Monitoring Seasonal Variation In Water Quality Of Amalnala Lake, District Chandrapur

D. D. Sontakke[1], P. B. Chatap[1] and P. M. Telkhade[2]

[1,2]Janata Mahavidyalaya, Chandrapur, (M.S) India
[3]Arts ,Commerce and Science College, Tukum, Chandrapur (M.S) India
Corresponding author: Dipti D. Sontakke (jogidipti@gmail.com)

Abstract:
The present piece of work has been made to investigate quality of water of Amalnala Lake in Chandrapur district. Physico-chemical analyses were carried out by collecting samples monthly from four site of lake over the period of 12 month from January-2016 to December-2016. All the physicochemical parameters were determined by standard methods. The parameters studied includes ambient Temperature, water Temperature, pH, Conductivity, Transparency, Dissolved Oxygen, Free CO_2, Total Alkalinity, Calcium Hardness, Magnesium Hardness, TDS, TS,BOD, COD. The monthly analysis over the period of one year suggest that the lake water is suitable for Domestics purposes. This study have shown that, there was considerable variation occurred. The study also has discussed factors responsible for significant seasonal variation.
Keywords: Amalnala Lake, Physico-chemical, Water quality

Introduction:

Approximately half of the world's population lives in urban areas and by the year 2025 will have risen to 60 per cent, comprising some 5 billion people. The public health significance of water quality cannot be over emphasized. Many infectious diseases are transmitted by water through the fecal-oral route. The effect of water pollution on human health is of serious nature.[1] Some trace elements are essential for human being within limit but cause serious health risk at high concentration.[2-4] Diseases contacted through drinking water kill about 5 million children annually and make 1/6th of the world population sick (**WHO, 2004**). Rapid urban population growth and industrialization are putting severe strains on the water resources and environmental protection capabilities of many cities particularly in developing nations. The lack of source of clean drinking water is giving birth to public health concern worldwide. Waterborne diseases are a consequence. Access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection. Human use of fresh water has registered a 35 fold increase in the last 300 years. [5] Water is not only an essential component for life but also a basic building block to maintain quality of life. Water scarcity has already revealed adverse effects on all populations in every continent. More recently, UNICEF and WHO reports have confirmed that 748 million people do not have adequate and safe water resource and over 2.5 billion people have access to meager water supply. The WHO also estimates that 1.8 billion people use faecally contaminated source of drinking water. Groundwater is used for potable purposes by over 50% of the global population. Thus, groundwater is sometimes described as the 'hidden sea'. This is indeed true to a greater extent in countries like India where local supply to ~80% rural and ~50% urban dwellings is provided by groundwater sources alone [6]. In view of this, it is very important to take care of our water bodies like lakes or water reservoirs etc by their assessment chemically and biologically. Most of the physicochemical parameter like BOD, COD, alkalinity, pH, chloride, fluoride, hardness, phosphate, sulphate, nitrate etc are responsible or decide the quality of water. Presence of this parameter in water if within permissible limit, the quality of water will be good. If these physicochemical parameter not in permissible limit, that will affect the quality of water. But due to nonscientific activity of human being like industrialization, use of excessive fertilizer in agriculture etc, contamination of water continuously taking place. Present research paper deals with the study of determination of water quality by finding physicochemical parameter of Amalnala Lake water. This water reservoir is one of biggest source of water in this area for domestic, agriculture and industrial purpose. Excessive interference from mankind activities have increased the pollution level of water quality of Amalnala Lake which yet not determined. Therefore, our present study has determined water quality by finding various parameters which clearly indicate pollution level of lake.

Methods and Materials:

Water samples were obtained from various locations (Site-1, Site-2 Site-3 and Site-4) from study area (Amalnala Lake, District Chandrapur). All the required chemicals were purchased from Sigma Aldrich and used without purification. The solvent used were purified by distillation methods. Physico-chemical

parameters of the water samples were determined according to standard methods during 2016. Physico-chemical parameters which have been tested include Temperature, pH, Transparency, Conductivity, Alkalinity, DO, Free CO_2, BOD, COD, Hardness, TS, Nitrate, Sulphate and Phosphate.

Results and Discussion:

Various physic-chemical parameters were determined as per processors given in literature. The analytical results (average of four sites) of physicochemical parameter of the various sites have been shown in following Table -1.1 and Figures.

