

MAHISHADAL RAJ COLLEGE

SESSION: 2020-2021

Total number of PUBLICATIONS in Journals: 26

(SCI/SCIE/SCOPUS-indexed/UGC care-listed: 18)

Faculty of Science

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

1. Indadul Khan, **Manas Kumar Maiti**, and Krishnendu Basuli. "A random-permutation based GA for generalized traveling salesman problem in imprecise environments." *Evolutionary Intelligence* 16, no. 1 (2021): 229-245, <https://doi.org/10.1007/s12065-021-00651-5>, Electronic ISSN: 1864-5917, Print ISSN: 1864-5909.
2. Indadul Khan, **Manas Kumar Maiti**, and Krishnendu Basuli. "Multi-objective traveling salesman problem: an ABC approach." *Applied Intelligence* 50 (2020): 3942-3960, <https://doi.org/10.1007/s10489-020-01713-4>, Electronic ISSN: 1573-7497, Print ISSN: 0924-669X.
3. Prasanta Kumar Ghosh, Amalesh Kumar Manna, **Jayanta Kumar Dey**, and Samarjit Kar. "An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies." *Journal of Management Analytics* 9, no. 3 (2021): 403-434, <https://doi.org/10.1080/23270012.2021.1882348>, Print ISSN: 2327-0012 Online ISSN: 2327-0039.
4. Barun Khara, Shyamal Kumar Mondal, and **Jayanta Kumar Dey**. "An imperfect production inventory model with advance payment and credit period in a two-echelon supply chain management." *RAIRO-Operations Research* 55, no. 1 (2021): 189-211, <https://doi.org/10.1051/ro/2020137>, eISSN: 2804-7303.
5. Prasanta Kumar Ghosh, Amalesh Kumar Manna, **Jayanta Kumar Dey**, and Samarjit Kar. "Supply chain coordination model for green product with different payment strategies: A game theoretic approach." *Journal of Cleaner Production* 290 (2021): 125734, <https://doi.org/10.1016/j.jclepro.2020.125734>, Print ISSN: 0959-6526, Online ISSN: 1879-1786.
6. Amalesh Kumar Manna, **Jayanta Kumar Dey**, and Shyamal Kumar Mondal. "Effect of inspection errors on imperfect production inventory model with warranty and price discount dependent demand rate." *RAIRO-Operations Research* 54, no. 4 (2020): 1189-1213, <https://doi.org/10.1051/ro/2019054>, eISSN: 2804-7303.
7. **Samiran Kumar** and Dilip Kumar Giri. "Nonclassical states and total noise in five-wave interaction process." *Journal of Optics* 49, no. 4 (2020): 549-555, <https://doi.org/10.1007/s12596-020-00657-9>, Electronic ISSN: 0974-6900, Print ISSN: 0972-8821.
8. **Subhabrata Mabhai**, Malay Dolai, Surya Kanta Dey, Anamika Dhara, Sujata Maiti Choudhury, Bhriguram Das, Satyajit Dey, Atanu Jana, and Deb Ranjan Banerjee. "A cell-compatible red light-emitting multianalyte chemosensor via three birds, one stone strategy." *Journal of Photochemistry and Photobiology A: Chemistry* 404 (2021): 112889, <https://doi.org/10.1016/j.jphotochem.2020.112889>, Online ISSN: 1873-2666, Print ISSN: 1010-6030.
9. Bhriguram Das, Malay Dolai, Anamika Dhara, Avijit Ghosh, **Subhabrata Mabhai**, Ajay Misra, Satyajit Dey, and Atanu Jana. "Solvent-regulated fluorimetric differentiation of Al³⁺ and Zn²⁺ using an AIE-active single sensor." *The Journal of Physical Chemistry A* 125, no. 7 (2021): 1490-1504, <https://doi.org/10.1021/acs.jpca.0c10518>, Print Edition ISSN: 1089-5639, Web Edition ISSN: 1520-5215.
10. Bhriguram Das, Malay Dolai, Anamika Dhara, **Subhabrata Mabhai**, Atanu Jana, Satyajit Dey, and Ajay Misra. "Acetate ion augmented fluorescence sensing of Zn²⁺ by Salen-based probe, AIE

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 14. Sukhendu Maity, Madhuchhanda Adhikari, Sambuddha Banerjee, **Rajkumar Guchhait**, Ankit Chatterjee, and Kousik Pramanick. "Critical analysis of biophysicochemical parameters for qualitative improvement of phyto-genic nanoparticles." *Biotechnology Progress* 37, no. 2 (2021): e3114.
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 17. Madhuparna Paul, Jyotiskanar Ray, C. Manikyamba, Sohini Ganguly, M. Rajanikanta Singh, Saraswati Pachal, and **Debaleena Sarkar**. "Mafic volcanic rocks of western Iron Ore Group, Singhbhum Craton, eastern India: Geochemical evidence for ocean–continent convergence." *Geological Journal* 56, no. 1 (2021): 102-129, Online ISSN:1099-1034, Print ISSN:0072-1050.

Journals (Others)

18. Bhriguram Das, Anamika Dharab, Subhabrata Mabhaic, and Satyajit Dey. "Solvato (fluoro) chromism, investigation of quenching mechanism and thermodynamic binding parameter of two azine based chemosensor for Cu²⁺ ion, application in onsite detection." *J. Indian Chem. Soc* 97, no. 9b (2020): 1498-1506, [http://indianchemicalsociety.com/portal/uploads/journal/Sept%20\(10\).pdf](http://indianchemicalsociety.com/portal/uploads/journal/Sept%20(10).pdf), Online ISSN: 2667-2847.

Faculty of Humanities & Social Science

Journals (UGC/Peer-reviewed)

19. **Asis De** and Anupam Roy. 'Homes across the Water: Dislocation and Transcultural Kinship in Amitav Ghosh's *The Glass Palace*' in *Drishiti: the Sight* (UGC Care-listed Journal), Vol.-IX, Issue-ii (April 2021), pp. 164-168.
20. **Bivash Mistri**. Carakasamhitāy Sāmkhyer Pravāb : Ekaṭi Samūkṣā, Journal: ANVĪKṢĀ, ISSN: 0587-1646, VOL. XLII, PART -II, Jadavpur University, pp. 43-49.
21. **Prakash Bisui**. Indigenous People: Evolution of Concept and Rights in Post Colonial International Phenomena, Journal Of History and Civilization, Dept. of Islamic History and Culture, Faculty of Arts, Jagannath University, Dhaka, Vol 1, Number 1, July to December 2020, ISSN: 2789 4258.

22. **Sujit Mondal.** স্ত্রী শিক্ষা: নারী মুক্তি ও ঐশ্বর চন্দ্র বন্দোপাধ্যায়-একটি পর্যালোচনা, প্রতিধ্বনি the ECHO, A peer Review International Journal of Humanities & Social Science, Edited by Dr. Biswajit Bhattacharjee, Vol.X, Issue-1, Oct.2021,ISSN 23219319(p),ISSN 22785264(E) (Index Copernicus International)
23. **Ashlesha Rai.** International Migration of Women from Darjeeling District: The Question of Empowerment, J Hum Ecol, Vol. 71, pp. 254-265, 2020, DOI: 10.31901/24566608.2020/71.1-3.3270, Print ISSN 0970-9274, Online ISSN 2456-6608.
24. **Barun Kumar Ghosh,** Somota O Boishamya : Noitik Samikhya, November 2020, PP. 242-248, Ebong Mohua, Volume – 126(A), Published by K.K.Prakashan.
25. **Deepmala Mahato.** “Representation of Tribal Women, Marginality and Transformation in Hansda Sowvendra Shekhar’s *The Mysterious Ailment of Rupi Baskey.*” NEW ACADEMIA: An International Journal of English Language, Literature and Literary Theory (Peer reviewed and Refereed Journal) Online ISSN 2347-2073 Vol. IX, Issue IV, Oct. 2020. Web: <https://interactionsforum.com/volume-ix-2020/vol-ix-issue-iv-2020>.
26. **Abantika Chakraborty.** “The Sacred and the Secular: Post-Colonial Mythopoeia and Cultural Identity in R. K. Narayan’s *The Man-eater of Malgudi*” in Literary Herald, Vol. 6, Issue 3 (October 2020), pp 68-75, (ISSN: 2454-3365). URL: <http://tlhjjournal.com/uploads/products/10.abantika-chakraborty-article.pdf>.



A random-permutation based GA for generalized traveling salesman problem in imprecise environments

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Received: 15 September 2020 / Revised: 1 June 2021 / Accepted: 1 August 2021
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Abstract

A random-permutation technique and the features of the genetic algorithm (GA) are combined together to develop a novel heuristic for solving generalized travelling salesman problem. Here, the random-permutation technique is used to find the sequence of clusters of a probable solution in which a complete tour to be commenced. The features of GA are used to select the cities from different clusters of the sequence. The algorithm has the ability to solve the problems in both the crisp as well as in the imprecise environments. A fuzzy membership-based selection process is proposed to select a solution for the mating pool. A general comparison rule of the solutions is proposed to rank the potential solutions of the population in imprecise environments. In the crisp environment, the efficiency of the proposed approach is tested against a set of different benchmark test problems from GTSP LIB having sizes up to 226 cities with 26 clusters. It is observed from the experimental results that the algorithm produces 100% accurate results for all the benchmark test problems under consideration. Imprecise test problems are generated from different benchmark crisp test problems of TSPLIB and are used to test the algorithm in the imprecise environments. It is also observed from the experimental results that the proposed approach finds multiple optimal paths (i.e., more than one path), if exists, for the problems in the crisp as well as in the imprecise environments.

Keywords Traveling salesmen problem · Genetic algorithm · Randomness · Triangular fuzzy number · Rough set

1 Introduction

A generalized form of the classical Traveling Salesman Problem (TSP), the generalized TSP (GTSP) was introduced by Henry-Labordere [11], Saksena [31], and Srivastava [33] in the context of computer record balancing and of visit sequencing through welfare agencies in 1960s. The problem consists of a set of n cities and a cost matrix $(c_{ij})_{n \times n}$, where,

c_{ij} is the cost of travelling from city i to city j . The n cities are grouped into several clusters- cl_1, cl_2, \dots, cl_k , where k is the number of clusters. Every city must belongs to at least one cluster. So, a city may belongs to more than one clusters. A salesman starts from a city of a cluster, visits one and only one city of every cluster and returns to the starting city with the minimum expenditure. So, the goal of the problem is to find the path/route of the salesman with the minimum cost covering all the clusters exactly once. There are several real-life applications of GTSP, such as, mail delivery [17], welfare agency routing [31], material flow system design [17], vehicle routing [17], and computer file sequencing [11], etc. The GTSP belongs to the class of NP-hard problems.

In most of the above-mentioned studies it is implicitly assumed that the travel cost, c_{ij} between any two cities i and j , is fixed and crisp in nature. But c_{ij} depends on the several factors, like, the quality of the vehicle used, condition of the roadways, duration of the travel, weather condition, etc. The travelling cost between any two cities mainly depends on the quality of transport used for the purpose. Sometimes it depends on the availability of the vehicle, condition of the road ways, etc., though its value normally lies in an interval.

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Multi-objective traveling salesman problem: an ABC approach

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Abstract

Using the concept of swap operation and swap sequence on the sequence of paths of a Traveling Salesman Problem (TSP) Artificial Bee Colony (ABC) algorithm is modified to solve multi-objective TSP. The fitness of a solution is determined using a rule following the dominance property of a multi-objective optimization problem. This fitness is used for the selection process of the onlooker bee phase of the algorithm. A set of rules is used to improve the solutions in each phase of the algorithm. Rules are selected according to their performance using the roulette wheel selection process. At the end of each iteration, the parent solution set and the solution sets after each phase of the ABC algorithm are combined to select a new solution set for the next iteration. The combined solution set is divided into different non-dominated fronts and then a new solution set, having cardinality of parent solution set, is selected from the upper-level non-dominated fronts. When some solutions are required to select from a particular front then crowding distances between the solutions of the front are measured and the isolated solutions are selected for the preservation of diversity. Different standard performance metrics are used to test the performance of the proposed approach. Different sizes standard benchmark test problems from TSPLIB are used for the purpose. Test results show that the proposed approach is efficient enough to solve multi-objective TSP.

Keywords Multi-objective traveling salesmen problem · Artificial bee colony algorithm · Swap operation · Pareto optimal solution · Performance metric

1 Introduction

Most of the real-life problems involve multiple conflicting goals, which leads to multi-objective optimizations, e.g., optimization of the profit of a company as well as the customer satisfaction; optimization of transportation time as well as transportation cost of a transport company; etc. In a multi-objective optimization problem (MOOP), as the

objective functions are generally conflicting in nature, the concept of optimality does not hold; rather the concept of pareto optimality takes place. Two solutions are called pareto optimal if each solution is better than the other with respect to at least one objective. One solution is said to be better than another one if it is better or equal with respect to all the objectives and strictly better with respect to at least one objective. Different multi-objective evolutionary algorithms (MOEAs) are proposed by several researchers [7, 9, 12, 40, 48] in the past decades. For a complete survey on MOEAs please see [44].

The Traveling Salesmen Problem (TSP) is one of the standard combinatorial optimization problems and is a familiar NP-hard problem [28, 29]. The problem consists of a complete graph of n vertices (node/ cities) where each edge is associated with a parameter having known value (the distance /the travel time/ the travel risk etc., between the associated nodes). The aim of the problem is to find a Hamiltonian circuit having minimum value (the distance /the travel time/ the travel risk etc.). When there is only one parameter associated with each edge, then the problem is called single-objective TSP (SOTSP) [24–26]. On the other hand, when more than one parameters are associated with each edge, the problem is called Multi-Objective

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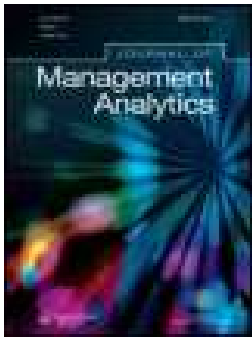
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An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies

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To cite this article: Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey & Samarjit Kar (2021): An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies, Journal of Management Analytics, DOI: [10.1080/23270012.2021.1882348](https://doi.org/10.1080/23270012.2021.1882348)

To link to this article: <https://doi.org/10.1080/23270012.2021.1882348>



Published online: 23 Mar 2021.



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An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies

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(Received 14 January 2020; revised 7 September 2020; accepted 25 January 2021)

This study investigated an economic order quantity (EOQ) model with complete backorder for fixed lifetime perishable items under multiple advance and delayed payments policies. Here, a new type of business policy is considered where supplier offers the retailer to pay a fraction of the purchasing cost before the order delivery by multiple equal installments starting from the ordering time and the rest amount after the delivery by multiple equal installments. Here, some theoretical results are illustrated to determine the conditions of existence and uniqueness of the optimal solutions. A closed form solution is determined to solve the proposed model under approximation. Some numerical examples are provided to examine the validity of the proposed model. Finally, sensitivity analyses are presented to obtain the effect of optimal policy and provide some managerial insights of the model.

