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Recent Trends in Applied Zoology

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Chapter -22

Analysis of Seasonal Variation in Water Quality Parameters of Manjara River (Nagzari Dam), Latur city.

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Abstract:
This study compared the physico-chemical parameters of the Nagzari Dam in Latur Maharashtra, looked at seasonal variations in the water's physico-chemical parameters, pinpointed potential pollution sources, and grouped the monitoring months according to common traits. In order to assess temperature, pH, dissolved oxygen (DO) concentration, five-day biochemical oxygen demand (BOD), chemical oxygen demand (COD), electrical conductivity (EC), chloride ion (Cl) concentration, total alkalinity (TA), turbidity, total dissolved solids (TDS) concentration, total suspended solids (TSS) concentration, and total hardness (TH) using standard methods, water samples were collected in four different seasons. The analytical results showed that, with the exception of Electric Conductivity EC, chlorinityCl concentration, Dissolved Oxygen DO concentration, Biological Oxygen Demand BOD, and Dissolved Carbon Dioxide COD in all seasons, 40% of water quality indicators were within the allowed levels recommended by various agencies. Analyses of statistics showed that, at a 95% confidence level, 52% of the contrasts were substantially different. With four factors accounting for 94.29% of the overall variance, the factor analysis demonstrated the greatest match among the parameters.
The main contributors to pollution loading were BOD, COD, EC, DO, and Cl, which were brought on by a sizable amount of toxicological chemicals and industrial discharge. The seasonal variation in surface water quality was shown by the cluster analysis, which is typically a sign of pollution from precipitation or other sources. The largest levels of contaminants were found in the winter, and the values of several physicochemical parameters changed with the season. The seasonal water in the Nagzari Dam changed according to the change in seasonal temperature and rise in rainfall in the following ways: wettest season: winter, then summer.

Introduction:

Every living thing on this planet values water dearly. Since fresh water only makes up between 0.3 and 0.5% of the total amount of water on earth, it is crucial to use it wisely. In the current situation, uncontrolled urbanisation, rapid industrialization, and the indiscriminate use of chemicals are leading to a heavy and varied pollution in aquatic ecosystems, which is causing the water quality to deteriorate and the disappearance of aquatic animals, including fish.Rivers play a significant role in the aquatic ecosystem. Ponds, despite their diminutive size, provide

important environmental, social, and economic purposes. These include providing drinking water, recharging groundwater, functioning as flood control sponges, promoting biodiversity, and supplying livelihoods. For ecological equilibrium and human existence, biodiversity is essential but climate change has a significant impact on it. The preservation of biodiversity is essential for inclusive and sustainable development.

The United Nations General Assembly defined access to clean and safe water for human consumption to be a human right in July 2016. Water quality deterioration has emerged as a critical global concern for the sustainable development of humanity as a result of climate change and anthropogenic activities that are significantly altering the hydrological cycle.

Water supplies are severely threatened by pollution brought on by human activity and improper agricultural riverbank drainage.

Anthropogenic sources are the main causes of surface water pollution and deterioration in water quality, including untreated industrial effluents, inadequately disposed of household trash, and agricultural runoff. The quality of river water is affected by seasonal variations in anthropogenic and natural processes, such as temperature and precipitation, which have an impact on both.

One of the rivers that encircle Latur, a city in the Indian state of Maharashtra, is the Majara River. This river is currently experiencing extreme water pollution and environmental issues that have led to a biological and hydrological standstill. An essential part of evaluating the water environment, ecosystem, hydrochemistry, and ecology and restoring water quality is monitoring the physicochemical water quality parameters.The seasonal change of surface water quality in various times has been studied in the past utilising multivariate statistical techniques to evaluate water quality parameters, physicochemical features, and river toxicity. Updated water quality data are required for water quality evaluation since water quality variation is a continual process. Consequently, the objective of this study was to assess the temporal (mostly seasonal) change of the physicochemical characteristics of the water in the Nagzari Dam.

1. WATER SAMPLE COLLECTION AND PROCESSING:

Four locations, including the Nagzari dam, opposite the Renapur bridge, and close to the Shiv Mandir, were used to collect water samples. A total of three different seasons winter (November to January), summer (February to May), and the rainy season were used to collect water samples, each of which contained about 1,000 mL. (June to September). From June 2022 to April 2023, samples were collected 09 times at intervals of 30 days. During the low tidal period, water samples were taken at each midstream location and at a water depth of roughly 10 to 20 cm. To remove suspended particles, a portion of each sample was filtered through Whatman 41 filter paper and water collecting plankton net.

