Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Spl Issue [1] January 2023 : 344-354.

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Physico-chemical analysis of Water from Ujani Reservoir at Pre-Monsoon and Post-Monsoon, Solapur District, Maharashtra, India.

Yuvraj Ghule [1], Bipin Shinde[2] and Sunil Barkade[3*]
[1]Department of Environmental Science, School of Earth Sciences, Solapur University, Solapur -413 255, MS. India
[2]Department of Chemistry, Karmaveer Bhaurao Patil College, Vashi,- 400703 ,MS.India.
[3] Department of Electronics, Yashavantrao Chavan Institute of Science, Satara-415002, India.*
***Corresponding author** Email – sunilbarkade123@gmail.com*

ABSTRACT
The present investigation deals with the seasonal analysis of physico-chemical parameters of the water samples from the back waters of the Ujani reservoir built on the River Bhima. The study recorded different range of water quality parameters from the different locations and water collection layers. The water samples were collected from ten different locations and at different layers like surface, middle, and bottom of the reservoir and were analyzed for pre-monsoon and post-monsoon conditions. The average readings of some important parameters viz. temperature (19.9-38.11 ℃), pH (6.5-9.57), turbidity (0.7-39 NTU), total dissolved solids (440-909.7 mg/l), biochemical oxygen demand (4.5-7.9 mg/l), chemical oxygen demand (10.1-45.75 mg/l), total suspended solids (119.7-435.9 mg/l), hardness (201-298 mg/l), chlorides (119-249 mg/l) are higher than WHO permissible limits in both pre and post-monsoon samplings. These observations revealed that the pollution of water in the reservoir is due to emerging domestic waste water, industrial influent, agricultural waste, and solid waste. Hence, the water is not suitable for either for irrigation, drinking, industry or for hydroelectric power stations and fishery, unless treated considerably.
Keywords
Physico–chemical parameters, Seasonal variations, Ujani reservoir, Water pollution, WHO.

Received 20.11.2022 Revised 30.11.2022 Accepted 25.12.2022

INTRODUCTION

Water is a unique solvent which has the capacity to dissolve lots of different substances as natural and non-living material. It is necessary for life and important for the sustainable development of human being. Water pollution usually creates ground and surfaces water quality problems in the reservoir due to increasing urbanization, industrialization, agricultural practices, and human activities (31, 46). In India, different types of chemical contents are dispersed in large quantities in almost all important river and dam which create problems related to water pollution. The interactions between the physical and chemical parameters of the water play an important role in the form of synthesis, dispersion, and plenitude of aquatic living 27). The Ujani reservoir is built on Bhima River near the Ujani village in Solapur District of Maharashtra and it is 120 km away from Pune, the major metropolitan and industrial city in the upstream region (31). The storage capacity of Ujani is about 110 TMC and it is among the big dams in Maharashtra state (15). It is a multipurpose reservoir lending benefits for irrigation, drinking, transportation, industrial water supply, hydroelectric power and development of fisheries (33).

The Bhima River originates in the Bhimashankar area of Northern Western Ghats and Mula, Mutha, Pavana, Ghod, Sina and Indrayani are the major sub-rivers which joins the Bhima(19). Majority of the sub-rivers flow through the Pimpri-Chinchwad and Pune city, which are the two major industrial zones having high population density (30). Most of the sub-rivers carry an enormous material load of different types of chemicals, sewage and industrial influent into the Bhima River (14, 26, 5). The Ujani water reservoirs meet huge demand of water for drinking, agriculture and industry sector. It is also vital for fish cultivation and migratory birds. However, high level of pollution subsists in the Ujani reservoir which is justified by the present study of different physico-chemical parameters of water samples from ten different locations (Bhigavan, Kumbhargaon, Palasdev, Chandgaon, Kalashi, Padasthal, Malvdi, Shaha, Kandaldaon, and Bhimanagar). This study is conducted at different water layers (surface, middle, and bottom layers) during pre- and post-monsoon seasons. The major pollution indicating physico-chemical parameters were evaluated for all the samples and the mean values of these parameters were compared with World Health Organization standards (47).

MATERIAL AND METHODS

Study site:-

The Ujani reservoir located between longitude 18°18'08.16" N to 18°07'26.22" N and latitude 74°48'04.66" E to 75°12'14.20" E and spread in Pune, Solapur and Ahmednagar districts of Maharashtra state, India.

Sampling:-

Water samples were collected from May 2015 to September 2015 to cover both seasons *viz*. Pre-monsoon (May) and post-monsoon (August). The water samples were collected from the different layer of water bodies such as surface, middle, and bottom layers from 10 sampling sites as per the norms of the APHA (American Public Health Association). The water samples collected in plastic bottles were brought to the laboratory for further studies, while parameters such as temperature, pH, electrical conductivity and total dissolved solids were analyzed at field levels.

Water quality parameter analysis:-

Temperature was measured by glass thermometer accurate to 0.1^0C, pH using a portable pH meter model type 802 and electrical conductivity (EC) was measured by digital conductivity meter model CD600. Alkalinity was measured via (APHA 2017), titrimetric method and turbidity was calculated through a Nephelometric Method. Total dissolved solids (TDS) and total suspended solids (TSS) were determined by using Filtration/Gravimetric Method. Dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total hardness, free CO_2, chloride, calcium and magnesium were estimated as per the standard methods described by APHA 2012. Nitrate and phosphate was measured using UV-VIS spectrophotometer model 119, while sodium and potassium were determined through flame photometry (23, 2, 32, 47).

RESULTS AND DISCUSSION

In the present study, the water samples were collected from the ten different locations of Ujani reservoir (Table 1). The results for different physico-chemical parameters of the water samples from the Ujani reservoir during pre-monsoon and post-monsoon are presented in table 2-3. Mineral contents of the water samples are presented in table 4-5.

