ISSN: 2249-894X Impact Factor :3.8014(UIF) Volume - 6 | Issue - 1 | October - 2016

Review Of Research

THE STUDIES ON IMPACT OF COMMON INORGANIC ANIONS ON HUMAN HEALTH AND ENVIRONMENT IN WATER

Vijay Kumar Chaudhary
Department Of chemistry, Dayanand Vedic College, Orai, Jalaun, U.P.

ABSTRACT

Inorganic anions constitute provide the sweatful and potable of water. They are present in greatest quantity as a consequence of natural processes but several important contaminants are present as a result of men activities. A number of inorganic anions have been reported in alarming concentrations in numerous drinking water sources around the world. Their presence even in very low concentration may cause serious environmental and health related problem. Inorganic anions contaminants are the most important determinants of acceptability to the consumer, affecting taste, colour. The aim of this paper some of the most important inorganic anions of drinking water covering major elements such as hardness and nitrate and more constituents in terms of quantity, such as arsenic, selenium and lead.

KEYWORDS: *Inorganic anions, potable, hardness, nitrate, arsenic, selenium, and lead.*

INTRODUCTION

Inorganic anions are usually present in natural water. Many of these anions are naturally occurring and should be considered as an integral part of those particular water e.g., calcium carbonate and calcium bicarbonate in hard waters. There are different inorganic anions present in water such as Bromide, Chloride, Nitrate, Fluoride, Sulphate in the form of their salts. It is clear that these major inorganic anions which make the difference in taste of various waters. The very high mineral waters are acceptable as society for good health and taste. However, there are many inorganic components usually contain in much smaller quantity, which could be considered as contaminants and which are major interest in terms of their effects on water quality and human health with environment than the major components.

There are some times the inorganic content of drinking water arises as a consequence of the difference between ground water and surface water. The time to time shown in different research report the different between surface water and low ground flow water that mean subsequent buildup of pollutants such as nitrate, sulphate, chloride, fluoride etc. An assessment of the health effects of inorganic contaminants in drinking water is largely complicated by the limited database on toxicity of these anions by the oral route and the fact that many of these elements are essential for human and plants nutrition.

The number of inorganic anions of important for water is largely. Therefore only a few particular significances on interest are consider and the important features are described.

MAJOR ANIONS –

Major anions include chloride, sulfate, carbonate, bicarbonate, fluoride and nitrate. Bicarbonate is the principal anion found in natural water. These ions are very important in the carbonate system, which provide a buffer capacity to natural water and is responsible in a great measure for the alkalinity of water.

MATERIALS AND METHODS –

Permissible limits for drinking water quality according to American Public Health Association (APHA), World health Organization (WHO), Bureau of Indian standards (BIS), Central pollution control board (CPCB) and Indian council of medical Research (ICMR) are comparing in this article. The following method are used for test water for anions.

Chlorides – For the determination of chlorides “Argentometric method” is being applied. (APHA 1998; part 4500 –Cl^- B, p 4-67).

Nitrate – For the estimation of nitrates “Brucine method” is being used (Trivedi and Goel, 1984, p.59).

Sulphate – Determination of sulphate is being done by “Turbidimetric method” (APHA 1998, part 4500-SO_4^{--}E, p.4-178).

Fluoride –For the determination of fluoride “Colorimetric method” is being applied. (APHA, AWWA and WEF, 21 Edition, 2005).

DISCUSSION

CHLORIDE – Chlorides are highly soluble and are leached from rocks and soil, eventually reaching the sea. Sodium chloride, Potassium chloride, Calcium chloride and Magnesium chloride are widely used in industry in the production of industrial chemicals and fertilizers, snow and ice control. Industrial and sewage discharges, run off from de-icing operations saline ion intrusion all contribute to chloride levels in surface and ground water. Chloride levels in unpolluted water can be below 10 mg/l. (WHO). But acceptable chloride level in drinking water is 250 mg/l (WHO, BIS). The concentration of chloride in surface and ground water increasing day by day.

BIS (Bureau of Indian Standard) have recommended an acceptable limit of 250 mg /l of chloride in drinking water; this concentration limit can be extended to 1000 mg/l of chloride in case no alternative source of water with desirable concentration is available. However, ground water having concentration of chloride more than 1000 mg /l are not suitable for drinking purposes. The chloride values less than 250 mg/ litre are found mostly in the states of J & K, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Orissa, M.P, Kerala, Maharashtra, West Bengal, North- Punjab, Sikkim & North-Eastern states.

