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

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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 physic-chemical pollution which is posing hazards to the public health.The plan of the study comprehends physic-chemical investigation of ground water at six important sectors of the city. The author feels that the present study and the work if published 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, 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 desilted. 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.

Water pollution-

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 this industry, 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.

Results and Discussion-

pH varied between 7.41-.58. Higher value was recorded at sec. IInd (Bus stand) and lower at sec. IIIrd (Awas Vikas Colony) the finding were similar to Raina et al (1984). ph follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd.

Temperature is an important factor to influence the biological activity in the water as it reduces solubility of dissolved oxygen. In this month temperature varied between 21.90-22.5^{0}C. Temperature in this month had not showed remarkable change at any sectors. Higher value was recorded at sec. IInd (Bus stand) and lower at sec Vth (Labour Colony). Findings are similar with Upadhyay and Roy (1982). It follows the order sec IInd> sec IIIrd> sec Ist> sec IVth> sec VIth> sec Vth.

Total solid contents was much above the desirable quantity 500mg/lt and touched the excessive limits of 1500mg/lt actually in many parts of the water with dissolved solids concentration ranging from 2000 to 4000mg/lt . It also used and no physiological effects were reported. However, it can be inferred that water with total dissolved solid contents up to 1000mg/lt. Only is satisfactory for domestic uses. Dissolved solids are undesirable for industrial water for many reasons. They form scales, causing foaming in boilers, accelerate corrosion and interfere with the odour and taste of many finished products. Maximum 462.11 mg/lt.at sec IInd (Bus stand) and minimum 458.23 mg/lt. at sec.IIIrd (Awas vikas colony). Was recorded in this month. Total solid content follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd.

Suspended solids varied between 26.21-12.52 mg/lt. Higher value was 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 VIth> secIVth> secIIIrd.

Settleable solids varied between 4.02-7.11mg/lt. Higher value was recorded at sec. IInd and lower at sec. IIIrd. It follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd.

Conductivity was recorded maximum 666 us/cm at sec IInd and minimum 648 µs/cm at sec IIIrd. No permissible limit for conductivity has been decided by ISI and WHO in drinking water conductivity has relations with dissolved solids. Conductivity follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd.

