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Analysis of Water Quality Using Physico-Chemical Parameters of Upper Manair Dam Rajanna Siricilla District, Telangana

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ABSTRACT

A Study was carried out in Upper Manair Dam Located in Narmal Village Rajanna Siricilla District. In the present study, monthly variation of Physico-chemical parameters and phytoplankton in Upper manair dam carried out for a period of one year. The various Physico-chemical parameters like Temperature, pH, carbonates, bicarbonates, chlorides, Total hardness, calcium, Magnesium, Dissolved oxygen, Nitrates, Nitrites, Phosphates and sulphates were analyzed. The values of Physico-chemical parameters which were found in the lake always below the drinking water quality standards. Upper Manair Dam, for a period of one years. The phytoplankton revealed the presence of four major groups: Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. This Upper Manair Dam provides multiple uses like source of drinking water for uncountable rural and urban communities and livestock, fish culture, recharge of ground water, etc.,[1]. Therefore, it can be concluded that the water of the Lake is fit for consumption according to drinking water quality standards [2].

Keywords : Physico-chemical Parameters, Water quality, Uppermanair Dam, Rajanna Siricilla District

I. INTRODUCTION

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose [3]. Limnological investigations are aimed to assess the water quality and its interaction with biotic and abiotic factors. The role of water in nature is unique, as animals and plants have large percentages of water in their make-up required for their sustenance. Physico-chemical properties of freshwater bodies are characterized by the climatic, geochemical, geo- morphological and

pollution conditions. Besides, physico-chemical properties also influence biological productivity of the water body. Physical parameters of water quality such as turbidity, conductivity and water mass influence the chemical nature of water and greatly affect its biota [4]. This is because of the high degree of sensitivity these organisms, exhibit to the altering environment. Algae have long been used to assess environmental conditions in aquatic habitants throughout the world [5]. They are ecologically significant as they form the basic link in the food chain of all aquatic floras [6]. Planktonic organisms are known to react to different types of water pollution. This reaction is very rapid because of relatively short lifetime and high reproduction rates of the organisms. Since the phytoplankton plays a key role of primary producer in aquatic environment; it is the first component in the trophic tier affected by pollution [7]. The Present Study involves the Analysis of water described by its Physical, Water Quality in Terms of Physico-chemical parameters of Upper Manair Dam.

II. METHODS AND MATERIAL

Study Area:

The Upper Manair Dam is a dam on the Manair River at Narmal Village, Gambhiraopet mandal, Rajanna Siricilla district, Telangana. Situated at narmala village, rajanna sircilla district. Foundation stone laid in 1943 by Nizam of Hyderabad state. Back water present mainly in lachapet, srigadha village srigadha and kollamaddi villages. Upper Manair Dam is a major irrigation project across the Manair River, at Narmal Village, Rajanna Sircilla district. It has a capacity to irrigate 2,00,000 acres. Latitude, longitude coordinates 18.1613° N, 78.3240° E. It has surface area 15.3 km. It is part of the prestigious Kaleshwaram project from which 2-3 tmcft water will be lifted and router to Upper Manair Dam. Once the dam reaches full capacity, water is released into the Lower Manair Dam, a major balancing reservoir at Karimnagar city with 24Tmcft Gross Capacity. The Gross Capacity of the reservoir is 25.873 Tmcft. The Left Bank Canal 22 km to irrigate 9,500 acres. The Right Bank Canal 64 km to irrigate 90,500 acres, the Kaleshwaram project feeds the Upper-Manair Reservoir with the Godavari water and stabilizes the ayacut via existing projects.

Sampling Sites:

Three sampling sites each from north upper manner dam (narmala and Lachaper) and South upper manner dam (Lachapet and Kondapochamma reservoir) were selected for the study. Analysis of water samples was carried out on monthly basis from september 2020 to October 2021.

III. RESULTS AND DISCUSSION

Table 1 : Indicating PH, Temperature

PH							
Months	Namala	Lachapet	kollamaddi	Temperature (°C)			
Sep10	5.3	6.3	5.3	Months	Namala	Lachapet	kollamaddi
Oct 10	5.8	5.5	5.9	Sep10	25.3	26.3	5.3
Nov 10	6.1	6.7	6.5	Oct 10	25.8	25.5	5.9
Dec 10	6.2	5.2	6.2	Nov 10	32.1	26.7	6.5

