। বিশ্বভারতী। পৃষ্ঠা ৩৬।

সংস্কৃত চন্দ্রিকা

ত্রয়োদশ বর্ষ

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সংস্কৃত : অ-মৃত এক নদীর ধারা

নবনীতা নাগ মাইতি

মানব সভ্যতা ও সংস্কৃতির ধারক ও বাহক হল ভাষা। যার মাধ্যমে যুগ থেকে যুগান্তরের সভ্যতা ও সংস্কৃতির এক অচ্ছেদ্য প্রবহমানতা বজায় থাকে। ভাষা হল এক নদীর মতো। যা দীর্ঘ পথ অতিক্রম করে চলে। কখনো তার চঞ্চল উদ্দাম গতি, কখনো বা সে ভরা যৌবনবতী। আবার কখনো সে ফল্গুধারারূপী।

পৃথিবীর ভাষা পরিবারের অন্তর্গত যে ভাষাগুলি পাওয়া যায় তার মধ্যে বহু ভাষা আছে যা আজ তার মানুষের কথ্য ভাষারূপে প্রচলিত নেই। কিন্তু সেসব ভাষার সাহিত্যপরম্পরা আজও বিশ্ববন্দিত। ভাষা যদি কথ্যভাষা হিসেবে না প্রচলিত থাকে তবে সাধারণভাবে আমরা তাকে অমৃত ভাষা বলি। কিন্তু যদি আমরা একটু অন্যভাবে ভেবে দেখি তাহলে দেখব যে—ভাষার মৃত্যু কখনো হতে পারে না। নদীধারার রূপবিবর্তনের মতোই ভাষাও বিবর্তনের মধ্য দিয়ে প্রবাহিত হয়। প্রতিনিয়ত ভাষা ও ভাষান্তরের মধ্যে পারস্পরিক আদান-প্রদানে ভাষার মূল রূপ পরিবর্তন বা বিবর্তিত হতেই পারে। যেমন আমরা প্রত্যেক রাজ্যের সীমান্তবর্তী এলাকায় প্রচলিত যে ভাষা দেখি সেই ভাষাগুলোর মধ্যে পার্শ্ববর্তী রাজ্যের ভাষার প্রভাব লক্ষ্য করা যায়। বিশেষ চর্চা করলে ওই সীমান্তবর্তী এলাকায় প্রচলিত ভাষা থেকে দুটি রাজ্যের মূল ভাষার উদ্ধার সম্ভব। কারণ সীমান্তবর্তী আঞ্চলিক ভাষার যে রূপ আমরা পাই সেই রূপের মধ্যেই দুটি রাজ্যের মূল ভূখণ্ডে প্রচলিত যে ভাষা তার রূপ অনুস্যূত হয়ে থাকে। যদি আমরা বাংলা এবং ওড়িশার বা যে-কোনো সীমান্তবর্তী এলাকার ভাষাগুলি নিয়ে চর্চা করি এ ধরনের উদাহরণ আমরা বিশেষভাবে অনুভব করব। সুতরাং পরিবর্তিত রূপের মধ্যেই মূল ভাষাটি কোনো না কোনোভাবে অনুস্যূত হয়ে অপ্রকট অবস্থায় ভাষান্তরে প্রবাহিত হয়ে চলে। আর এও তো হতে পারে যে কোনো ফল্গুধারারূপী ভাষা কোনো না কোনো কালে বিশেষ প্রচেষ্টায় প্রকটরূপে প্রকাশিত হবে।

আমাদের আলোচ্য ভাষা হলো সংস্কৃত। যে ভাষার সজীবতা নিয়ে শিক্ষিত সমাজে এক বিষণ্ণতার প্রবাদ প্রচলিত—'সংস্কৃত মৃতভাষা'। বিষণ্ণতা এ কারণে

সংখ্যাটি ভারতের মোট জনসংখ্যার মাত্র এক শতাংশেরও কম। তাসত্ত্ব এই সংখ্যাটি সংস্কৃতভাষার সঞ্জীবনতার প্রমাণ বহন করে। সুতরাং আধুনিক ভারতে সংস্কৃতভাষাকে আর মৃতভাষা বলা যায় না।

ভারত ছাড়িয়ে পৃথিবীর বিভিন্ন প্রান্তে সংস্কৃতভাষা চর্চাকেন্দ্র সুপ্রতিষ্ঠিত। প্রথমেই জার্মানির কথা বলতে হয়। জার্মানিতে প্রায় ১৯টি বিশ্ববিদ্যালয়ে সংস্কৃত ভাষা ও ইন্ডোলজি বিষয়ের পঠন পাঠন হয়। আমেরিকায় প্রায় তিনটি বিশ্ববিদ্যালয়ে সংস্কৃত সাহিত্যের পঠন পাঠন প্রচলিত। ইউনাইটেড কিংডম, অস্ট্রেলিয়া, রাশিয়া, পোলান্ড এবং অবশ্যই বাংলাদেশ, নেপাল—এ সমস্ত দেশেও সংস্কৃতভাষা ও সাহিত্যের পঠন পাঠন প্রচলিত। সাউথ আফ্রিকাতে সংস্কৃতকে মাইনোরিটি ল্যাঙ্গুয়েজ রূপে স্বীকৃতি দেওয়া হয়েছে। বিখ্যাত অক্সফোর্ড ও হার্ভার্ড ইউনিভার্সিটিতেও সংস্কৃতের পঠন পাঠন বহুদিন যাবৎই প্রচলিত।

এভাবেই সারা পৃথিবী জুড়ে সংস্কৃতভাষা ও সাহিত্যচর্চার প্রকৃষ্ট নিদর্শন পাওয়া যায়। ভারতের প্রাচীন ইতিহাস, রাজনীতি, বিজ্ঞান, ধর্ম, দর্শন ইত্যাদি জানতে গেলে সংস্কৃতভাষা চর্চা অত্যাবশ্যক। বর্তমান ভারতে সংস্কৃতভাষায় নতুন সাহিত্যসম্ভার গড়ে উঠছে আর এটাই আমাদের সংস্কৃতপ্রেমী মানুষের কাছে আনন্দের বিষয়।

