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Research Paper

Seasonal Variation in The Hydrobiology of River Ganga At Brijghat (J.p. Nagar), India

Zoology

KEYWORDS :

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Rivers are the important water resources and are being used for various purposes viz; drinking, irrigation and recreation. All great civilization of the world evolved around the rivers (Madhuri2004, Balasankar2000). Rivers play an important role in the development of nation and sustenance of life, which are being polluted due to rapid industrialization, urbanization and other development activities(Alam & Pathak 2010). The quality of river water as determined by its physical and chemical constituents is of great importance in determining its suitability for a certain use such as public water supply, irrigation, industrial application etc (Dwivedi and Pathak, 2007).

Pilgrimage to religious places of special importance are usual and normal for the average Indian. It is stated that according to Indian cultural heritage one has to visit various Tirtha (pilgrim center) to earn virtue. Brijghat is one of such famous pilgrim center where people crises-cross of the country and nearby areas being attracted and come for their aesthetic satisfaction. The holy Ganga signifies the importance of Brijghat as a place of religious importance and ultimately it has got a position in the tourist map of India and thought as a place of religious tourism, which hosts several religious festivals throughout the year. A number of castes and communities are involved, directly or indirectly, in the sphere of religious pilgrimage activities in Brijghat playing their respective roles at their own levels. Every year in the month of June/July/August (The Solar month of Cancer) known as Shravan month of Hindu calendar beginning from new moon day, the auspicious fortnight of Kanwar Mela is held in various parts of the country. During the Kanwar Mela, thousands of Hindu pilgrims from the neighboring states visit Brijghat to have a holy dip in River Ganga. Ritually they also carry the holy water of Ganga in small pitchers kept in two baskets fitted to a semicircular bamboo carrier, called Kanwar, to offer (pour) over the head of the Lord Shiva (Shivalingam) either at one of the most famous Shiva temple located in their region / native village or city. This mostly they do as an oath in fulfillment of any of their desire, pledged to Lord Shiva. It can be pledge in anticipation, for a better future or prospects of coming event. The holy Ganga water is offered to Lord Shiva on the 14th day of Lunar dark fortnight, in the Solar month of Cancer. The Kanwar Mela is one of the most famous sacred events in Brijghat and receives around 3.0 to 5.0 lakh pilgrims during a course of 15 days. This massive influx in the number of pilgrims not only exerts a heavy burden on the total socio-economic, sanitary, health-hygiene but also degrade the quality of ambient environment i.e., life supporting systems of nature. This leads to the high number of patients of water and food borne diseases during mass gathering events like Kanwar Mela on account of worsened conditions of Environment.

The degree of pollution is generally assessed by studying physical and chemical characteristics of the water bodies (Mustafa *et a1.*2007 and Sangpal *et al.*2011). The physico-chemical as well as the biological factor of river have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produced in it. The physical factors are water, temperature, water current and turbidity of water, whereas the chemical parameters of river comprise pH, dissolved oxygen, total alkalinity and total hardness of water.

There is lot of work which has been done on river water, ground water and lake water by scientists. Following are few of the many scientists who had worked on water parameters:

