

**Research Article**

## **COMPARATIVE STUDY ON THE ANALYSIS OF WATER QUALITY OF DIFFERENT WATER BODIES OF JAIPUR**

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### **ABSTRACT**

Rapidly expanding cities, industrialization, increased dependency on chemicals and massive production of waste and waste water has resulted in deterioration of the water bodies. This paper deals with the comparative analysis of water quality by using various physico chemical parameters of different water bodies of Jaipur. The parameters which are used for the study purpose are electrical conductivity, pH, total dissolved solids, chloride, total hardness, acidity, alkalinity, fluoride and nitrate. It was found that the TDS, chloride, hardness and fluoride of water of Jal Mahal were highest whereas the conductivity, alkalinity and acidity of Amanishah Nallah were highest among the four water bodies that were studied indicating that the water bodies are polluted.

**Keywords:** *Industrialisation, Physicochemical Parameters, Fluoride, Nitrate*

### **INTRODUCTION**

Water is one and whole, same by its name but it is different by its variable characteristics which are solely based on various factors which impact the quality of water. It is therefore necessary to check the quality of water to assess its further implication. In context of present era we can say that water and its quality plays a pivotal role on each and every living individual. Characteristics of water bodies influence the quality of water individually and in combination with various pollutants, thereby, affecting the living organisms present there (Srivastava *et al.*, 2003; Smitha *et al.*, 2007). In this study we had considered and assessed the quality of different water bodies in Jaipur.

Jaipur the capital of Rajasthan is situated at 27° 00' N latitude and 75° 50' E longitude. The climate of Jaipur is subtropical type, it receives over 650 millimeters (26 in.) of rainfall annually but most rains occur in the monsoon months between June and September, so the availability of water is scarce (World weather Information Services, 2011). In this paper a comparative study of the water quality of Kanota Dam, Jalmahal, Galta Kund and Amanishah Nallah has been carried out. All these water bodies are of different nature and importance, as one of them is used for irrigation and drinking purpose on the other hand one is solely waste and heavily contaminated water.

### **MATERIALS AND METHODS**

The water bodies that were selected for the current study hold some importance in the life of people of Jaipur. The Kanota Dam is a famous recreational spot for the local people. The source of water for the dam is rain water so it was proposed that it could be used to fulfill the drinking water requirements of the city. But the dam receives a lot of waste water and sewage from the surrounding areas. The Galta Kund an ancient Hindu pilgrimage site which is surrounded by Aravalli Hills where devotees from all over the state come to take a holy bath. The water seeping from the mountains is the source of water for the Kund. The Jal Mahal is a famous and well known tourist spot of Jaipur. It has a water spread area of 300 acres (121 ha) and a catchment area 23.50 Sq.Km. Rain is the major source of water in the Jal Mahal but the agricultural activities and the discharge of the city's waste water has deteriorated the condition of this water body. The Amanishah Nallah is the fourth water body selected for our study, which runs through almost whole of the Jaipur. The Amanishah nala, which originates from the western slopes of Jaigarh hills, flows northwards in the upper reaches, turns south and south-west in its middle course and flows towards east with a broad semi-circle. Finally it joins river Dhund further down stream. It was meant to carry the rain water but now due to rapid urbanization and industrialization it has been converted into a

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dirty drain to carry waste water of the city. The water is used to irrigate the fields in most of the agricultural fields so its quality holds importance.

The water samples were collected in between March to April 2014 and were analysed for the major physico- chemical parameters using the standard methods. The samples were collected from subsurface (20cm) in PVC bottles for analysis in the laboratory. Two to three replicates of the samples were taken and average was calculated. The pH of the water samples were measured with the help of pH meter using the potentiometric electrode, the conductivity and TDS were estimated using the conductivity electrode. Chloride, hardness (total, calcium and magnesium), alkalinity, acidity were calculated with standard methods of APHA (1995). Fluoride and Nitrate were estimated using the ion meter (model no. HannaHD53).

