



## Original Research Article

# Study of potability status, aquaculture and biodiversity of Natnagra Pond, Dhar (M.P.) India

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## ABSTRACT

### Keywords

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This paper deals with the study of Natnagra pond, Dhar town (M.P.). The potability status is analyzed by examination of physico-chemical parameters of water samples. Water samples were collected in three different seasons. Physico-chemical parameters like Turbidity, pH, Specific conductivity, TDS, Total Alkalinity, Chloride, Fluoride, Nitrate, Sulphate, D.O., B.O.D., C.O.D., Total Coliform and Faecal Coliform are examined. Their effects on human health are also discussed. The findings of the analysis will prove to be quite informative to the daily consumers of the water. It also deals with the study of aquaculture and biodiversity of the pond.

## Introduction

The availability of safe and reliable source of water is an essential pre-requisite for community. To meet this requirement the concept of water quality monitoring is studied in present work. The present study is undertaken to carry out quality assessment of the pond water and its effect on human health and aquaculture. The biodiversity of the pond is also studied. Natural and manmade influence the quality of water. The rain water plucks up various pollutants, gaseous and particulate matter from the atmosphere before it precipitates on the ground. The point of origin also influences the composition of the pond water. The water quality is also affected by environment,

recent weather condition and geology of catchment areas. The pond water is also characterized by their content of suspended matter. Nutrient received by the pond water favors growth of water fauna & flora. These in turn highly influence the oxygen and self-purification capacity of the water.

Due to the contamination of pond water, safe drinking water is not available to most of the undeveloped cities; Dhar town is one of them. So many people are died due to the water-borne diseases. Bacteriological examination of water is essential for potability purpose. The contribution of Mishra & Patel (2001) to the bacteriological

investigation and pollution of water bodies which effect the potability of water.

Polluted and contaminated water causes various diseases. These diseases are known as water born (diarrhea, jaundice, cholera, gastroentitis etc.) and water related (malaria, dengue, encephalitis etc) diseases. It has been well established that enteric and parasitic diseases like jaundice, dysentery, diarrhea, flurosis, cholera and gastointitis are very high in the absence of proper sanitation and safe drinking water facility. The water related diseases are also due to surface water resources. Many small pits are seen in different places of Dhar town around the residential area, they cause high range of effect of water related diseases like malaria, dengue, encephalitis etc. Hence the monitoring of non drinking water resources

like pond will be helpful in the management of such water body with respect to aquaculture, Peter (2002).

Dhar town was famous for *Saadhe Baarah Taalab* (twelve and half ponds) and its beauty. Natnagra pond is also one of them in town. Role of this pond in the town depicted in Table-1

### Study Area

Dhar is the district place which is situated at western part of Madhya Pradesh. Natnagra Pond is situated under the famous Khanderao's Tekri in Dhar town. This Pond is under the supervision of Municipality. The surface area of the pond is 0.15 sq.km.

**Table-1 (Role of Pond in Town)**

Environmental Components	Activities	Description
Water Resource	Bathing	A large number of people from lower economic background use them for bathing.
	Washing	Washing of clothes, utensils and other domestic requirements
	Rainwater Harvesting	Acts as rainwater storage.
Environment	Climate control	Ponds affect local micro-climate, making it cooler and soothing
	Open space	Ponds provide an open space providing room for air movement. Space for recreational use.
	Trees	Generally the pond banks have tree plantations, preserving urban nature
	Aquatic Ecology	Ponds support many aquatic and other species, a receptacle of biodiversity in town
Economy	Fish cultivation	Source for local employment and good protein
Social	Community gathering	People spend time sitting around these ponds. Many ponds have seats around them and are an important place for local community gathering.
	Clubs	Because of open space, there often exist many clubs by the pond side. These clubs also manage the ponds.

## Materials and Methods

The pond water monitored seasonally (rainy, winter & summer). For monitoring physico chemical and bacteriological analysis is done by standard methodology of APHA (1998). Obtained results were compared with standard values laid down by BIS. Collection of samples from the sampling stations done early in the morning (8AM to 11AM) during the year 2013.

Fishes are collected with the help fishing nets; they are preserved in formalin and identified by Day Fauna. Phyto planktons and zoo planktons are collected by planktonic net and preserved it in small bottles with 5% buffered formalin. Macrophytes are identified by harvest technique. The birds are identified by Salim Ali's book (2002).

## Results and Discussion

The results of physico chemical and bacteriological parameters of the pond are depicted in Table-2 and correlation between these parameters depicted in Table-3.

Colour of the pond water samples fluctuated seasonally. It is dusky in rainy season and dark green in winter season, in summer season water is poor and dirty. It is depends upon the optical characteristics, suspended matter and surrounding influence.

The turbidity value of the pond ranging from 44.8 to 67.2. Higher turbidity value was observed during summer season due to evaporation of water. In rainy season addition of silt load inflexed with run of the water so the values of higher than winter.

