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RESEARCH ARTICLE

ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL PARAMETERS OF RIVER NARMADA, MADHYA PRADESH, INDIA

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Abstract

The Narmada, also called Rewa is a river in central India and the fifth largest river in the Indian Subcontinent. The bank of Narmada river is covered by tribal people, and their daily wastes are drained into this holy river, which alters the Physico-chemical parameters of the river. Water is one of the most important of all natural resources known on earth. It is important to all living organisms, ecological systems, human health, food production and economic development. The present study was carried out for a period of one year to enumerate the various Physico-chemical parameters of Narmada River. Water samples were taken from sampling stations every month and were analyzed as per standard methods. Maximum of Phosphate, Nitrate, Calcium and Sulphate were recorded in September and October and Maximum of Temperature, pH, and Total hardness were observed during summer. Transparency was recorded maximum in winter and minimum in rainy season. DO concentration was higher in winter and lower in summer. The results indicated that most of the Physico- chemical characteristics of Narmada water samples were within the WHO limits.

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Introduction:-

The river Narmada, hemmed between Vindya and Satpuda ranges, extends over an area of 98,796 km². and lies between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern extremity of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (86%), Gujarat (14%) and a comparatively smaller area (2%) in Maharashtra.

The ecological conditions along the catchment of Narmada River have been complicated due to change in water level, Dam construction, dumping of human and industrial waste and other anthropogenic activities. The increased religious activities (Pilgrim visit as having religious importance), encroachment over catchment area by local population have resulted in the release of sewage and other waste product of both industrial and Municipal Origin. Due to the increase in pollution, the diversity of Insect fauna along the stretch of river is affected.

Accurate and timely information on the quality of water is necessary to shape a sound public policy and to implement the water quality improvement programmes efficiently. One of the most effective ways to communicate information on water quality trends is with indices. The physico-chemical indices are based on the values of various physico-chemical parameters in a water sample, while biological indices are derived from the biological information

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and are calculated using the species composition of the sample, the diversity of species, their distribution pattern, the presence or absence of the indicator species or groups etc (Trivedy and Goel, 1984).

The present study involves the Analysis of water described by its Physical, Water Quality in Terms of Physico-chemical parameters of river Narmada, Madhya Pradesh, India.

Materials and Methods:-

The present study was carried out for five different locations of river Narmada, Madhya Pradesh, India. In the present study the sampling was done during morning hours and all water samples were collected in the polyethylene bottles. For water sample collection the closed bottle was dipped in the lake at the depth of 0.7 to 0.9 m, and then a bottle was opened inside and was closed again to bring it out at the surface. The Physico- Chemical parameters were determined by standard methods of APHA (2002), Welch (1998), Golterman (1991). All the chemicals used were of AR grade.

Sampling stations:

Punasa Dam (Indira Sagar Dam) S-I:

The Indirasagar Dam (Punasa Dam) is a multipurpose key project of Madhya Pradesh on the Narmada river at Narmada Nagar in Khandwa (Tehsil of West Nimar district) Madhya Pradesh in India.

Omkareshwar (S-II):

Omkareshwar is a famous place of pilgrimages, situated 77 km from Indore in Khandwa District Madhya Pradesh. It is about 12 miles (20 km) from Mortakka in Madhya Pradesh. Omkareshwar is formed by the sacred river Narmada. This is one of the most sacred of rivers in India and is now home to one of the world's biggest dam projects. It is shaped like the holy Hindu Symbol 'OM'. This sacred island, on the conflux of the river Narmada and Kaveri is visited by pilgrims from all over the country to seek blessing at the temple of Shri Omkar Mandhata.

Mandleshwar (S-III):

Mandleshwar is a town and a Nagar Panchayat in Khargone district of Madhya Pradesh situated on the bank of Narmada river, 8 km east of Maheshwar and 99 km south of Indore.

Khalghat (S-IV):

Khalghat is a small town and a Municipality of Dhar district in the state of Madhya Pradesh, India. It is located on the banks of Narmada river and national Highway 3 Agra- Indore – Dhule – Mumbai. It is 76 kilometer away from Indore.

