



EVALUATION OF GROUND WATER QUALITY OF KASGANJ TOWN IN RAINY SEASON

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Abstract : *The Kasganj is a subdivision of Etah District (Now Known as District Kaganj) which is known for the manufacture of big cooking iron wares and kitchen utensils and is seat of small scale industries. However, there is no proper sewer system in the town and industrial effluents are allowed to flow over the roads and streets, consequently endangering the ground water quality.*

In order to assess the extent of ground water pollution physico chemical investigations of ground water was undertaken during the rainy season. For this purpose six sites- Gangeswar Colony, Aroly, Chitrak Gupta Colony, Durga Colony, Nathuram Mohalla and Nawab Mohalla were selected for study.

The Parameters which were determined are Colour, Taste, Odour, Temperature, pH, Conductivity, Turbidity and contents Total solids, Suspended solids, Settable solids, DO, BOD, COD, TKN, BHC. The water Samples were also analysed for the determination of Calcium, Magnesium, Chloride, Sulphate, Caarbonate, Nitrate, Sodium, Potassium and free CO₂.

The level of those parameters and contents were evaluated over all the six sites and results were smallest at site-4 (Durga Colony) and highest at site-3 Chitrak Gupta Colony) in the rainy session.

Introduction : Pollution of the ecosystem by man is a world wide phenomenon. The relation of to water has always been dual nature water must meet the daily requirements, of man, it must serve his 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 purify and regenerate itself to safely man's need. The ecosystem is now so burdened that it cannot regenerate itself. The phenomenon of acid rains, population of the international rivers and that of ground waters in many parts of world bear² witness to this rape of the ecosystem by man.

Ground water is generally a very good source of drinking water because of the purification properties of the soils it is also used for irrigations and spraying and where surface

water is source for industrial purpose. In many arid and semiarid zones it is main source of water. An aquifer constitutes a natural reservoir of usually high quality water.

The addition of something to water, which changes its natural quality to that down a stream riparian owners do not obtained the natural water of the stream transported to them.

OR

Pollution is a modification of the physical, Chemical and biological properties of water, restricting of preventing its³ use in the various applications where it normally plays a part.

Experimental and Discussion in the month of July: In this month temperature was found maximum 27.65 °C at site VI (Nawab Mohalla) and minimum 26.50 °C at site-IV (Durga Colony). It is very important to know temperature is an important factor to influence the biological reaction in water. Higher values of

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temperature augment the chemical reaction and reduce solubility of gasses and dissolved oxygen.

At the six sites pH followed the order site-III> Site-I >Site- II> Site-VI>Site>V Site IV. It ranged between 7.60-8.65. It was found maximum at site-III (Chitrugupta Colony) and minimum at site-IV (Durga Colony). In this month quantum of filth is quite high in this colony. Hand pumps are installed by the side of gutters where animal and vegetable waste is scattered all along the sides of these gutters. Peels of vegetable, fruits and morsels of edibles make the soil alkaline resulting increase the measured pH value.

Conductivity is a measurement of the dissolved solids in us/cm. No permissible limit has been decided for this. In this month Conductivity varied from 652.00-6736.00 us/cm. Lowest value was recorded at site-IV (Durga Colony) and highest at site-III. (Chitrugupta Colony). Obviously dissolved solids are in high concentration at site-III (Chitrugupta Colony). At the six sites it followed order site -III>site-V>site-I>site-VI>site-II>site-IV.

Turbidity may be caused by a wide variety of suspended materials ranged from colloidal to coarse dispersions. It makes water unfit for drinking. WHO recommended 5 NTU and is up to 10 NTU for drinking water (ISI, 1983). Highest value of turbidity 15.65 NTU was recorded a site-III (Chitrugupta Colony) and minimum 6.34 NTU site-IV (Durga Colony). Thus the pollution limit of 10 NTU is exceeded in the ground water at site-III (Chitrugupta Colony) and site-VI (Nawab Mohalla). This may be described to the bad community habits in the said sites and improper disposal of wastes; despite the adequate depth of ground water in this area. At the other sites turbidity was within the pollution limit. All these sites are maintaining better sanitation. These sites are provided with proper sewerage system and residents are more advanced and literate. Community habits and activities are also restrained likewise. Hygienic problems are not extent.

