International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 7; Issue 3(H); March 2018; Page No. 10961-10965
DOI: http://dx.doi.org/10.24327/ijcar.2018.10965.1884

Research Article

ASSESSMENT OF PHYSICOCHEMICAL CHARACTERISTICS OF DRINKING WATER IN NOTH PART OF GORAKGPUR IN UTTER PRRADESH, INDIA

Ram Vishun Prasad[1]., Amar Nath[2] and Ash tosh Singh[3]

[1]Department of Chemistry, A.N.D.Kisan P.G.College Babhnan- Gonda (U.P.) India
[2]Department of Chemistry, B.R.D.P.G. College Deoria (U.P.) India
[3]Department of Chemistry K.S.Saket P.G.College Ayodhya Faizabad (U.P.) India

A R T I C L E I N F O

Article History:

Received 16th December, 2017
Received in revised form 20th January, 2018 Accepted 4th February, 2018
Published online 28th March, 2018

Key words:

Physicochemical Characteristics, *groundwater, geochemical,* total hardness, calcium hardness.

A B S T R A C T

The present study was conducted to evaluate factors regulating physicochemical characteristics of drinking water in an area with drinking water purpose as main use. Ten groundwater samples have been collected from North port of Gorakhpur city during month of December 2014 –January 2015. The Gorakhpur city is a Mahanagar of Utter Pradesh which have nearly fifty lack population and covers an area of district approximately 3,483.8 sq. km. Rapid development in recent years has led to an increased demand for water, which is increasingly being fulfilled by groundwater abstraction. Groundwater samples were chemically analyzed for major physicochemical parameter in order to understand the different geochemical processes affecting the groundwater quality. . In this study, different parameters like pH, turbidity, chloride, total hardness, fluoride, nitrate, iron, residual free chlorine, calcium hardness, alkalinity, total alkalinity, sulphite were analyzed. The results revealed that parameters such as chloride, hardness, Nitrate, calcium hardness were in high concentration at most of the groundwater sampling areas.

INTRODUCTION

Water is indispensable and one of the precious natural resources of this planet[1]. Approximately 71% of the earth's surface is covered with water[2]. Water pollution is a serious problem in India as almost 70 per cent of its surface water resources and a growing percentage of its groundwater reserves are contaminated by biological, toxic, organic, and inorganic pollutants. In many cases, these sources have been rendered unsafe for human consumption as well as for other activities, such as irrigation and industrial needs. This shows that degraded water quality can contribute to water scarcity as it limits its availability for both human use and for the ecosystem[3]. The modern civilization, urbanization, industrialization and increased population lead to fast degradation of our environment. Water is a prime resource, a basic human need and a previous natural asset; it is needed in all aspects of life and health, for producing food, industrial activities, energy generation and maintenance of environment and substance of life and development. Groundwater is an important source of water supply throughout the world. Its use in irrigation, industries and domestic usage continues increase where perennial surface water sources are decreasing day by day.

Corresponding author:* **Ram Vishun Prasad
Department of Chemistry, A.N.D.Kisan P.G.College Babhnan- Gonda (U.P.) India

It is well known fact that potable water is absolutely essential for healthy living[4]. So the Present study deals to assess the some physicochemical parameter of ground water in north part of Gorakhpur city. In the present study, the water samples were collected from hand pumps of different areas in north part of Gorakhpur city. Various physicochemical parameters were determined and the results were compared with the values of various drinking water qualities standards such as world health organization (WHO[5]), Bureau of Indian standard (BIS[6]). The main aim of the study was to report on the assessment of physicochemical parameters of drinking water in north part of Gorakhpur city.