Bhatnagar, A. *et al.* **(2016)** studied impact of mass bathing and religious activities on water quality and observed that river water of different sites showing good, medium and poor quality after religious activities. Where the water bodies are large and number of pilgrims are less, water quality is good and the water quality is poor on the small water bodies carrying heavy load of pilgrims. **Matta, G. (2015)** investigated the physico-chemical parameters of Ganga River water at Rishikesh (Uttarakhand) and indicates that most of the physico-chemical parameters from Gangetic River System comparison to ISI and WHO for drinking water, may be suitable for domestic purposes, but it require attention due to drastic changes in climate and increase in pollution in last decade. **Shrivastava,** *et al.* **(2015)** worked on water quality management plan for Patal Ganga river for drinking purpose and health safety. They concluded that river water is affected by industrial, domestic and public wastewater so the water of river can use only after proper treatment for drinking purpose. **Mohammad,** *et al. (***2015)** carried out an assessment on analysis of water quality using limnological studies of Wyra reservoir, Khammam District, Telangana, India. They found that water quality within the acceptable values and water is good for drinking purpose and also acceptable for irrigation and pisciculture purpose. **Shrivastava, A.** *et al.* **(2015)** carried out an assessment on water quality management plan for Patalganga river for drinking purpose and human health safety and revealed that Patalganga river water fall under good to bad quality so it is observed that river water is not fit for drinking purpose. **Watkar, A.M. and Barbate, M.P. (2015)** worked on seasonal variations in physico-chemical properties of Chandrabhaga river in Dhapewada, district Kamleshwar Maharashtra. After study this is concluded that the water of river Chandrabhaga need proper and necessary treatment to avoid contamination of water for drinking purpose. At present the river water is suitable for irrigation and fishery purpose. **Singh** *et al.* **(2015)** studied the water quality assessment of river Ganga health hazard identification and control. They observed that Ganga river water is pollution free from Gangotri to Haridwar but there is deviation in the river water quality due to industrialization and urbanization. **Panwar** *et al.* **(2015)** worked on water quality assessment of river Ganga using remote sensing and GIS techniques and observed that Ganga river water is polluted by using remote sensing technology and revealed the remote sensing technology is excellent for water monitoring in future. **Abir, S. (2014)** worked on seasonal variations in physico-chemical characteristics of Rudrasagar