Calcium content at the six sites followed the order site- III>site-VI>site-V>site-II>site-I>site-IV. It varied between 92.25-99.24 mg/lit. Highest value was recorded at site- III (Chitrugupta Colony) and lowest at site- IV (Durga Colony). According to Ohle (1934) water with calcium values about 25 mg/lit were clasified as calcium rich. It was under the permissible limit for drinking water (200mg/lit, ISI, 1991 but exceeded the desirable limit (75mg/lit, ISI, 1991) at all the six sites. Calcium plays important role in the process of coagulation of blood and in the excretion of hormones.

Magnesium content followed the same order as calcium (site-III>site-VI>Site-V>site-II>site-I>site-IV). It ranged between 62.53-71.34 mg/lit. Highest value was recorded at site-III (Chitrugupta Colony) and lowest and site-IV(Durga Colony). It was above the permissible limit for drinking water (30 mg/lit, ISI,1991) at all the six sites. Magnesium constitutes a part of chlorophyll molecules and is necessary for the photosynthesis but only its small amount is required. It maintains the osmotic and electrolytic equilibrium in the body. It is closely related to the activity hexokinase for the phosphate transport reactions and glucose metabolism.

The concentration of total solids ranged between 658.00-707.00 mg/lit. The highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). At the six sites it followed the order site III>site-VI>site-V>site-II>site-I>site-IV.

Suspended solids varied from 21-27 mg/lit. Highest value was recorded at site-III(Chitrugupta Colony) and lowest at site- IV (Durga Colony). It followed the order site-III>site-VI>site-V>site-I>site-II>site-IV.

Settleable solids varied from 6.55-9.50 mg/lit. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). It followed the order site-III>site-VI>site-V>site-I>site-II>site-IV.

The chloride content followed the order site-III>site-VI>site-V>site-II>site-I>site-IV. It normally increases as the mineral content

increases. It is found in the form of Na, K and La salts. It shows the degree of pollution of animal origin. In this month it varied from 354-373 mg/l. The lowest value was recorded at site-IV (Durga Colony) and highest at site-III (Chitrugupta Colony). At all sites chloride content surpassed the limit for drinking water (250mg/l, ISI, 1991) but was found under the permissible limit for drinking water (1000mg/l, ISI, 1991).

Sulphate content shows cathartic effect upon human. Hence it is important to eliminate sulphate from public and industrial water supplies as it forms hard scales in boilers and heat exchangers. It followed the order site-III>site-VI>site-V>site-I>site-II>site-IV. In this month sulphate content ranged between 163.00-178.00 mg/l. Highest value was recorded at site - III(Chitrugupta Colony) and lowest at site-IV (Durga Colony). In this month it was found within the permissible limit (400 mg/l, ISI, 1991) at all sites.

Carbonate at the six sites followed the order site-III>site-VI>site-V> site-II>site-I>site-IV. It varied from 5.38-7.83 mg/l. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony).

Bicarbonate alkalinity results in greater buffer capacity keeping the pH relatively constant. It followed the order site-III>site-VI>site-V> site-I> site-II> site-IV. It varied from 583-625mg/l. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony).

Free CO₂ followed the order site-III>site-VI>site-II>site-V>site- I> site- IV. It varied from 10.83-15.60 mg/l. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). Water at all sites is corrosive in nature as CO₂ always exceeds the limit (6mg/l, Kudesia, 1991). The high CO₂ level here is an indication of pollutants in water and not much harmful for aquatic life.

Nitrate carried away to the around water by percolation of nitrogenous fertilizer through the soil, indicates the pollution. Prescribed limit of nitrate for drinking water is 45 mg/l by ISI (1983). In this month nitrate varied from 13.20-

18.60 mg/l. It followed the order site-III>site-VI>site-V>site-I>site-IV. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). Site-III is situated near the open ground which is suitable for agriculture. Its highest value at site-III was due to the influx of nitrogenous fertilizers through agricultural lands.

Nitrite varied from 1.63-4.74 mg/l. It followed the order site-III>site-VI>site-V>site-II>site-I>site-IV. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). At the site I, II, IV nitrite content was found under the provisional guidelines for drinking water (3mg/l, WHO, 1996).

Sodium is mostly associated with the chloride and bicarbonate ions. Thereby controlling the acid-basic equilibrium. Sodium content varied from 345-373 mg/l. It followed the order site-III>site-II>site-VI>site-V>site-I>site-IV. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony).

