

# LIIMNOLOGICAL STUDY OF MATH TALAB SEONI (M.P.)

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**ABSTRACT :-** Every day, ponds, rivers streams and their tributaries passing through cities are receiving large amount of contaminants released from different point and nonpoint sources and have become important sink for unused waste load. Water is indispensable to life on earth. It is a precious gift of nature which is essential for the survival of plants, animals and human beings. Present investigations were carried out on the assessment of pollution of Math Talab Seoni (M.P.). Many water quality parameters were found below the permissible limits for drinking water as suggested by WHO. A total of 15 parameters were analyzed and their seasonal variations in the year 2022 were discussed.

**KEYWORDS:** Water quality Parameters, Math Talab, Seasonal variations.

## **INTRODUCTION:-**

The quality of water in every ecosystem provides major information about the available resources for sustaining life in that ecosystem. The healthy aquatic ecosystem depends on the abiotic and biotic characteristics of water (Venkatesharaju K. et. al, 2010). The interactions of physical and chemical properties of water play an important role in abundance, composition, distribution, diversity, growth, reproduction and the movements of aquatic organisms. Monitoring of physico-chemical parameters is necessary to recognize the magnitude and the source of any pollution load. These characteristics help to identify the essential conditions of the ecology of living organisms for recommending suitable conservation and management strategies.

Water scarcity and the fast decline of aquatic biodiversity are indicators of ineffective implementation of water protection policies (Rapport et al; 1995). Freshwater is the most essential requirement for life and yet 1% of the Earth's surface water (Johnson et al., 2001). Sustainable and optimal use of natural resources

is imperative in any country due to its concomitant economic implication such as industrial and population growth infrastructure and development demands (Howarth and Farber, 2002). The total available water of use in India is estimated as 1900 billion cubic meters per years. About 80 percent of this form the surface runs off the rivers, streams, lakes and ponds. Man is dependent for his food supply entirely on the products of land, water, plants and animals of the earth. Ever since the turn of this century progress in limnology has been rapid and for reaching, as a result of which it has become as integrated and coherent branch of science (WHO 2004).

A study of freshwater habitat with special reference to its physico-chemical, a geological and biological characteristic is termed as limnology. The study of limnology is of great importance to human race as the biological and physico-chemical date of this branch can be useful for quick development and growth of fishes. The importance of primary productivity is also well realized practically in fish culture programmes. Besides that, elucidation of the physico-chemical conditions in lakes, reservoirs, ponds and rivers are utilized for tiding over difficulties in filtration of drinking water. Thus it is very much essential for a healthy growth. But it may become harmful for life, if one uses water polluted with harmful or with toxic substances and poor sanitation. Mishra, et al. 2009, Sirajudeen, et al. 2014. We depend on water for domestic needs, irrigation, sanitation and disposal of wastes. The quality and quantity of surface water bodies like lakes and tanks depend upon the climate, catchments, geography of the area and the inputs and outputs both natural and manmade (Gray, 1994). The water quality of lakes can be degraded due to microbiological and chemicals contaminants. In water natural impurities are in very low amounts. Lakes, dams, rivers are important source of fresh water.

Therefore, it is of immense important that a periodical research and timely monitoring of rivers, reservoir's and pond ecosystem are very much necessary to keep our rivers, research and timely monitoring of rivers reservoirs and pond ecosystem are very much necessary to keep our rivers reservoirs and ponds in a healthy condition or to take measures to tickly the pollution problems and to save them from becoming unsuitable for human consumption and other usage.

#### **Aims & Objectives of study:-**

The following objectives were kept in mind when the work was under taken-

- To study the limnological complexes of the pond water.
- To study the seasonal variation in physico-chemical parameters of the pond water.
- To study the nature of pollution.
- To study the source of pollution.
- To understand the physico-chemical parameter.