Water with chloride ranging between 250 and 1000 mg/l falling under ‘permissible’ range are confined mostly to parts of Maharashtra, Western M.P, Southern Punjab, Southern West Bengal, Karnataka, Andhra Pradesh and Western Uttar Pradesh.

The chloride concentration in Aligarh district U.P. found between 75 -300 mg/l (S. Parveen et. al. 2015)

Chloride is categorized as a pollutant for many reasons. Chloride is necessary for water habitats to thrive, yet high levels of chloride can have negative effects on an ecosystem. Chloride may impact freshwater organisms and plants by altering reproduction rates, increasing species mortality, and changing the characteristics of entire local ecosystem. In addition, as chloride filters down to the water table, it can stress plant respiration and change the quality of our drinking water.

At reasonably possible exposures, chloride is relatively not toxic to human health but does pose organoleptic issues, i.e., it compromises the taste of water. Chloride effects the taste of water, as well as pipes in residences and home appliances. Softened water reduces the formation of hard water scale which encrusts water heaters, hot water pipes, shower heads and water-using appliances. This scale can cause premature maintenance and failure. Therefore, water softening is an essential process for residents.

Chloride in drinking water normally contributes less than 2% to the average dietary intake of about 6 g/day. Chloride is an essential element and the chloride ion does not appear to have an adverse effect on health itself. The toxicity of chlorides depends on the associated cation.

The primary problem with chloride in drinking water, apart from a contribution to the corrosivity of the water, is its effect on taste. The taste thresholds for the chloride anion depend on the associated cation and the taste thresholds for sodium, calcium and potassium chloride are 210, 222 and 310 mg/l, respectively.

Relatively high values of Chloride (>1000 mg/litre) are observed in few parts of the country. **Table 1** shows the state wise list of districts affected by high chloride water (>1000 mg/litre) and these areas are water quality hot spots from point of view of chloride.

Table-1: Districts Having Chloride Concentration more than 1000 mg/litre in Ground Water in India

Sr. No	State	Parts of district having Chloride > 1000 mg/litre
1.	Andhra Pradesh	E-Godavari, Prakasam, Nellore, Guntur, Mahabubnagar Nalgonda, Kadappa, Krishna, Khammam, Kurnool, Medak, Warangal, Srikakulam
2.	Delhi	North West, West, South West
3.	Gujarat	Ahmadabad, Amreli, Anand, Bharuch, Bhavnagar, Banaskantha, Dohad, Porbandar, Jamnagar, Junagadh, Kachchh, Mehsana, Patan, Panchmahals, Rajkot, Sabarkantha, Surendranagar, Surat, Vadodara,
4.	Haryana	Bhiwani, Gurgaon, Jhajjar, Mahendragarh, Rohtak, Sirsa, Sonipat
5.	Karnataka	Bagalkot, Belgaum, Bellary, Dharwar, Gadag, Gulbarga, Raichur
6.	Madhya Pradesh	Bhind, Ujjain
7.	Maharasthra	Ahmadnagar, Chandrapur, Jalna, Nagpur, Satara
8.	Orissa	Jagatsinghpur
9.	Punjab	Firozepur
10.	Rajasthan	Barmer, Bharatpur, Bikaner, Bundi, Churu, Chittaurgarh, Dausa, Ganganagar, Hanumangarh, Jaipur, Jaisalmer, Jalor, Jhunjhununn, Jodhpur, Karauli, Nagaur, Pali, Sirohi, Sawaimadhopur, Nagaur, Sikar, Tonk, Udaipur
11.	Tamil Nadu	Chennai,Cuddalore,Coibatore, Karur, Pudukkottai, Thoothukkudi, Ramanathapuram, Namakkal, Shivaganga, Salem, Thirunamalai, Tirunelveli, Tiruvarur, Thanjavur, Vellore, Virudhanagar,
12.	Uttar Pradesh	Aligarh, Agra, Hathras, Mathura
13.	West Bengal	Haora, N-24 Pargana, S-24 Parganas

Fluoride - Most of the fluoride found in groundwater is naturally occurring from the breakdown of rocks and soils or weathering and deposition of atmospheric particles. Most of the fluorides are sparingly soluble and are present in ground water in small amounts. The occurrence of fluoride in natural water is affected by the type of rocks, climatic conditions, nature of hydrogeological strata and time of contact between rock and the circulating ground water. Presence of other ions, particularly bicarbonate and calcium ions also affect the concentration of fluoride in ground water.

