



Role of Aquatic Insects of Water Quality in Related to Physico-Chemical Parameters in Yamuna River at District Firozabad (U.P.)

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ABSTRACT

The present study deals with the role of aquatic insects in Yamuna river related to physico-chemical parameters at Firozabad (U.P.) during 2007-2008. The present investigation indicates that presence or absence of different insects of different groups in water are biological monitor of physical and chemical parameters of water quality. The water quality is going to declined due to directly discharging the domestic sewage, municipal wastes and industrial effluents from various area of town which directly or indirectly effect the biotic community of aquatic habitat.

KEYWORDS: *Physico-chemical characteristics, Yamuna, Aquatic insects.*

INTRODUCTION

Aquatic insects may be used as water indicators of aquatic ecosystem as their life span, their comparatively stable mode of life and distinct characters, offers as sorting and identification of these organisms. Many authors like Krishnamoorthi and Sarkar [1], Gupta and Paliwal [2] and Agarwal *et al.* [3] have studied the water quality in which aquatic insects are used as indicator of pollution. Aquatic insects community fluctuation can give quick information as they interact with water quality changed due to physical and chemical environment, Singh [4]. These insects are commonly used as tools for marking an integrated assessment of water quality.

Unplanned urbanization, capitalism, deforestation and technological advancement may have originated pollution crisis on earth, Odum [5]. At Firozabad many tanneries, diary, chemical and metal works, bangals and glass industries are established, whose effluents directly or indirectly discharged in the river Yamuna at Firozabad. The degree of pollution may be determined both biologically and chemically. So the gradual disposal of solid and liquid wastes from the surroundings chemical, metal, bangals and glass industries and the rapid rate of encroachment with the lack of proper maintenance together make this large water body polluted. Some of the important observations regarding water quality are reported by different authors [6-11].

MATERIALS AND METHODS

Monthly water samples of river Yamuna at Firozabad were collected during the year 2007-2008. Water temperature were measured with the help of centigrade thermometer and pH by digital meter immediately after collection of samples at site while other parameters are analyzed in laboratory within six hours as per the standard methods [12,13]. The aquatic insects were collected by aquatic insect net (Mesh size 40-80/cm²) from water body monthly and the average counts were recorded. Insects were sorted out orderwise and preserved with 70% alcohol with few drops of glycerin for further studies. The results of observation on physico-chemical parameters (Table-1) and list of aquatic insects species (Table- 2) from Yamuna river at Firozabad (U.P.) are presented.

RESULTS AND DISCUSSION

It has been observed that the average value of water temperature recorded from Yamuna river at Firozabad was between 26.0^oC-27.9^oC. The variation in temperature is one the most important factor in an aquatic environment. The water temperature also directly related to atmospheric temperature. The variation of temperature also indicates

the effluents which was drained from industrial units in the

Table- 1: Physico-Chemical parameters of river Yamuna at Distt. Firozabad (U.P.) 2007-2008

Parameters	Winter	Summer	Monsoon	Average
Temperature ($^{\circ}$ C)	17.0-19.6	29.0-30.5	32.0-33.6	26.0-27.9
Conductivity (micro.mha.)	924.0-929.7	941.0-943.0	946.0-962.0	937.0-944.2
Hardness (mg/l)	536.0-600.0	538.0-585.0	539.6-589.4	537.8-591.4
Turbidity (N.T.U.)	45.1-48.0	41.2-47.6	46.0-49.2	44.1-48.3
Ph	8.34-8.67	8.37-8.62	8.36-8.64	8.36-8.64
D.O.(mg/l)	4.8-7.1	3.9-6.9	4.3-6.4	4.3-6.8
B.O.D.(mg/l)	75.1-92.6	79.3-82.1	80.0-84.0	84.8-86.2
C.O.D.(mg/l)	220.0-322.0	273.1-362.2	216.0-316.0	236.4-333.4
Chloride(mg/l)	352.0-374.0	356.0-368.0	357.0-375.0	355.0-372.0
Phosphate(mg/l)	13.56-15.87	15.46-17.82	16.47-17.78	15.16-17.15
Calcium(mg/l)	348.1-403.0	282.0-412.0	326.0-400.0	318.7-405.0

Table- 2: Aquatic Insects from river Yamuna at Distt. Firozabad (U.P.)