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Rejuvenating the Voiceless Women Entities: Re-writing Mahasweta Devi's *Draupadi* and Toni Morrison's *Beloved*

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Abstract: *The issues of culture, identity and representation are significant to reflect analytically on tribal and black women's identity , culture, and their condition of being voiceless in Indian and American English texts with the reference to Stuart Hall's canonical essay 'Cultural Identity and Diaspora' which states identity and identification can be seen as a process never completed, thus always changing. In the definition of cultural identity, he popularizes a term called an essentialist identity which emphasizes the similarities among a group of people. Interestingly the said definition can and does inspire feminist, anti-colonial and anti –racist art and activism. Some prominent Indian and American fiction writers like Mahasweta Devi and Toni Morrison highlight the activism on behalf of indigenous tribal and black women and lead us to think about the voice for the voiceless tribal and black women's identity, existence and resistance.*

Keywords: *Cultural Identity, Representation, Activism and Resistance.*

"I see a voice" (Shakespeare, 1998/5.1). In '*A Midsummer Night's Dream'* Bottom playing the role of Pyramus rightly pronounces this meaningful and significant maxim. Actually it might express the experience of the reader who can see voices on the page. The French writer Pascal Quignard argues that in a literary text the writer tries to present silence and then perceive some lost voice in the socio-economic structure of the society and reflect the lost voice efficiently in their narratives to be a eloquent voice for the community. As Homi K. Bhabha justifiably says in his *The Locations of Culture, 'there is a conspiracy of silence around the colonial truth.* (Bhabha, 2004). My objective in this article is to illustrate how Draupadi Mehjen in Mahasweta's *Draupadi* and Sethe in Toni Morrison's *Beloved* break this shackle of silence of colonial truth and emerges as voice for socially, economically politically exploited and oppressed people in the postcolonial world. These prominent Indian and American fiction writers like Mahasweta Devi and Toni Morrison highlight the activism on behalf of indigenous tribal and black women and lead us to think about the voice for the voiceless tribal and black women's identity, existence and resistance.

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Socio-religious Complexities of Nyishi Tribes: A critical Study of Yumlum Tana's *the Wind Also Sings* and *The Place Where Rivers Meet*

Shyamal Mondal* Dr. Shantanu Siuli**

[*Arunachal Pradesh, the land of rising sun, is the abode of different tribes likeNyishi, Sherdukpen,Adi and Monpa etc. The Nyishi Community, the largest ethnic group in Arunachal Pradesh is passing through severe socio-cultural change. In this changing scenario of religious, political and cultural dynamics, theology of Christianity, Buddhism and Hinduism is tremendously striving with the indigenous tribal theology. Nyishi tribe specifically the youth with the arrival of the Hariangs(non-tribal) tries to hug the modern life, education and western culture raising the issue of tribal identity crisis . Indigenous tribal traditions, Donyi- Polo, Abutani of Nyishi tribes have to face challenges due to alien theological perspectives of Christian Church, Hinduism and Buddhist Spirituality. The purpose of my article is to explore and explain the socio-religious complexities and the revival of indigenous tribal religion of Nyishi tribe against the progressive chariot of Christianity through critical study of Nyishi Writer YumlumTana'sThe Wind also Sings and The Place Where Rivers Meet.*]

The most significant and influential prose writer of 20th century literature Franz Kafka vividly represents his feelings of imprisonment in foreign country as an immigrants and his participation in their alien bizarre rituals. Yumlum Tana as an embodiment of Nyishi Tribes has almost the same feelings when he was forcefully compelled to participate in the bizarre rituals of Christian missionaries leaving behind his indigenous identity, culture and theology. The analysis of Yumlum Tana's *The Wind Also Sings (2015)* and *The Place Where Rivers Meet* (2020) demonstrates to a great extend that the majoritarian discourse and religion encompass all the other minoritarian discourses. It is not wrong to say that the Nyishsi community, the largest ethnic group in Arunachal Pradesh, is made to mourn the cultural loss in main land India. This loss of culture and religion within Indian nation state is definitely due to the socio-cultural and socio-religious complexities of different dominant territorial groups. An ethno-culturally different and socio-economically disempowered group Nyishi Tribe is subjected to alienation and discrimination due to their status of marginalized minorities and cultural differences. However, with the British Colonization and growing urbanization the tribal theology of Nyishi people has been identified as peripheral with a stigma of superstitious beliefs

...two instances where Tana expresses and ...es the uniqueness of Nyishi mythology to ...their cultural beliefs and nature-human ...-spirits continuum amid the Christian and ...paradigm of theological dialectics.

...clusion

...ural Pluralism has been criticized for ...forming a single nation into several nations ...for destroying universal brotherhood. It is ...said that cultural pluralism laid more ...asis on ethnic identity than any other identity. ...lum Tana as a genealogist of his society, ...es his voice for the ethnic identity and tribal ...logy of the almighty Donyi Polu because this ...ally peripheral and politically suppressed ...shi tribe is going to lose their identity and its ...nct culture in name of cultural assimilation ...a multi-cultural Indian society which ...claim the very idea of Unity in Diversity. In ...is regard I would like to conclude my paper ...th a few lines of Tana where he criticizes the ...course of mainstream system of nation,

"What is this mainstream that you talk about often?

Is it a big stream

Where all the tributaries lose their identities?

