

WATER QUALITY ASSESSMENT OF VADGAON TANK OF KOLHAPUR (MAHARASHTRA), WITH SPECIAL REFERENCE TO ZOOPLANKTON

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ABSTRACT:

Study on hydrobiological status of Vadgaon tank water was made to assess the potability of water from Jan. 2009 to Dec. 2009. Some physico-chemical parameters were considered such as temperature, turbidity, pH, dissolved oxygen, carbondioxide, hardness, alkalinity, phosphate and nitrate. Among the zooplankton population four group of Rotifera, Cladocera, Copepod and Ostracods were studied.

Key words: Perennial tank; physico-chemical parameters; monthly variation, zooplankton

INTRODUCTION:

The interrelationship between the physicochemical parameters and plankton production of tank water and its relation with fluctuation of zooplankton are of great importance and basically essential in fish culture. Fishes are dependent on physicochemical parameters. Any change of these parameters may affect the growth, development and maturity of fish [1]. Different causal influences, which determine the quality of water, show a characteristic change from season to season [2-5].

Zooplankton constitutes important food item of many fishes. The larvae of carps feed mostly on zooplankton [6]. Zooplankton also plays a important role in the food chain as they are second in trophic level as primary consumers and also as contributors to next trophic level [7].

Sunkand and Patil [8], Islam [9] has worked on the physicochemical condition and seasonal variation of zooplankton.

The present study was made on water quality and occurrence of some zooplankton with respect to physicochemical parameters in Vadgaon tank of Kolhapur district (Maharashtra)

MATERIALS AND METHODS:

The study was conducted on Vadgaon tank situated 15 km away from Kolhapur city which lies between 16^o46' 26.56" N latitude and 74^o18' 21.54"E longitude, from January 2009 to December 2009. The area of the tank is 120 ha. Rainfall is the water source of water for tank. The water of the tank is clear and few aquatic plants are present.

Water samples were collected monthly in the morning at 8 am to 10 am from surface layer of the tank. Water temperature was recorded by a centigrade thermometer and pH was recorded by pocket digital pH meter. Turbidity was recorded by Nepheloturbidity meter, Dissolved oxygen was determined by the Winkler's method, Free carbondioxide was determined by titrimetric method, Hardness was estimated by EDTA titrimetric method, Alkalinity was estimated by titrimetric method Phosphate was estimated by ammonium molybdate method and Nitrate was estimated by Brucine method. Results were expressed in mg/l. [10-12]. The numerical estimation of zooplankton was made by Sedgewick Rafter cell and expressed in number per liter. All data were statistically analyzed (standard deviation).

RESULTS AND DISCUSSION:

The data on physico-chemical analysis of Vadgaon tank water has been given in Table No.1.

Temperature:

During the study period water temperature varied from $22.33 \pm 0.57^{\circ}\text{C}$ to $27 \pm 1.10^{\circ}\text{C}$. Jayabhaye et al; [13], Salve and Hiware [14], observed that during summer, water temperature was high due to low water level and clear atmosphere. Similar results were obtained in the present study

Turbidity:

The turbidity of water fluctuated from 0.41 ± 0.02 NTU to 3.51 ± 0.72 NTU. The maximum value was recorded in the month of March (summer) and minimum value in the month of October and November (winter). Maximum turbidity in March may be due to human activities like washing, bathing.

pH:

The pH values ranges from 7.32 ± 0.12 to 8.63 ± 0.10 . The maximum pH value was recorded in the month of August (monsoon) and minimum in the month of April (summer). pH was alkaline throughout study period.

Dissolved Oxygen:

The values of DO fluctuate from 5.09 ± 0.74 mg/l to 12.78 ± 1.08 mg/l. The maximum values were recorded in the month of April (summer) and minimum values in the month of December (winter). The high DO in summer is attributed to increase in temperature and duration of bright sunlight. The long days and intense sunlight during summer seems to accelerate photosynthesis by phytoplankton, utilizing CO_2 and giving off oxygen. This accounts for the greater quantity of O_2 recorded during summer. The quantity is slightly less during winter as reported by Masood Ahmed and Krishnamurthy [15].

