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Assessment of nitrate contamination of the groundwater samples in Bhiloda Taluka of Sabarkantha district, Gujarat

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Abstract

Nitrate contamination of 447 ground water samples (three seasons) of 100 villages from Bhiloda taluka of sabarkantha district of Gujarat was determined in 2008-09. 12 source of 12 villages were found to have Nitrate contamination more than 100mg/l in summer 2008 and monsoon 2008 and 13 source of 13 villages were found to have Nitrate contamination more than 100mg/l in winter 2009. Which is maximum desirable limit of drinking water standard Is, 10500, 1999. In these villages there is maximum possibility of Methamoglobinemia or Blue baby disease.

Key-Words: Nitrate contamination, Methamoglobinemia, Blue baby disease

Introduction

The most important source of the nitrate is biological oxidation of organic nitrogenous substance which come in sewage and industrial wastes or produced indigenously in the waters. Domestic sewage contains very high amounts of nitrogenous compounds.Run-off from agricultural fields is also high in nitrate. High amounts of nitrate are generally indicative of sewage pollution. Nitrate levels when exceeds 100mg/l, are of prime concern because of, Methamoglobinemia, also called Blue baby disease. This disease causes the skin to become blue due to decreased efficiency of haemoglobin to combine with oxygen. In cattle, the high concentration of nitrates is reported to cause more mortality in pigs & calves and abortion in brood animals. Beneficial effect of nitrate on crop production has been reported specially in brackish waters. The presence of K&No3 ions in appreciable amounts has been found to partially counteract the effect of salinity and sodium hazards of irrigation on crop growth.

The nitrate ion (NO3-) is the common form of combined nitrogen found in natural waters. It may be biochemically reduced to nitrite (NO2-) by denitrification processes,usually under anaerobic conditions. The nitrite ion is rapidly oxidised to nitrate. Natural sources of nitrate to surface waters include igneous rocks, land drainage and plant and animal debris. Nitrate is an essential nutrient for aquatic plants and seasonal fluctuations can be caused by plant growth and decay.

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Natural concentrations, which seldom exceed 0.1 mg l-1 NO3-N, may be enhanced by municipal and industrial wastewaters, including leachates from waste disposal sites and sanitary landfills. In rural and suburban areas, the use of inorganic nitrate fertilizers can be a significant source. When influenced by human activities, surface waters can have nitrate concentrations up to 5 mg/l NO3-N, but often less than 1 mg/l NO3-N. Concentrations in excess of 5 mg/ l NO3-N usually indicate pollution by human or animal waste, or fertiliser run-off. In cases of extreme pollution, concentrations may reach 200 mg/ l NO3-N. The World Health Organization (WHO) recommended maximum limit for NO3- in drinking water is 50 mg/l and waters with higher concentrations can represent a significant health risk. In lakes, concentrations of nitrate in excess of 0.2 mg/ l NO3-N tend to stimulate algal growth and indicate possible eutrophic conditions.

Nitrate occurs naturally in groundwaters as a result of soil leaching but in areas of high nitrogen fertilizer application it may reach very high concentrations (~500 mg/ l NO3-N). In some areas, sharp increases in nitrate concentrations in groundwater's over the last 20 or 30 years have been related to increased fertilizer applications, especially in many of the traditional agricultural regions of Europe (Hagebro *et al.,* 1983; Roberts and Marsh, 1987). Increased fertilizer application is not, however, the only source of nitrate leaching to groundwater. Nitrate leaching from unfertilized grassland or natural vegetation is normally minimal, although soils in such areas contain sufficient organic matter to be a large potential source of nitrate

(due to the activity of nitrifying bacteria in the soil). On clearing and ploughing for cultivation, the increased soil aeration that occurs enhances the action of nitrifying bacteria, and the production of soil nitrate.

Material and Methods

Ground water samples of 100 villages located in Bhiloda taluka of Sabarkantha district were collected in precleaned polythyne bottles with necessary precautions[Trivedy&Goel,1984].The samples were brought to the laboratory and nitrate concentration was determined by phenol disulphonic acid method[Trivedy & Goel,1984].

Results and Discussion

Nitrate concentration in Ground water samples of 447 sources of 100 villages of Bhiloda taluka was examined.The source code was concentration of nitrate is shown in fig.1.All the villages as well as sources were categorized according to following concentration range:

1. CategoryI: Nitrate concentration below 50 mg/l
2. CategoryII: Nitrate concentration from 51 to 100mg/l
3. CategoryIII: Nitrate concentration from 101 to150mg/l
4. Category Iv: Nitrate concentration from 151 to200mg/l
5. Category v: Nitrate concentration from 201 to250mg/l
6. Category vI: Nitrate concentration from 251 to300mg/l

From 447 sources, 373 sources [category-I] were found to have nitrate concentration below 50 mg/l. 41 sources [category II] were found to have nitrate concentration from 51 to 100mg/l. 27 sources [category III] were found to have nitrate concentration from 101 to 150mg/l. 3 source [category Iv] were found to have nitrate concentration from 151 to 200mg/l. 1 source [category v] were found to have nitrate concentration from 201 to 250mg/l. 2 source [category,vI] were found to have nitrate concentration from 251 to300mg/l.From category III to vI were found to have nitrate concentration more than 100mg/l.In this villages there is maximum possibility of Methamoglobinemia or Blue baby disease.