METHODS AND MATERIALS

Study Site

Gorakhpur occupies the north eastern corner of the state of Uttar Pradesh, and is located to the north of the river Ghaghra. It is about 265 km east of the capital city Luck now, on National Highway number 28. Gorakhpur is located between Latitude 26º 13' N and 27º 29' N and Longitude 83º 05' E and 83º 56' E. Based on its geographical area, the district occupies the 15th position in the state in terms of size, covering an area of 3,483.8 sq. km. Gorakhpur is bordered by districts Mahrajganj in the north Ambedkar Nagar, Azamgarh and Mau in the south, Kushinagar and Deoria in the east and Sant Kabirnagar in the west. On the west the border follows along Basti, on the east it adjoins Deoria and the Chhoti Gandak

Nadi, further south the Jharna Nala forms a partly dividing line and it shares a border with Nepal. Gorakhpur city is well connected to all major cities of India. The North Eastern Railways headquarter is situated in the city, which is one of the most utilized forms of transportation. Frequent bus services are also available from Gorakhpur to cities including Varanasi, Luck now, Kanpur, and Delhi. The main bus-stand is located near the railway station. Gorakhpur also has a commercial airport, which is just eight km from the railway station. Daily flights are available from Gorakhpur to Delhi and Kolkatta via Luck now, with link services for Sharjah also available, twice a week.

Fig 1 Gorakhpur Location map

Fig 2 Gorakhpur City map

Sample Collection

The samples were collected from different 10-locations during month of December 2014 to January 2015. The distance maintained nearly two to three kilometers between each locations. The samples were collected in plastic bottles which are cleaned with acid followed by rinsing twice with distilled water[7]. They were then carefully sealed, labeled and taken for analysis of physicochemical parameters such pH, turbidity, chloride, total hardness, fluoride, nitrate, iron, residual free chlorine, calcium hardness, total alkalinity, sulphite. The water samples were subjected to physicochemical analysis using standard procedure by Himedia water testing kit. The sampling places are listed in table-1

RESULTS AND DISCUSSION

The Various physicochemical parameters were determined and the results were compared with the values of various water qualities standards such as world health organization (WHO) and Bureau of Indian standard (BIS) .Various physicochemical parameters determined for the water samples are given in table-2. The findings and their comparison with WHO and BIS health based drinking guidelines are presented in table-3. The data revealed a considerable variation in the different water samples with respect to their chemical composition

Table 1 Sampling places in the north part of Gorakhpur

S.No.	Name of Sampling places	Source of water	Sampling places
1	Jangal Matadin	Hand pump	P_1
2	Shahpur	Hand pump	P_2
3	Rapti Nagar	Hand pump	P_3
4	Medical college	Hand pump	P_4
5	Fertilizer	Hand pump	P_5
6	Mahesara	Hand pump	P_6
7	Rajendra Nagar	Hand pump	P_7
8	Gorakhnath Mandir	Hand pump	P_8
9	Surajkund	Hand pump	P_9
10	Bichhiya	Hand pump	P_{10}

Table 2 Physicochemical parameters of water quality in the North part of Gorakhpur

S.No.	Sites → Parameters ↓	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
1	pH	7.8	7.3	7.6	7.2	7.3	7.6	7.3	7.5	7.4	7.5
2	Turbidity (NTU)	15	10	15	10	10	15	10	10	10	15
3	Chloride (mg/lit)	80	70	50	60	20	50	130	40	130	80
4	Total Hardness (mg/lit)	525	550	500	450	275	450	425	300	500	550
5	Fluoride (mg/lit)	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.5
6	Nitrate (mg/lit)	20	110	120	80	40	20	120	20	80	50
7	Iron (mg/lit)	0.6	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.4
8	Free Chlorine (mg/lit)	00	00	00	00	00	00	00	00	00	00
9	Calcium Hardness (mg/lit)	325	125	225	305	110	300	80	190	375	340
10	Total Alkalinity (mg/lit)	600	300	300	400	200	400	200	200	300	600
11	Sulphite (mg/lit)	10	10	10	10	00	00	00	10	10	10