Keywords: inventory; perishable item; expiry date; advance payment; delayed payment

1. Introduction

Payment policies of purchasing price for the items ordered and customer's reaction effect on out of stock of an item is the significant factor in the economic order quantity model. In 1913, F.W. Harris developed an EOQ (Economic Order Quantity) model, by considering with the assumption that the retailer or customer pays the whole amount of purchasing the item just when received the items. After that, many researcher and practitioners made their efforts to adjust the assumption to more realistic in inventory management. Based on the nature of payment of the purchase cost, there are three basic possibilities which are the following types: (i) payment before the receiving of delivery of the order quantity which is known as advance payment or prepayment. Several researchers, viz. Gupta, Bhunia, and Goyal (2009), Taleizadeh, Pentico, Jabalameli, and Aryanezhad (2013), Teng, Cárdenas-Barrón, Chang, Wu, and Hu (2016), Wu, Teng, and Chan (2017), Manna, Das, and Tiwari (2020) and others were reported interesting works in this area. (ii) payment just on the time of delivery (Ghosh, Manna, & Dey, 2017; Mallick, Manna, & Mondal, 2018; Shah & Cárdenas-Barrón, 2015), (iii) payment after the

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AN IMPERFECT PRODUCTION INVENTORY MODEL WITH ADVANCE PAYMENT AND CREDIT PERIOD IN A TWO-ECHELON SUPPLY CHAIN MANAGEMENT

BARUN KHARA¹, SHYAMAL KUMAR MONDAL¹ AND JAYANTA KUMAR DEY^{2,*}

Abstract. This paper presents an integrated imperfect production inventory model under two layer supply chain management. To ensure the orders, manufacturer convinces the retailer to pay a percentage of the purchasing cost prior to replenish the products and offers the facilities such as (i) delay in payment on the remaining part of the purchasing cost and (ii) free transportation on the basis of advance payment amount. Time dependent development cost is incurred to maintain the reliability of the production system and as a result it reduces the imperfectness of the product during production. Under such circumstances, an integrated profit function has been developed to find the optimum number of production cycle, optimum number of replenishment cycle and hence reliability parameter of the manufacturing system, replenishment quantity for the retailer which maximize the integrated profit. Branch and Bound technique is used to obtain the integer solutions. Furthermore, we derived some useful lemmas and algorithms to obtain the optimum solution. Finally, the model has been illustrated with some numerical examples exploring the sensitivity analysis with respect to some parameters and obtains some managerial insights.

Mathematics Subject Classification. 90B05, 90B30, 90B25, 90B50.

Received November 3, 2018. Accepted November 26, 2020.

1. INTRODUCTION

In present's competitive situation, supply chain management (SCM) plays a vital role in economy because it makes an integrated networking system among supplier, manufacturer, retailer and customer and learns how to survive in the present's competitive market through the co-operation among supplier, manufacturer, retailer and customer. It also co-ordinates a system of inter-related business process in order to procurement of raw materials, transportation of raw-materials, production of items, transportation of the finished product to the retailer for sale to satisfy their customers' demand. Along this direction, some previous research works to build an integrated SCM dates back to Bookbinder, Cachon and Zipkin [5], Agarwal *et al.* [1] and others. They have presented a production, distribution and inventory (PDI) planning system that integrated three supply

Keywords. Imperfect production, advance payment, replenishment cycle time, system reliability, credit period, branch and bound technique.

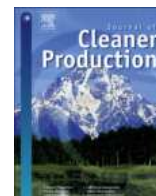
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Supply chain coordination model for green product with different payment strategies: A game theoretic approach

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ARTICLE INFO

Article history:

Received 1 June 2020

Received in revised form

19 December 2020

Accepted 24 December 2020

Available online 4 January 2021

Handling editor: Dr Sandra Caeiro

Keywords:

Supply chain

Greenness of product

Sales effort

Delay-in-payment

Advance payment

ABSTRACT

In our world, pollution arising from various sources like factories and vehicles, threaten the very environment we live in. We should become more and more aware of the products that pose a threat to our environment because otherwise through our lack of awareness, we will ourselves contribute towards the distractions of our beloved and beautiful world. In this paper, we have brought into focus a work regarding making the supply chain of a product as green as we possibly can. We have developed a strategy based on the manufacturer's advanced payment policy as well as trade credit facility to the retailer. We have assumed that for any particular retailer, the customers' demand for his goods is a direct consequence of how green the goods are, along with the selling price and the effort put into the environment friendliness of a product. To this effect, the manufacturer also allows the retailer a credit period for the goods as also a discount that can imposed on the selling price. We have provided a model that optimizes the retailer's sales effort, the wholesale price demanded by the manufacturer, the green level of the product as well as the selling price effected by the retailers. This model is exemplified numerically of its practicality. We also perform some sensitivity analyses of the model by varying market demand, price elasticity coefficient, greening awareness level and sales effort and the corresponding performance shown by the model are also recorded.

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1. Introduction

In recent times most of the world is under a threat from environmental pollution. Numerous researchers have dedicated their research time on green supply chain system (GSCS) to reduce the pollution in the environment. The concept of green supply chain system (GSCS) has been derived from traditional supply chain system (SCS) by embroilment of green activities in the supply chain. The aim of GSCS is sustainability on environmental front from suppliers to customer and manufacturer. Yadav and Pathak (2016) reported that most of the young customers will buy green (eco-friendly) products, which has been manufactured in an environmentally friendly fashion, and to create minimum havoc on the environment. To accommodate this situation manufacturers give

attention to producing green products. Recently, Sana (2020) pointed out that the authorities in developed countries collect lower tax from green product manufacturers than non-green product manufacturers. He also considered green technology investment to reduce carbon emission of the firm. As such, many researchers, viz. Chan and Lau (2002), Zhu et al. (2005), Zhang and Liu (2013), Wood et al. (2016), Manna et al. (2017), Jamali and Rasti-Barzoki (2018), Panja and Mondal (2019), Zhang et al. (2020) and others have been working on green supply chain system (GSCS) that reduce environment pollution and earn maximum profit for the supply chain members.

In a competitive market, delay-in-payment scheme is a very important strategy to run the business smoothly. Generally, the supplier offers the retailer the opportunity for paying partial an

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EFFECT OF INSPECTION ERRORS ON IMPERFECT PRODUCTION INVENTORY MODEL WITH WARRANTY AND PRICE DISCOUNT DEPENDENT DEMAND RATE

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Abstract. This paper deals with selling price-discount and warranty period dependent demand in an imperfect production inventory model under the consideration of inspection errors and time dependent development cost. Normally, due to long-run, a production process deteriorates with time and here we assume that the process shifts from “in-control” to “out-of-control” state at any random time. A time dependent development cost has been constructed to increase the reliability of the production system *i.e.*, to decrease the deterioration of the system during the production process. As a result, a few items are rejected. Here, two types of inspection errors such as Type-I error and Type-II error, have been considered during the period of product inspection process. In Type-I error, an inspector may choose falsely a defective item as non-defective and in Type-II error an inspector may choose falsely a non-defective item as defective. Due to these phenomena, the inspection process would consist of the following costs: cost of inspection, cost of inspection errors. The purpose of this paper is to investigate the effects of time dependent development cost on the defective items, selling price-discount and warranty policy on the market demand and finally optimize the expected average profit under consideration of such inspection costs in infinite time horizon. Some numerical examples along with graphical illustrations and sensitivity analysis are provided to test the feasibility of the model.

Mathematics Subject Classification. 90B05, 90B15, 90B25, 90B30, 90B60.

Received February 22, 2019. Accepted May 6, 2019.

1. INTRODUCTION

In a real manufacturing system, a long-run production process shifts from “in-control” to “out-of-control” state due to different machinery problems, labor problems, etc. On the other hand, the production of defective units is a natural phenomenon to be occurred due to different difficulties arisen in a long-run production process. Normally, it is seen that a production process is initiated from “in-control” state, because every factors associated with the system are in well condition. Then due to continuous running of system, these factors gradually lose their perfectness. So, after some time, the production process may shift from “in-control” state to “out-of-control” state. For this reason, some imperfect items along with perfect items are produced in every

Keywords. Inventory, Stochastic, Inspection, Production models, warranty policy.

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Nonclassical states and total noise in five-wave interaction process

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Received: 9 May 2020 / Accepted: 16 September 2020
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Abstract We investigated theoretically the squeezing, sub-Poissonian, and total noise of a quantum state in spontaneous and stimulated five-wave interaction process under short-time approximation. It has been found that the squeezing occurs in field amplitude, amplitude-squared in the fundamental mode in the process. It is shown that higher-order squeezing allows a much larger fractional noise reduction than lower-order squeezing. We observed that the squeezed states are associated with a large number of photons. It is shown that squeezing is greater in the stimulated interaction than the corresponding squeezing in the spontaneous interaction. The photon statistics of the fundamental mode in the process is investigated and found to be sub-Poissonian in nature. The effect of the sub-Poissonian nature of an optical field in terms of total noise is also incorporated. We showed that the depth of non-classicality directly depends on the amount of total noise present in the system. This suggests that the more squeezed the state is, the greater is its total noise in the system. It is found that a higher multi-photon absorption process is suitable for the generation of optimum squeezed light.

Keywords Multi-photon process · Squeezing · Sub-poissonian · Photon number · Total noise

Introduction

The idea of squeezing of the electromagnetic field was introduced by Hollenhorst [1] and Caves [2]. After that, D. F. Walls [3] has given a detailed review of squeezed states of light including the generation and detection of squeezed states as well as proposed potential applications. The concept of squeezing [4–10] in the quantized electromagnetic field has gained a great deal of importance in view of the possibility of reducing the noise of an optical signal below the shot-noise limit. R. E. Slusher et al. [11] have generated squeezed states of the electromagnetic field by non-degenerate four-wave mixing process and have measured with a balanced homodyne detector. Ling-Au Wu et al. [12] have generated squeezed states of light by parametric down-conversion in an optical cavity. Garraway et al. [13] have presented a simple scheme that allows the generation and detection of nonclassical states of the electromagnetic field with controllable photon number and phase distributions. Squeezing of radiation is a purely quantum mechanical phenomenon, and its low-noise property [14–16] has many attractive applications such as high-quality telecommunication [17] quantum cryptography [18, 19], and so on. The experimental detections and applications approve the importance of the theoretical investigations into various nonlinear optical processes such as Raman [20–22], Hyper-Raman [23], Harmonic Generation [24, 25], Multiwave-mixing processes [26–29], and so on. A squeezed state may exhibit sub-Poissonian photon statistics. The conversion of higher-order squeezed light into nonclassical light with higher-order sub-Poissonian

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It is concluded that greater total noise and hence greater squeezing exist in second order than in first order, having the same number of photons. It is inferred that the more squeezed the state is, the greater is its total noise in the system. Therefore, as the state becomes more sub-Poissonian, and its total noise increases.

These results suggest that the total noise of a quantum state can be measured the depth of nonclassicality i.e. more nonclassical state (squeezing and sub-Poissonian) of the field in any system.

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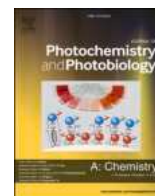
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A cell-compatible red light-emitting multianalyte chemosensor via three birds, one stone strategy

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ARTICLE INFO

Keywords:

Rhodamine
Azobenzene
Chemosensor
PET – CHEF
Paramagnetic quenching

ABSTRACT

The design and synthesis of red light-emitting multianalyte chemosensors have always been a challenging task because of its specific requirement of coordination pocket and selective fluorescence mechanism. Herein, we develop a chemosensor via “three birds, one stone” strategy in which we can detect three metal ions with one ligand. A highly sensitive new azo functionalized rhodamine based luminescent sensor is synthesized for selective fluorogenic recognition of Al³⁺, Cr³⁺, and chromogenic recognition of Cu²⁺ in ethanol : H₂O medium in the red light-emitting zone. Among the guest metals, Cu²⁺ efficiently quenches the emission whereas Al³⁺ and Cr³⁺ induce increased luminescent 4.76 fold for Al³⁺ and 2.47 fold for Cr³⁺ through chelation-enhanced fluorescence (CHEF) and photo-induced electron transfer (PET) regulated mechanism with the formation of 1:1 complex. The restricted imine isomerization through complex formation inhibits ongoing PET process with the instantaneous onset of CHEF. The mechanism is in good consonance with NMR (¹H & ¹³C), FT-IR, elemental analysis, DFT, TCSPC, and pH-dependent studies. Micromolar range detection of 1.1 μM, 1.3 μM, and 1.5 μM for Cu²⁺, Al³⁺, and Cr³⁺ respectively, easy penetration into HLCs cells and higher imaging resolution increase its potentiality to assess Al³⁺ and Cr³⁺ in vitro. Moreover, paper strip application increases its viability as an onsite naked-eye portable solid probe.

1. Introduction

Besides natural sources, various industrial activities and anthropogenic activity enrich the amount of Cu²⁺, Al³⁺, and Cr³⁺ in the environment. A living body requires a very low concentration of Cu²⁺. Its toxicity through excessive accumulation brings the loss of activity in various Cu-dependent enzymes viz. tyrosinase co-oxidase, cytochrome, and superoxide dismutase which is responsible for the generation of in vivo reactive oxygen regulation by iron and causes Menkes disease by disturbing the development of the brain [1]. Wilson's disease, a Cu²⁺

related disease, is grown up by the excessive deposition of Cu²⁺ in the liver and brain through irregular transport [2]. Among the different oxidation state trace element chromium is less harmful in its trivalent (Cr³⁺) state [3]. Balance concentration of chromium regulates the metabolism of fat lipids and carbohydrates by activating certain enzymes whereas insufficient dietary intake increases blood sugar by deactivating insulin, increases the risk of cardiovascular disease, and stops the formation of haemoglobin in the red blood cell [4]. Again diversified application of alumina includes not only industries like packaging, pharmaceuticals, food, and medicine but also in our daily life

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<https://doi.org/10.1016/j.jphotochem.2020.112889>

Received 14 June 2020; Received in revised form 28 August 2020; Accepted 2 September 2020

Available online 6 September 2020

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Solvent-Regulated Fluorimetric Differentiation of Al³⁺ and Zn²⁺ Using an AIE-Active Single Sensor

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Cite This: *J. Phys. Chem. A* 2021, 125, 1490–1504



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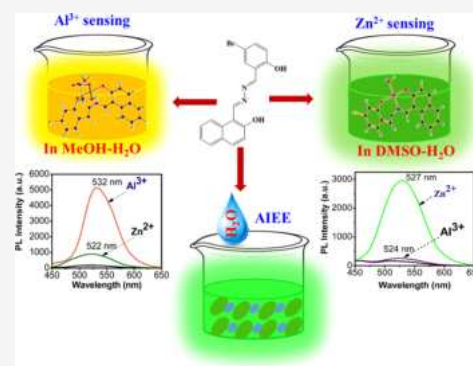


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ABSTRACT: The absence of d-orbital electrons or presence of full-filled d-orbital electrons in metal ions is a well-known Achilles' heel problem for the detection of these metal ions by a simple UV-visible study. For this reason, detection of metal ions such as Al³⁺ with no d-orbital electrons or Zn²⁺ with filled d-orbital electrons is a challenging task. Herein, we report a 2-naphthol-based fluorescent probe [1-((E)-((E)-(5-bromo-2-hydroxybenzylidene)hydrazono)methyl)naphthalen-2-yl] (H₂L) that has been used to sense and discriminate Al³⁺ and Zn²⁺ via solvent regulation. The probe exhibits excellent selectivity and swift sensitivity toward Al³⁺ in MeOH–water (9:1, v/v) and toward Zn²⁺ in dimethyl sulfoxide (DMSO)–water (9:1, v/v) among various metal ions. The respective detection limit is found to be 9.78 and 3.65 μM. The sensing mechanism is attributed to multiple processes, viz., the inhibition of photo-induced electron transfer (PET) along with the introduction of chelation-enhanced emission (CHEF) and excited-state intramolecular proton transfer (ESIPT) inhibition, which are experimentally well verified by UV–vis absorption spectroscopy, emission spectroscopy, and NMR spectroscopy. The probe shows aggregation-induced emissive (AIE) response in ≥70% aqueous media as well as in the solid state. The experimental results are well corroborated by time-resolved photoluminescence (TRPL) and density functional theory (DFT) calculations. An advanced-level OR-AND-NOT logic gate has been constructed from a different chemical combinational input and emission output. The reversible recognition of both Al³⁺ in MeOH–water (9:1, v/v) and Zn²⁺ in DMSO–water (9:1, v/v) is also ascertained in the presence of Na₂EDTA, enabling the construction of a molecular memory device. The probe H₂L also detects intracellular Al³⁺/Zn²⁺ ions in Hela cells. Altogether, our fundamental findings will pave the way for designing and synthesis of unique chemosensors that could be used for cell imaging studies as well as constructing molecular logic gates.