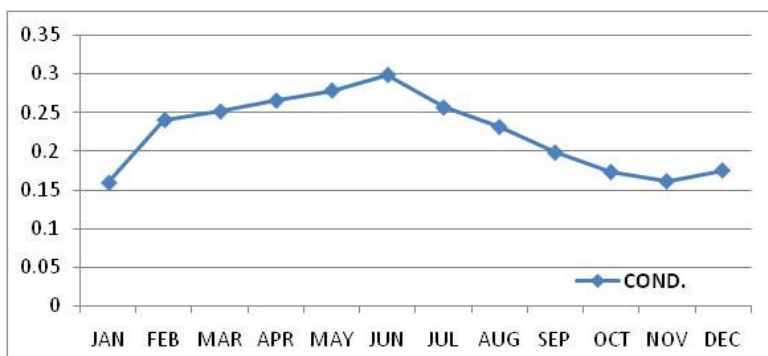**Table -1.1** Physico-chemical parameters of water samples of Amalnala Lake during 2016.

WATER PARAMETERS	MONTHS 2016											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMP	**23.90**	24.10	28.20	32.80	**34.10**	33.20	31.50	29.10	27.40	26.10	25.60	24.50
pH	7.40	7.20	7.45	7.40	**7.60**	7.05	7.35	7.55	7.35	7.22	**7.01**	7.40
COND	**0.159**	0.240	0.251	0.265	0.278	**0.298**	0.256	0.231	0.198	0.173	0.161	0.175
TRANS	44.00	**54.00**	52.00	48.00	37.00	36.00	**26.00**	34.00	46.00	48.00	50.00	46.00
DO	7.10	**5.40**	6.20	5.62	5.80	6.40	**7.80**	7.60	7.20	7.50	7.30	7.10
CO_2	3.85	**3.10**	4.70	4.90	5.40	**6.90**	5.11	5.13	4.22	3.78	4.80	3.20
HARDNESS	34.00	59	62	65.00	**83.00**	77.00	48.00	42.00	43.00	59.00	48.00	**38.00**
BOD	4.22	5.90	6.50	6.90	**7.20**	6.20	5.80	6.90	5.70	6.20	5.00	**4.10**
COD	33.00	**24.22**	26.10	29.15	28.10	26.20	31.05	32.07	34.09	**39.00**	29.10	28.15
ALKALINITY	**24.00**	45.00	51.00	54.00	58.00	**68.0**	46.00	38.00	32.00	40.00	42.30	37.00
TDS	**79.00**	95.00	115.00	119.00	156.00	135.00	136.00	**176.00**	141.00	102.00	95.00	101.00
SULPHATE	23.00	**19.00**	21.00	24.00	**30.00**	28.00	30.00	25.00	26.00	27.00	26.00	25.00
PHOSPHATE	0.29	0.230	0.384	0.466	**0.554**	0.478	0.419	0.522	0.320	0.253	0.236	**0.219**
NITRATE	**0.206**	0.210	0.256	0.288	0.310	**0.461**	0.455	0.429	0.380	0.360	0.290	0.264

Temperature: The water temperature fluctuated between 23.90 to 34.10 °C. Various biological and non biological processes in water have been affected by variation in water temperature and changes many physicochemical parameters of water such as solubility of oxygen, CO_2, bicarbonate and carbonate [7].

pH: pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity. In this result pH varies between 7.60 to 7.01. Higher value of pH (7.60) was due to high temperature in the month of May which clearly indicates high rate of photosynthesis in the month of May.
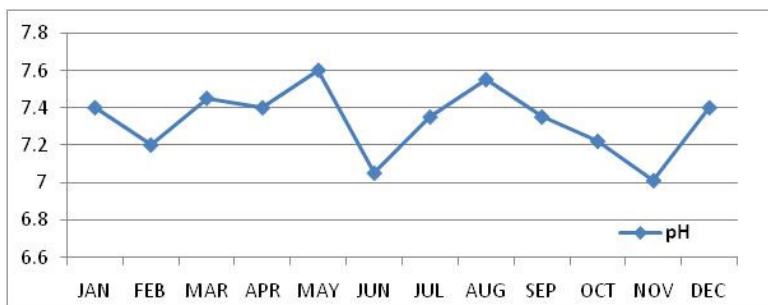

Conductivity: In the present investigation the values of conductivity recorded is 0.298 µ mhos/cm to 0.159 µ mhos/cm. In the present investigation seasonally maximum conductivity was recorded during summer season and minimum recorded during the monsoon season.

