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## ASSESSMENT OF POLLUTION HAZARDS IN PONDS AT BANDA (U.P.) INDIA

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### ABSTRACT

The three perennial ponds namely Sahab talab, Chhabi talab and Pragi talab of Banda city were studied. Their water analysis was done for the physical and chemical factors viz. Colour, Turbidity, water temperature, pH, CO<sub>2</sub>, D.O., B.O.D., chloride, carbonates, bicarbonates, total alkalinity, ammonical nitrogen, nitrate, phosphate considering the effects of meteorological conditions viz. photoperiod, atmospheric temperature, rainfall and relative humidity to assess the hazardous effects on the economically important bio-productivity viz. algae and fishes. During the study, it was marked that due to pollution the growth of the fishes was badly effected which have economic importance as food value besides such water is also hazardous to the living beings which consume it. It was found that B.O.D., chloride, nitrate, phosphate were quite high which are the indicators of water pollution. The management of the ponds under study will be suggested for their proper scientific management. Obviously such water bodies might be used for an optimum bio-productivity and consumption without any hazards. So the economic condition and well being for human health along with the employment might be enhanced.

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KEY WORDS : Assessment of bio-productivity, Meteorological conditions, Physico-chemical characteristics, Role of lentic water bodies in human welfare, .

### Introduction

Attempts should be made to increase production in the industrial and agricultural sectors to meet the demands of the growing population and increasing civilization. So the factory effluents and agricultural runoff chemicals contain pollutants. Besides, sewage, municipal wastage and human activities are also responsible for pollution. Obviously lentic and lotic water bodies become highly polluted. So the bio-productivity is adversely affected besides such water is hazardous for human health and other animals. The analysis of water for assessment of pollution is done by physico-chemical study of water along with

meteorological conditions which are responsible for diversity and periodicity of algae and fishes. As the lentic and lotic waters are very useful for bio-productivity, all the water bodies should be scientifically managed for the well being of bio-productivity.

The world's waters are under pressure as water resource system is a vital aid for its strategic management. So it is necessary for its revival information for national decisions in the welfare of the people because water is life. The central Government has also started "Rajiv Gandhi water mission" program which is being carried out. Ponds are being used since long as they are the traditional

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source of water. In Banda (U.P.) the ponds' water only was being used since past as complete resource of water for the entire city when there was no pipe line water supply system. At present such lentic waters are used for bio-productivity particularly for algae, fishes, human activities and cattles. Unfortunately such water has become very much polluted by various causes such as chemical uses in various ways and wastes from the drainages causing pollution hazards.

**Note :** Grade I : More Polluted  
Grade II : Less Polluted  
Grade III : Least polluted

Having in view the three existing ponds namely Chhabi Talab, Sahab Talab and Pragi Talab which are perennial and large in size have been taken for the present study considering their pollution hazards on bio-productivity and human beings. In Bundelkhand region, very few work has been done till date whereas no work was done on ponds in Banda district, which is under Chitrakoot Dham Commissionary Banda (U.P.). This region is tropical and plateau surrounded by Vindhya ranges, which is located between 23.8-23°N latitudinal, 78°11'- 81°30' E longitude.

The Sahab Talab is deep, its peripheral zone becomes shallow due to soil erosion. It acquires

an area of 2.5 hect. On eastern side is residential colony, western side is Jail road. It has a pakka bathing ghat. Chhabi Talab is second pond which is located in Kailashpuri colony and it acquires an area of 0.3 hect. Its western and southern sides have embankment, road and dhobi ghat and northern side has Naka colony besides eastern side has one temple and the large part of colony. The third pond Pragi Talab is located out of the city in at Ganchha road. Its area is approximately 8 hectares. It is deepest, nearly 20 feet deep in the middle zone; its peripheral zone becomes shallow due to soil erosion. These all ponds are perennial.

All the three ponds are still unexplored. They all may be scientifically used for high productivity so that their proper utilization might be an asset in wellbeing of the peoples of this area.

### Material and Methods

Having in view the entire ecology of the ponds water samples were collected from each of the pond from sub-surface in between 10 A.M. – 12.00 noon in PVC canes and D.O. bottles which were analyzed as per APHA methods<sup>2</sup>, for abiotic and biotic parameters. The abiotic factors investigated were water temperature, turbidity, pH, colour, dissolved oxygen (D.O.), chloride, carbon-di-oxide (CO<sub>2</sub>), B.O.D., phosphate, ammonical



**Fig. 1 : Chhabi Talab (Grade-I)**

nitrogen, nitrate, carbonates, bicarbonates. Under biotic factors phytoplanktons and fishes were studied. Phytoplanktons were collected by sedimentation preserved in 4% formalin after filtering through 100 liters of water through bolting silk net and examined under Sedgwick Rafter cell and their genera were identified. Phytoplankton were expressed for their density as units per org/ml with the aid of the formula  $[n=a.b./l]$ . Fishes were captured by dragnet with the help of fishermen and identified with the aid of Day fauna.

### Results and Discussion

In the present study physico-chemical analysis of three ponds' water in reference to assessment of pollution hazards and their impact on bio-productivity was done in summer season 2009-10 (March-June) at Banda. For this meteorological conditions *viz.* atmospheric temperature, photoperiod, rainfall, relative humidity conditions were also considered. Atmospheric temperature has direct correlation with water temperature which has direct effect on productivity. Higher water temperature is suitable for the growth of phytoplanktons besides photoperiod has also direct co-relationship. Rainfall and relative humidity were negligible. It was found that during summer season high values of turbidity adversely affected phytoplankton production and vice versa.