Temperature:-

The average values of water temperature were recorded during pre-monsoon [(surface water, 38.69°C; middle layer water, 34.98°C; bottom layer water, 28.46°C)] (Table 2) as well as for post-monsoon season [(surface water, 31.47°C; middle layer water, 29.54°C; bottom layer water 26.91 °C)] (Table 3). For pre-monsoon condition, minimum temperature value was recorded as 27.4°C for sampling site-X and maximum temperature of 39.5°C was observed at sampling site-I (Table 2). During post-monsoon, minimum temperature value was 25.7°C for site-X and maximum value of 32.8°C for sampling site–II (Table 3). The temperature of in-situ water sampling of surface, middle and bottom layers were directly measured by glass thermometer. The temperature of water plays a key role in the metabolic, physiological and physicochemical behavior of aquatic ecosystems (39). Low temperature was recorded in sampling site –IV in the post-monsoon period due to less solar radiation and low atmospheric temperature. Instead, high temperatures were recorded in sampling site –I for pre-monsoon period due to the high solar radiation, suitable atmosphere and clean weather conditions. Similar observations were reported by (29, 10, 43, 35, 21, 22).

pH:-pH is expressed as hydrogen ion concentration in water sample. WHO suggested standards for water pH ranged was from 6.5-8.5. The results of present study revealed the higher values of pH of surface water during pre- as well as post monsoon conditions at Ujani reservoir (Table 2 & 3). Average value of water pH during pre-monsoon were recorded as surface water 9.54, middle layer water 8.15 and bottom layers 6.97 **(**Table 2) and for post-monsoon were of surface water 8.22, middle layer water 7.58 and bottom layers6.93 **(**Table 3). These were crossed the WHO permissible limit. Pre-monsoon minimum pH value 6.5 for sampling site-IX to maximum pH value 9.9 for sampling site –III **(**Table 2). Post- monsoon minimum pH value 6.5 for sampling site-VIII to maximum pH value 8.6 for sampling Site-II **(**Table 3). The pH values were recorded maximum during pre-monsoon and similar observations were made in other studies (11, 41).

Alkalinity:-

Alkalinity is among the important parameters which affect human health. High alkalinity effects badly and causes water to be unpalatable and also causes intestine infection(32). In Ujani reservoir, the values of alkalinity were recorded on the higher side during pre-monsoon (surface water 233.6 mg/l, middle layers water 243.3 mg/l and bottom layers water 255.3 mg/l) **(**Table 2) as compared to post-monsoon (surface water 231.6 mg/l, middle layers water 241.2 mg/l and bottom layers water 250.4 mg/l) **(**Table 3). During pre-monsoon, minimum alkalinity value (227 mg/l) was recorded for sampling site-X, while maximum

alkalinity value (260 mg/l) were recorded for sampling site-I **(**Table 2), however, minimum alkalinity value (225 mg/l) at sampling site-IX and maximum alkalinity value (255 mg/l) for sampling site–I during post-monsoon conditions **(**Table 3). In the present study, the higher values of alkalinity were recorded during pre-monsoon and the minimum in post-monsoon. Similarly, maximum alkalinity in summer was also observed by (9, 43, and 44).

Turbidity:-

Turbidity is considered as a good determine of the quality of water and it calculates the amount of light that is scattered or absorbed. In the present investigation on Ujani reservoir, the value of water turbidity was recorded as pre-monsoon surface water 1.42 NTU, middle layer water 2.72 NTU and bottom layer water 3.51 NTU during pre-monsoon **(**Table 2), while post-monsoon study resulted in surface water 1.19 NTU, middle layers water 2.46 NTU and bottom layers water 3.26 NTU **(**Table 3). At sampling site-I the turbidity value was recorded minimum (1.1 NTU) and sampling site-IV resulted with maximum turbidity value (3.9 NTU) for sampling site-I during pre-monsoon conditions **(**Table 2). Post- monsoon study showed minimum turbidity value (1 NTU) for sampling site-III and maximum turbidity value (3.7 NTU) for sampling site –I **(**Table 3). The turbidity was found to be higher in post-monsoon season water samples. The flow of water slows down due to higher values of turbidity which directly affects aquatic ecosystem (12, 32). The recorded turbidity value is 3.9 NTU which is very close to the limiting value of turbidity (4 NTU). Therefore, the water from Ujani reservoir requires is treated before its use for any Purpose.

Total dissolved solids:

Total dissolved solids in water are due to inorganic and disintegrated salts. In Ujani reservoir, the TDS were calculated during both the seasons and values for pre-monsoon were recorded in the surface water (6200 mg/l), middle layer water (5300 mg/l) and bottom layer water (4220 mg/l) **(**Table 2) and for post-monsoon surface water (5310 mg/l), middle layer water (4450 mg/l) and bottom layer water (3320 mg/l) **(**Table 3). Pre-monsoon minimum TDS value was 4000 mg/l for sampling site-X to maximum total dissolved solids value was 6500 mg/l for sampling site- I **(**Table 2). During post- monsoon, minimum TDS value 2900 mg/l for sampling site-X and maximum TDS value (6000 mg/l) at sampling site-IV **(**Table 3). TDS values were usually maximum in the pre-monsoon and also observed by others[23,7]. The maximum value of TDS causes adverse effect on human health such as the central nervous system, face, irritability and dizziness.

Dissolved Oxygen:-Measuring the dissolved oxygen (DO) is essential to determine the standard water quality for a healthy aquatic system. The respiration and natural decomposition rate are high in river ecosystems. Most of the time water is usually polluted with a huge quantity of organic material which results in the reduced dissolved oxygen in water, affecting zooplankton and phytoplankton diversity in water ecosystems[4]. It is well recognized that the temperature and salinity has an effect on the dissolution of oxygen in water bodies(45). Average values of DO were recorded for pre-monsoon surface water (19.98 mg/l), middle layer water (18.23 mg/l) and bottom layers water (16.77 mg/l) **(**Table 2). However, post-monsoon values were recorded as surface water (18.2 mg/l), middle layer water (16.45 mg/l) and bottom layer water (15.15 mg/l) **(**Table 3). Pre-monsoon minimum dissolved oxygen value (16 mg/l) was recorded for sampling site-VIII and maximum DO value (20.2 mg/l) was at sampling site-IV **(**Table 2). For post- monsoon, minimum dissolved oxygen value (14 mg/l) was observed for sampling site-VIII and maximum dissolved oxygen value (19.2 mg/l) for sampling site –II **(**Table 3). In the present investigation higher values of dissolved oxygen were recorded during the post-monsoon. The results are in accordance with the previous reports on Tapi River and Estuary[8].

Biochemical oxygen demand:-

Biochemical oxygen demand (BOD) is an important parameter of the oxygen in the water bodies, because it is essential for the respiration of all living organisms. In the current study, average BOD values recorded for surface water (10.05 mg/l), middle layer water (8.43 mg/l) and bottom layers water (7.12 mg/l) during pre-monsoon **(**Table 2). While the post-monsoon values for surface water (9.40 mg/l), middle layer water (8.19 mg/l) and bottom layers water (6.88 mg/l) **(**Table 3). During pre-monsoon, minimum BOD value (6.9 mg/l) was recorded for sampling site-X and maximum BOD value (10.3 mg/l) for sampling site- I **(**Table 2). Post-monsoon study showed that minimum BOD value (6.2 mg/l) at sampling site-X and maximum BOD value (9.8 mg/l) for sampling site –V **(**Table 3). Highest absorption of BOD was during pre-monsoon due to the huge amount of sediment loaded in the river and low BOD values were observed during post-monsoon.

