CHAPTER – 8

GENERAL DISCUSSION

This chapter deals with the discussion on assessment of ecological characteristics along with physico-chemical parameters of the Kosi River in Almora District. In previous chapters a detailed study of different methods of physico-chemical and biological analysis were given for the two years of study period i.e. Jan., 2013 to Dec., 2014. The physico-chemical parameters and biological characteristics of any water body are dependent on the climate and environment of that particular place. The present study is revealing the present status of the Kosi River in physico-chemical and biological aspects. To reveal the present hydrological and ecological condition of the Kosi River, the present study was compared with the earlier two investigations done by Bhatt et. al. (1984) and by Seth, et. al. (2013) in the same river. The average values of the results of the present research were compared with the results of the above mention studies.

In the present study the three selected sites of Kosi River, namely Kosi (1650 amsl), Suyal Bari (520 amsl) and Garam Pani (345 amsl) were studied. During the study period work was done on physico-chemical parameters and biological characteristic of the river.

Temperature is the parameter that can alter the overall chemistry of the water body. The temperature of river water fluctuates with the season, climate, geographic location, time of sampling, etc. In the present study the maximum ambient temperature throughout the whole study period was recorded in the month of June and minimum in the month of January. Study of Bhatt et. al. (1984) also shows the similar pattern of fluctuation of ambient temperature. In their studies the maximum ambient temperature was recorded in the month of June and minimum in the month of January and February.
The water temperature is always affected by the ambient temperature surrounding the river. It is noted by many investigators that the rise in ambient temperature leads rise in water temperature. In the present study the maximum water temperature of the river was observed in the month of July and minimum was noted in the month of January. The early study done by Bhatt et. al. (1984) also shows a rise in water temperature during summer season and relatively lower water temperature during winters.

Velocity of river water indicates its fluency. The more water in the river the more its velocity. Generally, water velocity is recorded high in hill streams because of different elevations of land area tend to flow water more rapidly. During monsoon heavy rainfall increases the level of water. In the present study the water velocity was observed highest in the month of August and lowest in the month of March. Bhatt et. al. (1984) also found the maximum velocity of the river was during the month of August whereas low velocity was during the month of November to February.

Conductivity refers to the nature of any object to conduct the electrical current through it. Water is also conducted for electrical current. The conductivity of water depends on the ion content in water. In present research work the conductivity level of the river water was observed highest in the month of August due to discharge of ion rich rain water into the river water. The lowest value of conductivity was found in the month of December.

Transparency of water is meant by its ability to allow the sunlight to penetrate through it. It shows the clarity of water. Transparency indicates the turbidity level of water, i.e. transparency level increases with the decrease in turbidity level. During the whole study period transparency level found maximum in the month of January and minimum in the month of August. Bhatt et. al. (1984) reported the highest transparency during the month of December and January and the lowest level were observed in the month of August.
Total solids are the sum of all types of solids (dissolved and suspended) present in the river water. Generally monsoon is the season when the value of total solids and total dissolved solids in river water notices high. In the present investigation the maximum concentration of TS was recorded in the month of August and minimum concentration was recorded in the month of December while Bhatt et. al. (1984) found the maximum value of TS in the month of August and the minimum value in the month of January.

Total dissolved solids are the solid particles which are present in dissolved form in water. During the study period, the highest concentration of TDS was noted in the month of August and the lowest was recorded in the month of December and January.

Different biological activities in an aquatic ecosystem can occur only within a narrow range of pH and it could be fatal to a particular organism if this pH range disturbs. The maximum pH value in the present investigation was observed in the month of January and December and minimum in the month of June. Bhatt et. al. (1984) also found alkaline water throughout the study period with slight fluctuations in pH was observed during the months of May, June and October.

The alkalinity is positively correlated with pH. The concentration of carbonate and bicarbonate ions causes alkalinity in the water. Increase of carbonate and bicarbonate ions in the water increases the alkalinity. And the increase in alkalinity makes the pH values higher. Throughout the study period the maximum value of alkalinity was noted during the month of January and minimum in the month of August.

Dissolved oxygen is an important parameter of water quality. A high value of DO indicates rich biodiversity in an ecosystem and also its suitability for drinking purpose. During the present study period highest value of DO was
recorded in the month of January and minimum in the month of August. Bhatt et. al. (1984) also found similar results.

The aquatic organisms like zooplanktons, phytoplanktons and fishes, etc. releases CO₂ during respiration. In the present study the level of CO₂ was noted maximum in the month of August and minimum in the month of January. Bhatt et. al. (1984) also found the same results in their study.

