شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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كليه العلوم – قسم الكيمياء

Infiltration of Nile River Water into Ground Water Investigation and Modelling of Hydraulic and Geochemical Process during Bank Filtration

Thesis Submitted by

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B.Sc. (Chemistry) 2005

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To

Department of Chemistry

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Abstract

In natural environments, riverbank filtration is accomplished by decreasing the groundwater stream below the surface water level, either through the use of hydraulic barriers such as a bank of channels or through groundwater abstraction at pumping wells. A study has also been conducted on the mixing of infiltrated river water with groundwater at the pumping outlet well and the retention time of the bank filtrate, which has been identified as critical parameters that influence the efficiency of riverbank filtration and the quality of the water. Water quality is improved significantly when organic micropollutants (OMPs) are removed from surface river water using riverbank filtration (RBF) technology. This technique produces high-quality water at a reasonable cost. El-Qurain (Conventional Water Treatment Plant) and El Muzainin RBF plants were investigated to learn more about the presence of OMP's (pesticides, herbicides, and polyaromatic hydrocarbons) in the water. Both plants are geographically adjacent to one another and the El Saadia canal. The study concluded that the RBF water production technique was more effective than the traditional treatment for the 17 OMPs (5 polyaromatic hydrocarbons (PAHs), 6 herbicides, 3 pesticides, and 3 insecticides) were investigated in the El Saadia canal's raw surface water. To investigate and evaluate the treatment and removal of 17 OMPs from the El Saadia canal water source in the laboratory, batch experiments were carried out using fine silica sand at different temperatures (20, 25, and 30 °C). Additionally, experiments were carried out to investigate and evaluate the efficacy of the riverbank soil's biodegradation and adsorption process in reducing OMPs. In most cases, high-hydrophobicity chemicals such as pendimethalin, bisphenol A, simetryn, diazinon, and 5 of the PAHs (naphthalenediphenyl acetaldehyde, anthracenediphenyl acetaldehyde, phenanthrene, pyrene, and fluoranthene) are highly adsorbed onto sand grains (removal percentage >90 percent). The findings demonstrated that hydrophobic chemical compounds are cleared and removed during RBF, regardless of the environmental variables under consideration. The first goal of the study was to learn more about the presence of iron, manganese, microbiological parameters, and OMPs (disinfection by-products, pesticides, herbicides, and polyaromatic hydrocarbons) at Al-Qurain (Conventional Water Treatment Plant), Al Muzainin RBF Plants, and groundwater wells, all of which are located near the El Saadia Canal. The second goal of the study was to learn more about the presence of iron. According to the water quality results from the RBF water, the

water quality was excellent, particularly in terms of Fe and Mn values, as well as microbiological parameters; the FPs of disinfection by-product (THMs, HAAs, and HANs) for Al Muzainin RBF provided more significant reductions than the Al Qurian water Plant; and the 17 OMPs (5 polyaromatic hydrocarbons (PAHs), 6 herbicides, 3 pesticides, and 3 Second, using batch experiments with fine silica sand at different temperatures (20, 25, and 30 degrees Celsius), the researchers investigated and evaluated the treatment and removal of 17 organic pollutants from the El Saadia canal water source, as well as the effectiveness of the riverbank soil's biodegradation and adsorption process in the reduction of OMPs. According to the findings, hydrophobic chemical compounds are destroyed and removed during RBF, independent of the environmental circumstances (removal percentage >90 percent). Developing a modeling system for biodegrading organic matter traveling through the riverbed was the study's third objective, and the findings revealed that the correlation coefficient between DOC measured and DOC calculated washigh (r was 0.94).

Keywords: River bank filtration water quality, Dynamic model, OMPs, DBPs, Pesticides, Herbicides, PAHs, Sharkyia Governorate, and Egypt.

Supervisors:

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LIST OF ABBERVIATION

No.	Abbreviations	Meaning
1	DBPs	Disinfectant By-Products
2	THMs	Trihalomethanes
3	HAAs	Haloacetic Acids
4	TOC	Total Organic Carbon
5	WHO	World Health Organization
6	km	Kilometer
7	TDS	Total dissolved solids
8	NOM	Natural Organic Material
9	HAAs	Haloacetic Acids
10	WTPs	Water Treatment Plants
11	NOM	Natural Organic Material
12	DOC	Dissolved Organic Carbon
13	UV	Ultraviolet Irradiation
14	HANs	Haloacetonitriles
15	EPA	Environmental Protection Agency
16	OSE	On-Site Electrochlorination
17	DCAA	Dichloro-Acetic Acid
18	TCAA	Trichloro-Acetic Acid
19	mm	Millimeter
20	µm	micrometer
21	MTBE	methyl-tert-butyl-ether
22	min	Minute
23	µL	Micro Littre
24	µg/l	Microgram per Littre
25	mg/l	Milligram per Littre
26	IC	Ion chromatography
27	BDCM	bromodichloromethane
28	$CHCl_3$	chloroform
29	$CHBr_3$	bromoform
30	DBCM	dibromochloromethane
31	ppm	Part per million
32	GC	Gas chromatography
33	BF	Bank Filtration
34	EfOM	The fate of effluent organic matter
35	HCWW	Water and Wastewater Holding Company
36	RBF	River Bank Filtration
37	m^3	cubic meter

38	BM^3	Billion cubic meter
39	AHD	Aswan High Dam
40	COD	Chemical Oxygen Demand
41	BOD	Biochemical Oxygen Demand
42	DO	Dissolved Oxygen
43	OC	OrganoChlorine
44	OP	OrganoPhosphorus
45	MCL	Maximum Contaminant Level
46	PAH	Poly Aromatic Hydrocarbon

LIST OF TABLES