



## Physico-Chemical Parameters of Nautha Gaad Water From Garhwal Himalaya, Uttarkhand India

V.P Balodi

Department of Zoology, H.N.B Garhwal University, Pauri Campus, Pauri Garhwal-246001, UK, India

### ABSTRACT

*Physico-chemical parameters like water temperature, water velocity (WV), free carbon dioxide (CO<sub>2</sub>), dissolved oxygen (DO), pH, total alkalinity and total hardness were studied during January 2014 to December 2014 in NauthaGaad. Analysis observations reveal fluctuations in the value of Water velocity from 0.29-0.79m/s (0.45±0.17), DO from 9.7-11.2mg/l (10.45±0.439), Free carbon 0.0 mg/L to 0.5 mg/l (0.26±0.14). Total alkalinity ranges from 58.3-68.4 mg/l (62.36±2.76). Total hardness was recorded from 27.5-41.8 (34.48±4.62). The water pH was alkaline throughout the year. Other parameters like water velocity, temperature, free carbon dioxide, dissolve oxygen and alkalinity fluctuated widely according to seasons and there is a positive correlation between them.*

**KEYWORDS :** Physico-chemical parameter, Correlation, Nauthagaad

### Introduction

Water is one of the most common yet the most precious resource on earth without which there would be no life on earth. Without the knowledge of water quality, it is difficult to understand the biological phenomenon, because the chemistry of water reveals much about the metabolism of the ecosystem and explains the general hydrobiological inter-relationship. Water is the most vital resources for all kinds of life on the earth and essential for the sustainability of the earth's ecosystem. (UNESCO, 2003). Any chemical, biological or physical change in water quality that has a harmful effect on living organism or makes water unsuitable for desired use, is called water pollution. Rapid growth of population, increasing living standard is urban areas and industrialization have resulted in greater demands of quality water. The quality of aquatic life depends on the water quality and freshwater bodies utilize successfully for fish production (Mahor, 2010). Today it is very important to study physical and chemical properties of water, which influence the biological productivity of water body. Present investigation was carried out to study some physico-chemical parameters of freshwater in NauthaGaad which is a spring fed stream and an important tributary of river Nayar. NauthaGaad is confluence with an important river Nayar at Chipalghat (30.1108604 Latitude and 78.9252783 Longitude) in Pauri Garhwal District of Uttarakhand. Although several literature exists on the hydrobiology of the rivers and lakes of Garhwal and Kumaon Himalayas are Singh et. al. (1982, 1994), Sharma (1984), Dobriyal (1983), Bisht (1993), Agarwalet. al. (2003), Khanna et al. (2010) Madan, (2013), Matta (2014). Hitherto no such report was available on the water quality of NauthaGaad. The preliminary information that was collected from our study, will be useful in future to study the aquatic fauna of the stream

### Material and Methods

The water samples were collected on monthly basis for the period of one year from January 2014 to December 2014, as per standard methods APHA (1998). Physical parameters like water temperature, pH were measured immediately by using digital pen type thermometer and digital pH meter by dipping them in the water for five minutes in each sampling station respectively. Water velocity is measured by using floating block (m/s) method. The other chemical parameters like dissolved oxygen, free carbon dioxide, alkalinity and hardness etc. were analyzed (Trivedy and Goel, 1986). In statistical, simple correlation co-efficient analysis was performed between these parameters have been employed for the statistical interpretation of the data obtained from the study. MS, excel was used for the statistical data analysis.

### Result and Discussion

Results of the analysis of physico-chemical parameters are presented Table 1 and the seasonal variation data of physico-chemical parameters is in Table (2). It showed a fluctuation in water temperature from 10.0°C in January 2014 to 22°C in June 2014 (15.46±4.06) Temperature is known to influence the pH, alkalinity and DO concentration in the water. In general, the pH of water was alkaline throughout the study period. The lowest pH was recorded in July 2012 and highest in

