STUDY ON SOME SOURCES OF NITRATE POLLUTION IN WATER USING NITROGEN-15 ISOTOPE TECHNIQUE

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بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلِ اعْمَلُوا فَسَيَرَى اللهُ
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

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Abstract

STUDY ON SOME SOURCES OF NITRATE POLLUTION IN WATER USING NITROGEN -15 ISOTOPE TECHNIQUE

By

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FACULTY OF GIRLS AIN SHAMS UNIVERSITY, 2005

The aim of this thesis is to establish the effectiveness and applicability of using nitrogen isotope analysis method combined with environmental isotopes and hydrochemical techniques to help tracing sources and fate of nitrate contamination found in surface and groundwater at the north-eastern part of Cairo.

The study area is bounded by latitudes 30^{o} $8^{\backslash}$ $24^{\backslash\backslash}$ - 30^{o} $15^{\backslash}$ $00^{\backslash\backslash}$ N and longitudes 31^{o} $17^{\backslash}$ $30^{\backslash\backslash}$ - 31^{o} $26^{\backslash}$ $24^{\backslash\backslash}$ E. It is cultivated land and dense populated area. About 50 surface and groundwater samples as well as 15 surface soil samples were collected from the study area beside the principal nitrate sources that are likely to impact groundwater quality.

Surface and groundwater samples were found to suffer from high TDS, nitrate, phosphate, trace elements contents especially at the north-eastern part and at the southern part of the study area. Soil samples show increased trace elements and total nitrogen contents due to prolonging sewage water irrigation since 1915 especially at El- Gabal El-Asfar farm and at the northern part of the study area.

Results of environmental isotopes of $\delta^{18}O$ and $\delta^{2}H$ for groundwater samples mainly reflect the value of Nile water. Most of them are enriched than that of Nile River due to recycling of water used for irrigation. Others are depleted and could be attributed to mixing with Nile water, infiltrated before the construction of Aswan High Dam, having more depleted isotopic content than the present Nile water.

The nitrogen-isotope analyses of nitrate in water samples indicate that the source yielding lower nitrate concentrations could be commercial fertilizers or nitrifying soil organic nitrogen which is more pronounced at the western part. In the north-eastern part other sources being responsible for the higher nitrate concentrations appears to be mixing with sewage or manure and ammonium phosphate fertilizer. This mixing process has a major effect in lowering the $\delta^{15}N$ value of nitrate in this part.

At the southern part of the study area. The denitrification process is controlling nitrate levels where the loss of NO_3^- can result in a marked enrichment in the $\delta^{15}N$ content of the remaining NO_3^-.

One sample represents a contribution from a local source of human activity such as septic tanks located at the north-eastern part of the study area.

The $\delta^{15}N$ results included a wide range of values, which suggested different nitrogen sources in different parts of the study area. Nitrogen isotope technique offers a direct means of source identification because different sources of nitrate often have isotopically distinct nitrogen isotopic composition.

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