International Journal of Multidisciplinary Research Education Analysis and Development – IJMREAD

Peer-Reviewed : Open Access Journal

Determination of Physico-Chemical Parameters of Ground Water at Hathras City in Winter

1- Dr. B.D. Upadhyay, Principal Dharm Jyoti Mahavidyalaya, Aligarh
2- Dr. Pramod Kumar, Govt.Degree College Manikpur, Chitrakoot (U.P)
3- Shiv Kumar Upadhyay, Assistant Professor, S.V. College Aligarh

Abstract

The City of Hathras due to its thick population, unplanned constructions, unseemly habits and also being a big grain and subji mandi is reeling under the unhygienic conditions caused by the ambient pollution. The Pollution in the city further aggravated by the protracted influx of grain traders, farmers and commission agents who make the environment gravely morbid. Lack of proper drainage and sewerage systems have brought about the traumatic conditions in the city. Water borne diseases are menacing the city population. The elite class of the citizens and intellectuals simply grumble and condemn the ignoramous attitude of the local administration. As such the author felt as imperative need for investigating physico-chemical pollution which is posing hazards to the public health.The plan of the study comprehends physico-chemical investigation of ground water at six important sectors of the city. The authors feel that the present study and the work would certainly draw attention of administration and big wigs seated at the helm of affairs of this city famous for small scale industries such as carpet weaving, making asafetida, scissors and knives, toilet and laundry soaps, textiles industries and oil expellers.

Keywords-BOD,COD, Sanitation, Total Kjeldahl Nitrogen, Physico-Chemical etc.

Introduction-

The Hathras City now provided status of district headquarters is a well-known business centre. It tis stretched over an area of about 4 square km. the city is thickly populated and has a large number of small scale industries like carpet industries, factories manufacturing Ayurvedic pharmaceuticals mustard oils mills, oil expellers, factories manufacturing pure ghee, soap

factories, factories manufacturing knives, scissors and other cutlery, textile yarn and fabric industries etc. Apart from being centre of small scale industries Hathras City is a use mandi of grains, cereals, pulses, jiggery, loaves and the species like asafoetida. The city has no proper sewerage system. The whole animal and vegetable waste with the affluence of small scale industries is disposed in the open drains and gutters which are hardly distilled. Consequently water flows over the roads and is logged thereby into pits and drains themselves giving out stench hand pumps which are the sources of portable water to the public and passers-by are installed generally by the sides of open drains and gutters. Obviously the ground water supply cannot ensure the pollution free quality. With this point of view the physiochemical studies of ground water of this city and imperative need, and comparison with pollution free normal water will also add to the parameter of present study (The whole world depends on this indispensable water)All animate and inanimate objects around as require water for their existence food we consume is incomplete without water is required by all animals, water is full of vital energy. Water is full of supremacy water is in cosmic state water is knowledge, water is truth, water is liberty and symbol of purity water is the source for any form of life water is the source of any form of energy finally, anything we try to identify requires water and depend practically on water. To this unique indispensable of our life we pray.(YAJURVEDA, 4000 BC) Pollution of the ecosystem by man in world-wide phenomenon.

The relation of man to water has always been of dual nature, water must meet the daily requirements of man, it must serve these industries, produce crops provide recreation etc. and it must also simultaneously take away his produce. So long as the population was small and the overall needs of man for water use were small, nature was able to exert itself and the ecosystem could purify and regenerate itself to satisfy marks need. However with increase in population, increasing industrial activity, inter irrigation and cultivation practices etc. the ecosystem is now so burdened that it cannot regenerate itself. The phenomenon of acid rain, pollution of international rivers and that of ground water in many parts of the world bear witness to this “rape” of the ecosystem by man. Studies reported here would indicate that India is not logging behind in this respect.

Experimentaland Discussion in the Month of January-

PH was fluctuated between 7.4 to 7.72 higher value was recorded at sector second (Bus stand) and lower at sector third (Avas Vikas colony). The findings were similar to Rena et al (1984). It follows the order sec. IInd> sec. Ist> sec. Vth> sec. IVth> sec. VIth> sec. IIIrd. It’s a measure of the H^+ concentration or more precisely, H+ activity the temperature may not be important in pure water because of the wide range of the temperature tolerance in aquatic life but in the polluted water it has profound effects on the D.O. and B.O.D. (palharya) et al (1969). In this month temperature varied between 21.70^0 – 22.10^0C. Temperature in this month had not shown remarkable change at any sector. Higher value was recorded at sector IInd(Bus

stand and lower) and lower at sector IIIrd (Awas Vikascolony). Temperature follows the order sec. IInd> sec. Ist> sec. Vth> sec. IVth> sec. VIth> sec. IIIrd.

Total solid content are much above the desirable quantity 500 mg/lt and touched the excessive limits of 1500 mg/lt. maximum 466 mg/lt. at sector IInd (Bus stand) and minimum 461 mg/lt.at sector IIIrd (Awas Vikas colony) was recorded in this month . Suspended solids were varied between 17.89-22.15 mg/lt. Higher value wsas recorded at sector IInd (Bus stand) and lower at sector IIIrd (Awas Vikas colony). It follows the order sec. IInd> sec. Ist> sec. Vth> sec. IVth> sec. VIth> sec. IIIrd.

