

A Study on Potamological Profile of Sewage Fed River and its Effect on Biotic Population

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Abstract

On the other hand in the present investigation, the highest temperature noted at all the points was in June followed closely by July. However, taking an overall view of the condition it was found that during the study period maximum values were recorded at all five points from April to October with peak as started earlier in June. The minimum temperature is from November to March with minimum observed for the month of January. This can be explained due to the fact that in summer months the days are longer and the intensity of sun light is stronger while, in monsoon and winter, the days get shorter, cloudy and the sun light become comparatively weaker. This is in agreement with the study of several Indian workers on limnology.

Keywords: Cloudy, Points, Peak, Minimum, Resources, Renewable

The river is a continuous renewable resources for used domestic, agricultural and industrial purposes, as means for waste disposal, transportation, getting food resources and recreation activities (Boon, 1992). Human have exploited river resources and their food chains. As a result very few of the world, retain their original functional integrity and may have probably lost much of their capacity to adjust and recover from severe disturbance (Karr, 1993).

The growth of infra structure and various industries pose serious danger not only to aquatic biota, but to the inhabitants of locality to a great extent where these industrial fluids make way of their course. They not only interfere with the natural outlets but also causes the increase in salinity, alkalinity and acidity and consequently rise in various diseases. The industrial units besides directly endangering the environment by discharging of soils. They have

no proper waste and sewage disposal system to their credit causing the urban cities. Muzaffarpur is one of them. These environmental factors has the strain on the existing urban services and therefore affecting the environmental qualities of the region.

Many Limno biological investigations carried out with a view to known the Parameters having impact on the aquatic productivity during the last millennium. Several Foreign and Indian scientists worked on the a biotic and biotic factors (Birge & Juday; 1911, Atkins, 1926; Talling, 1957; Tilzer and Beese, 1988; Van Dijk and Van Zanten, 1995; Brummett and Mattson, 1966 etc.).

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Prasad (1916) was the first Indian to investigate the various aspects of Limnological studies of some Lentic water bodies and reservoir of Punjab followed Ganpati (1940); Das and Srivastava (1955, 1956 a & b) Alikunhi *et al.* (1955), Jhingram (1967), Michael 1969 etc. and since then several workers followed the suit till the closing period of last millennium.

Monthly variation of some physicochemical characteristics factors physiochemical condition from Point I to V are presented in tables which show variations in the physico-chemical conditions of these Point. These are also presented pictographically in figures.

Temperature

Temperature is very important for its effects on certain chemical and biological activities in the organisms attributing in aquatic media in Indian sub-continent. Temperature in most water bodies ranges between 7.8°C to 35.8°C Mean values for temperature are observed by Singhal *et al.* (1986), the maximum temperature was recorded in summer while minimum in winter.

The temperature of water from Point I to V varied considerably in different months. The ranges being above 17.2 to 30°C in Point I and IV and 18.2 to 30.1°C in Point II, III & V.

In station I and III temperature was higher (29.9°C) in the month of June 2018 and lower (17.3°C) in the month of January 2018 during first year of study. I the next year, the maximum temperatures 30.1°C was observed in the month of June 2019 and minimum 17.8°C in the month of January 2019.

Rivers are complex system of flowing water and drawing specific land surfaces called Barn or water sheds. The characteristics of river within total Barn system are related to number of features including size, form and geological characteristics of the basin and the climatic condition. River system represents the dynamic flow of drainage water and final product of surface run off, infiltration to ground water and groundwater discharge.

Annual Seasonal Variation in Water

The source of energy on the earth is the sun. It is an accepted fact that the solar radiation control the entire dynamics of fresh water ecosystem (Wetzel,

1983) because the sun provides light and heat which affect the ecosystem of aquatic bodies, Muawar (1970) indicated a direct relationship between sunlight and temperature. Earlier Hutchinson (1957) reported that the metrological condition have a profound effect on the seasonal changes of temperature. According to George (1976) and Olaniyan (1969), the temperature of water shows little fluctuation during days of over cart sky. Heavy showers are also responsible for keeping stable temperature in aquatic system. This obvious during monsoon (Uyeno 1966). In present investigation monthly air and water temperature of the all five points were noted from July 2018 to June 2020. It was ob served that the water temperature was lower than air temperature due to high specific heat of water. The lower water surface temperature of all five points was observed in month of January. This fact has been recorded by several other workers like Alikunhi *et al.* (1955), Micheal (1964), Hussiany (1967), Mukherjee and Moitra (1972) and Prasad (1977), V. Kumar & Prasad 1998.