Chemical oxygen demand:-

Chemical oxygen demand (COD) is regularly used to indirectly calculate the number of organic compounds in water (20). For Ujani reservoir, the values of COD recorded for both seasons such as pre-monsoon (surface water 11.93 mg/l, middle layer water 10.99 mg/l and bottom layer water 9.99 mg/l

(Table 2) and post-monsoon surface water (10.88 mg/l, middle layer water 9.75 mg/l and bottom layers water 8.99 mg/l) **(**Table 3). During pre-monsoon, minimum COD value (9.7 mg/l) was observed for sampling site-VIII and maximum COD value (12.2 mg/l) for sampling site- II **(**Table 2). Minimum COD value (8.2 mg/l) was recorded for sampling site-X and maximum COD value (11.2 mg/l) for sampling site-VI during post- monsoon **(**Table 3).The study of seasonal variation in the Ujani reservoir depicted that the maximum COD was throughout pre-monsoon season, which reflected the high organic matter in the reservoir and less COD was throughout the post-monsoon season.

Total suspended solids:-

Total suspended solids (TSS) in the Ujani reservoir may include a diversity of solid material and dissolved impurity. In the present study, TSS values recorded for pre-monsoon were (surface water 5480 mg/l, middle layer water 4810 mg/l and bottom layer water 4140 mg/l) **(**Table 2) and post-monsoon (surface water 5000 mg/l, middle layer water 4390 mg /l and bottom layer water 3770 mg/l) **(**Table 3). In pre-monsoon conditions, minimum value of TSS (3800 mg/l) was recorded for sampling site-IX and maximum TSS value (6000 mg/l) for sampling site-V **(**Table 2). However, post- monsoon results showed that minimum TSS value (3500 mg/l) for sampling site-V and maximum value of TSS (5500 mg/l) for sampling site-X **(**Table 3). Maximum total suspended solids were present in post-monsoon samples because of the high rainfall, sediment, plant waste material, and soil particle flow in the Ujani water.

Electrical conductivity:-

Electrical conductivity (EC) indicates the presence of cations and anions in water (soluble salts). The exceeding amounts of soluble salts are harmful to human as well as aquatic organism. Hence, we measured the electrical conductivity of in-situ water sampling. In the Ujani reservoir, the average values of water electrical conductivity was recorded for pre-monsoon (surface water 45.6 mg/l, middle layer water 38.6 mg/l and bottom layer water 31.2 mg/l) **(**Table 2) and for post-monsoon (surface water 51.4 mg/l, middle layer water 43.9 mg/l and bottom layer water 35.2 mg/l) **(**Table 3). Minimum EC value (27 mg/l) at sampling site-X and maximum EC value (51 mg/l) at sampling site-III were recorded during pre-monsoon **(**Table 2) however minimum EC (31 mg/l) for sampling site-VIII and maximum EC value (55 mg/l) were recorded for sampling site–I during post-monsoon **(**Table 3). Seasonal variations showed higher value of EC in pre-monsoon and lower value in post-monsoon. High EC indicates a large quantity of dissolved minerals, salt and thereby making it sour and unsuitable for drinking (18, 3, and 40)

Hardness:-

The total hardness of water is the accounts for the presence of various alkaline metals as positively charged ions. In the present study, total hardness of water samples from the Ujani reservoir were analyzed and the reading for pre-monsoon surface water (210.9 mg/l), middle layer water (228 mg/l) and bottom layer water (245.9 mg/l) **(**Table 2) and post-monsoon surface water (194.7 mg/l), middle layer water (217.5 mg/l) and bottom layers water (233.4 mg/l) were recorded **(**Table 3). In the pre-monsoon conditions, minimum total hardness value (209 mg/l) was reported for sampling site-VII; while maximum total hardness (260 mg/l) was at sampling site-I **(**Table 2). Post-monsoon results revealed that, minimum total hardness value (180 mg/l) was observed for sampling site-V; however, maximum total hardness (250 mg/l) was at sampling site –I **(**Table 3). The study on total hardness of water samples of Ujani reservoir showed highest measurements in post-monsoon samples and the lowest in pre-monsoon. Similar observations have been reported by(42,17).

Chloride:-

Chlorides were found basically in all kind of natural water. In the present study, the chlorides were analyzed from water samples from 10 different locations and average values were recorded for pre-monsoon surface water (235.7 mg/l), middle layer water (241.7 mg/l) and bottom layer water (252 mg/l) **(**Table 4) and post-monsoon surface water (222.8 mg/l), middle layer water (232 mg/l) and bottom layer water (241.5 mg/l) **(**Table 5). Minimum values of chlorides (230 mg/l) were found for sampling Site-I whereas, maximum chlorides (256 mg/l) reported for sampling site-VI during pre-monsoon **(**Table 4). During post-monsoon, sampling site-VI showed minimum chloride value (219 mg/l) while, maximum chlorides (246 mg/l) were reported from the sampling site-II **(**Table 5). The water chlorides of the Ujani reservoir were highest in pre-monsoon samples and the lowest in post-monsoon.

Calcium:-

A huge amount of calcium in freshwater is a suggestion of organic pollution(16). In this study, the calcium values were calculated for Ujani reservoir during pre-monsoon surface water were (138.3 mg/l), middle layer water (143.7 mg/l) and bottom layer water (150 mg/l) **(**Table 4) and post-monsoon surface water (121.1 mg/l), middle layer water (129.4 mg/l) and bottom layer water (138.1 mg/l) **(**Table 5). Sampling site-VI showed minimum calcium value (135 mg/l) and maximum calcium value (155 mg/l) was observed at sampling site-I during pre-monsoon conditions (Table 4). However, post-monsoon minimum

calcium value (118 mg/l) for sampling site- IX and maximum calcium value (141 mg/l) for sampling site-I **(**Table 5). The water calcium levels of the Ujani reservoir were highest in pre-monsoon samples and the lowest in post- monsoon.