Jan 10	5.6	6.6	5.6	Dec 10	26.2	31.2	32.2
Feb 10	5.5	6.5	6.5	Jan 10	25.6	29.6	31.6
March 10	5.9	5.9	6.9	Feb 10	25.5	31.5	32.5
April 10	6.5	6.5	6.5	March 10	31.9	33.0	28.9
May 10	6.2	5.2	6.2	April 10	29.5	32.8	26.5
June 10	6.6	6.9	6.9	May 10	27.2	31.2	26.2
July 10	6.7	5.7	6.7	June 10	27.6	29.9	31.9
Aug 10	5.9	6.9	5.9	July 10	29.7	27.7	29.7
Sept 10	6.0	6.7	5.7	Aug 10	32.9	31.9	32.9
Oct10	6.9	5.9	6.9	Sept 10	31.0	32.7	31.7
Nov 10	6.2	5.2	6.2	Oct10	29.9	32.9	29.9
Dec 10	5.9	6.9	6.9	Nov 10	29.2	31.2	29.2
				Dec 10	330	32.9	31.9

Table No-2 : Indicating TDS, Turbidity

TDS (mg/L)			Turbidity (NTU)				
Months		Namala	Lachapet	kollamaddi	Namala	Lachapet	kollamaddi
Sep10		25.3	16.3	15.3	625.3	46.3	715.3
Oct 10		25.8	25.5	25.9	625.8	45.5	1125.9
Nov 10		32.1	16.7	26.5	632.1	46.7	1326.5
Dec 10		26.2	11.2	32.2	526.2	41.2	1132.2
Jan 10		25.6	29.6	31.6	525.6	49.6	1231.6
Feb 10		25.5	31.5	32.5	525.5	41.5	1032.5
March 10		31.9	23.0	28.9	531.9	53.0	928.9
April 10		29.5	32.8	26.5	629.5	52.8	826.5
May 10		27.2	21.2	26.2	627.2	51.2	1026.2
June 10		27.6	29.9	31.9	627.6	49.9	1131.9
July 10		29.7	27.7	29.7	529.7	47.7	1129.7
Aug 10		32.9	21.9	32.9	532.9	41.9	932.9

Sept 10		31.0	32.7	31.7	531.0	52.7	831.7
Oct10		29.9	22.9	29.9	629.9	42.9	1129.9
Nov 10		29.9	31.2	29.2	529.9	51.2	1029.2
Dec 10		33.0	22.9	31.9	633.0	52.9	1231.9

Table No-3 : Indicating DO, BOD

Do(mg/l)				BOD (mg/l)			
Months	Namala	Lachapet	kollamaddi	Months	Namala	Lachapet	kollamaddi
Sep10	8.3	6.3	11.3	Sep10	10.3	BDL	31.3
Oct 10	7.8	7.5	5.9	Oct 10	11.8	BDL	35.9
Nov 10	8.1	6.7	6.5	Nov 10	12.1	BDL	36.5
Dec 10	6.2	11.2	9.2	Dec 10	13.2	BDL	29.2
Jan 10	6.6	9.6	11.6	Jan 10	11.6	BDL	31.6
Feb 10	7.5	11.5	9.5	Feb 10	9.5	BDL	29.5
March 10	8.9	9.0	8.9	March 10	8.9	BDL	48.9
April 10	9.5	8.8	9.5	April 10	9.5	BDL	59.5
May 10	7.2	9.2	9.2	May 10	11.2	BDL	49.2
June 10	7.6	9.9	11.9	June 10	9.6	BDL	41.9
July 10	9.7	9.7	9.7	July 10	9.7	BDL	59.7
Aug 10	10.9	9.9	10.9	Aug 10	10.9	BDL	50.9
Sept 10	8.0	11.7	11.7	Sept 10	8.0	BDL	51.7
Oct10	9.9	10.9	9.9	Oct10	9.9	BDL	49.9
Nov 10	9.9	11.2	9.2	Nov 10	10.9	BDL	49.2
Dec 10	8.0	9.9	11.9	Dec 10	9.0	BDL	51.9

Table No-4 : Indicating Nitrates

Nitrate			
Months	Namala	Lachapet	kollamaddi
Sep10	0.31	0.21	1.32
Oct 10	0.38	0.32	2.92
Nov 10	0.31	0.31	3.53
Dec 10	0.32	0.22	2.29
Jan 10	0.26	0.26	3.62
Feb 10	0.35	0.25	2.85
March 10	0.29	0.29	3.19
April 10	0.35	0.25	2.45
May 10	0.32	0.32	2.52
June 10	0.36	0.33	1.69
July 10	0.37	0.37	2.71
Aug 10	0.29	0.29	2.94
Sept 10	0.32	0.32	1.57
Oct10	0.33	0.33	1.19
Nov 10	0.39	0.29	1.22
Dec 10	0.33	0.23	1.91