February 2014. According to CPCB (2000) 70% of the pollution in rivers is from untreated sewage. Alkaline pH is considered water was to be good for promoting high primary productivity. Fluctuation in water velocity from 0.29m/s in June 2014 to 0.79m/s in July (0.45±0.17) were recorded. Highest water velocity was recorded in July is due to rainy season as the tributary is originated from the dense forest of Bharsar. The water velocity of Gaad is affected because water is used for the irrigation purpose in different station throughout the tributary. DO showed marked variation as it ranged from 9.7mg/l in June 2014 to 11.2mg/l in January 2014 (10.45±0.439). Lower temperature is known to favor greater dissolution of oxygen in water. DO in good quality water is usually more than 6 ppm to promote proper growth of fish and other aquatic organisms (Miller, 1994), similar result found in our study. The depletion of dissolved oxygen in the river water seems to be due to the microbial decomposition organic matter that accumulates in plenty. Free carbon dioxide fluctuated from 0.0 to 0.5 mg/l (0.26±0.14). No particular seasonal variation trend in Free CO<sub>2</sub> was recorded in this study. Total Alkalinity of the NauthaGaad water was higher when the temperature was lower. The alkalinity ranged from 58.3mg/l in July 2014 and 68.4 mg/l in January 2014 (62.36±2.76). Alkalinity serves as a pH reservoir for inorganic carbon. It is usually taken as an index of productive potential of the water (Manahan, 1994). The higher values of alkalinity indicate greater ability of the river water to support algal growth and other aquatic life. Total hardness of water is due to the presence of bicarbonate, sulphate, chloride, and nitrates of Ca and Mg (Kumar et al. 2010). Total Hardness was recorded from 27.5 mg/l in July 2014 and highest 41.8 in January 2014 (34.48±4.62). The seasonal variation in physico-chemical parameters (Table 2) and monthly biased parameters was tested for significance of difference using t-test. During study period of twelve month water parameter values show significant variation. Some of them were showed positive significant and other negatively significant after testing t-test. This showed that water quality is affected by various waste inputs, and environmental factors which caused the significant variations in water quality.

### Inter-Relationships

Table 3 presents the correlation coefficient between water parameters. Most of the parameters were found to bear statistically significant correlation with each other indicating close association between them. Some parameters of water are however, showed a highly positive correlation (p<0.001) similar result by Sharma et. al., (2011). These parameters are indicators of good quality water and give indication of favorable conditions for high primary and secondary productivity

### Acknowledgement

Author is thankful to Prof. A.K Dobriyal, HOD Zoology & Biotechnology, H.N.B Garhwal University, Pauri Campus for providing necessary laboratory facilities.



Table 1 Monthly variation in physico-chemical parameters of NauthaGaad 2014

Months	Water Temp. °C	Water velocity (m/sec)	pH	DO (mg/l)	C <sup>o</sup> 2 (mg/l)	Total Alkalinity (mg/l)	Total Hardness (mg/l)
January	10	0.38	8.1	11.2	0.0	68.4	41.8
February	11	0.37	8.2	10.9	0.1	65.2	38.5
March	14	0.35	7.9	10.6	0.2	63	37.8
April	16.5	0.35	7.7	10.5	0.2	61.2	33.2
May	19.5	0.31	7.5	10.3	0.3	61.1	32.8
June	22	0.29	7.3	10	0.4	60	30.4
July	21	0.79	7	9.7	0.5	58.3	27.5
August	18.5	0.71	7.1	10.1	0.4	59.5	28.6
September	15.5	0.62	7.4	10.2	0.4	61.7	30.9
Oct.	14	0.49	7.7	10.6	0.2	62.4	35.2
Nov	12	0.39	7.9	10.6	0.2	62.9	37.1
Dec	11.5	0.37	8.1	10.8	0.3	64.6	39.9
Mean±SD	15.46±4.06	0.45±0.17	7.66±0.40	10.45±0.439	0.26±0.14	62.36±2.76	34.48±4.62

Table2 Seasonal variation in physico-chemical parameters of NauthaGaad during 2014

Parameters	Winter (Dec-Feb.)	Summer (March-May)	Monsoon (June-Aug)	Autumn (Sept.-Nov)
Water Temp. °C	10.83±0.76	16.67±2.75	20.50±1.80	13.83±1.76
Water velocity (m/sec)	0.37±0.01	0.34±0.02	0.60±0.27	0.50±0.12
pH	8.13±0.06	7.70±0.2	7.13±0.15	7.67±0.25
DO (mg/l)	10.97±0.21	10.47±0.15	9.93±0.21	10.47±0.23
CO2 (mg/l)	0.43±0.06	1.43±0.98	0.43±0.06	0.27±0.12
Total Alkalinity (mg/l)	66.07±1.06	61.77±1.06	59.27±0.87	62.33±0.60
Total Hardness (mg/l)	40.07±1.66	34.60±2.77	28.83±1.46	34.40±2.18