INTRODUCTION

Multitasking application of materials is an important and emerging field of science in the modern world. Such types of materials make a product cheap and user-friendly, and the time management issue provides an endeavor toward sustainable development.^{1,2} A Schiff base is an example of such type of materials due to its versatile application in different applied fields of science including medicine and pharmacy (because of its properties, viz., antitumor, antiviral, antifungal, antibacterial, biocidal, and antimalarial properties), chemical synthesis and analysis, modern technological imaging systems, molecular memory storage, photochromic materials, and in colorimetric and fluorimetric ion/molecule sensors.^{3–6} The sensing of ions/small molecules by a Schiff base has useful applications in several interdisciplinary sciences. Several analytical scientific strategies including chromatography, spectrometry, titrimetry, spectrophotometry, and electrochemical techniques have been developed for the detection of metal ions.^{7,8} As the method mentioned above is complicated and time- and cost-consuming, simple but reliable methods for qualitative and quantitative as well as rapid and sensitive detection of metal

ions are in extreme need. Among various strategies utilized, fluorescence signaling is one of the first choices as it is simpler and rapid, convenient, and profoundly sensitive for the recognition of biologically and environmentally relevant metal ions.^{9,10}

The concentration of aluminum, which is the third most abundant element present in the earth's furthest layer, in soil or water increases during rain, which is perilous for growing plants.^{11,12} The far-reaching uses of aluminum in our everyday life, for example, aluminum foil, vessels, and treat sheets; medications; the paper industry; food additives; and aluminum-based pharmaceutical antiperspirants, antiulcer agents, and antacids, result in its exposure to the environment.¹³ Adverse effects of Al³⁺ influence the central nervous

Received: November 23, 2020

Revised: January 25, 2021

Published: February 10, 2021



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Received: 10 December 2020

Revised: 1 February 2021

Accepted: 3 February 2021

Acetate ion augmented fluorescence sensing of Zn²⁺ by Salen-based probe, AIE character, and application for picric acid detection

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Funding information

University Grants Commission, Grant/Award Number: Sanction letter No. PSW-155/14-15(ERO) ID No. WV6-027

Abstract

Counter anion-triggered metal ion detection has been rarely reported by fluorimetric method. To address this challenging issue, a fluorescent probe (**H₂L**) has been synthesized from bromo-salicylaldehyde and hydrazine hydrate, and structurally characterized by single crystal X-ray diffraction. The probe shows very weak fluorescence itself. However, its emission intensity increases in the presence of Zn²⁺ over other metal ions. Surprisingly, the emission profile of this probe in presence of Zn²⁺ is augmented only when acetate anion (OAc⁻) is present as counter anion, that allows for precise quantitative analysis by spectroscopic studies. The compositions and complexation among the probe, Zn²⁺ ion, and OAc⁻ are supported by ESI-MS, ¹H-NMR, and Job's plot. Based on these studies, it is confirmed that the binding ratio between probe: metal is 1:2 and the detection limit (LOD) for the Zn²⁺ is 2.18 μM. The probe is capable of recognizing Zn²⁺ ion in the wide range of pH~6.5-9.5, and it could be efficiently recycled by EDTA. Furthermore, the combinatorial molecular logic gate and memory device have been constructed from the fluorescent behavior of **H₂L** with Zn²⁺, OAc⁻, and EDTA input as based on NOT and AND gates. Interestingly, the aggregation-induced emission (AIEE) phenomenon is also perceived with greater than 50% water content in organic water mixtures, which are then useful for the detection of picric acid often used as explosive.

KEYWORDS

AIEE, counter anion, molecular logic gate, PET and CHEF, Picric acid, Schiff base, zinc sensor

1 | INTRODUCTION

Performing multiple tasks useful material is a significant and developing field of science in the cutting edge world. Such kind of materials makes an item modest, easy to use, and the time executives issue pro-

vides an endeavor and influence towards sustainable developments.^{1,2} Schiff base is a reasonable example of such type of materials because of its versatile application in different field of applied science including medicine and pharmacy (viz., antifungal, antibacterial, biocidal, antitumor, antiviral, and antimalarial properties), chemical synthesis

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Das B, Dolai M, Dhara A, et al. Acetate ion augmented fluorescence sensing of Zn²⁺ by Salen-based probe, AIE character, and application for picric acid detection. *Anal Sci Adv*. 2021;2:447-463.
<https://doi.org/10.1002/ansa.202000165>



Polyaniline and sulfonated graphene oxide supported bimetallic manganese cobalt oxides as an effective and non-precious cathode catalyst in air-cathode microbial fuel cells

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ARTICLE INFO

Editor: Dr. Zhang Xiwang

Keywords:

Single-chamber MFC
Cathode catalyst
Sulfonated graphene oxide, Mn-Co/
SGO-PAni nanocomposite
Oxygen reduction reaction

ABSTRACT

This study examines the feasibility of the use of nanocomposite of polyaniline (PAni) grafted sulfonated graphene oxide (SGO) supported manganese cobalt oxide as a novel and effective cathode catalyst for single chamber microbial fuel cell (SC-MFC). The graphene oxide (GO) was sulfonated to SGO for the development of a significant increase in the hydrophilicity of GO to enhance the nano-catalyst dispersion. The structural properties of the prepared nanocomposite were studied by X-ray diffraction, X-ray photoelectron spectroscopy, and Raman spectroscopy. Morphological studies of the nanocomposite revealed a wrinkled paper-like structure of SGO and a spherical type structure of Mn-Co. Both cyclic voltammetry and electrochemical impedance spectroscopy showed a reduction current value of -1.04 mA, and charge-transfer resistance of 52.4 ohm, which exhibited a higher oxygen reduction reaction activity and good conductivity compared to Mn-Co/GO-PAni, Mn-Co/rGO-PAni and Pt/C catalyst. Electrochemical tests also suggest that the Mn-Co/SGO-PAni nanocomposite exhibited excellent durability among the other three cathodes. Furthermore, the MFCs equipped with Mn-Co/SGO-PAni nanocomposite modified electrode achieved power density of 1392.68 mW m⁻² which is 2.89 times higher than state-of-art Pt/C (481.3 mW m⁻²). The Electrochemical studies also displayed a similar result. The significant increase in power generation with Mn-Co/SGO-PAni nanocomposite as a cathode catalyst indicates that it can be used as a promising, inexpensive electrocatalyst for the long-term operation for MFC.

1. Introduction

Microbial fuel cell (MFC) is a novel, environmentally friendly and promising alternative energy source that produces bioelectricity from wastewater or biomass in which bacteria are used as catalysts to oxidize organic matter [1,2]. The bacteria in anode chamber produce protons, electrons, and CO₂ from the biodegradation of organic fuel by catabolic metabolism. The electron is transferred from the anode to the cathode through an external wire and then reduces oxygen in the air to form water and electric current [2,3]. The overall MFC performance is affected by several factors such as cell design, electrode materials, bacterial inoculum, substrate, and ion-selective membrane [4]. Unfortunately, the sluggish kinetics of the oxygen reduction reaction (ORR) has become the bottleneck of power generation in MFC. Hence, a

number of studies have been employed to accelerate the sluggish kinetics of the ORR at the cathode [5]. Generally, high surface area, excellent electrical conductivity, high catalytic activity, good stability, and low cost are very necessary to enhance the ORR kinetics.

The most commonly employed cathode catalyst is platinum (Pt) and its alloys as they have good catalytic activity, stability, and resistance to corrosion [6–8]. Noble metal Pt is rare and expensive and has poor availability along with sensitivity to catalyst poisoning and these are the major hindrances to its commercial acceptance. Therefore, developing an alternative cost-effective non-platinum catalyst for ORR has stimulated wide research interests [9,10]. Several metal-based catalyst, i.e. CoO_x/FePc [11], Spinel-type Cu/Co [12], Co/Fe/N [13], α -Fe₂O₃/polyaniline [14], Ni-Co/SPANi [15], Cu₂O/RGO [16], Zn-Co/ZnO [17], V₂O₅/GO [18], δ -MnO₂ [19] and SGO-TiO₂-PAni

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<https://doi.org/10.1016/j.jece.2021.105992>

Received 18 January 2021; Received in revised form 27 June 2021; Accepted 1 July 2021

Available online 3 July 2021

2213-3437/© 2021 Published by Elsevier Ltd.

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Research article

FogIoT: A weighted majority game theory based energy-efficient delay-sensitive fog network for internet of health things

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ARTICLE INFO

Article history:

Received 10 November 2019

Revised 20 January 2020

Accepted 17 February 2020

Available online 26 February 2020

Keywords:

Fog Computing

Mobile Health

Energy Optimization

Game Theory

ABSTRACT

Internet of Health Things (IoHT) has become a demanding application of Internet of Things and cloud computing. In IoHT, the exchange and processing of health data are performed for monitoring the health status of patients. The health data collected using a body area network are stored and processed inside the cloud servers. The users can access the health data using their mobile devices as well as can receive health care advice. To reduce energy consumption and delay over the remote cloud servers, fog computing has been introduced. The health care system using fog computing is emerging due to the increasing need of energy and latency optimized health service provisioning. This article focuses on fog based Internet of Health Things for indoor as well as outdoor scenarios. In the proposed system the weighted majority game theory is used for selecting fog device in indoor and outdoor regions. Simulation results demonstrate that the proposed fog computing based system reduces the average delay, average jitter and energy consumption by approximately 15%, 20% and 15% respectively than the existing cloud only health care system.

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1. Introduction

Electronic health (e-health) monitoring has become an emerging research field in the last few years [1]. The exponential growth in the number of smart phone users has made a remarkable change in the traditional e-health system and mobile health (m-health) monitoring has been introduced. Nowadays most of the smart phones have health related applications, which can detect user activity and predict health condition based on pulse rate, BMI etc. Samsung S Health, Apple Healthkit, Google Fit, Microsoft Health etc. are some of the popular applications. Health sensor devices are also available which can detect several health parameters like blood sugar level, pressure level, ECG etc. [1]. After collecting respective health parameter values these sensor nodes transmit the same to the connected smart phone. The smart phone can process the data and predict the health status. However, execution of exhaustive applications for processing health data may not be possible inside the smart phones due to resource constraints. Mobile cloud computing may resolve these challenges [2]. By executing

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Full length article

Fractional frequency reuse based frequency allocation for 5G HetNet using master–slave algorithm

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ARTICLE INFO

Article history:

Received 13 December 2019

Received in revised form 12 May 2020

Accepted 25 June 2020

Available online 29 June 2020

Keywords:

FFR

Power consumption

SINR

Spectral efficiency

Micro-femtocell network

Master–slave algorithm

ABSTRACT

Frequency allocation in small cell-based green heterogeneous mobile networks is a demanding research domain nowadays. Femtocells are the essential components of small cell networks. In this paper, we propose a low power micro-femtocell network using the master–slave algorithm. In the master–slave algorithm, the master node allocates work to the slave nodes. When a slave ends its task given by a master node, it informs the master node, and it is being assigned a new workload. Slave nodes do not communicate with each other. In our approach, the microcell is divided into three sectors, and each sector is further categorized into three regions: inner region, outer region, and most-outer region. Femtocells are allocated in these three regions. According to the duty cycle, several femtocells are chosen as master femtocells. The rest of the femtocells are assigned under the supervision of the master femtocells. These femtocells are referred to as slave femtocells. The master femtocells communicate with the microcell, and the slave femtocells communicate with the corresponding master femtocell. Frequency allocation for this micro-femtocell network is proposed based on Fractional Frequency Reuse (FFR). The power consumption, signal-to-interference-plus-noise ratio (SINR), and spectral efficiency for the proposed network are calculated. The simulation results exemplify that the proposed scheme reduces the power consumption of the network by approximately 44%–80% than the conventional heterogeneous network. The simulation results also demonstrate that the proposed network has better SINR and spectral efficiency than the existing micro-femtocell network. For experimental analysis, vector signal generator (VSG) and vector signal analyzer (VSA) are used. The experimental results also show that the proposed network is greener compared to the existing micro-femtocell network.

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1. Introduction

The increasing use of smartphones has elevated the requirement of introducing new approaches for giving good signal strength at the outdoor as well as an indoor area. Long Term Evolution (LTE) network has come into the scenario to enhance the speed of data communication and to boost the capability of the mobile network [1]. For better, indoor and outdoor coverage LTE network is followed by LTE-Advanced (LTE-A) network. LTE-A is primarily for small cell-based heterogeneous networks. Small cell serves as a critical component for low power cellular network [1–4]. Heterogeneous cellular network (HCN) or heterogeneous network (HetNet) is a combination of macrocell base

station (MBS), microcell base station (MiBS), picocell base station (PBS) and femtocell base station (FBS) [2]. The HetNet is not only for third and fourth generation mobile networks but for the fifth-generation mobile network also. FBSs are allocated for giving better signal strength in the indoor region. FBS is a small cell base station, which can be deployed in a plug and play manner. The transmission power of an MBS or an MiBS is higher than that of an FBS. Deployment of several FBSs inside a macrocell or a microcell improves coverage [1]. An MiBS has lower transmission power than an MBS [4].

Hence, in this article, we use MiBS instead of MBS, where FBSs are allocated inside the microcell based on the master–slave algorithm. In the master–slave algorithm, the master node allocates work to the slave nodes. When a slave ends its task given by a master node, it informs the master node, and it is being assigned a new workload. Slave nodes do not communicate with each other. In our approach, FBSs are deployed under an MiBS. From these FBSs based on duty cycle, master FBSs are chosen,

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existing micro-femtocell network. The results also demonstrate that the proposed algorithms improve the spectral efficiency and the SINR. Hence we can conclude that the master-slave algorithm based proposed micro-femtocell network is a green cellular network. In the future, we wish to extend our method for micro-pico-femtocell based three-tier cellular networks.

CRedit authorship contribution statement

Priti Deb: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing - original draft, Writing - review & editing. **Anwasha Mukherjee:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Debashis De:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

Department of Science and Technology (DST), India for DST-FIST, reference no.: SR/FST/ETI-296/2011 and TEQIP III.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.phycom.2020.101158>.

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REVIEW

Critical analysis of biophysicochemical parameters for qualitative improvement of phytogetic nanoparticles

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Funding information

Council for Scientific and Industrial Research, India, Grant/Award Number: 08/155 (0075)/2019-EMR-I; Science and Engineering Research Board, Grant/Award Number: EEQ/2018/000275

Abstract

Conventional chemical approaches for synthesizing nanoparticles (NPs) may restrict their applicability as they are not eco-friendly, energetically efficient and often involve toxic reducing/capping agents; but phytonanotechnology enabled the synthesis of safe, inexpensive, highly biocompatible NPs. In this regard, thorough understanding of green components and the modulatory effects of different reaction conditions on the physicochemical parameters of green synthesized NPs would be a prerequisite, which is not depicted elsewhere. This review critically analyzes the relevant reaction conditions from their mechanistic viewpoints in plant-based synthesis of NPs arising fundamental issues which need to be determined carefully. The size, stability and surface chemistry of phytogetic NPs may be fabricated as a function of multiple interconnected reaction parameters and the plant species used. The therapeutic potential of phytogetic NPs may depend on the plant species used; and so the meticulous understanding of physicochemical parameters and the family wise shorting of elite plant species may potentially benefit the theranostic future of plant-based NPs.