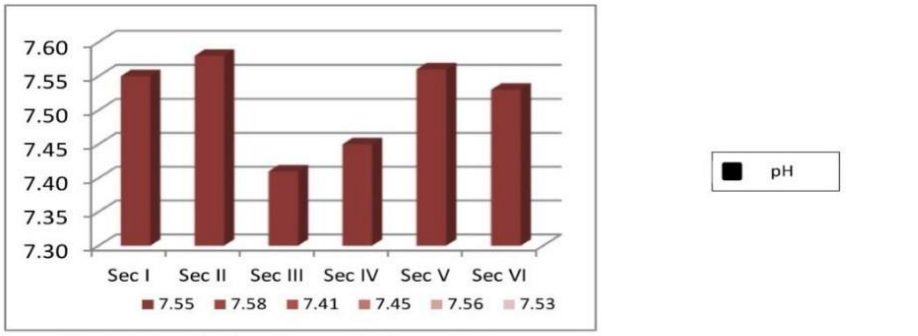

Fig. 2.1 Graph showing variations of pH

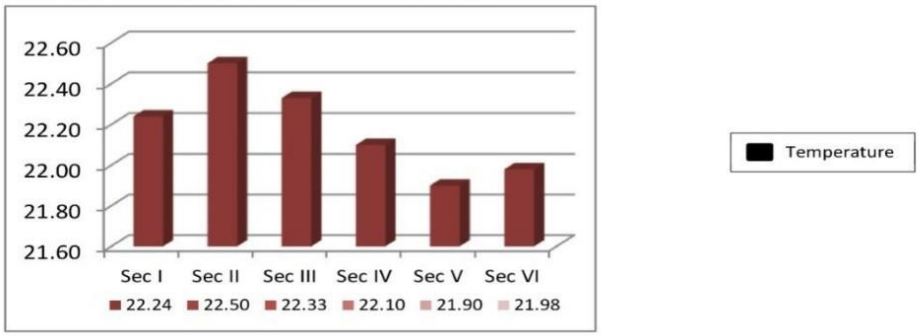

Fig. 2.2 Graph showing variations of Temperature

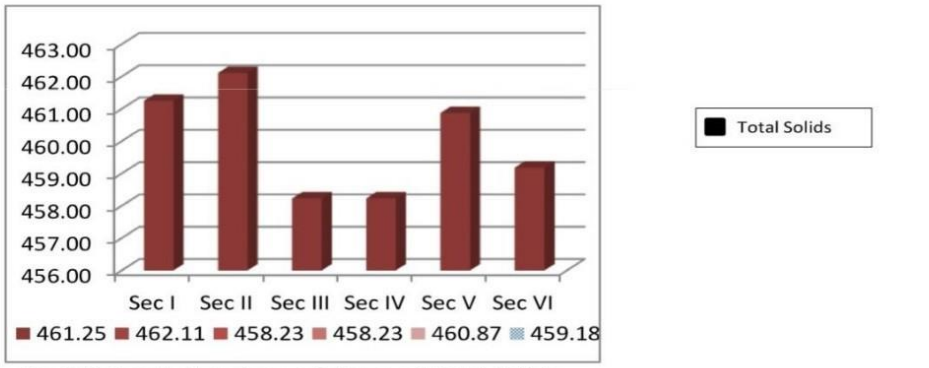

Fig. 2.3 Graph showing variations of Total Solids

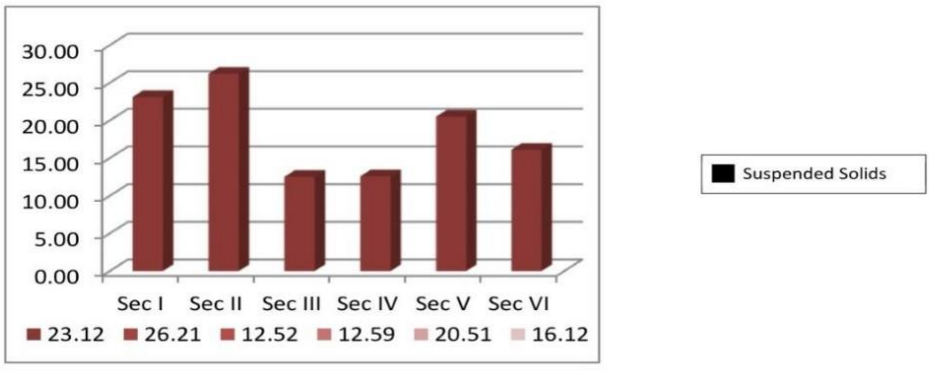

Fig. 2.4 Graph showing variations of Suspended Solids

Turbidity varied between 8.20-14.92 NTU. Higher value was recorded at sec IInd (Bus stand) and lower at sec. IIIrd (Awas vikas colony). Turbidity at all sectors surpassed the desirable limit (5 N.T.U.) as well as permissible limit 10 (NTU) for drinking water (ISI 1991). Findings are similar to Trivedi (1997) and Bhatnagar (1989). Turbidity also follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd.

B.O.D. in this month varied between 34.67-42.05mg/lt. Higher value was observed at sec IInd (Bus stand) and lower at sec IIIrd (Awas vikas colony). BOD at all sectors exceeded this maximum permissible limit of 2 mg/lt for drinking water. It follows the order sec IInd> sec Ist> sec Vth> sec VIth> secIVth> secIIIrd. B.O.D. is attest of greater value in the analysis of sewage, industrial effluents and grossly polluted water.