Where the smaller fishes live

In perpetual fear of the big fishes

In a fish eat fish world?" (Tana: 16)

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◆◆

ভারতীয় নারী এবং সামাজিক পরিবর্তন : একটি বিশ্লেষণ

বরুন কুমার ঘোষ
সহকারী অধ্যাপক, দর্শন বিভাগ,
মহিষাদল রাজ কলেজ

সারসংক্ষেপ :- পরিবর্তনশীলতা হল মানব সমাজের ধর্ম। আর সামাজিক পরিবর্তন হল এই বৃহত্তর সমাজের পরিবর্তন। ম্যাকাইভার ও পেজ তাই সমাজের সংজ্ঞায় বলেছেন – 'সমাজ হল সামাজিক সম্বন্ধের জটাজাল, যা নিয়ত পরিবর্তনশীল'। আদিম সমাজ ব্যবস্থা এ প্রকার নানা পরিবর্তিত অবস্থার মধ্য দিয়ে বর্তমান সমাজে পরিণত হয়েছে। বর্তমান সমাজ-ব্যবস্থাও পরিবর্তনশীল এবং গতিশীল। কারণ সমাজ স্থির থাকতে পারে না। আমরা বলতে পারি যে, পরিবর্তন হল সমাজের আইন, অপরিবর্তনীয় সমাজ একটি কল্পকাহিনী। আমাদের জীবনের দৈনন্দিন শুরু হয় শব্দ পরিবর্তন দিয়ে, দিনের শুরু থেকেই আমরা আলোচনা শুরু করি গত এক বছর, এক দশক বা বিগত পঁচিশ বছরে পরিস্থিতি কী ছিল। মূল্যবোধ, রীতিনীতি, আচার-আচরণ, ধর্ম, সংস্কৃতি, ঐতিহ্য, বিশ্বাস ইত্যাদি কতটা পরিবর্তন হয়েছে। নিঃসন্দেহে পরিবর্তন সমাজ ও মানবজীবনের কোনো কোণ রেখে যায়নি। নারীরাও পরিবর্তনের ব্যতিক্রম নয়। আমরা দেখি নারীর জীবন নিয়ে লিখতে শুরু করলে কালি ও কাগজের অভাব হবে। একটি মজার বিষয় হল পৃথিবীর প্রতিটি কোণে যেখানে আমরা মানুষের আবাস খুঁজে পাই সেখানে নারীর মর্যাদা পুরুষদের পাশে, প্রায় সব সংস্কৃতি ও সম্প্রদায়ে আছে। এই সত্য নিজেই প্রকৃতির নিয়ম হয়ে উঠেছে। স্বাধীনতা অর্জনের পর, ভারত সরকারও উন্নয়নমূলক কর্মসূচির মাধ্যমে নারীদের পুরুষের সমান মর্যাদা দেওয়ার পরিকল্পনা করেছে। আমি আমার এই প্রকল্পে সামাজিক পরিবর্তনে ভারতীয় মহিলাদের মুখ্য ভূমিকা নিয়ে আলোচনা করেছি।

সূচকশব্দ :- মহিলাদের অবস্থান, সমতা, শিক্ষা, ক্ষমতায়ন, কর্মসংস্থান, রাজনীতি।

ভূমিকা :- পরিবর্তনশীলতা হল মানব সমাজের ধর্ম। আর সামাজিক পরিবর্তন হল এই বৃহত্তর সমাজের পরিবর্তন। ম্যাকাইভার ও পেজ তাই সমাজের সংজ্ঞায় বলেছেন – 'সমাজ হল সামাজিক সম্বন্ধের জটাজাল, যা নিয়ত পরিবর্তনশীল'। আদিম সমাজ ব্যবস্থা এ প্রকার নানা পরিবর্তিত অবস্থার মধ্য দিয়ে বর্তমান সমাজে পরিণত হয়েছে। বর্তমান সমাজ-ব্যবস্থাও পরিবর্তনশীল এবং গতিশীল। কারণ সমাজ স্থির থাকতে পারে না। আমরা বলতে পারি যে, পরিবর্তন হল সমাজের আইন, অপরিবর্তনীয় সমাজ একটি কল্পকাহিনী। আর এই পরিবর্তনশীল সমাজে নারীরা হল মৌলিক একক। নারীরা একটি পরিবার তৈরী করে, পরিবার একটি বাড়ি তৈরী করে, বাড়ি একটি

রয়ে গেছে। যদিও ভারতে আজকের আধুনিক নারীদের মর্যাদা উচ্চতর হয়েছে। মহিলারা সমস্ত প্রতিকূলতার বিরুদ্ধে একটি পার্থক্য তৈরী করেছে। বর্তমানে মহিলারা বিভিন্ন ক্ষেত্রে পঞ্চায়েত রাজ করছে বলা যায়। সমসাময়িক ভারতীয় সমাজে নারীর দৃষ্টিভঙ্গির পরিবর্তন হয়েছে বিভিন্ন কারনে। যেমন – আধুনিক শিক্ষা, উচ্চ ভৌগলিক এবং পেশাগত গতিশীলতা এবং নতুন অর্থনৈতিক নিদর্শনগুলির উত্থান মহিলাদের একটি নতুন মর্যাদা অর্জনে সাহায্য করেছে। সুতরাং মহিলাদের জন্য সামাজিক পরিবর্তনের ইতিবাচক পদ্ধতিগুলি সময়ে নেওয়া প্রয়োজন। নারী এবং দেশের অগ্রগতিতে নারীদের সমান অংশগ্রহণকারী হিসাবে গ্রহণ করা প্রয়োজন।

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কবি বিনয় মজুমদার : জীবন ও সৃষ্টি

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'আমি তার উপেক্ষার ভাষা আমি তার ঘৃণার আক্রোশ'—প্রেমে এমনি বিপর্যাসের ছবি এঁকেছিলেন কবি জীবনানন্দ দাশ। 'যে নক্ষত্র নক্ষত্রের দোষ' কবির প্রেমের পথে বাধা হয়ে উঠেছিল, তিনি নিজেও তাকে ভুলে গিয়েছিলেন—এমনটাই স্বীকারোক্তি শুনি। কিন্তু এই উপেক্ষা, ঘৃণা যখন প্রেমকে ছাড়িয়ে একজন কবির জীবনের সকল উপান্তকে গ্রাস করে ফেলে—আর ব্যক্তি যদি তাকে কখনোই ভুলতে না পারেন— যদি ভুলতে দেওয়া না হয়—তাহলে জীবনের গান কীভাবে জীবনের গদ্য হয়ে ওঠে? আজীবন আগুনের সেঁক চেয়ে চেয়ে হাঙরের ঢেউয়ে লুটোপুটি খাওয়া এমনি একটি জীবনকে যদি 'পাগল' বিশেষণে চিহ্নিত করে অনিবার বিদ্ধ করা হয়, পাগলাগারদে আটকে রেখে এক শ্রেণীর মানুষ যদি আখের গোছাতে চায়— তবে সেই সেই অবমূল্যায়নের নাম দেওয়া যেতে পারে কবি বিনয় মজুমদার।