Transparency: The transparency of water body is mainly affected by the suspended particles and indirectly influenced by the physicochemical parameters. In the present investigation, Sacchi disc transparency was recorded at 26.00 cm to 54.00 cm in Amalnala Lake.
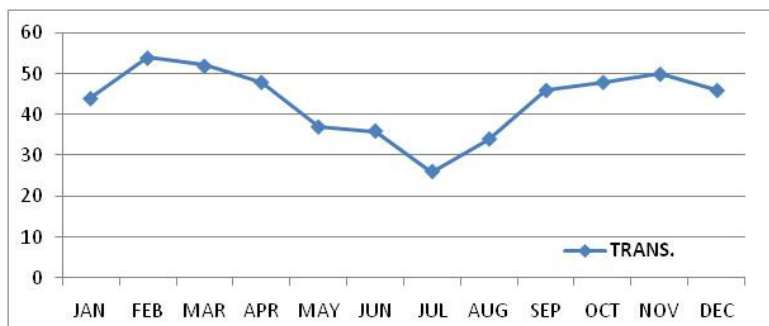
Dissolved Oxygen: Dissolved Oxygen levels are considered as the most important and commonly employed measurement of water quality and indicator of a water body's ability to support desirable aquatic life. Like terrestrial animals, fish and other aquatic organisms need oxygen to live. In the present investigation the values of dissolve oxygen recorded ranges between 5.40 mg/lit. to 7.80 mg/lit.
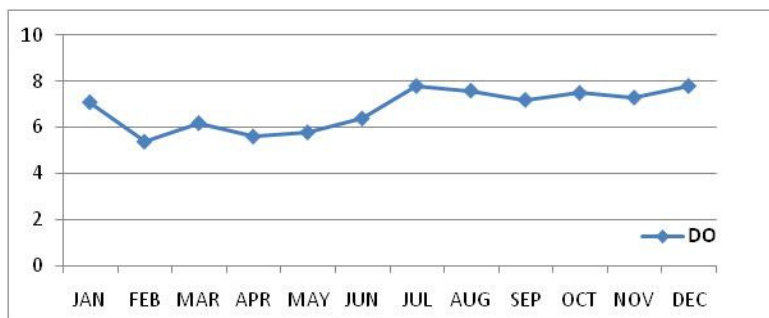
Free CO_2: Free carbon dioxide dissolve in water is essentially the only source of carbon that can be assimilated and incorporated into the skeleton of living matter of all the aquatic autotrophs. Most of the carbon in fresh water system occurred as equilibrium products of carbon dioxide. Carbon dioxide is added to aquatic ecosystem by other factors like rainwater, inflowing ground water and respiration of aquatic flora and fauna. In the present investigation, the range of free carbon dioxide recorded is 3.10 mg/lit. to 6.90 mg/lit. In the present investigation, the maximum free carbon dioxide in summer is due to the decomposition of organic matter and the respiration of aquatic flora and fauna, however minimum free carbon dioxide during winter is probably due to a decrease in the photosynthetic activity of aquatic flora [**8**].
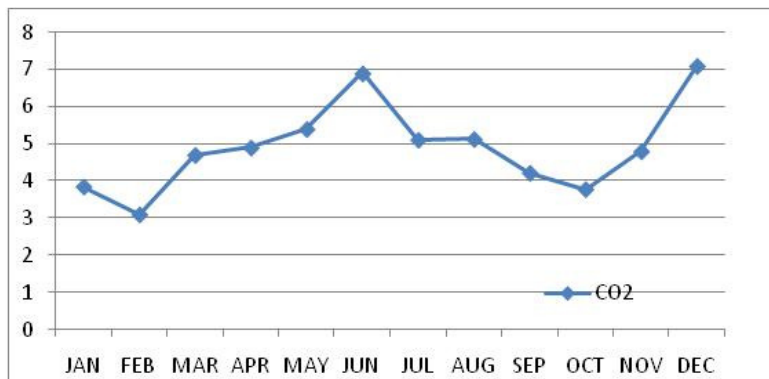

Hardness: Total hardness in water is the sum of the concentrations of alkaline earth metals cations. Hardness is generally governed by calcium and magnesium salts which largely combines with

bicarbonates and carbonates giving temporary hardness and with sulphates, chlorides and others anions of a minerals acids causing permanent hardness. In the present investigation the total hardness was recorded in the range of 38.00 mg/lit. to 83.00 mg/lit. Here, value of hardness was higher in summer may due to high temperature and found lower in winter season due to lower temperature.
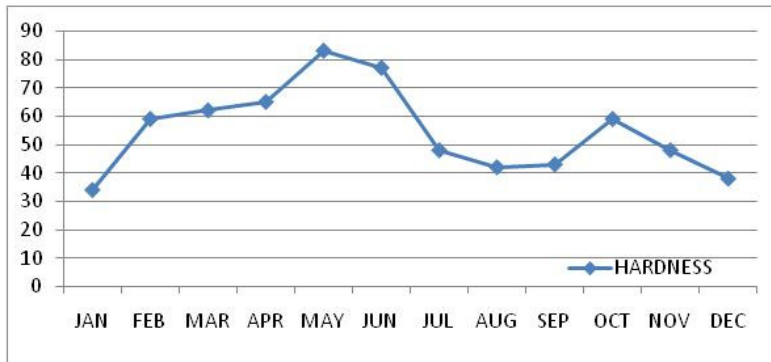