The samples were then used to calculate the chemical oxygen demand (COD) and five-day biochemical oxygen demand (BOD), as well as chemical oxygen requirement (COD).

After sampling, a potassium iodide solution that is alkaline was added to shield the water sam ples from fungi or other pathogens. The bottles were transported to the lab,
labelled correctly, and stored correctly in the refrigerator for further investigation.

2. MATERIALS AND METHODS:

Nagzari River was chosen for the current investigation. From June 2022 to April 2023, authors made biweekly trips to the study locations. Twice a month, between 7 and 8 a.m., water samples from the river under study were taken, and physicochemical analysis was performed. On-site measurements of temperature and pH were made using thermometers and digital pH metres,

respectively. Winkler's method was used to measure dissolved oxygen, whereas conventional techniques were used to calculate free CO2, alkalinity, and hardness.

2.1 TEMPERATURE:

With a conventional thermometer, note the water's temperature. The temperature in contaminated aquatic bodies may be somewhat enhanced by the heat emitted by the respiration and decomposition of organic waste. The concentration of DO, Free Co, and other 2 gases dissolved in water changes as the temperature rises. Ubale, M. B. (1994) A rise in water temperature causes chemical processes to occur more quickly, decreases the solubility of gases, and intensifies taste and odur.When the temperature rises, an organism's metabolism uses more oxygen, but at the same time, oxygen's solubility falls, highlighting the trace. According to D. Kelein's 1959 study, the temperature of ground water can range from 24 to 28 C

2.2 pH:

The hydrogen ion concentration in water is measured by the pH value of the water source, which also determines whether the water is acidic or alkaline. The pH of the water system has an impact on the majority of biological and chemical processes. The pH paper is submerged in a sample of water, and the colour that results is compared to the provided standard colour code. Before contacting the pH paper strip to record the sample's pH, care should be taken to thoroughly clean your fingertips with distilled water.

2.3 ODOR:

Taste and odor can come from biological sources or processes (such as aquatic microbes), natural inorganic and organic chemical pollutants, corrosion, contamination by synthetic chemicals, or issues with water treatment (e.g. chlorination). Microbial activity during storage and distribution may also result in the development of taste and odor. Drinking water taste and odor could be signs of pollution or a problem with distribution or treatment of the water. As a result, it can be a sign that potentially dangerous drugs are present. If there is a sudden or significant change, the cause should be looked into and the proper health authorities should be consulted.

2.4 DO (DISSOLVED OXYGEN):

All aquatic species place a high value on dissolved oxygen in the water. It depicts the natural and biological processes occurring in the body of water. The oxygen content of water often decreases as a result of biota respiration, temperature increases, waste that requires oxygen, organic matter decomposition, and inorganic reactants20. Drinking water must meet the optimum DO requirement of 5.0 mg/l. The DO ranges have been discovered to be between 6.4 and 9.3 mg/l. Using Winkler's approach, estimate of DO (dissolved oxygen): Using a sample of water, fill a 300mL BOD bottle. Add a mixture of Winkler's A and B totaling 2 to 3 mL. Allow the brown ppt to form to settle and avoid exposing the bottle to direct sunlight. Melt the brown ppt by turning the stoppered container upside down while adding the least amount of acid necessary to dissolve the paper. 100 mL of the sample should be titrated using a starch indicator. The colour blue vanishes.

2.5 Total Hardness:

Water hardness, a desirable aesthetic characteristic, is brought on by calcium and magnesium carbonates, bicarbonates, sulphates, and chlorides. It raises the boiling point of water and inhibits the production of soap lather. The maximum total hardness that can be used for drinking is 300 mg/l (BIS). Up to 75 mg/l of hardness is considered soft, between 76 and 150 mg/l is considered moderately soft, between 151 and 300 mg/l is considered hard, and beyond 300 mg/l is considered very hard.More over 300 mg/l of hardness can harm the kidneys and the heart. Add 1 mL of ammonia buffer and a pinch of the Erichrome black T indicator to a 50 mL sample. When titrated against a 0.01M EDTA solution, the sample's colour shifts from red wine to blue.