BIS has recommended an upper desirable limit of 1.0 mg/l of F^- as desirable concentration of fluoride in drinking water, which can be extended to 1.5 mg/l of F in case no alternative source of water is available. Water having fluoride concentration of more than 1.5 mg/l are not suitable for drinking purposes.

It is well known that small amounts of fluoride (less than 1.0 mg/l) have proven to be beneficial in reducing tooth decay. Community water supplies commonly are treated with NaF or fluorosilicates to maintain fluoride levels ranging from 0.8 to 1.2 ppm to reduce the incidence of *dental carries*.

However, high concentrations such as 1.5 mg/l of F and above have resulted in staining of tooth enamel while at still higher levels of fluoride ranging between 5.0 and 10 mg/l, further pathological changes such as stiffness of the back and difficulty in performing natural movements may take place.

Table 2: Districts Showing Localized Occurrence of Fluoride (>1.5mg/litre) in Ground Water in India

Sl. No.	State	Parts of Districts having F > 1.5mg/litre
1.	Andhra Pradesh	Adilabad, Anantpur, Chittoor, Guntur, Hyderabad, Karimnagar, Khammam, Krishna, Kurnool, Mahbubnagar, Medak, Nalgonda, Nellore, Prakasam, Ranga Reddy, Vizianagaram, Warangal, West Godavari, Visakhapatnam,
2.	Assam	Goalpara, Kamrup, Karbi Anglong, Nagaon,
3.	Bihar	Aurangabad, Banka, Buxar, Jamui, Kaimur (Bhabua), Munger, Nawada, Rohtas, Supaul
4.	Chhattisgarh	Bastar, Bilaspur, Dantewada, Janjgir-Champa, Jashpur, Kanker, Korba, Koriya, Mahasamund, Raipur, Rajnandgaon, Surguja
5.	Delhi	East Delhi, North West Delhi, South Delhi, South West Delhi, West Delhi
6.	Gujarat	Ahmadabad, Amreli, Anand, Banaskantha, Bharuch, Bhavnagar, Dohad, Junagadh, Kachchh, Mehsana, Narmada, Panchmahals, Patan, Rajkot, Sabarkantha, Surat, Surendranagar, Vadodara,
7.	Haryana	Bhiwani, Faridabad, Gurgaon, Hissar, Jhajjar, Jind, Kaithal, Kurushetra, Mahendragarh, Panipat, Rewari, Rohtak, Sirsa, Sonepat
8.	Jammu & Kashmir	Rajauri, Udhampur
9.	Jharkhand	Bokaro, Giridih, Godda, Gumla, Palamu, Ranchi
10.	Karnataka	Bagalkot, Bangalore, Belgaun, Bellary, Bidar, Bijapur, Chamarajanagar, Chikmagalur, Chitradurga, Davangere, Dharwad, Gadag, Gulburga, Haveri, Kolar, Koppal, Mandya, Mysore, Raichur, Tumkur
11.	Kerala	Palakkad
12.	Maharashtra	Amravati, Chandrapur, Dhule, Gadchiroli, Gondia, Jalna, Nagpur, Nanded
13.	Madhya Pradesh	Bhind, Chhatarpur, Chhindwara, Datia, Dewas, Dhar, Guna, Gwalior, Harda, Jabalpur, Jhabua, Khargaon, Mandsaur, Rajgarh, Satna, Seoni, Shajapur, Sheopur, Sidhi
14.	Orissa	Angul, Balasore, Bargarh, Bhadrak, Bandh, Cuttack, Deogarh, Dhenkanal, Jajpur, Keonjhar, Sonapur
15.	Punjab	Amritsar, Bhatinda, Faridkot, fatehgarh Sahib, Firozepur, Gurdaspur, Mansa, Moga, Muktsar, Patiala, Sangrur
16.	Rajasthan	Ajmer, Alwar, Banaswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittaurgarh, Churu, Dausa, Dhaulpur, Dungarpur, Ganganagar, Hanumangarh, Jaipur, Jaisalmer, Jalor, Jhunjhunun, Jodhpur, Karauli, Kota, Nagaur, Pali, Rajsamand, Sirohi, Sikar, Sawai Madhopur, Tonk, Udaipur
17.	Tamil Nadu	Coimbatore, Dharmapuri, Dindigul, Erode, Karur, Krishnagiri, Namakkal, Perambalur, Puddukotai, Ramanathapuram, Salem, Sivaganga, Theni, Thiruvannamalai, Tiruchirapally, Vellore, Virudhunagar
18.	Uttar Pradesh	Agra, Aligarh, Etah, Firozabad, Jaunpur, Kannauj, Mahamaya Nagar, Mainpuri, Mathura, Mau
19.	West Bengal	Bankura, Bardhaman, Birbhum, Dakshindinajpur, Malda, Nadia, Purulia, Uttardinajpur
Source: CGWB, March 2008		