BOD: Biochemical oxygen demand has been used as a major indicator of the amounts of organic materials in an aquatic solution which supports growth of microorganisms. In the present investigation, the biochemical oxygen demand values recorded is 4.20 mg/lit. to 7.10 mg/lit. In the present investigations, the maximum biochemical oxygen demand in summer is probably due to high microbial activities during summer.
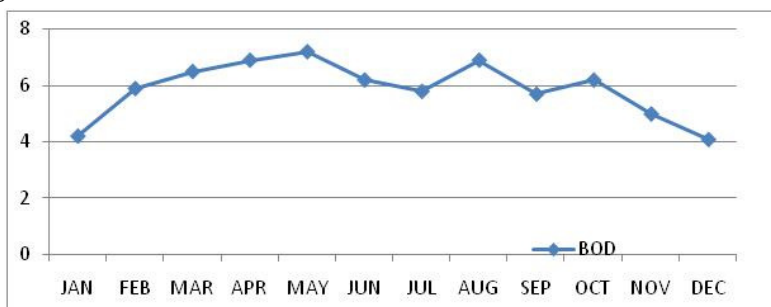

COD: The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in water surface, making COD a useful measure of water quality. In the present investigation, the chemical oxygen demand values recorded are 24.22mg/lit. to 39.00 mg/lit.
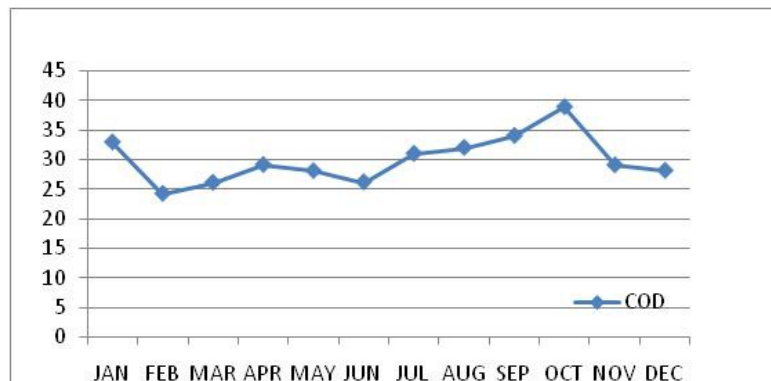
Alkalinity: Alkalinity is a measure of buffering capacity of the water. It is generally imparted by the salts of carbonates, bicarbonates, phosphate, nitrates, borax, silicates etc., together with the hydroxyl ions in a free states. In the present investigation the total alkalinity ranged 24.00 mg/lit. to 68.00 mg/lit.
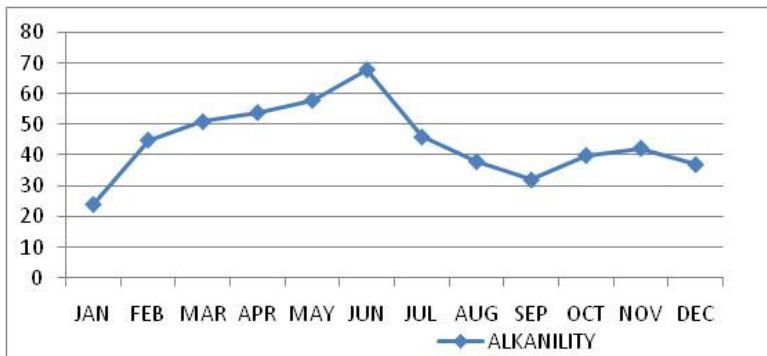