Magnesium:-

In the current study, the magnesium values were recorded for pre-monsoon surface water 44.84 mg/l, middle layer water 46.69 mg/l and bottom layer water 48.46 mg/l **(**Table 4), whereas, post-monsoon surface water 21.9 mg/l, middle layer water 29.7 mg/l and bottom layer water 38.1 mg/l **(**Table 5). Pre-monsoon minimum magnesium value (43.2 mg/l) recorded for sampling site-VI while, sampling site-X showed maximum magnesium value (49.3 mg/l) **(**Table 4). The post- monsoon minimum value of magnesium (19 mg/l) were found for sampling site-V and maximum magnesium value (41 mg/l) at sampling site –IX **(**Table 5). The presence of magnesium in the waters of the Ujani reservoir among the seasons were highest in pre-monsoon samples and the lowest in post -monsoon. Similar observations have been previously reported by(36) .

Sodium:-

Sodium assumes an enormous part of the human body. It identifies with element of the sensory system[13]. In the present study, the sodium was assessed for different water samples from the Ujani reservoir for two seasons, where the values recorded for pre-monsoon as surface water 158.5 mg/l, middle layer water 174.9 mg/l and bottom layer water 190.2 mg/l **(**Table 4). However, the post-monsoon reading for surface water 139.2 mg/l, middle layer water 149 mg /l and bottom layer water 160.8 mg/l **(**Table 5). During pre-monsoon, sodium value were recorded minimum (152 mg/l) for sampling site-V, whereas, the maximum sodium value (195 mg/l) for sampling Site-I **(**Table 4). Post- monsoon minimum sodium value (135 mg/l) was observed for sampling site-VII and maximum sodium value (165 mg/l) at sampling site –I **(**Table 5). The water sodium of the Ujani reservoir among the seasons was highest in pre-monsoon samples and the lowest in post-monsoon.

Potassium:-

In the current investigation, the potassium was calculated for different water samples from the Ujani reservoir for the two seasons including pre-monsoon surface water 1.25 mg/l, middle layer water 1.79 mg/l and bottom layer water 2.32 mg/l **(**Table 4) and post-monsoon surface water 1 mg/l, middle layer water 1.57 mg/l and bottom layer water 2.12 mg/l **(**Table 5). The sampling site- III reported minimum potassium value (1 mg/l), while sampling site-X was found with maximum potassium value (2.6 mg/l) during pre-monsoon condition **(**Table 4). Post-monsoon minimum potassium value (0.8 mg/l) was recorded for sampling site-III and sampling site –IX resulted with maximum potassium value (2.3 mg/l) **(**Table 5). The water potassium of the Ujani reservoir was found highest in pre-monsoon samples and the lowest in post-monsoon.

Nitrate:-

Nitrate is one of the most important nutrients which accounts for the primary productivity of water body. In the present study, nitrate from the Ujani reservoir were analyzed for two seasons such as value-pre-monsoon surface water 27.5 mg/l, middle layer water 33.5 mg/l, bottom layer water 41.4 mg/l **(**Table 4) and post-monsoon surface water 18.8 mg/l, middle layer water 26.4 mg/l and bottom layer water 35.9 mg/l **(**Table 5). Nitrate value during pre-monsoon was minimum (24 mg/l) for sampling site-II and maximum (47 mg/l) for sampling site-VII **(**Table 4). The post- monsoon minimum nitrate value (16 mg/l) was recorded for sampling site-II and recorded maximum (39 mg/l) for sampling site –VII **(**Table 5). The water nitrate values for Ujani reservoir were highest in pre-monsoon and the lowest in post-monsoon. Similar observations have been reported by **(**38, 34, and 25).

Phosphates:-

Phosphate (PO_4-P/l) is one of the true nutrients on the water bodies and in charge of organic efficiency. In the present study, the phosphate accumulation in the Ujani reservoir were assessed for two season such as pre-monsoon surface water 13.4 mg/l, middle layer water 21.4 mg/l, bottom layer water 27.6 mg/l **(**Table 4) and post-monsoon surface water 10.9 mg/l, middle layer water 17.9 mg/l and bottom layers water 24.8 mg/l **(**Table 5). In pre-monsoon, sampling site-VII showed minimum phosphate value (11 mg/l) and maximum phosphate value (30 mg/l) was recorded for sampling site-V **(**Table 4). During post-monsoon conditions, minimum phosphate value (8 mg/l) was recorded for sampling site-I while, sampling site-VII resulted with maximum phosphate value (27 mg/l) **(**Table 5). The water phosphate of the Ujani reservoir has been found highest in post-monsoon and the lowest in pre-monsoon. The higher phosphate concentration in monsoon might be owing to influx through rainwater from the nearby agriculture lands and as has already been reported by (1).

Free CO_2:-

In the present study, the free carbon dioxide from water samples from the Ujani reservoir collected from two season *viz*. pre-monsoon surface water 12.14 mg/l, middle layer water 10.27 mg/l and bottom layer

water 8.72 mg/l **(**Table 4) and post-monsoon surface water 13.19 mg/l, middle layer water 11.72 mg/l and bottom layer water 9.75 mg/l **(**Table 5). Pre-monsoon minimum free carbon dioxide value was recorded as 8.1 mg/l for sampling site-III and maximum free carbon dioxide value (12.5 mg/l) for sampling site-VIII **(**Table 4). During post-monsoon, minimum free carbon dioxide value (9.4 mg/l) was recorded for sampling site-I, however, sampling site -IX showed maximum free carbon dioxide value (13.7 mg/l) **(**Table 5).The free carbon dioxide of the water samples from Ujani reservoir were highest in post-monsoon and the lowest in pre-monsoon. Similar observations have been reported by (28).

Table 1 Geographical locations of sampling stations of Ujani reservoir.

Sr. No.	**Locality**	**Latitude**	**Longitude**
1	Bhigavan	18°18'08.16"N	74°48'04.66"E
2	Kumbhargaon	18°15'45.47"N	74°48'56.47"E
3	Palasdev	18°15'10.53"N	74°52'41.83"E
4	Chandgaon	18°15'49.99"N	74°56'56.34"E
5	Kalashi	18°13'14.31"N	75°0'48.81"E
6	Padasthal	18°12'20.59"N	75°3'47.50"E
7	Malawdi	18°9'3.98"N	75°5'22.23"E
8	Shaha	18°7'16.30"N	75°6'29.44"E
9	Kandaldaon	18°7'6.35"N	75°9'4.99"E
10	Bhimanagar	18°4'30.58"N	75°7'14.47"E

Table 2 Physico-chemical properties of pre-monsoon water samples collected from sampling stations of Ujani reservoir.