KEYWORDS

green-synthesis, nanotechnology, phytochemicals, phytonanotechnology, plant-based nanoparticles, reducing/capping agents

1 | INTRODUCTION

Cancer is an emerging health concern due to its high rate of global occurrence in every year and associated therapeutic complications.¹⁻⁴ The waned enhanced permeability and retention (EPR) effects of chemotherapeutic agents, underdeveloped drug delivery systems for tissue/organs/organelles specific targeting and the deficit of original bioavailability would be the major technological limitations subduing the therapeutic efficiency of chemotherapeutants.

The advent of nanotechnology has opened up a new horizon to the treatment of many deadly ailments including cancer.⁵⁻⁷ The present physical and chemical methods (including both top-down and bottom-up approaches) for nanoparticles (NP) synthesis still have to depend on the use of a lot of toxic and environmentally hazardous

reagents, which might impose severe detrimental effects on the environment, ecosystem and public health; and are labor intensive, energetically inefficient and expensive.⁸⁻¹⁵ These hurdles compelled researchers to think another way and to make use of biomolecules for NPs synthesis aiming to develop facile, inexpensive, energetically efficient and eco-friendly technologies (green technology) for biocompatible NPs synthesis (Figure 1).

The phytomining approach of NPs recovery depends on the sequestration of biocompatible NPs from the plants which can bioaccumulate the metals ions and are able to reduce them making NPs *in vivo*; but this process is time consuming and cannot monitor the size and shape of synthesized NPs.¹⁶ In this way, the *in vitro* approach for plant-based synthesis of NPs (bottom-up approach) has been developed. The green synthesis of NPs involves the biomolecules of plants,

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How to cite this article: Maity S, Adhikari M, Banerjee S, Guchhait R, Chatterjee A, Pramanick K. Critical analysis of biophysicochemical parameters for qualitative improvement of phyto-genic nanoparticles. *Biotechnol Progress*. 2020;e3114. <https://doi.org/10.1002/btpr.3114>



Functional interplay between plastic polymers and microbes: a comprehensive review

Sukhendu Maity · Sambuddha Banerjee · Chayan Biswas · Rajkumar Guchhait · Ankit Chatterjee · Kousik Pramanick 

Received: 22 February 2021 / Accepted: 26 May 2021 / Published online: 4 June 2021
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Abstract Escalated production of plastic, their worldwide distribution and persistent nature finally results into their environmental accumulation causing severe threats to the ecological environment and biotic health. Thus, development of suitable measurements for environmental remediation of plastic may be an urgent issue in this plastic age. Some recent reviews have categorized the microbial species able to degrade different plastic polymers and the different factors effecting bio-degradation of plastic are poorly understood. This review comprehensively discusses bio-degradation of traditional and biodegradable plastic polymers both in natural and biological environment (gut microbes and fungi) to understand different factors regulating their degradation, and also shows how degradation of plastic polymers under abiotic factors influence subsequent biological degradation. Different physicochemical modifications like - breaking large polymers into small fragments

by pre-treatment, functional groups enrichment, identifying potent microbial species (consortia) and engineering microbial enzymes might be crucial for bio-degradations of plastic. Effects of micro/nanoplastic and other chemical intermediates, formed during the bio-degradation of plastic, on species composition, abundance, growth, metabolism and enzymatic systems of microbes involved in the bio-degradation of plastic should be determined in future research.

Keywords Bio-degradation · Pre-treatment · Functional groups · Biotic-abiotic factors · Microbial enzymes · Composting

Introduction

Global production rate of plastic production is increasing every year since 1950 s due to their wide range of applications in different sectors such as agriculture, packaging, construction, automotive industry, biomedicine etc. Increasing annual production of plastic and their improper waste management collectively results in higher environmental accumulation. The global production of plastic reached 368 million tons in 2019 and 51% of this total production was contributed by Asia (Plastics—the facts 2020 by Plastic Europe). Eriksen et al. (2014) showed the improper waste management system to be accounted for floating of >5 trillion plastic pieces

Sukhendu Maity, Sambuddha Banerjee and Chayan Biswas have contributed equally to this work.

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Review

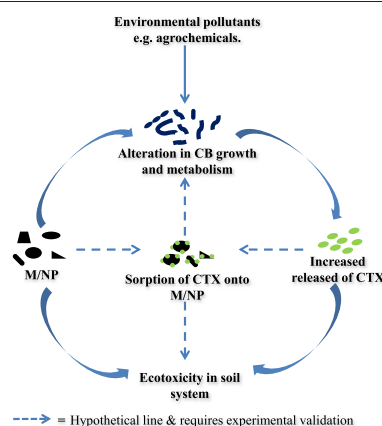
Co-occurrence of co-contaminants: Cyanotoxins and microplastics, in soil system and their health impacts on plant – A comprehensive review

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HIGHLIGHTS

- Cyanotoxin and micro/nanoplastics may be emerging co-contaminants in soils.
- Phytotoxic effects of cyanotoxin and its mixture are poorly understood.
- Co-occurrence in soil suggests sorption of cyanotoxin onto micro/nanoplastics.
- Distinct lack of combined effects of cyanotoxin & micro/nanoplastics.
- Ecotoxicity should be measured using environmentally relevant doses.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 13 May 2021

Received in revised form 25 June 2021

Accepted 25 June 2021

Available online 29 June 2021

Editor: Qilin Wang

Keywords:

Cyanobacteria
Cyanotoxin
Micro/nanoplastics
Co-contaminant
Soil
Sorption
Phytotoxicity

ABSTRACT

Cyanotoxins (CTX) and micro/nanoplastics (M/NP) are ubiquitously distributed in every environmental compartment. But the distribution, abundance and associated ecological risks of CTX are still poorly understood in soil system. On the other hand, M/NP could serve as vectors for persistent organic/inorganic pollutants in the natural environment through the sorption of pollutants onto them. Thus, co-occurrence of CTX and M/NP in soils suggests the sorption of CTX onto M/NP. So, major aim of this review is to understand the relevance of CTX and M/NP in soils as co-contaminants, possible interactions between them and ecological risks of CTX in terms of phytotoxicity. In this study, we comprehensively discuss different sources and fate of CTX and the sorption of CTX onto M/NP in soil system, considering the partition coefficient of different phases of soil and mass balance. Phytotoxicity of CTX, CTX mixture and co-contaminants has also been discussed with insights on the mechanism of action. This study indicates the need for the evaluation of sorption between co-contaminants, especially CTX and M/NP, and their phytotoxicity assessment using environmentally relevant concentrations.

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Solvato(fluoro)chromism, investigation of quenching mechanism and thermodynamic binding parameter of two azine based chemosensor for Cu²⁺ ion, application in onsite detection

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Manuscript received online 29 July 2020, accepted 25 August 2020

Two solvatochromic fluorescent azine derivative 1-((E)-((Z)-(4-(diethylamino)-2-hydroxybenzylidene)hydrazono)methyl)naphthalen-2-yl (L1) and (E)-2-((4-(diethylamino)-2-hydroxybenzylidene)amino)-3',6'-dihydroxyspiro[isindoline-1,9'-xanthen]-3-one (L2) was synthesized via Schiff base condensation. The introduction of an electron-donating diethylamino group and an electron-accepting fluorophore unit into the pi-conjugated system of L1 and L2 endowed a prominent solvatochromic emission property. In contrast with the very little changes of absorption spectra in the different solvents, the emission was strongly dependent on the solvent polarity and could be tuned from blue region to red region by changing the solvent from less polar tetrahydrofuran to highly polar water. Both the ligand L1 and L2 were able to binds Cu²⁺ ion selectively via fluorescence turn-off process. The limit of detection (LOD) for Cu²⁺ was found to be 1.9 μM and 1.62 μM with L1 and L2, respectively. The photophysical experimental results reveal that the Cu²⁺ ions quenched the intrinsic fluorescence of both L1 and L2 by forming the ligand-metal complexes, but the quenching process different (static or dynamic) for the two probes. In addition, the binding spontaneity was mainly entropy-driven. Again both ligands successfully detect Cu²⁺ by means of TLC paper as well as simple filter paper based strips and hence, they would be very useful for onsite detection purpose.

Keywords: Solvato(fluoro)chromism, Cu²⁺ ion, quenching, LOD, thermodynamic spontaneity, paper strips.

Introduction

Luminescent materials derived from Schiff base compounds have attracted great attention in the past few decades owing to their potential applications in the fields of organic electronics, optoelectronics, sensors and informational displays¹. It is well known that the absorption and emission spectral responses of chemical compounds may be influenced by the surrounding medium and that medium can bring about a change in the position, intensity, and shape of absorption and/or emission bands. Hantzsch later termed this phenomenon solvatochromism^{2,3}. The term often solvatofluorochromism was defined for the emission position change upon solvent polarity variation. Obviously, this phenomenon is caused by differential solvation of the ground and first excited state of the light-absorbing molecule (or its chromophore). Differential solvation of these two states is

responsible for the solvent influence on emission spectra⁴. In general, molecules with a large change in their permanent dipole moment upon excitation exhibit a strong solvatochromic behaviour⁵. Besides the dipole moment change on excitation, the ability of a solute to donate or to accept hydrogen bonds to or from surrounding solvent molecules in its ground and Franck-Condon excited state determines further the extent and sign of its solvatochromism^{4,6,7}.

Fluorescent molecules possessing solvatochromic properties display different emission spectra depending on solvent polarity whose fluorescence intensity, color, and wavelength are sensitive to the environment^{5,8}. The absolute value of the red shift depends, usually linearly, on the solvent polarity. The more polar solvent with a higher static dipole moment polarizes molecules more strongly, the stronger the red shift. Due to their sensitivity to polarity and hydration,

for Cu²⁺ was found to be 1.9 μM and 1.62 μM with **L1** and **L2**, respectively. The thermodynamic parameter reveals the binding of metal ion is associated with entropy favorable path. The complete quenching of the emission intensity was observed with Cu²⁺ ions in paper strips unravel the efficiency of the probe **L1** and **L2** to detect Cu²⁺ ions as an onsite sensor.

Acknowledgements

Authors thankful to the University Grants Commission, New Delhi, India, for financial support by sanctioning a minor research project (Sanction letter No. PSW-155/14-15 (ERO) ID No. WV6-027, S. No. 223832 dated 03-02-2015). We thank Dr. Asim Kr. Bera, Principal, Mahisadal Raj College and Dr. Abdul Motin, Principal, Tamralipta Mahavidyalaya for providing laboratory facilities.

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**RESEARCH ARTICLE**

WILEY

Mafic volcanic rocks of western Iron Ore Group, Singhbhum Craton, eastern India: Geochemical evidence for ocean–continent convergence

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Department of Science and Technology, Grant/Award Number: SR/S4/ES-510/2010; GeoMet, Grant/Award Number: MLP 0002 FBR2-EVSSKB

Handling Editor: N.V. Chalapathi Rao

Precambrian mafic magmatism is an important global episode which played a significant role in the crustal evolution. In India, Singhbhum Craton being the oldest craton, witnessed significant occurrences of Precambrian geological activity, marked by several episodes of volcanism, plutonism, sedimentation spanning from Palaeoarchean to Mesoproterozoic age. Here we present petrological and geochemical characteristics of Precambrian mafic volcanic rocks (occurring in western Iron Ore Group (IOG), Singhbhum Craton, eastern India) to evaluate their petrogenetic aspects, tectonic setting, and magma generation. The mafic volcanic rocks are porphyritic in nature with the phenocrysts of plagioclase and groundmass composed of clinopyroxene, plagioclase, ilmenite, and volcanic glass. These rocks are mostly tholeiitic, sometimes with a transitional behaviour towards calc-alkaline nature and display basalt-basaltic andesite affinity. These mafic volcanic rocks also preserve geochemical signatures (high Nb/U, Nb/La, [Nb/Th]_{pm} ratios) in support of Nb-enriched basalts and are classified as Nb-enriched basalts (NEB; Nb > 7 ppm) and high-Nb basalts (HNB; Nb > 20 ppm) on the basis of Nb concentrations and mantle normalized Nb/La ratios (>0.5). The NEBs and HNBS are marked by lesser magnitude of negative Nb anomalies with high (Nb/Th)_{pm}, (Nb/La)_{pm}, and Nb/U ratios as compared to normal arc basalts. Several major element oxides, trace elements, and selected element ratios (like SiO₂, CaO/Al₂O₃, Y, V/Cr, Zr/Nb, and \sum REE) show systematic variations with MgO which suggests role of magmatic fractionation. Chondrite-normalized REE patterns for NEB and HNB rocks exhibit uniform LREE enrichment with distinct Eu negative anomalies while primitive mantle-normalized incompatible trace element patterns reflect enrichment in LILE and LREE with prominent Nb-Ta anomalies. Different HFSE ratios corroborate a subduction related setting for magma generation formed by ~10%–20% melting in the domain of garnet lherzolite. Relative enrichment of LILE and LREE with depleted HFSE characteristics attest a garnet-bearing mantle source and melt extraction with garnet in the residue. Geochemical signatures suggest that the genesis of NEB and HNB is attributable to slab-melting and wedge hybridization processes

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Paul M, Ray J, Manikyamba C, et al. Mafic volcanic rocks of western Iron Ore Group, Singhbhum Craton, eastern India: Geochemical evidence for ocean–continent convergence. *Geological Journal*. 2020;1–28. <https://doi.org/10.1002/gj.3944>

Homes across the Water: Dislocation and Transcultural Kinship in Amitav Ghosh's *The Glass Palace*

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Abstract:

*Kinship studies, a key area of anthropology since the late nineteenth century, implies human relationships based on consanguinity and biological affinity, where blood-relationships play an essential role in the social grouping of people and identity formation. The essentialist idea of kinship insists on a universal assumption—'Blood is thicker than water'. However, this idea has been challenged by modern cultural anthropologists in the late twentieth century (David M. Schneider and Marilyn Strathern) and early twenty-first century (Janet Carsten) since it does not take into consideration multiple cultural factors in the formation of kinship in this modern age of transnational migration and dislocation. Setting the 'blood-related', 'natural' or biological kinship aside, they advocated for the 'cultural' dimensions of kinship configured by regional specificity, community, ethno-nationality, language, marriage and even diasporic dislocation. In this article, we attempt an exploration of transcultural kinship concerning diasporic individuals and their families constituted by members with different ethno-cultural identities. Taking Amitav Ghosh's *The Glass Palace* (2000) as case-study, this essay would examine how dislocation beyond the familiar cultural space opens up avenues for re-imagining kinship beyond the bonds of community and often leads to the establishment of families across the "water" (metaphoric of diasporic mobility). We also attempt to investigate how cultural hybridity and transculturality reconfigure family-ties situating an individual in a newer pattern of kinship; how a relationship like close friendship or mentorship turns into strong kinship bonds resembling family-ties.*

Keywords: *Migration, Dislocation, Identity, Borders, Negotiation, Kinship, Family-ties*

"The ideas of kinship, the kin-based society, the idiom of kinship, and the content of kinship are the received wisdom of today, as they have been almost from the beginnings of anthropology."

A Critique of the Study of Kinship (1984): David Murray Schneider

-With this proposition, Schneider's influential volume *A Critique of the Study of Kinship* (1984) initiates a relatively new way of looking at kinship studies beyond the formalist tradition, by attempting cross-cultural analyses of kinship only three decades back. The inception of kinship studies is attributed to Lewis Henry Morgan and his 'magnum opus' *Systems of Consanguinity and Affinity of the Human Family* (1871) which centres around the essentialist idea of kinship based on blood relationships and biological affinity. The propositions of Schneider's new anthropology of kinship, which he finds as "the received wisdom of today" (3), rely heavily on nature/culture interplay than the biologically determined structuralist way of assessing kinship. The inclusion of 'local' culture/s and community history as no less essential determinants than the exclusive factors like progeny and ethnology in kinship studies, has allowed a broader and more fluid conceptualization of

the eventual birth of Ilongo is a strong example of transcultural kinship in dislocation. The ending of the novel is significant since it shows how lack of wealth, homelessness and dislocation transform people. Despite their mutual antipathy, the redemptive love brings Rajkumar and Uma together to dissolve the borders between them. The crossing of borders not only liberates the 'self' from a confined space but also situates it in a global network of kinship that paves the way for re-imagining community and a home across the water.