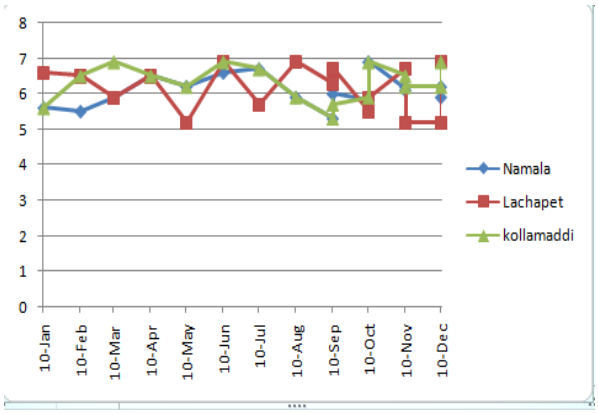

Fig 1- Variation in PH

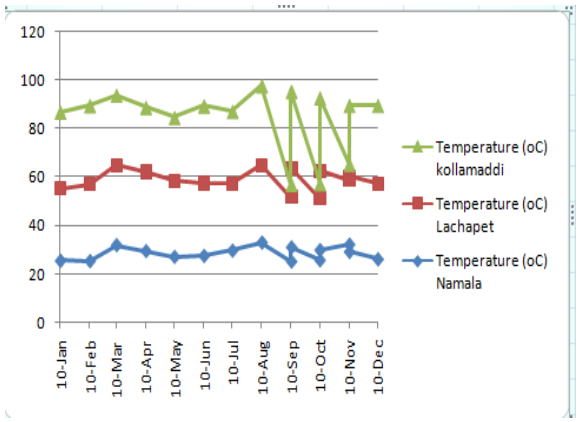

Fig 2-Variations in Temperature

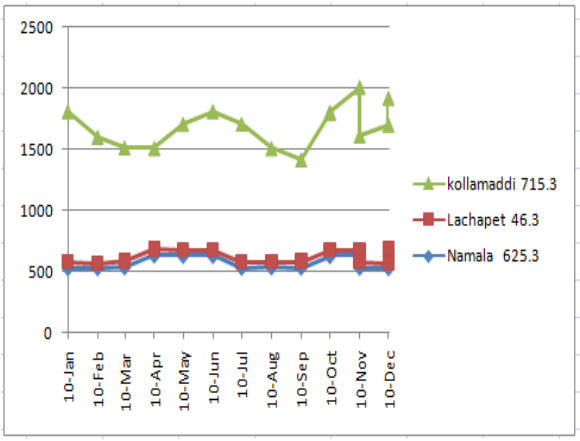

Fig 3 - Variation in TDS

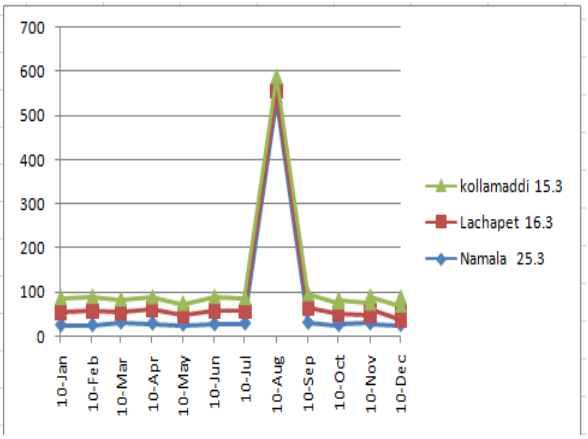

Fig 4 - Variation in Turbidity

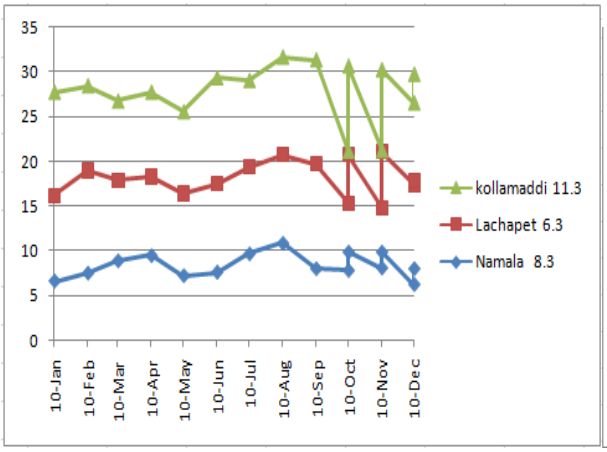

Fig 5- Variation in D.O

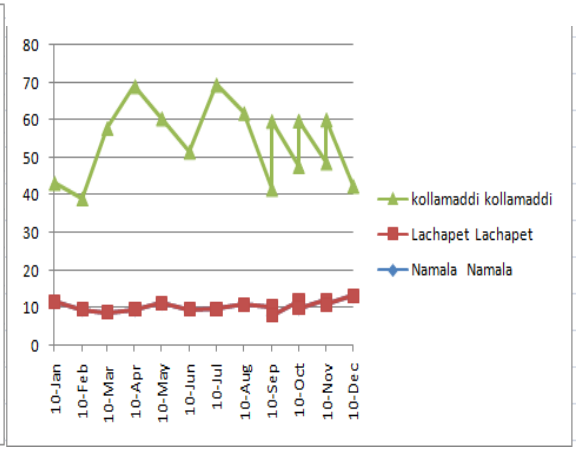

Fig -6 Variation in BOD

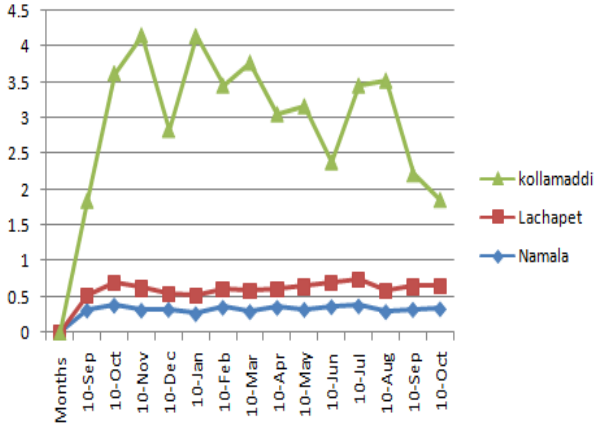

Fig 7- Variation in Nitrate

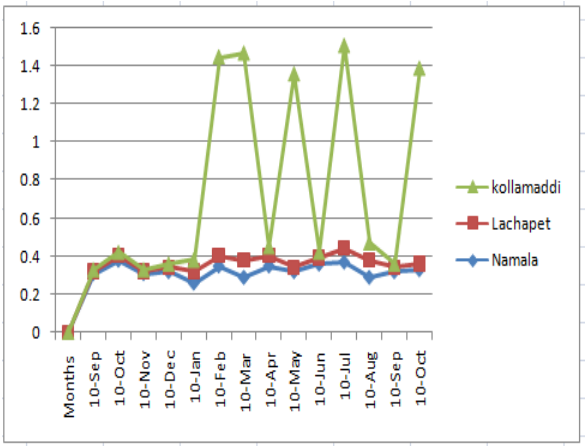

Fig -8 Variation in Phosphates

pH -The pH of water in the selected water bodies undertaken for the study ranged from 5.2 to 6.9. Variations in pH were recorded in all the water bodies studied. The pH in narmala reservoir varied from 5.2 to 6.9, lachapet resrvoir varied from 5.2 to 6.9, kola maddi ranged from 5.2 to 6.9 (Table 1; Fig. 1).

The variations recorded in phytoplankton diversity may be attributed to the changing pH levels. Physico-chemical and biological characteristics of water bodies are known to influence each other [8]. The pH range of 5.0 to 8.5 is reported to be ideal for phytoplankton growth [9] As pH levels.