DISCUSSION

The present investigation, the highest temperature noted at all the points was in June followed closely by July. However, taking an overall view of the condition it was found that during the study period maximum values were recorded at all five points from April to October with peak as started earlier in June. The minimum temperature is from November to March with minimum observed for the month of January. This can be explained due to the fact that in summer months the days are longer and the intensity of sun light is stronger while, in monsoon and winter, the days get shorter, cloudy and the sun light become comparatively weaker. This is in agreement with the study of several Indian workers on limnology. Thus, Ganpati, (1940), 1941, 1943), Chocko and Ganpati (1949), Durve and Bal (161) have all reported peak of temperature during April and May whereas, minimum temperature during November and December. The slight changes from the present datas are due to geographical locations of the points. Other interesting feature is about the range of temperature reported by other workers.

Transparency

The transparency of water of all five stations

was measured by Sacchi disc which is essentially a function of the reflection of light from its surface and is therefore followed by absorption characteristic of water, suspended particles and wind action. However, among all the above parameters transparency is most influenced by suspended organic matter and to a lesser extent by wind action, (Edmondson 1961; Ganapati, 1962; Srenivasan 1922; Orreen, 1974; Bilgrami *et al.* 1985) Ranjan and Haque (2008) and Nipunika & Sinha R.K. 2010).

Besides Suspended materials, planktons population also plays an important role in reducing transparency (Rao, 1955; Ruth 1955; Vyas and Kumar 1968; Krishnamurthy and Vishwanathan 1968; Behara 1976; Bilgrami *et al.* 1985) Ranjan and Haque (2008) and Nipunika & Sinha R.K>). It is to be noticed that transparency plays an important role in primary productivity and thus influence of ecology of all river. At to Jhingram (1982) loss of transparency due to dense population of plankton showed rivers high fertility but it caused by excessive silt or mud it is harmful to aquatic animals. However, earlier Khan and Siddique (1974) established a reciprocal relationship between transparency and phytoplankton.

Total dissolved Solids

Total dissolved solid is due to presence of organic and inorganic matter and its variation along the course of the river indicates erosion and weathering in the river catchment and discharge of industrial and human beings usually, the high conductivity values indicate the presence of higher content of dissolved solids in the river water (Abdullah and Musta, 1999) and conductivity values are good measures of the relation difference of water quality between two rivers (Roscoe and Moss company 1990). The TDS has two fold functions; it affects the water transparency which in turn affects the photosynthesis and parts of the TDS supplies nutrients to the river biota. Due to presence of dissolved solids the conductivity of the water is increased. In the present study the TDS value for point-I, was between 106 mg/L to 196 mg/L and at four polluted points between 305 mg/L to 395 mg/L. At all five points, the low concentration was during winter months and then there was a gradual rise and high concentration was present during rainy

season. This is to be expected that during rainy season a lot of solid materials is brought in to the river from adjoining tributaries.

pH

pH is negative logarithms of hydrogen ion concentration. It calculate the acidity or alkalinity of pH is considered as an indicator of overall productivity that causes habitat diversity (Mims, 1989) A/c to Depasse, (1956) a pH range between 6.5 to 9.0 is optimum for flourishing of aquatic life. The variation in pH range in water according to Talling and Talling (1965) is due to presence of total alkalinity and free CO₂.

Discussion: In the present study period similar findings have been reported by Prapurne and Shashikanth (2002). The pH value of water appears to vary depending upon various factors like soil condition and effluents etc. water of point-I, was alkaline than that of other four points, which receives lots of effluents from different sources some which may be acidic and other alkaline in nature. In the present study, high pH value 8.3, 8.6, 8.5, 9.2 was observed for month of December to March. This is probably due to the fact that during these month being dry months vary little water from rain and sugar mill is received. This could also be attributed to dense population of phytoplankton which increases photosynthesis which increase DO and pH value.

Dissolved Oxygen (DO)

The importance of dissolved O₂ for aquatic life cannot be over rated. It is an accepted fact that the metabolism of all aerobic aquatic organisms is dependent upon the solubility and specially the dynamics of Oxygen distribution in confined water bodies (Wetzel, 1983). According to Ganapati (1943), the amount of dissolved Oxygen present in water is the sum total effect of several factors, such as water temperature, primary productivity, wind, pollution and role of decomposers. Ried (1961) stated that air-water inter phase plays an important role in the passage of DO is the water bodies.

According to him, the rate at which the atmospheric Oxygen passes from the air to water inter phase is dependent on the wave action, difference in partial pressure between air and water and moisture in

gas. Other important factor is photosynthesis, which alters the DO in natural waters, various physical, chemical and biological process present in a water body can also alter the DO fluctuation is more frequent and drastic in a confined small water body. In the present study, all the points of the river DO was high during months of November, December and January and lower in month of July to September.

The high DO in winter is due to high photosynthesis by phytoplankton facilitated by clear sky. The low temperature prevailing during winter also enables to hold more Oxygen. The high temperature and low DO during summer create favorable condition for the development of blue green algae (Jayaraju *et al.* 1964) similar observation of minimum DO during winter months have been reported by Sehgal (1980).