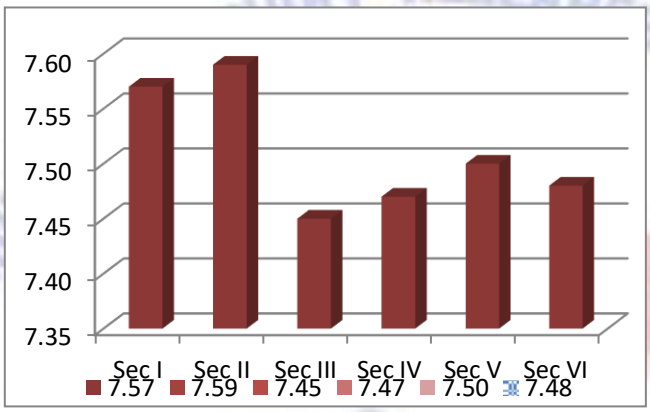

Fig. 1.1 Graph showing variations of pH

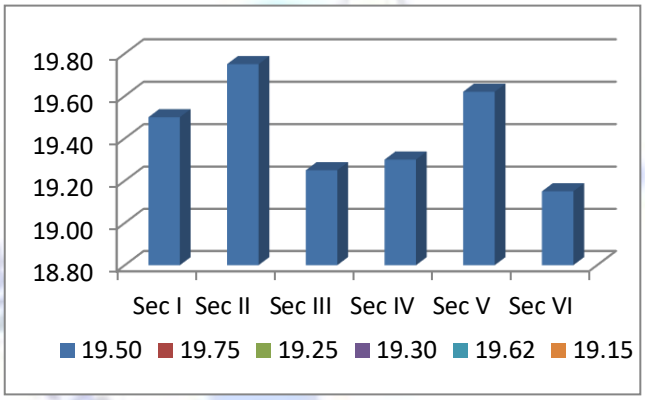

Fig. 1.2 Graph showing variations of Temperature

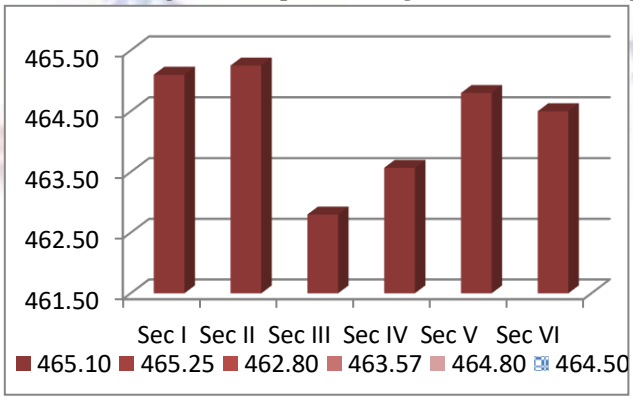

Fig. 1.3 Graph showing variations of Total Solids

Fig. 1.4 Graph showing variations of Suspended Solids

Settle ablesolids varied between 5.10-8.00 mg/It. Higher value was recorded at sec IInd (Bus stand) and lower at sec. IIIrd (Avas Vikas Colony). 500 ml of decanted water was taken and suspended solids were determined in it.

Conductivity can measure the dissolved solids, measured in us/cm. No. between 645-665 us/cm. Lowest value was recorded at sec. VIth (Ramanpur) and Highest at sec. IInd (Bus stand) Conductivity also follows the order sec IInd> sec Ist>sec Vth> sec> sec VIth > sec IVth > sec IIIrd.

Turbidity may be caused by a wide variety of suspended materials ranged from colloidal to coase dispersions, makes water unfit for drinking. WHO recommended 5 NTU and ISI up to 10 NTU tubidity for drinking (ISI, 1983) Higher value of turbidity 13.80 NTU was recorded at sec. IInd and minimum 7.50 N.T.U. at sec. IIIrd (Avas Vikas Colony). Thus the pollution limit 10 is surpassed in the ground water of the sector IInd (Bus stand) and sector Ist (Laxmi Nagar). It can be due to bed community habits in the said sector and improper disposal of waster dispite the adequate depth of ground water in this area. It is polluted in the other sectors the turbidity is under the pollution limit all these sectors are maintaining better sanitation. These sectors are provided with propr sewerage system and residents are more advanced and literat. Bad community habits activity are also restrained likewise problams are not extent.

B.O.D. in this month varied between 33.15-39.87 mg/It. Highest value was recorded at sec. IInd (Bus Stand) and lowest at sec. IIIrd (Avas Vikas Colony) B.O.D. at all sectors crossed the maximum permissible limit of 2 mg/It for drinking water high BOD is the indicator of high organic pollution in the ground water. B.O.D. is highest at the sector IInd (Bus Stand) It followed the order sec. IInd>sec. Ist>sec. Vth>sec. VI>sec. IIIrd Infect cause of the highest B.O.D. at the sec. IInd (Bus Stand) is a big sewerage disposal drain sides of which are thickly in habited by people of people of lower middle class who have installed hand pumps in their houses for meeting their need of potable water and water for are relatively neat and clean. Sec. Ist (Laxmi Nagar) is densely populated by the people of non-vegetarian habits lacking adequate proper hygienic sense. Animal waste is disposed into the gutters hardly disilted and cleansed by the municipal sanitary labour and scavengers. More overs the faulty and careless installation of hand pumps in another nuisance to physico-chemical qualities of potable water drawn from these hand pumps. Sec Vth (Labour Colony) is also a congested sanitation for this area. Municipal authorities are also lukewarm to maintaining proper hygienic conditions, therein. Streets when in hand pumps installed are steams with vegetable and animal refuse such

an insanitation also augments soil and pollution too does not have adequately advance inhabitants. They too are non cholent towards maintaining the sanitary conditions in their colony. The area all around is precipitous industry having roads with deep pits water is logged posing health and decadence of vegetable wastes in particular local self-administration too, is ignorent of the hygiene.