## RESULTS AND DISCUSSION

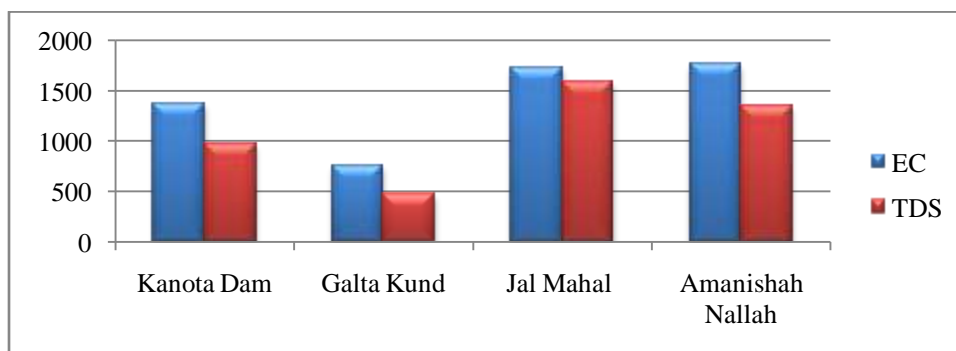
**Table 1: Comparative analysis of the physico-chemical parameters of different water bodies of Jaipur**

S.N. Parameters	Kanota Dam	Galta Kund	Jal Mahal	Amanishah Nallah	Drinking Water Standards	Agency
1. pH	8.95	8.31	7.7	6.7	6.5-9.2	WHO
2. Conductivity ( $\mu\text{mho/cm}$ )	1377	760	1739	1770	300 $\mu\text{mho/cm}$	USPH
3. TDS (mg/l)	970	478	1590	1350	500-1500	WHO
4. Alkalinity (mg/l)	80	72	84	932	50-200	BIS 105000
5. Acidity (mg/l)	43	40	30	288	-	-
6. Chloride (mg/l)	247.79	42.60	399.02	178.92	200-600	WHO
7. Total Hardness (as $\text{CaCO}_3$ mg/l)	340	460	730	550	100-500	WHO
8. Ca Hardness (as $\text{CaCO}_3$ mg/l)	231	336	430	262.5	75-200	WHO
9. Mg Hardness (as $\text{CaCO}_3$ mg/l)	109	124	300	287.5	30-150	WHO
10. Fluoride (mg/l)	0.272	0.288	1.3	0.659	1.5	USPH
11. Nitrate (mg/l)	3.8	1.8	2.4	1.6	45	WHO

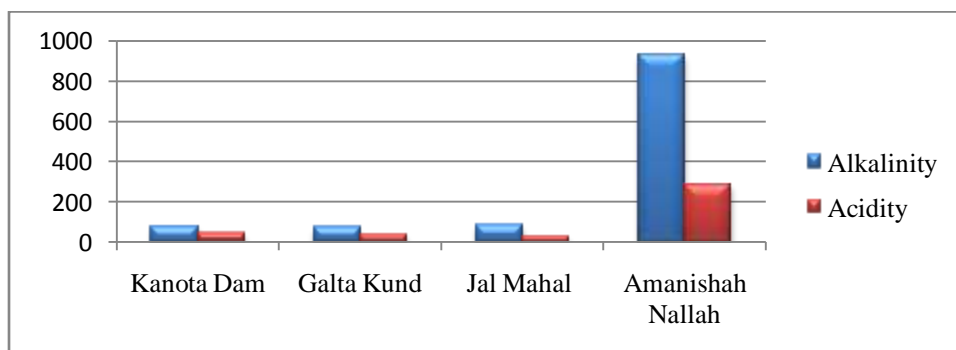
USPH- United States Public health Standards

