CHAPTER -III

Review of Literature

‘The state of world’s waters remains fragile, and the need for an integrated and sustainable approach to water resource management is as pressing as ever.’

Ban Ki-moon, Secretary General, United Nations
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3.1 Introduction

The present work deals with water quality parameters resulting due to urbanization and industrialization in relation to the Ujjani dam water. This water resource is the sole source of drinking and irrigation for Solapur and some parts of Pune District and also for generation of electricity. Though believed as one of the very clean waters of the country, the reservoir is presently subjected to point and non-point sources of pollution.


Bhimachar and David (1946) observed the effects of factory effluents on the Bhadra river fisheries at Bhadravati. Ganapati and Alikunthi (1950) observed factory effluents from the Mettur chemical and industrial corporation Ltd. near Mettur dam, Madras and their pollutional effects on the fisheries of river Cauvery. Iyengar and Venkataraman (1951) studied the river Cooum at Madras with special reference to the Diatomataceae. Acharya et al. (2008) studied chemical properties of groundwater in


Chakrabarty et al. (1957) studied plankton and physico-chemical conditions of river Jamuna at Allahabad. Quasium and Siddiqui (1960) made preliminary observations of river Kali covered by the effluents of industrial wastes. Rai (1962, 1974a, b) studied the hydrobiological aspects of river Yamuna at Okhla, Delhi. Venkateswarlu and Reddy (1985) observed algae as biomonitors in river ecology and also studied ecology of algae in paper mill effluents and their impact on the river Tungabhadra. Sudhakar and Venkataswarlu (1989) showed the observations on ecological imbalances in the rivers of Tungabhadra and Godavari of Andhra Pradesh. Shinde et al. (2010) studied seasonal variations in physico-chemical characteristics of Harsool - Savangi Dam, Aurangabad.
David (1963) studied pollution of Bhadra, Godavari and Krishna rivers. He studied the dynamics of potamo plankton populations and showed the relationship between the bio-chemistry and the state of pollution in the river Yamuna. One of the largest rivers in India, the Ganga was studied by Lakshminarayan, (1965a, b) at Varanasi. Bulusu et al. (1967) have made certain observations on self-purification of Khan River and its effects on Kshipra river. Venkateshwarlu (1969a, b, c,) carried out an ecological study of the algae of the Moosi river, Hyderabad with special reference to water pollution. In his investigations he determined the physico-chemical complexes, factors influencing the distribution of algae and algal periodicity.

Bapat and Madalpure (1974) carried out the work on hydrology of the river Kham in Maharashtra. Verma and Dalela (1975) studied on pollution of Kali nadi by industrial wastes and showed biological index of pollution. Agarwal et al. (1976) studied physico-chemical characteristics of the Ganga river at Varanasi. Vass et al. (1977) carried out hydrobiological studies on Zhelum river. Unni et al. (1992) studied preliminary hydrobiological studies of river Narmada from Amarkantak to Jabalpur. Srinivasan et al. (1980) made observations on pollution of river Cauvery due to industrial and urban wastes. Prasad and Saxena (1980) studied the blue-green algae in relation to industrial pollution of the river Gomati, Lucknow. They used the species of blue-green as ‘marker species’ or ‘index species’.


Rao and Srivastava (1989) showed biological monitoring of water quality in Chambal and Khan rivers of central India. Mittal and Sengar (1991) have made observations on

Kodarkar (2006), in his report, has discussed the nature of water pollution during irrigation. He has highlighted the undesirable organic and inorganic impurities, blackish green colour and obnoxious smell of water as causal factors of pollution. These studies have also suggested that the geochemical environment of river water has worsened worst in the regions where Mula-Mutha and Pavna rivers carry their untreated sewage and industrial waste and depositing them into the Ujjani reservoir.

Marale et al. (2010) studied the water quality of Alandi, Dehu and Chikali cities and have concluded that as a result of water pollution about 1.46% and 1.38% population at Dehu and Alandi got affected by diarrhea during 2007-2008. Joshi and Joshi (2005) studied the biological count of the water in the Upper Bhima Basin and Pune City. Kharat et al. (2001) has reported hazardous effect of polluted water on the long-term distribution of fish. Out of 66 species reported, 18 were found to be locally extinct while 11% showed decline in their population.

