



Evaluation of Seasonal variations in Physicochemical Properties of z-minor canal of Gang Canal in Sriganganagar Rajasthan, India

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Abstract

Gang Canal was introduced to Sriganganagar in 1927 by Maharaja Ganga Singhji of Bikaner estate. Its one of the minor near Sriganganagar city is known as z-minor. It supplies water mainly for irrigation and drinking purpose to different villages. This study aimed to record and evaluates seasonal variations in the physicochemical parameters of canal water like temperature, transparency, ph, total alkanity, dissolved oxygen (DO). Seasonal variations has been observed in above water quality parameters.

Keywords: Gang Canal, z-minor canal, physicochemical parameters, Seasonal variation, Sriganganagar etc.

Introduction

Water is an elixir of life; it is the unique component of nature that has played an important role in the evolution of life from molecules. Since time immemorial the great human civilizations developed, evolved and flourished around water resources¹.

In order to make an organized use of the river waters, extensive canal network is used to transport to remote places for irrigation. A significant quantity of river water is drawn into canals to meet the requirement of growing urbanization and industrialization in India. As a result, the water quality of canals has become a subject of concern in recent past.

Sriganganagar District of Rajasthan state of India is Situated between Latitude 28.4⁰ to 30.6⁰ and Longitude 72.2⁰ to 75.3⁰. The total area of Sriganganagar is 11,154.66 km² or 1,115,466 hectares. It is surrounded on the east by Hanumangarh District, which was carved out of it on July 12,1994, on the south by Bikaner District, and on the west by Bahawalnagar district of the Pakisthani Punjab and on the north by the Punjab. The Bikaner state was affected by the worst famine in the year 1899-1900. In order to get rid of this problem permanently, in 1903 Maharaja Sri Ganga Singhji obtained the services of A.W.E. Standley, Chief Engineer, who demonstrated the feasibility of the western area of the Bikaner state being under irrigation from the Satluj Waters. The Gang Canal was getting supplies from Ferozepur Headworks up to 1955. After the construction of Harike Barrage during 1955 The Gang Canal (Gangnahar) is getting supplies partially through Ferozepur Head works and through Ferozepur feeder²⁻⁵.

The Gang Canal (Gang Nahar) and Ignp Canal crossing the Sriganganagar District has changed the flora and fauna. Gang canal is the life line of Sriganganagar District. City of

Sriganganagar get canal water supplies from Z-distributary and that divides into three a, b, and z-minor.

Its one of the minor near Sriganganagar city is known as z-minor. It supplies water mainly for irrigation and drinking purpose to different villages.

Methodology

The proposed study will be carried out on minor z of Z-distributary of Gang Canal around Sriganganagar for a period of 12 months From September, 2012 to August 2013. The sampling will be carried out of monthly intervals from the study stations selected on the banks of these shallow waters. This study aimed to record and evaluates seasonal variations in the physicochemical parameters of canal water like Temperature, Transparency, pH, Total alkanity, Dissolved Oxygen (DO).

The physical-chemical estimates will be made following APHA - AWWA -WPCF (1981)⁶.

Results and Discussion

The main objective of the seasonal variation in physico-chemical analysis of water is to determine its nutrient status. The results on water quality in terms of physico-chemical properties are summarized in the table-1.

Temperature: Temperature is an important environmental factor because it plays an important role in the metabolic activities of the organism. Dissolution of gases, pH and conductivity are some characteristics of water are also affected by temperature. The temperature at all the sampling sites range between 16°C to 30°C and temperature fluctuations are dependent on climate seasons, geographic location.