Temperature-The water temperature at the study sites varied from 25°C to 33°C (Table 1; Fig. 2). Maximum temperature was recorded in May (later summer and early rainy season) and minimum in January (winter season). Water temperature plays an important role in controlling the occurrence and abundance of Phytoplanktons [10]. The seasonal change of productivity is related to variation in temperature and photic conditions [11]. Water temperature has been called as 'abiotic master' factor due to its effect on aquatic organisms. It influences many other parameters and can alter the physical and chemical properties of water as it affects the metabolic rates and biological activity of aquatic organisms [12].

TDS- were least at lachepet reservoir (32.60 to 51.45 mg L-1), followed by namala reservoir (604 to745 mg L-1), kollimaddi (616 to 1078 mg L-1) and were maximum at Curtorim Lake (922 to 1389 mg L-1) (Table 2; Fig. 3) [13], attributed an increase in TDS in Dams to cultural eutrophication and suggested the separation of Oligotrophic (TDS100 ppm) lakes based on TDS values. Increase in TDS above 100 ppm in Syngenta, Lotus and Curtorim Lakes indicate cultural eutrophication. Higher values of TDS are due to contamination of domestic waste water, garbage, fertilizers, etc [14]. During the present study maximum amounts of TDS were recorded in monsoon and minimum in post-monsoon and pre-monsoon. Depending on the ionic properties, excessive TDS can produce toxic effects on fish.