High chloride content in river water is a clear sign of pollution. The presence of chloride in water is due to the calcium, potassium and chloride salts. In the present research work highest concentration of chloride was recorded in the month of July and minimum in the month of December.

The study carried by Seth, et. al. (2013) for the periods of two years from 2010 to 2011 on the water quality of Kosi River of Almora district for drinking and irrigation purpose, the data were taken during pre-monsoon (April to June) and post-monsoon (October to December) of both the years. The present study also compared with the study of Seth, et. al. (2013) by taking only pre-monsoon and post-monsoon data. The comparative study shows relatively higher values of pH, alkalinity, chloride and TDS in the earlier study than the present study. During the year 2010 to 2011, there was a heavy rainfall during monsoon season and eventually a cloudburst in September 2010 in district Almora. Hundreds of people died in that natural hazard. Countless agricultural fields and roads drained with rain water. Domestic animals also died and drained with the flood (NDTV correspondent, September 2010). Because all these drainages of organic and inorganic materials the river become highly turbid and contaminated. The dead and decaying materials and mud load in the river due to the flood increased the alkalinity, pH, TDS and chloride concentration in the river.

Phytoplanktons are the producers in aquatic ecosystems. These are tiny aquatic plants depends on the water flow for motion. There is a huge diversity in phytoplankton groups in all over the world. The health and diversity of fish
species of an aquatic system depend on the abundance and species diversity of phytoplankton in the system. In the present study, four groups of phytoplankton Chlorophyceae, Bacillariophyceae, Cyanophyceae and Xanthophyceae were recorded in Kosi River. Of these four groups, total 31 species were found.

Zooplankton are the primary consumers in ecosystem of water. These are microscopic water animals depending on the water current for locomotion. During present research work three major groups of zooplankton Rotifera, Protozoa and Crustacea were found and total 16 species belonging of these groups were observed. Rotifera was the group constituting the highest number of species (7). The abundance of zooplankton species was found during the months of February to May. The early investigation (Bhatt et. al., 1984) also shows the finding of three zooplantonic groups Rotifera, Protozoa and Crustacea and total 13 species belonging from groups. Out of 13 species, the maximum number of species (6) was found to belong the group Rotifera. In early study the abundance of zooplankton was noted during the months of December to April.

In the present study the population of zooplankton and phytoplankton shows a positive correlation. However Das and Srivastawa (1956) noted a negative correlation between zooplanktons and phytoplanktons in their studies.

Fishes possess the position of secondary or tertiary consumers in water ecosystems. Fishes are the most studied organisms of aquatic life because of its mega diversity along with its economic and social value. In the present study two families of Ichthyo-fauna were observed in the river Cyprinidae and Botinae. A total 12 species were found belonging to these groups. Cyprinidae was the dominant group, including 9 species. In early investigation (Bhatt et. al., 1984) three families of fish fauna were found Cyprinidae, Cobitidae and Sisoridae and total 23 species were observed. In early study also Cyprinidae was the most dominant group.
CONCLUSION-

The present study was carried out with objectives to study the physico-chemical parameters of the river in order to consume by human and to investigate the present ecological status of the river. After the study of varying physico-chemical and biological parameters of river water the mean of data was compared with drinking water standards provided by the Bureau of Indian Standards for Drinking Water, 2009 (Table 8.1).

The comparison of the results of the present study with potable water standards revealed that river water in the study area is not polluted and the parameters are under the standard limits. A slight increase in pH value was noticed that is negligible. Therefore, water in the study area is fit for human consumption and agriculture with respect to the selected parameters. The results also show the diversity richness of plankton community and fish fauna. This is the clear indication of pollution free water and suitability of water for aquatic organisms and fish production.
<table>
<thead>
<tr>
<th>Water quality parameters</th>
<th>Standard values (BIS 2009)</th>
<th>Result values</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS</td>
<td>500mg/l</td>
<td>65.33±3.51 – 97.66±0.57mg/l</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-8.5</td>
<td>7.2±0.15 – 8.8±0.05</td>
</tr>
<tr>
<td>Chloride</td>
<td>250mg/l</td>
<td>3.06±0.51 – 5.76±0.15mg/l</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>200mg/l</td>
<td>50.33±2.08 – 75.33±3.21mg/l</td>
</tr>
</tbody>
</table>

Fig. 8.1: Comparison of result values with standard values of drinking water guidelines by BIS, 2009