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ROLE OF MUNICIPAL SEWAGE AND INDUSTRIAL EFFLUENT IN DETERIORATION OF PANCHAGANGA RIVER

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ABSTRACT

Some of the elements from sewage and industrial effluents are responsible for deteriorating the quality of river Panchaganga water in Kolhapur district. The concentration of certain elements was estimated from sewage contaminated site for Nitrogen (N) -13.46 mg/l, Phosphate (P) -4.38 mg/l and Biological Oxygen Demand (B.O.D.) -145.17 mg/l where distillery effluent affected water sample were analysed for B.O.D. (185.6 mg/l), Chemical Oxygen Demand (C.O.D.) -762.20 mg/l, N (22.16 mg/l), P (9.31 mg/l), and Potassium (K) – 28.23 mg/l. The concentration of these elements was found very high than the uncontaminated site. The amount of N, P and K from sewage and distillery effluent is the main cause of accelerating the fast growth of aquatic weeds and algal bloom in river water which affects the physico-chemical and biological characteristics and then the water becomes less suitable for our diverse need.

KEYWORDS : Panchanganga water, N, P, K, B.O.D., C.O.D., algal bloom.

INTRODUCTION :

Every water stream have its own self purification capacity and maintain quality of water itself. But from the last few decades the growth of human settlements and industrial townships are coming up very speedily near by water shade area. Villages becomes towns and towns becomes cities. Where small industries are converted into a multinational companies. These developmental sectors are contentiously catters the water for their various uses and processes. On the bank of Panchaganga river number of distillery industries are settled and these industries are directly or indirectly disposing their effluents into river. On the another side the population of Kolhapur city is going on increasing without primary facilities like water supply and sanitation, management of garbage and unscientific development of housing sector. At the last these practices generates huge amount of waste water which finds its way to mix in river water. At present more than 180 MLD sewage is generated in city which directly or after partial treatment

disposed into river.

Day by day use of water and its requirements are contentiously going on increasing and after the use of water it either converted in to sewage or effluent. The urban waste i.e. sewage is highly loded with night soil which consists 65% proteins, 25% fats and 10% carbohydrates (Goel, 1997). Distillery industry is generating very vast quantity of spent wash which is very rich in B.O.D. and C.O.D. This spent wash have high potential to make pollution of receiving water, because of its nutricious elements like N, P and K. These nutrients are highly useful for fasting the growth of aquatic weeds and various algal forms present in water. In the present study sewage contaminated zone and distillery effluent contaminated zone are considered for monitoring the changes in river water samples which was collected from three different zones and its impacts on quality of river water.

MATERIALS AND METHODS :

Panchaganga river is a tributary of Bhogawati, Dhamni, Kumbhi, Kasari and Tulshi river. The main source of water to the river is from Bhogawati river which is originates from the Radhanagari Dam located in Western Ghat of Maharashtra about 56.6 k.m. away from Kolhapur city. Panchaganga river passes through northern side of Kolhapur city and it is the main source of water to meet the thrust of Kolhapur peoples and many villagers and industries which are settled on the bank of river. For the present study three sampling sites were selected and out of it site no. I is considered from upper side of Kolhapur city where site no. II was selected after mixing of sewage and site no. III was selected after mixing of distillery effluent in river near by Bawada bridge. From the above three sites water samples were collected in already cleaned plastic containers for physico-chemical analyses. For microbiological study purpose separate samples were collected in sterilized bottles from three sites. These water samples immediately analyzed for physico-chemical and bacteriological parameters. For the analysis of water samples the standard methods were used which was prescribed by Trivedy and Goyel (1984) and APHA (1992).

RESULTS AND DISCUSSION :

The waste water generated by human habitation is rich in organic pollutants and it invites number of microbial communities for degradation of organic matter. As well as the amount and nature of organic matter fastely reproduce pathogenic microbes like fungi and bacteria in water. This degradation of organic waste in water helps to increase the amount of nutrient in water and further it changes the physico-chemical characteristics of water. With this fact in the present investigation some surprising observations are noted. When the comparative assessment was made for various parameters and there values, the temperature of Panchaganga river water collected from site one is 22.5^{o}C and which is collected from site two is 23.2^{o}C where site three sample shows 24.5^{o}C temperature. Variation in temperature indicates that, when any foregian material go under the process of degradation with action and reaction in between various organic and inorganic ions generate the heat which is absorbed by the water and ultimately increase the temperature of water. The gap between two different contaminants (sewage and spent wash), the spent wash contaminated water shows high level of temperature. As well as when organic waste go under the process of oxidation with the help of microbial activity, it increases the temperature in water.

In case of total solids, sewage consists 1% of its amount and out of it 70% are fastely degradable (organic) and 30% are in inorganic nature. In the present study unpolluted site i.e. site one shows 180.7 mg/l of total solids where 975.32 mg/l of solides found at site two and it is again increases at site three up to 1968.89 mg/l. It indicates that the municipal and industrial effluents are the main cause of high

solids in Panchaganga river. Further it go under the degradation process and helps to increase the amount of dissolved salts in water which increases the salinity and alkalinity of water results in increase the pH in water. The control site one shows 7.1 pH and site two shows 7.8 pH and site three was observed 7.5 pH. It may be due to acidic nature of distillery effluent. The pH of distillery effluent i.e. fresh spent wash pH is ranged inbetween 4.2-4.5 which is acidic and when it get mix in river water it reduces pH in water at site three. This is the fact which helps to stabilize the pH of river water at site three (Baruch et. al., 1993). At the same time the adverse trend was observed in alkalinity and conductivity of river water at site three and it was observed 192.78 mg/l of alkalinity and 1809.68 □S/cm of conductivity. The amount of organic material when go under degradation in the form of sewage and spent wash sufficiently in river water increases the alkalinity and conductivity of water.