Turbidity- measurements are used as an indicator of water quality based on clarity and estimated total suspended solids in water. Higher turbidity levels were recorded during monsoon while low values were recorded during post-monsoon. The values ranged from 22 to 53 NTU in namala, 15.4 to 31 NTU in lachipet, 29 to 54.78 NTU in rajana Siricilla kollimaddi and 26 to 56.7 NTU (Table 2; Fig. 4). Increased turbidity levels in monsoon may be due to rainfall and surface runoff of water bringing sediments from the surrounding area. Similar observations have been recorded in earlier [15].

DO- is an important parameter in assessing water quality because of its influence on the organisms living within a waterbody. In limnology, DO is an essential factor as high or low level can harm aquatic life and affect water quality [16]. DO levels ranged between 6.01 to 12.06 mg L^{-1} at namala reservoir 7.20 to 11.97 mg L^{-1}.(Table3,fig.5.)

BOD- values were maximum in summer followed by monsoon and winter seasons. Levels of BOD varied from 6.07 to 18.34 mg L^{-1} at namala reservoir, 18.79 to 47.83 mg L^{-1} at lachapet, and 21.89 to 59.9 mg L^{-1} at rajanna Siricilla. BOD was below detectable level at kollamaddi reservoir (Table 3; Fig. 6). Increase in BOD levels caused rapid depletion of DO. According to [17][18] high BOD in summer may be due to the increased oxygen demand for the degradation of the organic wastes dumped into the water body.

Nitrate-levels in the water bodies varied from 0.29 to 0.59mg L-1in namala , 0.29 to 0.60 mg L^{-1}in lachapet, 1.59 to 5.55 mg L^{-1}in kollamaddi and 0.80 to 2.76 mg L^{-1} (Table 4; Fig. 7). High nitrate levels were recorded.
Phosphate-In the present study variations in P concentrations in different water bodies were recorded and ranged from 0.07 to 0.31 mg L-1 in namala , 0.01 to 0.30 mg L-1 in lachapet, 0.01 to 2.41 mg L-1 in kollamaddi and 0.01 to 1.72 mg L-1 (Table 4; Fig. 8). During monsoon season, levels of nitrates and phosphates elevate as they enter the water bodies from the surrounding area, especially farmlands and sewage [19].

WQI- Water Quality Index

Table 5: CCME WQI- and categorization of water quality.

Sr. No	Rating	WQI	Categorization
1	Excellent	95 - 100	Water quality is protected with virtual absence of threat or impairment conditions very close to natural levels.
2	Good	80-94	Water quality is protected with only a minor degree of threat, condition rarely deviate from natural condition.
3	Fair	65 - 79	Water quality usually protected, but occasionally threatened, conditions sometimes deviate from normal levels.
4.	Marginal	45 - 64	Water quality is frequently threatened; conditions often deviate from normal levels
5	Poor	0 - 44	Water quality almost always threatened; conditions regularly deviate from natural levels.

Table 6-CCME WQI for namala

Data Summary	Overall	Drinking	Aquatic	Recreation	Irrigation	Livestock
CWQI	15	11	15	10	8	22
Categorization	Poor	Poor	Poor	Poor	Poor	Poor
F1 (Scope)	93	100	100	100	100	75
F2 (Frequency)	47	49	80	78	58	39
F3 (Amplitude)	100	100	100	92	100	100

Table 7: CCME WQI for lachapet

Data Summary	Overall	Drinking	Aquatic	Recreation	Irrigation	Livestock
CWQI	26	24	6	8	19	29
Categorization	Poor	Poor	Poor	Poor	Poor	Poor
F1 (Scope)	64	70	100	100	80	62
F2 (Frequency)	100	100	100	100	100	88
F3 (Amplitude)	100	100	100	92	100	100

IV. RESULTS AND DISCUSSION

Slightly different with the scope values ranging from 62 to 100 with the parameters DO, phosphates and nitrates passing the objectives. Frequency (F2) ranged from 50 to 84 at namala, 39 to 80 at lachapet 60 to 87 at kollamaddi indicating that the percentage of analytical results do not comply with the guidelines and water is suitable for drinking, aquatic, recreation and irrigation purpose.

V. CONCLUSION

Narmala- The principal component in this lake was turbidity while temperature played a supporting role. Lachapet - Turbidity was the principal component found correlated to TDS Lachapet - BOD played important role as principal component followed by turbidity. kollamaddi - Total DO major role as principal component followed by BOD. Analytical results are complied with the guidelines and water is suitable for drinking, aquatic, recreation and irrigation purpose.

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