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RESEARCH ARTICLE

WATER QUALITY ASSESSMENT OF PUNASA DAM (INDIRA SAGAR DAM), MADHYA PRADESH

Heena Saraswat and Meenakshi Solanki

Department of Zoology, Dr. A. P. J. Abdul Kalam University, Indore.

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Abstract

The Indirasagar Dam (Punasa Dam) is a multipurpose key project of Madhya Pradesh on the Narmada river at Narmada Nagar in Khandwa (Tehsil of West Nimar district) Madhya Pradesh in India. The physical and chemical properties of water including temperature, pH, transparency, dissolved oxygen, biological oxygen demand, hardness, nitrate, calcium and phosphorus concentration, were monitored from October 2018 to September 2019. The physical and chemical parameters were analyzed as per APHA, revealed that there were fewer variations in the physicochemical parameters and results received through the entire one year of study showed that the status of water quality is quite normal and within the permissible limit as mentioned with ISI. Moreover, according to the findings of this research and their comparison with the national and international water quality guidelines/standards, it could be said that the water quality of Punasa dam during the study period was acceptable. However, due to the changes occurred in nitrate and phosphorus and extensive development of eutrophication problem, accurate and continuous evaluation of water quality in this reservoir is deemed necessary.

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Introduction:-

The Narmada river flows in central India and the fifth largest river in the Indian subcontinent. It forms the traditional boundary between North-India and South-India and flows westwards over a length of 1312 km (815.2 miles) before draining through the Gulf of Cambey (Khambhat) into the Arabian sea, 30 km (18.6 miles) West of Bharuch city of Gujarat. It is one of only three major rivers in peninsular India that runs from East to West (largest west flowing river) along with the Tapi river and the Mahi river.

Water is the precious gift of nature. It is the most important medium for sustaining life and it is required in almost all the activities like drinking, municipal use, irrigation to meet out the needs of growing food and fiber, for industries, power generation, navigation, railways and recreation. The development, conservation and use of water therefore, form the main elements in the country's development planning. Water has been described as the 'Elixir of Life' and cleanser of sins'. People's lives and livelihoods depend on water. The demand for water is rising as population and economic activity as well as agriculture irrigation grows. However, worldwide resources of accessible water are decreasing due to over use and pollution. Today most of the rivers of the world are polluted by domestic water, industrial and agriculture effluents. The water resources in the country are however limited considering the future demands. In the very near future water will be a scarce resource and therefore, needs to be harnessed in the most scientific and efficient manner.

Corresponding Author:- Heena Saraswat

Address:- Department of Zoology, Dr. A. P. J. Abdul Kalam University, Indore.

The aim of the present study deals with to determine the water quality of Punasa dam. Water is to determine the nutrient status of the water with reference to drinking water quality as well as irrigational purpose. Also observe the seasonal variations of selected water parameters and identify the pollution sources at this dam. Hence the water quality parameters which focus on the Punasa dam have been mentioned in this paper. All the results point out that the Punasa dam is out of pollution.

Materials And Methods:-

Study area

The Indirasagar Dam (Punasa Dam) is a multipurpose key project of Madhya Pradesh on the Narmada River at Narmada Nagar in the Khandwa district of Madhya Pradesh in India. The foundation stone of the project was laid by late Smt Indira Gandhi, former Prime Minister of India on 23 October 1984. The construction of main dam started in 1992. The downstream projects of ISP are Omkareshwar, Maheshwar and Sardar Sarovar Project.

The Project envisages construction of a 92 m high and 653 m long concrete gravity dam. It provides Irrigation in 1,230 square kilometres of land with annual production of 2700 million units in the districts of Khandwa and Khargone in Madhya Pradesh and power generation of 1000 MW installed capacity (8x125). The reservoir of 12,200,000,000 m³ (9,890,701 acre-ft) was created.

Sampling Methods:-

Water samples were collected in polythene containers from the dam in 1liter pit bottles and carried to the laboratory. The Physico- Chemical parameters were determined by standard methods of APHA (2002), Welch (1998), Golterman (1991). All the chemicals used were of AR grade.

Results and Discussion:-

The overall systematic analysis of the present water quality parameters undertaken and results received through the entire one year of study showed that the status of water quality is quite normal and within the permissible limit as mentioned with ISI. Basically this entire premises of the study area is in the remote and tribal also natural area, hence, the pollution load is minimum. The Punasa dam in the rural region is relatively clean. The average value of various water quality parameters had been represented in graphs.