Table 3 Comparison of water with drinking water quality standards

S.No.	Parameters	WHO	BIS	Range		Mean
				Min.	Max.	
1	pH	6.5-8.5	6.5-8.5	7.2	7.8	7.45
2	Turbidity (NTU)	5	5	10	15	12
3	Chloride (mg/lit)	250	250	20	130	71
4	Total Hardness (mg/lit)	300	300	275	550	407.5
5	Fluoride (mg/lit)	1.5	1.5	0.3	0.5	0.41
6	Nitrate (mg/lit)	50	45	20	120	66
7	Iron (mg/lit)	0.3	0.3	0.2	0.6	0.34
8	Free Chlorine (mg/lit)	00	00	00	00	00
9	Calcium Hardness (mg/lit)			80	340	237.5
10	Total Alkalinity (mg/lit)			200	600	330
11	Sulphite (mg/lit)			00	10	7

pH

The pH values of all station water samples are found to be in the range of 7.2 – 7.8. The highest value of 7.8 is observed at P1 station whereas the lowest value of 7.2 is observed at P4 station. The permissible limit of pH for drinking water is 6.5 - 8.5.The all stations water samples are found to be within the acceptable limit of WHO and BIS standards. There is no abnormal change of pH in the station water samples. pH is used to determine whether a solution is acidic or alkaline. If the pH is found beyond the permissible limit, it affects the mucous membrane of cells[8]. The variation of pH in the study area water samples are represented in the chart -1.

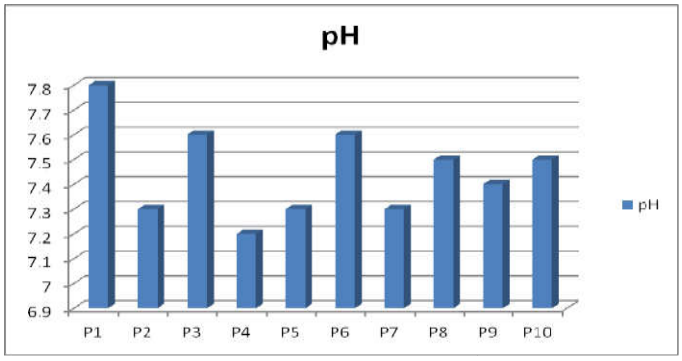

Chart 1 Variation of pH

Turbidity

The turbidity values of study area water samples are found to be in the range of 10-15 NTU. It indicates that ground water of all samples are in the permissible limit of all drinking water quality standards[9]. The variation of turbidity in the study area water samples are represented in the chart -2.

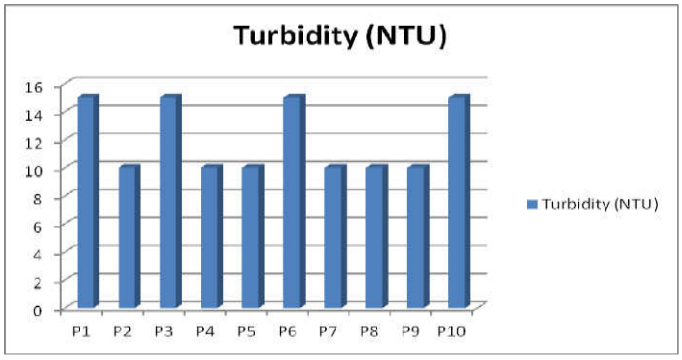

Chart 2 Variation of Turbidity

Chloride

The chloride values of study area water samples are found to be in the range of 20 –130 mg/lit. All station water samples shows chloride values within the acceptable limit (250 mg/l) of WHO and BIS standards. The highest value of 130 mg/lit is observed at P7 and P9 station whereas the lowest value of 20 mg/lit is observed at P5 station. Excessive chloride in potable water is particularly not harmful but the criteria set for chloride value is based on its potentially high corrosiveness. Increase of chlorine level in water is injurious to people suffering due to heart and kidney diseases [10]. The variation of chloride in the study area water samples are represented in the chart -3.