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wetland-A Ramsar site, Tripura and concluded that the water of Rudrasagar wetland has high concentration of TSS, TDS, nitrate, phosphate etc. This high concentration shows that Rudrasagar wetland is enriched in dissolved nutrients or eutrophicated. **Pawar** *et al.* **(2014)** studied on characterization of ground water using water quality index of Solapur industrial belt in Maharashtra and they observed that water is fit for drinking purpose after proper treatment. **Pandey, R.R. and Dr. Augur, M.R. (2014)** carried out an assessment on study of physico-chemical parameters of Ib river, Jashpur in chattishgarh. They observed good water quality of Ib river and river water is good for agricultural purpose. **Lamare** *et al.* **(2014)** carried out an assessment on ground water quality from dug wells in west Jaintia hills in Meghalaya. They found that dug well water is acidic in nature and the other parameters are within the permissible limits. **Sharma,** *et al.* **(2014)** studied on Effect of Mass Bathing on Water and Sediment Quality of Sagar Island Beach during Ganga-Sagar Mela. They observed that during Ganga-Sagar Mela water is polluted by faecal matter and bacterial load is also observed higher in water sample during Mela. **Gaikwad, S.S and Kamble, N.A. (2014)** carried out an assessment of the Qualitative analysis of surface water of Panchganga river (MS). Different monitoring sites indicates the poor water quality of river Panchganga and confirmed need of necessary efforts to overcome the problem of pollution for maintenance of healthy aquatic ecosystem and its balance. **Kaur, I. and Verma, D.D. (2014)** carried an assessment on physiochemical and microbiological study of river water of Ganga and Yamuna in Allahabad. They investigated the water of river Ganga, Yamuna and Sangam, found that water is to be above the permissible limits and various pathogenic microorganisms also isolated from these rivers water, so they concluded that the water of these rivers is not fit for human consumption without the treatment. **Ahmad, A.B. (2014)** did evaluation of ground water quality index for drinking purpose from some villages around Darbandikhan in Iraq. He concluded that ground water is showing excellent quality of water and fit for drinking purpose without any treatment. **Lodh** *et al.* **(2014)** researched on physiochemical studies of water quality with special reference to ancient lakes of Udaipur city in Tripura. They investigated that lakes water is receiving high number of pollutants from the surroundings so that water of lakes is highly contaminated. It is necessary to take proper steps to prevent the water from contamination. Otherwise in future the lakes water became barren biologically. **Singh, P. (2014)** did study on seasonal variation in physico-chemical parameters of the river Gomti and investigated that river water is not good for domestic purpose. Many activities polluting the river water which deteriorating the water quality of aquatic life. **Gummadi** *et al.* **(2014)** worked on determination of water quality index for ground water of Bapatla, Andhra Pradesh. They analyzed that water of selected sites is safe for drinking and domestic purpose but some of the ground water of the area needs proper treatment before use. **Ramesh, N and Krishnaiah, S. (2014)** carried out an assessment on physicchemical parameter of Bullandur lake and studied that almost water parameters within the permissible limits as per BIS except BOD (biochemical oxygen demand) and COD(chemical oxygen demand) which is found in higher amount. **Mohan** *et al.* **(2014)** worked on physico-chemical analysis of bore-well water of Kurnool environs in Andhra Pradesh and concluded that water needs treatment to minimize the contamination although fit for domestic and drinking purpose. **Salla, S. and Ghosh, S. (2014)** carried out an assessment on of water quality parameters of lower lake in Bhopal. They concluded that the lake water is highly contaminated because it receives sewage and effluents of nearby area, so the water is unsuitable for drinking purpose and there is need for proper drainage facility to protect the water from deterioration. **Mishra, K. and Nayak, R.L. (2014)** carried out an assessment on the study of water pollution in two major rivers in Odisha- Mahanadi and Brahmani, They analyzed the status of pollution of Mahanadi and Brahmani of Odisha and concluded that the sewerage system of nearby town is polluting the Mahanadi whereas Brahmani is polluted by the steel plants and chemical factory effluents. **Kumar, P.