Sulphate – Sulphate is usually soluble in water, it is occurred naturally in numerous minerals, including barite ($BaSO4$), epsomite ($MgSO4.7H2O$) and gypsum ($CaSO4.7H2O$). These dissolved minerals contribute to the mineral content of many drinking waters. Sulphate in environment by other sources are animal sewage, septic system, sewage by product of coal mining and industrial waste.

Sulphate is discharged into water from mine and smelting and from croft pulp and paper mills, textile mills and tanneries. Sodium, Potassium and Magnesium sulphates are all highly soluble in water, whereas calcium and Barium sulphate and many heavy metal sulphates are less soluble. Atmospheric Sulphur dioxide, formed by the combustion of fossil fuels and in metallurgical roasting processes may contribute to the sulphate content of surface waters. Sulphur trioxide produced by the photolytic or catalytic oxidation of Sulphur dioxide, combine with water vapour to from dilute sulphuric acid, which falls as "acid rain".

The major physiological effects results from the in gestation of large quantities of sulphate are catharsis, dehydration and gastrointestinal irritation. Water containing magnesium sulphate at level above 600 mg/l acts as a purgative in human.

According to BIS standard the concentration of sulphate in drinking water is desirable 200 mg/l and maximum permissible 400 mg/l.

Nitrate – The major source of nitrates in drinking water is from agricultural activity, household waste water, live stocks facilities and particularly the breakdown of plants materials in soil when there is no plant growth to take up the released nitrate. Excess fertilizer and wastes containing organic nitrogen first decompose to ammonia and then undergo oxidation to nitrate. Concentration of nitrate in surface water are usually less than about 18 mg/l but may be higher where there is agricultural run off or contamination with animal waste or sewage effluent.

Nitrate in ground water generally originates from nonpoint sources such as leaching of chemical fertilizers & animal manure, ground water pollution from septic and sewage discharges etc. It is difficult to identify the natural and man- made sources of nitrogen contamination of ground water. Some chemical and micro-biological processes such as nitrification and denitrification also influence the nitrate concentration in ground water.

As per the BIS Standard for drinking water the maximum desirable limit of Nitrate concentration in ground water is 45 mg/l with no relaxation. Though Nitrate is considered relatively non-toxic, a high nitrate concentration in drinking water is an environmental health concern arising from increased risks of matheomoglobinemia particularly to infants. Adults can tolerate little higher concentrations. The specified limits are not to be exceeded in public water supply. If the limit is exceeded, water is considered to be unfit for human consumption.

The impact of nitrate on health primarily relates to bottle – fed infants and is caused by the reduction of nitrate to nitrite in the body and subsequent oxidation of hemoglobin to methaemoglobin. This leads to a reduction in oxygen transport which manifests itself as blue – baby syndrome or methaemoglobinaemia when the proportion of methaemoglobin reach 10% to, compare to normal levels of < 1 to 3%. The problem seems to be confined to infants since older children appear to be much more resistant to the formation of methaemoglobin.

Bottle-fed infants under 3 months of age are particularly vulnerable to methaemoglobin formation for reasons:

a) A high intake of water in relation to body weight.
b) A high stomach pH allowing growth of bacteria which convert nitrate to nitrite.
c) Foetal haemoglobin which is present in first few months of life is more readily oxidized to methaemoglobin.
d) Deficiency of the enzymes which convert methamoglobin back to heamoglobin.

Table-3 shows the districts where nitrate has been found in excess of 45 mg/l in ground water.