The **water temperature** varied between 19°C to 32°C. The minimum temperature of 17°C was recorded in the month of January and maximum temperature 35°C was recorded in the month of May. **pH** varied between 7.6 to 9.1. The minimum pH 7.6 was recorded in the month of September and maximum 9.1 in the month of January. **Transparency** fluctuated between 12 cm and 53 cm. The minimum transparency of 12 cm was recorded in the month of July and maximum of 53 cm in the month of January. The **Total hardness** varied from 100 mg/l to 160 mg/l. **Dissolved oxygen** showed variation from 7.3 mg/l to 9.1 mg/l and the **biochemical oxygen demand** varied between 2.2 mg/l to 3.8 mg/l. The value of **Phosphate** varied from 0.22 milligram per liter to 0.90 milligram per liter. The minimum value 0.22 milligram per liter was recorded in the month of May and the maximum value 0.99 milligram per liter was recorded in the month of September. The value of **Nitrate** was observed between 0.19 milligram per liter to 0.88 milligram per liter. 88. The value of **Sulphate** was observed between 4.1 milligram per liter to 9.2 milligram per liter. The value of **Calcium** varied from 10 milligram per liter to 28 milligram per liter. The minimum value 10 milligram per liter was recorded in the month of January and the maximum value 28 milligram per liter was recorded in the month of July.

Jain studied the water quality of Khnop reservoir in chhatarpur, Madhya Pradesh in 1997. He obtained pH values varied from 7.1 to 7.2 with average value of 7.1, which is safe range for drinking. Rao [16], observed dissolved oxygen 2.1 to 4.3 mg.L-1 and 1.1 to 4.7 mg.L-1 in western and eastern zones of Kollerulake Andhra Pradesh during 1998. The elevated levels of BOD and COD, lower the concentration of dissolved oxygen in a water body resulting in a bad water quality and stress to the resident aquatic life. Sulekh *et al.*, (2011) while studying the physico-chemical characteristics of various rivers in India have reported that the temperature of river water ranged between 26 °c to 31 °c. Chatterjee (2000) noticed BOD values ranged from 16.0 mg/l to 28.0 mg/l in river Nunai and stated that the high values of BOD throughout the entire stretch of river Nunia indicate that the water is saturated with organic wastes. Raja *et al.*, (2008) recorded PH values ranged between 0.33– 0.38 mg/l while studying physical and chemical parameters of river Kaveri at Tamil Nadu, India. Sankar and Biswas (2011) recorded phosphate values ranged between 0.14– 0.50 mg/l while studying a lake in Kalyani, West Bengal. Singh and Singh (2003) in their

study on the river Ami recorded Phosphate values ranged between 0.04– 1.13 mg/l. Pulle and Khan (2003) recorded phosphate values ranged between 0.06 – 0.57 mg/l from Isapur Dam (M.S.) India. Sulekh *et al.*, (2011) recorded phosphate values with mean value of 0.05 mg/l from river Cauveri.