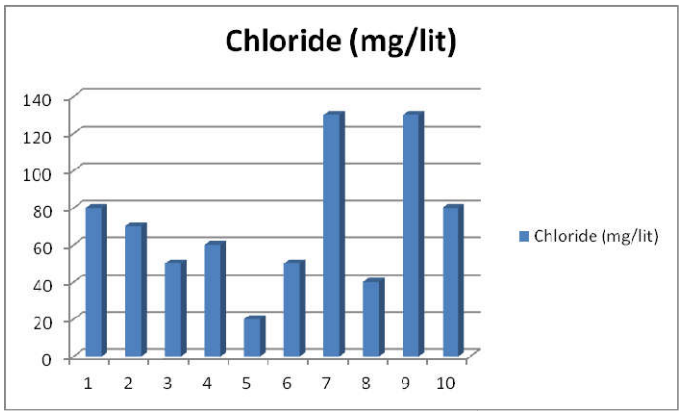

Chart 3 Variation of Chloride

Total hardness

Hardness of the water is due to the presence of Ca and Mg salts. The total hardness values of study area water samples are found to be in the range of 275-550 mg/lit. The maximum value (550 mg/lit) is observed at P2 and P10 stations and minimum value (200 mg/lit) recorded at P5 station. The permissible level of total hardness is 300 mg/lit (WHO and BIS standards). All the water samples are found to be hard. Maximum water samples are found to be higher than the permissible limit of water standards. The variation of total hardness in the study area water samples are represented in the chart -4.

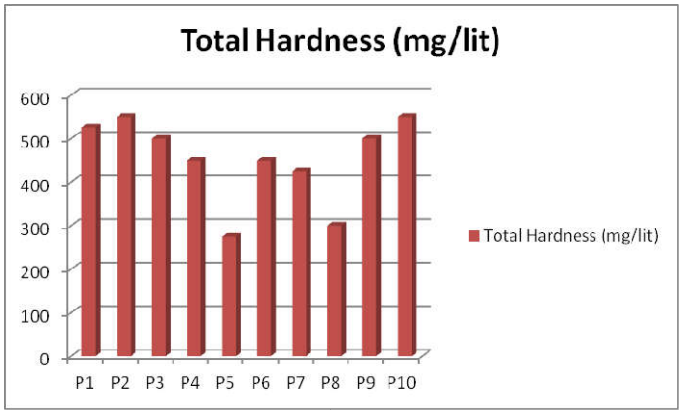

Chart 4 Variation of Total hardness

Fluoride

The fluoride values of study area water samples are found to be in the range of 0.30-0.50 mg/lit. The maximum value (0.50 mg/lit) is observed at P1 and P10 stations and minimum value (0.30 mg/lit) recorded at P7 station. The permissible limit of total hardness is 1.50 mg/lit (WHO and BIS standards). All the water samples are found to be within this permissible level. High fluoride concentration causes dental fluorosis and more skeletal fluorosis[11] whereas the low concentration or absence of fluoride in drinking water results in dental caries in children particularly when the fluoride concentration is less than 0.5 mg/lit30. The variation of fluoride in the study area water samples are represented in the chart -5.

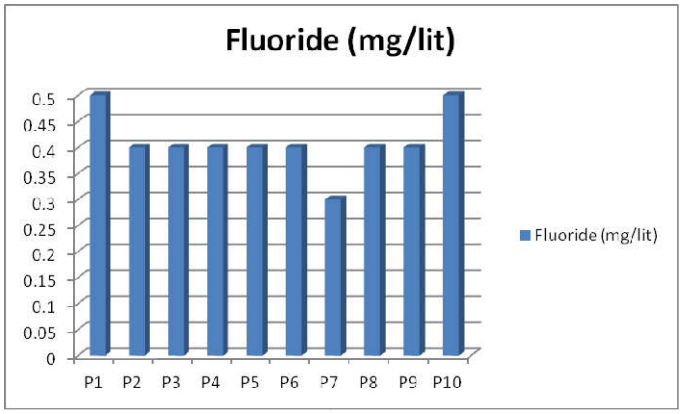

Chart 5 Variation of Fluoride

Nitrate

The nitrate values of study area water samples are found to be in the range of 20-120 mg/lit. The maximum value (120 mg/lit) is observed at P3 and P7 stations and minimum value (20 mg/lit) recorded at P1, P6 and P8 station. The permissible

limit of nitrate is 1.50 mg/lit (WHO and BIS standards). All the water samples are found to be within this permissible limit of water standards. The variation of nitrate in the study area water samples are represented in the chart -6.