D.O. in this month ranged between 6.12-9.00 mg/It. Higher value was recorded at sec IInd and lower at sec. IIIrd D.O. at all sectors except sec IInd was followed below the minimum desirable limit of 6 mg/It for drinking water (ISI, 1991). Dissolved oxygen contents also follows the order sec. IInd>sec. Ist>sec. Vth>sec VIth>sec IVth>sec IIIrd. It varied from 09.00-6.12 mg/It.

Total Kjeldahl Nitrogen follows the same order as D.O. It's value is lowest in sector IIIrd (Avas Vikas Colony) which is least dirty and maintaining some hygiene. This confirm to the relatively neat and clean habits of resident of this colony.

It was recorded maximum 13.25 mg/It. At the sec. IInd (Bus stand) and minimum 8.09 mg/It at sector IIIrd (Avas Vikas Colony). It is an indicator of ammonical and organic nitrogen and not of nitrites and nitrates. As these sec. are not adequately neat and clean total kjeldahi nitrogen shows its presence in average quantities of ground water of sectors discussed above.

The Chloride shows the degree of pollution of animal origin. Above 250 mg/It water becomes saline in taste. Chloride content in the month catied between 180.29-199.10 mg/It. The lowest value was recorded at sec IIIrd and highest at sec IInd. At all sectors. It was found under the limit for drinking water (250 mg/It, ISI, 1983). Chloride contents follows the same order as BOD, DO and TKN. It occurs in the ground water of these colony to such an extent as does not exceed the limit the pollution.

Excess of sulphate ions show cathartic effect upon human (kataria 1994) Hence it is important to eliminate sulphate form public and industrial water supplies as it forms hard scales in boilers and heat exchangers.

In this month sulphate contents were raged between 90.10-104-.23 mg/It. Highest value recorded at sec II and lowest at sec III. Sulphate at all sectors was found within the permissible limit in this month. In out investigation the value in different sectors varies within the permissible limits following the order Sec. II > sec. Vth >sec. VIth > sec. IIIrd. Is varies from 324.75-310.59 mg/It.