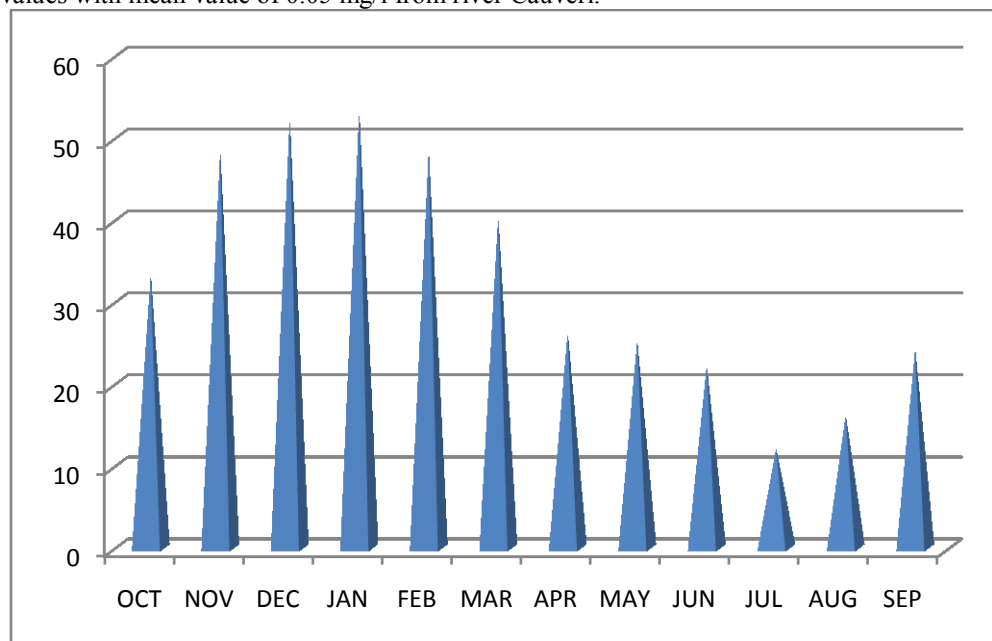


Fig. 1:- Monthly Variation of water temperature at Punasa Dam during 2018-2019.

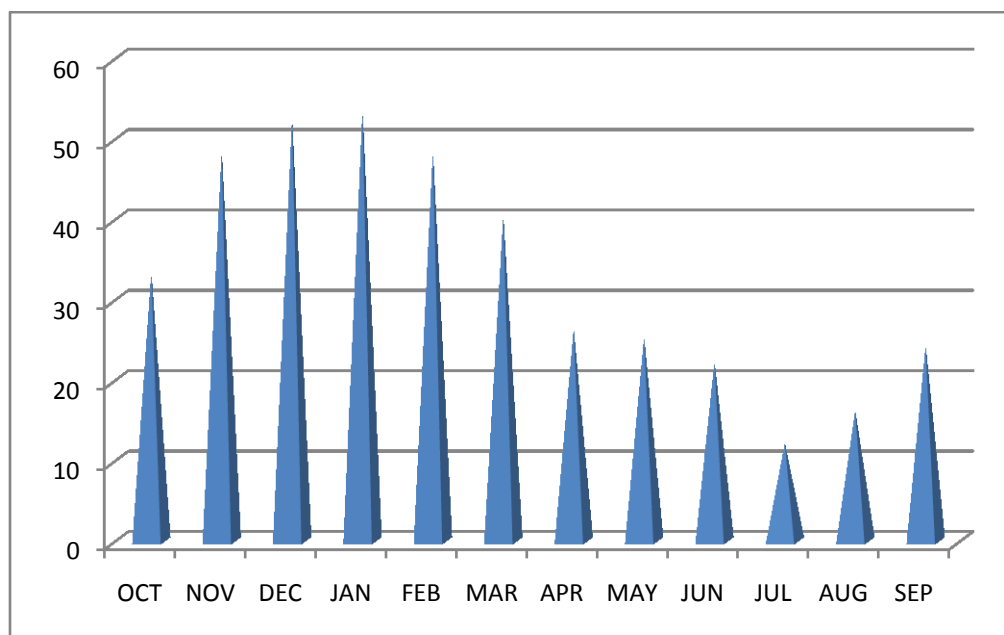


Fig. 2:- Monthly Variation of Transparency at Punasa Dam during 2018-2019.