End Note:

¹ Ghosh's narrator indulges in a fanciful reference to botanical kinship while reflecting over the relationship between teak and mint: "Teak is a relative of mint, *tectona grandis*, born of the same genus" (70), and "there was an unmistakable kinship, a palpably familial link" (71).

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ISSN : 0587-1646

ANVĪKṢĀ

RESEARCH JOURNAL OF THE DEPARTMENT OF SANSKRIT
(REFEREED JOURNAL)

VOL. XLII

Part-II

General Editor

Dr. Ashok Kumar Mahata

JADAVPUR UNIVERSITY

KOLKATA - 700 032

February, 2021



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চরকসংহিতায় সাংখ্যের প্রভাব : একটি সমীক্ষা

বিভাস মিস্ত্রী

সাংখ্যদর্শন মূলতঃ দ্বৈতবাদী দর্শন, কেননা সাংখ্যমতে জগতের মূল তত্ত্ব দুটি — পুরুষ (আত্মা) ও প্রকৃতি (জড় সত্তা)। পুরুষ নিত্য শুদ্ধ বুদ্ধ মুক্ত চৈতন্যস্বরূপ। প্রকৃতি ত্রিগুণাত্মিকা — সত্ত্ব রজঃ ও তমঃ গুণের সাম্যাবস্থা। মঙ্গলাচরণ কারিকায় এই তত্ত্বদুটির সূচনা করা হয়েছে —

অজামেকাং লোহিতশুক্লকৃষ্ণাং বহ্বীঃ প্রজাঃ সৃজমানাং নমামঃ
অজা যে তাং জুষমাণাং ভজন্তে জহত্যনাং ভুক্তভোগাং নুমস্তান্ ৷^১

শুধুমাত্র যে মঙ্গলাচরণ কারিকার প্রথম চরণে প্রকৃতিকে নমস্কার করে দ্বিতীয় চরণে পুরুষকে নমস্কার করা হয়েছে তাই নয়, সাংখ্যকারিকার তৃতীয় কারিকায় সাংখ্যশাস্ত্রের যে চারটি প্রতিপাদ্য বিষয়ের কথা বলা হয়েছে, তার মধ্যে সর্বপ্রথমে প্রকৃতিতত্ত্বের ও সর্বশেষে পুরুষতত্ত্বের উল্লেখ করা হয়েছে —

মূল প্রকৃতিরবিকৃতির্মহাদ্যায়াঃ প্রকৃতিবিকৃতয়ঃ সপ্ত
ষোড়শকস্তু বিকারো ন প্রকৃতিবিকৃতয়ঃ পুরুষঃ ৷^২

চরকসংহিতা অরতীয় আয়ুর্বেদ চিকিৎসাশাস্ত্রের আকর গ্রন্থ। বিশাল এই গ্রন্থে চরক বিভিন্ন রোগের কারণ, লক্ষণ, ঔষধতৈরি এবং রোগের চিকিৎসা-নির্ণয়ের কথা উল্লেখ করেছেন। চরকসংহিতায় আটটি স্থান আছে এবং ১২০ টি অধ্যায় আছে। এই আটটি স্থান হল — সূত্রস্থান, নিদানস্থান, বিমানস্থান, শারীরস্থান, ইন্দ্রিয়স্থান, চিকিৎসাস্থান, কল্পস্থান এবং সিদ্ধিস্থান। ভারতীয় চিকিৎসাবিজ্ঞানের ইতিহাসে চরকসংহিতা এত বড় ও বিষয়বহুল যে, এই সংহিতাটিকে মহাভারতের মতো বলা হয়েছে — চিকিৎসা বহিবেশস্য স্বস্থাতুরহিতং প্রতি, যদিহাস্তি তদন্যত্র যন্নেহাস্তি ন তৎ ক্চিৎ ৷^৩

চরকসংহিতা যে এককালে বহুল সমাদৃত হয়েছিল তার প্রমাণ এই গ্রন্থের উপর অসংখ্য টীকা। চরকসংহিতার টীকাকারদের মধ্যে বিশেষ উল্লেখযোগ্য হলেন চক্রপাণি দত্ত, তাঁর টীকার নাম আয়ুর্বেদ-দীপিকা, শিবদাসেনের চরকতত্ত্বদীপিকা, গঙ্গাধরকৃত কল্পতরু প্রভৃতি। চরকসংহিতার সূত্রস্থানের প্রথম অধ্যায়ে বলা হয়েছে শরীর, মন ও আত্মার মিলিতরূপই হচ্ছে পুরুষ। সেখানে একটি উপমার সাহায্যে দেখানো হয়েছে যে — তিনটি দণ্ডের সংযোগের ফলে যেমন একটি ত্রিদণ্ড প্রস্তুত হয়, যার উপর সব দ্রব্য রাখা যায়। তেমনি শরীর, মন ও আত্মার মিলিতরূপের দ্বারা যে-পুরুষ গঠিত হয়, সেই পুরুষেতেই সুখ,

দুঃখ, বিষয়, বাসনা, জ্ঞান, অজ্ঞান সব কিছু থাকে। শরীর, মন ও আত্মা এই তিনটি যতদিন পরস্পর থেকে বিচ্ছিন্ন না হয় ততদিন লোক জীবিত থাকে, চেতন এই পুরুষকে লক্ষ্য করেই আয়ুর্বেদশাস্ত্রের যা কিছু উপদেশ।

সত্ত্বমায়া শরীরঃ ত্রয়মেতদ্ভিদগুবত্, লোকস্তিষ্ঠতি সংযোগাত্ তত্র সর্বং প্রতিষ্ঠিতম্।
স পুমাংশ্চেতনং তচ্চ তচ্চাধিকরণং স্মৃতম্, বিদেশ্যাস্য, তদর্থং হি বেদোহয়ং সম্প্রকাশিতঃ।^{১৪}

চেতন শব্দের ব্যাখ্যা করতে গিয়ে চক্রপাণি দত্ত আয়ুর্বেদ-দীপিকা টীকায় চেতনাকে জ্ঞানবান্ বলে উল্লেখ করেছেন। চেতনমিতি জ্ঞানবত্।^{১৫} সাংখ্যপ্রবচনসূত্রে বলা হয়েছে — এই পুরুষ ভোক্তা অর্থাৎ সকলের দ্রষ্টা, পুরুষ শরীর প্রভৃতির ব্যতিরিক্ত — শরীরাদিব্যতিরিক্তঃ পুমান্।^{১৬}

চরকসংহিতায় পুরুষতত্ত্বের প্রভাব: চরকসংহিতার সূত্রস্থানের ২৫তম অধ্যায়ের ৮ থেকে ২০ সংখ্যক শ্লোক পর্যন্ত পুরুষের উৎপত্তির কথা বলা হয়েছে। এও বলা হয়েছে, আত্মাই কর্ম করেন এবং আত্মাই কর্মের ফল ভোগ করেন। চেতনাস্বরূপ আত্মা ছাড়া সুখ-দুঃখের প্রবৃত্তি হতে পারে না- আত্মাজঃ পুরুষো রোগাশ্চাত্মজাঃ কারণং হি সঃ।^{১৭} শরীরব্যতিরেকে শারীরিক রোগের এবং মনের স্থিতি হতে পারে না। চরকসংহিতায় বলা হয়েছে, রস থেকেই প্রাণী ও তাদের রক্ত উৎপন্ন হয়ে থাকে। আবার জল থেকেই রস উৎপন্ন হয়। অতএব জলই পুরুষের ও রোগের উৎপত্তির কারণ —

নর্ভে শরীরাস্থারীরোগো ন মনসঃ স্থিতিঃ।

রসজানি তু ভূতনি ব্যাধেয়শ্চ পৃথগ্বিধাঃ

আপো হি রসবতন্তাঃ স্মৃতা নিবৃত্তিনিবৃত্তিহেতবঃ।^{১৮}

চরকসংহিতায় পুরুষকে ষড়্-ধাতুজ বলা হয়েছে — ষড়্ধাতুজস্ত পুরুষো রোগাঃ ষড়্ধাতুজস্তথা, রাশিঃ ষড়্ধাতুজো হ্যেব সাংখ্যৈরাদ্যৈঃ পরীক্ষিতঃ।^{১৯}

পুরুষ ক্ষিতি, অপ, তেজ, মরুৎ ও ব্যোম এই পঞ্চ ধাতু এবং আত্মা — এই ছয় ধাতু থেকে উৎপন্ন হয়েছে এবং রোগ সকলও এই ছয় ধাতু হতে জন্মেছে। এই পুরুষের ছয় ধাতুর সমষ্টিমাত্র প্রাচীন সংখ্যাসূত্রে ঋষিরা বলেছেন। ষড়্-ধাতুজ বলা হলেও মাতাপিতা ছাড়া পুরুষের উৎপত্তি সম্ভব নয়। একটি নারহরণের সাহায্যে চরকসংহিতায় তা বোঝানো হয়েছে। যেমন পুরুষ থেকে পুরুষ, গরু থেকে গরু, গ থেকে অশ্ব জন্মায়, সেরূপ মাতা-পিতা থেকে পুরুষের, রোগসমূহও উৎপন্ন হয়। অতএব মাতা-পিতাই পুরুষের ও রোগসমূহের কারণ — পুরুষঃ পুরুষাদ্ গোর্গোরশ্বাদশ্বঃ প্রজায়তে, মাতাপিতৃভবাশ্চোক্তা গান্তাবত্র কারণম্।^{২০} আবার বলা হয়েছে, কর্ম থেকেই পুরুষের উদ্ভব। সৃষ্টির প্রথমে মাতা-পিতার অভাব। অতএব মাতা-পিতা কখনো জন্মের কারণ নয়। পূর্বজন্মার্জিত কর্মকে এক্ষেত্রে কারণ বলা হয়েছে। হতেই পুরুষের উৎপত্তি, কর্ম হতেই রোগেরও উৎপত্তি। পুরুষের জন্ম বা রোগ কর্ম ছাড়া সম্ভব হয়

কর্মজন্তু মতো যন্তুঃ। কর্মজাতস্য চাময়াঃ।
নহ্যতে কর্মণো জন্ম রোগাণাং পুরুষস্য বা।^{১১}
চরকসংহিতার শারীরস্থানে কর্ম থেকে যে পুরুষের উৎপত্তির কথা বলা হয়েছে, সেখানে বলা হয়েছে, যেহেতু পরমাত্মা অনাদি, অতএব তাকে কোনো কিছুর উৎপত্তির কারণ বলা চলে না। মোহ, ইচ্ছা ও দ্বেষকৃতকর্ম থেকেই রাশিসজ্জক পুরুষ অর্থাৎ চতুর্বিংশতি পুরুষ উৎপন্ন হয় — পুরুষে রাশিসজ্জন্তু মোহেচ্ছাদ্বেষকর্মজঃ।^{১২}

পুরুষের স্বরূপ: পুরুষের স্বরূপ প্রসঙ্গে চরকসংহিতার শারীরস্থানে উল্লেখ পাওয়া যায়, সেখানে বলা হয়েছে — এই পুরুষ নিত্য, অনাদি। কিন্তু হেতুজাত পুরুষ অনিত্য-অনাদিঃ পুরুষো নিত্য বিপরীতস্ত হেতুজঃ।^{১৩} নিত্য আত্মার স্বরূপ হচ্ছে বিভু, অব্যয়, ক্ষেত্রজ্ঞ, শাশ্বত, অব্যর্থ ও অচিন্ত্য — ...তদব্যক্তমচিন্ত্যং ব্যক্তমন্যাথা, অব্যক্তাত্মা ক্ষেত্রজ্ঞঃ শাশ্বতো বিভুরব্যয়ঃ।

তস্মাদ্ যদন্যৎ তদ্ব্যক্তং, বন্ধতে চাপরং দ্বয়ম্, ব্যক্তমৈন্দ্রিয়কশ্চৈব গৃহ্যতে তদ্ যদিদ্রিয়েঃ।
অতোহন্যৎ পুনরব্যক্তং লিঙ্গগ্রাহ্যমতীন্দ্রিয়ম্।^{১৪}
এখানে অব্যক্ত বলতে যা ইন্দ্রিয়ের সাহায্যে গ্রহণ করা যায় সেগুলো ভিন্ন যা কিছু অতীন্দ্রিয় লিঙ্গ গ্রাহ্য। আত্মা অব্যক্ত, শাশ্বত, বিভু ও অব্যয়। অনাদি পুরুষের স্বরূপ হল—সৎ এবং নিত্যধর্মবিশিষ্ট। হেতুজাত পুরুষ অসৎ।
অব্যক্ত থেকে পুরুষ কিভাবে ব্যক্ত হয় সে সম্পর্কেও চরকসংহিতার শারীরস্থানের প্রথম অধ্যায় নির্দেশ পাওয়া যায়। সেখানে বলা আছে অব্যক্ত থেকে বুদ্ধির জন্ম হয়, আর এই বুদ্ধির সাহায্যেই অব্যক্ত নিজে মনে করে আমি কর্তা। অর্থাৎ বুদ্ধি হতেই অহঙ্কার উৎপন্ন হয়, অহঙ্কার থেকেই যথাক্রমে আকাশ প্রভৃতি পঞ্চভূতের উৎপত্তি। এইভাবে পুরুষ সম্পূর্ণ হলে তাকে জাতি বা অভ্যুদিত বলা হয়। প্রলয়কালে পুরুষ এইসকল ইষ্টভাব থেকে বিযুক্ত হয়ে পড়েন। এইভাবে পুরুষ রজঃ তমোগুণ সংযুক্ত হয়ে অব্যক্ততা থেকে ব্যক্ততা এবং ব্যক্ততা থেকে আবার প্রলয় অব্যক্ততা হয়ে চক্রবৎ বারবার পরিবর্তিত হতে থাকে। যারা রজঃ ও তমোগুণযুক্ত দ্বন্দ্ব লিঙ হন এবং অহঙ্কারপ মোহে আবিষ্ট হন, তাঁদেরই জন্ম ও মৃত্যু বারবার হতে থাকে, কিন্তু যারা অনাসক্ত এবং অহঙ্কার বুদ্ধিশূন্য তাঁদের বার বার জন্ম ও মৃত্যু হয় না, তাঁরাই মুক্তি লাভ করেন।

জায়তে বুদ্ধিরব্যক্তাদ্ বুদ্ধ্যাংহমিতি মন্যতে, পরং খাদীন্যহঙ্কারাদুৎপদ্যন্তে যথাক্রমম্।
ততঃ সম্পূর্ণসর্বাস্তো জাতোহভ্যুদিত উচ্যতে, পুরুষঃ প্রলয়ে চেষ্টী পুনর্ভাবৈর্ধিযুজ্যতে।
অব্যক্তাদ্ব্যক্ততাং যাতি ব্যক্তাদব্যক্ততাং পুনঃ, রজস্তমোগুণ্যবিষ্টচক্রবৎ পরিবর্ততে।
যেষাং দ্বন্দ্ব পরা সঞ্জিরহঙ্কারপরাস্চ যে, উদয়প্রলয়ো তেষাং নি তেষাং যে ততোহন্যাথা।^{১৫}

