STUDIES ON EFFECT OF SOIL CONDITIONERS ON GROWTH OF VEGETABLE CROPS

By

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B.Sc.Soils, Faculty of Agriculture., Ain Shams University, 1987

A thesis submitted in partial fulfillment

of

the requirements for the degree of

MASTER OF SCIENCE

in

Agriculture

Soil Science

Department of Soils

Faculty of Agriculture

Ain Shams University

1996

Approval sheet

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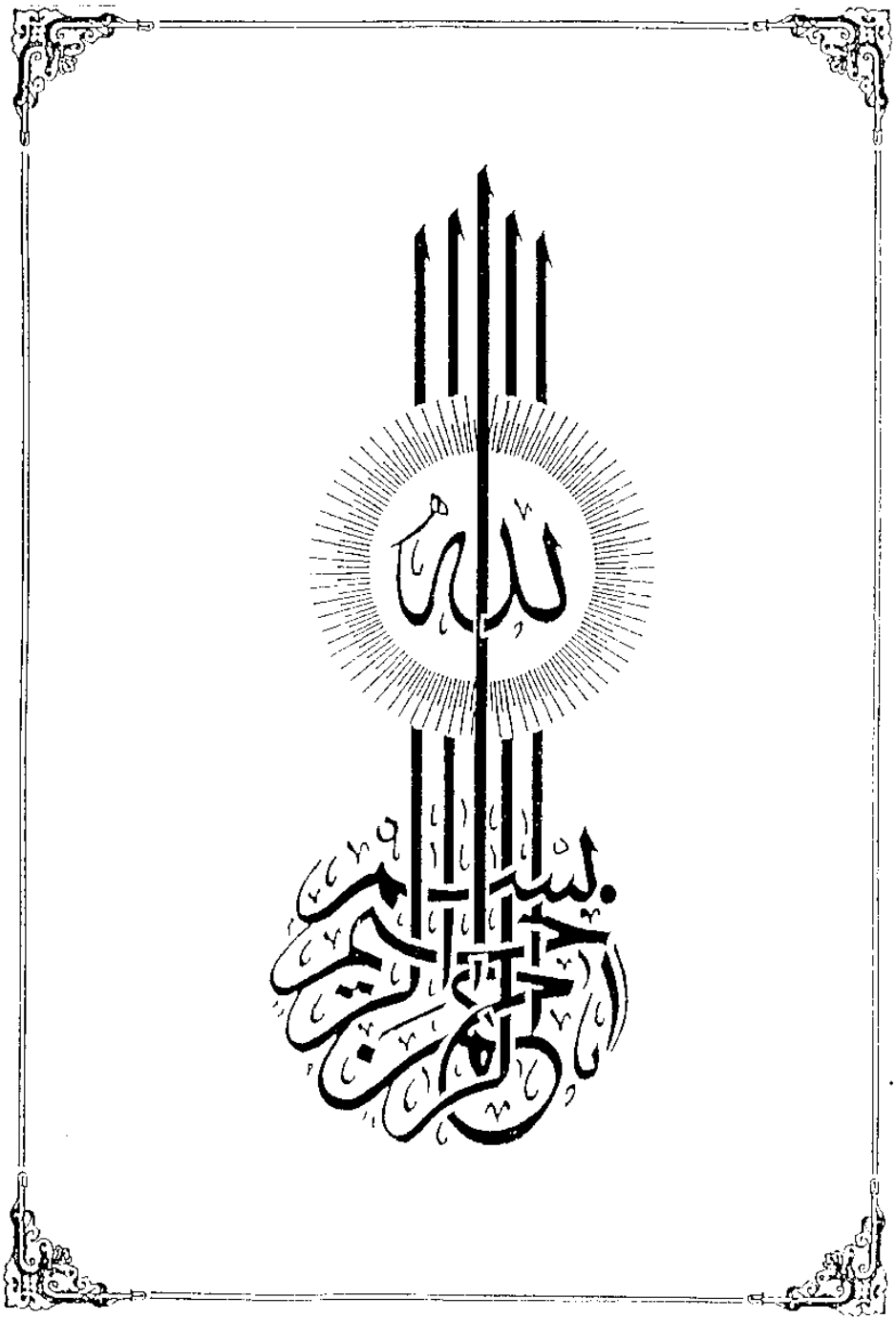
Date of examination: 6 / 12 /1995



Studies on effect of soil conditioners on growth of vegetable crops

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Abstract

Manal Mohamed Hosny Gad El-Moula, studies on effect of soil conditioners on growth of vegetable crops. Unpublished Master of Science in Agriculture Soil Science, University of Ain Shams 1996.

