RECENT FERTILIZATION TECHNIQUE FOR SOYBEAN PLANTS UNDER DROUGHT CONDITIONS

By

HOSSAM HUSSEIN MOHAMED HUSSEIN

B.Sc. Agric. Sc. (Agronomy), Ain Shams University, 2008

M.Sc. Agric. Sc. (Crop Production), Ain Shams University, 2014

A thesis Submitted in Partial Fulfillment

Of

The Requirements for the Degree of

DOCTOR OF PHILOSOPHY
in
Agricultural Science
(Crop Production)

Department of Agronomy

Faculty of Agriculture

Ain Shams University

2019

Approval Sheet

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This thesis for Ph.D. degree has been approved by:

Dr. Fawzy sayed Abd El-Samyaa .....

Prof. Emeritus of Agronomy, Faculty of Agriculture, Fayoum University

Dr. Olfat Hassan El-Bagory .....

Prof. Emeritus of Agronomy, Faculty of Agriculture, Ain Shams University

Dr. Mohamed Ahmed Abd El-Hady .....

Assistant Prof. of Agronomy, Faculty of Agriculture, Ain Shams University (Supervisor)

Dr. Ramadan Thabit Abd Rabou .....

Prof. of Emeritus Agronomy, Faculty of Agriculture, Ain Shams University (Principal Supervisor)

Date of examination: / /2019

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Under the supervision of:

Dr. Ramadan Thabit Abd Rabou

Prof. Emeritus of Agronomy, Department of Agronomy, Faculty of Agriculture, Ain Shams University (Principal Supervisor)

Dr. **Mohamed Ahmed Abd El-Hady**

Assistant Prof. of Agronomy, Department of Agronomy, Faculty of Agriculture, Ain Shams University

ABSTRACT

Hossam Hussein Mohamed Hussein, Recent Fertilization Technique for Soybean plants under Drought Conditions. Unpublished Ph.D. Thesis. Agronomy Department, Faculty of Agriculture, Ain Shams Universtiy, 2019.

During summer seasons of 2015 and 2017, two field experiments were conducted at the Research and Experimental Station (30°19′ N, 31°16′ E), Faculty of Agriculture, Ain Shams University at Shalakan, Kalubia Governorate, Egypt, to investigate the effects of combinations between hydroxyl apatite nanoparticles (0, 3, and 6 kg/fad) and calcium carbonate nanoparticles (0, 500g/fad) as Nano-fertilizers under two irrigation intervals levels, (irrigation every 2 or 3 weeks whereas irrigation every 2 weeks as a recommended practice) on growth, yield components and quality of soybean plants.

Irrigation intervals had statistically significant effect on growth traits (plant height (cm), number of branches per plant, number of leaves per plant, leaf area index, number of pods per plant, number of root nodules per plant, root dry weight per plant, stem dry weight per plant, leaves dry weight per plant and pods dry weight per plant) and yield attributes (plant height at harvest (cm), number of branches /plant, number of seeds /pod, pod yield /feddan, 100-seed weight, seed yield /feddan and biological yield /feddan). These results were fairly true in the two studied seasons 2015, 2017 and combined result.

Growth parameters i.e. plant height, numbers of branches per plant, numbers of leaves per plant, leaf area index, number of nodules per plant and number of pods per plant and yield attributes (plant height at harvest (cm), number of branches /plant, number of seeds /pod, pod yield /feddan, hulling%, 100-seed weight, seed yield /feddan and biological yield /feddan) of soybean plants which treated with 500 g/fed surpassed untreated plants in the two studied seasons 2015, 2017 and combined.

Soybean plants treated with 6 kg hydroxyl apatite nanoparticles per feddan out-numbered other plants in its numbers of leaves per plant, leaf area index, number of root nodules per plant, number of pods per plant plant height at harvest (cm), number of branches /plant, number of seeds /pod, pod yield /feddan, hulling%, 100-seed weight, seed yield /feddan and biological yield /feddan in the two growing seasons 2015, 2017 and combined data.

Results showed that normal irrigation x 500g/fed calcium carbonate nanoparticles x 6kg/fed hydroxyl apatite nanoparticles was the effective combination for producing the highest values of plant height (cm), number of branches per plant, number of leaves per plant, leaf area index, number of pods per plant, number of root nodules per plant, root dry weight per plant (g), stem dry weight per plant (g), leaves dry weight per plant (g), pods dry weight per plant (g), plant height at harvest (cm), number of branches /plant, number of seeds /pod, pod yield /feddan, hulling%, 100-seed weight, seed yield /feddan and biological yield /feddan.

