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Sodium Silicate Protects Tomato Plants from Water Stress by Enhancing Ant Oxidative Defense System

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Abstract—*Drought is an important threat to sustainable agriculture worldwide. Drought causes serious economic, social and environmental losses. It has been estimated that water stress severely reduces the yield and productivity of food crops up to 70%. Water stress also leads to oxidative stress in the plants due to stomatal closure which causes significant reduction in photosynthetic electron transport chain and produces reactive oxygen species. Reactive oxygen species (ROS) such as superoxide anion (O_2^-), hydrogen peroxide (H_2O_2) and hydroxyl radical (OH^-) are highly reactive which can directly attack on pigments, membrane lipids, proteins and nucleic acids. The degree of damage by ROS depends on the balance between the production of ROS and its removal by the antioxidant scavenging mechanism.*

Lycopersiconesculentum Mill. (family: Solanaceae) commonly known as The Poor Man's Apple, is one of the chief vegetable crops in India. Tomato is excellent source of antioxidants, fiber, amino acids, minerals and vitamins. The antioxidants present in tomato fruits are mainly lycopene and β-carotene which has been found defensive against cancer, tumor and cardiovascular diseases.Silicon is recognized as quasi-essential element which acts as plant protectant and plays a pivotal role in enhancing growth and productivity of plants especially in stress condition.In the present study water stress treatment (3d and 6d) on tomato plants (Lycopersiconesculentum Mill. var. Pusa 120) significantly decreased relative water content, pigment content, sugar and protein contents but the accumulation of proline was stimulated in tomato leaves. The activities of antioxidant enzymes such as SOD, CAT, APX and POX were significantly increased under (3d and 6d) water stress condition at 60 DAS in sodium silicate treated tomato plants in comparison to control.The results clearly indicate the positive impact of sodium silicate in protection of tomato plants under water stress condition.

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