আজীবন ছিন্নমূল, আজীবন ছন্নছাড়া, আজীবন উপেক্ষিত, আজীবন চক্রান্তের শিকার হওয়া এক নির্জিত মানুষ যদিও বা কখনো প্রতিরোধে হিংস্র হয়ে ওঠেন, আর হাসপাতালে নিয়ে গিয়ে আঠারোবার ইলেকট্রিকের শক দেওয়া হয়—তাহলেই বুঝি তাঁর মধ্যেকার কবিত্বের যত বাষ্প উবে যায়? হাসপাতেলে থেকে কিংবা সেখান থেকে ফিরে এসেও যে মানুষটি লেখনীর অনায়াস শক্তিতে জিতে নেন 'রবীন্দ্রপুরস্কার' কিংবা 'সাহিত্য অ্যাকাডেমি'র মতো মহার্ঘ পুরস্কার—তাঁকে যাঁরা 'পাগল কবি'র লেবেল সেঁটে দিয়ে নিজেদের দিগ্‌গজ প্রমাণ করার চেষ্টা করেন—তাঁদের জন্য উপহার হিসেবে রইল কবি প্রেমেন্দ্র মিত্রের কবিতার নিম্নোক্ত চরণক'টি—

" ছোট ভীরু হাত দিয়ে

জীবনের মাপ নিয়ে যারা

৩৯. তদেব।

৪০. বিনয় মজুমদার। ২০১৪। মানুষের আলো। আমাদের বাগানে। কাব্যসমগ্র, ২য় খণ্ড। প্রতিভাস। পৃ: ৮২।

৪১. রবীন্দ্রনাথ ঠাকুর। ১৪২১। বর্ষশেষ। কল্পনা। বিশ্বভারতী। পৃ: ৪৭।

৪২. রবীন্দ্রনাথ ঠাকুর। ১৪২১। গীতবিতান ১ম খণ্ড। পূজা পর্যায়। বিশ্বভারতী। পৃ: ৫০।

৪৩. বিনয় মজুমদার। ২০১৪। মানুষের আলো। আমাদের বাগানে। কাব্যসমগ্র, ২য়খণ্ড। প্রতিভাস। পৃ:৮২।

৪৪. দীপেন্দ্রনাথ বন্দ্যোপাধ্যায়। ২০১২। অশ্বমেধের ঘোড়া। দীপেন্দ্রনাথ বন্দ্যোপাধ্যায় গল্পসমগ্র। একুশ শতক। পৃ: ২৫১।

৪৫. সনাতন পাঠক। জানুয়ারী ২০০৬। একটি অসাধারণ কবিতার বই। বিনয় মজুমদারের ডায়েরি (সম্পা. অজয় নাগ, কমল মুখোপাধ্যায়)। শিলীন্ধ্র প্রকাশন। পৃ: ১৪৫।

পাণিনীয় বর্ণোচ্চারণ-শিক্ষা বনাম বিদ্যাসাগরীয়-বর্ণপরিচয়

অসীম সুন্দর মিশ্র *

সংস্কৃত-বিভাগ, মহিষাদল রাজ কলেজ

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সারসংক্ষেপ:- *মনুষ্য ভাষার মাধ্যমে পরস্পরের মধ্যে ভাব ব্যক্ত করে থাকে। পৃথিবীতে যদি ভাষার মতো কোন বস্তুর অস্তিত্ব ই না থাকতো, বোধ হয় কোন শব্দই হত না। কবি দণ্ডীর কথায় - ''বাণী বিনা সংসারের কার্য অচল হত। আর যদি শব্দ নামক জ্যোতি জগৎ কে প্রকাশিত না করতো তাহলে সম্পূর্ণ জগৎ অবিদ্যারূপী অন্ধকারে ব্যাপ্ত হতো।" তাই ভাষা হল ব্যক্ত বাণী অর্থাৎ যার দ্বারা বর্ণের সুস্পষ্ট উচ্চারণ সম্ভব হয়। আমরা কথা বলার সময় উচ্চারণের প্রতি ধ্যান দিই না। কিন্তু অধ্যয়ন-অধ্যাপনের সময় উচ্চারণের প্রতি ধ্যান দেওয়া উচিৎ। বিশেষ করে পূজো-অর্চনা বা যজ্ঞীয় আচার-অনুষ্ঠানের সুস্পষ্ট রূপে বর্ণের উচ্চারণ করা বাঞ্ছনীয় হয়ে যায়। কারণ উচ্চারণের ত্রুটির ফলে অর্থ অনর্থে পরিণত হয়ে যায় এবং অযাচিত ফলপ্রাপ্তির সম্ভাবনা থেকে যায়। এরূপ ঘটনা যাতে না ঘটিত হয়, তারজন্য আচার্য পাণিনি "বর্ণোচ্চারণ-শিক্ষা" শাস্ত্রে বর্ণের যথাস্থান উচ্চারণ প্রদর্শিত করেছেন। যাতে শিশুরা প্রথম থেকেই সেই শিক্ষা গ্রহণ করতে সমর্থ হয় এবং পরবর্তীকালে উচ্চারণের দোষে অর্থ অনর্থে পরিণত না হয়ে বিতরীত ফললাভও না হয়।*