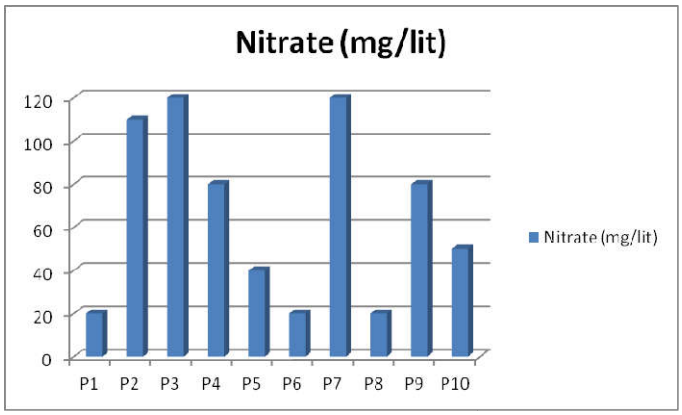

Chart 6 Variation of Nitrate

Iron

The iron values of study area water samples are found to be in the range of 0.20-0.60 mg/lit. The maximum value (0.60 mg/lit) is observed at P1stations and minimum value (0.20 mg/lit) recorded at P5and P6 station. The permissible limit of iron is 0.30 mg/lit (WHO and BIS standards). All the water samples are found to be within this permissible limit of water standards. The variation of iron in the study area water samples are represented in the chart -7.The storage of iron causes a diseases called "anaemia" and prolonged consumption of drinking water with high concentration of iron may be lead to liver diseases called as haemosiderosis[12-13].

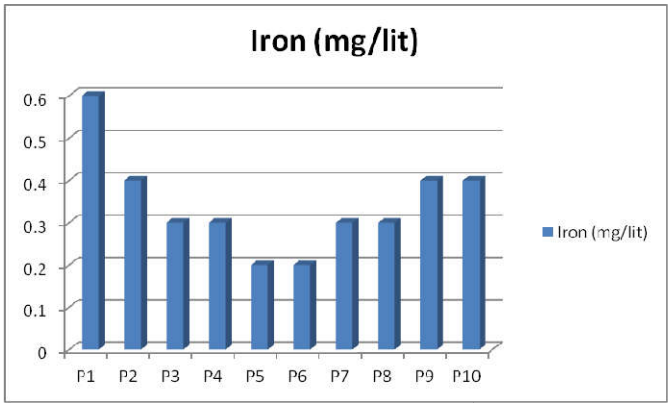

Chart 7 Variation of Iron

Free Chlorine

The free chlorine was found to be absent in all the samples.

Calcium Hardness

Calcium is an essential and important nutrient for aquatic organisms being a cell wall constituent and regulatory factor for physiological function. It is commonly found in all water bodies. Calcium hardness of the water is due to the presence of Ca salts. The Calcium hardness values of study area water samples are found to be in the range of 80-375 mg/lit. The maximum value (375 mg/lit) is observed at P9 stations and minimum value (80 mg/lit) recorded at P7 station. The permissible limit of calcium hardness is 300 mg/lit (WHO and BIS standards). All the water samples are found to be hard. Maximum water samples are found to be higher than the permissible limit of water standards. The variation of calcium hardness in the study area water samples are represented in the chart -8. Higher calcium content in drinking water cause incrustation in water supply structure and adversely affect on domestic used. The values of present study are found to desirable limit for the domestic use.