পুরুষ, রজঃ তমোগুণের সঙ্গে সংযুক্ত হলে এই সংযোগ হয় অনেকপ্রকার এবং এদের দ্বারা পুরুষ নিরাকৃত হলে একমাত্র সত্ত্ববুদ্ধি দ্বারা এই সংযোগের নিবৃত্তি হতে পারে। অর্থাৎ রজঃ ও তমোগুণের সংযোগ হলে চতুর্বিংশতি পুরুষের সৃষ্টি হয় এবং রজঃ তমোগুণের অভাব হলে সত্ত্ববুদ্ধি দ্বারা পুরুষের মুক্তি হয়ে থাকে — রজস্তমোগুণ যুক্তস্য সংযোগোহয়মনস্তবান্। তাভ্যাং নিরাকৃত্যভ্যাস্ত সত্ত্ববুদ্ধ্যা নিবর্ততে।^{১৬} সাংখ্যকারিকায় বলা হয়েছে ত্রিগুণাদি অর্থাৎ সত্ত্ব, রজঃ ও তমোগুণের বিপরীত পুরুষ হচ্ছেন সাক্ষী অর্থাৎ দুঃখ প্রভৃতি ছাড়া নিত্যমুক্ত, উদাসীন, দ্রষ্টা ও অকর্তা — তস্মাচ্চ বিপর্যাসাৎ সিদ্ধং সাক্ষিত্বমস্য পুরুষস্য। কৈবল্যং মাখ্যাহ্যং দ্রষ্টৃত্বমকভূতাবশ্চ।^{১৭} সাংখ্যপ্রবচনসূত্রেও বলা হয়েছে পুরুষ জন্ম প্রভৃতি ব্যবস্থার জন্য বহু — জন্মদিব্যবস্থাতঃ পুরুষবহুত্বম্।^{১৮} এবং ব্যবস্থাদিজন্য পুরুষ বহু বলা হয়েছে — পুরুষবহুত্বম্ ব্যবস্থাতঃ।^{১৯}

চরকসংহিতায় পুরুষ সম্পর্কে বিভিন্ন মতবাদ: চরকসংহিতায় পুরুষ সম্পর্কে বিভিন্ন স্থানে বিভিন্ন মতবাদ দেখা যায় — কোথাও বলা হয়েছে চতুর্বিংশতিপুরুষ, কোথাও বা ষড়ধাতু পুরুষ এবং কোথাও বা পুরুষ এক প্রকার বলে উল্লেখ করা হয়েছে — ষড়ধাতুক একধাতুকচতুর্বিংশতিধাতুকশ্চেতি ধাতুভেদেন ত্রিবিধঃ পুরুষো ভবতীতি।^{২০}

চতুর্বিংশতি পুরুষ: চরকসংহিতায় ধাতুভেদের কল্পনানুসারে পুরুষকে চব্বিশ প্রকার বলা হয়েছে। মন, দশটি ইন্দ্রিয় ও পাঁচটি ইন্দ্রিয়ের অর্থ অর্থাৎ শব্দতন্মাত্র, স্পর্শতন্মাত্র, রূপতন্মাত্র, রসতন্মাত্র ও গন্ধতন্মাত্র এবং আটটি ধাতু বিশিষ্ট প্রকৃতি — এই চতুর্বিংশতি ধাতুর সমষ্টিকে চতুর্বিংশতিক পুরুষ বলে — পুনশ্চ ধাতুভেদেন চতুর্বিংশতিকঃ স্মৃতঃ, মনো দর্শেন্দ্রিয়াণ্যর্থাঃ প্রকৃতিশ্চাষ্টধাতুকী।^{২১} এই চব্বিশ প্রকার ধাতুর সমবায়কে চতুর্বিংশতি পুরুষ বলা হয়েছে। আটটি ধাতু বিশিষ্ট প্রকৃতি হল- আকাশ, জল, তেজ, বায়ু ও পৃথিবী—এই পঞ্চমহাভূত, বুদ্ধি অহঙ্কার ও অব্যক্ত এই আটটি— খাদীনি বুদ্ধিরব্যক্তমহঙ্কারস্তথাষ্টমঃ।^{২২} চক্ষু, কর্ণ, নাসিকা, জিহ্বা ও ত্বক্- এই পাঁচটি বুদ্ধীন্দ্রিয়। বাক্, পাণি, পাদ, পায়ু ও উপস্থ- এই পাঁচটি কর্মেন্দ্রিয়। মনঃ এবং শব্দ, স্পর্শ, রূপ, রস ও গন্ধ এই পাঁচটি পঞ্চতন্মাত্র। এই ষোলটিকে প্রকৃতির বিকৃতি বলে গণ্য করা হয়। অব্যক্ত ছাড়া অন্যগুলোকে ক্ষেত্র এবং অব্যক্তকে ক্ষেত্রের ক্ষেত্র বলা হয়েছে—অব্যক্তমস্য ক্ষেত্রস্য ক্ষেত্রস্তম্ভয়ো বিদুঃ।^{২৩}

সাংখ্যদর্শনে পঞ্চবিংশতিতত্ত্বের উল্লেখ দেখা যায়। জড়বর্গের আদি কারণ প্রকৃতি, এটি কার্য নয় কেবল কারণ। সাংখ্যদর্শনে কার্য-কারণতত্ত্ব সংকার্যবাদ নামে খ্যাত। সংকার্যবাদানুসারে কার্যোৎপত্তির পূর্বে কার্যকারণের মধ্যে প্রচ্ছন্নভাবে থাকে, কাজেই সাংখ্যমতে উৎপত্তির পূর্বে জগৎ জড়প্রকৃতির মধ্যে প্রচ্ছন্নভাবে ছিল। মূলপ্রকৃতি বা অব্যক্ত থেকে উদ্ভূত মহৎ, অহংকার ও পঞ্চতন্মাত্র—এরা সকলেই কার্যকারণ ভিন্নরূপ। অপরপক্ষে পঞ্চমহাভূত, পঞ্চজ্ঞানেন্দ্রিয়, পঞ্চকর্মেন্দ্রিয় ও মন—এই ষোলটি কেবলমাত্র কার্য কারণ। পুরুষ সকলের উর্ধ্বে। এটি কার্যও নয়, কারণও নয়— মূলপ্রকৃতিরবিকৃতির্মহাদায়াঃ প্রকৃতি-কৃতয়ঃ সপ্তঃ। ষোড়শকল্প বিকারো ন প্রকৃতির্নবিকৃতিঃ পুরুষঃ।^{২৪}

ষড়-ধাতুজ পুরুষ: ক্ষেত্রবিশেষে পুরুষকে ষড়-ধাতুজ বলা হয়েছে। আকাশাদি পঞ্চমহাভূত অর্থাৎ আকাশ, জল, তেজ, বায়ু, পৃথিবী এই পঞ্চমহাভূত এবং চেতনা ধাতু—এই ষড়-ধাতুর সমষ্টিকেও চরকসংহিতায় পুরুষ বলে অভিহিত করা হয়েছে — খাদয়শ্চেতনাষষ্ঠা ধাতবঃ পুরুষঃ স্মৃতঃ।^{২৫} চক্রপাণি চরকসংহিতার টীকায় চেতনা বলতে ‘মনসংযুক্ত আত্মাকে’ বুঝিয়েছেন। চক্রপাণির এই ব্যাখ্যানানুসারে,

যে আত্মা পুরুষ শব্দের দ্বারা উক্ত হয় তাকেই চেতনা বলে।^{২৬} এই চেতনাকে স্থান বিশেষে ব্রহ্মা বা অব্যক্ত ব্রহ্মরূপে অভিহিত করা হয়েছে। এজন্য চরকসংহিতায় আমরা দেখতে পাই — পৃথিবী, জল, তেজ, বায়ু, আকাশ ও অব্যক্ত ব্রহ্ম একত্রে মিলিত হলে পুরুষ বলে অভিহিত করা হয় — পৃথিব্যাপ্তেজো বায়ুরাকাশঃ ব্রহ্ম চাব্যক্তমিতি এত এব চ ষড়্-ধাতুবঃ সমুদিতাঃ 'পুরুষ' ইতি শব্দং লভন্তে।^{২৭} এই পুরুষের মূর্তি হচ্ছে পৃথিবী, ক্লেদ হচ্ছে জল, সন্তান হচ্ছে তেজ, প্রাণ হচ্ছে বায়ু, ছিদ্রসমূহ হচ্ছে আকাশ এবং অন্তরাঙ্গা হচ্ছে ব্রহ্মা-পুরুষস্য পৃথিবী মূর্তিরূপঃ ক্লেদঃ, তেজোহভিসন্তাপঃ, বায়ু প্রাণঃ, রিয়ৎ সুবিরাদি, ব্রহ্মা অন্তরাঙ্গা।^{২৮} এই ছয় ধাতুর সমন্বয়ে গঠিত পুরুষ সাংখ্যদর্শনেও অনুমোদিত, একথা চরকের উক্তি থেকে পাওয়া যায়। তাই ষড়্-ধাতুর সমন্বয়ে গঠিত পুরুষকেও রাশিপুরুষ বলা হয়ে থাকে—

ষড়্-ধাতুজস্ত, পুরুষো রোগাঃ ষড়্-ধাতুজাস্তথা
রাশিঃ ষড়্-ধাতুজো হ্যেষ সাংখ্যৈরাদ্যৈঃ পরীক্ষিতঃ।^{২৯}

একক পুরুষ: অনেকে পুরুষকে চতুর্বিংশতি ধাতুজ ও ষড়্-ধাতুজ পুরুষ বলে গণ্য করা ছাড়াও এককভাবে চেতনাধাতুকেও পুরুষ বলে গণ্য করেছেন—চেতনাধাতুরপ্যেকঃ স্মৃত পুরুষসঙ্ককঃ।^{৩০} চরকসংহিতার টীকাকার চক্রপাণি দত্ত কিন্তু ভিন্নমত পোষণ করেন। তার মতে কেবলমাত্র চেতনা ধারণ করে রয়েছে যে পুরুষ সে পুরুষ দর্শনের পুরুষ হতে পারে কিন্তু সে পুরুষের তো চিকিৎসা করা যাবেনা। চিকিৎসাবোগ্য হতে পারে একমাত্র ষড়্ধাতুবিশিষ্ট পুরুষ—তেন ন চেতনাধাতুরূপঃ পুরুষচিকিৎসায়ামনভিপ্রেতঃ কিন্তু শাস্ত্রানু তরব্যবহারানুরোধাদিহাপ্যয়ং পুরুষশব্দো সঞ্জিত ইতি দর্শয়তি, চিকিৎসা বিষয়বস্তু ষড়্ধাতুক এব পুরুষঃ।^{৩১}

চরকসংহিতায় প্রকৃতি তত্ত্বের প্রভাব: চরকসংহিতায় প্রকৃতির স্বরূপ সম্পর্কে একটাই কথা বলা হয়েছে — বিকারো ধাতুবৈষম্যং সাম্যং প্রকৃতিরচ্যতে, সুখসংজ্ঞকমারোগ্যং বিকারো দুঃখমেব চ।^{৩২} অর্থাৎ ধাতুদের মধ্যে যে বৈষম্য দেখা যায়, তার নাম হচ্ছে বিকার বা রোগ। এদের যখন সমভাবে অবস্থান করতে দেখা যায়, তখন তার নাম হলো প্রকৃতি বা আরোগ্য। আরোগ্য নামই সুখ এবং রোগের নামই দুঃখ। টীকাকার চক্রপাণি দত্ত আয়ুর্বেদ-দীপিকা টীকায় বলেছেন যে—বায়ু প্রভৃতি এবং রস প্রভৃতির সাম্যাবস্থায়ই হলো প্রকৃতি।^{৩৩} অব্যক্ত হচ্ছে মূল প্রকৃতি। অহংকার হচ্ছে বুদ্ধির বিকার। এই বিকার হচ্ছে তিন প্রকার-ভূতপ্রকৃতি, তৈজস্ এবং বৈকারিক। প্রাণীদের স্থাবর জঙ্গম প্রকৃতি হলো ভূতপ্রকৃতি এবং সেখানে অব্যক্ত প্রকৃতিই শ্রেষ্ঠ। বুদ্ধি প্রভৃতি নিজকারনে বিকৃতিরূপা হলেও এবং নিজকার্যের অপেক্ষায় প্রকৃতিরূপে বিবেচিত হয় বলে তাকেও প্রকৃতি বলে। সাংখ্যদর্শনের তৃতীয় কারিকার ব্যাখ্যায় মূলপ্রকৃতি শব্দের অর্থ নিরূপণ প্রসঙ্গে বাচস্পতি বলেছেন।^{৩৪}

এই আলোচনা শেষে বলা যায়, সাংখ্যমতে পুরুষ সত্য ও বহু। প্রকৃতি ও সত্য। জগৎ সেই প্রকৃতির পরিণাম। সুতরাং সাংখ্যমতে জ্ঞানের কর্তা ও জ্ঞেয়পদার্থ উভয়ই সত্য, মিথ্যা নয়। চরকসংহিতায়ও পুরুষ বহুত্বের বর্ণনা সরাসরি না হলেও একের অধিক পুরুষের বর্ণনা পরিলক্ষিত হয়। সাংখ্যদর্শনে আমরা জানি যে, জন্ম-মরণ-করণ প্রভৃতির ভিত্তিতে সেখানে পুরুষবহুত্ব স্বীকৃত হয়েছে- জন্মমরণকরণানাং প্রতিনিয়মাদয়গপত প্রবক্তেশ্চ পুরুষবহুত্বং সিদ্ধং ত্রৈগুণ্য বিপর্যয়াচ্চৈব।^{৩৫} কিন্তু নিত্য শুদ্ধ বুদ্ধ মুক্ত

পুরুষের জন্মমরণাদি কিছুই নেই। উপাধিভেদেই পুরুষের বহুত্ব হয়েছে।^{৩৬} আকাশ এক হলেও ঘট, পট, প্রভৃতি উপাধিভেদে ঘটাকাশ, পটাকাশ ইত্যাদি বলা হয়। তেমনি স্বরূপতঃ পুরুষ এক হলেও দেহাদি উপাধিভেদেই তার ভেদ। সাংখ্যদর্শনে যেমন — পুরুষের অধিষ্ঠান ছাড়া প্রকৃতি ক্রিয়া করতে সক্ষম হয় না, পুরুষের অধিষ্ঠান বশতঃই মহাদিক্রমে প্রকৃতির পরিণাম ক্রিয়া শুরু হয়। অনুরূপভাবেই চরকসংহিতায় অভিব্যক্তিক্রিয়ার পুরুষের অধিষ্ঠান স্বীকৃত হয়েছে। সাংখ্যদর্শনের মতোই মহাদিক্রমে সৃষ্টিতত্ত্বের বর্ণনা চরকসংহিতায় পাওয়া যায়। সেখানে বলা হয়েছে—অব্যক্তং মূলপ্রকৃতিঃ অহঙ্কারো বুদ্ধিবিকারঃ, স চ ত্রিবিধো ভূতাদিস্তৈজসো বিকারিকশ্চ ভূতানাং স্থাবরজঙ্গমানাং প্রকৃতিভূতপ্রকৃতিঃ। তত্র চাব্যক্তং প্রকৃতিরৈব পরম্।^{৩৭} প্রকৃতির এই অভিব্যক্তিক্রিয়া সাংখ্যদর্শনে বর্ণিত অভিব্যক্তি ক্রিয়ার অনুরূপ। এই আলোচনা থেকে সিদ্ধান্ত করা যায় যে, সাংখ্যের পুরুষত্ব ও প্রকৃতিতত্ত্ব চরকসংহিতায় যথাযথভাবে প্রতিফলিত হয়েছে।

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ISSN 2789-4258

Journal of History & Civilization

Volume 1

Number 1

July-December 2020



DEPARTMENT OF ISLAMIC HISTORY & CULTURE

Faculty of Arts

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Dhaka-1100

Indigenous People: Evolution of Concept and Rights in Post-Colonial International Phenomena

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Abstract: In the post-colonial era, democratic pluralistic societies and nation-states developed, along with the concept of human rights. Holding hands of postmodern thinkers, international organizations such as the International Labour Organization and the United Nations continued to be driven by the notion of pluralistic human rights. As a result, issues such as international law, human rights, protection of marginalized people, etc., have become international issues, in which the protection of tribes and their rights became one of the issues in the international arena. In this research paper, I shall discuss how the protection of the rights of the people, who were accustomed to a somewhat primitive and natural way of life and maintained their own characteristics across the region, became important in the international arena and what were their rights. On the other hand, environmentalist thinkers felt the urge to protect their way of life, keeping in mind the protection of the environment because the tribes have been protecting the environment for a long time in pursuit of their own way of life and in the mainstream society and state system, whenever they wanted to violate their way of life and rights, they have become protesters. thus the tribal environmentalist movement has developed.