Sr. No.	Sampling site	Depth in (Ft.)	Temp. (°C)	pH	E.C (ms/cm)	Alkalinity (mg/l)	Turbidity (NTU)	TDS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	Hardness (mg/l)
	WHO		-	6.5-	-	-	4	1000	-	6	10	-	100-
1	Bhigavan	S.W	39.5	9.8	334.67	239	1.5	6500	20	10.3	12	5500	210
		M.W	35.4	8.2	321.30	247	3	5500	18	8.5	11.1	4800	230
		B.W.	29.1	6.9	307.33	260	3.9	4200	16.1	7	10	4000	260
2	Kumbhar-gaon	S.W	39.2	9.7	335.67	238	1.6	6300	20.1	10.2	12.2	5300	211
		M.W	35	8	317.00	244	2.9	5200	17.9	9	11.3	4700	225
		B.W	28.8	7.2	305.03	259	3.7	4100	16.8	7.2	9.9	4100	255
3	Palasdev	S.W	38	9.9	334.30	239	1.2	6100	19.9	10.1	11.9	5100	205
		M.W	34.8	8.1	319.33	245	2.7	5300	18.1	8.6	11	4800	222
		B.W	29	6.8	302.00	257	3.6	4200	16.9	7.4	10.1	4000	245
4	Chandgaon	S.W	38.2	9.6	331.00	233	1.1	6200	20.2	9.9	11.8	5600	212
		M.W	34.9	7.9	315.30	244	2.8	5100	18.7	8.1	10.9	4900	230
		B.W.	28.5	7	303.00	255	3.6	4300	17	7	10	4100	247
5	Kalashi	S.W	38.8	9.7	327.03	234	1.3	6000	20.1	10	12	6000	215
		M.W	35.1	8.3	314.67	242	2.7	5400	19	8.4	11.3	5100	235
		B.W	29.4	7.4	304.30	252	3.5	4200	17.2	7.1	10.2	4200	245
6	Padasthal	S.W	38.8	9.4	329.00	234	1.2	5900	20	9.8	12.1	5800	210
		M.W	34.7	8.5	317.00	244	2.8	5000	18.5	8	11.2	5000	230
		B.W	28	7.6	303.00	258	3.4	4100	16.7	7	10.1	4400	240
7	Malvadi	S.W	38.6	9.2	326.00	231	1.3	6100	19.8	9.9	11.9	5600	209
		M.W	35.7	8	313.33	243	2.5	5200	18	8.4	11	4800	225
		B.W	27.9	6.9	302.33	253	3.4	4300	17.1	7.3	9.9	4000	237
8	Shaha	S.W	38.5	9	330.00	233	1.4	6200	19.9	10.1	11.7	5000	215
		M.W	33.9	7.8	316.03	242	2.7	5400	17.8	8.2	10.9	4700	226
		B.W	27.6	6.6	301.00	256	3.2	4500	16	7	9.7	4100	241
9	Kandalgaon	S.W	38.7	9.6	331.33	228	1.7	6400	19.7	10.2	11.9	5000	212
		M.W	35.4	8.7	318.07	243	2.4	5500	17.5	8.6	10.2	4200	227
		B.W	28.9	6.5	303.67	252	3.3	4300	16.3	7.3	9.8	3800	242
10	Bhimanagar	S.W	38.6	9.5	334.70	227	1.9	6300	20.1	10	11.8	5900	210
		M.W	34.9	8	315.00	239	2.7	5400	18.8	8.5	11	5100	230
		B.W	27.4	6.9	303.33	251	3.5	4000	17.6	6.9	10.2	4700	247
	Average	S.W	38.69	9.54	331.40	233.6	1.42	6200	19.98	10.05	11.93	5480	210.9
		M.W	34.98	8.15	316.799	243.3	2.72	5300	18.23	8.43	10.99	4810	228
		B.W	28.46	6.97	303.532	255.3	3.51	4220	16.77	7.12	9.99	4140	245.9

Table 3 Physico-chemical properties of post-monsoon water samples collected from sampling stations of Ujani reservoir.

Sr. No.	**Sampling site**	Depth in (Ft.)	Temp (°C)	pH	E.C (ms/cm)	Alkalinity (mg/l)	Turbidity (NTU)	TDS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	Hardness (mg/l)
	WHO			6.5-8.5			4	1000		6	10.0		100 -300
1	Bhigavan	S.W	32.2	8.3	434.67	235	1.2	5000	18	9.5	11	5000	200
		M.W 32	30.4	7.7	421.03	244	2.9	4500	16	8.1	10.3	4300	220
		B.W. 64	28.1	7	406.3	255	3.7	3000	14.1	6.9	9.5	3700	250
2	Kumbhar-gaon	S.W	32.8	8.6	435.67	239	1.1	5300	19.2	9.2	11.1	4900	190
		M.W 35	30	7.6	417.00	243	2.5	4200	17.4	8.7	10.2	4000	215
		B.W 70	28.5	7.1	405.43	252	3.6	3100	16.1	7	9.7	3600	235
3	Palasdev	S.W	31.8	8	434.35	237	1	5900	18.9	9.1	10.9	4800	195
		M.W 39	29.8	7.4	419.00	244	2.5	5100	17.1	8.5	10	4400	212
		B.W 78	27	6.9	401.00	253	3.4	4000	16.5	7.2	9.1	3800	225
4	Chandgaon	S.W	31.2	8.3	431.00	231	1.1	6000	18.2	9	10.7	5100	185
		M.W 45	29.9	7.7	415.33	242	2.7	5000	17.4	8	9.8	4500	220
		B.W 90	26.5	7.3	403.00	250	3.3	4100	16	6.9	9	3700	237
5	Kalashi	S.W	31.6	8.4	427.33	232	1.2	5000	18.1	9.8	11	5300	180
		M.W 52	29.4	7.6	414.67	240	2.4	4400	16	8.2	10.2	4800	225
		B.W 104	27.4	6.9	407.75	248	3.2	3200	15.2	7	9.1	4000	230
6	Padasthal	S.W	32	8.5	429.00	230	1.1	4900	18.1	9.5	11.2	5300	200
		M.W 49	29.8	7.8	417.00	241	2.6	3800	16.7	8	10	4700	215
		B.W 98	26.5	7.3	403.00	250	3.1	2800	15.4	7.2	9	3900	230
7	Malvadi	S.W	31.4	8.2	426.00	230	1.5	5100	17.8	9.7	10.9	5100	190
		M.W 54	29.7	7.6	413.33	240	2.1	4200	16	8.2	9	4200	215
		B.W 108	27.1	6.7	402.03	249	3	3300	15.1	7.1	8.7	3500	227
8	Shaha	S.W	30.5	8	430.00	231	1.2	5200	17.9	9	10.5	4500	200
		M.W 57	28.9	7.4	416.33	240	2.4	4400	15.8	8	9.7	4200	216
		B.W 114	26.2	6.5	402.00	248	3.1	3500	14	6.1	8.8	3600	231
9	Kandalgaon	S.W	30.1	8.1	431.33	225	1.4	5400	17.7	10.2	10.7	4500	202
		M.W 60	28.4	7.6	418.67	241	2.2	4500	15.5	8.1	9.3	4000	217
		B.W 120	25.9	6.8	403.06	250	3.1	3300	14.3	7	8.8	3600	232
10	Bhimanagar	S.W	31.1	8	434.70	226	1.6	5300	18.1	9	10.8	5500	205
		M.W 62	29.1	7.4	415.00	237	2.3	4400	16.6	8.1	9	4800	220
		M.W 124	25.7	6.7	403.33	249	3.1	2900	14.8	6.4	8.2	4300	237
	Average	S.W	31.47	8.22	431.30	231.6	1.19	5310	18.2	9.4	10.88	5000	194.7
		M.W	29.54	7.58	416.33	241.2	2.46	4450	16.45	8.19	9.75	4390	217.5
		M.W	26.91	6.93	403.97	250.4	3.26	3320	15.15	6.88	8.99	3770	233.4