2.6 COD (DISSOLVED CARBON DIOXIDE):

10 mL of 0.25 N potassium dichromate, a pinch of silver sulphate, and mercuric chloride should be added to a 20 mL sample in a reflux flask. The sample should then be thoroughly mixed and refluxed for two hours. Condenser should be cleaned with pure water. After the liquid has cooled, dilute it with distilled water to 150 mL. After adding three drops of ferroin indicator and titrating the mixture to the 0.25 N standard, the colour of the ferrous indicator changes from blue green to reddish blue.

2.7 BOD (BIOLOGICAL OXYGEN DEMAND):

The term "biochemical oxygen demand" (BOD) refers to how much oxygen is used by bacteria and other microorganisms during the aerobic (oxygen-containing) decomposition of organic matter at a particular temperature.
One thing you cannot see in a lake's water when you look at it is oxygen. We tend to think of water as the antithesis of air, although the typical lake or stream does contain trace levels of dissolved oxygen. The presence of a sufficient concentration of dissolved oxygen is essential to preserving the aquatic life and aesthetic quality of streams, despite the fact that the amount of dissolved oxygen in natural water bodies is modest, up to around ten molecules of oxygen per millions of waters.To preserve the aquatic life and aesthetic appeal of streams and lakes, there must be a sufficient amount of dissolved oxygen present. Water-quality management depends on knowing how organic matter influences a stream's or lake's level of dissolved oxygen (DO). Biochemical or chemical oxygen demand is a measurement of the decomposition of organic materials in water. The amount of oxidizable compounds in a water sample that can lower DO concentrations is measured by oxygen demand.

2.8 TOTAL ALKALINITY:

The ability of water to neutralize a potent acid is measured by its alkalinity. Water's alkalinity is caused by bases such as carbonates, bicarbonates, hydroxides, phosphates, nitrates, silicates, and borates, among others10. Alkalinity gives a sense of the natural salts in water. Alkalinity is a parameter that is safe for people to use. The alkalinity readings were taken between 130 and 300 mg/l. The desired level of 100 mg/l for drinking water is exceeded in all tests.

2.9 ELECTRIC CONDUCTIVITY:

The ability of water to conduct electrical current is measured by its electrical conductivity. The ion concentration, ionic mobility, valence of the ions, and temperature all affect this ability. Water's total dissolved salts8 directly affect its electrical conductivity. The maximum electrical conductivity in water that is permitted by the WHO is 600 S/cm. The studied area's electrical

conductivity ranged from 440 to 2120 S/cm, indicating the existence of a significant amount of dissolved inorganic material in ionised form. The germination of practically all crops is impacted when electrical conductivity reaches 3000 S/cm, which may lead to a very low yield.

2.10 CHLORINITY:

One of the most prevalent inorganic anions in water and wastewater is chloride, which takes the form of the chloride (Cl-) ion. Sodium chloride, a typical food item that passes through the digestive tract undigested, has a higher chloride concentration in wastewater than in raw water (average estimate of excretion: 6 g of chlorides/person/day; additional chloride load owing to human intake on wastewater: 15 mg/L). When salt water leaks into the sewage system, chloride may be present in high concentrations along seacoasts. Moreover, industrial processes may cause it to rise. The salty taste caused by chloride concentration in drinkable water varies and is dependent on the chemical makeup of the water.

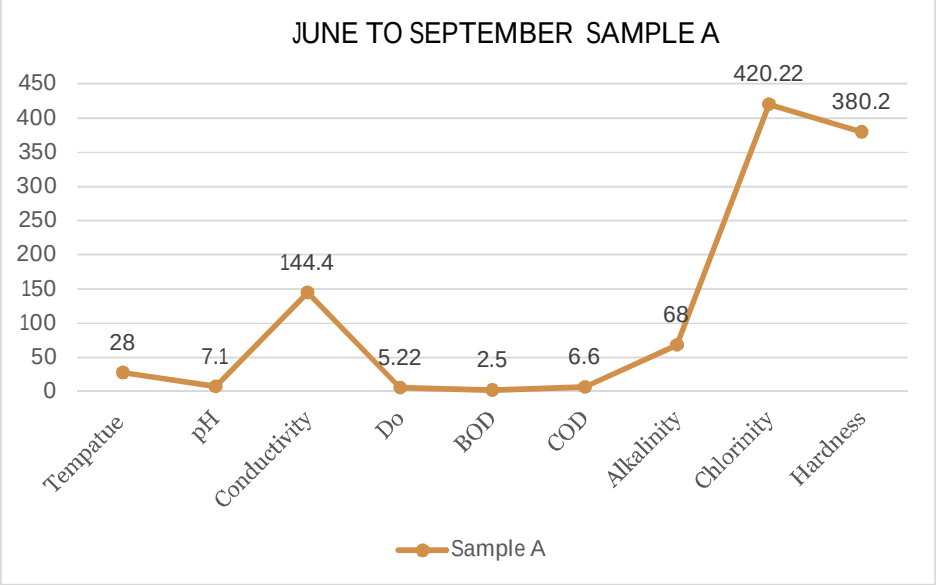
3. Observation Table:

Water Quality Parameter	**Rainy Season (June To September)**		**Winter Season (November To January)**		**Summer Season (February To April)**	
	Sample A	**Sample B**	**Sample A**	**Sample B**	**Sample A**	**Sample B**
1. Temperature	28˚C	28 ˚C	23 ˚C	23 ˚C	31 ˚C	31 ˚C
2. Ph	7.1	6.2	7.5	6.1	7.2	6.8
3. Do	5.22 Mg/L	4.25 Mg/L	5.5 Mg/L	4.1 Mg/L	5.2 Mg/L	3.9 Mg/L
4. Cod	6.60 Mg/L	6.20 Mg/L	6.8 Mg/L	7.2 Mg/L	6.3 Mg/L	7.1 Mg/L
5. Bod	2.5 Mg/L	3.8 Mg/L	2.9 Mg/L	3.2 Mg/L	2.8 Mg/L	3.3 Mg/L
6. Hardness	380.2 Mg/L	416.4 Mg/L	368.8 Mg/L	402.5 Mg/L	356.6 Mg/L	410.5 Mg/L
7. Alkalinity	68 Mg/L	102 Mg/L	78 Mg/L	146 Mg/L	92 Mg/L	201 Mg/L

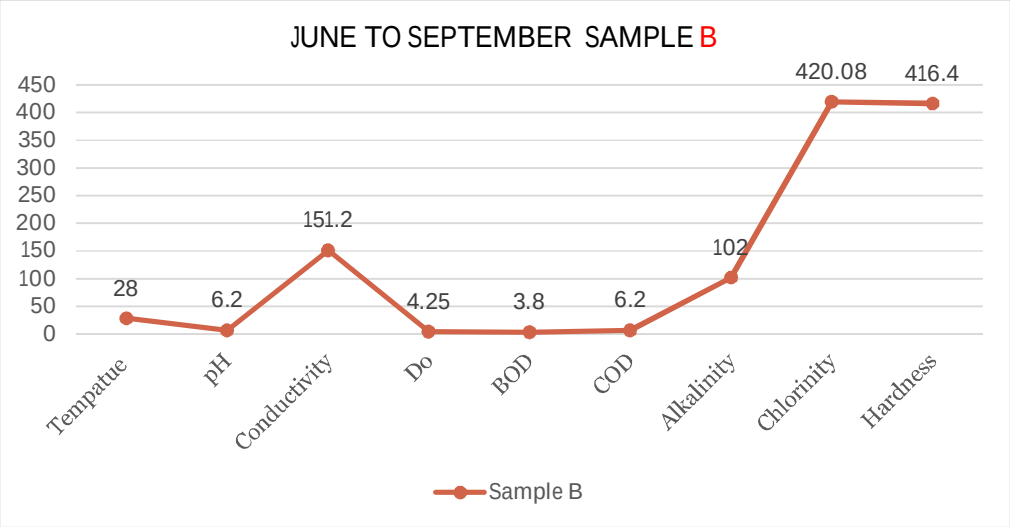
8. Chlorinity	420.22 Mg/L	408.08 Mg/L	380.5 Mg/L	405.6 Mg/L	396.4 Mg/L	428.4 Mg/L
9. Conductivity	144.4 µs/Cm	151.2 µs/Cm	148.6 µs/Cm	158.3 µs/Cm	138.6 µs/Cm	157.2 µs/Cm