These ponds water temperature was found to vary from 33.0°C to 35.0°C in summer season. The higher water temperature was found suitable for the growth of phytoplankton.

Turbidity varied from 97 NTU to 128 NTU in summer season in these ponds. Higher turbidity has adverse effect on photosynthesis.

Green colour all the three water bodies during the study course.

The pH range was found to vary from 7.50 to 8.40 in summer season in these ponds. Though the said pH range is suitable for bio-productivity.

CO<sub>2</sub> varied from 16.00mg/l to 21.00mg/l in the course of study. High concentration of CO<sub>2</sub> was due to higher rate of decomposition of organic matter.

Dissolved oxygen (D.O) varied from 5.70 mg/l to 7.15 mg/l. Concentration of dissolved oxygen in these ponds showed a direct relationship with phytoplankton density due to their higher photosynthetic activities. But the adverse effect was due to more decomposition of organic matter, which decreases the D.O. values. Thus the D.O. values were found less whereas B.O.D. increased.

Chloride varied from 65 mg/l to 71mg/l in the ponds. Besides considerable chloride contents due to organic matter during summer season indicated the pollution in the water which was due



Fig. 2 : Sahab Talab (Grade-II)

to drainages. This causes adverse effect on bio-productivity. In Chhabi talab chloride concentration was quite high which has adverse effect on bio-productivity.

Carbonates and bicarbonates varied from 46.00 mg/l to 51.00mg/l and 175.00 mg/l to 192.00 mg/l in summer season in these ponds. Ponds I, II & III showed co-relation with alkalinity.

Ammonical nitrogen varied from 0.45 mg/l to 0.70 mg/l in these ponds in summer season. Ammonia provides a source of recycled nitrogen to speed the growth of phytoplankton particularly blue green algae when their forms of nitrogen have been exhausted<sup>6</sup>. Higher values during summer season due to assimilation in the allogenic organic matter.

Nitrate varied from 0.99 mg/l to 2.00 mg/l. in summer season. In pond ecosystem besides the input of nitrate through runoff decomposition of nitrogenous matter and its further oxidation plays a significant role.

Phosphate varied from 0.55 mg/l. to 1.05 mg/l. in these ponds in summer season.

Phosphate is rapidly assimilated by phytoplankton and micro-organism<sup>9</sup>.

Biological Oxygen Demand (B.O.D) varied from 4.70 mg/l to 6.70 mg/l. in these ponds in summer season. It is negatively related with D.O. Analysis of biological materials along with chemical factors of water is proper method for assessment of quality of water<sup>4</sup>.

Under phytoplankton (Chlorophyceae, Bacillariophyceae and Cyanophyceae) were studied qualitatively. Under the qualitative study various genera of the said phyceae were identified as given in Table-1. The economically important algae were identified. Besides fishes collected by dragnet, economically important fishes were identified with the aid of Day fauna.

Considering the physico-chemical factors of all the three ponds under study the pollution grades were assessed. The most polluted was Chhabi talab next to this was Sahab talab whereas Pragi talab was least polluted. The pollutants chlorides *etc.* were found above the BIS standards.

**TABLE - 1 : Physico-chemical parameters of ponds during summer season (March-June) 2009-2010**

Parameter	Chhabi talab Grade-I	Sahab talab Grade-II	Pragi talab Grade-III
Water temp. °C	33.00	34.00	35.00
Turbidity N.T.U	128	120	97
Colour	Green	Green	Green
pH	7.50	8.20	8.40
CO <sub>2</sub> mg/l	21.00	20.00	16.00
D.O mg/l	5.70	6.00	7.15
Chloride mg/l	71.00	68.00	65.00
Carbonates mg/l	51.00	47.00	46.00
Bicarbonates mg/l	192.00	188.00	175.00
Ammonical nitrogen mg/l	0.70	0.59	0.45
Nitrate mg/l	2.00	1.90	0.99
Phosphate mg/l	1.05	0.81	0.55
B.O.D.	6.70	5.80	4.70



Fig. 3 : Pragi Talab (Grade-III)

So, it was inferred that the bio-productivity viz. phytoplankton and fishes in the ponds were affected adversely. The measures are to be adopted for maintaining these ponds without pollutants resource.

Having in view the causes of pollution the suggestions are for all the ponds. The embankment should be constructed either Kacha or Pakka with plantation and all the sewages drainages should be diverted to other places besides all the solid wastes should be dumped, somewhere else. The inlet for incoming water resource and outlet for discharges water should be properly made with gauzed gate so that the entire pond's water might be controlled at certain level and incoming water might circulate properly as the circulation of water is also very essential for the fish productivity.

#### Phytoplankton in summer season (March-June) 2009-10

The under mentioned genera were identified of the three phyceae :

**Chlorophyceae** : *Ulothrix*, *Spirogyra*, *Zygnema*, *Tetraspora*, *Colastrum*, *Protocoecus*.

TABLE-2 : Economically important fishes were identified with the help of Day fauna and their feeding habits were studied.

Fishes (Major carps)	Feeding habits
<i>Catla catla</i>	Surface plankton feeder
<i>Labeo rohita</i>	Herbivorous
<i>Wallago attu</i>	Carnivorous
<i>Mystus seenghala</i>	Carnivorous
<i>Clarias bacrachus</i>	Omnivorous
<i>Heteropneustes fossilis</i>	Bottom feeder, omnivore

**Bacillariophyceae** : *Cyclotella*, *Navicula*, *Synedra*, *Amphora*, *Nitzschia*.

**Cyanophyceae** : *Microcystis*, *Oscillatoria*, *Nostoc*, *Anabaena*, *Tetrasporedia*.

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