Five experiments were carried out in order to study the effect of different rates of synthetic soil conditioners on the water holding capacity (W H C) and field capacity (F. C) of different soil samples (sandy, calcareous, and clay soils) under normal and saline water conditions. As well as the effect of such soil conditioners on the germination of tomato and cucumber seeds was studied. The used soil conditioners were Hidroplus, Agriplus, Sanwet, Acryhope, Polyacrylamide and Vermicompost.

Data indicate that the used soil conditioners had a favourable effect on increasing the ability of the studied soils to hold water in case of using either normal or saline water. Such efficiency was varied according either to the type and rate of the used soil conditioners or to the soil sample. Also the germination percentages of tomato and cucumber seeds were enhanced by treating soil with such soil conditioners. On the other hand the growth of tomato plants as measured as plant height, number of leaves, fresh weight of both shoots and roots were significantly increased by adding soil conditioners. This reflected on increasing the uptake of Na,K and N by tomato plants. The yields of cucumber w+ere also greatly increased in the Hidroplus treated plots compared with the control treatment.

ACKNOWLEDGEMENT

The author wishes to express her deep gratitude and sincere appreciation to **Prof.Dr. Ahmed Mohamed El-Araby**, professor of soil science, Faculty of Agriculture Ain Shams University for his continuous valuable help, sumpathetic supervision, guidance, and encouragement throughout the whole stages of this investigation .

Grateful acknowledgment is also to **Prof. Dr. Ahmed Abdel-Fattah Ibrahem,** professor of soil science, Faculty of Agriculture, Ain Shams University for his supervision, kind help, valuable advices, continuous support, guidance many valuable suggestions and deep interest during this work.

The author is also most grateful to **Dr. Mohamed Ahmed Hashem,** Lecturer of Horticulture, Faculty of Agriculture, Ain Shams University for his advice, interest and help in the early stage of the study.

Thanks also are extend to **Dr. Salem. E.El- Maghraby**, Lecturer of soils, soil conservation dept. Desert research center for his keen help, appreciable ideas and fruit full cooperation during this work.

Thanks are forwarded to all staff members of Soil Science, Faculty of Agriculture Ain Shams University for their useful help and cooperation during this work.

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1 - INTRODUCTION

Egypt has for long been a country of excessive population pressure. The cultivated lands, should be increased for increasing the efficiency of agricultural production as rapidly as the rate of population increase requires. Therefore a new areas out of the delta and valley have to be put under cultivation. Most of these areas are sandy soils which are poor with respect to their physical properties, particularely that related to soil-water relationship and soil nutrient.contents. under such conditions where soil water holding capacity is low decreasing irrigation water intervals is highly required. On the other hand irrigation water in these areas is a limiting factor.not only in the quantity but also in the quality.

Mixing the soil of growth medium with super water absorbant natural or synthetic materials i.e. soil conditioners can be useful for improving soil water holding capacity. This may be benifit for increasing irrigation water intervals.

Organic manure is one of the most efficient nutural soil conditioners could be used under such conditions for improving so hydrophysical properties (Ibrahim, 1989 and Ibrahim, et al. 1987). T available quantity of organic manure is limited particularely in nev reclaimed areas.

Several synthetic polymers materials can be also used as a soi conditioners, such as Hidroplus, Agriplus, Sanwet, Vermicompos Acryhope and polyacreylamide.

A fair number of investigations have discussed how to improve the hydrophysical properties of sandy, calcareous and clay soils to achieve the better environmental conditions for plant growth. Howeve

informations about the effect of different soil conditioners on the nutritional status of soil and plant under saline irrigation water are limited.

The main objectives of this work are to eavluate the effect of synthetic soil conditioneres on soil hydrophysical properties and growth of vegetable crops (tomato and cucumber) under different soil textures and water qualities.

