THE PERFORMANCE OF SOME ACRYLAMIDE HYDROGELS IN IRRIGATION WATER HAVING DIFFERENT SALINITIES

BY

ELHAM EL SAYED AHMED MOUSA
B.Sc. Science, Tanta University

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AIN SHAMS UNIVERSITY

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Approval Sheet

Name : Elham El Sayed Ahmed Mousa

Title : The performance of some Acrylamide Hydrogels in irrigation water having different Salinities

Thesis For The M.Sc. Degree in Environmental sciences (Biology Section) has been approved By :

Prof. D. Saad El Sherif
Prof. of Soils.
Faculty of Agriculture
Ain- Shams University

S. El Sherif

Prof.Dr.Amin Abd-El Maasoud
Prof.of organic chemistry
Faculty of Science
Ain- Shams University

A. A. Afifi

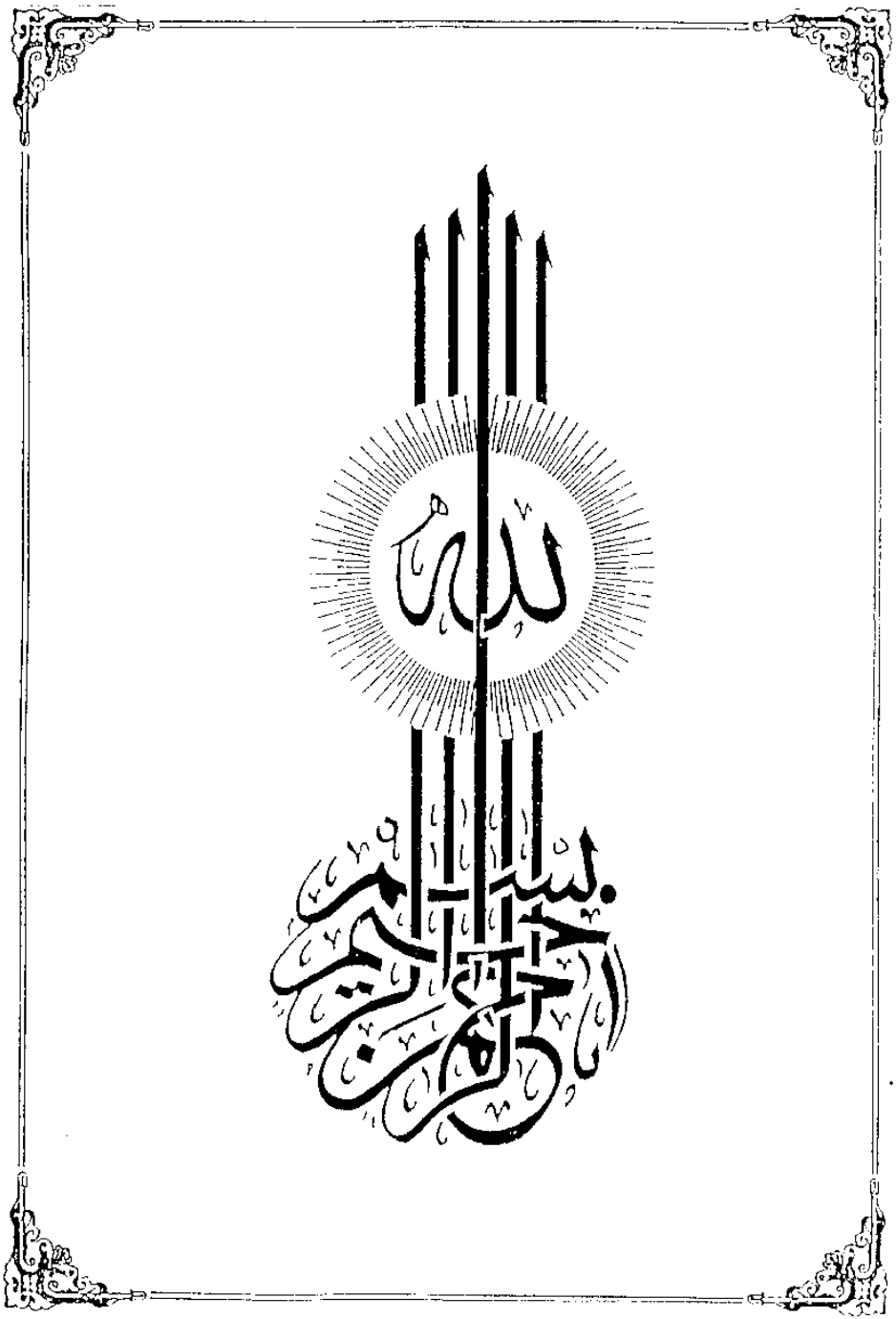
Prof. Dr. Mohamed Tarek Mohamed Zaki
Prof. of Analytical Chemistry
Faculty of Science
Ain- Shams University