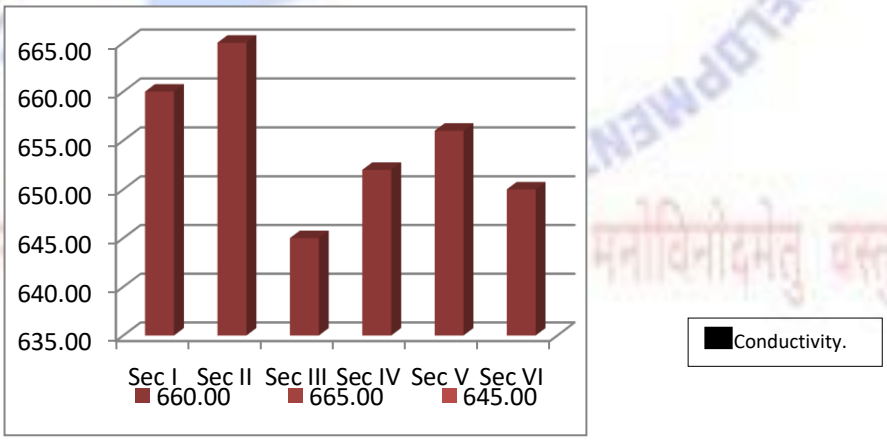

Fig. 1.5 Graph showing variations of Conductivity

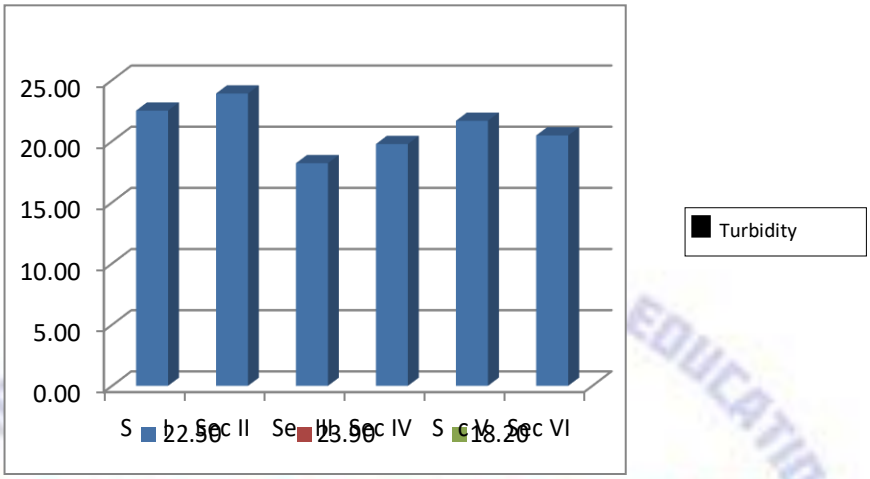

Fig. 1.6 Graph showing variations of Turbidity

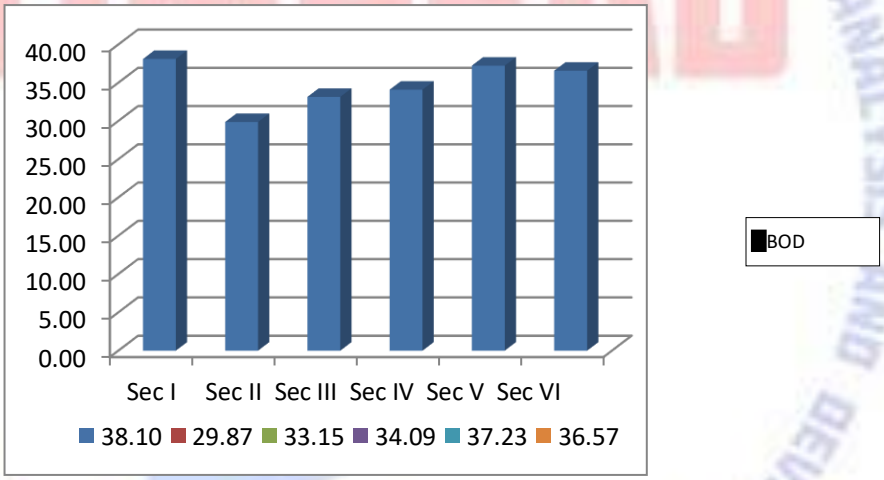

Fig. 1.7 Graph showing variations of B.D.O.

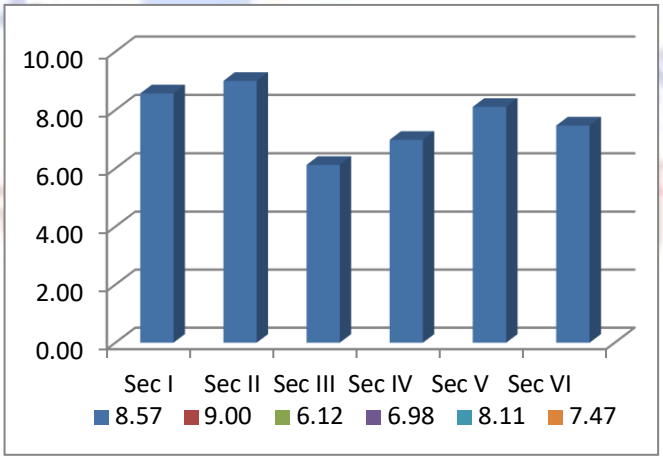

Fig. 1.8 Graph showing variations of D.O.

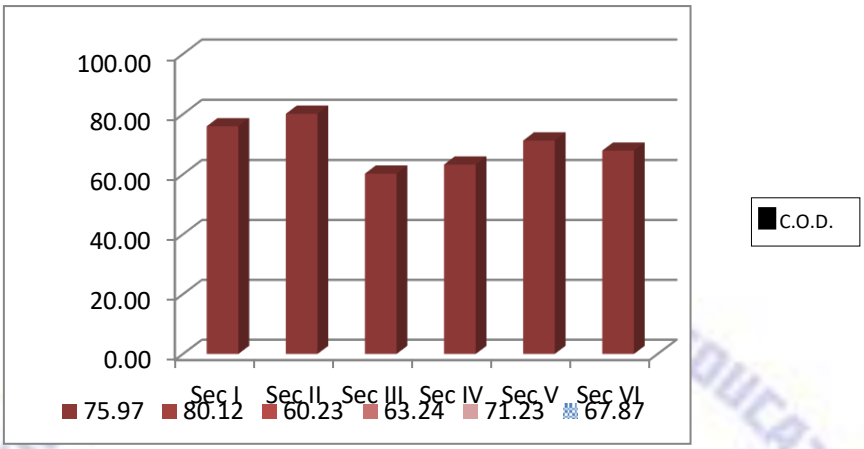

Fig. 1.9 Graph showing variations of C.O.D.

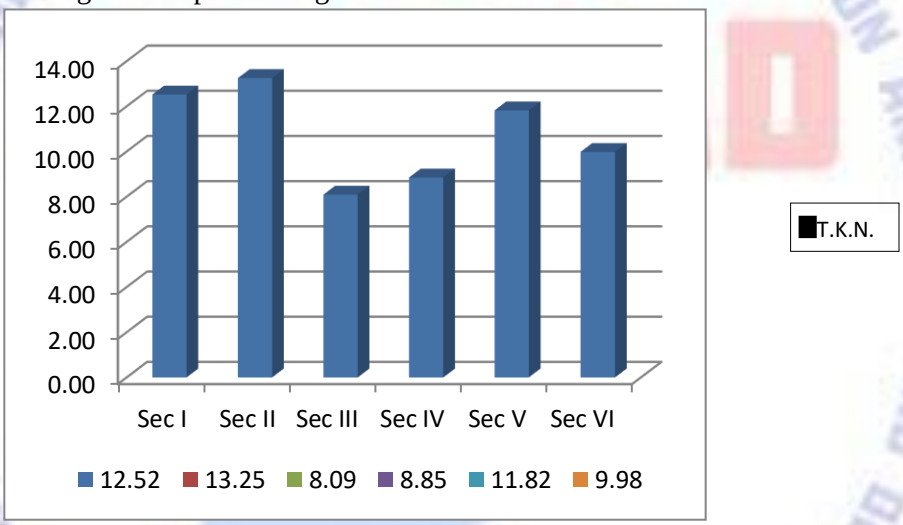

Fig. 1.10 Graph showing variations of T.K.N.