অনুরূপভাবে পণ্ডিত ঈশ্বরচন্দ্র বিদ্যাসাগর মহাশয়ও "বর্ণপরিচয়" এর মাধ্যমে বাংলায় শিশু-শিক্ষার উপর জোর দিয়েছিলেন। যাতে বাংলার শিশুরা বর্ণ শিক্ষা গ্রহণ করে উচ্চশিক্ষায় শিক্ষিত হতে পারে। তাই প. মহাশয় দ্বারা বাংলা "বর্ণমালাকে" নতুন রূপ প্রদান করে বর্ণপরিচয় রচনা করা ছিল যুগান্তকারী ঘটনা। যার ফল সমাজে পরিলক্ষিত হয়েছিল।

শব্দসংকেত -

ভাষা, সুস্পষ্ট-উচ্চারণ, যজ্ঞীয়-অনুষ্ঠান, ফললাভ, শিশু-শিক্ষা,দোষমুক্ত ।

ভূমিকা: -

সংস্কৃত-ব্যাকরণ শাস্ত্রের অমর জ্যোতি-স্বরূপ দেদীপ্যমান আচার্য্য পাণিনির সময় বিষয়ে পর্যাপ্ত মত পার্থক্য দেখা গিয়েছে । তবুও প্রামাণিক বিদ্বানদের দ্বারা উনার সময় আনুমানিক 450-400 খ্রী:পূ: মধ্য ভাগ নির্ধারিত করা হয়েছে । আচার্য্য পাণিনির পূর্বজ শালাতুর(বর্তমান-লাহৌর, পাকিস্তান) গ্রামের নিবাসী ছিলেন, তাই তিনি শালাতুরীয় নামে পরিচিত ছিলেন ।

প. ঈশ্বরচন্দ্র বিদ্যাসাগর মহাশয় ছিলেন ঊনবিংশ শতকের এমনই এক ব্যাক্তিত্ব; যিনি ছিলেন বিশিষ্ট শিক্ষাবিদ, সংস্কৃতজ্ঞ, সাহিত্যজ্ঞ ও সমাজ-সংস্কারক । কারণ সেসময় দেশে প্রচলিত ছিল নানা কুরীতি ও কুপ্রথা । সেই কুরীতি ও কুপ্রথার বিরুদ্ধে জোনাকির মতো আলো জ্বালিয়ে সংঘর্ষরত ছিলেন সামান্য কিছু

8 . অষ্টা. 1/3/2
9 . উচ্চারণম্ । কুত এতত্ ? দিশিরুচ্চারণমক্রিয়: । বৃত্তিসমবায়ার্থো বর্ণানামুপদেশ: । (উচ্চারর্য হি বর্ণানাহ-``উপদিষ্টা ইমে বর্ণা'' ইতি) মহা.ভা.-বা.16
10 . বর্ণপরিচয় -ঈশ্বরচন্দ্র বিদ্যাসাগর ।
11 . মহা. ভা. - 1/1/5
12 . ঐ - 1/2/1
13 . ঐ
14 . ঐ
15 . ঋগ্বেদ প্রাতিশাখ্য - উবটভাষ্যম্
16 . সমগ্র ব্যা. কৌ. - ঈশ্বরচন্দ্র বিদ্যাসাগর, পৃ. 2
17 . ম. ভা - 1/1/2
18 . বর্ণোচ্চারণ-শিক্ষা, পৃ. 5
19 . বর্ণপরিচয় রচনা ও প্রকাশনার ইতিহাস ।
20 . বর্ণ. র. প্র. ইতিহাস ।
21 . স. ব্যা. কৌ, পৃ.- 5
22 . স. ব্যা. কৌ, পৃ.- 7
23. স. ব্যা. কৌ, পৃ.- 5
24 . বর্ণপরিচয় (প্রথম-ভাগ) ।
25 . অ ই উ ণ্ - সূত্র ব্যাখ্যা প্রসঙ্গ ।

সন্দর্ভ-গ্রন্থসূচী:-

1. শ্রীমদ্দয়ানন্দ সরস্বতী কৃত ব্যাখ্যা সহিত, 2009, বর্ণোচ্চারণ-শিক্ষা(পাণিনি-মুনি-প্রণিতা), রামলাল কপূর ট্রাস্ট, সোনীপত ।
2. শ্রী ঈশ্বরচন্দ্র বিদ্যাসাগর, সং-1931,বর্ণপরিচয়(প্রথম-ভাগ), কলিকাতা ।
3. ড. দ্বিবেদী কপিলদেব,1983, লঘুসিদ্ধান্ত কৌমুদী, বিশ্ববিদ্যালয় প্রকাশন, বারাণসী ।
4. ড. কর গঙ্গাধর ন্যায়াচার্য্য, 2002 মহাভাষ্যম্ সংস্কৃত বুক ডিপো, 28/1 বিধান সরণী, কোলকাতা ।
5. দুর্গাচরণ সাংখ্য-বেদান্ত তীর্থ , jun-2009, , সমগ্র ব্যাকরণ কৌমুদী (ঈশ্বরচন্দ্র বিদ্যাসাগর), শ্রীঅরুণ কুমার মজুমদার,দেব সাহিত্য কুটীর প্রা.লি.21, কলিকাতা ।
6. প্রো. পাণ্ডেয় গোপালদত্ত , 1992, অষ্টাধ্যায়ী, চৌখম্বা সুরভারতী প্রকাশন, বারাণসী ।
7. ড. ত্রিপাঠী রমাকান্ত, 2008,রঘুবংশম্ , চৌখম্বা প্রকাশন, বারাণসী ।
8. ড. বন্দ্যোপাধ্যায় অসিত, 2005, বাংলা সাহিত্যে বিদ্যাসাগর, দেজ পাবলিশিং, কোলকাতা ।