Table 4 Mineral content analysis of pre-monsoon water samples collected from sampling stations of Ujani reservoir.

Sr. No.	**Sampling site**	Depth in (Ft.)	Chloride (Cl) (mg/l)	Calcium (Ca) (mg/l)	Magnesium (Mg) (mg/l)	Sodium (Na) (mg/l)	Potassium (K) (mg/l)	Nitrate (NO_3) (mg/l)	Phosphate (PO_4) (mg/l)	Free CO_2 (mg/l)
			200-	200	50	200		50	0.5	-
1	Bhigavan	S.W	230	140	46	160	1.5	30	15	12
		M.W 10	240	145	47.5	175	2	35	21	10
		B.W. 21	245	155	48.1	195	2.5	45	27	8.9
2	Kumbhar-gaon	S.W	235	138	45.9	158	1.4	24	14	11.9
		M.W 13	242	143	47.7	176	1.9	35	22	9.5
		B.W 26	252	148	48.6	192	2.4	44	26	8.4
3	Palasdev	S.W	236	139	44.4	154	1.1	29	16	11.7
		M.W 16	244	144	46.8	169	1.8	35	21	9.9
		B.W 32	253	151	48.2	187	2.3	41	26	8.1
4	Chandgaon	S.W	235	141	43.2	157	1.2	26	14	12.1
		M.W 19	238	147	45.1	179	1.9	32	20	10.3
		B.W. 38	251	152	46.9	189	2.6	41	26	9
5	Kalashi	S.W	235	137	44.8	152	1.3	25	13	12
		M.W 20	240	142	46.4	167	1.9	30	21	10.1
		B.W 40	249	150	48.7	189	2.4	35	30	8.8
6	Padasthal	S.W	240	135	43.9	158	1.4	26	12	12.3
		M.W 24	245	140	45	176	1.8	31	22	10.4

		B.W 48	256	145	48	188	2.3	36	29	9
7	Malvadi	S.W	238	136	45	160	1.1	27	11	12.2
		M.W 29	242	141	47.6	175	1.6	32	20	10.6
		B.W 58	254	147	49.1	190	2.1	47	27	8.9
8	Shaha	S.W	237	138	44.9	162	1.2	29	12	12.5
		M.W 30	244	144	46.1	178	1.7	34	21	10.9
		B.W 60	252	149	48.5	192	2.2	39	28	8.7
9	Kandalgao n	S.W	234	140	45.6	163	1.3	33	13	12.4
		M.W 33	240	146	47.8	179	1.8	37	24	10.4
		B.W 66	253	152	49.2	191	2.4	44	29	8.8
10	Bhimanagar	S.W	237	139	44.7	161	1	26	14	12.3
		M.W 35	242	145	46.9	175	1.5	34	22	10.6
		B.W 70	255	151	49.3	189	2	42	28	8.6
	Average	S.W	235.7	138.3	44.84	158.5	1.25	27.5	13.4	12.14
		M.W	241.7	143.7	46.69	174.9	1.79	33.5	21.4	10.27
		B.W	252	150	48.46	190.2	2.32	41.4	27.6	8.72

Table 5 Mineral content analysis of post-monsoon water samples collected from sampling stations of Ujani reservoir.

Sr. No.	**Sampling site**	Depth in (Ft.)	Chloride (Cl) (mg/l)	Calcium (Ca) (mg/l)	Magnesium (Mg) (mg/l)	Sodium (Na) (mg/l)	Potassium (K) (mg/l)	Nitrate (NO_3) (mg/l)	Phosphate (PO_4) (mg/l)	Free CO_2 (mg/l)
			200-300	200	50	200		50		
1	Bhigavan	S.W	220	125	25	140	1	20	8	13
		M.W 32	230	132	32	155	1.7	28	19	12
		B.W. 64	240	141	40	165	2.2	36	26	9.4
2	Kumbhar-gaon	S.W	225	120	22	142	1.1	16	11	12.8
		M.W 35	235	127	30	150	1.6	25	18	10.7
		B.W 70	246	138	39	160	2.1	35	25	9.9
3	Palasdev	S.W	222	122	23	138	0.8	21	14	12.9
		M.W 39	231	129	31	145	1.5	27	20	10.7
		B.W 78	240	138	40	155	2	38	26	9.7
4	Chandgaon	S.W	223	121	21	142	0.9	18	12	13.2
		M.W 45	231	130	29	153	1.4	25	19	11.4
		B.W 90	239	139	35	162	2.1	34	25	9.8
5	Kalashi	S.W	228	120	19	140	1.2	19	10	13
		M.W 52	231	128	27	152	1.7	26	15	11.8
		B.W 104	244	136	36	163	2.2	35	21	9.9
6	Padasthal	S.W	224	123	24	139	1.1	17	10	13.4
		M.W 49	236	131	31	147	1.6	25	17	12.5
		B.W 98	245	140	40	159	2.1	32	26	10
7	Malvadi	S.W	222	119	20	135	1	18	12	13.1
		M.W 54	230	126	27	144	1.5	26	19	11.7
		B.W 108	238	134	34	157	2	39	27	9.7
8	Shaha	S.W	219	121	20	139	1	20	11	13.5
		M.W 57	229	134	29	149	1.5	29	17	11.8
		B.W 114	241	140	37	163	2.2	37	24	9.6
9	Kandalgao n	S.W	224	118	22	138	1	19	9	13.7
		M.W 60	235	127	31	145	1.6	24	16	12.7
		B.W 120	242	136	41	162	2.3	35	22	9.9
10	Bhimanagar	S.W	221	122	23	139	0.9	20	12	13.3
		M.W 62	232	130	30	150	1.6	29	19	11.9
		M.W 124	240	139	39	162	2	38	26	9.6
	Average	S.W	222.8	121.1	21.9	139.2	1	18.8	10.9	13.19
		M.W	232	129.4	29.7	149	1.57	26.4	17.9	11.72
		B.W	241.5	138.1	38.1	160.8	2.12	35.9	24.8	9.75