There weren't significant results between plants treated with Nano-mineral fertilizers (calcium carbonate nanoparticles and hydroxyl apatite nanoparticles) under irrigation every 3 week and plants untreated but irrigated every 2 week in all growth traits and yield components which reflect appositive result of this chemical substance in mitigation harmful effect of water shortage in season 2015, 2017 and combined data.

Key words: Soybean, Nano fertilizers, Calcium Carbonate Nanoparticles, Hydroxyl apatite nanoparticles, irrigation intervals.

ACKNOWLEDGEMENT

The writer wishes to express his deep gratitude and sincere appreciation to **Prof. Dr. Neamat Abd El-Aziz Noure El-Deen**, Prof. Emeritus of Agron. Dept., Fac. of Agric., Ain Shams Univ. for her supervision, valuable guidance, continuous encouragement, sincere efforts and helpful suggestion during the progress of this work.

The writer is deeply indebted to Dr. **Prof. Dr. Ramadan Thabit Abd Rabou** Prof. Emeritus. of Agronomy, Department of Agronomy, Faculty of Agriculture, Ain Shams University for his supervision, faithful assistance, encouragement and valuable advice in the execution of the work and in the preparation and revision of the manuscript and thesis.

Thanks to **Dr. Mohamed Ahmed Abd El-Hady,** Assistant Professor, department of Agronomy, Faculty of Agriculture, Ain Shams University for his supervision and encouragement in the preparation and revision of the manuscript and thesis.

Thanks to Prof. **Dr. M. F. Hamed** and Prof. **Dr. H. S. S. Saudy** for their help in the begging of this work.

My great and deep gratitude and sincere appreciation to **Dr. Ashraf Bakry** Professor, department of Genetics, Faculty of Agriculture, Ain Shams for his help, encourage and support this work.

My great and deep gratitude and sincere appreciation to my father late **Dr. Hussein Mohamed Hussein,** Assistant Prof. in Dept. of poultry,A.R.C for his encouragement and valuable advice in the execution of this work, his love and life. My God forgive to him and mercy on him and led him to paradise without the agony with the prophets and saints and martyrs.

Thanks are also extended to all Faculty members of Agron. Dept., Fac. of Agric., Ain Shams Univ. for their interest and kind help during the course of this work.

Thanks also to **Dr. Mohamed Mahmoud Abo El-Ftoh** and **Dr. Mohamed Kalf** for their help and support in this work.

Special gratitude and greater thank to my mother and all my family members for their efforts and encouragement.

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INTRODUCTION

Soybean is a fundamental wellspring of vegetable protein for human food and animal feed around the world. It is anticipated to turn into a noteworthy crop in Africa **(Sinclair *et al*. 2014)**. Soybean possesses an extraordinary position in science and farming, in addition of being a crop with enormous uses. Soybean is cultivated in practically all pieces of the world for human utilization, industry and creature feed **(Boydak *et al*. 2002).** Soybean assumes a vital job in providing oil and protein required by people **(Agarwal, 2007; Shi *et al.* 2010).** Its protein has incredible potential as a noteworthy wellspring of dietary protein. Oil delivered from soybean seeds is very edible and contains no cholesterol **(Essa and Al-Ani 2001).**

Irrigation factor is one of the important factors affecting in soybean growth, yield and its components. Exhibiting soybean plants to soil drought at any stage of its life cycle may play a great role in impeding of growth plants, yield and its attributes. The most vital stages for soybean plants to have sufficient water are during pod development and seed fill **(Kranz *et al*. 2012)**. Water has become a limited resource in Egypt. Hence, the search for technologies/ measures to save/ conserve water in irrigated agriculture has intensified. Therefore, decreasing plant water consumption by stretching irrigation intervals will keep water through reducing number of irrigation but still attain similar economic yield **(Mahmoud, *et al.* 2013)**. **Ibrahim and Kandil (2007)** in clay loam soil in Egypt reported that irrigation intervals significantly affected growth and yield attributes. Highest values of plant length (cm), plant dry weight (g), number of seeds /plant and seed yield /fed were achieved by irrigation every two week as compared with irrigation one week and three weeks days.

The rising of nanotechnology and the development of new nano-devices and Nano-materials open up potential novel applications in agriculture and biotechnology (**Scott and Chen, 2003; Joseph and**