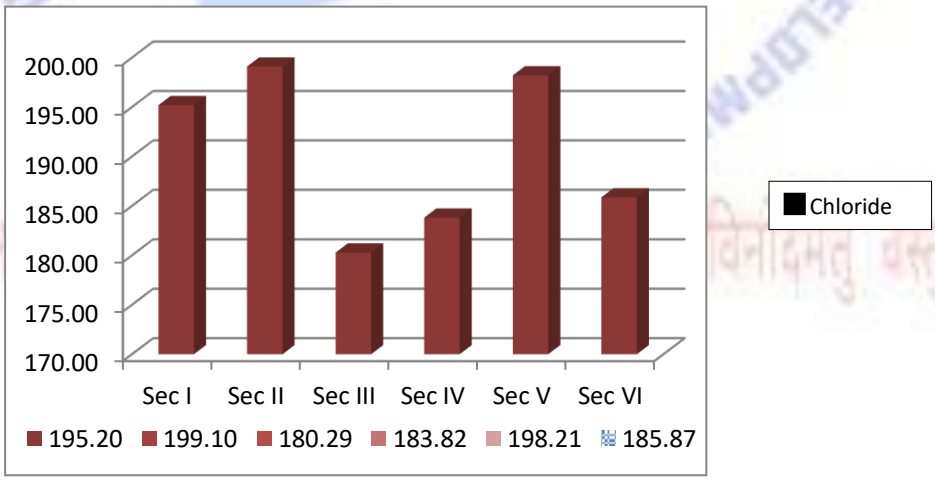

Fig. 1.11 Graph showing variations of Chloride

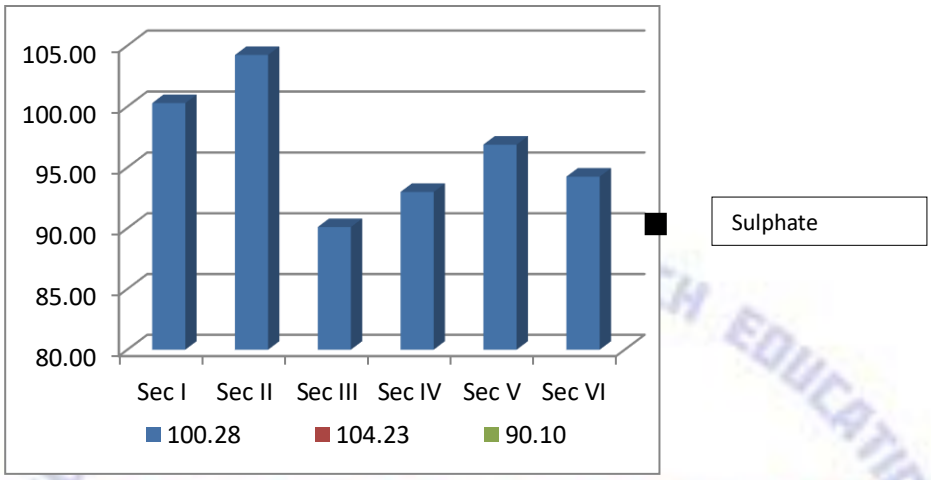

Fig. 1.12 Graph showing variations of Sulphate

Fig. 1.13 Graph showing variations of Potassium

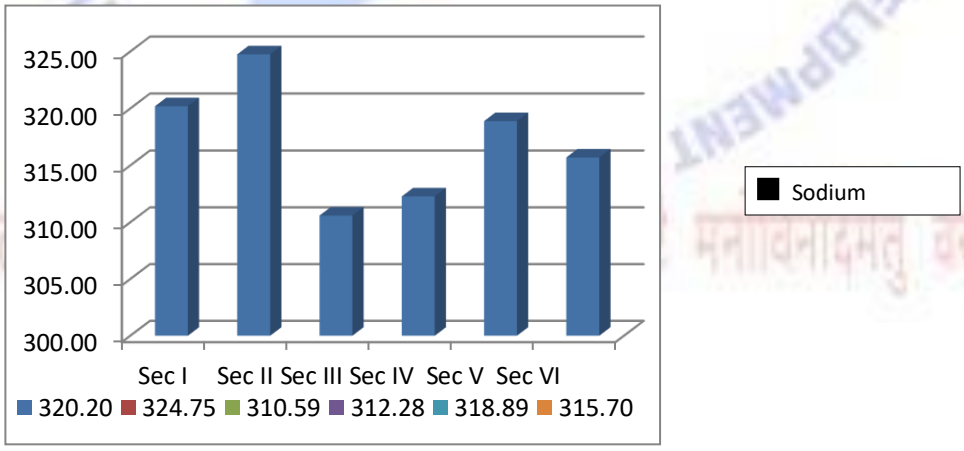

Fig. 1.14 Graph showing variations of Sodium

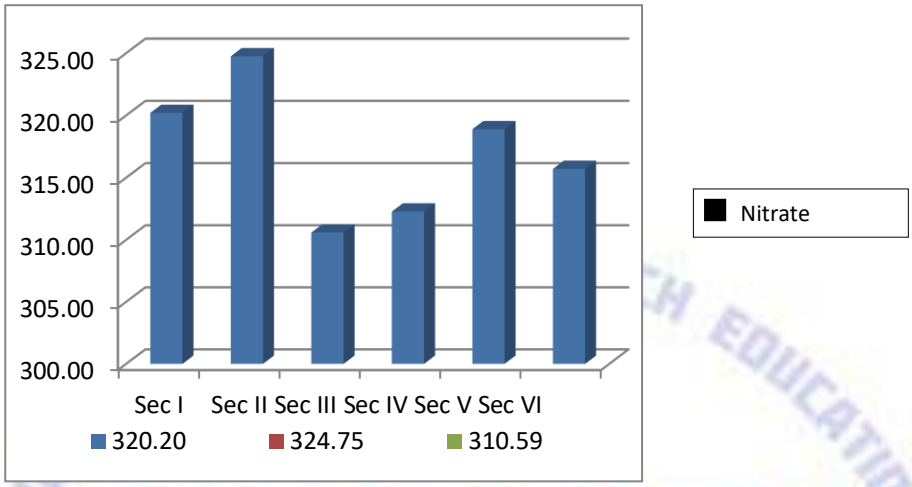

Fig. 1.15 Graph showing variations of Nitrite

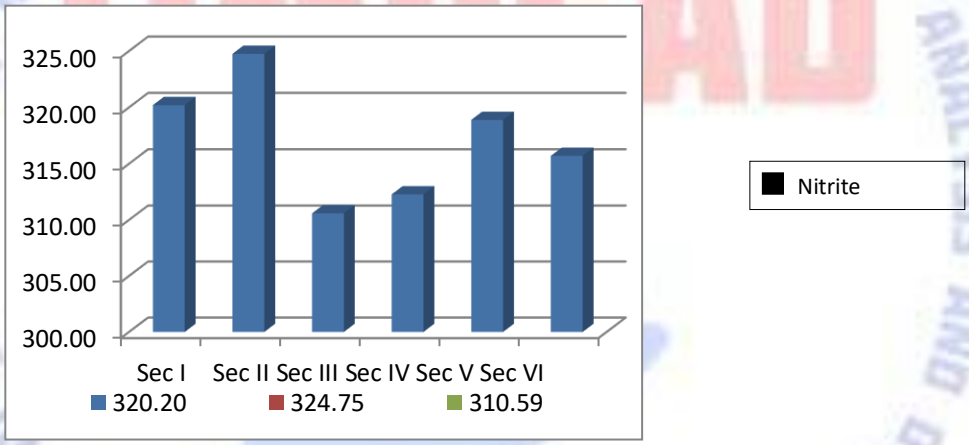

Fig. 1.16 Graph showing variations of Nitrite

Sulphate content shows cathartic effect upon human its elimination is necessary from the public and industrial water supply, as it deposits hard scales in boilers and heat exchangers. Will within the permissible limits.

Sodium contents varied between 310.59-324.75 mg/It. Higher value was recorded at sec II and lower at sec IIIrd. Sodium standard solution sample was filtered through filter paper and then fed in the flame photometer. The readings were noted and sodium content of the sample were determined by comparing with the standard curve. It follows the order sec. IInd>sec Ist>Vth>Sec VIth>sec IVth>sec IIIrd.

Potassium varied between 28.18-35.87 mg/It higher value recorded at sec. II and lower at sec. IIIrd Potassium standard solution was filtered through the filter paper and then fed in the flame photometer. The readings were noted and potassium content of the sample were determined by comparing with standard curve. It follows the order sec. IInd >sec Ist >sec Vth > sec IVth > sec VIth >sec IVth>sec IIIrd.

Nitrate carried away to the ground water by percolation of nitrogenous fertilizers though the soil, indicates the pollution prescribed limit of nitrate in drinking water is 45 mg/It by ISI, In this month nitrate varied from 7.10-9.10 mg/It. Highest value was recorded at sec II and lower at sec. IIIrd. The highest value

of it were due to influx of nitrogenous fertilizers through agricultural
:09lands and industrial influents near the river. Nitrate contents also follows the order sec. Ist>sec IInd>sec IVth>sec VIth>sec Vth>sec IIIrd.