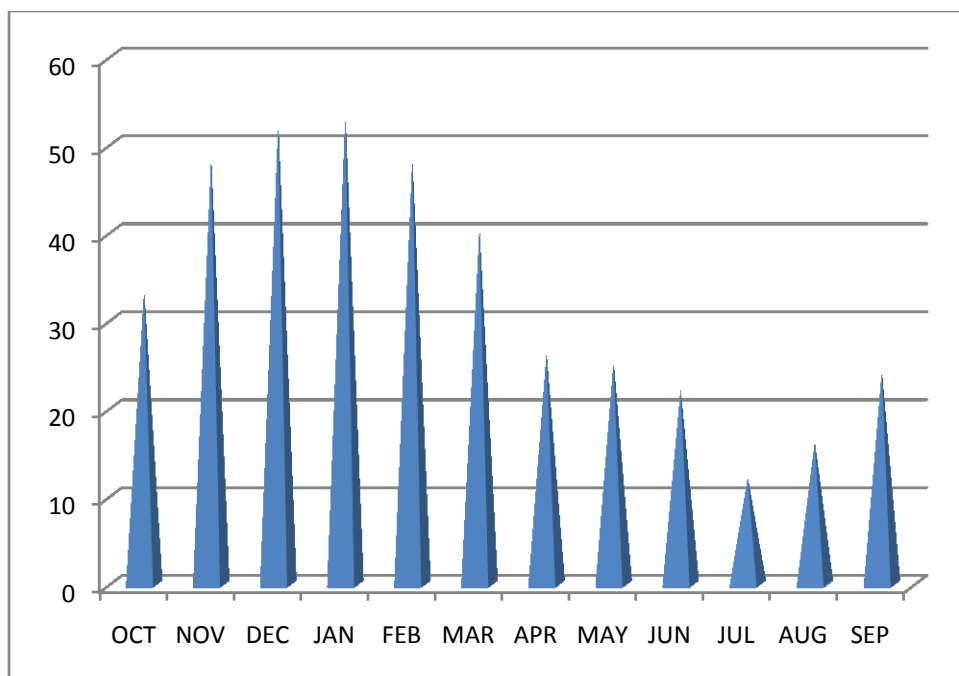


Fig. 3:- Monthly Variation of pH at Punasa Dam during 2018-2019.

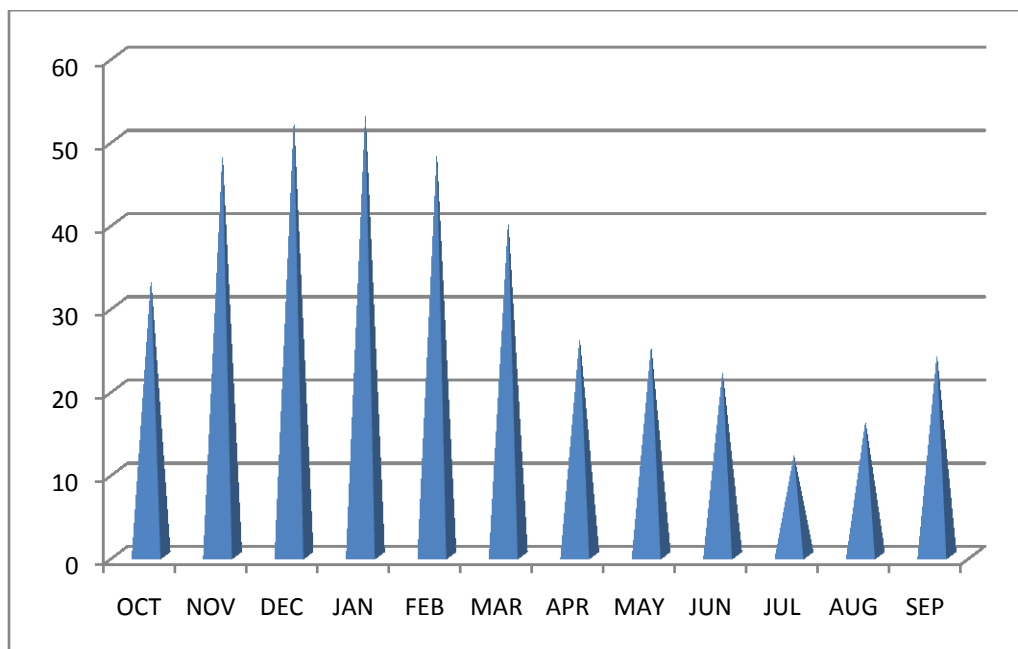


Fig. 4:- Monthly Variation of BOD at Punasa Dam during 2018-2019.