Table 3: List of Districts Showing Localized Occurrence of Nitrate (>45 mg/litre) in Ground Water in Different States of India

Sl. No.	State	Parts of Districts having Nitrate > 45 mg/litre
1	Andra Pradesh	Adilabad, Anantpur, Chittoor, Cuddapah, East Godavari, Guntur Hyderabad, Karimnagar, Khammam, Krishna, Kurnool, Mahbubnagar, Medak, Nalgonda, Nellore, Nizamabad, Prakasam, Ranga Reddy, Srikakulam, Visakhapatnam, Vizianagaram, Warangal, West Godavari
2	Bihar	Aurangabad, Banka, Bhagalpur, Bhojpur, Kaimur (Bhabua), Patna, Rohtas, Saran, Siwan
3	Chattisgarh	Bastar, Bilaspur, Dantewada, Dhamtari, Jashpur, Kanker, Kawardha, Korba, Mahasamund, Raigarh, Raipur, Rajnandgaon
4	Delhi	Central Delhi, New Delhi, North Delhi, North West Delhi, South Delhi, South West Delhi, West Delhi
5	Goa	North Goa
6	Gujarat	Ahmadabad, Amreli, Anand, Banaskantha, Bharuch, Bhavnagar, Dohad, Jamnagar, Junagadh, Kachchh, Kheda, Mehsana, Narmada, Navsari, Panchmahals, Patan, Porbandar, Rajkot, Sabarkantha, Surat, Surendranagar, Vadodara,
7	Haryana	Ambala, Bhiwani, Faridabad, Fatehabad, Gurgaon, Hissar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonepat, Yamuna Nagar
8	Himachal Pradesh	Una
9	Jammu & Kashmir	Jammu, Kathua
10	Jharkhand	Chatra, Garhwa, Godda, Gumla, Lohardaga, Pakaur, Palamu, Paschimi Singhbhum, Purbi Singhbhum, Ranchi, Sahibganj
11	Karnataka	Bagalkot, Bangalore, Belgaum, Bellary, Bidar, Bijapur, Chikmagalur, Chitradurga, Davangere, Dharwad, Gadag, Gulburga, Hassan, Haveri, Kodagu, Kolar, Koppal, Mandya, Mysore, Raichur. Shimoga, Udupi, Uttara Kannada
12	Kerala	Alappuzha, Idukki, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur, Wayanad
13	Maharashtra	Ahmednagar, Akola, Amravati, Auragabad, Beed, Bhandara, Buldana, Chandrapur, Dhule, Gadchiroli, Gondia, Hingoli, Jalgaon, Jalna, Kohlapur, Latur, Nagpur, Nanded, Nandurbar, Nashik, Osmanabad, Parbhani, Pune, Sangli, Satara, Solapur, Wardha, Washim, Yavatmal
14	Madhya Pradesh	Anuppur, Ashok Nagar, Balaghat, Barwani, Betul, Bhind, Bhopal, Burhanpur, Chhatarpur, Chhindwara, Damoh, Datia, Dewas, Dhar, Gwalior, Harda, Hoshangabad, Indore, Jabalpur, Jhabua, Katni, Khandwa, Khargaon, Mandla, Mandsaur, Morena, Narsimhapur, Neemuch, Panna, Raisen, Rajgarh, Ratlam, Rewa, Sagar, Satna, Sehore, Seoni, Shahdol, Shajapur, Sheopur, Shivpuri, Sidhi, Tikamgarh, Ujjain, Umaria, Vidisha
15	Orissa	Angul, Balasore, Bargarh, Bhadrak, Bolangir, Baudh, Cuttack,

		Deogarh, Dhenkanal, Gajapati, Ganjam, J.Singhpur, Jajpur, Jharsuguda, Kalahandi, Kendrapara, Keonjhar, Khurda, Koraput, Malkangiri, Mayurbhanj, Nawapada, Nayagarh, Phulbani, Puri, Sambalpur, Sundergarh, Sonapur
16	Punjab	Amritsar, Bhathinda, Faridkot, Fatehgarh Sahib, Firozepur, Gurdaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Mansa, Moga, Muktsar, Nawan Shahr, Patiala, Rupnagar, Sangrur
17	Rajasthan	Ajmer, Alwar, Banaswara, Baran, Barmer, Bundi, Bharatpur, Bhilwara, Bikaner, Chittaurgarh, Churu, Dausa, Dhaulpur, Dungarpur, Ganganagar, Hanumangarh, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunun, Jodhpur, Karauli, Kota, Nagaur, Pali, Partapgarh, Rajsamand, Sirohi, Sikar, Sawai Madhopur, Tonk, Udaipur
18	Tamil Nadu	Chennai, Coimbatore, Cuddalore, Dharmapuri, Dindigul, Erode, Kancheepuram, Kanyakumari, Karur, Madurai, Namakkal, Nilgiris, Perambalur, Pudukkottai, Ramanathapuram, Salem, Sivaganga, Theni, Thiruvannamalai, Thanjavur, Tirunelveli, Thiruvallur, Trichi, Tuticorin, Vellore, Villupuram, Virudhunagar
19	Uttar Pradesh	Agra, Aligarh, Allahabad, Ambedkar Nagar, Auraiya, Badaun, Baghpat, Balrampur, Banda, Barabanki, Bareilly, Basti, Bijnor, Bulandshahr, Chitrakoot, Etah, Etawa, Fatehpur, Firozabad, GB Nagar, Ghaziabad, Ghazipur, Hamirpur, Hardoi, Jaunpur, Jhansi, Kannauj, Kanpur Dehat, Lakhimpur, Mahoba, Mathura, Meerut, Moradabad, Muzaffarnagar, Raebareli, Rampur, Sant Ravidas Nagar, Shahjahanpur, Sitapur, Sonbhadra, Sultanpur, Unnao
20	Uttarakhand	Dehradun, Hardwar, Udham singh nagar
21	West Bengal	Bankura, Bardhaman