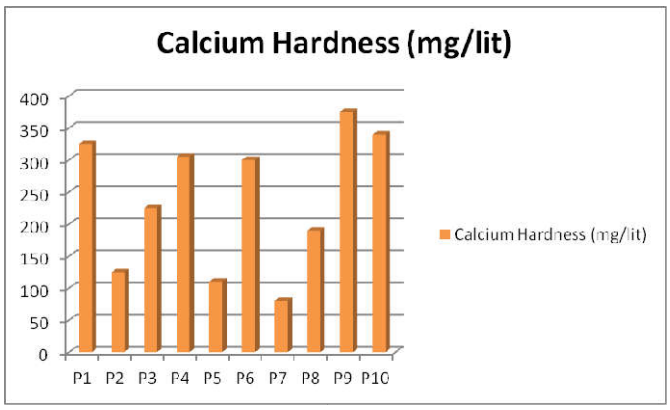

Chart 8 Variation of Calcium Hardness

Total Alkalinity

Alkalinity of the water is due to presence of carbonates, bicarbonates and hydroxide salts. The total alkalinity values of study area water samples are found to be in the range of 200-600 mg/lit. The maximum value (600 mg/lit) is observed at P1 and P10 stations and minimum value (200 mg/lit) recorded at P5 P7 and P8 station. The permissible limit of total alkalinity is 300 mg/lit (WHO and BIS standards). All the water samples are found to be hard. Maximum water samples are found to be higher than the permissible limit of water standards. The variation of total alkalinity in the study area water samples are represented in the chart -9. All stations water samples are found to be within the permissible level.

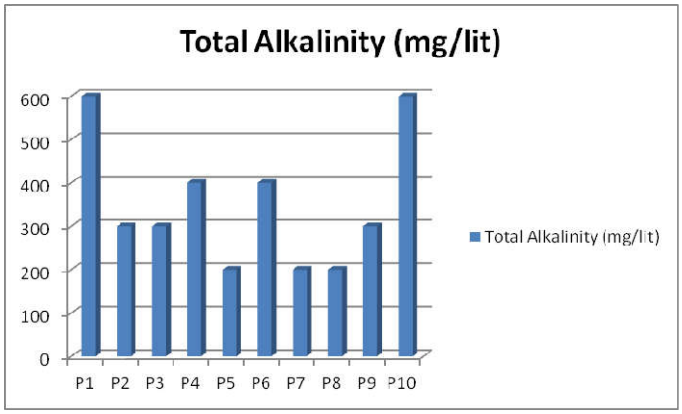

Chart 9 Variation of Total Alkalinity

Sulphite

The sulphite values of study area water samples are found to be in the range of 00-10 mg/lit. The maximum value (10 mg/lit) is observed at P1,P2,P3,P4,P8,P9 and P10 stations and minimum value (00 mg/lit) recorded at P5, P6 and P7 station. The permissible limit of sulphite is 300 mg/lit (WHO and BIS standards).It indicates that ground water of all samples are in the permissible limit of all drinking water quality standards. The variation of sulphite in the study area water samples are represented in the chart -10.

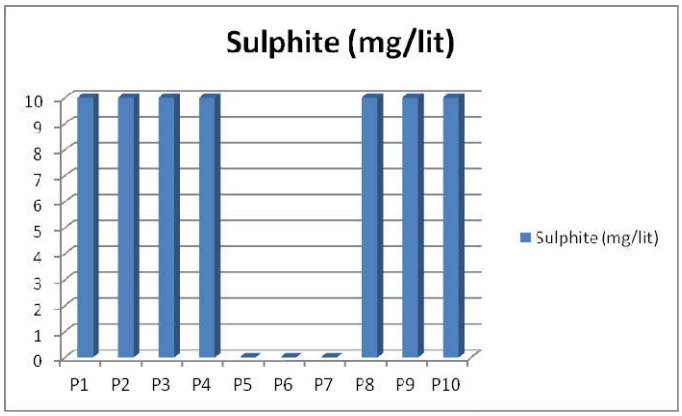

Chart 10 Variation of Sulphite

CONCLUSION

The physicochemical characterization of drinking water samples at different stations are taken from north part of Gorakhpur city of Utter Pradesh, India. The total ten water samples were collected from different locations and analyzed for pH, turbidity, chloride, total hardness, fluoride, nitrate, iron, residual free chlorine, calcium hardness, alkalinity, total alkalinity, sulphite using standard procedures. The values of all the station water samples are compared with the standard permissible values of WHO and BIS. It has been found that Chloride, Total hardness, Calcium hardness at maximum stations are slightly higher than the permissible limit of WHO and BIS and Nitrate, iron are little higher at some locations. It has been also found that maximum parameters of water samples from all different stations are at permissible level as per WHO and BIS standards. However, it is suggested to monitor the station water quality and assess periodically in this study station to prevent the contamination from different type of industries, municipal wastewater and other sources.
Our results suggest the following:

