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MEASUREMENT OF NITRATE FROM DRINKING AND IRRIGATION WATER BY CHEMICAL METHODS

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ABSTRACT

In the present investigation an attempt has been made to examine the water quality of various potable water sources of drinking and irrigation water of Modasa Taluka, North Gujarat. Some physico - chemical parameters of ground water have been studied. Nitrate was estimated by using standard methods reported earlier. BIS (Bureau of Indian Standard) has recommended a desirable limit of Nitrate is 45 mg/L as the safe limit. Four samples were showed the amount of nitrate very high whereas three samples were showed the amount of nitrate very low.

KEYWORDS : Drinking and Irrigation Water, Nitrate, Chemical Activation, Physico Chemical

Nitrate is relatively non toxic but it can be reduced to nitrite in gastrointestinal tract by bacteria which is toxic. It absorbs in blood and reacts with heamoglobin leading to a diseases methaemoglobinaemia (blue baby syndrome). Methemoglobin does not act as oxygen carrier leads to cyanosis and hypoxia (US National research council, 1995), nitrate reacts with gastric juice to form nitrosamines and these nitrosamines are responsible for carcinoma (WHO, 1996). The guideline value for nitrate of 50 mg/litre as nitrate is based on epidemiological evidence for methaemoglobinaemia in infants, which results from short-term exposure and is protective for bottle-fed infants and, consequently, other parts of the population. Several nitrogen compounds including ammonia, nitrites and nitrates have been frequently present in drinking water and various types of agricultural, domestic and industrial wastewater (Ozturk and Bektas, 2004). specially nitrates can cause severe problems, ncluding eutrophication and infection diseases, such as cyanosis and cancer of the alimentary canal (Wang et al., 2007).

Traditional methods for removal of nitrates from water include two main groups of treatment processes: biological and physicochemical. Biological denitrification is an ecofriendly and costeffective method by which facultative anaerobic denitrifying bacteria reduce nitrate or nitrite into harmless nitrogen gas in the absence of oxygen. The biological denitrification process is slow, particularly for industrial wastewater containing high concentrations of nitrate and for low temperatures. The most conventional physico-chemical processes for nitrate removal are ion exchange, reverse osmosis, electrodialysis and adsorption (Chatterjee and Woo, 2009). Activated carbon produced from environmental waste with high carbon content is the most important material to clean environmental pollution (gases and liquid impurities). Environmental wastes are very important starting materials for preparing activated carbon. Various polymeric wastes, based on petroleum, agriculture by-product (ligno-cellulosic) and coals are commonly used as a starting material for preparing activated carbon (Bassar, 2006).

In recent years, there has been considerable research concerning the preparation of low-cost activated carbon from agricultural wastes such as coconut shell, corn cob, hazelnut bagasse, palm shell, rice husk, cherry stone and apricot stones (Azevedo, 2007, Chang et al., 2000. Sugar beet production and sugar industry have a very significant role in Turkey's agriculture industry. In Turkey, 13,000,000 tonnes of sugar beet were produced in 2007 (Turkish Statistical Institute, Turkstat, 2008). Sugar beet bagasse is the by-product of sugar production and large quantities of bagasse are obtained after sugar production. In this study, activated carbons were produced from sugar beet bagasse by chemical activation. The effects of impregnation ratio and activation temperature on activated carbon production were investigated (Bhatnagar et al., 2008, BIS (Bureau of Indian Standards), 1991). The produced activated carbons were used to remove nitrate from aqueous solutions by adsorption.

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This present study searches measurement of nitrate from drinking and irrigation water by chemical methods and new technology for the removal of nitrate from contaminated water due to adsorption based on binding capacities of sodium and calcium presented in lemon leaf, neem leaf .

MATERIALS AND METHODS

Chemicals and Reagents

Brucine-sufanilic acid solution: Dissolve 1 g brucine sulphate and 0.1 g of sulfanilic acid in about 70 ml of hot distilled water. After addition of 3 ml conc. HCL make up the volume to 100 ml. The pink colour develops slowly does not affect the sensitivity. Sulphuric acid solution: Add 500 ml conc. H_2SO_4 in 125 ml distilled water and cool. Sodium chloride solution: Dissolve 300g NaCl in distilled water and cool.