Table-1

Seasonal variations in Physicochemical Properties of z-minor canal of Gang Canal during September, 2012 to August, 2013

Physicochemical parameters → Sept. 2012 to Aug. 2013 ↓	Temperature (°C)	Transparency (cm)	pH	DO (mg/l)	Total Alkanity (mg/l)
September	26	7.5	7.4	3.06	260
October	26	18	7.2	3.64	268
November	25	21	7.08	4.12	280
December	18	24	7.09	5.1	300
January	16	24	7.04	5.6	335
February	18	22	7.04	4.8	363
March	21	21	7.06	4.6	357
April	22	20	7.1	4.2	360
May	28	18	7.2	3.7	369
June	30	17	7.2	3.4	383
July	29	15	7.1	3.23	320
August	27	09	7.3	3.16	309

An upward trend is shown by temperature in the present investigation from winter to summer season followed by downward trend from monsoon seasons onwards. The low water temperature during winter may be due to high water level and low solar radiation and higher temperature in summer might be due to low water level, greater solar radiation and clear atmosphere^{7,8}.

pH: The intensity of the acid or alkaline condition of a solution is universally expressed by a term called pH. The suitability of water for various purposes is determined by this chemical factor. Most of the aquatic organism are adapted to an average pH so it is an important for the biotic communities. In the present investigation pH value of all ecosystems under study is slightly alkaline throughout study period which range from 7.04 to 7.4. The value of pH is was found maximum (7.4) in monsoon season and minimum (7.04) was observed during winter season. Maximum value of pH was observed due to increase chemical load in the canal during monsoon season^{7,9}.

Transparency: Minimum transparency 7.5cm was recorded in the monsoon season in the present investigation which might be due to the large inflow of runoff and the suspension of fine silt¹. The maximum transparency 24cm was observed during the winter season. Datta *et al.*, (1988) pointed out that high amount of sand and silt carried by the river during rainy seasons results with consequent decrease in transparency¹⁰.

DO: Survival and distribution of flora and fauna in an aquatic ecosystem is directly affected by Dissolved oxygen, so it is one of the most important parameter in assessing the quality of water. In the present study the higher values 5.6 of DO were recorded during winter and whereas lower values 3.06 were recorded during the monsoon.

High value of DO in winter season and reported to be due to its increased solubility with reduction in the water temperature. Large quantity of water in the canal, dilute the organic matter, the organic matter from surface runoff, sewage discharge and domestic activities, and flooded canal lowers the level of dissolved oxygen in the monsoon season. The reduction of oxygen contents due to the entry of drainage water is also reported by Welch, Rattner, and Blum^{11,12,13}. While studying the ecology of river Nile, similar observation was also made by Talling^{14,15}.

Total Alkalinity: Alkalinity of water is defined as the capacity to neutralize strong acids that gives primarily a function of carbonate, bicarbonate and hydroxide content and formed due to the dissolution of CO₂ in water. In the present investigation, at minimum values were recorded in 260 mg/l during monsoon season and maximum value 383 mg/l. Maximum value of alkalinity was recorded due to increase in concentration of salts in water due evaporation during summer and minimum during monsoon in conformity with the findings of Sankar *et al.* (2002)¹⁶.