Koteshwar (S-V):

Koteshwar is a holy place in Barwani district of Madhya Pradesh in Central India. It is located 17 kilometer from Barwani district and 160 kilometer from Indore.

Result and Discussion:-

Temperature:

Temperature is one of the most important parameters that influence almost all the physical, chemical and biological properties of water and thus the water chemistry. In the present study temperature varied from 17°C to 34°C. The minimum temperature was recorded in the month of January and maximum was recorded in the month of May. Sharma et al (2001), Yogesh et al (2001) also reported the same type of fluctuation in various freshwater bodies.

Transparency:

Transparency is a characteristic of water that varies with the combined effect of color and turbidity. It measures the depth to which light penetrates in the water body. In the present study the value of transparency varied from 12 cm to 53cm. The transparency of the river was found to be lowest (12 cm) during rainy season and highest (53 cm) in winter. Reduced transparency during rainy season may be due to erosion of soil carried by runoff from the catchment areas. Jain and Sharma (2000) also reported lowest transparency in rainy season and maximum in winter.

pH:

pH was alkaline values ranges from 7.2 to 9.2. The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month (Kamble, S. M. et al.,). The factors like temperature bring about changes the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition (Karanth, 1987; Tiwari et al., 2009).

Dissolved Oxygen:

Dissolved oxygen in natural and waste water depends on the physical, chemical and biological activities in the water body. Dissolved Oxygen (DO) content, plays a vital role in supporting aquatic life and is susceptible to slight environment changes. DO an important limnological parameter indicating level of water quality and organic pollution in the water body (Wetzel and Likens, 2006). The value of DO fluctuated from 7.0 mg/l to 9.3 mg/l. The maximum values (9.3 mg/l) was recorded in the month of November and minimum values (7.0 mg/l) in the month of June.

Total hardness:

Total hardness is the parameter of water quality used to describe the effect of dissolved minerals (mostly Ca and Mg), determining suitability of water for domestic, industrial and drinking purposes and attributed to presence of bicarbonates, sulphates, chloride and nitrates of calcium and Magnesium (Taylor 1949). The observation of total hardness reveals that the monthly variation in the water samples of Narmada River ranged between 90 mg/l to 210 mg/l with minimum in the month of September and Maximum in the month of November. The lower values of hardness in post monsoon might be due to settlement of anions and cations.

Nitrate:

Nitrates are the most oxidised forms of nitrogen and the end product of the aerobic decomposition of organic nitrogenous matter. Nitrogen is an essential building block in the synthesis of protein. The evaluation of nitrogen is therefore an important parameter in understanding the nutritional status of water bodies. The concentration of nitrate in Narmada water was found to be in the range of 0.19 mg/l to 0.99 mg/l. Minimum nitrate concentration was recorded in the month of May and minimum was also recorded in the month of September. Nitrate is attributed mainly due to anthropogenic activities such of run of water from agricultural lands, industrial wastes, discharge of house hold and municipal sewage from the market place and other effluents containing nitrogen. Such observations were also reported by Royer et al (2004).

Sulphate:

Sulphates are found appreciably in all natural waters, particularly those with high salt content. Besides industrial pollution and domestic sewage, biological oxidations of reduced sulphur species also add to sulphate content. Soluble in water, it imparts hardness with other cations. Sulphate causes scaling in industrial water supplies, and odour and corrosion problems due to its reduction to hydrogen sulphide. The observation of sulphate reveals that the monthly variation ranged between 3.6 mg/l and 9.3 mg/l. Minimum sulphate was recorded in the month of April and maximum was recorded in the month of September. Similar fluctuation in sulphate values were reported by Sharma et al (2004) in Yashvant Sagar reservoir India.

Calcium:

Calcium is an alkaline-earth metal that is an important component of the cell walls of aquatic plants, and of the bones and shells of aquatic animals. Calcium ions find their way into water as it flows over rocks that contain calcium, such as limestone and gypsum. The observation of calcium reveals that the monthly variation ranged between 10 mg/l and 33 mg/l. Minimum calcium was recorded in the month of January and the maximum was recorded in the month of July.

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