Sodium arsenite solution: Dissolve 0.722 g of KNO_3 in distilled water and make up the volume to 1 litre. This solution contains 100 mg N/1. Dilute it to 100 times to prepare a solution having 1 mg N/1. Dilute it to 100 times to prepare a solution having 1 mg N/1 (10 1000 ml.)

Procedure

Free chlorine interfaces with the nitrate determination. If the sample is having residual chlorine, remove it by addition of 0.05 ml (one drop) of sodium arsenite solution for each 0.1 mg of chlorine. Add one drop in excess to a 50 ml sample portion. Take 10 ml of sample portion. Put all the tubes in a wire rack. Place the rack in cool water bath and add 2 ml of NaCl solution. Add 10 ml of H_2SO_4 solution after mixing the contents thoroughly swirling by hand. Add 0.5 ml brucine reagent and mix thoroughly. Place the rack in a hot water bath with boiling water exactly for 20 minutes. Cool the contents again in a cold water bath and take the reading the reading at 410 nm. Find out the concentration of NO_3 from the standard curve. Prepare a standard curve between concentration and absorbance by taking the dilutions from 0.1 to 1.0 mg N/1 at the interval of 0.1, employing the same procedures as for the sample.

Calculation

1. mg of N per L = mg N from standard curve × 1000 / ml of sample

2 mg/L nitrate =mg of N/L × 4.43

RESULTS AND DISCUSSION

Measurement of nitrate in drinking water of Modasa Taluka (North Gujarat).

Water samples were collected from different villages of Modasa Taluka, Sabar-khantha district, North Gujarat and then analyzed by the standard methods reported earlier. The results obtained are graphically represented in figure 1, 2a, 2b, 3a, 3b, 4a and 4b.

Nitrate in Water of Modasa Taluka

BIS (Bureau of Indian Standard) has recommended a desirable limit of Nitrate is 45 mg/L. Indian drinking water quality standards states that a value of 45 mg/L of nitrate is considered as the safe limit. The higher concentration of nitrate can cause methaemoglobinemia, gastric cancer and birth defects(IS: Indian standards 1983).

The highest concentration of Nitrate was recorded 199.86 mg / L in drinking water, 198.8mg/L in irrigation water and 230.36 mg / L in drinking water in the