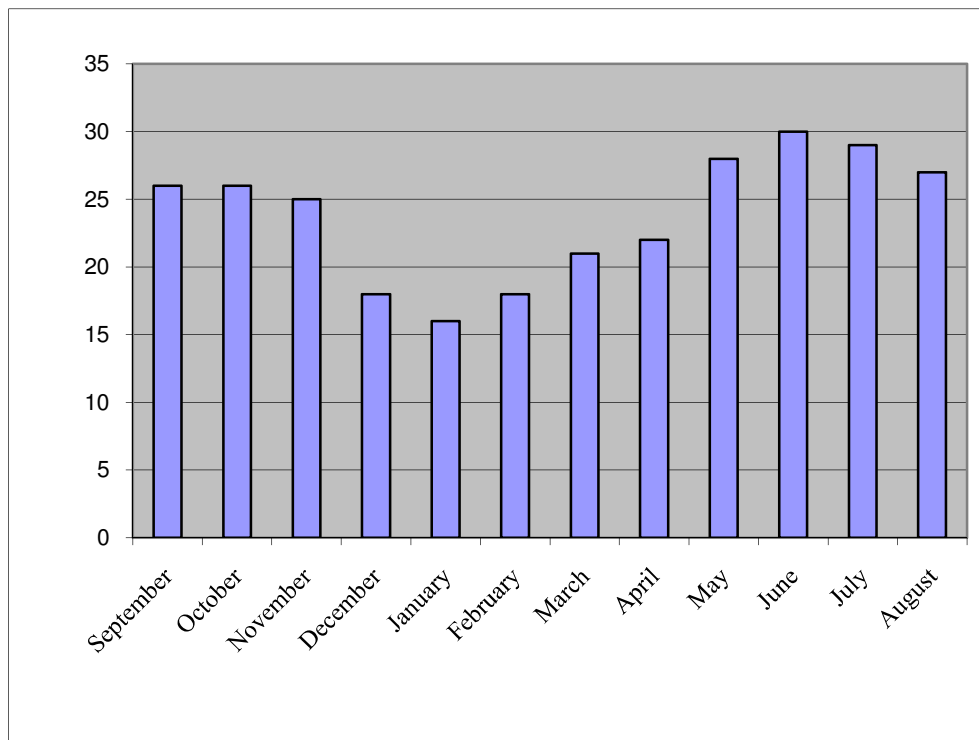


Figure -1
Seasonal variations in Temperature

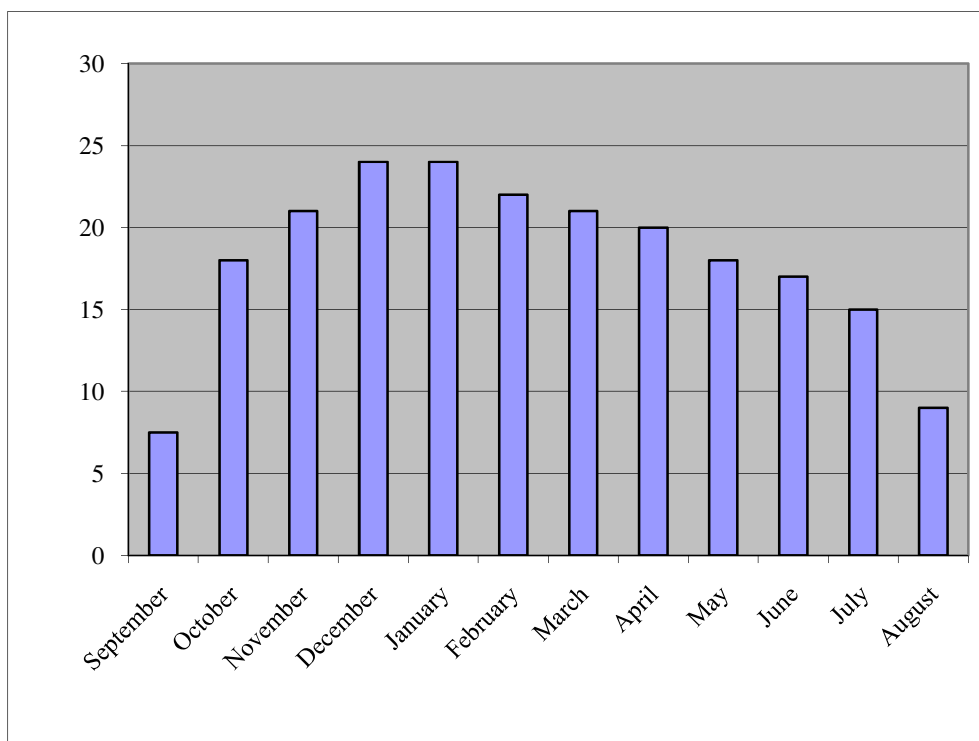


Figure-2
Seasonal variations in Transparency

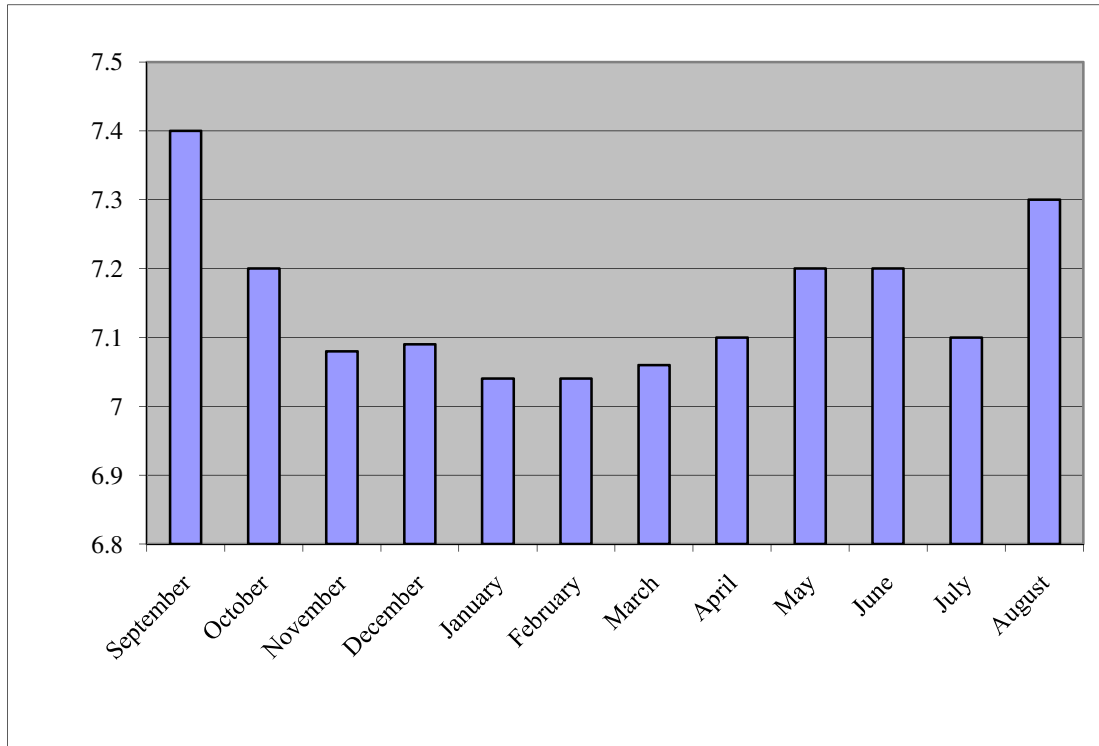


Figure -3
Seasonal variations in pH

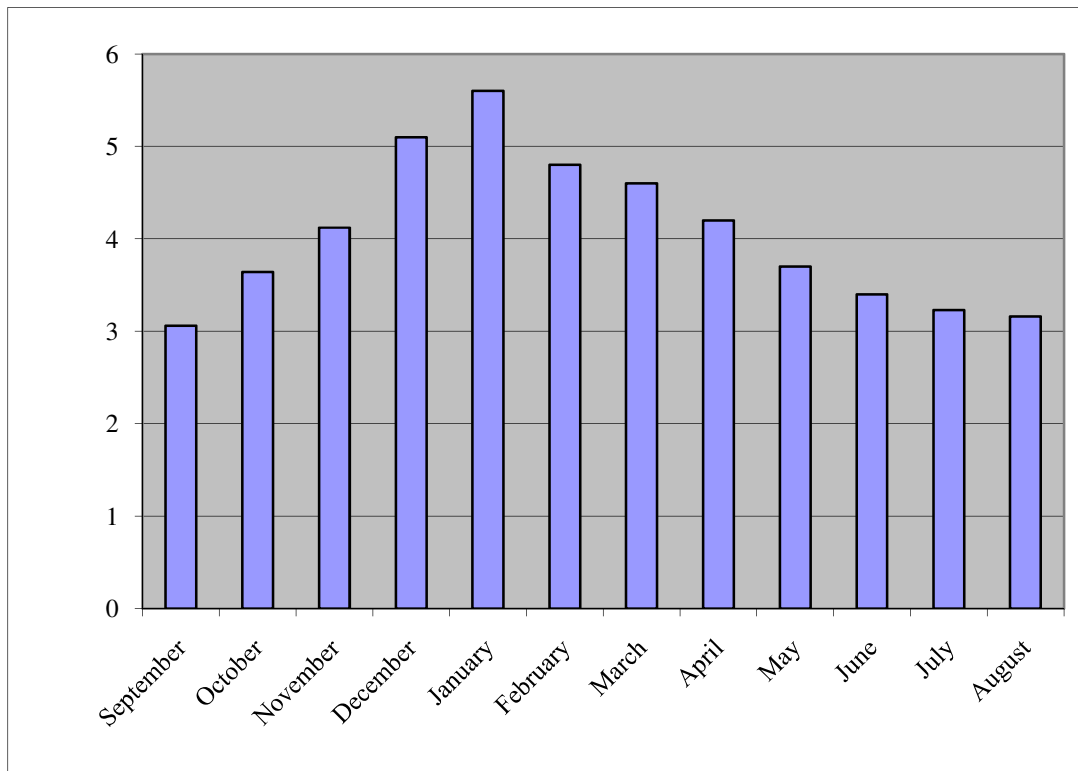


Figure-4
Seasonal variations in Dissolved Oxygen (DO)

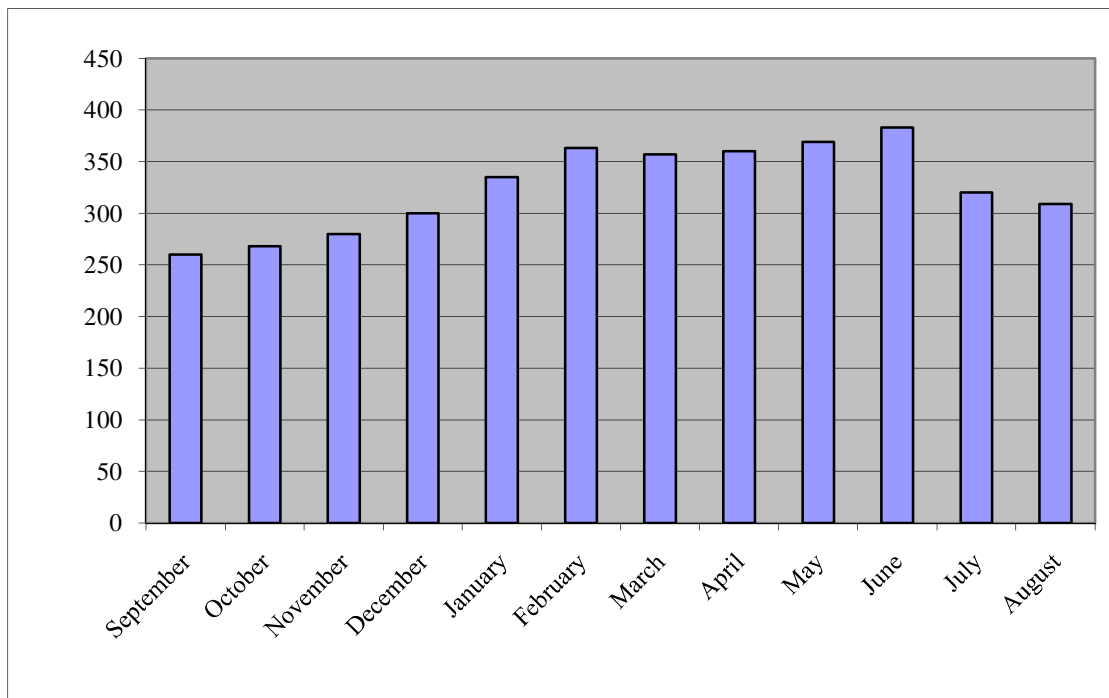


Figure-5
Seasonal variations in Total Alkalinity (TA)

Conclusion

The present study was undertaken with an aim to analyze seasonal variations in certain physico-chemical parameters in canal water sample. Seasonal variation was shown by physicochemical characteristics. In nutshell, the parameters analyzed have shown that they are all well within the permissible limits for drinking water except TA, and DO was comparatively recorded less during monsoon and summer seasons. The quality of water is neither in safe limit now nor good for flora and fauna, but the situation is alarming and degradation is in continuous process, so there should be continuous monitoring of the pollution level is necessary and immediate action is required for the improvement of quality of water.

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