** *et al.* **(2014)** carried out an assessment on seasonal variation in physico-chemical properties of Kali river and revealed that water of Kali river is polluted. **Katakwar, M. (2014)** studied the physico-chemical characteristics of Anjan river water in near Pipariya Madhya Pradesh. On the basis of various parameters studied, the water quality analysis indicates that the river water in the Pipariya area is polluted and can serve as a bad habitat for many aquatic animals including endangered species with Narmada River. **Mullai** *et al.* **(2013)** they worked on monitoring of water quality parameters in Uppanar River of Cuddalore District, Tamil Nadu. During this research they observed that the water of Uppanar River is polluted due to continuous discharge municipal and industrial effluents. Increase in pollution concentration leading serious problems to aquatic animals of Uppanar River. **Sahu** *et al.* **(2013)** carried out an research on Impact of urban wastes on the physico-chemical characteristics of Gomti river at Lucknow. They found that the water of Gomti river at different sites is not suitable due to the presence of heavy metals and other pollutants so there is a need for the treatment of river water before using for various purposes. **Das** *et al. (***2013)** carried out an assessment of ground water quality index (WQI) in and around Balgopalpur Industrial Estate in Odisha. They concluded that water is not within the permissible limit so not acceptable for drinking purpose directly. Water need prpoer treatment before consumption specially for drinking purpose. **Rai, B. (2013)** carried out an project on pollution and conservation of Ganga river in modern India. According to this project report, The situation is much better for DO for which at only one site the bathing standard is not met. On the other hand in terms of total coliform count only at one place the bathing standard is met. The count exceeds by many times the bathing standard. **Eknath (2013)** worked on seasonal fluctuations of physico-chemical parameters of river Mula Mutha at Pune and their impact on fish biodiversity. He concluded that Mula-Mutha river is highly polluted due to domestic and industrial effluents. Due to high pollution in river water some species are tolerant and during winter and summer the disappearance of fish fauna is also shown. **Shrivastava, N. (2013)** they studied on deterioration of Machna river due to sewage disposal at Betul in Madhya Pradesh and it was concluded that the sewage water quality is affecting the water quality of Machna river so the water of river is not acceptable for drinking and other purposes. **Arora** *et al.* **(2013)** carried out an assessment on analysis of water quality parameters of river Ganga during Mahakumbh, in Haridwar. They observed that there is increased value of different parameters during and after mass bathing. It highly contaminated the river water so mass bathing is main cause of contamination of river water. **Gangwar** *et al.* **(2013)** carried out an assessment of water quality index of river Ramganga at Bareilly (UP). On the basis of various parameters analyzed in this investigation, it was concluded that the water quality of river Ramganga is unfit for drinking purposes The discharging of domestic and industrial wastewater and also other anthropogenic activities were the main factors for contaminating Ramganga stream. **Das** *et al.* **(2013)** worked on assessment of ground water quality in and around paradeep phosphate limited at paradeep area, Odisha, India. They collected the ground water sample from different locations and investigate. Investigation shows that the water quality is good and water is fit for dinking purpose. **Jena** *et al.* **(2013)** worked on assessment of water quality index of industrial area surface water sample and investigated that surface water can be used for consumption but after proper treatment. **Sharma** *et al.* **(2013)** they studied on monitoring of water quality of Yamuna river at Mathura, U.P.- physico-chemical characteristic. They concluded that water quality of Yamuna river is not within permissible limits so that river water is highly contaminated. **Kumar** *et al.* **(2013)** they carried out water quality assessment of river Gomti