2 - REVIEW OF LITERATURE

Soil conditioning refers to the improvement of hydrophysical, chemical and biological properties of soil, particularly for agricultural purposes; by using small amounts of conditioners.

According to De - Boodt (1979) and Gabriels (1975) these conditioners can be natural in organic from (e.g. farmyard manures and peat deposits). or in inorganic form (e.g. bentonite and gypsum), and can be artificial in hydrophilic form (e.g. polyvinyl alcohol, polyvinyl acetate and polyacrylamide) or in hydrophobic form (e.g. bituminous emulsion).

Such conditioners are used to solve many reclamation and land utilization problems of sandy and calcareous soils.

However, most of work done on soil conditioners was mainly related to improvement of soil physical properties and erosion control. But attention paid to the effect of soil conditioners on water use efficiency and the nutritional status of both soils and plants (especially vegetables) is still lacking .

Gouda (1979) observed a remarkable decrease in soil bu density due to bitumen emulsion application. Also, El-Hady (1979) found that applying soil conditioners (bitumen emulsion, PVC and PAM) decreased the bulk density relative to the control

He added that more reduction was found with increasing their application rate. In addition, considerable increase in the void ratio and total porosity was obtained in the conditioned soi relative to the control. Tayel and El-Hady (1981) concluded th by using PAM in a sandy soil beneficial changes in bulk densi

void ratio and total porosity were achieved. Sadek (1984) stated that, regardless the type of soil conditioner used (i.e., hydrophobic or hydrophilic), addition of soil conditioners to sandy soil decreased the values of bulk density relative to the control. In addition the values of total soil porosity increased by increasing the applied rate of the conditioner. Similar results were found by Gawish (1985) who mentioned that the values of soil bulk density decreased by increasing the application rate of soil conditioner. Moreover, the lower effect on decreasing soil bulk density was attained for polyacrylamide treatments, while the others (i.e. bitumen, uresol and ureaformaldehyde) showed approximately the same effect and the values of total soil porosity showed a marked increase by increasing the application rate .

The aim of applying soil conditioners is to improve the physical properties of the soil which is largely determined by a relatively high stability of the aggregates in the surface layer.

In Egypt, Tayel and Anter (1978) and El-Hady (1979) indicated that aggregate stability was increased by adding bituminous emulsion and PAM solution. This increase was proportional to the applied doses. Also, Callebaut et al (1979) found that application of PAM at 1% increased aggregate stability of a silty loam soil from zero to 48%. In a study on sandy soils, Gouda (1979) found an increase in water stable aggregates and aggregation index associated with increasing bituminous emulsion doses . Tayel and El-Hady (1981) stated by using PAM + glyoxal as a cross linker in a sandy soil, the percentage of water stable aggregates (>4mm.) reached 39.3%

and the water stable aggregates (>2mm) increased to more than 60%.

In addition Abou Seeda (1982) showed that the formation of large aggregates was mere effective with bituminous emulsion than with uresol. The percentage of aggregates between 8.00 - 4.76 m m was 10% higher when bitumen was used. He found also, that aggregates distribution after wet sieving of three soils (calcareous, highly calcareous and sandy lama soils) of Egypt did not differ much from the distribution after dry sieving. He added that the addition of soil conditioners not only improve aggregation but also those aggregates are relatively stable.

Moulood et al. (1985) studies the effect of bitumen emulsion and fuel oil on some physical properties of sandy clay loam and clay soils. Their results showed a remarkable increase in the mean weight diameter. The mean weight diameter increased by 65 and 116 times under the application of 1.0% bitumen emulsion and 5.0% fuel oil, respectively. The same trend was observed in the clayey soil but to a lesser magnitude.

Terry and Nelson (1986) found that the irrigation metho (flood or sprinkler) had no significant effect on aggrega stability, but the stability of aggregates in the PAM amended soils was three to four times greater then the stability of non treated ones. Dougrameji and Saeed (1986) mentioned that addition of hygromull and bitumen proved to be effective in reducing the wettability and increasing the mean weight diameter of the soi' aggregates.

The major objective of applying soil conditioners to soil is to modify the normal water regime through alternation of thei