Tarek Zaki

Prof. Dr. Omar Abd-El Aziz El-hady
Prof. of Soils
National Research Centre

O. A. El-Hady

14/7/1993



Supervised By

1-Prof. Dr. Mohamed Tarek Mohamed Zaki
Prof. of Analytical Chemistry,
Faculty of Sciences,
Ain Shams University

2- Prof. Dr. Omar Abd El-Aziz El-Hady
Prof. of Soils,
National Research Centre

3- Dr. Eng. Bothaina Mohamed Abdel-Hady
Ass. Prof. of Polymer Chemistry
and its applications,
National Research Centre

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INTRODUCTION

1. INTRODUCTION

The desert areas are still growing and there is no doubt that water is the limiting factor for managing such areas. Of the promising approaches to improve the situation and to solve the problems of excessive evaporation and water seepage in sandy soils from one side and the poor nutritional status of these soils from the other side is the application of super absorbent polymers (hydrogels) as soil conditioners. Hydrogels are polymeric networks characterized by their extremely high hydrophilicity and at the same time insolubility in water. In contact with the irrigation water, hydrogels swell due to their absorbing effect of a substantial volume of water.

Acrylamide polymers and co-polymers - in the gel form - are considered as one of the most widely used products for conditioning sandy soils. When mixed with such soils, they associate quickly with irrigation water to form gels resulting in an increase of the soils capacity to store water. The water stored in this way is available to plants for some considerable time. Due to the bonding effect of hydrogel molecules with sand particles and their swellability, an imporved and stable structure of the sandy soil is obtained. Besides, beneficial changes in

soil porosity, particularly the amount of water retaining pores, were achieved by soil conditioning. Moreover, the germination process, plant growth, nutrients: uptake, the yield and both the water and fertilizers use efficiency by the growing plants were beneficially increased by mixing the plant pits in sandy soils with hydrogels.

One of the most important property of a hydrogel in general and polyacrylamide hydrogels in particular is its absorption capacity of water and electrolytes solutions. Previous studies showed that the absorption capacity (swelling degree or swellability) of polyacrylamide hydrogels depends on their molecular design on one hand and on the ionic strength of the external solution (irrigation water and/or soil water) on the other hand.

In desert areas, where there is no alternate source of good quality irrigation water, it is inevitable to use the available water of poor quality.

The aim of the present work is to study the performance of some acrylamide hydrogels - when used as conditioners for sandy soils - against the content and the components of salts in irrigation water. With this respect, various acrylamide hydrogels (nonionic, anionic

"either Na^+ or K^+ salts" and cationic "Cl^- salt") as well as mixtures of the anionic and the cationic products were examined. Ten samples of water - having different salinities - were collected form those used for irrigation at Sinai. Deionized water and a nearly distilled water (salt content ~ 10 ppm) were also taken for comparison. A virgin sandy soil from the western part of Sinai was chosen for the study. Therefore, present investigatioin includes the following main points:

1. Sorption capacity of acrylamide hydrogels as affected by the total salt content, valency and concentration of individual ions in the water as well as its adjusted sodium adsorption ratio (adj. SAR).
2. The interaction between the studied hydrogels and irrigation waters to assess the retention and/or release of salts and salt components of irrigation water by and/or from the polymer molecule.
3. The performance of acrylamide hydrogels in sandy soil after irrigation with water having different salinities.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1. Acrylamide hydrogels as soil conditioners:

Hydrogels are polymeric networks that associate quickly with water forming gels. When mixed with a plant growing medium, they increase its capacity to store water. Water stored in this way is available to plants for some considerable time, as required. In this respect, acrylamide polymers and co-polymers - in the gel form - are considered the most widely used products for conditioning sandy soils (El-Hady, 1987 and 1988 a)

2.1.1. Laboratory and greenhouse studies on the effect of acrylamide hydrogels on soil properties and plant growth:

Since 1974, several authors have reported the benificial changes in soil properties and consequently plant growth due to hydrogels addition.

Eikhof *et al.* (1974) carried out irrigation trials with Chrysanthemums and Poinsettias to control wilting in potted plants. Agricultural hydrogel "Concentrate 506" (a hydrophilic polymer) realized 100% increase in shelf life (compared to the control) in case of Chrysanthemums and a marked resistance to wilting with an extension of