Tabl2-3 Correlation between physico-chemical parameters

Parameters	Water Temp. °C	Water velocity (m/sec)	pH	DO (mg/l)	CO2 (mg/l)	Total Alkalinity (mg/l)	Total Hardness (mg/l)
Water temp.	1						
Water velocity (m/sec)	0.314	1					
pH	-0.899*	-0.664	1				
DO (mg/l)	-0.917*	0.571	0.946	1			
C <sup>o</sup> 2 (mg/l)	0.013	-0.2314	0.151	0.035	1		
Total Alkalinity (mg/l)	-0.893*	-0.496	0.896*	0.957*	0.1049	1	
Total Hardness (mg/l)	-0.899*	-0.622	0.9690*	0.959*	0.0297	0.9413*	1

\*Correlation Coefficient (r) is significant at the 0.001 level (2-tailed)

REFERENCES

Agarwal, N.K., Rawat, U.S., Thapliyal, B.L., and Raghuvanshi, S.K., (2003). Seasonal variation in physico chemical characteristics of the River Bhagirathi and its impact on phytoplankton and benthic entomofauna.Pro.of 12th Nat. Symp. onEnv.pp. 430-437. | APHA, (1998).Standard method for the examination of water and waste water. APHA, AWWA, WPEC, 19th edition, New York | Khanna, D.R., Bhutiani, R., Matta, G., Singh, V., Tyagi, P. and Ishaq, F. (2010). Water quality characteristics of river Tons at District-Dehradun, Uttarakhand (India). Env.Consv. J. 11(1&2) 119-123. | Kumar, A., Bisht, B.S., Talwar, A. and Chandel, D. (2010).Physico-chemical and microbial analysis of ground water from different regions of Doon Valley.Int. J. Appl. Env. Sci, 5(3): 433-440. | Mahor, R.K., (2010). Water quality of Tighra freshwater resevoir in relation to physico-chemical characteristics & periodicity of zooplanktons.Int.Res.J.vol. (13) 74-76. | Madan, S., S. Dutta and Chanchal, (2013).Water quality assessment of river Tons, Dehradun (Uttarakhand), India. Journal of Applied and Natural Science 5 (1): 76-81. | Manahan, S.E (1994). Environmental Chemistry. Lewis Public. CRC Press, US. | Matta, G. (2014). A study on physic-chemical Characteristics to assess the pollution status of river Ganga in Uttarakhand.Journal of Chemical and Pharmaceutical Sciences Vol. 7 (3) 2010-2017. | Miller, T.G., (1994). Living in the Environment, Principles, connections and solutions, 8th edn.Wadsworth Publ. Co., California. | Sharma, R.C., (1984). Potamological studies on lotic environment of the upland river Bhagirathi of Garhwal Himalaya .Environment and Ecology2, pp. 239-242. | Sharma, S, Vishwakarma, R. Dixit, S. and Jain P. (2011). Evaluation of Water Quality of Narmada River with reference to Physicochemical Parameters at Hoshangabad city, MP, IndiaRes. J. Chem. Sc.Vol. 1(3). | Singh, H.R., Badola S.P., and Dobriyal A.K., (1982).Ecology of the river Nayar of Garhwal Himalaya.Uttar Pradesh Journal of Zoology 2, pp. 72-76. | Singh, H.R., Nautiyal, P., Dobriyal, A.K., Pokhriyal, R.C., Negi, M., Baduni, V., Nautiyal, R., Agarwal, N.K., Nautiyal, P., and Gautam. A., (1994).Water quality of the River Ganga (Garhwal Himalayas).Acta Hydrbiologia 36, pp.3-15. | Trivedy, R.K., and Goel P.K., (1986).Chemical and biological methods for water pollution studies. Environmental publication,Kared | UNSESCO.(2003). Water for people water for life the United Nations world water Development report.UNESCO and United Nation water Assessment Program (WWAP). Berghahn