Source: CGWB, March,2008

CONCLUSION -

Inorganic anions occur in drinking water as a consequence of dissolution from natural sources that is the drinking water tasty and useful humans and environment, but some of cases as a consequence of man's activities. The inorganic anions contaminated into drinking water as water pollutants There is insufficient scope here to discuss all of the different inorganic founds in drinking water.

These inorganic anions play a major role in the operation of drinking water supplies and impact on public health with environment, both positively and negatively.

The above discussion the concentration of chloride more than 1000 mg/l is more affect district in Andhra Pradesh, Gujrat, Rajasthan, and Tamil Nādu. In this way the fluoride in ground water more than 1.5 mg/l Andhra Pradesh, Gujrat, Karnataka, Madhya Pradesh, Rajasthan, Chhattisgarh, Haryana, Orissa, Maharashtra and Assam.

The concentration of nitrate and sulphate as pollutants of water increased in different area of India.

The difficulties which are encountered the need in many cases to study human population with all the attendant problems and their requirements increasing the industrialization and globalization to increase water pollutant as inorganic anions.

Inorganic anions will continue to be major importance as an integral part of or as contaminants in drinking water. There is a continuing need for research on their substances, many of which have been clearly demonstrated to both beneficial and adverse effect on human populations as drinking water.

REFERENCE -

1. "Ground water quality in shallow aquifers of India" Central ground water board ministry of water resources, Government of India, Faridabad 2010.
2. Spalding,R.F; Exner, M.E; "Occurrence of Nitrate in Groundwater – A review" J. Environ. Qual.,1993, 22:392-402.
3. Kumar, M; Puri, A; "A review of permissible limits of drinking water" India J. Occup. Environ med. 2012; 16(1): 40-44.
4. Guideline for Chloride in drinking-water quality, 2nd ed. Vol.2 Health criteria and other supporting information, WHO, Geneva, 2003.
5. Drinking Standards of BIS (IS: 10500:1991).
6. Sharice Fontenot, Sane Lee "The effects of chloride from waste water on the environment" oct. 9, 2013, University of Minnesota, Morris.
7. WHO 2014, Guideline for Drinking water quality, Fourth Edition, acceptability aspect: Taste, Odour and Appearance, WHO, Ganeva.
8. Fawell, J.k, "The impact of inorganic chemicals on water quality and heelth" Ann,1st.Super, Vol.29.n. 2(1993), p 293-303.
9. VICAIRE – Model 2 – chapter 2.
10. Health and Welfare Canada. 2011. Guideline for Canadian drinking water quality, Department of Nation Health and welfare, Ottawa.
11. Craun, G.F,Greathouse, D.G and Gunderson, D.H, 1981, Methemoglobin levels in Young children consuming high nitrate well water in the United states, Int.J. Epidatial.10:309-317.
12. USEPA 1987. Estimated National Occurance exposure to nitrate and in public drinking water supplies, USEPA, office of drinking water, Washington.
13. Guideline for Sulphate in drinking water quality, WHO/SDE/WSE/03.04/03.
14. Chemical analysis of drinking water, www.aurovilli.info.
15. ICMR. Manual of standards quality for drinking water supplies, New Delhi.1975.
16. Perween,S; Fatima,U." Study of groundwater quality by the assessment of physic-chemical parameters and water quality index in Aligarh, Uttar Pradesh" J. of Chem. And Pharm. Research,2015, 7(5):761-77