DO in this month varied between 6.51-8.56 mg/lt. Higher value was recorded at sec. IInd and lower sec. IIIrd. D.O. at all sectors except sec. IInd was found below the minimum desirable limit of 6 mg/lt for drinking water ISI (1991). D.O. Content follows the order sec.IInd> sec.Vth> sec.Ist> sec.VIth> sec.IVth> sec.IIIrd. It is essential to the life of the fish and other aquatic organism.

The C.O.D. value in this month varied between 62.11-85.77 mg/lt lower value wasrecorded at sec IIIrd (Awas vikas colony) and higher at sec. IInd (Bus stand). It follows the order sec.IInd> sec.Ist> sec.Vth> sec.VIth> sec.IVth> sec.IIIrd. It indicates the amount of oxygen required to oxidize the carbonaceous matter.

Kjeldahl nitrogen is one of the important indicators of pollution of water it arises from anaerobic decomposition of nitrogenous matter in the stream. Kjeldahl nitrogen fluctuated between 7.50-12.05 mg/lt. A maximum of 12.05 mg/lt at sec IInd and minimum 7.50 mg/lt at sec IIIrd were recorded. It follows the order sec.IInd> sec.Ist> sec.Vth> sec.VIth> sec.IVth> secIIIrd. It is the sum of the ammonia, nitrogen and organic nitrogen.

Klein(1957) found direct correlation between chloride and pollution load Chloride contents in this month varied from (178.59-202.01) mg/lt. lower value was recorded at sec. IIIrd (Awas vikas colony) and higher at sec IInd (Bus stand). Chloride at sectors IIIrd and IInd exceeded the limit 250 mg/lt for drinking water ISI (1991). The presence of higher value showed high pollution load.

Steiver (1967) has reported that the sulphate reduce to H_2S very quickly under high organic pollution and depleted oxygen conditions. In this month sulphate contents varied between 95.12-114.95mg/lt. Higher value was recorded at sec IInd and lower at sec IIIrd sulphate surpassed the limit 200 mg/lt (ISI, 1991) at

sectors Ist, IVth and VIth.

Sodium contents varied between 315.10-335.23 mg/lt. Higher value was noted at sector IInd (Bus stand) and lower at sector IIIrd (Avas vikas colony). No permissible limit has been decided for sodium in drinking water.

Potassium was found maximum at sector IInd (37.0 mg/lt) and minimum at sec IIIrd (29.19mg/lt). it follows the order sec. IInd> sec.Ist> sec.Vth> sec.VIth> sec.IVth> secIIIrd. Potassium is not essential plant nutrient. It is present is chloroplast.

Nitrates at all the sectors was within the limit (45 mg/l by ISI, 1991) varied between 6.67-8.66 mg/lt. higher value was recorded sec IInd and lower at sec IIIrd. (Kataria 1994) reported nitrate ranged between 0.6-4.45 mg/lt. in river Kaliasot. It follows the order sec.IInd> sec.Ist> secVth> sec.VIth> sec.IVth> secIIIrd.

Nitrite nitrogen was found in appreciable concentration ranging between 2.50-5.52 mg/lt. Higher value was found at sector IInd (Bus stand) and lower at sector IIIrd (Awas vikas colony). Nitrite contents follows the order sec.IInd> sec.Ist> sec.Vth> secVIth> sec.IVth> sec.IIIrd.

Calcium and magnesium are the principal cations imparting hardness to the water. Calcium contents varied between 54.28-69.12mg/lt. Higher value was recorded at sector IInd and lower at sec IIIrd calcium at all sectors exceeded the limit 75mg/lt. (ISI 1991) for drinking water. Magnesium content was ranged between 28.72-39.15mg/lt. Showed highest value at sec. IInd and lowest at sec. IIIrd. Magnesium constituents a part of chlorophyll molecule and is necessary for photosynthesis, but only a small of it is required. It follows the order sec.IInd> sec.Ist> sec.Vth> sec.VIth> sec.IVth> sec.IIIrd.