মনুসংহিতা ও অর্থশাস্ত্রের দিশায় স্বাস্থ্য সচেতনতা

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সারসংক্ষেপ : *ডারউইনের 'বিবর্তনবাদ অনুযায়ী অভিযোজনই প্রাকৃতিক নির্বাচনের চাবিকাঠি। অর্থাৎ প্রকৃতির দরবারে সবল জীবেরই লড়াই করে টিকে থাকার সম্ভাবনা বেশি।*এই সম্ভাবনাময় জীবন যুদ্ধে *শ্রেষ্ঠ জীব হিসাবে মানবজাতি তাই সৃষ্টির উষালগ্ন থেকে নানা উদ্ভাবনী উপায়ে জীবনযাত্রার মানোন্নয়নের প্রচেষ্টা চালিয়ে যাচ্ছে। সেই উচ্চাকাঙ্খা থেকেই মানুষ* অত্যাধুনিক প্রযুক্তি ও উদ্ভাবনীবিদ্যার মাধ্যমে তার *দৈনন্দিন জীবনশৈলীতে* নানা *পরিবর্তন আনতে সক্ষম হয়েছে। তবে* এই উন্নতি করতে গিয়ে *প্রকৃতিতে অত্যাধিক মানব হস্তক্ষেপ,*মানুষের অতি *স্বার্থপ্রিয়তা দুরারোগ্য ব্যাধির প্রকোপ, প্রকৃতির হঠাৎ হঠাৎ ধ্বংসলীলায় মেতে ওঠা প্রভৃতি পরিস্থিতির কারণ হয়ে উঠছে।* বিভিন্ন শতাব্দীতে এবং *সম্প্রতিও আমরা সেইরকম পরিস্থিতির (করোনা* ভাইরাসের প্রাদুর্ভাব , *আমফান, যশ প্রভৃতি* ঘূর্ণঝড়*) সম্মুখীন হয়েছি। সেখান থেকে আজও আমরা* সম্পূর্ণভাবে নিষ্কৃতি পাইনি*। সমগ্র বিশ্বের বিজ্ঞানি থেকে শুরু করে প্রকৃতিবিদ,স্বাস্থ্যবিশেষজ্ঞরা এর মুক্তির পথ* অনু*সন্ধানে নিরলস চেষ্টা* চালিয়ে *যাচ্ছেন।*এই ধরণের পরিস্থিতিতে স্বাস্থ্যসচেতনতা কথাটি বারবার উঠে আসে আমাদের সামনে । আমরা খুঁজতে থাকি সম্পূর্ণভাবে সুস্বাস্থ্য বজায় রাখার বিভিন্ন পথ । ফিরে দেখি ভারতীয় প্রাচীন সভ্যতা, সংস্কৃতি,প্রাচীন শাস্ত্রগুলি ,যদি কোন মুক্তির সন্ধান পাওয়া যায় । আর সুস্বাস্থ্যের এই উপায় সন্ধান করতে গিয়ে *ভারতীয়* সংস্কৃত *সাহিত্যের প্রাচীন দুই গ্রন্থ অর্থশাস্ত্র ও মনুসংহিতার স্বাস্থ্য সম্পর্কিত* সচেতনা*মূলক ভাবনা* ও *বিধান*গুলির যুক্তিগ্রাহ্যতা আমাদের বিস্মিত করে বারে বারে । আলোচ্য প্রবন্ধে এই দুই গ্রন্থের স্বাস্থ্য সম্পর্কিত সচেতনতামূলক বিষয়গুলির কিছু অংশ বিশ্লেষিত হয়েছে । *বিশেষত* স্বাস্থ্য সচেতনতার ক্ষেত্রে নিত্যকর্ম,খাদ্যাভ্যাস, আচার আচারণ প্রভৃতি বিষয়ে কি ধরণের সচেতনতা অবলম্বন করলে সুস্থ থাকা যায় *প্রভৃতি* বিষয় *নিয়ে* সূক্ষ্ম *তিসুক্ষ্মভাবে* আলোচনা *করা হয়েছে।*

শব্দ সংকেত:

ধর্মশাস্ত্র, অর্থশাস্ত্র, স্বাস্থ্যসচেতনতা, নিত্যকর্মে, খাদ্যাভ্যাসে, আচার আচরণে স্বাস্থ্য সচেতনতা ।

ভূমিকা - সুপ্রাচীনকাল থেকে ভারতীয় সমাজব্যবস্থা, শিক্ষা, সংস্কৃতি মূলত ধর্মের উপর ভিত্তি করে দাঁড়িয়ে আছে। ধ্রিয়তে লোকোহনেন ধরতি লোকং বা ইতি ধর্মঃ (ধৃ + মন্) ।অর্থাৎ যার দ্বারা বা যা লোক সমূহের ধারক তাই ধর্ম। জীবনের প্রতি পদক্ষেপে নিয়মানুবর্তিতা,কর্তব্যতা, সতর্কতার বার্তা দিয়ে মানবচরিত্রেকে মহিমান্বিত করে তোলাই হল ধর্ম। এই ধর্মের নির্দেশক গ্রন্থকে বলা হয় ধর্মশাস্ত্র।ভগবান মনু রচিত মনুসংহিতা গ্রন্থটি মানবহিতকর কল্যাণের বিধানে সমুজ্জ্বল ধর্মগ্রন্থ। সেখানে মনু কেবল বেদবিহিত ধর্মবিধানের নির্দেশ দেননি, পরিবেশ ও স্বাস্থ্যসম্পর্কেও মানবকুলকে সচেতন করছেন যা বর্তমান পরিস্থিতির প্রেক্ষিতেও যুক্তিযুক্ত। ধর্মশাস্ত্রের একটি অঙ্গ রাষ্ট্রনীতি বা রাজধর্ম । সকল ধর্ম আবার রাজধর্মের উপর নির্ভরশীল। তাই মহাভারতে

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To Study the Relationship between Emotional Intelligence and Learning Style among Adolecent School Students of Paschim Medinipur District

