IMPROVING GROWTH AND PRODUCTIVITY OF SWEET PEPPER PLANT UNDER LOW WATER SUPPLY CONDITIONS

By

NESMA ELSAYED ELIWA YOUSSIF

B.Sc. Agric. Sc. (Biochemistry), Ain Shams University, 2006

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This Thesis for M.Sc. Degree has been approved by:

Dr. Hosny Mohamed Abdel-Daym **…….....**

Prof. Emeritus of Plant Physiology, Faculty of Agriculture, Banha University.

Dr. Mahmoud Mohamed Mahmoud **…….....**

Prof. Emeritus of Plant Physiology, Faculty of Agriculture, Ain Shams University.

Dr. Hany Samir Mohammed Osman ……..…

Associate Prof. of Plant Physiology, Faculty of Agriculture, Ain Shams University.

Dr. Sanaa Abdel-Rahman Mostafa Zaghlool **…….....**

Prof. of Plant Physiology, Faculty of Agriculture, Ain Shams University.

Date of Examination: / /2017

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Under the supervision of:

Dr. Sanaa Abdel-Rahman Mostafa Zaghlool

Prof. of Plant Physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University, (Principal Supervisor)

Dr. Hany Samir Mohammed Osman

Associate Prof. of Plant Physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University

Dr. Yasser Abd Elhakim Mohammed Ahmed Salama

Associate Researcher Professor, Genetic Resource Department, Desert Research Center

ABSTRACT

Nesma Elsayed Eliwa Youssif: Improving Growth and Productivity of Sweet Pepper Plant Under Low Water Supply Conditions. Unpublished M. Sc. Thesis, Agric. Botany Department, Fac. of Agric., Ain Shams Univ., 2017.

Two experiments were conducted during the two growing seasons of 2013-2014 and 2014-2015, in the greenhouses at a private farm at El-Salheya El-Gedida City, Ismailia Governorate, Egypt, to investigate the effect of rice straw (RS) as soil alternative and sandy soil (SS) for comparison, and drenching applications of potassium humate (K_2-HA) at 2 g/l, potassium silicate (K_2SiO_3) at 5 g/l, and seaweed extract (SWE) at 0.5 g/l on improving growth and yield of sweet pepper (*Capsicum annuum* L.) plants under deficit irrigation regimes; every 2 (I_2), 3 (I_3) and 4 (I_4) days in addition to daily irrigation (I_1) as control (1.5-3 l/ plant/ each irrigation according to the growth stage). Plant samples were taken at 90 days after transplanting for growth measurements and chemical analysis. All drenching applications showed significant increase in shoot fresh weight, shoot dry weight, leaf area and LRWC, as well as, concentrations of N, P and Ca in the two seasons comparing to untreated control and the best results were due to K_2-HA followed by SWE then K_2SiO_3. Drenching with K_2-HA resulted in the highest significant values of fruits no/plant, average fruit weight, fruits yield/plant and total soluble solids (TSS). Plants grown on RS showed significant increase in LRWC comparing to plants grown on sandy soil (SS). The best results of growth and fruits yield/ plant of plants grown on RS were achieved under I_3 & I_4. In regard to interaction treatments, application of I_2+ K_2-HA+ SS showed the best results of growth, fruits yield/ plant, determined macronutrients (except K) and biochemical constituents (except proline) followed by I_2+ SWE+ SS comparing to control plants applied with I_1+ SS without drenching applications. The highest concentration of K was observed with plants grown on SS under the highest level of irrigation deficit I_4 by

K_2SiO_3. It could be concluded from the present study that rice straw could alleviate the negative effect of low water supply and applications of K_2-HA and SWE are recommended for enhancing sweet pepper growth and yield under normal and low water supply.

Key words: *Capsicum annuum* L., irrigation deficit, rice straw, N, P, Ca, total chlorophylls, total proteins, total soluble sugars.

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LIST OF ABREVIATIONS

AWR	Annual water requirement
AIWS	Annual irrigation water supply
IWR	Irrigation water requirement
IWUE	Irrigation water use efficiency
°C	Celsius degree
Ca	Calcium
Chl.	Chlorophylls
cv	Cultivar
cm	Centimeter
DAT	Days after transplanting
d.w.	Dry weight
e.g.	Exempli gratia
ET	Evapotranspiration
Fed.	Feddan
f.w.	Fresh weight
g	Gram
g/l	Gram per litter
h	Hour
ha	Hectare
I_1	Daily irrigation (control)
I_2	Irrigation every 2 days
I_3	Irrigation every 3 days
I_4	Irrigation every 4 days
K	Potassium
K_2-HA	Potassium Humate
K_2SiO_3	Potassium Silicate
LRWC	Leaf relative water content
mg	Milligram
ml	Milliliters

min	Minutes
mm	Millimeter
µl	Micro litre
µm	Micro mole
mmol	Milli mole
N	Nitrogen
nm	Nanometer
no.	Number
P	Phosphorus
ppm	Part per million
RS	Rice straw
Sec.	Second
SS	Sandy soil
SWE	Seaweed extract
TSS	Total Soluble Solids
t.w	Turgid weight
WUE	Water use efficiency

INTRODUCTION

Sweet pepper (*Capsicum annuum* L.) is a member of the solanaceous fruity vegetables group. It is one of the most important, popular and favorite vegetable crops cultivated in Egypt for local consumption and exportation **(El-Bassiony *et al.*, 2010)**. Sweet pepper is consumed both as fresh and dehydrated spices **(Bosland and Vostava, 2000)**. Pepper is a good source of vitamins A, C, E, B1, and B2, potassium, phosphorus and calcium. Moreover, it is one of the valuable medicinal plants in pharmaceutical industries because of high amounts of antioxidant **(Aminifard *et al.*, 2012)**.

The relative amount of water available to agriculture is declining worldwide due to the rapid population growth and the greater incidence of drought in recent years caused by climate change and different human activities. Competing agricultural, municipal and industrial water usage will eventually threaten food security **(UNWWAP, 2003 and Bank, 2006).** Continued successful management of the limited amount of water available for agricultural uses depends upon better agronomic practices and enhanced understanding of water productivity, defined as the crop productivity output per unit of water consumed **(Howell *et al.*, 1998 and Jones, 2004)**.

Rice straw represents an important summer crop by-product in Egypt. The high amount of rice straw that produced (more than 5 million tons every year from the rice fields), there is no organized practical use for this waste until now, which causes serious pollution when disposed by burning. The very cheap price and the major components of rice straw are silica, lignin and hemicelluloses, which are not attractive or favorable for soil fungi or nematodes, it could represent a good substrate for sowing instead of natural infested soil under open field conditions **(Abdel-Sattar *et al.*, 2008)**. **El- Sayed *et al.* (2015)** demonstrated that rice straw could be recommended as a growing substrate in replacing naturally infested