Nitrite contents varied between 2.15-4.00 mg/It. Higher value was recorded at sec IInd (Bus stand) and lower at sec. IIIrd (Avas Vikas Colony). It follows the order sec. Ist>sec IInd>sec IVth>sec VIth>sec Vth>sec IIIrd.

Calcium content varied between 50.40-64.20 mg/It. Highest value was recorded at sec. IInd and lowest at sec IIIrd (Avas Vikas Colony). According to ohle (1934) water with calcium value above 25 mg/I are classified as calcium rich. The presence of calcium ion in water is mainly due to its passage through or over deposits of limit stone, dolomite, gypsum and other gypsiferous materials. It also follows the order sec IInd>sec Ist sec> sec Vth> sec VIth>sec sec IVth>sec IIIrd.

Magnesium content ranged between 31.10-41.90 mg/It. Highest value was recorded at sec. IInd and lowest at sec IIIrd. Magnesium constitutes a part of chlorophyll molecule and is necessary for the photosynthenis, but only small of it point of abundance of in the body and healthy man it occurs to extent about 2100 gm. Most of it occurs in bones along with calcium and phosphate and the remaining amount is found in the soft tissues and the body fluid in the blood. Magnesium content follows the order sec IInd> sec Ist>sec Vth> sec VIth>sec IVth >sec IIIrd.

Alkalinity of water was constituted by bicarbonates as no carbonates was found at any sec. during the entries study. Bicarbonate alkalinity results in greater buffer capacity keeping the pH relatively constant. A similar situation perhaps exists in the ooty lake (Rao et al 1994). Alkalinity is the quantitative capacity of aqueous media to react with H^+. It also follows the order as some in the magnesium.

Free CO_2 varied between 12.12-13.99 mg/It. Maximum value was recorded at sec. IInd and minimum at sec. IIIrd water at all sector is corrosive in nature as the CO_2 always exceeds the limit (6 mg/It, Kudesia 1991). The high CO_2 level is in indication of pollutants in water and not much harmful for aquatic life Sahu et al (1995) reported free CO_2 ranged between 0-13.2 mg/It in the river Ganga at Kanpur. The findings were similar with Sahu et al (1995). Carbon dioxide follows the order sec IInd>sec Ist>sec V>sec VIth>sec IVth>sec IIIrd.