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Abstract: *This research studies the relationship between learning styles and emotional intelligence school going adolecent student's in govt aided/govt sponsored schools in paschim medinipur district of West Bengal.students with higher levels of emotional intelligence are managing better than themselves and others around them.It helps them in many ways like sub scales of emotional intelligence: self-awareness,self-motivations,empthy,internal motivation etc,emotional intelligence not only influences one's emotionas but also their learning styles.If a students lacks emotional intelligence ,then their environment,psychological,physiological characteristics and process are affected which in term affects their learning styles and education.Learning styles differ from one student to anather.This examines the relationship between learning styles and emotional intelligence among adolecents students and find out the significant difference in learning styles between Girl's and Boy's students and their significant differ in emotional intelligence too.*

Keywords: *Emotional Intelligence, Learning style, Adolecents.*

1. Introductions:

Education is the continuous process to all round development of the student and enrichment of high and better quality of life. Education is now become a successful passport for the development of a nation in general and of a person in particular. Success in life can be achieved through education. Today our educational systems mainly focus on student academic achievement. But not interested to know causes of unsatisfactory academic performance of their children and how to find out the causes of the psycho-social and emotional problem of school -going adolescents.

The present study research has been an attempt to study the relationship to emotional intelligence and learning style of school going adolescents of paschim medinipur district.

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A Study on Financial Performance of Cement Industry with Special Reference to Ambuja Cement Limited

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Abstract: *India's cement industry plays a vital role in economy.This industry provides employment to more than a million of people directly and indirectly.Cement Industry mainly engaged in housing, infrastructure, commercial and industrial. Indian cement industry is the largest producer of cement is the world just behind china.*

The study mainly deals with financial performance of Ambuja Cement Limited. The primary objective is to study the financial performance and the secondary objectives are to evaluate the profitability and liquidity position as well as operational position of the industry. The researcher has used only secondary data. Ratio analysis, paired correlation and regression analysis have been used for analysing the data. The results indicate that the liquidity position of the company is satisfactory. The researcher does not find out any significant relationship between liquidity and profitability.

Keywords*:* Liquidity, Profitability, Paired Correlation and Regression Analysis

1. Introduction:

Cement is a very essential commodity which is manufactured by local plants. There are twenty companies in cement industry. India is a developing country so there is a large scope to expand the cement industry. Development is synonymous with industrialization and industry mainly concentrating to the basic goods of steel and machinery.

Liquidity has an important relationship with profitability. If we have enough liquid resources then we may be able to get benefit of cash discount on purchases and as well as increasing profits. If we cannot pay the creditors in the given period then we have to pay interest. Thus, shortage of liquid resources will show the low cash discount and payment of interest. Both the losses will certainly decrease profits. Stock is also an important factor because if we are not able to keep sufficient stock due to shortage of liquid resources, then the production cycle may not be continued and that will result in heavy losses. Financial analysis is a depth study of a firm's financial position (i.e., capital, assets and liabilities of a firm at a point of time) and its financial performance (i.e., income, profitability, solvency, earnings per share, dividend payout etc.,) over a period.

2. Objectives of the study:

The study was conducted to achieve the following objectives-

In India the cement sector is one of the most important manufacturing industries. Cement companies make a significant contribution to India's economy. These businesses have created employment opportunities. Liquidity position of the company was satisfactory during the study period. The result of profitability shows the satisfactory results of the concern. The correlation between liquidity and profitability was highest in the company which shows a high degree of positive correlation but liquidity has no impact on profitability.

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Amino Acid And Fatty Acid Analysis Of Avocado (*Persea Americana*) Powder

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Abstract:
Avocado (*Persea americana*) is a well-known food ingredient with a variety of health benefits. Avocado powder is derived from dried and ground avocados. This article focuses on the amino acid and fatty acid composition of avocado powder, highlighting its potential health benefits and applications in food science. The lipid extract of the sample was analyzed using gas chromatography-mass spectrometry (GC-MS) and characterized by the presence of saturated, monounsaturated, and polyunsaturated fatty acids, with the following percentages: lysine, leucine, valine, linoleic acid, glutamic acid, and aspartic acid. The presence of 1.2 and 1.5 grams of valine per 100 grams of the avocado powder contributes to muscle health and metabolic regulation. The high concentration of olic acid in avocado powder adds to its overall nutritional profile, supporting various bodily functions ranging from muscle repair and immune response to energy metabolism and cognitive health. This makes avocado powder an attractive ingredient for dietary supplements, protein-rich foods, and functional food products aimed at promoting overall health and well-being.

Keywords: *Avocado, amino acids, fatty acids, human health, functional foods*

Introduction:

Avocado (*Persea americana*) has a long history of cultivation, dating back to ancient Mesoamerican civilizations such as the Aztecs and Mayans (Galindo-Tovar, 2007), who valued it for its nutritional benefits and believed it possessed aphrodisiac properties. The fruit was introduced to Europe and other parts of the world by Spanish explorers in the 16th century and has since spread to many tropical and subtropical regions (Galán Saúco and Cubero, 2010). Avocado, a nutrient-dense fruit, is widely recognized for its rich content of healthy fats and amino acids. The growing popularity of avocado powder, derived from dried and ground avocados, has spurred interest in its nutritional profile. This article delves into the amino acid and fatty acid composition of avocado powder, highlighting its potential health benefits and applications in food science.

Methodology:

Sample Preparation

Fresh avocados were sourced from local markets, peeled, and the seeds removed. The pulp was sliced, dried at 60°C until completely dehydrated, and then ground into a fine powder.

Amino Acid Analysis

Amino acid composition was determined using high-performance liquid chromatography (HPLC) following acid hydrolysis of the sample. The amino acids were quantified and expressed in grams per 100 grams (g/100g) of the sample (Qabaha, 2010).