#### **MATERIALS AND METHODS:-**

##### **Study site:**

Seoni is primarily a tribal dominated district formed on 1st November 1956. The district is situated on a narrow, North-South section of Satpura plateau in the South of Jabalpur Division. The Math pond is situated in district Seoni. It is located 22.08°N 79.53°E. It has an average elevation of 611 meters (2004 feet). The city is 2,043 ft. above sea-level, half-way between Nagpur and Jabalpur. It is bordered by Jabalpur, Narsinghpur and Mandla districts to the north, Balaghat to the east and Chhindwara to the west and the shares its southern boundary with Nagpur (Maharashtra). National Highway No. 7 connects the Kanyakumari-Banaras passes through the district from north to south. Fair weather roads connect the major towns in the district. The narrow-gauge Chhindwara- Nainpur Central Railway passes through Seoni connecting Jabalpur, Nagpur, Chhindwara, Balaghat, Katangi, Keolari and Nainpur.Prateet.

**Collection of water sample:** The water sample was collected during the early morning for assessing the qualitative analysis of physico-chemical parameters at every month for the period of one year i.e. January 2022 to December 2022. The recorded data was yearly

segregated in four seasons, summer (Mar to May), Premonsoon (Jun to Aug), Monsoon (Sep to Nov), winter (Dec to Feb).

**Qualitative analysis of water samples:** Samples of the water for physicochemical characteristics were analyzed according to standard methods of APHA (1998) and Paka and Rao (1997). Water samples were collected from Seoni town during morning hours in between 10.00AM to 01.30 PM with one liter containers from the Math.



**Fig. 1- Location Map Math Talab Seoni (M.P.)**



**Fig. 2- A View of Math Talab Seoni**

talab in three seasons. To study the water quality and its seasonal variations, the water samples are collected during summer, monsoon and winter seasons. Some of

the results were recorded at the sampling sites whereas the others were recorded in the laboratory. The parameters observed were pH, total dissolved solids, carbonates, bicarbonates, hardness, calcium, magnesium, sodium, DO, BOD, COD, nitrate and phosphate. The colour of Math talab water was observed visually concentration was determined with the help of BDH narrow range pH strips. Later on, to confirm the results the pH was also measured in the laboratory by the Phillip's digital pH meter. Total dissolved solids were measured by 100 ml of water sample (filtered) dried on a hot plate in a pre-weighed China dish.

### **RESULTS AND DISCUSSION:-**

**Physico-chemical parameters:** In the present study, the season wise mean data of physico-chemical parameters for one year (January 2022 to December 2022 Table no. 1) were obtained and compared with the BIS and WHO standards shown in Table-1. The mean value of water temperature, pH, Dissolved Oxygen, Total Alkalinity, Total Hardness, Chloride, Phosphate, Iron, Nitrite, and Nitrate were found to be within the desirable limit. Parameters like Calcium Hardness, Fluoride, Residual Chlorine and Ammonium are higher than the desirable limit but not exceeding the maximum permissible limit as prescribed by WHO and BIS32-34. The analysis of Physical and chemical properties of water body play an imperative role in the distribution and richness of biota.

**Water temperature:** In the present study, the value of water temperature was recorded season wise. The observed water temperature was maximum in summer season (32.25 °C) due to high atmosphere temperature, clear atmosphere, low water level and high solar radiation, and the minimum in winter season (20.75 °C) due to shorter photoperiod and cold low ambient temperature. A similar result was also observed by Pradeep et al. The range of water temperature acts as an "abiotic master factor" due to its influence on aquatic organisms.

**pH:** In the present study, the value of pH concentration was season wise recorded. The observed pH was maximum in winter season (8.75) due to high decomposition activities of biotic (aquatic organism) and abiotic (physical and chemical) factors, and minimum in summer season (7.15) due to high temperature of water.

Similar results were also observed by Sharma et al (1992); Daheriya R.S. (2022); Saraiya et. al.,(2022). This was probably due to much more concentration of OH<sup>-</sup> ions released from the dissociation of alkaline salts. High pH induces the formation of tri halo methane which are toxic (Kumar et al.2010). The standards of pH lower 4.5 and greater than 9.5 are generally hazardous to aquatic life of organisms still less extreme pH values can affect growth, reproduction and other biological activities.