Colour of water in this month was observed yellowish at sec Vth brownish at sec I Brownish colour of water may be due to heavy discharge of presence of other dissolved materials. Many industrial processes need virtually colour less water only.Taste of water was agreeable at sectors IIIrd, IVth, VIth and was disagreeable at sectors sec Ist, IInd and Vth.Odour in this month was objectionable at sectors Ist, IInd and Vth and unobjectionable at sectors IIIrd, IVth and VIth.

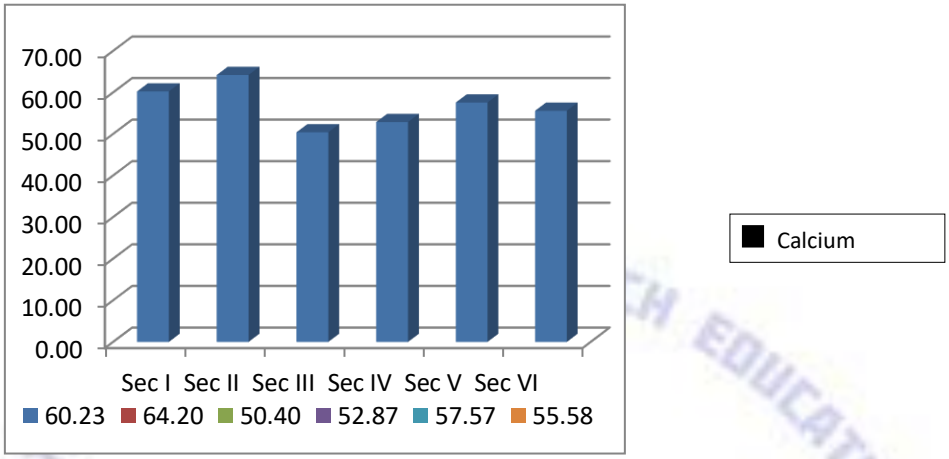

Fig. 1.17 Graph showing variations of Calcium

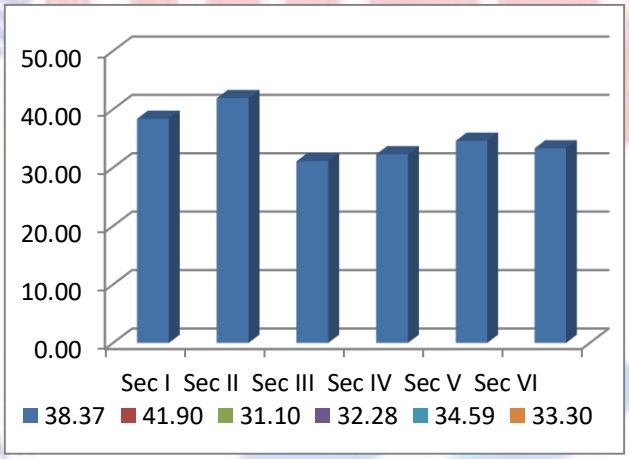

Fig. 1.18 Graph showing variations of Magnesium

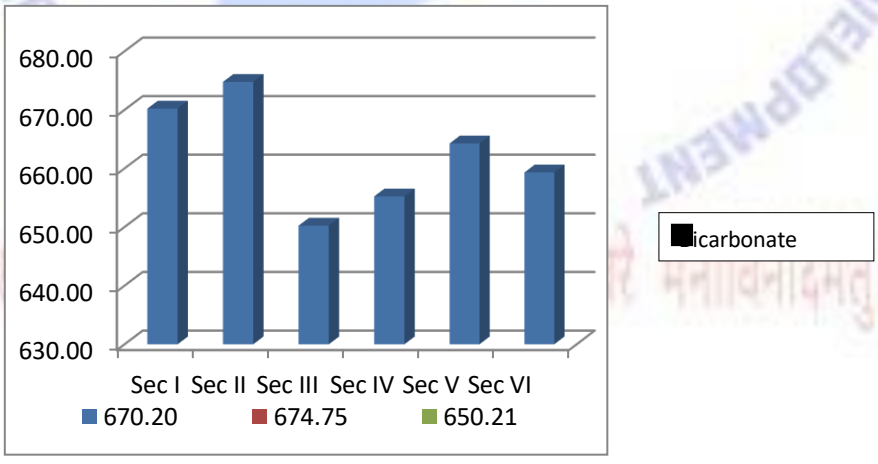

Fig. 1.19 Graph showing variations of Bicarbonate

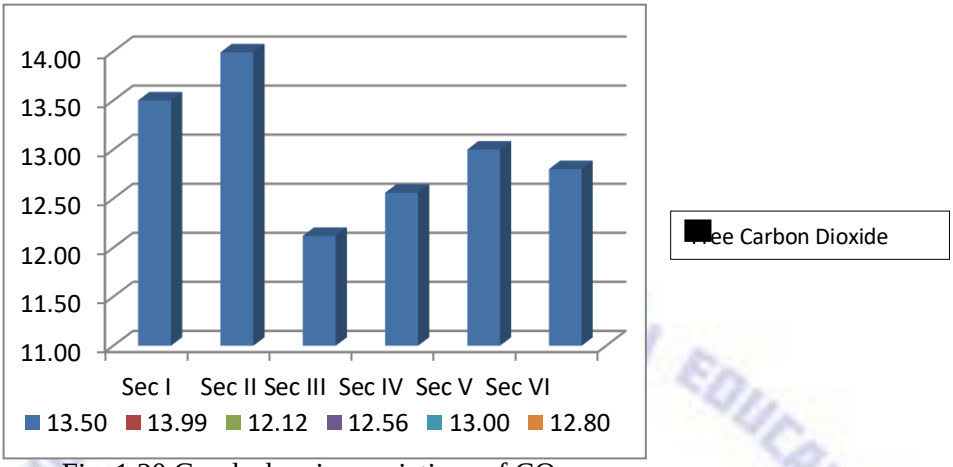

Fig. 1.20 Graph showing variations of CO_2

Conclusion-

The comprehensive study of physical and inorganic coupled with organic analysis of ground water at six different sectors namely, LaxmiNagar (Vijay Nagar), Bus stand, Avas Vikas colony, Water Works, Labour colony, Ramanpur in the month of January leads to the conclusion that physical studies i.e. taste, colour, odour and turbidity are objectionable confirming to the impaired and polluted quality of the ground water. But the physical studies such as pH, conductivity, total solids, suspended solids and settleable solids are contained within the limit and are indicative of qualities of normal surface water.

As regard the chemical investigation minerals, calcium and free CO_2 transgress the limit of drinking water at all sectors. Chloride contents is higher then the limit at three sectors namely LaxmiNagar (Vijay Nagar), Bus stand, Labour colony. Sulphate contents is higher then the limit at three sectors namely Laxmi Nagar (Vijay Nagar), Bus stand and Ramanpur.

Dissolved oxygen excels the limit at all sectors evidently glossing over unfitness of water for drinking and gargling purpose. Chemical oxygen demand and total Kjeldahl nitrogen within the limit of drinking water.

References-

1. A. J. Appelo, B. Drijver, R. Hekkenberg, M.de Jonge: modeling in situ iron removal from ground water. Ground water (1999), 37 (6) : 811-813.

2. A.R. Lawrence, D.C. Gooddy, P. Kanatharana, W. Meesilp, V.Ramnarong: ground water evolution beneath Hat Yai, a rapidly develops City in Thailand. Hydrogeology Journal (2000) 8: 564-575.

3. A. Maric, A Vengosh : Sources of Salinity in groundwater from Jericho Area, Jordan Valley. Ground water (2001) 39 (2) :240-248.

4. A. J. Femandes D.L. Rudolph : The influence of Cenozoic tectonics on the ground water – production capacity of fractured zones : A Case study in Saopaulo, Brazil. Hydrogeology Journal (2001) 9: 151-167.