Fatty Acid Analysis

Fatty acid methyl esters (FAMEs) were prepared from the lipid extract of the sample and analyzed using gas chromatography-mass spectrometry (GC-MS). The fatty acid content was expressed as a percentage of total fatty acids (Prato and Biandolino, 2012)

Chemical Analysis Of Avocado (*Persea Americana*) Powder

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Abstract
Avocado (*Persea americana*) is a nutrient-dense fruit that offers a wide array of health benefits. Its rich content of vitamins, minerals, healthy fats, and antioxidants makes it a valuable addition to any diet. The present study investigates the chemical composition of avocado powder, focusing on its proximate composition. Avocado is widely recognized for its health benefits, attributed to its rich nutrient profile. This study aims to provide a detailed chemical analysis of avocado powder to explore its potential as a nutritional supplement.

Keywords: Avocado, carbohydrate, protein, health benefits, human health, nutritional supplement.

Introduction

Avocado (*Persea americana*) is a nutrient-dense fruit known for its high content of healthy fats, vitamins, and minerals (Chaudhary et al., 2015). With the increasing interest in functional foods and dietary supplements, avocado powder has gained popularity for its potential health benefits (Siol and Sadowska, 2023). This study aims to analyze the chemical composition of avocado powder, including its proximate composition, amino acid profile, and fatty acid content, to evaluate its nutritional value and potential health benefits.

Health benefits of Avocado:

Heart Health

Avocados are heart-healthy due to their high content of monounsaturated fats, particularly oleic acid, which has been shown to reduce bad cholesterol (LDL) levels while maintaining or increasing good cholesterol (HDL) levels. Additionally, avocados contain potassium, which helps regulate blood pressure, and dietary fibre, which is associated with lower cholesterol levels and a reduced risk of heart disease (Wang et al., 2015).

- **Reduces LDL cholesterol**: Oleic acid helps lower bad cholesterol levels.
- **Increases HDL cholesterol**: Monounsaturated fats promote good cholesterol.
- **Regulates blood pressure**: Potassium content helps manage blood pressure.
- **Supports overall heart health**: Fibre and antioxidants like vitamin E contribute to cardiovascular wellness.

Weight Management

Despite being high in calories, avocados can aid in weight management. The fibre and healthy fats in avocados promote a feeling of fullness, which can help reduce overall calorie intake. The fruit's low carbohydrate content also makes it suitable for low-carb and ketogenic diets (Heskey et al., 2019).

- **Promotes satiety**: Fibre and healthy fats keep you full longer.
- **Supports metabolism**: Nutrient-rich profile aids in balanced nutrition.
- **Suitable for low-carb diets**: Low in carbohydrates, making it ideal for ketogenic and other low-carb diets.

Digestive Health

Avocados are high in fibre, which is essential for maintaining a healthy digestive system. Fibre helps regulate bowel movements, prevent constipation, and promote a healthy gut microbiome (Dreher, 2018).

- **Regulates bowel movements**: High fibre content ensures regularity.
- **Prevents constipation**: Fibre helps soften stool and ease passage.
- **Supports gut health**: Promotes a healthy gut microbiome.

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Physicochemical Analysis of Dietary Fibre Enriched Prebiotic Biscuit

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ABSTRACT: This research study's primary goal was to assess the physicochemical analysis of freshly made biscuits. In this study, control biscuits were made without prebiotics, while experimental biscuits were made with varying prebiotic dosages. A prebiotic was used, oat powder. Customers' interest was piqued by the nutritional content of bakery goods and their potential for use in feeding programmes and crises. Physical and chemical tests revealed that the experimental treatment combination had a higher concentration of dietary fibre.

Keywords: Bakery products, carbohydrate, dietary fibre, fat, physicochemical analysis, prebiotics, protein, oats.

INTRODUCTION

It is customary to prepare biscuits primarily with wheat flour, oil, and sugar. Biscuits are ready-to-eat foods. Technology for biscuits has recently advanced quickly in order to enhance their nutritious qualities (Goubgou *et al.*, 2021). In this research, dietary fibre rich biscuit has been developed. The component of a plant that resists intestinal digestion in the human large intestine is known as total dietary fibre. Total dietary fibre has been shown to have positive impacts on human health and bodily function, therefore in modern societies, consuming a lot of dietary fibre is linked to a lower occurrence of common disorders and diseases (Parveen *et al.*, 2017).

This research study was carried out to develop dietary fibre enriched prebiotic biscuit. As a source of dietary fibre and prebiotics, oats are used in this experimental biscuit.

Aims And Objectives. The research study was carried out to evaluate the physicochemical analysis of newly prepared biscuit.

MATERIALS AND METHODS

Procurement of raw material. For preparation of biscuit, the raw ingredients like Oat powder, Wheat Flour, sugar, oil, Baking Powder were purchased from local market of Mahishadal.

Treatment combinations (Mondal *et al.*, 2022).

T_0= Oats powder (0%): Wheat Flour (80 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) + Water (10) Baking at 175°C for 15 Mins.

T_1= Oats powder (10 g): Wheat Flour (70 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) + Water (10) Baking at 175°C for 15 Mins.

T_2= Oats powder (15g): Wheat Flour (65 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175°C for 15 Mins.

T_3= Oats powder (20 g): Wheat Flour (60 g) + Sugar (5 g) + Salt (0.90 gm) + Butter (5 g) +Water (10) Baking at 175°C for 15 Mins.

No. of Treatment: 4 +1 =5
No of replication: 03
Total no of trials: 15

Physicochemical analysis of final products

- **Determination of carbohydrate:** The carbohydrate percent in the sample was measured by method as per Ranganna (1977).
- **Determination of protein:** The protein content of prebiotic chocolate samples was determined by method as per Ranganna (1977).
- **Determination of fat:** Fat content of prebiotic chocolate samples was determined by modified Gerber method (Kleyn *et al.*, 2001).
- **Determination of ash:** Ash content of prebiotic chocolate samples was determined according to AOAC, 2000 (AOAC, 2000).
- **Determination of moisture:** Moisture content of prebiotic chocolate samples was determined according to AOAC, 2000 (AOAC, 2000).
- **Determination of dietary fibre:** The dietary fibre percent in the sample was measured by AOAC, 2000 standard method (AOAC, 2000).

Flow chart for the preparation of biscuit (control biscuit) (Uchenna & Omolayo 2017)