**Total Alkalinity:** The maximum value of alkalinity (175.88 mg/L) was recorded in the summer season. Jain et al. The maximum alkalinity in summer due to the accumulation of organic matters produced by the decomposition of flora. The minimum mean value of alkalinity (165.75 mg/L) was recorded in monsoon season due to dilution of water. Similar result found Daheriya R.S. (2022); Saraiya et. al.,(2022). The alkalinity level may eventually be restored. However, a provisional loss of buffering capacity decreases the pH level, which is detrimental to life in the aquatic ecosystem. According to ISI, permissible limit of alkalinity in the water is 600 mg/l. The alkalinity in water is caused by carbonate, bicarbonate and hydroxyl ions. Carbonate alkalinity is an environmentally critical parameter in maintenance of buffering capacity of aquatic life forms. It had been assumed that in tandem with pH which has a complex interrelationship, is responsible for poor species diversity in aquatic life forms, including total absence of large crustaceans, brachiopods, decapods (Prawn, Shrimp etc.). Due to alkalinity value correlate positively with the pattern of rainfall and this implies that surface run-off from the Math talab contains substances which contribute to alkalinity.

**Dissolved Oxygen:** The highest value of Dissolved Oxygen (6.5 mg/L) was recorded in winter season due to the low temperature, salinity, and elevation, and minimum mean value (4.7 mg/L) was recorded in monsoon season due to the rain and temperature and turbulence of water facilitating the diffusion of atmospheric oxygen. The level of dissolved oxygen in natural water are depending on the physical, chemical and biochemical process existing in the water body.

**Total Hardness:-** The maximum value of total hardness (292 mg/L) was recorded in summer season while the minimum value (242 mg/L) was recorded in monsoon season. Same result are also founded by Pandey and Tiwari (2016), Daheriya R.S. (2022); Saraiya et. al.,(2022). The increase in hardness can be attributed to the reduction in water volume and augmentation in the rate of evaporation at high temperature. However adequate levels of hardness can help reduce the level of ammonia and pH toxicity in the aquatic ecosystem. Total hardness of water is due to the presence of bicarbonate, sulphate, chloride, and nitrates of calcium and magnesium. The permanent hardness is mainly caused by chloride and sulphates (Roy and Kumar, 2002). Limit for total hardness is 600 mg/l as per Indian standard. The higher hardness may be ascribed to accumulation of dissolved materials due to increasing pollution from tourist wastage of eatables and surrounding domestic sewage. Hardness has got no adverse effect on human health. Water with hardness above 200 mg/l may cause scale deposition in the water distribution system and more soap consumption.

**Calcium:-** Calcium is found in greater abundance in all natural water as its main source is weathering of rocks from which it leaches out. Calcium was found in the same quantity and comparatively higher in winter and lower summer seasons. The value of Calcium concentration was recorded in the range between 4.2 mg/l to 7.5 mg/l. A high value of calcium was observed in winter season which is due to quick oxidation or putrefaction of organic matter and low hardness in summer is due to calcium absorption by the great number of organisms for shell structure, bone construction and plant precipitation of lime.

**Phosphate:** The most important source of phosphate is biological oxidation of phosphate substances present in wastes, chemical fertilizers, decayed vegetables, animal feed lots, leachates from refuse dumps, septic tank effluent, etc. The maximum value of phosphate (7.4 mg/L) in monsoon season and minimum (5.3 mg/L) in winter season due to the high rate of algae, aquatic plants growth and decay of vegetation. The value of phosphate lowered in winter season compared to pre-monsoon and monsoon season due to increased uptake of phosphate for the luxuriant growth of macrophytes.

**Nitrate:** The most important source of nitrates is biological oxidation of nitrogenous substances present in sewage, industrial wastes, chemical fertilizers, decayed vegetables, animal feed lots, leachates from refuse dumps, septic tank effluent, etc. High amounts of nitrates in river water are indicative of pollution. The highest values of nitrate are 4.2 mg/L in winter season and minimum value 2.45 mg/l, respectively in the monsoon season. The maximum values are due to organic wastes, agricultural fertilizers, intensive livestock operations, surface runoff and sewage discharge. The minimum values are due to high vegetation that supports the growth of plankton.

