

# A Comparative Study of Three Pond Ecosystem for Physico-Chemical Parameters in Kota Rajasthan

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## Abstract:

This study was conducted in 2020-2021 with the help of the regional office Rajasthan state pollution control board Kota Rajasthan. Water was collected from different places of Sultanpur, Ganeshganj and Ayana ponds, to investigate the physico-chemical parameters like temperature, pH, electric conductivity, dissolving oxygen, biology O<sub>2</sub> demand, COD, total alkalinity, Cl and NO<sub>3</sub>. Vegetation and ecosystem metrics like metabolism, nutrient concentration was compared of three ponds. In the result all parameters and vegetations are different to each other and have large qualitative variations, so that ecology and environment of the pond is also different and this study is useful to control the physico-chemical and biological condition of water.

*Keywords: Physico-chemicals parameter, Ponds, ecosystem, BOD, COD, Chloride, Nitrate, Electric conductivity, DO, BOD, COD, and TDS*

## INTRODUCTION

Water is the good sources of life and it is required by all livings being. It affects all form of life (Ramesh and Soorya 2013). Pond is the small aera of fresh water and it is different from river in moving water. Pond bottom usually covered with mud and plant grow along the pond edge. It is also the reservoir of rainwater. Ponds can influence the ecological environment of the soil and human health (Mao et al., 2022). Kota Rajasthan boasts a complex and diverse wetland system including riverside habitats, lagoons and marshlands. This region rich in agriculture land as well agriculture practices, so play vital role to build environment. The wetlands and associated environments support many insect species. The majority of macro invertebrates have been identified as valuable bio-indicators for aquatic and wetland environments, but their utility in quick evaluations is constrained by the challenges associated with collecting, sorting, and distinguishing aquatic stages. Kota district is encircled by the districts of Bundi and Tonk in the north, Sawai Madhopur in the north west, Baran in the east, Jalawar and Mandisor in M.P. in the south, and Chittorgarh in the west. Kota has a hot, semi-arid climate with high temperatures and a mild winter. (Yadav et al., 2015).

Understanding an aquatic ecosystem's physicochemical properties is essential for comprehending its biological production. Although each element has a specific function, the composition and productivity of the flora and fauna are determined by the interaction of many different characteristics. (Bisht et al., 2013). The water chemistry like source, composition, reaction and transportation plays an important and direct role with human welfare. We hypothesized the temperature, pH, electric conductivity, dissolving oxygen, biology O<sub>2</sub> demand, COD, total alkalinity, Cl and NO<sub>3</sub> of three comparative pond waters.

## **MATERIALS AND METHOD**

### **Study Location**

In Kota, Rajasthan, three waterbodies were the subject of the study. This city is situated in the Chambel river basin in the state of Rajasthan. The Sultanpur, Ganeshganj, and Ayana ponds were among the water bodies sampled. Seasonal variations and a wide range of temperatures can be found in the Hadoti region. The average monthly temperature ranges from 27°C to 30°C and the average monthly relative humidity is below 70%.

### **Latitude, Longitude and Altitude of Ponds**

Ganashganj pond latitude was N25°30'1", Longitude E76°22'39" and ALTITUDE was 227.1m(736.39 ft). Similarly, Ayana Pond Latitude, longitude and altitude was N25°26'38", E76°26'18" and 240.3m(780.48 ft). Sultanpur Pond Latitude Longitude and altitude was N25°17'26", E76°10'16" and 244.4m(792.48 ft).

### **Study Sites**

Three ponds of Sultanpur, Ganeshganj, and Ayana ponds were suitable for study. The Sultanpur pond is characterized by the presence of grasses, shrubs and trees. The pond is a shallow, slow-moving body of water. Observed anthropogenic activities around the pond include bathing, vehicles navigating the shallow waters, and cattle grazing on the river banks. Ganeshganj pond site is located at Pipalda tehsil of Kota. Grasses, shrubs and trees are also present in pond. The pond is quite shaded, with lots of organic matter in suspension. Ayana Pond site is located at Ayana village Panchayatsimiti Itawa of Kota. It is characterised by the presence of herbs and trees. This pond has different vegetation and biodiversity. The pond is clear, shallow flowing slowly, and with a fine sand bed. Human activities observed at this site include the clearing of aquatic vegetation, washing and extraction of water for irrigation and other domestic purposes.

### **Collection of Water**

This study was conducted in 2020-21 at the regional office state pollution control board Kota Rajasthan. Sample Water was collected from different places of Sultanpur, Ganeshganj and Anana ponds in clean and sterilized bottle for laboratories analysis. The samples were stored at 4°C temperature to analysed the temperature, pH, electric conductivity, DO, BOD, COD, total alkalinity, Cl and NO<sub>3</sub> with the help of APHA, (1998). Phosphate, sulphate, chloride and fluoride were used for analyse the water sample and double distilled water was used for preparation the solution. This method adapted was according to APHA (1998).