CONCLUSION

The physico-chemical analysis for the water samples of Ujani reservoir for pre- and post-monsoon and collected from ten different location *viz*. Bhigavan, Kumbhargaon, Palasdev, Chandgaon, Kalashi, Padasthal, Malvdi, Shaha, Kandaldaon and Bhimanagar showed horrendous physical condition issues and may lead to various diseases. The post-monsoon physico-chemical analysis has higher average readings

than the WHO permissible limits. This is due to anthropogenic activities like unsustainable utilization of water and release into the Mula, Mutha and Bhima waterway with no pre-treatment. The Ujani reservoir water quality in all the mentioned townships is marred with high grade pollution. Hence, the Ujani water is not suitable for the household utilization and also for agriculture without purification. These observations may prompt a noteworthy risk to the human health and wellbeing. The natural contaminants added into the water due to erosion process also lead to decaying of the water quality. We recommend that the strict measures may be taken against industries and municipal corporations by pollution control board in order to save flora and fauna of the Ujani water reservoir and the ecosystem created by its backwater.

REFERENCES

1. Aher, S. Mane, U., and Pawar, B., A study on physicochemical parameters of Kagdipura swamp in relation to pisciculture, near Aurangabad, Maharashtra. *J. Aqua. Biol.*, 22(1): 93 – 96 (2007).
2. APHA. Standard Methods for the Examination of Water and Waste Water, 17th Edition.*American Public Health Association, Washington DC*, (2012).
3. Balamurugan C. and Leena L. Studies on the Pollution Potential of Vaigai River at Madurai, India. *Asian J. Research Chem.* 5(9): 1108-1112 (2012).
4. Chhatwal, R. Environment Sciences- A Systematic Approach‖, 2nd Ed., *UDH Publishers and Distributors (P) Ltd*, 104-105 (2011).
5. Eknath, C. The Seasonal Fluctuation of Physico-Chemical parameters of River Mula- Mutha at Pune , India and their Impact on Fish Biodiversity. Research Journal of Animal, *Veterinary and Fishery Sciences,* 1:11–16 (2013).
6. Fakayode, S. Impact Assessment of Industrial Effluent on Water Quality of the Receiving ALaro River in Ibadan, Nigeria", *Ajeam-Ragee* 10:1-13(2005).
7. Fotache, A., Linder, C., Chmielewski, P., Galan, P., and Torres-Orozco, D. Fish Assemblages as an indicator of the ecological state of Lake Durowskie. Present in the Summer School on 'Ecological state of the lake during restoration measures'. *Poznań and Wągrowiec. Held during, at Poland* (2013).
8. Gadhia, M., Surana, R., and Ansari, E. Seasonal Variations in Physicochemical Characteristics of Tapi Estuary in Hazira Industrial Area. *Our Nature*, 10:249-527 (2012).
9. Garg, R., Saksena, D. and Rao, R. Assessment of physicochemical water quality of Harsi reservoir, district Gwalior, Madhya Pradesh. *J. Ecophysiol. Occup. Hlth*, 6:33-40 (2006).
10. Garg, V., Suthar, S., Singh, S., Sheoran, A., Garima, Meenakshi, and Jain, S. Drinking water quality in villages of Haryana, India: assessing human health risks associated with hydrochemistry. *Environmental Geology*, 58:1329-1340 (2009).
11. Gupte, A., and Shaikh, N. Seasonal Variations in Physicochemical Parameters and Primary Productivity of Shelar Lake Bhiwandi, Thane, Maharashtra.*Universal Journal of Environmental Research and Technolog,.* 3(4):523-530 (2013).
12. Gupta, N., Pandey, P., and Hussain J. Effect of physicochemical and biological parameters on the quality of river water of Narmada, Madhya Pradesh, India. *Water Science*, 31:11-23 (2017).
13. Hamaidi-Chergui, F., Hamaidi M. A Preliminary Survey on Abiotic Parameters and Phytoplanktonic Algae of Keddara Dam Lake (Boumerdes-North-East Algeria). *Journal of Applied Phytotechnology in Environmental Sanitation*, 2:115–120 (2013).
14. Jadhav S and Jadhav M. Heavy Metal Pollution Study of Mula-Mutha River in Pune (Maharashtra).*International Journal of Innovative and Emerging Research in Engineering*, 2:22–25 (2015).
15. Karikar, S., Mali, S., and Kulkarni, P., and Aphale, P. An assessment of bird communities across Ujani and its five satellite wetlands in Solapur District of Maharashtra, India. *Journal of Threatened Taxa*, 11(15): 14989-14997 (2019).
16. Khamabrade, S. and Mule, M. Studies on physicochemical parameters in Pundi water reservoir from Tasagon Tahsit (Maharashtra). In: Fundamentals of Limnology *(APH Publishing Corporation, New Delhi)*, 206-214 (2005).
17. Khan, R., Jadhav, M., and Ustad, I., Physicochemical Analysis of Triveni lake water of Amravati district in (Ms) India. *Biosci. Disc*. 3:64-66 (2012).
18. Kumar, A., and Bahadur, Y. Physico-Chemical Studies on the Pollution Potential of River Kosi at Rampur (India). *World Journal of Agricultural Sciences*, 5 (1): 01-04 (2009).
19. Kumbhar, A. and Ghorpade, B. Survey of waders in the catchment area of Ujani dam, near Bhigavan, District Pune (M.S.). *International Journal of Researches In Biosciences, Agriculture And Technology*, 3(2): 280-281 (2015).