TDS: According to WHO and Indian standards, TDS values should be less than 500 mg/L for drinking water. In the present study TDS ranged from79 mg/lit to 176 mg/lit.
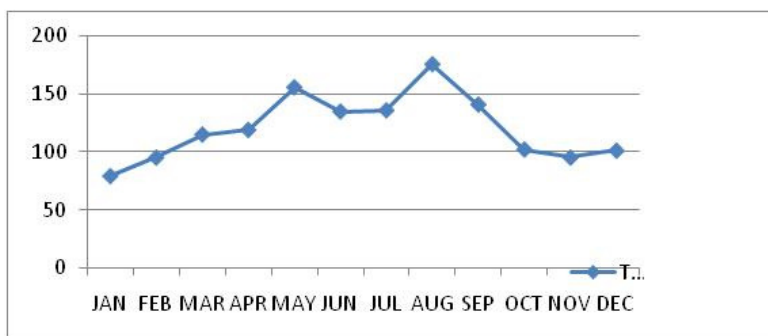

Sulphate: In natural water, sulphide is the second most common anion, being from most sedimentary rocks. In the present investigation, the values of sulphate recorded are 19 mg/lit. to 30 mg/lit. In the present study, higher concentration of sulphate recorded in summer is probably due to the activity of biodegradation whereas dilution and utilization of sulphate by the aquatic plants gradually brought down the sulphate concentration in monsoon followed by winter.
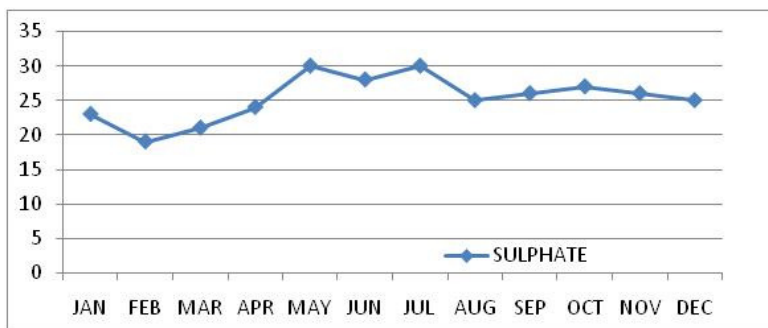
Phosphate: During the natural process of weathering, the rocks gradually release the phosphorus as phosphate ions which are soluble in water. In the present investigation, phosphate is recorded between 0.210 mg/lit. to 0.554 mg/lit. In the present investigation, high values of phosphate during summer seasons may be due to rapid evaporation and mineralization of decomposed materials in pond water.
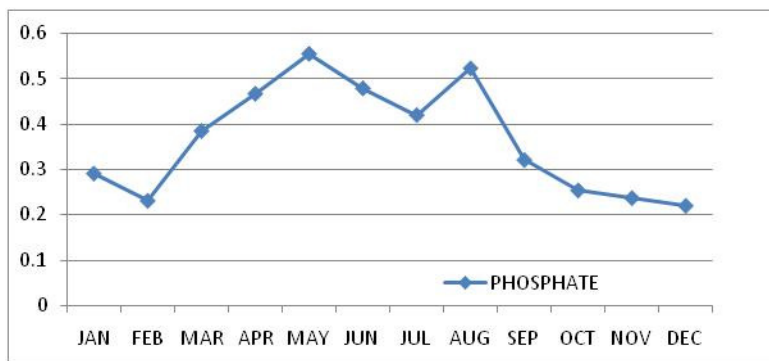
Nitrate: Nitrate content is excellent parameters to judge organic pollution and it represents the highest oxidized form of nitrogen. The nitrates are an important source of nitrogen for phytoplankton. In the present investigation, the values of nitrate range between 0.206 mg/lit to 0.461 mg/lit. In the present investigation, maximum nitrate was recorded during the monsoon and minimum during the winter season.
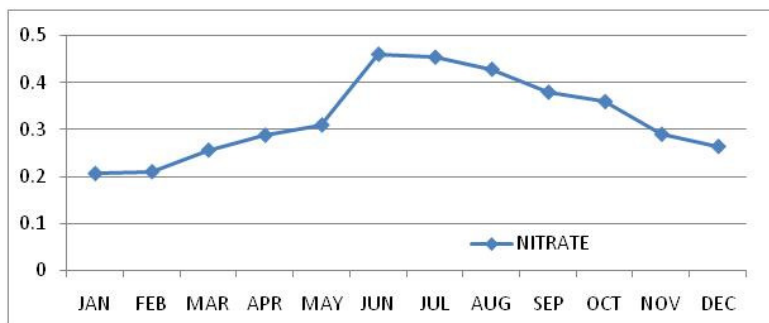
Conclusion: The analysis of the water quality parameters of Amalnala Lake shows that few parameters are not under permissible limit. In conclusions from the results of the present study it may be said that the water of lake is though fit for domestic purpose but drinking water need treatments to minimize the contamination.

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