Table 1 shows the variation in physico-chemical and biological characteristics from three sites of Panchaganga river. Site one is at upper elevation site of Kolhapur city where there is no any chances for contamination of river water expect agricultural practices. It is evident from the Table 1, the amount of total solids and dissolved solids are contentiously going on increasing at site two and site three. It clearly indicates that the mixing of sewage and industrial effluent rises the solids in water. The sufficient amount of degradable organic substances helps to increase the electrical conductivity. This increased conductivity in water disrupts the quality of water and becomes less suitable for its various uses.

The degradation of organic matter in river water it directly make adverse impact on available amount of dissolved oxygen in water. In the present study site one shows 9.3 mg/l D.O. where site two and three shows 3.8 mg/l and 3.28 mg/l of D.O. in water respectively. This decline amount of D.O. in water is very critical condition for survival of fish in river. Some times this level of D.O. in water when go below then it increases mortality rate in fish community. The level of B.O.D. from three sites shows exactly opposite trend and it was 1.8 mg/l at site one where 145.17 mg/l and 185.6 mg/l was observed from site two and site three respectively. It is because of the increase in organic matter due to mixing of sewage and distillery effluent into river. When such type waste go under degradation aerobically in water system, it consumes more dissolved oxygen from river water. This biological degradation of organic matter invites number of microbial communities in water which further becomes a reproduction centre for various pathogenic micro-organisms and then this water resource becomes less suitable for human and animal consumption.

Alkalinity and C.O.D. level studied from three different sites of river also followed same trend and after the degradation of organic and inorganic matter in water, it changes its forms in different ions which easily dissolves in water and then slowly helps to increase alkalinity in water. The level of alkalinity is depends upon the nature of waste and it is directly proportional to the total dissolved solids and electrical conductivity. When the alkalinity in water increases it makes water hard which is less suitable for drinking and domestic use. From the table 1, the amount of nitrogen level is progressively found increased at site II and site III. It is due to mixing of sewage and industrial effluent which contains nitrogen containing material (night soil and solids from industrial effluent). The significant amount of such organic material release high amount of nitrogen with the help of bacterial degradation of organic waste and due to ammonification.

Phosphate and potassium level also found increased at site II & III where site I shows very poor i.e. 0.04 mg/l of P and 0.12 mg/l of K. At the same time site II shows 4.38 mg/l and site III shows 9.31 mg/l of phosphate level in water. In case of potassium status in river water, site II shows 18.13 mg/l and at site III it was observed 28.23 mg/l. These increased trend of N, P and K in studied river water is the main cause of fasting the growth of algal communities and aquatic weeds in river (Bais et. al., 1997). The significant growth of algal community further affects the physical, chemical and biological

characteristics in water (Kakati and Bhattacharya, 1990). The high density of algal forms changes the colour, taste, odour and light penetration in water, which is harmful to native aquatic life forms which are in suspended and rooted at bottom in river (Das, 1997). The same change is continued in water then the water becomes eutrophic (Baruah et. al., 1993). This eutrophic condition in water reagain increase load of organic nutrient due to mortality and decomposition of algal community because of changes occur in water characteristics. Which further increases the amount of N, P and K at allerming level and water body becomes useless for our diverse needs.

In the studied river water sampling sites the septic condition is getting form at site II and III because of tremendous growth and reproduction of pathogenic organisms. In the present investigation sampling site one shows 2.01 MPN/100ml or less than it and at the same time the samples collected from site two and site three shows more than 2400 MPN/100ml. This results are indicating that the sewage and industrial effluent is the main cause of pathogenic organisms and these organisms play very important role in degradation and decomposition of organic waste which results in increasing level of N, P and K in water. This is the outcome and findings of the present study. For protection and preservation of water resources and their quality it is urgent need to control the mixing of sewage and industrial effluent in river water.

Problems of Indian river water pollution is becoming more serious on which our development is depending. Now it is every bodies responsibility to minimize the use of water and everybody have to take care of their wastewater by himself to manage it. The another solution for solving sewage or industrial effluent problem, it must be treated up to certain level and reuse for irrigation (Kadam, 1989, Khopkar, 1993). Mishra and Yadav (1975) have studied some water resources from central part of India and they stated that the sewage and anthropogenic activities are the main cause of water pollution. From the wastewater management point of view it is needed to reduce, recycle and reuse it for further needs. This is the key practice for conservation and protection of our water resources which are vital for sustenance of life on this unique earth planate.

Table 1 : Physico-chemical characteristics of Panchaganga river from three sites

Sr.No.	Parameters	Values		
		Site – I	Site – II	Site – III
1.	Temperature ^{o}C	22.5	23.2	24.5
2.	Total Solids mg/l	180.7	975.32	1968.89
3.	Total Dissolved Solids mg/l	95.3	635.10	1150.72
4.	E.C. µS/ml	15.31	468.56	1809.68
5.	pH	7.1	7.8	7.5
6.	D.O. mg/l	9.3	3.8	3.28
7.	B.O.D. mg/l	1.80	145.17	185.60
8.	C.O.D. mg/l	32.6	570.33	762.20
9.	Alkalinity mg/l	41.3	155.21	192.78
10.	N mg/l	0.12	13.46	22.16
11.	P mg/l	0.04	4.38	9.39
12.	K mg/l	0.12	18.13	28.23
13	MPN / 100ml	2.01	>2400	>2400

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