Conclusion

Result shows the high concentrations of nitrate in some villages.Nitrate are one of the important parameters since it is directly related with flora& fauna. It affects the human being by causing Methamoglobinemia or Blue baby disease.

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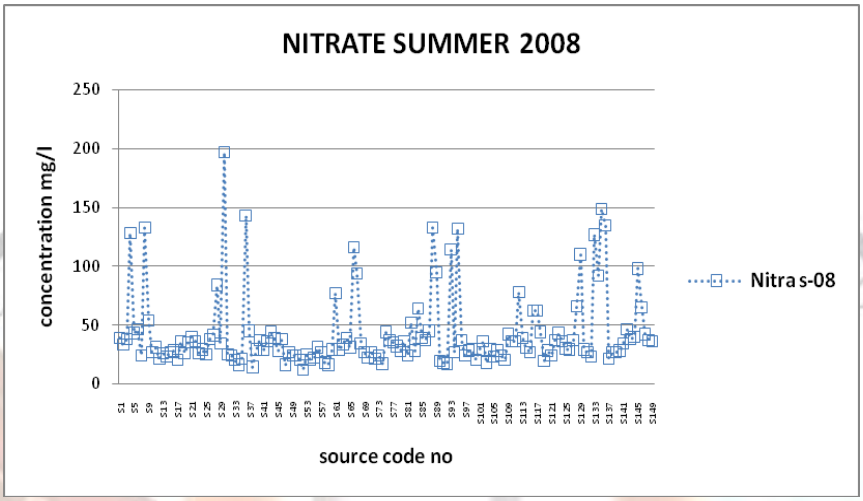
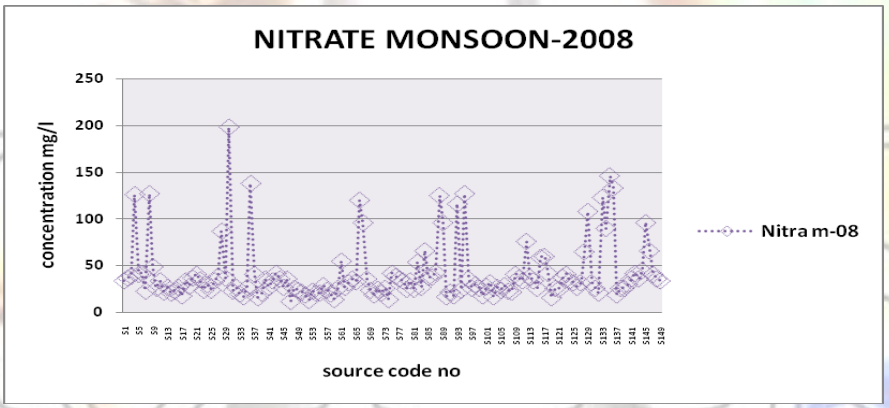


Graph no -1



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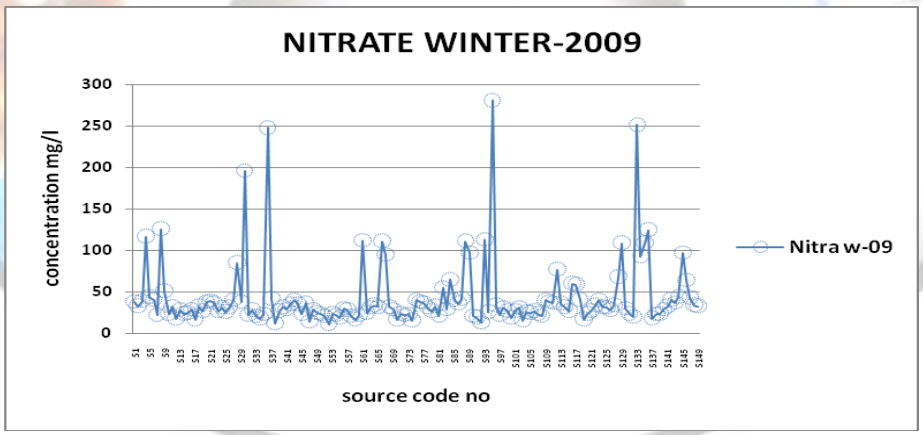

Graph no -3


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