# NITRATE CONTAMINATION IN DRINKING WATER AROUND THE VILLAGES OF KALI EAST RIVER, MEERUT U.P., INDIA

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**Abstract:** Nitrate contaminations in drinking water were measured around the villages of Kali east river of Meerut district. The results indicate a large variation of nitrate from 2.5 mg/l-80 mg/l. In this study 32 sample were collected for the study and found about 21.85% high nitrate contents (>50 mg/l), which is more than the permissible limit in drinking water. The study indicates that ground water of villages near Kali east river is more polluted. The possible source for the high nitrate level in ground water were identified as excessive utilization of nitrogenous fertilizers for agricultural purposes and effluent from different industries, sewerage of city and villages are dumped in to kali east river without any treatment which pollute the river and ground water resources.

**Key words:** Nitrate pollution, Ground water, Kali east river, Meerut, India.

## INTRODUCTION

It is true that the majority of sources of ground water contamination are of human origin However; contamination may also have a natural origin. Nitrate is the most common chemical contaminant in the world's ground water aquifers (Spalding and Exner 1993). High nitrate concentration (>50 mg/l) in ground water would normally indicate pollution of ground water. The U.S. environmental protection agency (EPA), maximum contaminant level (MLC) for nitrate in drinking water of 10 mg/l, nitrate-nitrogen (nitrate-N) equivalent to 45 mg/l as nitrate and the World Health Organization (WHO, 1993 and 2004) standard was originally set at 45 mg/l nitrate has been adjusted to 50 mg/l. The excess of nitrate in ground water is harmful to health. Fertilizer is the largest contributor to anthropogenic nitrogen world wide, other major source include septic tank, poor dug wells defective sewerage systems, animal and human wastes are the suspected major source of nitrate in ground water system (Lindsay,1997 Field 2004)(Spalding and Exner 1993).

It is reported that the nitrate are consumed more than the permissible limit (>50 mg/l). It may create serious health problem. The health implications of exposure to nitrate in drinking water were first reported in the scientific literature by commonly in 1945 after observing cyanosis in infants in Iowa, more recent evaluation of the health implications of nitrates in drinking water have examined reproductive and developmental effects(Arpuckle *et al*. 1986, 1988; Dorsch *et al*. 1984, Fan *et al*. 1987, Cilperin *et al*. 1975, Super *et al*. 1981 and Tabacova *et al*. 1997, 1998).Nitrate toxicity from water is most likely to occur when livestock drink water from pond, road ditches or other surface impression that collect drainage from poultry houses, feed lots, heavily fertilized field, septic tank or manure disposal lagoons.

The study area around the villages of kali east river is very fertile for the agricultural point of view. Tubewell and hand pump are the major source of drinking water in the villages. As a part of research work particularly drinking water, 32 water samples were collected from different villages around the kali east river and analyzed in laboratory. The purpose of these work to study the nitrate contamination in drinking water around the villages of kali east river, possible source of nitrate pollutants for the protection of ground water quality around the villages of Kali east river.

## MATERIALS AND METHODS

Meerut is situated at latitude of 29º N and longitude of 77.10 E with an elevation of about 222.0 meters above the mean sea level. Meerut region have a typical climate of semi and with extremes of weather conditions. The river kali east originates from the Antwara, district Muzaffar Nagar after covering a distance of 300 Km. in Uttar Pradesh, it emerges in to the India most popular Ganga River. A larze number of district such as Meerut, Ghaziabad, Bulandshahr, and Kannauj are near located to kali east river.

### Ground Water Sampling

A total of 32 ground water samples from different urban areas and villages were collected seasonally from in the month of April. In order to remove any stagnant water in hand pump, samples were collected after a pumping time of about 20 minutes until the electrical conductivity (EC) and pH value had stabilized. The depths of the water samples different villages are 100-140 feet and water samples were collected in double stopper 100 ml polythene bottle. All water samples were kept at 40 C and the analysis performed with in a weak. The location of sampling points is shown in table -1.

## METHEDOLOGY

Nitrate analyzer was used to measure the nitrate concentration in drinking water. For the measurement of pH, pH meter was used and to estimate the electric conductivity (EC), EC meter was used

