



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

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلْ اَعْمَلُوا فَسَيَرَى اللَّهُ
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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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 $30^{\circ} 8' 24''$ - $30^{\circ} 15' 00''$ N and longitudes $31^{\circ} 17' 30''$ - $31^{\circ} 26' 24''$ 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 $\delta^{18}\text{O}$ and $\delta^2\text{H}$ 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 $\delta^{15}\text{N}$ 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 $\delta^{15}\text{N}$ 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 $\delta^{15}\text{N}$ 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.

List of Contents

	Page
List of Tables-----	V
List of Figures-----	VII
List of Symbols and Abbreviations-----	XI
Acknowledgments-----	XII
Abstract-----	XIV

CHAPTER (1) INTRODUCTION AND REVIEW OF LITERATURE

1.1	Introduction-----	1
1.2	Nitrates and human health-----	3
1.3	Sources of Nitrate in Groundwater-----	4
1.4	Scope of the Work-----	6
1.5	Location and Description of the Study Area--	8
1.6	Methodology and Techniques-----	8
1.7	Sampling Techniques-----	11
1.8	Literature Review and previous Work-----	12

CHAPTER (2) GEOLOGICAL HYDRO-GEOLOGICAL SETTING

2.1	Introduction-----	22
2.2	Geological Setting-----	22
	2.2.1 Geo-morphological aspects-----	22
	2.2.2 Stratigraphic succession-----	24
	a- Quaternary deposits-----	27
	b- Tertiary deposits-----	27
	2.2.3 Geologic Structure-----	29
2.3	Hydro-geological Setting-----	29

	Page
2.3.1 Groundwater conditions-----	30
2.3.2. Aquifer types and extensions-----	30
a- Upper aquifer-----	31
b- Lower aquifer-----	31
2.3.3 Groundwater flow and fluxes-----	32
2.3.4 Recharge and Discharge-----	33

CHAPTER (3)

HYDROCHEMISTRY AND WATER QUALITY

3.1	Introduction-----	34
3.2	Major inorganic constituents of water-----	35
3.3	Results and discussion-----	36
	3.3.1 Total Dissolved Solid (TDS)-----	42
	3.3.2 Major Ion Distribution-----	43
	3.3.3 Hydrochemical formula and water type--	56
	3.3.4 Ion Ratios-----	59
	3.3.5 Graphical presentation of the Hydrochemical Data-----	65
	a- Bar Graph and Hypothetical Salt Combinations-----	65
	b- Trilinear Diagram (Piper Diagram)----	69
	c- Sulin Diagram-----	70
3.4	Water quality-----	73
	3.4.1 Water quality for drinking purposes-----	73
	3.4.2 Water quality for domestic purposes-----	75
	3.4.3 Water quality for Agricultural purpose--	78
	a- Total Dissolved Solids (TDS)-----	78
	b- Sodium Adsorption Ratio (SAR)-----	79
	c- Percentage Sodium (Na %)------	81
	d- Residual Sodium Carbonate (RSC)-----	82
	3.4.4 Water quality for Industrial purposes----	84

	Page
3.5 Environmental Sources of Pollution-----	85
3.5.1 Nutrients-----	85
a- Nitrogen Compounds-----	85
b- Phosphorus Compounds-----	87
3.5.2 Trace elements-----	89

CHAPTER (4)

ASSESSMENT OF SOIL POLLUTION

4.1 Introduction-----	112
4.2 Methods of Soil Chemical Analysis-----	114
4.2.1 Measurements of Major Ions-----	114
4.2.2 Measurements of Heavy Metals-----	115
4.2.3 Measurement of Inorganic Nitrogen-----	115
a- Extraction of ammonium and nitrate---	115
b- Separation of ammonium and nitrate in water and soil extracts (Vacuum Distillation Method)-----	116
4.2.4 Determination of Total Nitrogen by Kjeldahl Method-----	118
4.3 Results and Discussion-----	120

CHAPTER (5)

ENVIRONMENTAL ISOTOPES IN HYDROGEOLOGY

5.1 Introduction-----	132
5.2 Main Environmental Isotopes-----	132
5.2.1 Stable Isotopes in Meteoric Waters-----	136
5.2.2 Stable Isotopes in Groundwater-----	137
5.2.3 Tritium in the Hydrological Cycle-----	138
5.3 Recharge from the Nile River-Connected Aquifer-----	139
5.4 Results and Discussion-----	140

CHAPTER (6)		
NITROGEN ISOTOPE		
6.1	Introduction-----	147
6.2	Nitrogen cycle-----	149
6.3	Fundamentals of Nitrogen – 15 Isotopes-----	156
6.4	Conversion of Ammonium Sulphate to Nitrogen gas for isotopic analysis-----	161
6.5	Results and discussion-----	164

Appendix(I) Analytical Measurements of water samples-----	175
Appendix(II) Environmental Isotopes Measurements-----	186

List of Figures

Figure	Description	Page
1.1	Key map of the study area-----	9
1.2	Distribution of canals and drains in the study area-----	9
2.1	Geomorphological map, Heliopolis basin, East of Cairo, Egypt, (after El-Shazly et al, (1975)---	23
2.2	Compiled geological map, Heliopolis basin, Cairo-Ismailia desert road, Egypt-----	25
2.3	Idealized compiled stratigraphic columnar section, Heliopolis basin, East of Cairo, Egypt--	26
2.4	Groundwater aquifers in the study area-----	31
2.5	Groundwater direction flow in the study area----	32
3.1	Location map of ground-and surface samples---	36
3.2a	TDS distribution for surface water samples-----	44
3.2b	Iso-salinity (TDS) contour map in mg/L for groundwater samples-----	44
3.3a	(Na ⁺ +K ⁺) distribution for surface water samples-	47
3.3b	Iso-contour map of (Na ⁺ +K ⁺) concentration mg/L of groundwater samples-----	47
3.4a	Ca ²⁺ distribution for surface water samples-----	49
3.4b	Iso-contour map of Ca ²⁺ concentration in mg/L of groundwater samples-----	49
3.5a	Mg ²⁺ distribution for surface water samples-----	51
3.5b	Iso-contour map of Mg ²⁺ concentration in mg/L of groundwater samples-----	51
3.6a	Cl ⁻ distribution for surface water samples-----	53
3.6b	Iso-contour map of Cl ⁻ concentration in mg/L of groundwater samples-----	53
3.7a	SO ₄ ²⁻ distribution for surface water samples-----	55