Methodology: In composing this article, a comparative discussion of various research papers and various declarations of the international laws, the United Nations and the International Labour Organization regarding the tribes have been intensively tried and evaluated.

Objective: The principal objective of this study is to create an idea in the readership about the tribes and their rights, to create the model of a society that is in harmony with the pluralistic society and environment. In today's society, human rights violations, environmental destruction, marginalization of surfaced people, etc. are becoming common phenomena all over the world, then the more the researchers and academicians discuss such issues, the more the issues like protection of rights, respect for citizens, protection of marginalized people, protection of environment will increase.

Interdiction: Debating tribes and tribal beings have attained quite significant in today's discussions of social science. They are referred to by varied nomenclature

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created political pressure in favour of these demands. These demands were raised in the conference of the International Human Rights Commission in 1993. Countries, whose interests may be harmed by this law (specially the colonial countries), claimed it to be unfair and they protested against it.²⁷

The principal demands of these movements were of self-control and self-determination. Because they had been incurred in the trap of colonialism for many days and the colonial rulers were constantly violating their self-control. The tribes are socially, culturally and politically a completely new race. Continuing this system of governance based on the idea of another nation violates their human rights. However, their demand for self-determination is not consistent with their demand for a new nation-state. Woodrow Wilson was the first to talk about the subject as the Right to Self-Control in 1918. After this, the issue had been discussed in the 1st and 55th Section of the San Francisco Conference of the United Nations in 1945.²⁸ But the conference did not say who were entitled to self-determination. In later period, a discussion was conducted in the Human Rights Conference of the United Nations elaborately in 1941. 'The General Assemblies on Declaration on the Greeting of Independent Countries to Colonial Countries and Peoples' was established in 1966, which worked a great deal respecting this issue.

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Pratidhwani the Echo

A Peer-Reviewed International Journal of Humanities & Social Science

ISSN: 2278-5264 (Online) 2321-9319 (Print)

Impact Factor: 6.28 (Index Copernicus International)

Volume-X, Issue-I, October 2021, Page No.01-07

Published by Dept. of Bengali, Karimganj College, Karimganj, Assam, India

Website: <http://www.thecho.in>

শ্রীশিক্ষা: নারীমুক্তি ও ঈশ্বরচন্দ্র বন্দোপাধ্যায়-একটি পর্যালোচনা

ড. সুজিত মণ্ডল

সহকারী অধ্যাপক, ইতিহাস বিভাগ, মহিষাদল রাজ কলেজ, মহিষাদল, পূর্বমেদিনীপুর, পশ্চিমবঙ্গ

Abstract:

women in India were deprived for education privileges for centuries, but there were always some expectations to this general condition. It is difficult to determine the exact extent of education imparted to women during the early Vedic period in India. Uponayana ritual was obligatory for girls, and this must have ensured the imparting of a certain amount of Vedic and literary education to the girls of all classes. But female education received a great setback during later vedic period primarily owing to the deterioration of religious status of women. During the Medieval period women education was constrained because Muslim men were also subjected to low educational attainment in general. The reawakening of India was started with the efforts of Ram Mohan Roy. After that Iswarchandra vidyasagar also took a leading role in that field. At the outset Christian missionary had started English education in India. Systematic female education was started in India with the efforts of Baptist Mission Society in 1819. Vidyasagar was also a fully supporter of female education by improving the condition of Indian. He took an important role to spread education among women with the help of Sir J.E. Drinkwater Bethune. He established 35 female schools with an average total attendance of 1300 girls in four districts. Besides, Vidyasagar was appointed as Honorary Secretary of Bethune School Committee for the progress of this school. Miss Mary Carpenter also helped vidyasagar to spread education among women in India. After Independence of India, government has taken various measures to provide education to women. As a result, women's literacy rate has grown over the three decades and the growth of female literacy has in fact been higher than that of male literacy rate.

Keyword: Renaissance, Intellectual, Systematic, Supervision, Vedanta, Compound, Missionaries, Idealism, Moderity, Vernacular, Superstitions, Emancipation, Enegetic, Impulse, Inspector, Committee, Philanthropic, Acquaintance, Superintendent, Lieutenant.

ভূমিকা: সৃষ্টির উষালগ্ন থেকেই ক্রিয়াকলাপ, পোশাক-পরিচ্ছদ, বিবাহ প্রভৃতি ক্ষেত্রে নারী ও পুরুষ -উভয়ের মধ্যে সুস্পষ্ট বিভাজন পরিলক্ষিত হয়। মাতৃতান্ত্রিক সভ্যতা রূপে পরিচিত সিন্দু সভ্যতায় নারীর প্রাধান্য থাকলেও বৈদিক ও বেদান্তের যুগ থেকে (পিতৃতান্ত্রিক সমাজে) পুরুষের প্রাধান্য স্থাপিত হলে নারী ক্রমশ অন্তঃপুরবাসী হয়ে পড়ে। বৈদিক ও বেদান্তের যুগ থেকে স্মৃতিশাস্ত্রকারগণ পুরুষ ও নারীর মধ্যে সম্পর্ক, বিবাহ সম্পর্কিত রীতিনীতি, শিক্ষা, সম্পত্তির অধিকার প্রভৃতি বিষয়ে বিধান দিয়েছেন এবং বিভিন্ন যুগে সমকালীন সমাজে বাস্তব পরিস্থিতি অনুযায়ী

বিধানগুলি ক্রমশ পরিবর্তিত হয়েছে।¹ প্রাচীন ও মধ্যকালীন ভারতে বালিকাদের গুরুগৃহে পাঠিয়ে অনেকেংশে শিক্ষাদানের রীতি প্রচলিত না থাকলেও প্রাচীনকালে গাণ্ডী, মৈত্রী, অপালা, লোপামুদ্রা প্রমুখ বিদুষী রমণীর কথা জানা যায়; যারা স্বচেষ্টায় জ্ঞানতাপস পিতা, মাতা ও স্বামীর সহযোগিতায় বাড়িতে বসে জ্ঞান অর্জন করেছেন। মধ্যযুগেও নারীদের স্বাধীনতা এবং অধিকার ক্রমশ সংকুচিত হয়েছে। প্রাচীন ও মধ্যকালীন ভারতে সমাজপতিরা স্ব স্বার্থে একের পর এক বিধি নিষেধ দ্বারা নারীজাতিকে কুসংস্কারের জালে আবদ্ধ করেছে।²

ঔপনিবেশিক শাসনে পাশ্চাত্য সভ্যতার সংস্পর্শে এসে বাঙালি মধ্যবিত্ত সমাজে এক আধুনিক দৃষ্টিভঙ্গির উদ্ভব ঘটে এবং এর প্রধান ভিত্তি ছিল যুক্তি ও মানবতাবাদ-যা সমকালীন শিক্ষা, সাহিত্য, ধর্ম ও সমাজকে গভীরভাবে প্রভাবিত করে। নবসৃষ্ট বঙ্গ সমাজে পাশ্চাত্য সভ্যতা ও শিক্ষা প্রসারের মাধ্যমে নারীশিক্ষা ও নারীর অধিকার প্রতিষ্ঠার আন্দোলন ধীরে ধীরে গড়ে ওঠে।³

ভারত পৃথক রাজা রামমোহন রায়ের আবির্ভাবের (১৭৭২ মতান্তরে ১৭৭৪ খৃষ্টাব্দে) প্রায় অর্ধশতাব্দী পর যুক্তিবাদী, বিজ্ঞানমনস্ক, মানবতাবাদী ঈশ্বরচন্দ্র বিদ্যাসাগরের জন্ম হয় ১৮২০ সালের ২৬ সেপ্টেম্বর তৎকালীন ছগলী জেলার এবং বর্তমানে পশ্চিম মেদিনীপুর জেলার বীরসিংহ গ্রামে ঠাকুরদাস বন্দ্যোপাধ্যায় ও ভগবতী দেবীর সন্তান রূপে।⁴ এই সময় নব্যবঙ্গনদের প্রচেষ্টায় বাংলা তথা ভারতে ইংরেজি সাহিত্য, দর্শন, বিজ্ঞান, এবং রাজনীতিতে এক নতুন যুগের সূচনা হয়। মহর্ষি দেবেন্দ্র নাথ ঠাকুর, কেশবচন্দ্র সেন, শিবনাথ শাস্ত্রী নিজ নিজ ক্ষেত্রে অবদান রাখেন। ইউরোপ থেকে আগত আলেকজান্ডার ডাফ, মেরি কারপেন্টার, বেথুন প্রমুখ সংস্কারকণ সমাজের সর্বাঙ্গীণ উন্নতির ক্ষেত্রে আত্মবিকশিত নারীর অসামান্য ভূমিকার গুরুত্ব সম্পর্কে সচেতন ছিলেন। তাঁদের প্রচেষ্টায় সমগ্র ঊনবিংশ শতাব্দী ধরে বাংলায় নারীকেন্দ্রিক বিভিন্ন সামাজিক আন্দোলন সংগঠিত হয়। এই সময় নিজস্ব গুনে উজ্জ্বল ছিলেন বাংলার অমর সন্তান ঈশ্বরচন্দ্র বিদ্যাসাগর। তাঁর শিক্ষা ও কর্ম জীবনের সূচনায় বাংলার ধর্ম ও সমাজ এক যুগসন্ধিক্ষণের মধ্য দিয়ে চলে। হিন্দু ধর্ম খ্রিষ্টান মিশনারিদের প্রবল বিরোধীতার সম্মুখীন হয়। রামমোহন রায় যুক্তি ও মানবতাবাদের উপর হিন্দুধর্মকে প্রতিষ্ঠা করেন ও সকল ধর্ম সমন্বয়ের চেষ্টা করে এর যোগ্য জবাব দেন। রামমোহন রায়ের প্রগতিশীল সংস্কারগুলি রাধাকান্তদেবের নেতৃত্বাধীন রক্ষণশীল হিন্দু সমাজ মেনে নেয়নি। খ্রিষ্টান মিশনারির পাশাপাশি ডিরোজিওর অনুগামী নব্যবঙ্গনও হিন্দুধর্মের কুপ্রথা ও কুসংস্কারগুলির বিরুদ্ধে আন্দোলন শুরু করে। বিদ্যাসাগর যখন সমাজ সংস্কারে প্রবৃত্ত হন তখন বাঙালি সমাজ সম্পূর্ণরূপে কুসংস্কারে আচ্ছন্ন ছিল। ব্রাহ্মসমাজ ও নববঙ্গ-উভয় গোষ্ঠীর সঙ্গে তার সুসম্পর্ক ছিল এবং অনেক ক্ষেত্রে তিনি তাদের সহায়তা করলেও কাদেরও সাথে কখনো ঘনিষ্ঠ হননি। নিজে বিবেক ও বিবেচনা অনুযায়ী তিনি সর্বদা লক্ষ্য ও পথ নির্ধারণ করেন।⁵

রাজা রামমোহন রায় সতীদাহ প্রথা নিবারনে আন্দোলন শুরু করেন। ফলস্বরূপ স্বামী মারা যাওয়ার পর স্ত্রীর বাঁচার অধিকার আছে -এ ধারণায় বশবর্তী হয় নারী সমাজ যদিও এর দ্বারাই নারীর সর্বময় মুক্তি হয়নি। নারীকে কুসংস্কারের বন্ধন থেকে মুক্ত করার জন্য প্রয়োজন ছিল শ্রীশিক্ষা। বাঙালী মেয়েদের মধ্যে পাশ্চাত্য শিক্ষা প্রসারে প্রথম এগিয়ে এসেছিল খ্রিষ্টান মিশনারিগুলি। লন্ডন মিশনারি সোসাইটির সদস্য রবার্ট মে উল্লেখ করেছেন যে, ১৮১৮ খ্রি. লন্ডন মিশনারি চিনসুরাতে একটি বালিকা বিদ্যালয় স্থাপন করে। ১৮১৯ খ্রি. ব্যাপটিস্ট মিশনারি সোসাইটি ভারতে নারী শিক্ষায় অগ্রণী ভূমিকা নেয়। ব্যাপটিস্ট মিশনারি সোসাইটি ১৮১৯ খ্রি. কলকাতায় প্রতিষ্ঠা করে "The Female Juvenile Society"; যার লক্ষ্য ছিল বাঙালি নারী শিক্ষার প্রসার ঘটানো। ১৮২৩ খ্রি. এই সোসাইটি ৮টি বালিকা বিদ্যালয় পরিচালনা করে। ১৮২৮ খ্রিষ্টাব্দের মধ্যে এই প্রতিষ্ঠানটি ১২টি স্কুল পরিচালনা করতে সক্ষম হয়। চার্চ মিশনারি সোসাইটি বাঙালী মেয়েদের শিক্ষার জন্য "Ladies Society" প্রতিষ্ঠা করে এবং ১৮২৪ খ্রি. মধ্যে কলকাতা এবং তৎসংলগ্ন অঞ্চলে ২৪ টি স্কুল পরিচালনা করে। ১৮২৯ খ্রিষ্টাব্দের চার্চ মিশনারির তত্ত্বাবধানে কলকাতা ও শ্রীরামপুর এলাকায় ৪৪৮ জন, ঢাকায় ১৯০ জন, চিটাংগাওতে ১০০ জন এবং বীরভূমে ৯০ জন ছাত্রী অধ্যয়ন করে।⁶

অভিযান আন্দোলন শুরু হয়েছিল তার প্রয়োজনীয়তা আজও ফুরায়নি। নারী শিক্ষা সম্প্রসারণে সরকার অনেকাংশে সফল। আমরা আশাবাদী যে আগামী দিনে নারীরা শিক্ষিত ও সচেতন হয়ে নিজেরাই নিজেদের মুক্তির পথ বেছে নেবে।

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শ্রীশিক্ষা: নারীমুক্তি ও ঈশ্বরচন্দ্র বন্দোপাধ্যায়-একটি পর্যালোচনা

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International Migration of Women from Darjeeling District: The Question of Empowerment

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KEYWORDS Darjeeling. Empowerment. International Migration. Patriarchy. Women

ABSTRACT The phenomenon of migration flows is not a new process in Darjeeling district. It has evolved time and again with diversified patterns in terms of class, caste and gender specifics. Historical evidences addressed in hill studies show that the pattern of migration from Darjeeling district was mainly dominant by the male migrants who were migrating to the metropolitan cities to work in private sectors. But the recent trends in migration from this region are of women migrating independently to work in informal sectors mostly as a domestic worker to countries like Gulf countries, Middle East countries and South East Asian countries. They have become active economic agents as well as inspiration for aspirant migrants in the home country. Thus, on the basis of this context, exploratory research has been conducted in Darjeeling district in an attempt to study the patterns and impact of women's international migration and examine socio-cultural implications that caters towards the empowerment of women in Darjeeling district.