4. Observation:

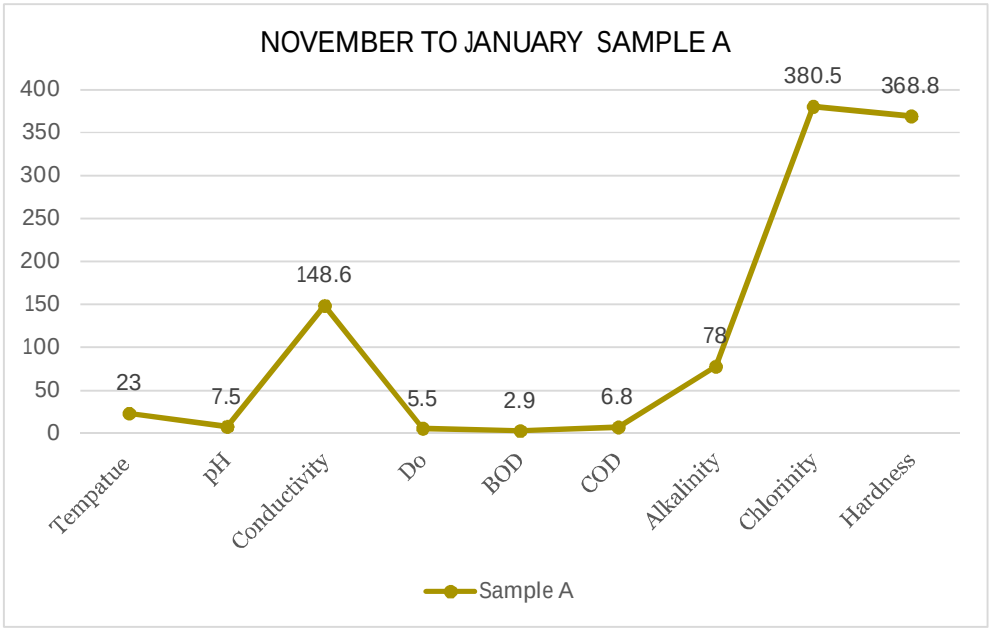
Water Quality Parameters Of Rainy Season (June To September)
Sample A



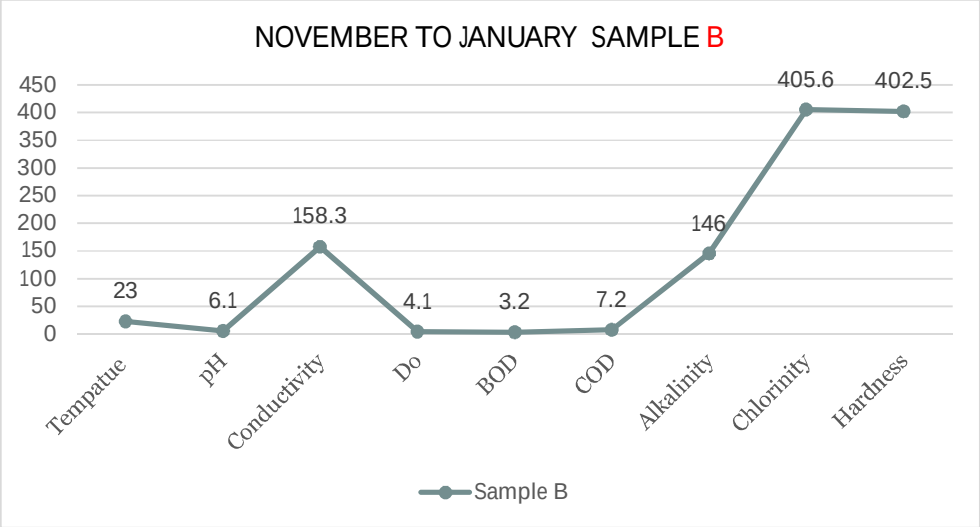
Water Quality Parameters Of Rainy Season (June To September)
Sample B



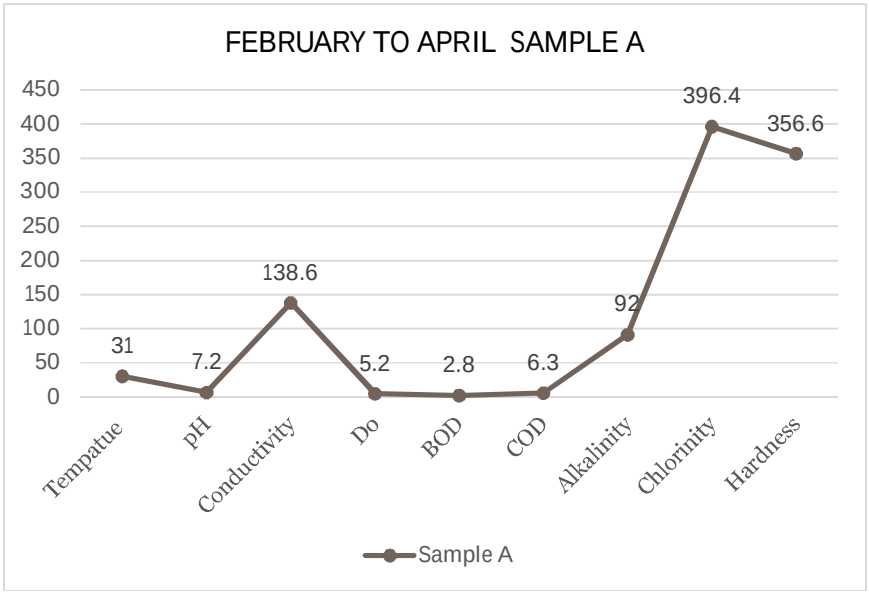
Water Quality Parameters of Rainy Season (November To January) Sample A