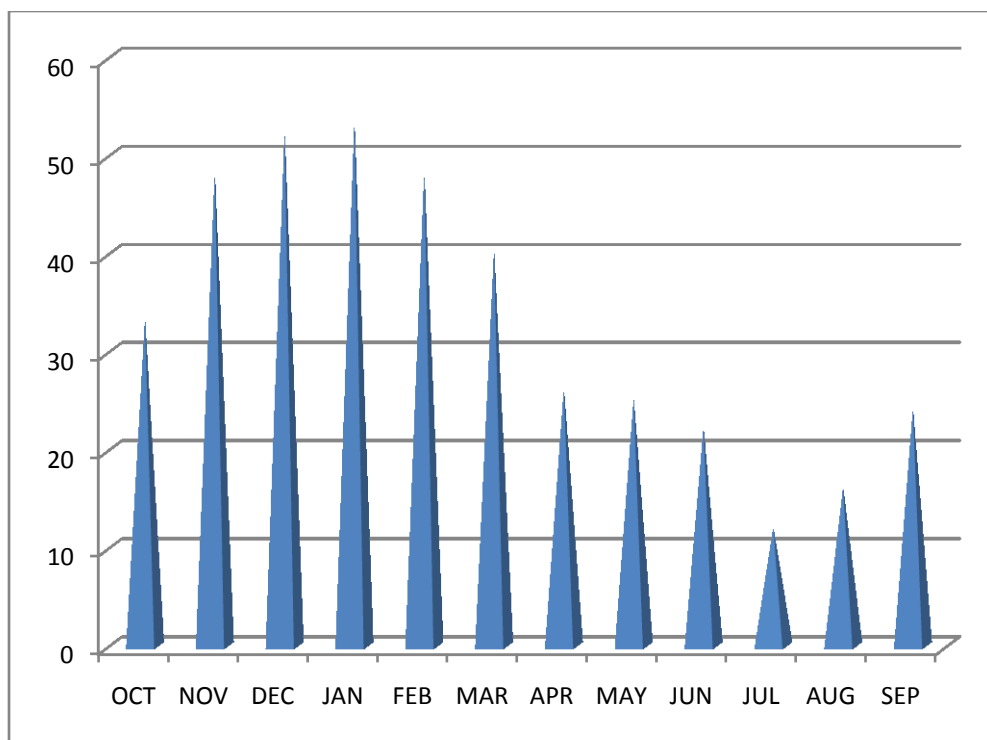


Fig. 5:- Monthly Variation of DO at Punasa Dam during 2018-2019.

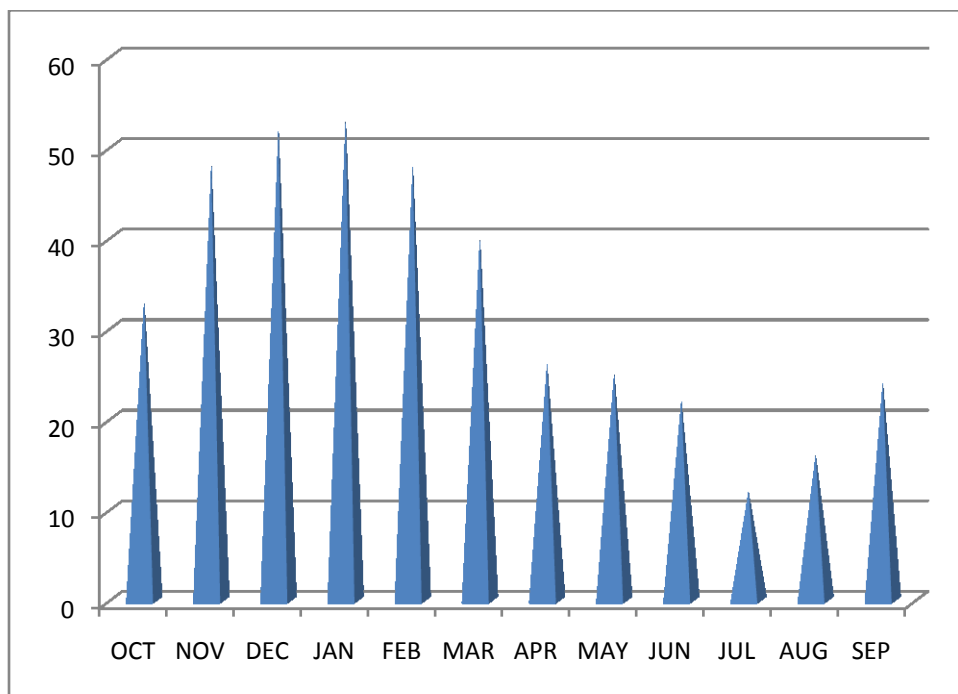


Fig. 6:- Monthly Variation of Total Hardness at Punasa Dam during 2018-2019.