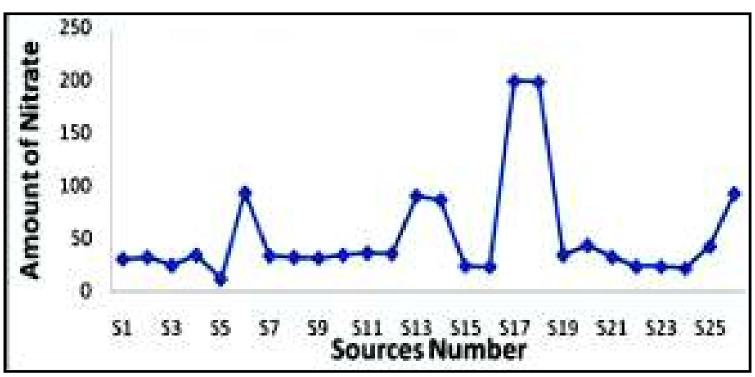

Figure 1 : Nitrate of East-Zone, Modasa Taluka Acknowledgement

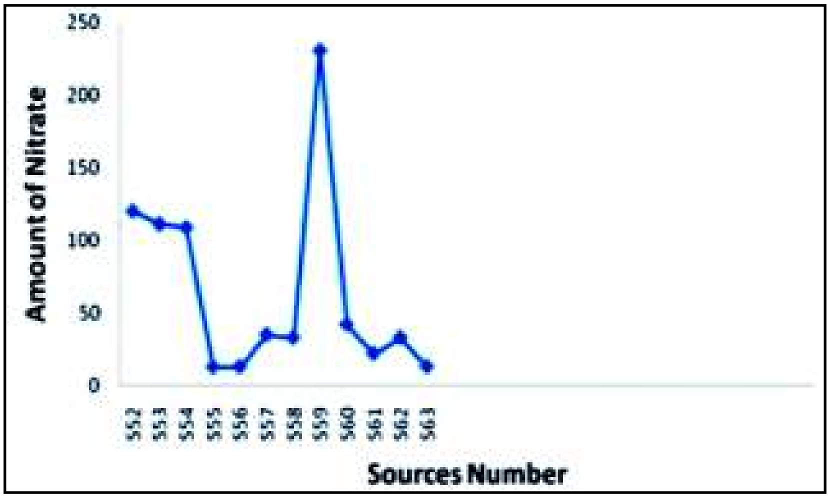

Figure 2a : Nitrate of West-Zone, Modasa Taluka

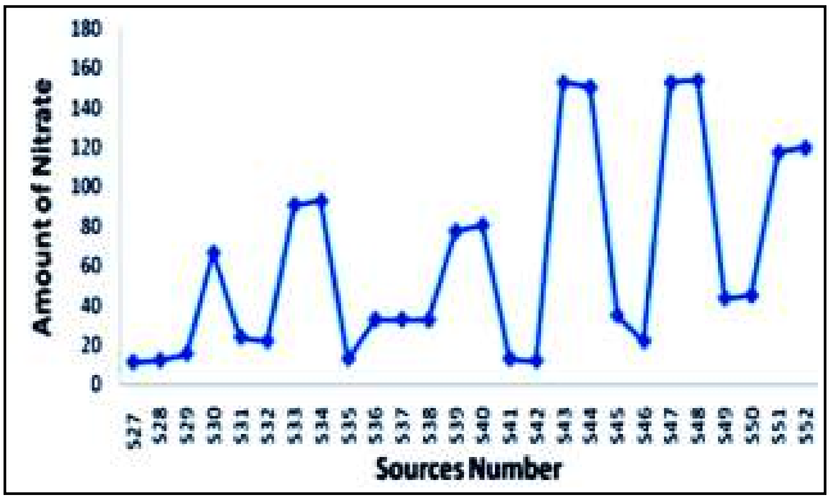

Figure 2b : Nitrate of West-Zone, Modasa Taluka

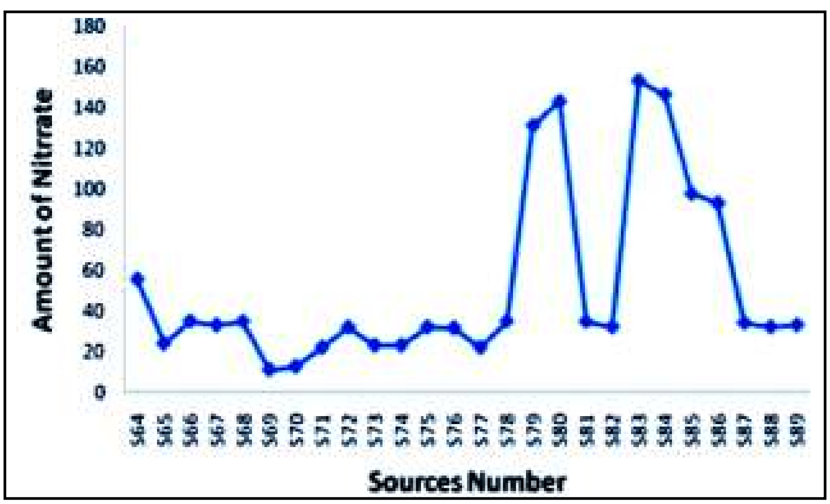

Figure 3a : Nitrate of North-Zone, Modasa Taluka

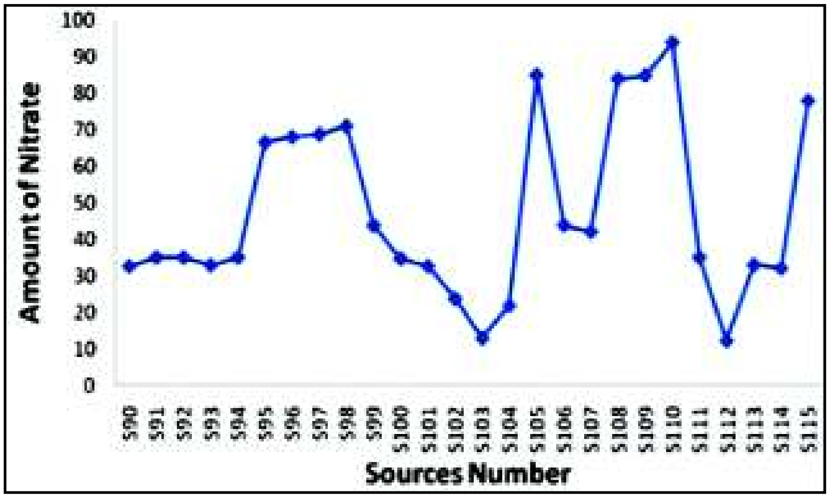

Figure 3b : Nitrate of North-Zone,Modasa Taluka

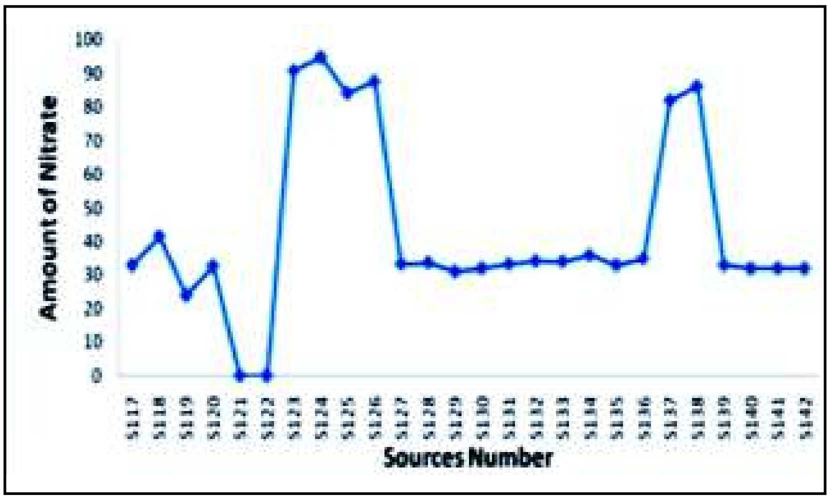

Figure 4a : Nitrate of South-Zone, Modasa Taluka

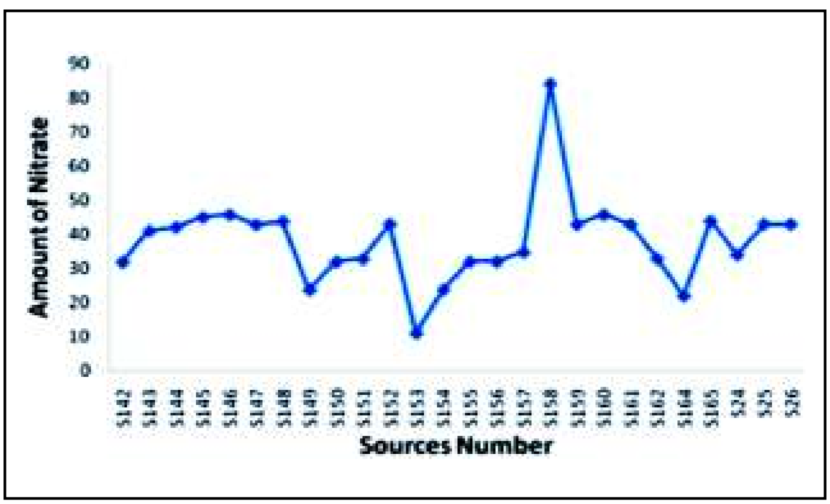

Figure 4b : Nitrate of South-Zone,Modasa Taluka

year 2007-08. The lowest concentration of Nitrate was recorded 0.0 mg / L, 11.0 mg / L and 12.8 mg / L in drinking water whereas 0.0 mg / L in irrigation water in the year 2007-08.

CONCLUSION

In the present study an attempt has been made to examine the water quality of various potable water sources of drinking and irrigation water of Modasa Taluka, North Gujarat. Some physico chemical parameters of ground water have been studied. Nitrate was estimated by using standard methods reported earlier. BIS (Bureau of Indian Standard) has recommended a desirable limit of Nitrate is 45 mg/L as the safe limit.

Here four samples were found the amount of nitrate very high 199.86 mg / L in drinking water, 198.8mg/L in irrigation water and 230.36 mg / L in drinking water whereas three samples were showed the amount of nitrate very low 0.0 mg / L, 11.0 mg / L and 12.8 mg / L in drinking water whereas 0.0 mg / L in irrigation water.

The major advantages of this study, nitrate adsorption by neem leaf powder, lemon leaf powder could be possible. Activated carbon and chemically treated lemon leaf powder also include low cost, high efficiency and minimization of nitrate contaminated water.

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