WHO- World Health Organization

BIS- Bureau of Indian Standards

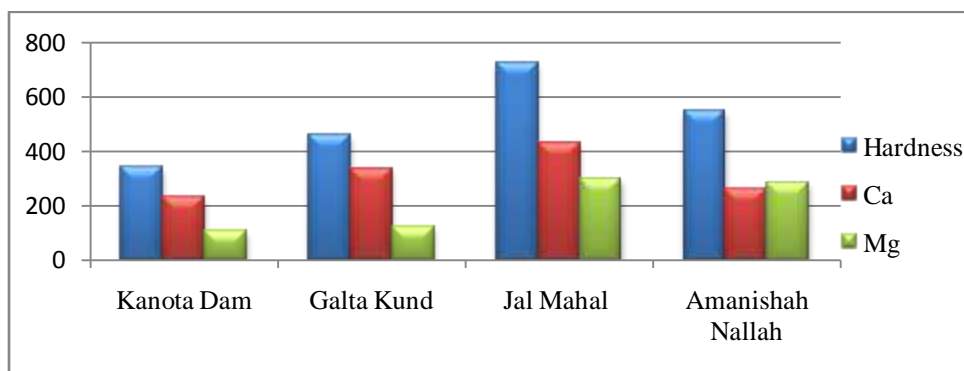


**Graph 1: Showing levels of EC and TDS**

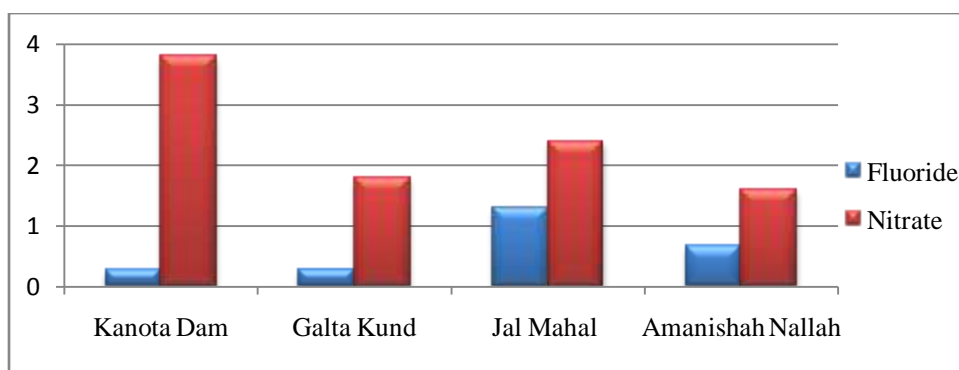


**Graph 2: Showing relation between alkalinity and acidity**

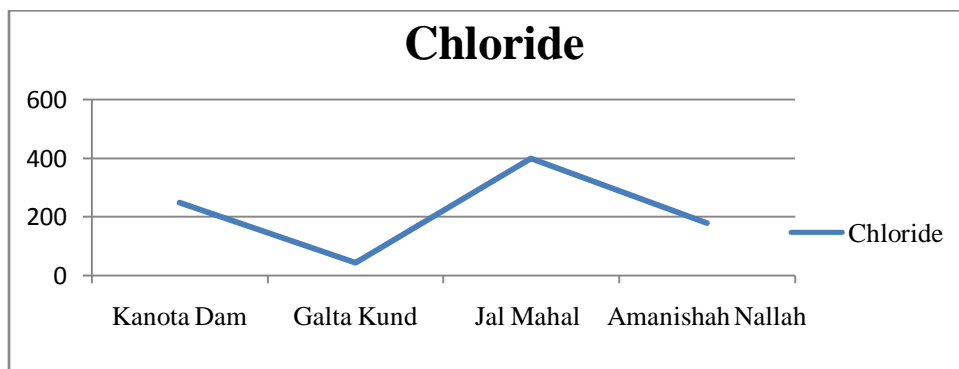
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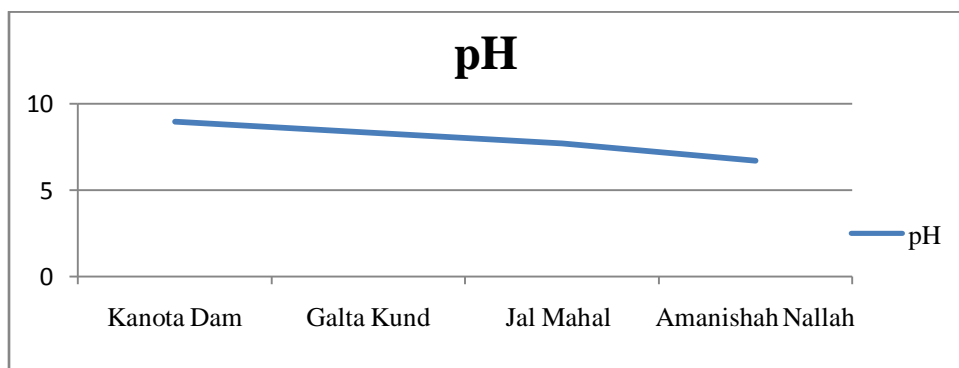
**Graph 3: Relation between Total hardness, Ca and Mg**