## **RESULT AND DISCUSSION**

The quality of the pond depends on physical-chemical character of the water as well as the biological diversity of the ecosystem. The analysis of the biological diversity material and the physico-chemicals factors of the constitute an evolution of the water quality (Cairns and Dickson, 1971). The values of the examined physico-chemical characteristics of the water for the three water bodies (Sultanpur, Ganeshganj and Ayana Pond and) were presented in Table 1. However, most of the results obtained for the physico-chemical parameters were within the limits prescribed for tropical bodies (McCaffrey, 2018).

### **PH of Ponds**

The pH of the Ganeshganj, Ayana and Sultanpur, Pond was 7.63, 6.96 and 7.72 respectively. The highest pH range was recorded in Sultanpur Pond comparison to Ayana and Ganashganj pond.

On the other hand (Singh, 2022) reported that the Ganeshganj pond pH was 7.39. It might be due to the pollution.

### **Temperature and Dissolving Oxygen (DO) of Ponds**

Temperature is a major parameter which can affect the quantity of dissolved oxygen (DO) in freshwater bodies. This is one of the important factors and it is known to influence the amount of DO (Dissolving oxygen) available in water, also effect other properties of water. The highest temperature was recorded in Ganeshganj pond (21°C) which was followed by Ayana Pond (20°C) and Sultanpur pond (20°C). Dissolving oxygen is variable in all pond. Ayana pond has very less DO 2.02 mg/l in comparison to sultanpur 4.8 mg/l and Ganeshganj pond 5.34 mg/l. Water temperature can reduce the amount of DO in water. According to McCaffrey (2018), water at 0 °C can hold up to 14.6 mg/L oxygen, and at 30 °C it contains about 7.6 mg oxygen. This decreased ratio was also reported by Adu et al. al., 2019. In situ DO concentration variability is driven by factors such as water depth, proximity to water's edge, current velocity and temperature. Pond edges are usually richer in DO than deep water. Increased temperatures usually lead to lower dissolved oxygen levels, which also affects the metabolic rate of aquatic insects (Corbet 2004). According to Suhling *et al.*, (2015) and Kemabonta *et al.*, (2020) Plants are also affected by DO. The low levels of dissolved oxygen found at all sites indicate deteriorating water quality and may be due to the presence of nutrients in water bodies as a result of anthropogenic activity.

### **TDS and Total Hardness of Ponds**

TDS and total hardness of pond effect on the vegetation and ecology of the pond. TDS of ganeshganj, Anaya and Sultanpur ponds were 360 mg/l, 310 mg/l and 458 mg/l. The total hardness of these three ponds were 116 mg/l, 180 mg/l and 160 mg/l. Electrical conductivity and TDS values showed significant differences in the Apommu River. This suggests that there is a close relationship between EC and TDS, as dissolved salts in water increase the electrical conductivity of this water. According to Ezekiel, Hart, and Abowei, 2011, the low EC range characteristic of tropical African waters.

### **Conductivity, BOD and COD of Ponds**

Pond conductivity effect the pond environment. Sultanpur Pond conductivity was higher 660 µMHO/cm as compare to Ganeshganj pond conductivity 510µMHO/cm and Ayana Pond conductivity at 450 µMHO/cm at 25°C. BOD is very low (1.5 mg/l) of Sultanpur pond in compare to Ayana Pond (1.8 mg/l) and Ganeshganj pond (4.2 mg/l). According to Prommi and Payakka (2015), increased conductivity is an indicator of dissolved ions. Ganeshganj pond had highest COD (71.76 mg/l). Sultanpur pond COD value was (30.42 mg/l). Ayana pond had minimum COD value (29.64 mg/l).

### **Alkalinity, Chloride and Nitrate in Ponds**

Chloride concentration is the important parameter for detection the contamination of sewage Ponds give variable results of alkalinity, chloride and nitrate. Sultanpur pond had high alkalinity 108 mg/l as compared to Ayana Pond (100 mg/l) and Ganeshganj pond (80 mg/l). Chloride value was higher in Ganeshganj Pond (88mg/l) as compared to Sultanpur Pond (60 mg/l) and Ayana Pond (40 mg/l). Temperature, dissolved oxygen (DO), alkalinity, hardness, pH, electrical conductivity (EC), turbidity, total dissolved solids (TDS), and biological oxygen demand are some of the physicochemical parameters that are routinely measured within water bodies such as ponds (USDA, 1999).

## CONCLUSION

Freshwater quality plays a vital role in distribution, abundance, and diversity of pond. This study revealed that the pond ecology is somewhat polluted based on the similar trend in species assemblages recorded at the selected study sites. The abundance of pollution tolerant species and few stenotopic species evidenced that the water maybe experiencing a level of human disturbance at the period the research was carried out. Efforts should therefore be taken to reduce pollution in order to preserve the diversity of these insects.