in Lucknow and concluded that water of river Gomti is polluted due to heavy metals. **Kaur, B.J.** *et al.* **(2013)** did study on water quality assessment of river Yamuna in Delhi stretch during Idol immersion and concluded that due to Idol immersion and immersion of puja articles such as polythene bags, flowers, food offerings, decorations, metal polish and plastic sheets, riiver water of Yamuna is highly polluted. **Agarwal and Agarwal (2013)** studied on linear regression and correlation analysis of water quality parameters was carried out in river Kosi at District Rampur in India. They concluded that the validity of regression equation that can used to find the value of one parameter if the value of other is known in same water. **Kale, G.B. (2013)** worked on zooplankton diversity of Danyanganga reservoir near Khamgaon, Maharashtra. He found that the number of fishes is reduced in the reservoir because of low nutrient level in the reservoir and variations in the pH of water. **Khongwir** *et al. (***2013)** worked on physico-chemical and bacteriological analysis of river Umkhrah in Shillong. They concluded that the water of river showing maximum permissible limit of ICMR and WHO and presence *E.coli* indicated that water is polluted with fecal matter so the water of river can cause the health risks to the people. There is a need for control the pollution of river water. **Singh, L.** *et al.* **(2012**) worked on pesticide concentration in water and sediment of river Ganga and observed various toxic heavy metals and pesticides in the river water. These heavy metals and pesticides causing toxic effects in peoples who are consuming Ganga river water. **Shivayogimath,** *et al***. (2012)** he worked on water quality evaluation of River Ghataprabha in India. They concluded that there is a gradual increase in Physico-Chemical parameters of water. This shows to keep the water quality parameters within the permissible limit by taking proper steps. **Akkaraboyina and Raju (2012)** did a comparative study of water quality indices of River Godavari. After this study, they concluded that water of River Godavari, at selected sites (Rajahmundry and Dowlaiswaram), is excellent to good quality and suitable for consumption. **Khan, A.S. and Srivastava, P. (2012)** carried out an assessment on physico-chemical characteristics of ground water in and around Allahabad city and investigated that there is high concentration of salts in the ground water so it is not suitable for drinking and domestic purpose. It needs proper purification treatment before use. **Bajpai, R. (2012)** did comparative study analysis of physicochemical parameters of Hasdeo river barrage and Arpa river water samples of Bilaspur river and studied that Hasdeo river water is good and within the permissible limits but Arpa river water is polluted and not fit for domestic purpose. **Bhadula, S. and Joshi, B.D. (2012)** carried out an assessment of the impact of sewer drains on the main canal of river Ganga within Haridwar city. They concluded that rural community is responsible for the water quality degradation in Ganga river canal. **Parveen** *et al. (***2012)** investigated on physico-chemical properties of the water of river Ganga at Kanpur. They concluded that Ganga water of Kanpur is though fit for drinking purposes yet it need treatment to minimize the contamination especially turbidity and Fe contents. **Rai** *et al. (***2011)** studied of selected water quality parameters of River Ganges at Patna, Bihar. the study indicated that increase water pollution levels in the River Ganga present near urban environment due to discharge of various types of waste water/ sewage/ effluents. **Basawaraja** *et al.* **(2011)** analyzed of water quality using physico-chemical parameters Hosahalli tank in Shimoga district in Karnataka and concluded that all parameters are within the permissible limits so that the tank water is pollution free and suitable for domestic and irrigation purpose. **Sonawane, G.H. and Shrivastava, V.S. (2010)** worked on ground water quality assessment nearer to the dye user industry they observed the drinking water of different sites is to be contaminated and not suitable for drinking purpose **Parmar, K and Parmar, V. (2010)** studied on evaluation of water quality index for drinking purpose of river Subernarekha in Singhbhum district. They observed that river water is excellent to average quality so that main cause of deterioration of river water is industrial effluents, untreated sewage and unprotected river sites. **Bhatnagar** *et al. (***2009)** carried out a research on water quality indices and abiotic characteristics of Western Yamuna canal in Yamunanagar, Hariyana. Their study revealed the high values of various parameters such as; turbidity, conductivity, free CO_2, alkalinity, calcium, hardness, chloride. The hydrobiological conditions of the river is not optimum for survival of aquatic animals and also for domestic purpose. **Samatray** *et al. (***2009)** carried out an assessment of water quality index in Mahanadi and Atharabanki rivers and Taldanda canal in paradip area, India. They concluded in their assessment that the river water of Atharabanki is polluted due to human activities and industrialization. **Ramakrishnaiah** *et al***. (2009)** carried out an Assessment of Water Quality Index for the Ground Water in Tamkur Taluk, Karnataka State. After the study of various parameters they concluded that ground water needs some degree of treatment before using for domestic and various purpose. There is also need for protect the water from contamination. **Jain, C.K** *et al.* **(2009)** carried out an assessment of ground water quality for drinking purpose and studied that water should be properly treated before drinking only for eliminate any kind of disinfection. **Chauhan and singh (2009)** they concluded that the water of river Ganga is not suitable for drinking purpose. Ganga Action Plan also launched by government of India for decreasing the Ganga water pollution but it failed to reduce the pollution of Ganga. From this report this is concluded that the water of river Ganga is not suitable for human beings, cattle and for wild animals. **Verma, S. (2009)** carried out and assessment of water quality in Betwa river at Bundelkhand region and observed that Betwa river water is polluting due to organic and inorganic pollutants of agricultural and household activities. **Yogendra, K. and Puttaiah, E.T. (2008)** Studied determination of water quality index and suitability of an Urban water body in Shimoga town in Karnataka. They determined that environmental parameters influenced the water quality. **Satyanarayan, S.** *et al.* **(2008)** worked on limnological study on lonar lake and revealed that water of lonar lake is very rich in mineral nutrients so that water is highly alkaline-saline in nature. **Prasad, N.R. and Patil, J.M. (2008)** carried out a study of Physico-Chemical Parameters of Krishna River Water in Western Maharashtra. After the study they found that most of the physico-chemical parameters of Krishna River water are within the permissible limit of ICMR and WHO so the water of Krishna River is suitable for drinking purposes and for aquatic animals in studied period. **Koliyar, J.G and Rokade, N.S (2008)** carried out an assessment on water quality in Powai lake and observed different water parameters of lake. These lake water parameters increased during summer season but during rainy season these increased water parameters become diluted and this change affecting the aquatic environment. **Sinha, D.K. and Kumar, N. (2006)** carried out an assessment on monitoring of trace metals in Gagan river water at Moradabad. according to this report, Gagan river water was found to be enriched with Zinc, Copper, Iron, Lead, micronutrients. These indicated a marked decrease in river water quality for trace metal studied. People exposed to river water might be suffering from the toxicity of trace metals.

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