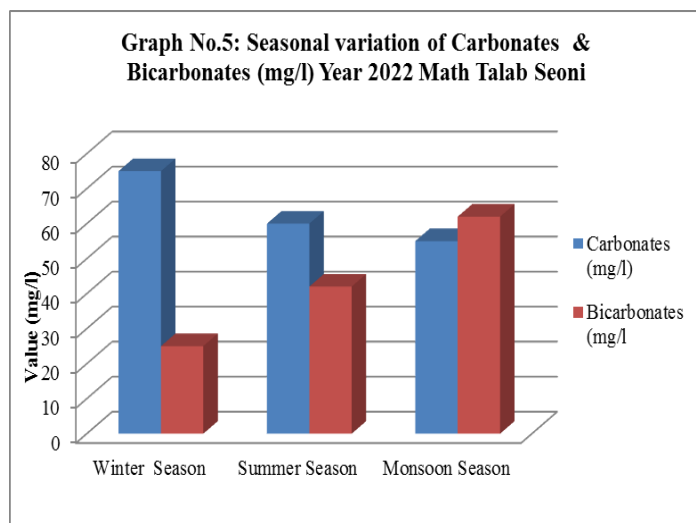
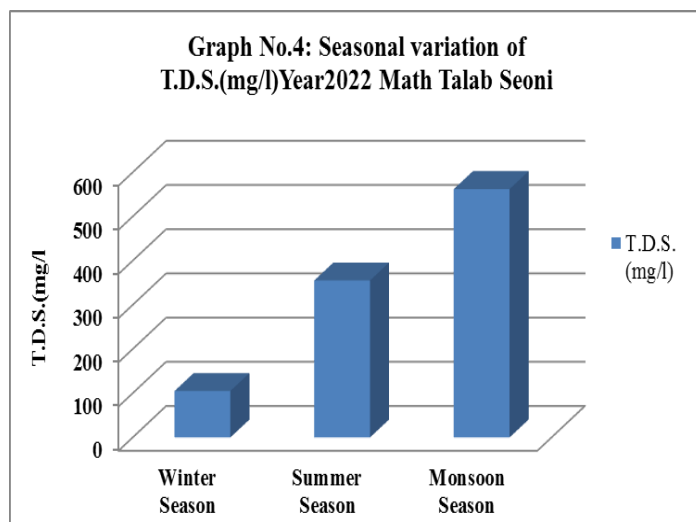
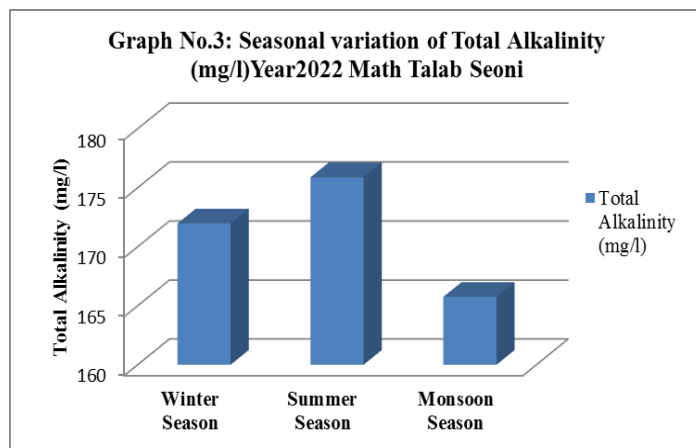
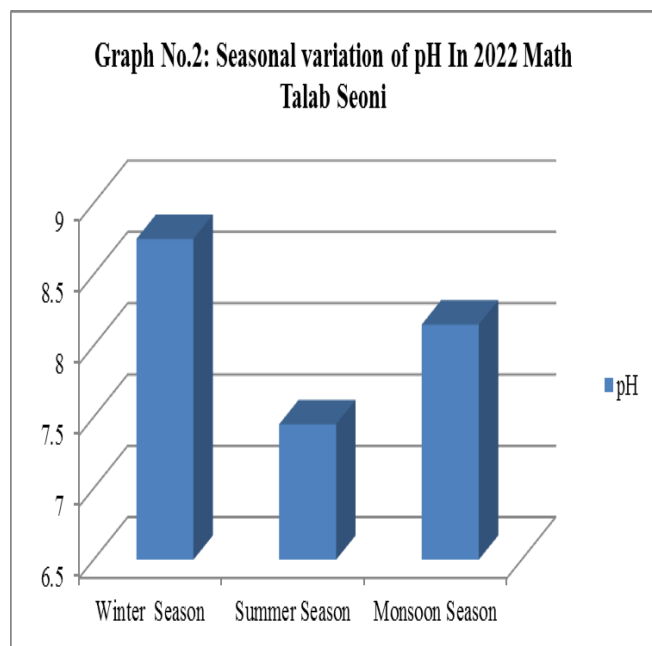
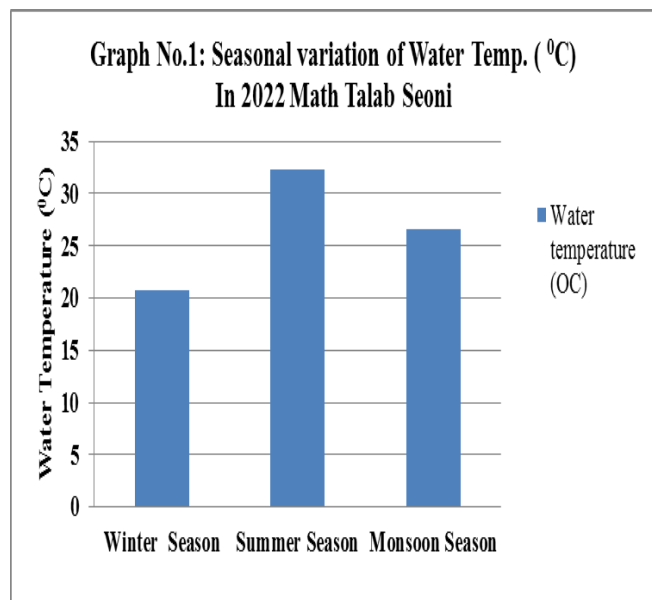
**Carbonates & Bicarbonates: -** The carbonates were noticed maximum value 75.00 mg/l in winter season and minimum in 60.0 mg/l summer season. The bicarbonate alkalinity varied from 25 to 62 mg/l in three seasons, during which minimum value was observed in winter season and the maximum in summer season. Larger quantities of bicarbonates during summer may be due to the liberate ion of CO<sub>2</sub> in the process of decomposition of bottom sediments with resultant conversion of carbonates to bicarbonates. Carbon dioxide exhibited an inverse relation with dissolved oxygen. A gradual rise in dissolve oxygen and fall of free carbon dioxide level had probably disrupted the equilibrium between these two gases. Cole (1975) noted that free CO<sub>2</sub> supply rarely limits the growth of phytoplanktons. Alternately the bicarbonates are utilized as a source of carbon by the photosynthetic activity of phytoplanktons.

