جامعة المنوفية
كلية الزراعة
DEPARTMENT OF HORTICULTURE

Effect of Some Nanotechnology Materials in Inducing Tomato Productivity Under Temperature Stress

By

Tamer Wageh Nagib

M. Sc. Agric. Sci. (Vegetable Crops), 2013

Thesis
Doctor of Philosophy
In Agricultural Sciences (Vegetable Crops)

Supervised by

Prof. Dr. Abdel-Razek A. Midan
Professor of Vegetable Crops,
Fac. of Agric., Minufiya Univ.

Prof. Dr. Sally A. Midan
Professor of Vegetable Crops,
Fac. of Agric., Minufiya Univ.

Prof. Dr. Mervat E. Sorial
Professor of Plant Physiology,
Fac. of Agric., Minufiya Univ.

Prof. Dr. Alfons G. Zakher
Professor of Vegetable Crops,
Horticulture Res. Inst.

2020

CONTENTS

LIST OF TABLES

LIST OF FIGURES

The response of antioxidant enzymes to exogenously applied to previous nanobiostimulators was different. It depended on the level of its concentration.

Chlorophyll content, free proline content and antioxidant enzymes (peroxidas, poly phenol oxidase and catalase), total sugars and phenols were all greater in chilled plants with NB_2 treatment compared to the control (chilled plants) and other treatments. The results indicated that the application of NB_2 (contains CPPU, BR, proline) can ameliorate the harmfull effects of chilling stress and enhanced chilling resistance.

Chilling injury (CI) decreased sharply at all-time were taken (60, 75 and 90 DAT). Meanwhile, the lowest chilling injury recorded by treating tomato plants by NB_2, NB_1 and $Si_{1,2}$ compared to untreated plants in both seasons. This results might be due to the effect of seaweeds, salicylic acid, proline, CPPU, BR and Si which significantly effective in increase growth parameters compared to chilled plants.

There was a significant reduction in leaf chlorophyll content due to chilling stress. Proline is one of the most common compatible osmolyles in abiotic stressed plants. Proline accumulations increased by NB_2 and NB_1 (contained proline) treated plants under chilling stress was found to be at maximum. Proline accumulation is the first response of plants exposed to chilling stress in order to reduce the injury effects to cells and stabilization of cell membrane and reduced membrane leakage.

Brassinolide, CPPU and proline presented in NB_2 sharply increased the antioxidant enzyme activity indicating efficient scavenging ROS. Antioxidant enzymes showed maximum response to NB_2, NB_1 and Si compared chilled plants only.

BR feeding reduced the formation of ROS triggered by chilling stress induced oxidative stress. The capacity of BR to ameliorate the desiccation stress and also BR could considerably alleviate the negative effect of chilling stress on tomato.

Chilling stress caused a significant reduction in tomato early yield and total yield with bad quality. NB_2, NB_1 and Si applications were more effective in improving tomato yield and its quality under chilling stress condition. The explanation of yield increasing of stressed plants after spraying with proline (present NB_1 and NB_2) proposed to the increased net photosynthetic, decreased rate of photorespiration, induced water use efficiency which reflect good growth rate as well as best yield with good quality.

In conclusion, results may show that tomato plants subjected to chilling created oxidative stress. NB_2, NB_1, Si as nanobiostimulators contain BR, CPPU, Seaweed and SA, which exerted the most protecting effect at low concentrations. Meanwhile, alleviation of chilling injury was more obvious with low concentration were the most promising dose. Which reflect a good performance of tomato plants under chilling with high quality and good quantity of yield.