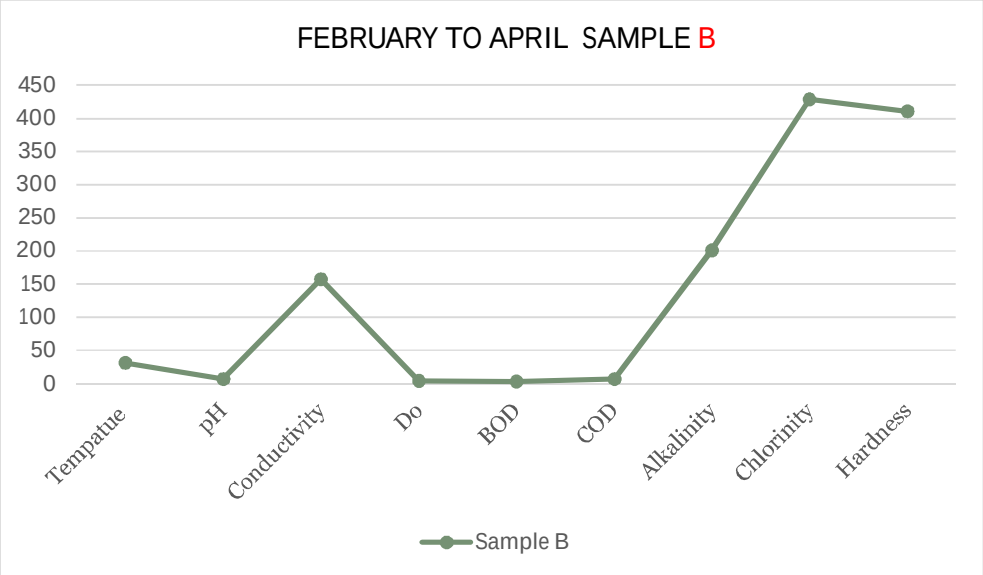
Water Quality Parameters of Rainy Season (November To January) Sample B



