STUDIES ON RISKS ASSOCIATED WITH THE PRESENCE OF SELECTED CONTAMINANTS IN IRRIGATION AND DRAINAGE WATER IN GIZA GOVERNORATE

By

Mamdouh Mohy El-Din Abdel-Maksoud Poraas

B. Sc. (Soil Science) Faculty of Agriculture Ain-Shams University (1982)

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B.sc. (soil science), Faculty of Agriculture, Ain Shams university (1982).

Under the supervision of :

Prof. Dr. A. S. Ismail :

Prof. of Soil Science, Faculty of Agriculture, Ain Shams University.

Prof. Dr. S. M. Abdel-Azize :

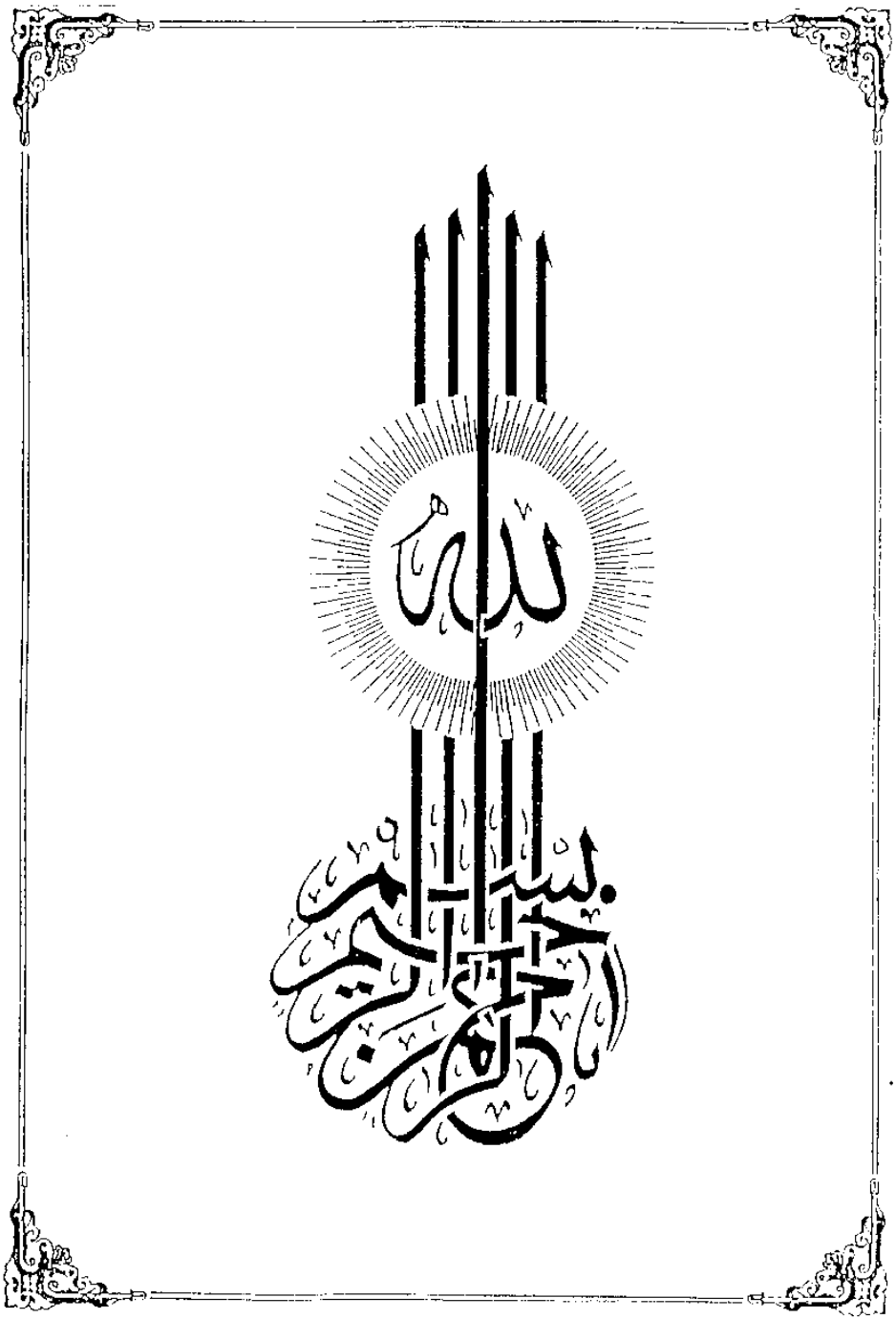
Prof. of Soil Science, Soil and water research institute.

Abstract

Studies on risks associated with the presence of selected contaminats in irrigation and drainage water in Giza Governorate were the aim of this study .

Five locations were selected to represent the soil affected with different source of pollution.

Namely El-Badrashin, El-Hawamdia, El-Shikh Etman, Nahia and Bashtiel. Soil plant and water samples were collected from different locations and different distances.



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1. INTRODUCTION

Environmental pollution is widespread throughout the world as a result of reuse of waste waters and industrial wastes in agriculture. The main reasons for use of these pollutant waters are the urgent need to expand agricultural production a shortage of fresh water and the desire to economize the purchose of mineral fertilizers. However, epidemicological studies have indicated that significant diseases can be associated with reuse of these pollutant waters. They generally contain high concentrations of excreted pathogens, especially in the countries where diarrhoeal diseases and intestinal parasites are particularly prevalent. Although, it was apparent that health risks might a rise from the chemical content of the pollutant waters and from sludge produced in sewage water treatment. Since, the discharge of the pollutant waters into the environment can give rise to pollution problems in both surface and ground waters. One possible environmental pollution which might result from the use of the pollutant waters in irrigation is groundwater contaimination with nitrate. Also, sludge from the treatment of waste water containing a significant proportion of industrial wastes in which they are chemical substances, such as heavy metals, which likely to contain these substances in concentrations high enough to be toxic to plants, animals and man.