Carbon-dioxide:

The values of free CO_2 range from 0.0 mg/l to 9.96 ± 1.01 mg/l. The maximum value was recorded in the month of December (winter) and absent in the month of September (monsoon). High carbondioxide is due to increase in the decomposition of organic matter, low temperature and photosynthetic activities of phytoplanktons. Absence of free carbondioxide is due to its utilization by algae during photosynthesis or carbonates present.

Hardness:

The values of hardness fluctuate from 45.00 ± 0.90 mg/l to 133.33 ± 1.16 mg/l. The maximum value was recorded in the month of December (winter) and minimum value in the month of October (winter).

Alkalinity:

Total alkalinity ranges from 148.33 ± 0.94 mg/l to 210 ± 1.00 mg/l. The maximum value was recorded in the month of August (monsoon) and minimum value in the month of January (winter).

Phosphate:

The value of phosphate fluctuatds from 0.11 ± 0.03 mg/l to 4.11 ± 0.90 mg/l. the maximum value was recorded in the month of September (monsoon) and minimum value in the month of April (summer). The high values of phosphate in September (monsoon) months are mainly due to rain, surface runoff, agriculture runoff; washing activities that contributed to the inorganic phosphate content. Similar results were reported by Arvindkumar [16].

Nitrates:

The value of nitrate ranges from 1.53 ± 0.47 mg/l to 29.75 ± 0.56 mg/l. The maximum value was observed in the month of August (monsoon) and minimum in the month of January (winter). Swaranlatha and Narsingrao [17] reported that nitrates are in low concentration in summer and high during monsoon which might be due to

surface run off and rain. Similar results were obtained in the present study.

The zooplanktons were represented by four groups viz Rotifera, Cladocera, Copepoda and Ostracoda. Among these Rotifera comprises 7 species, Cladocera 5 species, Copepoda 1 species and Ostracoda 1 species. In Vadgaon tank, the Rotifera population recorded peak in the month of October (57.89 %) with its maximum composition in July (37.60 %) respectively. Among these *Brachinous angularis*, *B. caudatus*, *B. fulcatus*, *B. calyciflorus* and *B. vulgaris* were most common forms. The *B. rubens* and *Kertella tropica* was observed with minimum population density. *B. angularis*, *B. caudatus*, *B. fulcatus*, comprises maximum population density as compare to other species of Rotifera, whereas their absence was noted in the month of June. The copepod population was recorded at distinct peak in the month of September (20.96%) with their maximum density in January (20.90%) while minimum in the month of June (8.75 %). The copepod species includes *Cyclopid copepod*, *Calanoid copepod*, *Eucyclop species*, *Mesocyclops*, *Neodiaptomus*, *Paracyclops*, *Diaptomus copepod* etc. Among these copepod most dominant species were *Calanoid copepod*, *Mesocyclops*, *Rhinediaptomus Spp.*, *Paracyclops*, *Diaptomus copepod*, *Cyclopid copepod* were observed in the winter and summer seasons, whereas their absence was noted in the month of September.

The maximum percentage of Ostracoda was recorded in June (45.77 %) and minimum in November (11.31 %) with their absence from July to September. The Ostracoda group was represented by *Hemicypris fossulate*.

Cladocera was observed maximum in the month of July (98.64%) and minimum in

October (12.95%) the Copepods were represented as *Diaphanosoma sarsi*, *Diaphanosoma excisum*, *Monia brachiata*, *Daphnia pulex*, *Macrothrix laticornis*. The annual range of zooplankton richness in Vadgaon tank are higher than reported by Kaushik and Sharma [18] and Patil and Karikal [19]. The present study depicted considerable variations in community structure within limnetic zooplankton. Dominance of rotifers in the tank could be attributed to the continuous supply of food material [20]. The order of dominance of various groups of zooplanktons were represented as-

In Vadgaon tank Rotifera (40.33%) > Cladocera (36.49%) > Ostracoda (12.75%) > Copepoda (10.41%)