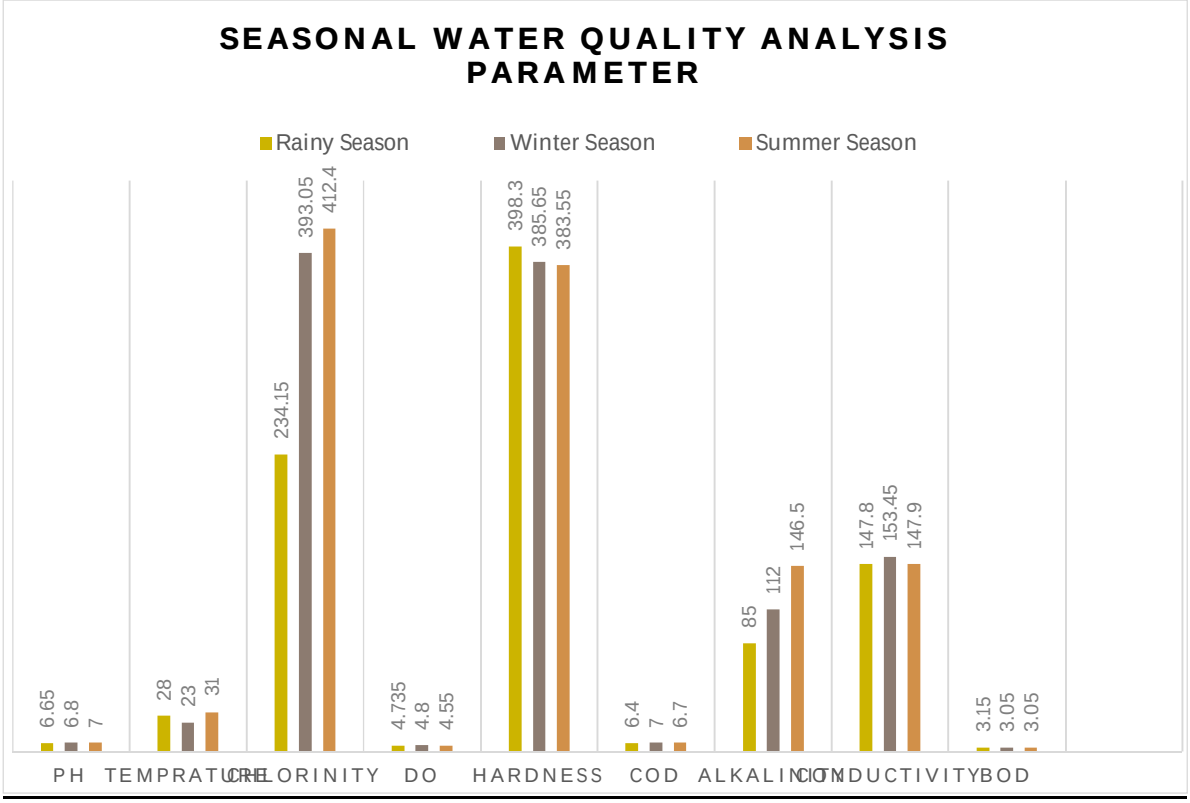
Water Quality Parameters of Rainy Season (February To April)
Sample A



Water Quality Parameters of Rainy Season (February To April)
Sample B


FEBRUARY TO APRIL SAMPLE B
450
400
350
300
250
200
150
100
50
0
Tempatue
pH
Conductivity
Do
BOD
COD
Alkalinity
Chlorinity
Hardness
Sample B

Result:



Conclusion:

The goal of the current study was to analyse a fewphysico-chemical parameters of a water sample taken from the Nagzari Dam in the Latur District of Maharashtra. To determine the impact of residential activities, other pollutant loads, or industrial effluent on ground water quality, a sample of river water was analysed. It is discovered that wastewater percolation has contaminated ground water. Salinity and chloride levels in this area are far higher than WHO and ISI's recommendations for drinking water in India. It might be caused by the ground water becoming more polluted as a result of the addition of industrial wastewater. Hence, it is everyone's responsibility to protect our ecology and to abstain from pollution, which is hazardous to everyone.

Reference:

1. Anand Y. A., Linz B. G. and Hyacinth N. H. (2016) . Study of Physicochemical Parameters and Zooplankton of Lapkaman pond, Ahmedabad, Gujarat, India. International Research Journal of Environmental Sciences. 5(7):1-6.
2. APHA (2005). Examination of Water and Waste Water American Public Health Association, DC; PP. 1-1368.
3. Bhagde R., Ban R., Pingle S. A. and Borgave S. (2019). Study of Physicochemical Parameters of Lentic Ecosystems in Ahmednagar District of Maharashtra State India. International Journal of Scientific Research in Science and Technology. 5(4):91- 95.
4. Bhoye M., Pansambal S., Bhadge R., Oza R., Ingale P. and Deshmukh R. (2019). Analytical study of groundwater from Sangamner Taluka of Ahmednagar District Maharashtra, India. International Journal of Scientific Research in Science and Technology. 5(4): 118-121.

5. Ghosh B. B. (2018). Physicochemical analysis of pond water in PurbaBarddhaman, West Bengal, India. International Research Journal of Environmental Sciences. 7(2):54- 59.
6. 6. Alkarkhi AFM, Ahmad A, Easa AM (2009) Assessment of surface water quality selected estuaries of Malaysia: Multivariate statisticaltechniques. Environment 29:255–589.
7. Allafta H, Opp C (2020) Spatio-temporal variability and pollution sources identification of the surface sediments of Shatt Al-Arab.
8. BIS,(1983). Standards for Water for Drinking and Other Purposes, Beauru of Indian Standards, India.
9. BIS(1991). Bureau of Indian standards Speci□cations for drinking water, IS, 10500, New Delhi, India.
10. B.L. Gupta,(1969). Proc. Symp. on Ground water Studies Regions, Roorkee, 415.

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