Phylum -	Arthropoda
Class -	Insecta
Order -	(1) Diptera
	(i) <i>Anopheles culifibacies</i>
	(ii) <i>Cladopelma sp.</i>
	(iii) <i>Aedes sp.</i>
	(iv) <i>Chironomous sp.</i>
	(v) <i>Culex sp.</i>
	(2) Coleoptera
	(i) <i>Agabus sp.</i>
	(ii) <i>Noterus sp.</i>
	(iii) <i>Laccophilus sp.</i>
	(iv) <i>Hydraena quadricollis</i>
	(v) <i>Hydrophilus olivaceous</i>
	(3) Odonata
	(i) <i>Anax immaculifrons</i>
	(ii) <i>Ischnura delicate</i>
	(iii) <i>Crocothemis servillia</i>
	(iv) <i>Orthetrum neglectum</i>
	(v) <i>Zyxomma petiolatum</i>
	(4) Hemiptera
	(i) <i>Anisops nivea</i>
	(ii) <i>Anisops batiliforns</i>
	(iii) <i>Anisops extendoforns</i>
	(iv) <i>Ranatra filiforns</i>
	(v) <i>Micronecta thyeata</i>
	(vi) <i>Micronecta ludibunda</i>
	(vii) <i>Hydrometra martini</i>

river. pH is an important environmental factor which affects the life process of biota inhabiting the water. The average of pH was 8.36-8.64 during study period. The increased rate of decomposition of organic matters, influx of carbon dioxide, sources of high water temperature, mixing of domestic sewage and industrial effluents caused low pH value during monsoon period, Dubey *et al.* [14]. Conductivity is higher which indicates that sewage and other effluents are being discharged more in the river. Turbidity is higher in every season which is due to higher concentration of suspended solids, coming through sewers drains, this finding is in the present investigation supports the studies of Kumar and Sharma [15].

The considerable variation of dissolved oxygen content of water average range from 4.3mg/l - 6.8mg/l, with the maximum value in winter and minimum in monsoon period which was due to cloudy weather which also increased turbidity and reduced photosynthetic activities. Maximum amount of the free CO₂ was due to high surface area, influx of carbonic acid through rain water and also the decomposition of organic matter in the river. BOD and COD are the significant parameters of polluted water bodies which affects the limno-biotic fauna of the river. Ansari and Prakash [16] observed that COD is requires oxygen from the organic substance of water to oxidize them by a strong chemical oxidant. Calcium average was 318.7mg/l to 405.0mg/l which is more in winter and monsoon periods. The ground water is very hard and contains highest amount of calcium near river. Chloride range from 355.0mg/l to 372.0mg/l during observation period which may be due to large amount of sewage discharge in the river. Phosphate is the most critical single element for maintaining aquatic productivity. Phosphate range between 15.16mg/l to 17.15mg/l during observation period which indicates that a lot of untreated domestic sewage and industrial effluents being mixed with river water. In some recent studies it was found that the water hyacinth affects the water temperature, pH, bicarbonate and alkalinity of water. The present study indicates that there is a high value of chloride, calcium and phosphate during summer season which is due to increased rate of decomposition of organic matter because of high temperature and concentrated sewage discharge and solid wastes from its surroundings.

The seasonal aquatic insects population recorded higher in summer season as 59.8% Diptera, 15.5% Coleoptera, 2.8% Odonata and 21.4% Hemiptera. The annual population density was 68.9% and the insects sequence is as Diptera, Hemiptera, Coleoptera and Odonata respectively. The minimum population of aquatic insects recorded in monsoon while maximum were recorded during summer season at river. This observation indicates that some Odonata species were found in fresh water habitats of rich oxygen. The present study also indicates that these insects can survive in fresh water as well as in industrial polluted water but algal abundance is necessary. Dipterean species were mostly represented by larvae of different mosquitoes and chironomid flies which was inversely proportional to dissolved oxygen of the river. Presence of these aquatic insects indicates that the presence of more industrial effluents has resulted in good growth of macrophytes in the river. It also indicates that the pollution quality of water is due to sewage and industrial effluents.

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