Figure	Description	Page
3.7b	Iso-contour map of SO_4^{2-} concentration in mg/L of groundwater samples-----	55
3.8a	HCO_3^- distribution for surface water samples-----	57
3.8b	Iso-contour map of HCO_3^- concentration in mg/L of groundwater samples-----	57
3.9	Relation between $(\text{Na}^+ + \text{K}^+)$ vs. Cl^- for water samples-----	61
3.10	Relation between Ca^{2+} vs. Mg^{2+} for water samples	63
3.11	Relation between Ca^{2+} vs. SO_4^{2-} for water samples	64
3.12	Relation between Mg^{2+} vs. Cl^- for water samples	66
3.13	Relation between $(\text{Ca}^{2+} + \text{Mg}^{2+})$ vs. HCO_3^- for water samples-----	67
3.14	Bar graph for water samples-----	68
3.15a	Piper diagram for surface water samples-----	71
3.15b	Piper diagram for groundwater samples-----	71
3.16a	Sulin diagram for surface water samples-----	72
3.16b	Sulin diagram for groundwater samples-----	72
3.17	U.S. Lab. Classification of irrigation water-----	81
3.18	Wilcox Classification of irrigation water-----	83
3.19a	NO_3^- distribution for surface water samples-----	88
3.19b	Iso-contour map of NO_3^- concentration in mg/L of groundwater samples-----	88
3.20a	PO_4^{3-} distribution for surface water samples-----	90
3.20b	Iso-contour map of PO_4^{3-} concentration in mg/L of groundwater samples-----	90
3.21a	Fe^{3+} distribution for surface water samples-----	95
3.21b	Iso-contour map of Fe^{3+} concentration in mg/L of groundwater samples-----	95
3.22a	Cd^{2+} distribution for surface water samples-----	97
3.22b	Iso- contour map of Cd^{2+} concentration in mg/L of groundwater samples-----	97

Figure	Description	Page
3.23a	Co ²⁺ distribution for surface water samples-----	99
3.23b	Iso-contour map of Co ²⁺ concentration in mg/L groundwater samples-----	99
3.24a	Cr ³⁺ distribution for surface water samples-----	101
3.24b	Iso-contour map of Cr ³⁺ concentration in mg/L groundwater samples-----	101
3.25a	Cu ²⁺ distribution for surface water samples-----	103
3.25b	Iso-contour map of Cu ²⁺ concentration in mg/L groundwater samples-----	103
3.26a	Mn ²⁺ distribution for surface water samples-----	105
3.26b	Iso-contour map of Mn ²⁺ concentration in mg/L groundwater samples-----	105
3.27a	Ni ²⁺ distribution for surface water samples-----	107
3.27b	Iso-contour map of Ni ²⁺ concentration in mg/L groundwater samples-----	107
3.28a	Pb ²⁺ distribution for surface water samples-----	109
3.28b	Iso-contour map of Pb ²⁺ concentration in mg/L groundwater samples-----	109
3.29a	Zn ²⁺ distribution for surface water samples-----	111
3.29b	Iso-contour map of Zn ²⁺ concentration in mg/L groundwater samples-----	111
4.1	Vacuum distillation line for separation ammonium and nitrate-----	117
4.2	Distribution of soil samples around the study area	121
5.1	Relation between O-18 vs., delta D for surface and groundwater samples-----	144
5.2	Relation between O-18 vs. d-parameter for groundwater samples-----	145
5.3	Relation between delta O-18 and TDS for groundwater samples-----	145
5.4	Relation between delta O-18 and tritium for some groundwater samples-----	146

Figure	Description	Page
6.1	The Nitrogen cycle-----	150
6.2	Common ranges for $\delta^{15}\text{N}$ values of N compounds in nature (clark,1997)-----	157
6.3	Various possesses affect on the enrichment of $\delta^{15}\text{N}$ values(Townsend,2000) -----	159
6.4	Vacuum line for conversion of ammonium sulphate to nitrogen gas by using lithium hypobromite-----	162
6.5	Relationship between delta N-15 vs., NO_3^- -N Concentration of groundwater samples-----	171
6.6	Relation between nitrate and chloride for groundwater samples-----	172
6.7	Relation between nitrate and phosphate for groundwater samples-----	173
II.1	Schematic of a gas source isotope ratio mass spectrometer (IRMS), showing both continuous flow and dual inlets-----	187
II.2	A fully automated H_2O / gas phase equilibration for hydrogen and oxygen isotope analysis-----	189
II.3	Functional diagram of the CO_2 / H_2O equilibration device designed for fully automatic computer-controlled reparation and isotopic analysis of water samples for the same stable isotopes-----	189
II.4	Assembly of electrolysis cells, additive funnel and electrodes-----	193
II.5	Device for electrolytic enrichment of tritium in water samples-----	193
II.6	Receiving unit for the distillation of enriched sample-----	195
II.7	Diagram of the physical and electronic configuration of the liquid scintillation	195