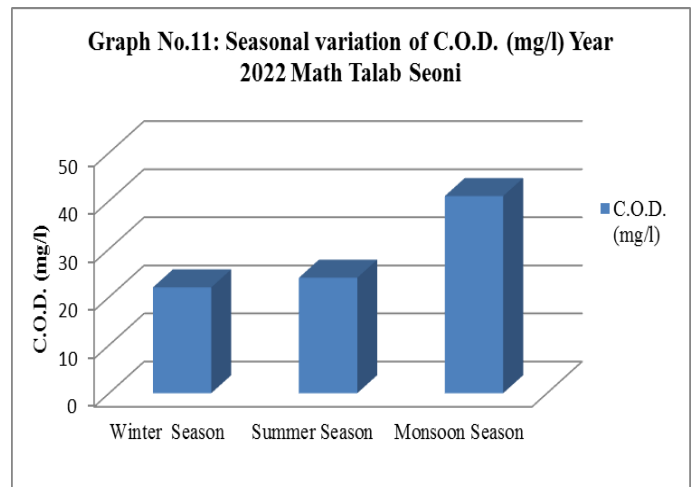
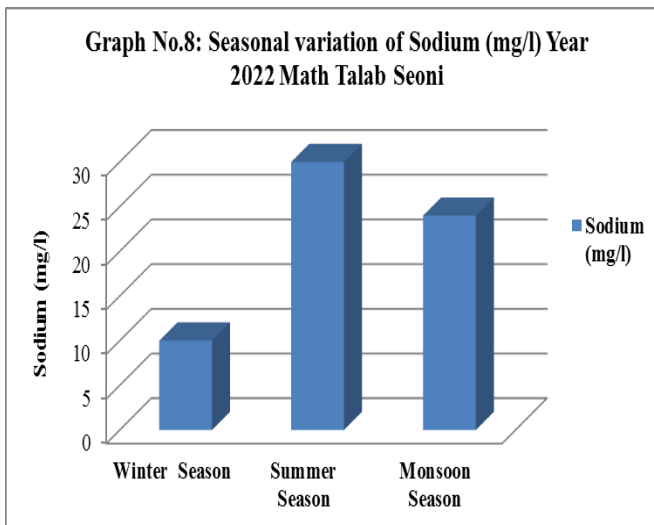
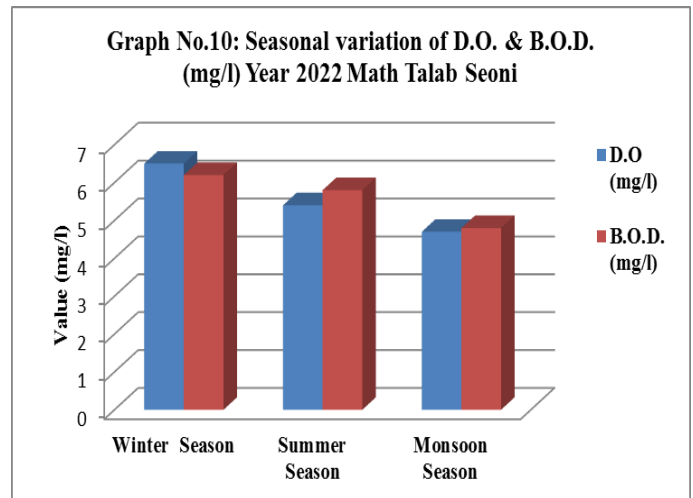
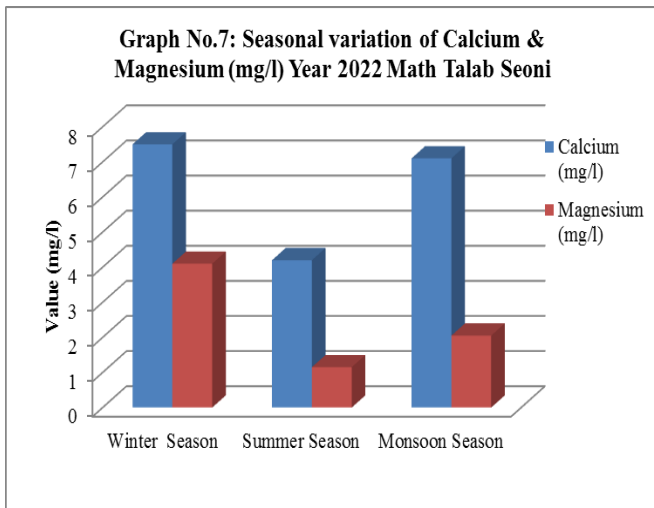
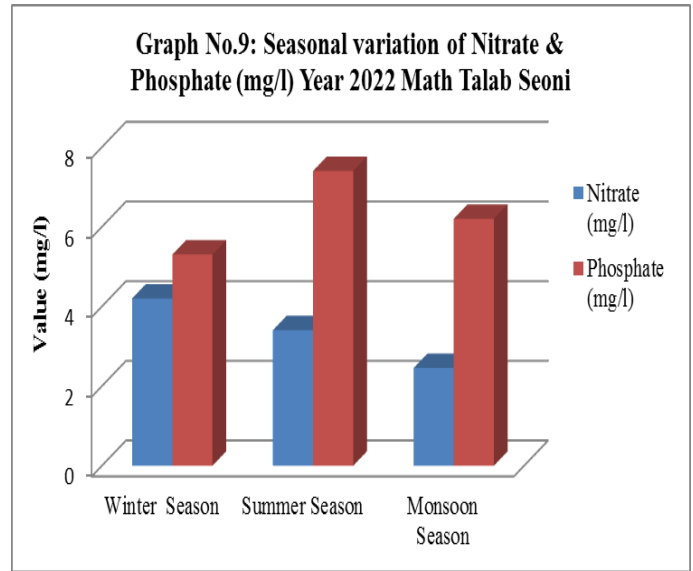