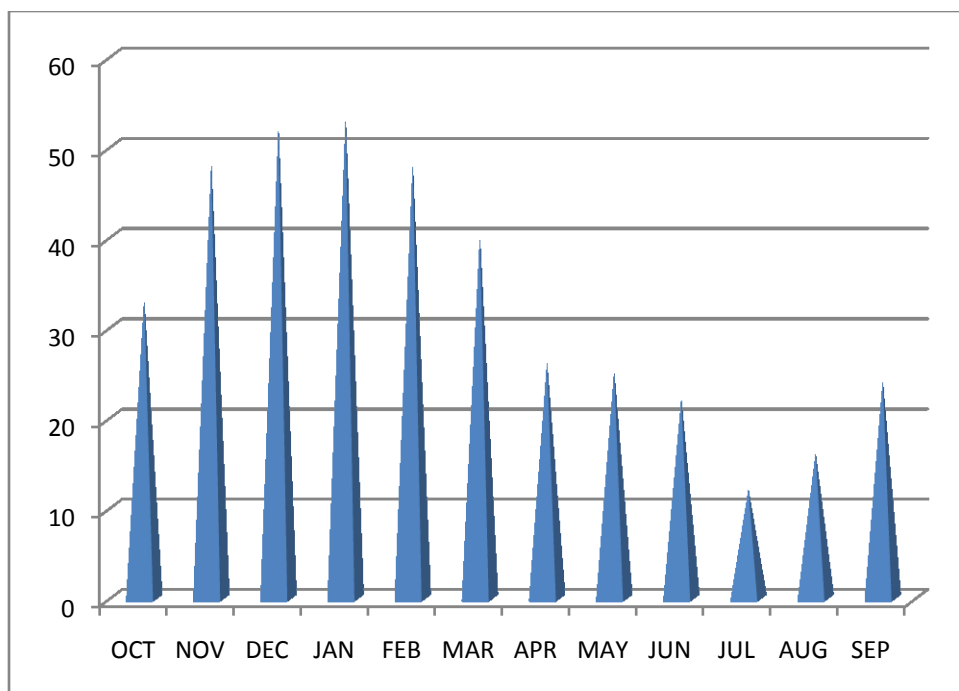


Fig. 7:- Monthly Variation of Sulphate at Punasa Dam during 2018-2019.

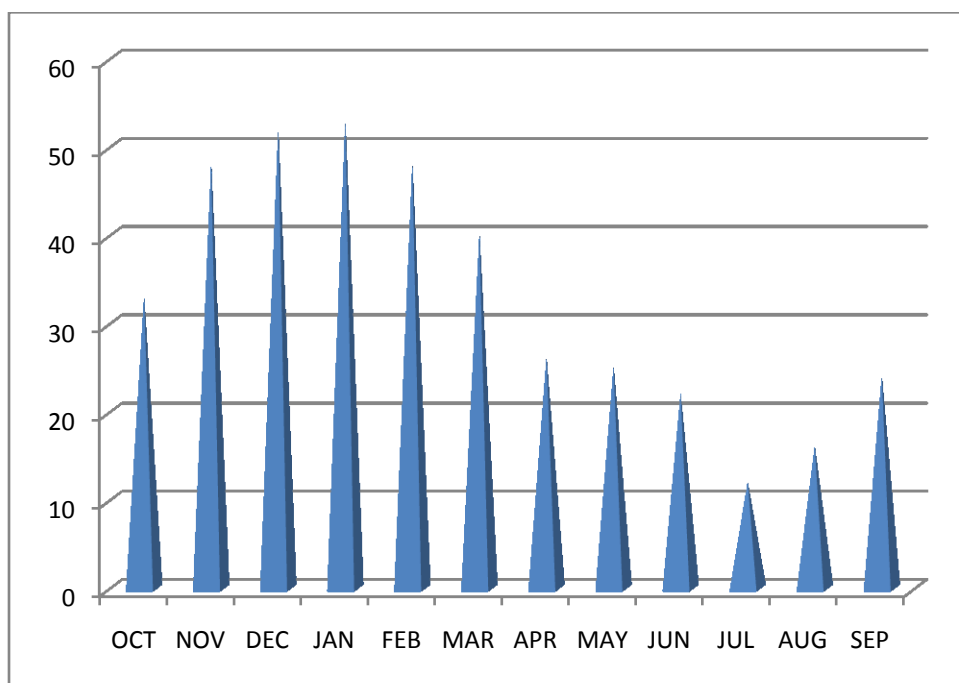


Fig. 8:- Monthly Variation of Nitrates at Punasa Dam during 2018-2019.

