بسم الله الرحمن الرحيم

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SALT TOLERANCE AND PRODUCTIVITY OF BARLEY (*Hordeum vulgare* L.) AND GRAIN SORGHUM (*Sorghum bicolor* L.) PLANTS IN SANDY SOIL

By

MONTASER HASSAN MOHAMED YOUSSEF
B.Sc. Agric. Sc. (Horticulture), Fac. Agric. Ain Shams University, 2014

A Thesis Submitted in Partial Fulfillment

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MONTASER HASSAN MOHAMED YOUSSEF

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

Dr. Amr Adel Mohamed El Kelish .....

Associate Prof. of Plant Physiology, Faculty of Science, Suez Canal University.

Dr. Hatem Mohamed Ashour Abd El-Salam .....

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

Dr. Mohamed Farag Mohamed Ibrahim .....

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

Date of Examination: 27 / 2/ 2022

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MONTASER HASSAN MOHAMED YOUSSEF
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Under the supervision of:

Dr. Aly Rafaat Youssef Rafaat
Prof. Emeritus of Plant Physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University, (Principal Supervisor).(late)

Dr. Mohamed Farag Mohamed Ibrahim
Associate Professor of Plant Physiology, Department of Agricultural Botany, Faculty of Agriculture, Ain Shams University.

ABSTRACT

Montaser Hassan Mohamed Youssef: Salt Tolerance and Productivity of Barley (*Hordeum vulgare* L.) and Grain Sorghum (*Sorghum bicolor* L.) Plant in Sandy Soil. Unpublished M.Sc. Thesis, Department of Botany, Faculty of Agriculture, Ain Shams University, 2021.

This study was carried out to was to investigate the influence of potassium silicate on the growth and yield of great millet (*Sorghum bicolor* L. Moench cv. Dorado) plants and barley (*Hordeum vulgare* L. cv. Giza 123) plants grown under salinity stress in the two successive seasons of 2018 and 2019 in the Faculty of Agriculture, Ain Shams University, Qalyubia Governorate, Egypt. Four concentrations of salinity at 0, 50, 100 and 150 mM of NaCl were used. Pure sodium chloride was dissolved in tap water to prepare the concentrations. Three concentrations of foliar sprayings of potassium silicate were used at 0, 1 and 2 mM. Results revealed that saline water irrigation decreased vegetative growth, flowering parameters, chlorophyll a and b, relative water content (RWC) percentage. As the salinity concentration increased, the osmolytes content, H_2O_2 and antioxidant enzymes, i.e. APX, CAT and POX were increased. Concerning the minerals content, increasing the salinity level decreased in K and Si percentages, however, Na percentage was increased in both seasons at great millet and barley plants. With respect for yield attributes, increasing the salinity concentration decreased the yield attributes, i.e. grain yield/plant, panicle weight and spike weight for great millet and barley plants.

The application of potassium silicate alleviates the negative effects of salinity on plants. Under each salinity concentration, the application of potassium silicate at 1 and 2 mM enhanced the vegetative growth parameters, chlorophyll pigments, RWC percentage, the concentrations of proline, sugars and antioxidant capacity in term of scavenging ROS by DPPH (antioxidant activity) and the antioxidant

enzymes, i.e. APX, CAT and POX as compared to control treatments. In addition, potassium silicate significantly diminished the concentration of H_2O_2 to the minimum levels compared to untreated plants of great millet and barley. Also, the application of potassium silicate at 1 and 2 mM under each salinity concentration significantly increased the grain yield/plant, panicle weight and spike weight for great millet and barley plants.

Generally, spraying potassium silicate at 1 or 2 mM with all the salinity concentrations enhanced the grain yield/plant at grain sorghum and barley plants as compared to control treatments.

Keywords: Barley, Grain sorghum, K_2O_3Si, Salinity, NaCl, Antioxidant capacity and Enzymes activity

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