The pH value ranging from 8.3 to 9.4 during the study period. It was good planktonic growth and leading to better fish production.

Specific conductivity of the pond was ranged between 247 to 294  $\mu\text{mhos/cm}$ . higher values observed in summer season due to evaporation. During rainy season dilution of water resulted in lower value. TDS ranged between 240 to 260 mg/l. It follows the trend of specific conductivity and strongly significant correlation with it. Hardness value of the pond ranged between 260 to 282 mg/l. The higher values due to calcium and magnesium salts (Bagde and Verma 1985). This value indicates water quality is very hard of the pond. Higher hardness value adversely affects human health.

Alkalinity value was ranged between 219 to 260 mg/l. The higher alkalinity value causes unpleasant test of water, Hujare (2008).

Chloride value of the pond was ranged between 127 to 175 mg/l. The water samples suitable for aquaculture purposes. Chloride value of the pond water was higher during winter as compared to rainy season due to mixing of organic waste of animal origins, same observed during in summer. It is directly correlated with the pollution level (Munnawar, 1970).

Fluoride concentration was ranged between 0.34 to 0.50 mg/l. It was under the permissible limit of BIS. Hence the sampling station is suitable for drinking and aquaculture purposes.

Nitrate ranged between 1.2 to 2.6 mg/l. The excessive use of nitrogenous fertilizers in agriculture is primary source of high nitrate content. It is under the permissible limit of the BIS. Sulphate concentration ranged between 52.6 to 56.8 mg/l. This pond is being used for bathing and cloth washing activities. Hence the values were higher. It increased hardness and potable water causes gastrointestinal irritation (Jain, et.al.1996).

**Table.1** Physico- chemical and bacteriological examination (Mean value ) of The Natnagra Pond

S.N	Micro biological parameters	Station-1			Station-2			Station-3			Station-4			Centre-Pond		
		Rainy	Winter	Summer	Rainy	Winter	Summer									
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2	Turbidity(NTU)	44.8	45	65.1	44.9	47	66.2	44.8	46.2	67.2	44.6	45.2	66.4	45.1	46.2	66
3	pH	8.3	9.4	8.2	8.4	9	8.5	8.3	9.4	8.4	8.4	9.2	8.3	8.4	9.2	8
4	Specific Conductvity	294	247	267	290	253	278	292	254	268	292	254	272	294	256	2
5	T.D.S.(mg/l)	225	260	240	227	258	242	228	256	240	226	260	242	228	258	2
6	Total Hardness(mg/l)	260	278	282	264	282	286	262	270	284	262	276	282	266	280	2
7	Total Alkalinity (mg/l)	219	225	260	232	230	256	220	222	258	218	224	258	230	236	2
8	Chloride(mg/l)	127	131	175	130	132	172	128	136	168	130	136	174	136	140	1
9	Fluridie(mg/l)	0.35	0.50	0.34	0.36	0.45	0.34	0.36	0.42	0.34	0.34	0.40	0.36	0.32	0.40	0.
10	Nitrate (mg/l)	1.20	1.60	2.60	1.30	1.50	2.10	1.50	1.60	2.40	1.40	1.60	2.40	1.40	1.70	1.
11	Sulphat(mg/l)	56.80	52.60	54.40	55.40	53.20	54.20	54.80	53.20	55.20	54.60	50.60	53.40	55.20	53.20	54.
12	Phosphate (mg/l)	1.26	1.80	1.48	1.24	2.00	1.50	1.28	1.80	1.42	1.24	1.60	1.44	1.22	2.00	1.
13	D.O.(mg/l)	4.90	5.50	4.20	4.60	5.20	4.00	4.80	5.40	4.20	4.80	5.40	4.00	4.60	5.00	4.
14	B.O.D.(mg/l)	4.80	4.30	5.20	4.60	4.00	4.10	4.40	4.20	5.00	4.80	4.40	5.00	4.40	4.80	4.
15	C.O.D.(mg/l)	31.30	33.00	36.20	31.60	33.40	36.40	31.50	33.20	36.20	32.30	34.00	36.40	30.40	32.40	36.
16	Total coliform	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>24
17	Faecal Coliform	175	120	185	152	80	160	168	112	145	178	122	186	150	90	1