**Graph 4: Showing levels of Fluoride and Nitrate**



**Graph 5: Levels of chloride**



**Graph 6: Levels of pH**

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### **pH**

The pH of water indicates the health of a water body. In this study the pH of the water bodies ranges from 6.7 to 8.95 with all the values lying within the permissible limit. However, the water of Kanota dam is alkaline while that of Amanishah Nallah is slightly acidic. Since the pH range 5-9 is suitable for the survival of aquatic life (Lloyd, 1960) so all the water bodies are capable for sustaining the aquatic life.

### **Conductivity**

Higher the electrical conductivity, higher is the amount of impurities in the water. The given water samples show a wide variety of values ranging from 760- 1770  $\mu\text{mho/cm}$ . The samples show very high level of conductivity that exceeds the permissible limit, indicating the impure condition of the water bodies.

### **TDS**

High content of dissolved solids in water reduces the utility of water for drinking, irrigation and industrial purpose. TDS of Kanota, Galta and Amanishah nallah are within the permissible limit while that of Jal Mahal (1590 mg/L) exceeds the acceptable range.

### **Chloride**

Large concentration of chloride is an indicator of organic pollution of water (Venkatasubramani and Meenambal, 2007). Chloride of all the water bodies is within the range. However the chloride content of Jal mahal is observed highest (399.02mg/l) among all.

### **Hardness**

In terms of total hardness water of Amanishah nallah (550 mg/l) and Jal Mahal (730mg/l) exceeds the given range. In case of Ca hardness all the water bodies exceed the permissible limit with Jal mahal having the highest value (430 mg/l). Mg hardness of Jal Mahal exceeds the range followed by Amanishah nallah and that of Kanota and Galta Kund are within the range.

**Table 2: Water hardness classifications (reported as  $\text{CaCO}_3$  equivalents), U.S. EPA (EPA 1986)**

<b>Classification</b>	<b><math>\text{CaCO}_3</math> equivalent (mg/L)</b>
Soft	<75
Moderately hard	75–150
Hard	150–300
Very hard	>300

### **Fluoride**

Estimation of fluoride is important as its impact on all the living beings especially humans is of much concern. Fluoride content of all the water bodies lies within the permissible limit. The fluoride level of Jal Mahal is highest i.e. 1.3 mg/l and that of Kanota dam is lowest i.e. 0.272.mg/l.

### **Acidity and Alkalinity**

Medium of water is acidic or alkaline due to many reasons and it directly or indirectly depends upon the temperature, amount of rainfall, nature of rain water which may be of any nature either acidic or alkaline. On the basis of above conditions the nature of water varies from time to time and so is the survival of organisms associated with it. Here the water of Amanishah Nallah is observed as highly acidic (288 mg/l) and in terms of alkalinity same Amanishah Nallah is highest (932mg/l). Increasing acidity or alkalinity may make some poisons present in water more toxic (Lloyd, 1960).

### **Nitrate**

Levels of Nitrate are within the range. Kanota dam recorded the nitrate level of 3.8 mg/l while that of Galta, Jalmahal, Amanishah Nallah have 1.8, 2.4, 1.6 mg/l respectively. Low levels of nitrates in water indicate that the water bodies are not eutrophic.

### **Conclusion**

The water bodies that were studied in the present work showed varied levels of pollutants in them. The water of all four water bodies is not fit for consumption due to one reason or the other. Jal Mahal Lake is highly polluted since it receives the sewage of the city. The sewage must be treated properly before

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discharging it into the water body. The water of Galta Kund is the least polluted water body since there are no significant sources of pollution close to the water body. Amanishah nallah on the other hand shows expected result since it carries waste water. The Kanota dam is also deteriorating day by day since it also receives some amount of waste water of the city. So the water bodies of Jaipur require restoration and proper and timely monitoring to surmount the ongoing contamination in them.

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