The concentration of potassium is trivial in most drinking waters. It varied from 9.00-11.00 mg/l. It followed the order site-III>site-VI>site-V> site-II>site-I>site-IV. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony).

DO in this month followed the order site-III>site-VI>site-V> site-II>site-I>site-IV. It varied from 5.65-7.90 mg/l. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). DO at the sites, I, IV was found below the minimum desirable limit 6 mg/l for drinking water (1991).

BOD in this month varied from 9.83-11.60 mg/l. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). It followed the order site-III>site-VI>site-V>site-II>site-I>site-IV. BOD at all sites exceeded the maximum permissible limit of 2mg/l for drinking water. Ostensibly cause of the high BOD i.e. organic pollution at the site-III (Chitrugupta Colony) is a big sewage disposal, drain sides of which are thickly

inhabited by people of lowest middle class who have installed hand pumps in their houses for maintaining their need of potable water and water for cleaning purpose. BOD is lowest at the site-IV (Durga Colony) because at this site the community habits are comparatively neat and clean. Site-VI (Nawab Mohalla) is densely populated by the people of non vegetarian habits lacking adequate proper hygiene. Animal waste is disposed into the gutters hardly disilted and cleaned by the municipal sanitary labour and scavengers. Moreover the faculty and careless installation of hand pumps is another nuisance to the physico-chemical qualities of potable water drawn from these hand pumps. Site-V (Nathuram Mohalla) is also a congested place. Resident of this mohalla too are careless about maintaining the sanitation of the area. Municipal authorities are also lukewarm to maintaining proper hygienic conditions therein. Vegetable and animal refuse heaped around the hand pumps. Such an insanitation also augments soil and water pollution. Site- II (Aroly) too does not have adequately educated inhabitants. They too are nonchalant towards maintaining the sanitary conditions at this site. The area all around is precipitous with deep pits in the roads wherein water is logged posing health hazards and decadence of vegetable waste in particular. Local self administration too is ignorant of the proper hygiene.

COD in this month followed the order site-III>site-VI>site-V > site- II> site- IV > site- I. It varied from 68.75-87.60 mg/lit. Highest value was recorded at site- III (Chitrugupta Colony) and lowest at site- I (Gangeshwar Colony). COD is an amount of oxygen consumed under specified conditions in the oxidation of organic and oxidisable organic matter collected for the influence of chlorides. It indicates the amount of oxygen required to oxidise the carbonaceous matter.

TKN followed the order site-III>site-VI>site-V>site-II-I>site-IV. It varied from 10.28-18.80 mg/lit. Highest value was recorded at site-III (Chitrugupta Colony) and lowest at site-IV (Durga Colony). It is lowest at site-IV because it is least dirty and maintaining some hygiene.

BHC is a powerful insecticide. It is also known as Gammexane and Lindane. BHC was found absent at all the sites during the entire study. Since there is no source at all the sites so that it may find its way into the ground water.

Colour is one of the common constituent of many natural waters and it is caused by metallic substance such as iron, manganese compounds and humus materials. In this month water was found to be colourless at sites I, IV, light yellow at sites II, V and yellow at site-VI. Light yellow and yellow colour of water indicate the presence of sand.

Taste always depends upon odour. However in some case it does not depend on odour since the dissolved mineral matters in water produce taste not odour. Taste of water in this month was agreeable at sites I, IV and disagreeable at sites, II, III, V, VI.

If water possesses odour, it is not suitable for domestic and industrial purpose. the extent of odour depends upon the pH of water. Lower pH produce highest amount of H_2S . Odour in this month was unobjectionable at sites I, IV. And objectionable at sites II, III, V, VI. Similarly various parents and contents were determined and discussed in the month of Sep. also.

Summary-

A comparative analysis of entire results of the study ultimately leads to the inference that the ground water has slight high degree of pollution in rainy season (July and Sep.). The causes of slight high pollution in rainy season are -filth is quite high and all the sites have roads with deep pits wherein water is logged due to

rain; municipal authorities are passive towards sanitation condition and drainage of this logged water.

Durga Colony (site-IV) is marked with qualities of adequately clean water. Worst affected is Chitragupta Colony (site-III) due to the bad community habits, rivulets and gutters delivering fifthly and boggy water, a big sewage disposal drain is going through middle of the colony, sides of which are thickly inhabited by people of lower middle class; who have installed hand pumps in their houses for meeting their needs of potable water and water for cleaning purpose.

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