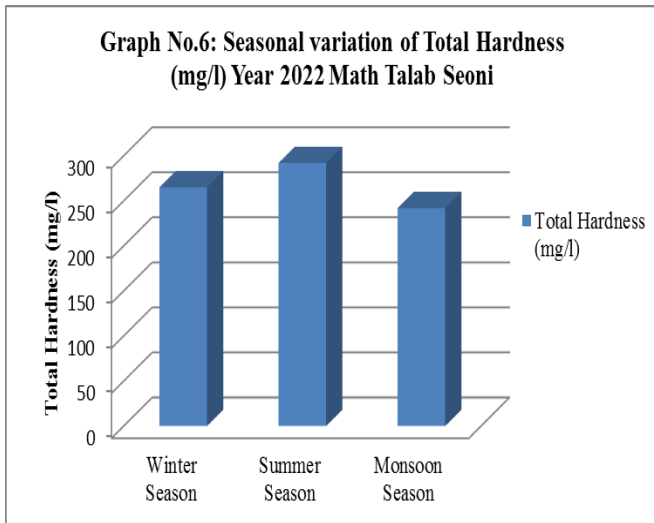
**Magnesium & Sodium: -** Magnesium values are minimum 1.15 mg/l in summer and maximum 4.1 mg/l winter season. Sodium quantities varied between 10 to 30 mg/l with its summer maxima and winter minimum.