Alkalinity of water was constituted by bicarbonates as no carbonate was found at any sector bicarbonate in this month varied between 665.21-668.23 mg/lt. Higher value was found in sewage polluted water.

Odour in this month was objectionable at sector Ist, IInd and Vth and unobjectionable at sector IIIrd, IVth and VIth.

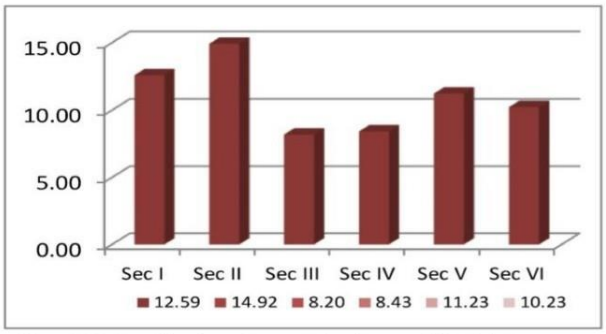

Fig. 2.5 Graph showing variations of Turbidity

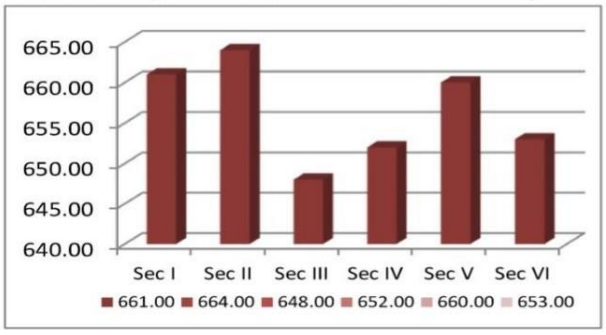

Fig. 2.6 Graph showing variations of Conductivity

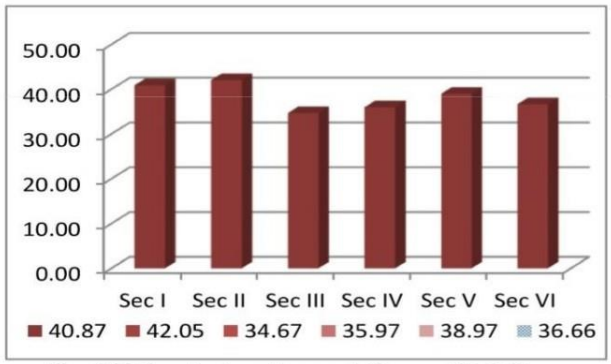

Fig. 2.7 Graph showing variations of B.O.D.

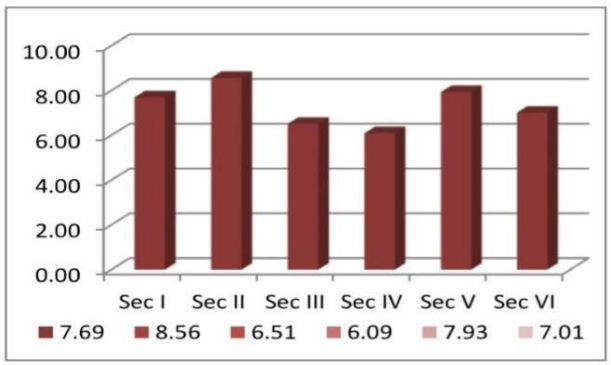

Fig. 2.8 Graph showing variations of D.O.