**Table 1.**- Sample collected from different villages around the Kali east river, Meerut.

| S.No. | Location | Type of well. | Depth of well | Nitrate | pH | Ec |
|---|---|---|---|---|---|---|
| 1. | Satguru Nagar | H.P. | 120 feet | 20.0 | 7.60 | 780 |
| 2. | Nagali | H.P. | 130 feet | 10.0 | 7.90 | 590 |
| 3. | Mehalka | H.P. | 120 feet | 40.0 | 7.70 | 630 |
| 4. | Kheri | H.P. | 142 feet | 10.0 | 7.90 | 630 |
| 5. | Mohammadpur | H.P. | 140 feet | 12.0 | 8.50 | 765 |
| 6. | Daurala | H.P. | 140 feet | 10.0 | 7.85 | 730 |
| 7. | Iklauta | H.P. | 120 feet | 68.0 | 7.80 | 700 |
| 8. | Dhanju | H.P. | 110 feet | 70.0 | 8.60 | 930 |
| 9. | Ajohata | H.P. | 100 feet | 15.4 | 7.70 | 970 |
| 10. | Dedwa | H.P. | 140 feet | 7.4 | 8.20 | 780 |
| 11. | Jalalpur | H.P. | 110 feet | 9.4 | 8.50 | 1030 |
| 12. | Jalalpur | H.P. | 120 feet | 7.4 | 8.20 | 1030 |
| 13. | Uldaypu r | H.P. | 90 feet | 15.0 | 8.30 | 1050 |
| 14. | Uldaypur | H.P. | 110 feet | 12.0 | 8.20 | 1040 |
| 15. | Maithna | H.P. | 140 feet | 5.7 | 8.30 | 680 |
| 16. | Khanauda | H.P. | 110 feet | 2.5 | 8.25 | 1020 |
| 17. | Chalera | H.P. | 120 feet | 60.0 | 7.80 | 540 |
| 18. | Auragabad | H.P. | 120 feet | 4.50 | 8.00 | 550 |
| 19. | Saini | H.P. | 140 feet | 4.20 | 8.10 | 720 |
| 20. | Aurangabad | H.P. | 120 feet | 3.40 | 7.95 | 540 |
| 21. | Rali | H.P. | 120 feet | 4.50 | 7.7 | 750 |
| 22. | Geshupur | H.P. | 110 feet | 60.0 | 7.80 | 1470 |
| 23. | Kajipur | H.P. | 110 feet | 30.0 | 8.00 | 970 |
| 24. | Gokalpur | H.P. | 120 feet | 25.0 | 7.80 | 980 |
| 25. | JaiBhim Nagar | H.P. | 110 feet | 5.50 | 7.90 | 1980 |
| 26. | JaiBhim Nagar | H.P. | 140 feet | 2.50 | 7.80 | 1820 |
| 27. | Alipur | H.P. | 120 feet | 80.0 | 7.80 | 3480 |
| 28. | Kohal | H.P. | 140 feet | 2.50 | 7.80 | 816 |
| 29. | Ataria | H.P. | 120 feet | 60.0 | 8.20 | 1200 |
| 30. | Itola | H.P. | 110 feet | 66.0 | 8.40 | 780 |
| 31. | Ajarara | H.P. | 120 feet | 17.80 | 8.30 | 760 |
| 32. | Kudha | H.P. | 110 feet | 10.50 | 8.20 | 790 |

## RESULTS AND DISCUSSION

Nitrate concentration in ground water in the study area ranged between 2.50 mg/l to 80.0 mg/l. The nitrate concentration in different ranges, classification this water sample in to three categories and shown in table-1 This table shows that 43.75% villages nearest to kali east river are up to 0- 10 mg/l., followed by 21.85% samples were recorded up to 11.0- 45mg/l of nitrate in drinking water. However, the maximum limit of nitrate concentration 28.12% were recorded up to 46-80 mg/l nitrate concentration in ground water around the villages of kali east river, which were not permissible limit. It seems to be at a high pollution level and the water can be used other than drinking purpose. The table indicates that the villages i.e. Iklauta, Dhanju, Geshupur, Alipur, Ataria, Itola are indicate high concentration of nitrate, which may be due to rise of highly nitrogenous fertilizer live sock residues (Liquid and semi liquid manure), leaching towards the subsoil through the rainfall or irrigation. This problem has been reported by different researcher (Hammer, 1986, Vrba and Romijn 1986, Dudley, 1990, Bacci et al. 1994,Rivers et al. 1996, Carter 1997, Nolan 1998, Smit et al. 1999, and Zaporazec 2004) pH varies from 7.60 to 8.50 it indicates that ground water is mildly alkaline.

During the course of investigation, different industries effluents, sewerages lines from cities and villages around which are dumped in to kali east river without any treatment which polluted the river and ground water resources, another reason of that the area around the kali east river is very fertile which is very much favorable for the cultivation of sugarcane, paddy, potato and wheat. The inorganic nitrogen fertilizers are raised to increase the growth rate of this agriculture production (Bhatnagar and Singh 2002 and Singh et al. 2004).

The commonly inorganic fertilizers, which are widely used in this area are urea, DAP, the nitrogen content in these fertilizers is high and varies from 18-46%. These fertilizers are soluble in water and easily release nitrogenous mass (Burt et al. 1993). A generally held view is that nitrogen in aquifers occurs mainly as nitrate on the basis that ammunification and nitrification occurs in unsaturated sediments above aquifers and that nitrate is sufficiently mobile in soils to be transported to aquifers in quantity (Koram 1992 and Bouwman et al. 2005.). By the personal communication to the habitats, it is observed that high of fertilizers are being used around the villages of kali east river.

## CONCLUSION

On the basis of the study, it may be concluded that the high level of nitrate in ground water due to excessive use of nitrogenous fertilizer, effluents from various industries, sewerage of city and rural area are dumped in to kali east river with out any treatment. People use water for drinking purpose mostly from hand pump As results, contamination of water effect a large number of people.

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