**COD (Chemical Oxygen Demand):-** The estimation of COD is of great importance for waters having BOD value of the pond water ranged between 22.0 to 41.0 mg/lit. Highest COD was observed in monsoon season and Lowest was in winter season. Similar result found in Daheriya R.S. (2022).

**BOD (Biological Oxygen Demand):-** BOD represents the amount of oxygen that microbes need to stabilize biologically oxidizable matter. It is found to be more sensitive test for organic pollution. BOD is found to be more sensitive test for organic pollution. BOD value of pond water ranged between 4.8-6.2 mg/ l. Highest BOD value was observed in winter season and lowest in

monsoon season. Increased temperature and sedimentation load reduce BOD (Pyatkin and Krivoshein, 1980). According Indian standards, desirable limit of BOD is 4.0 mg/l. and permissible limit is 6.0 mg/l. Biological oxygen demand below 3 mg/l or less is required for the best use.





**Table No. 1. Seasonal Variation of Water Quality of Math Talab Seoni (M.P.)**

Sr. No.	Water Quality Parameters	Winter Season	Summer Season	Monsoon Season
1.	Water temperature (°C)	20.75	32.25	26.55
2.	pH	08.75	07.45	08.15
3.	Total Alkalinity (mg/l)	171.98	175.88	165.75
4.	T.D.S. (mg/l)	105.00	355.00	562.00
5.	Carbonates (mg/l)	75.00	60.00	55.00
6.	Bicarbonates (mg/l)	25.00	42.00	62.00
7.	Total Hardness (mg/l)	265.00	292.00	242.00
8.	Calcium (mg/l)	07.50	04.20	07.10
9.	Magnesium (mg/l)	04.1.	01.15	02.05
10.	Sodium (mg/l)	10.00	30.00	24.00
11.	Nitrate (mg/l)	04.20	03.40	02.45
12.	Phosphate (mg/l)	05.30	07.40	06.20
13.	D.O (mg/l)	06.50	05.40	04.70
14.	C.O.D. (mg/l)	22.00	24.00	41.00
15.	B.O.D. (mg/l)	06.20	05.80	04.80

**CONCLUSION:-**

The physico-chemical study of Math talab water during all the three seasons shows different seasonal fluctuation among various parameters. The results of the water quality clearly show that the most number of parameters were within the desirable limit while some parameters are higher than the desirable limit but not exceeding the maximum permissible limit as prescribed by BIS and WHO. This investigation confirms that Math talab is polluted. Thus the status of water quality of Math talab should be protected and conserved by raising the awareness of the local people and by reducing anthropogenic activities.

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