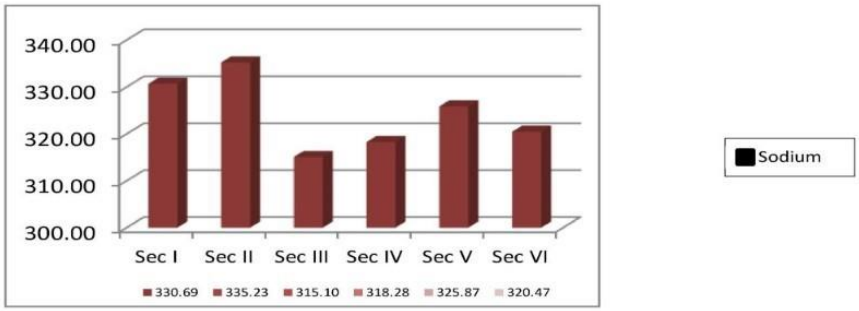

Fig. 2.13 Graph showing variations of Sodium

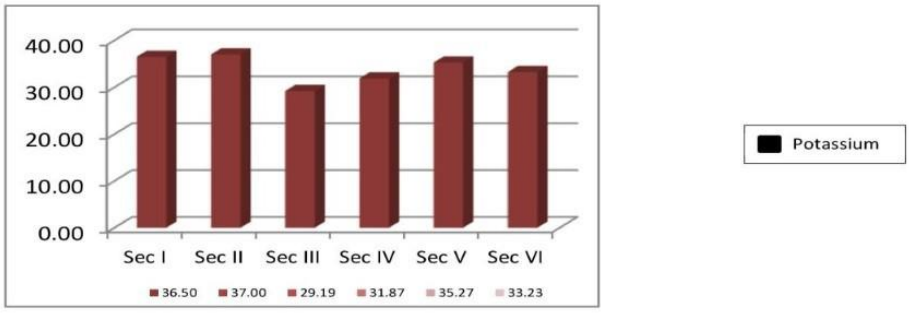

Fig. 2.14 Graph showing variations of Potassium

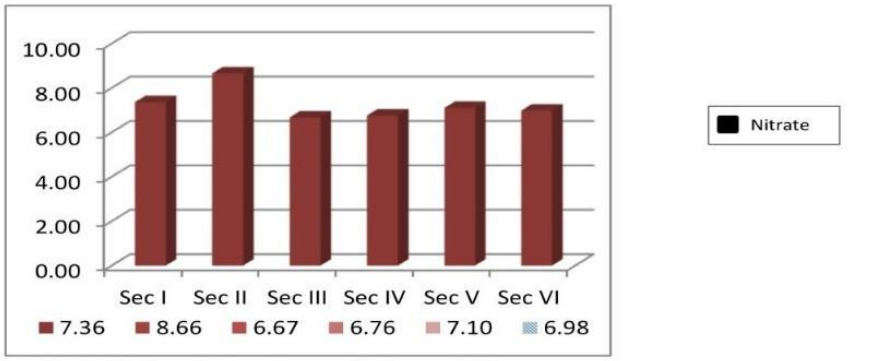

Fig. 2.15 Graph showing variations of Nitrate

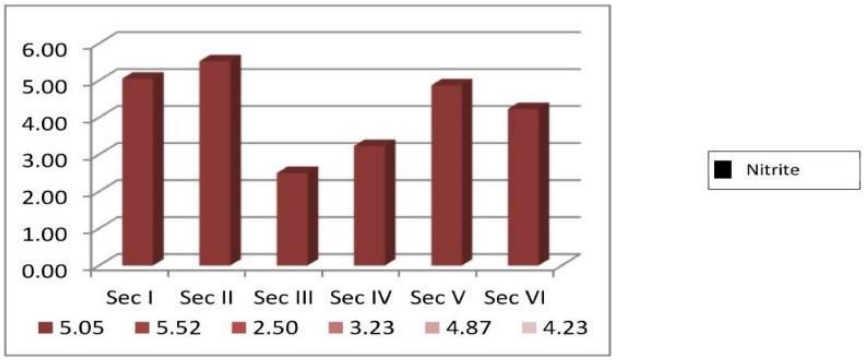

Fig. 2.16 Graph showing variations of Nitrite

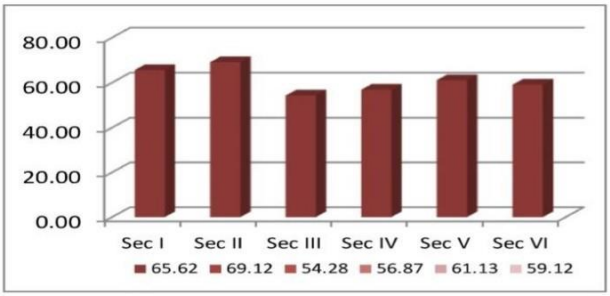

Fig. 2.17 Graph showing variations of Calcium

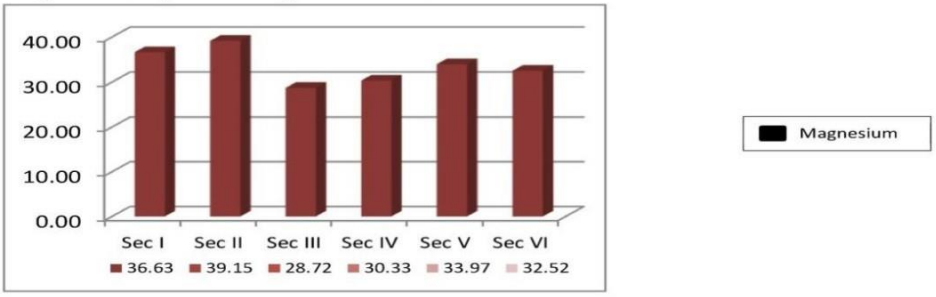

Fig. 2.18 Graph showing variations of Magnesium

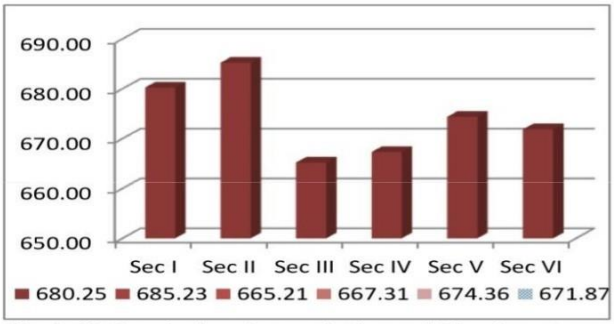

Fig. 2.19 Graph showing variations of Bicarbonate

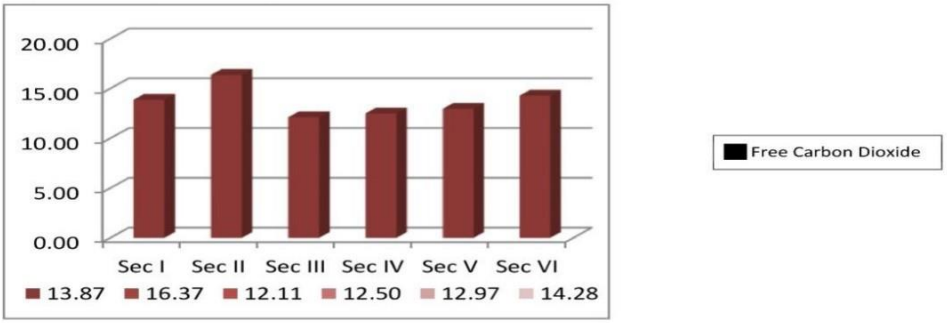

Fig. 2.20 Graph showing variations of Free CO_2

Conclusion-

Conclusion arrived at as a result of physico-chemical study of ground water in the Spring Season is that taste, colour, odour and turbidity are objectionable obviously indicating pollution in the ground water physical studies such as pH, conductivity, total suspended and settleable solids are within the limit and are indicative of qualities of normal surface water. Minerals such as calcium and free CO2 crossed the limit at all sectors chloride content are higher than the limit at sector II. Sulphate is higher than the limit the sectors I and II. Dissolved oxygen exceeded the limit at all sectors proving unfitness of water for drinking, gargling, bathing etc. C.O.D. and T.K.N. are within the limit of drinkable water.

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