**Table.2** Correlation between various parameters of the sampling stations- NATNAGRA POND

S.no	Parameter	Trbidity	pH	Sp. con	TDS	Tot. Hard.	Tot. Alk.	Cloride	Fluoride	Nitrate	Sulphate	Phosphate	DO	BOD	COD	Tot. Colifrm	Faecal Coliform
1	Turbidity	1.00															
2	pH	-0.41	1.00														
3	Spe. Conductivty	-0.05	-0.08	1.00													
4	TDS	-0.01	0.86	0.97	1.00												
5	Tot. Hard.	0.74	0.16	0.60	0.59	1.00											
6	Tot. Alkali.	0.96	-0.41	0.07	0.01	0.76	1.00										
7	Chloride	0.98	-0.36	0.10	0.03	0.75	0.96	1.00									
8	Flouride	-0.54	0.89	0.75	0.79	0.11	0.50	-0.51	1.00								
9	Nitrate	0.92	-0.27	0.25	0.14	0.75	0.91	0.94	-0.37	1.00							
10	Sulphate	0.06	-0.80	0.87	0.91	-0.50	0.03	-0.01	-0.77	-0.10	1.00						
11	Phosphate	-0.12	0.83	0.91	0.96	0.51	-0.10	-0.08	0.80	0.01	-0.90	1.00					
12	DO	-0.83	0.79	0.47	0.51	-0.35	-0.83	-0.80	0.85	-0.70	-0.50	0.57	1.00				
13	BOD	0.41	-0.64	0.31	0.51	-0.05	0.44	0.41	-0.57	0.48	0.59	-0.60	0.50	1.00			
14	COD	0.94	-0.12	0.35	0.29	0.89	0.92	0.95	-0.27	0.93	-0.20	0.18	0.60	0.23	1.00		
15	Total Coliform	-0.05	-0.43	0.62	0.59	-0.51	-0.08	0.02	-0.58	-0.10	0.43	-0.60	0.30	0.14	0.20	1.00	
16	Faecal Coliform	0.35	-0.81	0.73	0.79	-0.26	0.31	0.36	-0.79	0.29	0.69	-0.90	0.70	0.67	0.90	0.64	1.00

**Table.3** The list of Phytoplankton and Zooplankton.

<b>PHYTOPLANKTON</b>	<b>ZOOPLANKTON</b>
<b><u>Chlorophyceae-</u></b>	1. Branchionus sp
1. Volvox Sp.	2. Monostylus sp.
2. Closterium Sp.	3. Daphnia sp.
3. Spirogyra Sp.	4. Cyclops sp.
4. Chlorella Sp.	5. Cypris sp.
5. Chlorococcm sp.	6. Nauplius sp.
<b><u>Euglenophyceae</u></b>	7. Diptomus
1. Euglena Sp.	
2. Navicula Sp.	
3. Synendra Sp.	
<b><u>Cynophyceae</u></b>	
1. Anacystis sp.	
2. Anabina Sp.	
3. OscillariaSp.	
4. Spirulina sp.	
<b><u>Bacillariophyceae</u></b>	
1. Fragillaria sp.	
2. Cyclotella sp.	
3. Surinella Sp.	

Phosphate ranged between 1.26 to 1.8 mg/l. It was higher due the mixing of sewage, bathing and cloth washing activities. Its higher concentration favored the productivity of this pond.

DO was ranged between 4.2 to 5.5 mg/l. During summer depletion in oxygen was observed due to high temperature. In rainy season regain of oxygen was observed. In winter higher oxygen value due to low temperature. These observations concluded that water of the pond suitable for fish culture and irrigation purposes.

BOD level ranged between 4.2 to 5.3 mg/l. This higher affects the aquaculture.

COD value ranged between 31.3 to 36.2 mg/l. This higher value indicates the organic pollution in pond water.

Total Coliform was > 2400 MPN/100ml. It was observed in class 'B'. Hence this water can be use for drinking purpose after the necessary treatments.

Faecal coliform ranged between 0 to 400MPN/100ml. Hence this water can be use for drinking purpose after the necessary treatments.

In the present study all the physico chemical properties under the desirable limits of aquatic life, Bhatnagar et.al.(2000). During the study period following fish species were observed i.e. Catla catla, Labeo rohita, Cirrhinus mrigala, Channa striatus, Channa gachua, Heteropneustes fossilis, Wallago attu, Mystus seenghala, Notopeterus notopertrus, Clarius batrachus, Rasbora daniconius etc.

Phytoplankton and zoo planktons are depicted in Table-4, as per Patil Shilpa et.al. (2012)

During study period following aquatic birds like Pondheron, Purpleheron, Niddle cormorend (Fish Killer), Dow, Duck, Red wanted bulbul, Crow, Pigeon, Water fowl, Saras, Dubkni, Parrots, King fisher, Peacock, Great carmorand, Red watted lapwing were seen.

Aquatic plants like *Utricularia vulgaris*, Curly-leaf pond weed, *Chara* sps., *Potamogeton* sps., *Nymphaeodorata*, *Spirodala polyryza*, *Sagittaria*, *Typha* sps., *Sparganium eurycarpum* etc. were seen.

Following aquatic animals like water hog louse, Shrimps, water flea, fresh watrwer worms, dragon fly and May fly, Insect larva, Mosquito larvae, Tadpoles of frog, Snails. Frog species were also seen.

Due to contamination and pollution of water various water born and water related diseases observed. Known as Diarrhoea, Jaundice, Cholera, Gastroentitis, Malaria, Dangué, and Encephalitis. On the basis of analysis of data it is observed that the highest number were suffering from malaria diarrhea and gastroentitis.

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