1. The hand pump attached study area should with filter based on activated alumina adsorption might be solution for filtering drinking water.
2. Water should be filter by iron remover resin.
3. Environmental awareness of the health implication of fluoride is emphasized through education of public aid community participation[14].

Acknowledgement

The author is thankful to Dr. Vinod Kumar Pandey, Principal, A.N.D. Kisan P.G. College Babhnan-Gonda (U.P.) for their constant encouragement for this work and also Dr. Vinod Kumar, Assist.Prof.-Dipt. of Zoology, A.N.D. Kisan P.G. College Babhnan-Gonda (U.P.) for motivating and giving valuable guidelines and suggestions to this work.

References

1. R.V. Prasad, D.R. Tripathi, V.Kumar Physicochemical Analysis of Ground water of Basti Sadar Block of District Basti, (U.P.), India *IJCPS Vol. 3, No. 4, July-Aug 2014*
2. PRASAD *et al.*, Assessment of Groundwater Quality in Saltaua Gopalpur Block of Basti District, (U.P.) India *Curr. World Environ.,* Vol. 8(3), 483-487 (2013)
3. M.N. Murty and Surender Kumar, An Economic Appraisal19 Water Pollution in India
4. Pantnagar, Uttarakhand Suman Panwar, Srivastava. R.K, Assessment of groundwater quality in contiguous of integrated industrial estate*, International Journal of Environmental Sciences* Volume 3, No 3, 2012.
5. WHO, International standard for drinking water, 3rd ed.,Geneva (2008)
6. BIS, Specification for drinking water, Bureau of Indian standards, New Delhi, 171-178 (1998)
7. R.V. Prasad1, D.R. Tripathi2, V.Kumar2, Assessment of Groundwater Quality in Saltaua Gopalpur Block of Basti District, (U.P.) India., *Curr. World Environ.,* Vol. 8(3), 483-487 (2013)
8. K. Nishtha, R.S. Lokhande and J.K. Dhar, *I.Res. J. Environment Sci.,* 2012, 1, 1.
9. P.S. Bundela, A.Sharma, A.K.Pandey and A.K. Awasthi, *Int.J.of Plant Animal and Envi.Sci.,*2012, 2 (1),217-222.
10. C.K. Jain, K.K. Bhatio, S.R. Kumar, *International Journal of Environmental Protection.*, 2005, 23, 321.
11. Ravindra K. and Garg V.K., Appraisal of ground water quality for drinking purpose in Hisar city (India) with special reference to fluoride. *Int. J. Env. Hlt. Res,* in press (2005).
12. Behera B., Das M. and Rana G.S., Studies on ground water pollution due to iron content and water quality in and around Jagdalpur, Bastar District, Chattisgarh, India, *J.Chem. Pharma Res*., 4(8), 3803-3807 (2012)
13. Rajgopal, Ground water quality assessment for public policy in India, 1st Annual report. Deptt. of geography, IOWA University, IOWA, 10-11 (1984)
14. Prasad R.V.1, Tripathi D.R.2 and Kumar Vinod2 ,A Concise Report on the Status of Groundwater of Babhnan Town, Basti, UP, India *Res. J. Chem. Sci.* Vol. 3(9), 80-82, September (2013).

How to cite this article:

Ram Vishun Prasad., Amar Nath and Ash tosh Singh (2018) 'Assessment of Physicochemical Characteristics of Drinking Water in Noth Part of Gorakgpur in Utter Prradesh, India', *International Journal of Current Advanced Research,* 07(3), pp. 10961-10965. DOI: http://dx.doi.org/10.24327/ijcar.2018.10965.1884

****