## ACKNOWLEDGEMENT

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**Table-1: Physicochemical parameters of three different sites of Kota, Rajasthan**

S.No	Parameter	Ganeshganj Pond	Ayana Pond	Sultanpur Pond
1	pH	7.63	6.96	7.72
2	Temperature	21	20	20
3	TDS mg/L	360	310	458
4	Total Hardness mg/L	116	180	160
5	Conductivity $\mu$ MHO/cm (at 25°C)	510	450	660
6	DO mg/L	5.34	2.02	4.8
7	BOD mg/L	4.2	1.8	1.5
8	COD mg/L	71.76	29.64	30.42
9	ALKALINITY mg/L	80	100	108
10	CHLORIDE mg/L	88	40	60
11	NITRATE mg/L	0.16	0.02	0.02
12	LATITUDE	N25°30'1"	N25°26'38"	N25°17'26"
13	LONGTITUDE	E76°22'39"	E76°26'18"	E76°10'16"
14	ALTITUDE	227.1m(736.39 ft)	240.3m(780.48 ft)	244.4m(792.48 ft)

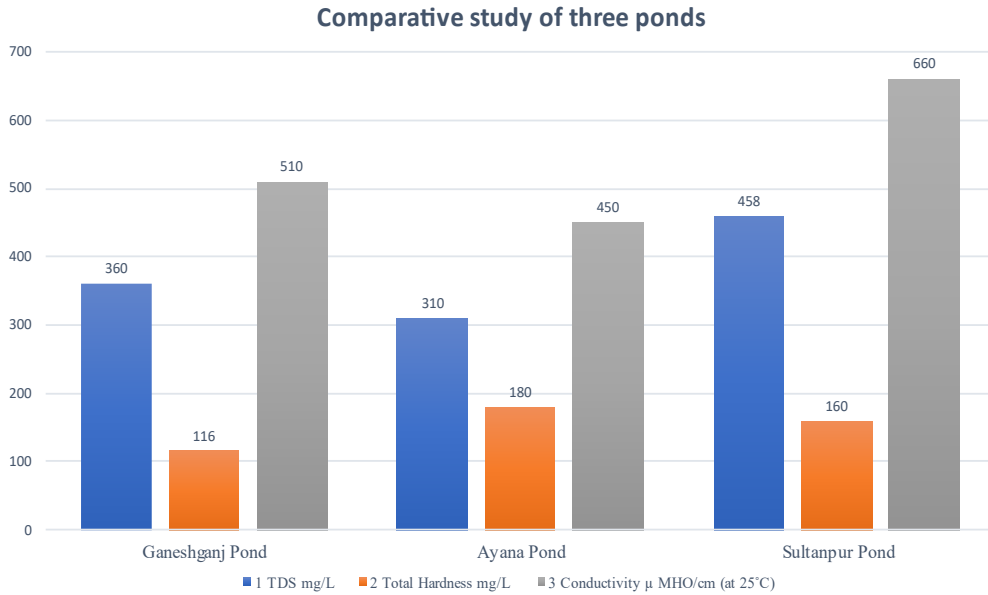


Figure-1

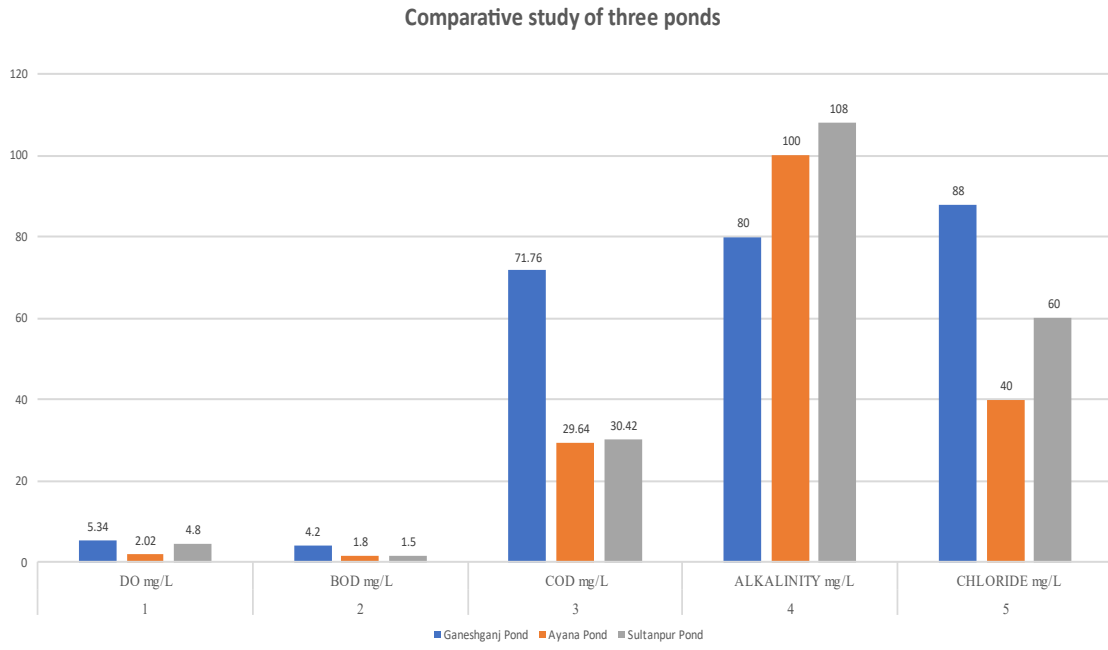


Figure-2