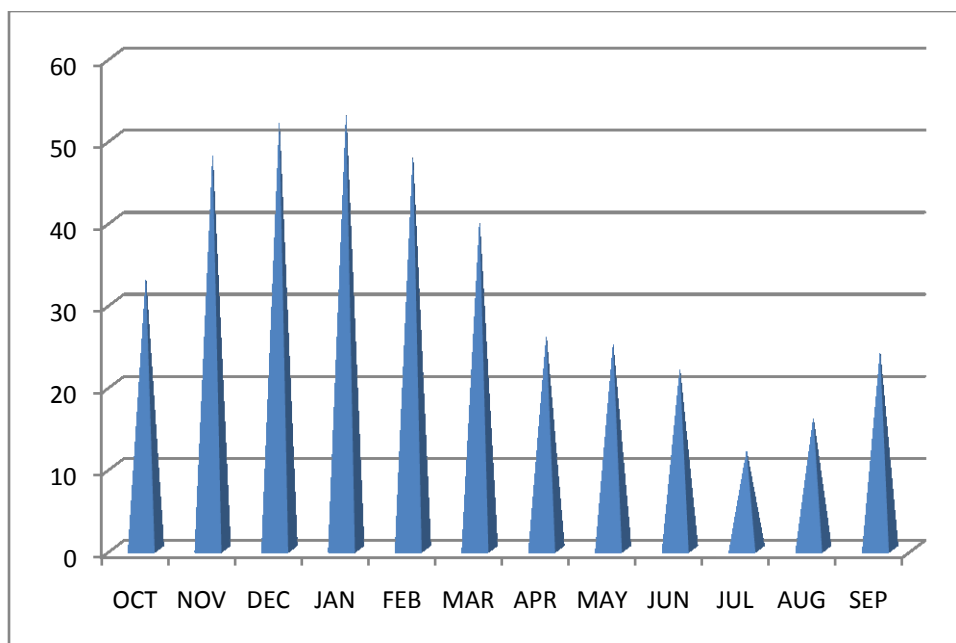


Fig. 9:- Monthly Variation of Phosphates at Punasa Dam during 2018-2019.

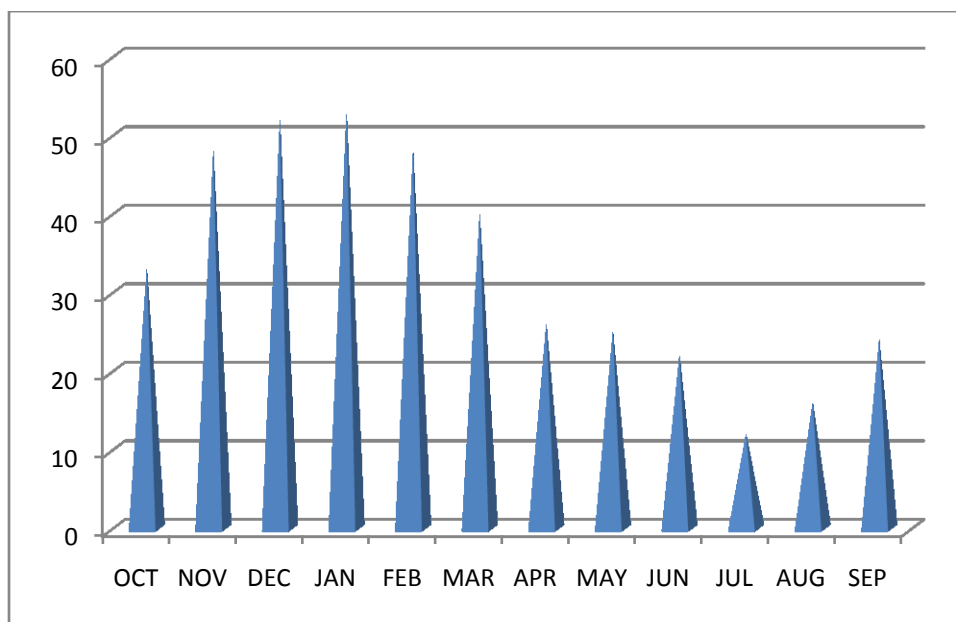


Fig. 10:- Monthly Variation of Calcium at Punasa Dam during 2018-2019.

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