Calcium and Magnesium

In the present study, calcium and magnesium were observed in all five sampling stations. Increased level of calcium and magnesium originating from industries effluents contribute to the hardness of water. Among these, calcium has been found to be most abundant mainly in the form of calcium carbonate.

At point-I the highest concentration of calcium was recorded in the month of May (2019) (31.7 mg/L) while other four polluted points were recorded in the month of February of 2019 (26.2 mg/L). The highest concentration of Mg for the all five sampling points during study period was 22.3 mg/L in February and 20.5 mg/L in January. It is generally accepted that water hardness affects copper toxicity. Ca and Mg concentration may affect copper toxicity differently. Copper toxicity in fishes increased with lower Ca:Mg ratio (Naddy *et al.* 2001). But certain studies found an influence of the water hardness on cardio vascular disease and mortality (Marier *et al.* 1979 and Neri and Johnson 1985). The dominant calcium has been reported Timms (1970), Munawar (1970), Grim Show and Hudson (1970), Khan and Zutshi (1980), Jhingran (1982) and Vass *et al.* (1989). A/c to Ohle, water containing calcium below 10mg/L is regarded as poor; between 10 mg/L to 25 mg/L as medium and above 25 mg/L as rich or productive. On the basis of mentioned workers, the water quality of point-I can be regarded as medium to rich so far productivity is concerned. The water

quality of other four polluted points II, III, IV & V can be regarded as medium only because of concentration of calcium is between 13.9 mg/L to 26.2 mg/L. It has been observed that at all stations; the calcium content was relatively higher during the winter seasons and comparatively lower in summer, reaching minimum in autumn. It is suggested that higher concentration of calcium in winter may be due to partially increased oxidation of the organic matter present in the river water. The comparatively low concentration of calcium during autumn is due to dilution of river water by rains.

Sulphates

Most common form of sulphate present in water bodies are combination with the cation of calcium, potassium and magnesium etc. the most common sources of sulphate present in a confined water body is sulphur compound present in the sedimentary rocks of the substratum (Wetzel, 1933). In the present study, sulphate compound was present in all five sampling points varied concentration throughout the year, whereas, the concentration showed a great degree of fluctuation. While, at point-I, the high concentration was observed from month of January to May. The trends starts in January (3ml/L) reaching the peak in April (15 ml/L) then highest (23.6 ml/L) in May. The low concentration of sulphate was noted during monsoon (3ml/L to 3.5ml/L). A similar structure also emerges in all four polluted points.

Phosphate

The major role of phosphorus is in biological metabolism; Relatively small amount of phosphorus present in aquatic world makes it an important parameter of ecological interest for almost all the living beings. Its role in energy transfer in the metabolism of living forms is well known. It is used during the photosynthesis as a result it affects the concentration of the mineral elements phytoplanktons and Bactrian also use phosphorus for their metabolic activities. Ruttner (1963) and Hutchinson (1967) have considered it as the limiting factor because it plays a crucial role in the enrichment of productivity of water body. According to Philips (1964) the present of phospholipids in water bodies is derived from dead tissues. Atkins (1923) stated that concentration of phosphorus in

excess of 0.5 ppm in water bodies indicates state of pollution. Several workers have studied the role of phosphorus on aquatic life. They are Hutchinson (1957), Lee (1970), and Boyd (1979). As to then that higher concentration of phosphate stimulates plant production. This is in agreement with finding of Saha *et al.* (1971), Srinath and Pillai (1972), Khan and Siddique (1974) and Agrawal (1978).

In the present study the range of phosphate in point-I, was between 0.295 mg/L in August to a maximum of 0.811 mg/L in January, the concentration of four polluted points range varied between 0.464 mg/L to 0.827 mg/L in May. The concentration was higher in May before rain and then it gradually declined reaching the lowest point in August. At the all five sampling points, the concentration was high during pre-monsoon months that it declined reaching the lowest point in the month of August. When the river has maximum water level due to rains, the decrease of rains the concentration gradually rises and reaches its highest points in April and May. This is related the findings of Hussainy (1967), Sahai and Sinha (1969), Verma *et al.* (1978) and Singh (1983).

CONCLUSION

The present study point I, showed much higher transparency that other four populated stations. The two high monthly transparencies at point I, in the month of December and January (60.2 and 60.8 cms.). While at the four populated stations the two high reading (31.2 and 32.8 cms.) also observed in December. The low marks in all five points observation in monsoon months i.e. July to September. When a lots of mud is deposited in river bottom from the flooded water. A difference of the transparency of all five points. It is due to lack of human and animal life around the point-I, while other four point-II, III, IV & V were influenced from the neighborhood is drained into the river.

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