Moreover, a possible long-term problem with pollutant irrigation water is that toxic materials or salinity may build up

in the soil. In the arid and semiarid zones , chemical pollutants, particularly heavy metals, in the soil will increase with time and after many years of irrigation, it is possible that levels will be reached at which crops will take up such pollutants at concentration toxic to man. Nevertheless, in special cases under strictly controlled conditions, pollutant waters have been used at minimum risk. In this concern, four main measures can be taken to protect health in pollutant water use; namely pollutant water treatment, crop restriction, control of pollutant water application and promotion in hygiene.

Therefore, studies on risks associated with the presence of selected contaminants in irrigation and drainage water in Giza Governorate are the main purpose of this investigation.

2. REVIEW OF LITERATURE

2.1. Effect of sewage water application on heavy metals in soils.

2.1.1. Cadmium:

Pollution of agricultural soils with Cd have been studied by many investigators. Mills and Zwarich (1975), found that Cd content in agricutlural soils of Monitobia ranges from 0.4 to 1.7 ppm with an average of 1.0 ppm. Abdel Shakour (1982), found that the average Cd concentration in the soil at shoubra El-Kheima was less than 0.5 ppm.

Moreover, pollution of soil with Cd as a result of sludge addition was studied by Gaynor and Halstead (1976). They pointed out that the addition of sludge to sandy loam and clay soils of Canada increased DTPA extractrable Cd from twice to 5 times than those untreated soil. Abdel haleem (1984), found that the average value of Cd concentration in the soils of Egypt at Bahteem, El-Merg and Mostorod were 0.23, 0.3 and 3.4 ppm, respectively.

El-Nashar (1985), found that the increases of both total and availablegwd extracted by DTPA from El-Gabal El-Asfar soils were largely increased with the prolonged period of irrigation with sewage effluent, while the available Cd as percentages of the total Cd was higher than that of any other heavy metal. Fawzy (1986), stated that applying liquid sewage sludge to the soil tended to increase total and available Cd extracted by DTPA in the surface layer at El-Gabal El-Asfar soil.

2.1.2. Lead:

All over the world, the contamination of roadside soils and plants is now a well established phenomenon. Conner (1970), found a range of 6 to 710 ppm Pb in some surface soils from New Jersey, Bennsylvania, and Maryland. Also, he found that Pb content decreased with depth of the soil. Mills and Zwarich (1975), found that Pb content of the surface rural soil in winnipeg in Canada was 17 ppm, and its content in A and C horizons of some Monitabia soils were ranged from 7 to 23 ppm and from 10 to 23 ppm, respectively. They also added that the Pb concentration in the surface layers were closely related to its concerntration in the parent materials. Yousry and El-Sherif (1977), and El-Sokkary (1978), reported that Pb content in soils of Egypt ranged between 58 and 282 ppm; the high amounts of Pb were found along the soils adjacent to the desert road between Cairo-Alexandria . These amounts were decreased with distance from the road. They also reported that the surface layer of soil contained higher amounts of Pb than the subsurface. Also, nriagv (1978), reported that Pb content in several regions of non contaminated soils were 18, 12, 12, 11, 12 and 12 ppm for U.S.A, U.S.S.R, Canada, Japan, South Africa and Egypt, respectively. Abdel Shakour (1982), mentioned that average Pb concentration in the cultivated soil of lower Egypt away from pollution source are in the range of 9 to 21 ppm with mean value of 14.9 ppm.

Anderson and Nilson (1972), indicated that application of sewage to New Mexico (U.S.A) land often resulted in significant

increases toxic metal concentration in the soil. After application of 45 metric tons/ha dry matter of sludge, extractable (2 N HCl) soil content of Pb increased more than 50%. Touchton and Boswell (1975), found that the amounts of extractable metals generally increased with sewage sludge addition. The final Pb concentration was higher in sandy soil than clay soil. Gaynor and halstead (1976), found that sewage sludge application to Windsor, Ontaria sandy loam soil increased DTPA-extractable Pb from 2 to 3 times.

Williams et al, (1980), studied the availability of metals added to Oxford Tract at the University of California soil with application of sewage sludge as measured by DTPA extraction. They showed that Pb was more available than the other metals. Abdel Naim et al, (1982), El-Nennah et al, (1982), Eid (1984), El-Nashar (1985), Fawzy (1986) and Allam (1986), found that the, values of both total and available Pb extracted by DTPA were ,also, largely increased with prolonging the periods of irrigation with sewage effluents. Moreover, Ibrahim (1986), found that concentration of available Pb in El-Gabal El-Asfar soil was ranged between 200 to 250 ppm.

2.1.3. Copper:

Blakeslle (1973), studied the total and dissolved Cu of waste water effluent from 58 treatment plants in Michigan. He found that the range of Cu was 0.01 to 1.3 ppm. Mytelka et al, (1973), reported that the average content of copper ranged between 0.02 and 5.9 ppm in raw and treated sewage collected from treatment plants in the interstate sanitation district (New York, New Jersey, and