

## ABBREVIATIONS

<b>APX</b>	Ascorbate Peroxidase
<b>BSA</b>	Bovine Serum Albumin
<b>CAT</b>	Catalase
<b>DAE</b>	Days After Emergence
<b>DAS</b>	Days After Sowing
<b>DHAR</b>	Dehydroascorbate reductase
<b>GPX</b>	Glutathione Peroxidase
<b>GR</b>	Glutathione Reductase
<b>LA</b>	Leaf Area
<b>LMR</b>	Leaf Mass Ratio
<b>LWD</b>	Leaf Water Deficit
<b>MDA</b>	Malondialdehyde
<b>MSI</b>	Membrane Stability Index
<b>mg/g</b>	milligram/gram
<b>mg/g DW</b>	Milligram/gram Dry Weight
<b>mg/g FW</b>	Milligram/gram Fresh Weight

<b>mg/l</b>	milligram/liter
<b>MI</b>	Membrane Integrity
<b>mM</b>	millimoler
<b>mmol/l</b>	millimole/ Liter
<b>MPa</b>	Megapascal
<b>MSI</b>	Membrane stability index
<b>NAR</b>	Net Assimilation Rate
<b>NPs</b>	Nanoparticles
<b>OP</b>	Osmotic Pressure
<b>POD</b>	Peroxidase
<b>ppm</b>	Part Per Million
<b>PSII</b>	Photosystem 2
<b>RDM</b>	Root Dry Mass
<b>ROS</b>	Reactive Oxygen Species
<b>RWC</b>	Relative Water Content
<b>SDM</b>	Shoot Dry Mass
<b>SE</b>	standard Error
<b>SOD</b>	Superoxide Dismutase

<b>TAA</b>	Total Free Amino Acids
<b>TP</b>	Total Phenols
<b>Trays/ha</b>	Trays/ Hectare
<b>TSP</b>	Total Soluble Protein
<b>TSS</b>	Total Soluble Sugars
<b>WUE</b>	Water Use Efficiency
<b>μmol</b>	Micromoler
<b>μg/ml</b>	microgram/ millilitre

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### ABSTRACT

Application of nanofertilizers is one of the promising methods for increasing resources use efficiency and reducing environmental pollutions. This study was carried out to investigate the effects of lithovit (nano-CaCO<sub>3</sub>), nano titanium dioxide (nano-TiO<sub>2</sub>) and nano silicon dioxide (nano-SiO<sub>2</sub>) on chemical constituents and yield characteristics of cotton plant under drought and normal conditions. The cotton plants pre-treated with four concentrations of nano-CaCO<sub>3</sub> (3000, 6000, 9000 and 11000 ppm), nano-TiO<sub>2</sub> (25, 50, 100 and 200 ppm) or nano-SiO<sub>2</sub> (400, 800, 1600 and 3200 ppm) then exposed to drought and normal conditions. In general, the drought stress reduced the pigments content, total soluble sugars content, glutathione reductase activity and yield characteristics, while increased total phenolics, total soluble proteins, total free amino acids, free proline content, total reducing power, total antioxidant capacity, catalase, peroxidase and superoxide dismutase activities in comparison with control. The obtained results showed that pretreatment of cotton plants under drought and normal conditions with nano-CaCO<sub>3</sub>, nano-TiO<sub>2</sub> or nano-SiO<sub>2</sub> caused increasing of pigments content, total soluble sugars, total phenolics, total soluble proteins, total free amino acids, free proline content, total reducing power, total antioxidant capacity, antioxidant enzyme activities and enhancement of yield characteristics. The optimum concentrations of nano-CaCO<sub>3</sub>, nano-TiO<sub>2</sub> and nano-SiO<sub>2</sub> to alleviate the drought stress and improve the productivity under normal condition in cotton plants were 1100, 50 and 3200 ppm, respectively. Finally, it can be concluded that foliar application of nano-CaCO<sub>3</sub>, nano-TiO<sub>2</sub> or nano-SiO<sub>2</sub> could improve the drought tolerance and improve the productivity of cotton plants under normal condition.

**Key words:** Drought stress, Normal condition, Cotton, Lithovit, Titanium dioxide, Silicon dioxide, Nanofertilizers.