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Table No. 1 Monthly variations in Physico-chemical parameters (mg/l) of water samples of Vadgaon tank (Jan 2009-Dec 2009)

Stations/ Months	Temp ⁰ C	pH	Dissolved oxygen	Free CO ₂	Hardness	Alkalinity	Phosphate	Nitrate
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WATER QUALITY ASSESSMENT OF VADGAON TANK OF KOLHAPUR (MAHARASHTRA)

Jan-2009	24.16 ± 0.28	8.00 ± 0.47	7.11 ± 0.77	3.66 ± 1.07	85.25 ± 0.48	148.33±0.94	0.32 ± 0.03	1.53 ± 0.47
Feb	23.83 ± 0.28	8.32 ± 0.24	6.61 ± 0.49	4.40 ± 0.00	85.75 ± 0.69	155.83±0.77	0.35 ± 0.03	1.57 ± 0.24
Mar	25.00 ± 1.00	8.48 ± 0.28	9.91 ± 0.32	4.40 ± 0.00	82.58 ± 0.58	150.83±1.00	1.85 ± 0.81	1.92 ± 0.38
Apr	27.66 ± 0.57	7.32 ± 0.12	12.78 ± 1.08	3.66 ± 1.07	80.66 ± 1.15	180.00±1.00	0.11 ± 0.03	3.55 ± 0.24
May	27.00 ± 1.00	8.55 ± 0.08	11.83 ± 0.77	2.93 ± 1.07	81.33 ± 0.30	176.66±1.16	0.30 ± 0.12	3.77 ± 0.90
Jun	25.33 ± 0.57	8.57 ± 0.14	9.78 ± 1.14	4.40 ± 0.00	80.00 ± 0.20	166.66±0.27	0.18 ± 0.10	5.13 ± 1.05
Jul	24.15 ± 0.27	8.32 ± 0.17	9.36 ± 0.82	7.33 ± 0.54	73.33 ± 0.27	186.66±0.14	0.12 ± 0.04	12.00 ± 0.95
Aug	25.17 ± 0.75	8.63 ± 0.10	9.80 ± 0.86	3.26 ± 1.10	78.66 ± 1.01	210.00±1.00	1.86 ± 0.56	29.75 ± 0.56
Sept	26.41 ± 1.52	8.63 ± 0.05	10.41 ± 0.62	0.00 ± 0.00	61.66 ± 0.88	186.66±0.77	4.11 ± 0.90	5.84 ± 0.27
Oct	26.00 ± 1.00	8.08 ± 0.12	10.34 ± 0.62	3.66 ± 1.07	45.00 ± 0.90	203.33±0.77	1.58 ± 0.44	4.92 ± 0.59
Nov	22.66 ± 0.57	8.07 ± 0.13	8.04 ± 1.06	9.26 ± 0.80	110.00±0.82	203.33±0.77	0.21 ± 0.10	4.88 ± 0.41
Dec	22.33 ± 0.57	8.19 ± 0.17	5.09 ± 0.74	9.96 ± 1.01	133.33±1.16	206.66±0.54	7.82 ± 0.71	3.62 ± 0.21

List of phytoplankton species from Vadgaon (Jan2009-Dec 2009)

Chlorophyceae	Bacillariophyceae	Dynophyceae	Myxophyceae	Euglenophyceae
<i>Volvox sp.</i> <i>Ankistrodesmus sp.</i> <i>Pediastrum sp.</i> <i>Ulothrix sp.</i> <i>Odogonium sp.</i> <i>Spirogyra sp.</i> <i>Cosmarium sp.</i>	<i>Navicula sp.</i> <i>Surella sp.</i> <i>Cyclotella sp.</i> <i>Coscinodiscus</i>	<i>Ceratinium</i> <i>hirudinella</i>	<i>Microcystis sp.</i> <i>Merismopedia sp.</i> <i>Nostoc sp.</i> <i>Anabena sp.</i> <i>Oscillatoria sp.</i>	<i>Euglena sp</i>