Gole (1985, 1993) studied animal and plant life in the vicinity of Panshet reservoir and conducted biological survey of Ujjani reservoir and its surrounding area in order to know the existing conditions of the wetland and its ecology. He also made a zone-wise listing of the dominant plant species including useful and wild plants in the catchment area and studied their status and characteristics. Gole (1985) According to him, less vegetation diversity and paucity of woody species is noticeable in the vicinity of Ujjani dam. Outside the cultivation area, sparse vegetation cover is
apparent. The soil is alkaline; but during summer, the salt content is high and reduces as soil begins to be inundated. Organic carbon content of the soil is low. Gole (1993) noticed that the dissolved oxygen concentration in the Ujjani reservoir water was high during monsoon but dropped in the post monsoon period. The pH of water was above 7 in all the seasons. In some areas (during February, 1991) the recorded pH was as high as 9 to 10. He also reported poor sanitary quality of the reservoir water and a very high total coliform count. High incidences of waterborne diseases’ were also noticed in the surrounding villages which are obviously the after-effects of consumption of polluted water. He also observed that along the banks of the Ujjani reservoir, a semi aquatic grass paspalum scrobiculatum has gradually replaced Hydrilla verticallata and vallisneria spiralis since 1987. During March-April (1983), Gole also observed that there is rapid increase in COD, BOD, and dissolved solid concentration in the Mutha river after it meets in Mula river and the bacteriological count, in its water, was very high throughout the city region.

A number of workers have surveyed the quality of Mula-Mutha rivers which are flowing through Pune and Pimpri-Chinchwad cities. Pawar et al. (1992) observed that the chemical composition (Ca-Mg-HCO$_3$) of the Mutha river water, before it reached the city area, shows typical characteristics of the basaltic terrain. This composition changes rapidly as the river enters the city area. Wagh et al. (1987) studied the chemical, biological and microbiological quality of the Mutha river which crosses the Pune city. As the river travels the city, the DO dropped from 8mg/L to 2 mg/L, while COD and BOD values increased considerably. The electrical conductivity increased by three times and total hardness increased by almost six times, suggesting the dissolution of major ions in the water. Amongst these ions, chloride increases from 10 mg/L to 462 mg/L and sulphate increases from 38 mg/L to 980 mg/L. Similar patterns were also observed for BOD and COD values. However, in spite intense human activities, an appreciable algal growth in the river was noticed. They also reported that the discharge from dyestuff industry has a profound effect on the diversity of plankton species. Wagh (1999) during winters of 1994-95 again studied the physico-chemical characters of Mutha River in Pune city zone. The BOD values varied from 30 mg/L to 120 mg/L and COD 38 mg/L to 156 mg/L. However, change in phosphate concentration was 0.1 mg/L to 1.2 mg/L and his previous study it was 0.15 mg/L to 80
mg/L. The DO concentrations, in some of the areas were found to be almost zero. Koli (2001) observed that as the river Mula-Mutha flows downstream of the city, its DO concentration gradually increases while the BOD value decreases, indicating self-purification of the river. But the values of dissolved solids and electrical conductivity (EC) increase along the stretch of river. Sahasrabuddhe et al. (2003) investigated changing status of urban water bodies and associated health concerns in Pune. Vasanthkumar and Vijaykumar (2011) studied diurnal variation of physico-chemical properties and primary productivity of phytoplankton in Bheema River.

Sharma, (1993) reported that during monsoon of 1992, the total sediment load in the river Bhima increased towards downstream direction and the maximum load was noticed near Daund. The TDS, too showed similar changes from 107.9 mg/L at Kalamb and 356.3 mg/L at Daund. At Pargaon, after the confluence of Mula-Mutha and the Bhima rivers, the TDS increased from 85ppm to 260 mg/L. The concentration of potassium showed a high value of 23 mg/L, but after few spells of rains it dropped rapidly to 3 mg/L. Similar trends were noticed for sulphate, from 70 mg/L after few spells of rain and 17 mg/L with more rains. Ghodke (2009) determined the agricultural productivity in Daund Tahasil of Pune. Sangpal et al. (2011) made an assessment of the physico-chemical properties to study the pollution potential of Ujjani reservoir. The physico–chemical characteristics of Ujjani and Panshet reservoir were studied by the scientists of Central Water and Power Research Station (CWPRS) in (2002) and evaluated that the water quality of Panshet reservoir is better than Ujjani for almost all beneficial uses. Although a number of number of attempts have been made to study the physico-chemical characteristics of Mula-Mutha and Pavna rivers, there is not much published literature available on the quality of water and silt in the Ujjani reservoir. The above review reveals that the studies of Ujjani reservoir are very limited and few. In addition, they do not cover comprehensive assessment of water and silt quality. Systematic studies on the physico-chemical characteristics of the Ujjani reservoir are also scanty. Since detailed investigations are not available on the impact of urbanization and industrialization on the quality of water, the present research problem to study the physico-chemical parameters in the lake was undertaken. It was, therefore, decided to make an attempt to prepare a state of the art report on the chemical environment of the Ujjani reservoir, with regard to its stored water and its environmental effects.