5. Agarkar SV (1998) physico – chemical characteristics of ground water in chikhli town of Buldana dist, poll, Res. 17(3) 291 – 292.

6. Agnihotri Narendra P, Gazabhiya Vijay T, Kumar M Mukesh, Mohapatra Satya P. C. (1994). Organochlorine insecticide residences in Ganga river water near Farrukhabad, India, Env, momit, Assess, 30(2) 105-112

7. Asthana R.K. Singh K. N. (1993) Physico-chemical characteristics of Gomath water oriential, Jr. Chem. 9(2) 155-157.

8. Abbasi S. A. , Arya D. S. , Hameed A. S. , Abhasi Nasema (1996) water quality of a typical river of Kerala: Punnurpuzha poll. Res. 15. (2) 163-166

9. Agarwal G.D. (1996) Locationally distributed pollution loads on rivers India scenario Jr. Ind. Asoci. Env, manag, 23(3) 10-112.

10. Agrawal G.D. Kannan G.K. (1996) Degradation of river due to diffuses activities and appropriate approach for management – a case study of river Manadakini. Jr. Ind. Assoc , Envmaneg. 23(3) 113-121.

11. Ahmed Irfan, Jain Praveen (1996) pollution load of karwa dam water at Bhopal during permission session. Oriental Jr. Chem. 12 (3) 329-331.

12. Abbasi S.A, Nipaney P.C. (1995) An assessment of drinking waterqualityof the open wells in malappuram coast, Kerala poll. Res. 14 (3) 313-316.

13. Arvind H.B., Manjappa S and Puttaiash E.T. (1988) correlation coefficients of some physico-chemical parameters of river Tunga Bhadra, Karnataka. Poll. Res. 17(4) 371-375.

14. Ajmal M, Khan M.A. and Nomani A.A. (1985) Distribution of heavy metals in water and sediment of selected sites of Yamuna River (India).Env. Monit, Assess. 5, 205-214.

15. Ajmal M, Khan M.A. and Nomani A.A. (1985) Distribution of heavy metals in plant and fish of Yamuna river (India) Env. Monit. Assess 5, 361-369.

16. Ajmal M, Khan M.A. and Nomani A.A. (1982) Quality of Ganga River in U.P. and Bihar, JAWPC tech, Annual IX 165-166.

17. Adholia U.N. (1986) Hydrology of river Betwa (India) Int. Workshop on sur. Wat. Manag.
18. Ayyadurai, K. And V. Krishnasamy, Total mercury concentration in fresh water sediments and fish, J. Environ, Biol. 10, 165-171(1989)

19. Ayyadurai, K., C.S. Swaminathan and V. Krishnasamy, studies on heavy metal pollution in the finfish, Oreochromis mossambicus from River Cauvery, Indian, J. Environ, Hlth. 36, 99-100(1994).

20. Abhik, G. and G Susmita, Biomagnifications of heavy metals in fresh water food chain and its relation to certain elemental properties, proc. 3rd Nat. Symp on environ, Thiruvananthapuram, March, 190-193 (1990).

21. American public Health Association. “Standard Methods for examination of water as waste water” 15th Ed. Washington D.C. (1985).

****