INTRODUCTION

Migration is a universal phenomenon concerning people's movement from one place to another for multiple reasons and having manifold connotations. International Organisation for Migration defines migration as, "the movement of a person, whatever its length, composition and causes, and it includes migration of refugees, displaced persons, economic migrants and persons moving for other purposes, including family reunification" (Bhardwaj and Sawant 2015). Donald (1979) defines migration as a "rationally planned action, which is the result of conscious decisions taken after a consideration or calculation of the advantages and disadvantages of moving and staying". In the simplest form, international migration can be defined as the movement of people across borders and staying in the host country on a temporal or permanent basis.

Conceptualising the historical trend of migration, the phrase "migrants" was used only as a code for male migrants while women migrants have always been linked with marriage and other associational reasons. While, with the oil boom in Gulf countries, the emergence of newly industrialising economies, expansion of the service economy, high demand of skilled and unskilled labour in the developed regions has intensified a much broader pattern of international

migration incorporating women migrants as well. Apparently, females represent half of the international migrants in developed regions whereby "the phrase feminisation of migration" is gaining prominence in the field of research studies.

Of the above issues of significance, international migration from Darjeeling District is a topic worth studying. International migration from this region is readily enforced and reshaped by the radical changes in the demographic pattern during the last one hundred and fifty years. The structural changes of the region are concomitant with the historic migration between and from neighbouring countries with the resultant effect of colonial regime during the early and mid-nineteenth century¹. The widespread influx of Nepalese of Nepal has not only affected the socio-economic profile of the region but also constantly blurred their (Indian Nepalese) national identities and thwarted their protracted demand of autonomy (Gorkhaland Movement), which has been a controversial issue till date. By the time of the second Census of India in 1881, the Nepalese formed the absolute majority not only in the three hill sub-divisions but also in the whole district of Darjeeling" (Dasgupta 1999).

Moreover, if one looks at the socio-economic profile of Darjeeling district, half of the population is agriculturist and majority of them are engaged in tea plantation works. Since its in-

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Paper received for publication in July, 2020
Paper accepted for publication in August, 2020

সমতা ও বৈষম্য : নৈতিক সমীক্ষা

বরুণ কুমার ঘোষ

বর্তমান শতাব্দীর সবচেয়ে আলোড়ন সৃষ্টিকারী নৈতিক সমস্যাগুলির মধ্যে একটি হল মানুষে মানুষে বৈষম্য। যদিও নৈতিক সমস্যাগুলির অধিকাংশ আজও বিতর্কিত। ভারতীয় সংবিধানে 'সমতার অধিকারকে' একটি মৌলিক অধিকার বলা হয়েছে এবং এও বলা হয়েছে এই অধিকার প্রত্যেক নাগরিকের অবশ্যই উপভোগ করা উচিত। এর অর্থ হল জাতি, ধর্ম, লিঙ্গ, বর্ণ ও শ্রেণীগত কারণে কোন বৈষম্য ছাড়াই আইনের চোখে সবাই সমান। তারপরও যদি আমরা আমাদের চারপাশে তাকাই তাহলে আমরা দেখতে পাব যে আমাদের সমাজে প্রকট বৈষম্য রয়েছে। 'সমতার অধিকার' নীতিটি বর্তমানে রাজনৈতিক, সামাজিক ও অর্থনৈতিক গোঁড়ামির অংশ বিশেষে পরিণত হয়েছে। কিন্তু আমরা জানি মানবাধিকারের অধিকারত্বের প্রক্ষে 'সকল মানুষ সমান'। তাই অধিকারের দিক থেকে যে সকল মানুষ সমান এবং মানুষের মধ্যে যে বৈষম্য রয়েছে এবং সেই বৈষম্য দূর করবার প্রয়োজন আছে কি না - এটি একটি নৈতিক আলোচনার বিষয় হতে পারে।

'মানবাধিকার' কথাটি সাম্প্রতিককালে প্রচলিত। এই কথাটি পূর্বে 'প্রাকৃতিক অধিকার' এবং 'সুশীল সমাজের অধিকার' নামে পরিচিত ছিল। প্রাচীন গ্রিক যুগে মানবাধিকারের আদিরূপ প্রাকৃতিক বিধি থেকে নিঃসৃত প্রাকৃতিক অধিকারের পদচিহ্ন হিসাবে পাওয়া গেলেও মূলত টমাস হবস, জন লক ও টমাস পেইন - এর লেখায় প্রাকৃতিক অধিকারের স্বপক্ষে জোরালো যুক্তির উল্লেখ পাওয়া যায়। প্রাকৃতিক অধিকার পরম্পরার শেষের দিকে ১৭৮৯ সালে ফরাসি বিপ্লবের পর 'Declaration of the Rights of Man and the Citizen' জারি হয়, যেখানে টমাস পেইন - এর ঘোষিত অধিকারগুলি স্থান পায় যা পরে সার্বজনীন মানবাধিকার ঘোষণা পত্রের স্থান পায়।

মানুষ হিসাবে যে প্রাণী জন্মগ্রহণ করেছে সে তার মনুষ্যত্বের অধিকারে কতকগুলি অধিকার নিয়েই জন্মগ্রহণ করেছে। যে অধিকারগুলি তার জন্মসূত্রে প্রাপ্ত এবং এই অধিকার থেকে কোনভাবেই তাকে বঞ্চিত করা সম্ভব নয়। কারণ সমস্ত মানুষই জন্মসূত্রে সমান মর্যাদা ও অধিকারসম্পন্ন। এই প্রসঙ্গে Recharad Wasserstorm তাঁর 'Rights-Human Rights' নামক নিবন্ধে মানুষের অধিকারের

চারটি বৈশিষ্ট্যের উল্লেখ করেছেন। যথা - (১) 'মানুষের অধিকার' সব মানুষের সাধারণ অধিকার এবং কেবলমাত্র মানুষেরই অধিকার। (২) সাধারণ অধিকার হওয়ায় 'মানুষের অধিকারের' প্রতি সব মানুষের সমান অধিকার। (৩) পদাধিকারের জন্য, সমাজে ব্যক্তির বিশেষ ভূমিকার জন্য মানুষ কতকগুলি বিশেষ বিশেষ সুবিধার দাবীদার হলেও 'মানুষের অধিকার' থেকে তাদের কেউ বঞ্চিত হয় না। (৪) পদমর্যাদা বা প্রতিষ্ঠার ওপর নির্ভরশীল না হওয়ায় 'মানুষের অধিকার' অপরের ইচ্ছা-অনিচ্ছার ওপর, সম্মতি-অসম্মতির ওপর নির্ভরশীল নয়। অপরের ইচ্ছা ও সম্মতির বিরুদ্ধেও 'মানুষের অধিকারের' প্রতি প্রত্যেক মানুষের দাবী চূড়ান্ত। অর্থাৎ অধিকারগুলির দিক থেকে প্রত্যেক মানুষ সমান। কিন্তু আমরা লক্ষ্য করছি যে বর্তমান সভ্য সমাজে জাতি-ধর্ম-লিঙ্গ ও বর্ণ ভেদে মানুষের মধ্যে নানাভাবে বৈষম্য করা হচ্ছে, যা নৈতিক দিক থেকে সমর্থনযোগ্য নয়।

বর্তমান সভ্য সমাজে মানবাধিকার রক্ষার জন্য অনেক আইন প্রণীত হয়েছে। ইংল্যান্ডে ১২১৫ সালে 'Magna Carta', অষ্টাদশ শতাব্দীতে আমেরিকায় 'Bill of Rights' এবং ঊনবিংশ শতাব্দীতে বিভিন্ন স্বাধীন রাষ্ট্র আইনের দ্বারা মানবাধিকার সংরক্ষণের চেষ্টা করেছে। সম্মিলিত জাতিপুঞ্জই সর্বপ্রথম ঘোষণা করেছে মানুষের সমতার কথা। পরবর্তীকালে মানবাধিকারের বিশেষ বিশেষ দিকের উপর গুরুত্ব দিয়ে কয়েকটি আনুষ্ঠানিক ঘোষণাপত্র গৃহীত হয়। যেমন অর্থনৈতিক, সামাজিক ও সাংস্কৃতিক অধিকার বিষয়ে ১৯৬৬ সালে আন্তর্জাতিক ঘোষণাপত্র গৃহীত হয়। এই ঐতিহাসিক দলিলগুলি সারা বিশ্বে মানবাধিকার রক্ষা ও মানবাধিকারের দাবি পূরণের মৌলিক ভিত্তি। সমস্ত মানুষই যদি জন্মসূত্রে সমান হয় তাহলে সকলেরই - জীবনের অধিকার, স্বাধীনতার অধিকার, মতপ্রকাশের অধিকার, আইনের সামনে সমবিচারের অধিকার, শিক্ষার অধিকার ইত্যাদি - এই সমস্ত অধিকার থাকা উচিত। অর্থাৎ অধিকারের দিক থেকে প্রত্যেক মানুষ সমান এটি একটি নৈতিক দাবী বলে গণ্য হতে পারে।

অনেকে এখানে আপত্তি করতে পারেন যে সকল মানুষ কোন অর্থে সমান এবং কোন মানদণ্ডের ভিত্তিতে আমরা সকল মানুষের সমতা প্রমাণ করতে পারি? কারণ বর্ণভেদ, লিঙ্গভেদ, সামর্থ্য বা যোগ্যতা ভেদে সকল মানুষ কখনো সমান হতে পারে না। কোন মানুষ দীর্ঘ, কোন মানুষ খাটো, কোন মানুষের বুদ্ধি বেশী, কোন মানুষের বুদ্ধি কম, কোনো মানুষ কৃষিতে পারদর্শী আবার কোন মানুষ শিল্পসৃষ্টিতে দক্ষ ইত্যাদি।

এই প্রসঙ্গে Peter Singer তাঁর 'Practical Ethics' গ্রন্থে রলস - এর বক্তব্যের উল্লেখ করেছেন। সকল মানুষের সমতাকে রলস এক ধরণের পরিবৃত্তিগুণের পরিপ্রেক্ষিতে ব্যাখ্যা করেছেন। একটি বৃত্তের অভ্যন্তরে যত বিন্দু আঁকা যায় সেই সমস্ত বিন্দুকেই পরিবৃত্তিও বলা যাবে। "কিছু কিছু বিন্দু কেন্দ্রের

সংবেদনশীল বিষয় তাই এটিকে যত্নসহকারে এবং সতর্কতার দ্বারা আরোপিত করা উচিত। সংরক্ষণ নীতির সুযোগ কাউকে দেওয়ার আগে বিশেষভাবে মনোনেওয়া প্রয়োজন যে যাকে অগ্রাধিকার দেওয়া হচ্ছে সে বাস্তবিক বৈষম্য নীতির প্রয়োগ হওয়ার ফলে বঞ্চিত হয়েছিল কি না। যাইহোক বর্তমান পরিস্থিতিতে সমাজের কিছু শ্রেণী সংরক্ষণ নীতির সুযোগ লাভের বিপক্ষে মতামত প্রকাশ করছেন। কারণ সংরক্ষণ নীতি প্রত্যেক ব্যক্তির কাছে প্রধানত দেশের যুব শক্তির কাছে একটা বাধা হয়ে দাঁড়িয়েছে তাদের নিজেদের উৎকর্ষতা অর্জনে। রাজনৈতিক দলগুলি এই নীতিকে অস্ত্র হিসাবে ব্যবহার করেছে ভোট পাওয়ার জন্য। এই দরকষাকষিতে সংখ্যাগরিষ্ঠের সুযোগ সুবিধা থেকে বঞ্চিত হচ্ছে। এটি এমন একাধিক নীতি যেখানে একজন যোগ্য ছাত্র সংরক্ষণের কারণে তার সুযোগ হারাচ্ছে। এজন্য সাম্প্রতিক মহামান্য সুপ্রীম কোর্ট সংখ্যাগরিষ্ঠদের জন্য, যারা আর্থিকভাবে পিছিয়ে, তাদের জন্য ১০% সংরক্ষণের ব্যবস্থা করেছে। তাই আমার মনে হয় বর্তমানে পরিবেশের উপযোগী করে তোলার জন্য সংরক্ষণ নীতির পুনর্মূল্যায়ন প্রয়োজন।

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REPRESENTATION OF TRIBAL WOMEN, MARGINALITY AND TRANSFORMATION IN HANSDA SOWVENDRA SHEKHAR'S *THE MYSTERIOUS AILMENT OF RUPI BASKEY*

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Abstract

India, being a culturally diverse country, treasures numerous ethno-cultural communities. Santhal community is one of them, due to their sizeable population. Santhals of Chotanagpur region, like any other tribal community believes in numerous myths and legends, often these beliefs consider 'mysterious' and beyond the border of reason, 'dahni-bidya' or witchcraft is one of them. This eerie knowledge of spirits is practiced by few Santhal women to gain benefit from others by causing them harm. The damaging nature of such knowledge made Santhals avoid those women who participate in it, thus making them socially marginalized in their own community. On the other hand Santhals have their own set of socio-cultural and religious practices which considered under-civilized by main-stream Indians, consequently making them unequal 'other' and marginalized.

*Both the socio-ethnic marginalization of the tribals due to cultural difference outside the border of the community, and the marginalization of the women empowered by the knowledge of witchcraft inside the community find sharp literary representation in Hansda Sowvendra Shekhar's debut novel *The Mysterious ailment of Rupi Baskey* (2014). The present paper will focus on the portrayal of the Santhal women who are the victims and practitioners of 'dahni-bidya' and marginalization as well as those who are benefitted by such practices. The paper will further convey how globalization has influenced the lives Santhals women and the future of 'dahni-bidya' in the age of 'modern' medical sciences as represented in the novel.*

Key words: Ethno-cultural difference, Tribal culture, Marginality, Transformation etc.

Tribal culture treasures numerous myths, legends and folklores. Epistemologically, the socio-cultural practices in tribal are often shaped by so-called 'mysterious' beliefs which seem to be rooted beyond the border of logic and reason. People of the Santhal tribal community, like

issue of marginality becomes less severe as it was earlier. As Rupi, with the assurance of the ending of witchcraft over her family, curls up to sleep and then slips into a dream of wish fulfillment and prosperity, Hansda's narrative excels in creating a space where ailment could only be replaced by happiness and a dream of peace.

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Acronym used:

MARB – *The Mysterious Ailment of Rupi Baskey*

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The Sacred and the Secular: Post-Colonial Mythopoeia and Cultural Identity in R. K. Narayan's *The Man-eater of Malgudi*

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ABSTRACT

In the post-colonial Indian Anglophone literary scenario, the urge to represent a distinctly Indian cultural identity is the effect of both modernist experimentation and a nationalist assertion. Mythopoeia, mainly a post-religious literary aesthetic, becomes a favourite trope for certain Indian litterateurs, as it conveys an intermediate perspective between the doctrinal sacred and the liberal secular. The retelling of ancient Indian myths in the context of contemporary post-colonial reality becomes trendy in literary imagination and functional in asserting an Indian cultural identity in the second half of the previous century. To bring home the point, I would consider R.K. Narayan's *The Man-eater of Malgudi* as a case study, which, in the words of John Thieme, is the "most mythic novel" (120) among all the fourteen novels he has written. This paper would explore Narayan's dexterous and subtle use of religio-cultural references from ancient Indian mythology as found in the epics and the Puranas, and establish the point that Narayan's mythopoeic treatment is essentially secular. This paper attempts to challenge the superficial reception of the character of Vasu as archetypally "demonic," as Nataraj's assistant Sastri finds him. Even Vasu's death at the end of the novel, which Sastri finds resembling the destruction of the mythical Bhasmasura in the 'Shiva Purana', may be seen from a post-religious perspective: justifying the death of the despicable. This paper finally aims to establish that Narayan's representation of Indian cultural identity relies more on the minute delineation of the Malgudi society, its culture and people rather than on Nataraj's campaign of the 'sacred'.

Keywords: Sacred, Secular, Mythopoeia, Post-colonial, Cultural Identity

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