20. Kumar, V., Arya, S., Dhaka, A., Minakshi and Chanchal, A study on physicochemical characteristics of Yamuna River around Hamirpur (UP), Bundelkhand region central India. *International Multidisciplinary Research Journal*, 1(5):14-16 (2011).
21. Lianthumluaia, Landge A, Purushothaman C, Deshmukh G, and Ramteke K., Assessment of seasonal variations of water quality parameters of Savithri Reservoir, Poladpur, Raigad district, Maharashtra. *The Bioscan*. 8(4):1337-1342 (2013).
22. Mahajan, S., and Billore, D. Seasonal variations and assessment of water quality of nagchoon pond of Khandwa District (M.P) India. *Current World Environment*, 9(3):829-836 (2014).
23. Mahananda, M., Mohanty, B., and Behera. M. Physico-Chemical Analysis of Surface and Ground Water of Bargarh District, Orissa, India. *International Journal of Recent Research and Applied Studies*, 2(3): 285-295 (2010).
24. Manivaskam, N. Physicochemical examination of water sewage and industrial effluent, 5th Ed. *Pragati Prakashan* (2005).
25. Mohammad, J., Krishna, P., Lamma, O., and Khan, S., Analysis of Water Quality using Limnological Studies of Wyra Reservoir, Khammam District, Telangana, India. *Int. J Curr Microbiol App Sci*. 4(2):880-895 (2015).
26. More, A., Chavan, S., Gurung A., Sarwade, P., Chaudhari, S., and Vyas, R. Water Quality Status of Mula-Mutha River. *Global research analysis*, 3(4):75–77(2014).
27. Mustapha, M., and Omotosho, J. An assessment of the Physico- Chemical properties of Moro Lake, Kwara State, Nigeria. *African J. of App. Zoo. And Envt l. Bio*. 7:3-77 (2005).
28. Mustapha, M. Assessment of the Water Quality of Oyun Reservoir, Offa, Nigeria, Using Selected Physico-Chemical Parameters. *Turk. J. Fish. Aquat. Sci*. 8: 309-319 (2008).
29. Narayana, J., Puttain E., and Basavaraja, D. Water quality characteristics of Anjanapura reservoir near Shikaripur, district Shimoga, Karnataka. *J. Aqua. Biol.* 23: 59-63(2008).
30. Pachorkar, D and Jaybhaye R. Assessing the suitability of the Ujani Dam water and its surrounding ground water for irrigation purposes using GIS techniques. Trans. Inst. Indian. *Geographers*, 39(2): 197-210 (2017).
31. Patil, S., Contribution to freshwater decapoda (crustacea: arthropoda) from Ujani wetland, Maharashtra. *Zoos' Print Journal* 17(10): 918 (2002).
32. Patel V. and Parikh P, Assessment of seasonal variation in water quality of River Mini, at Sindhrot, Vadodara. *International Journal of Environmental Sciences*, 3(5): 1424-1436 (2013).
33. Pawar, R., and. Jagdale, A. Study on water quality parameters of Ujani dam back water in Pune District (M.S.) India. *International Journal of Science and Research*, 8(12): 501-508 (2019).
34. Pawar S. and Shembekar, V. Studies on the physicochemical parameters of the reservoir at Dhanegoan district Osmanabad (M.S.), India. *J. Exp. Sci.* 3: 51-54 (2012).
35. Prabhakar, C., Saleshrani, K., Tharmaraj, K. and Kumar, V. Seasonal variation in hydrological parameters of Krishnagiri dam, Krishnagiri district, Tamil Nadu, India. *Int. J. Pharm. Biol. Arch*. 3: 134-139 (2012).
36. Prasath, B., Nandakumar, R., Dinesh Kumar, S., Ananth, S., Devi, A. Jayalaksmi, T., Raju, P., Thiyagarajan, M. and Santhanam, P. Seasonal variation in physicochemical characteristics of pond and groundwater of Tiruchirapalli, India. *Journal of Environmental Biology*. 34: 529-537 (2013).
37. Qureshimatva U. and Solanki H., Physico-chemical Parameters of Water in Bibi Lake, Ahmedabad, Gujarat, India. *Pollution Effects & Control*, 3(2): 2-5 (2015).
38. Raj A., and Jayasekher T., Hydrogeochemistry of the river basins of Kanyakumari District. *Indian J. Environ. Prot.* 27(2):145-152 (2007).
39. Sawant R and Chavan N. Water quality status of Mahagaon reservoir from Gadhinglaj Tahsil from maharashtra. *International Journal of Science, Environment and Technology*, 2(6):1196 –1204(2013).
40. Shah, A. and Kumar, H. Determination of various Physical and chemical parameters in industrial effluents and sewage of Phagwara, Tehsil of Punjab. *International Journal of Current Research*, 5(2): 192-193(2013).
41. Silambarasan, K., Sujatha, K., Joice, A., and Senthil Kumaar, P. Studies on Ichthyo faunal Biodiversity in relation with physicochemical variables of Kolavoi Lake, Chengalpet, Tamil Nadu. *International Journal of Plant, Animal and Environmental Sciences*. 4(4):176-184(2014).
42. Sinha, S., and Biswas, M. Analysis of physicochemical characteristics to study the water quality of a lake in Kalyani, West Bengal. *Asian J. Exp. Biol. Sci*. 2: 18-22 (2011).
43. Verma S., Chaudhari P., Singh R., and Wate S. Studies on the ecology and trophic status of an urban lake at Nagpur city, Indian. *Rasyan J Chem*. 4(3):652- 659 (2011).

44. Verma, P., Chandawat, D., Gupta, U., and Solanki, H. Water quality analysis of an organically polluted lake by investigating different physical and chemical parameters. *Int. J. Res. Chem. Environ*. 2: 105-111(2012).
45. Vijayakumar, S., Rajan K., Mridula, R., and Hariharan, V. Seasonal distribution and behavior of nutrients with reference to tidal rhythm in the Mulki estuary, southwest cost of India. *Journal of Marine Biological Association of India*, 42(1&2):21-31(2000).
46. Wagh, V. Kharjule, S., Mukate, S., Pawar, R., Aamalawar, M. and Varade, A. Assessment of Groundwater Quality in Aundha Nagnath Town,Maharashtra usingWater Quality Index. *Journal of Geosciences Research*, 4(1): 61-66 (2019).
47. World Health Organization, (2017). Guidelines for drinking-water quality: fourth edition incorporating the first addendum.Geneva: *Licence: CC BY-NC-SA 3.0 IGO.*

CITATION OF THIS ARTICLE

Y. Ghule, B. Shinde and S. Barkade: Physico-chemical analysis of Water from Ujani Reservoir at Pre-Monsoon and Post-Monsoon, Solapur District, Maharashtra, India.. Bull. Env. Pharmacol. Life Sci., Spl Issue [1]: 2023:344-354.