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Short Communication

Drought Stress: Major Cause of Low Yield and Productivity

Ali N* and Anjum MM
Department of Agronomy, The University of Agriculture, Pakistan

***Corresponding author:** Nawab Ali, Department of Agronomy, The University of Agriculture, Pakistan

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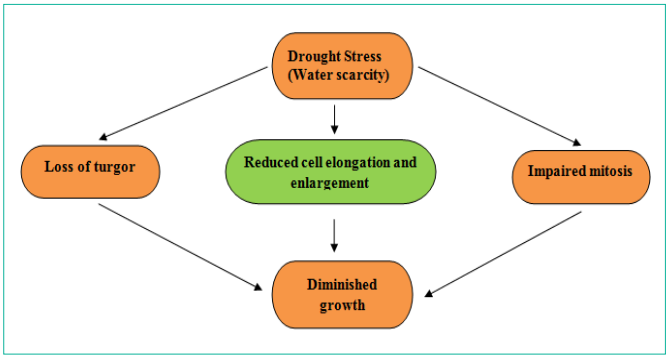
Drought; the greatest fear of global climatic changes and is one of the most important stress among various environmental stresses for plant growth and productivity. Growth and production of plants is negatively affected by various biotic and a biotic stress factors. It is very crucial limiting factor at the initial stages of plant growth and establishment. Changes caused by drought stress are principally linked to altered metabolic processes; among those one is either reduction or loss in photosynthetic pigments synthesis. As a result of loss in these pigments cause reduction in light harvesting and making of reducing powers, which are a source of energy for dark reactions of photosynthesis. Drought induced various changes in morphological, physiological and pigments composition in flora. Cell enlargement is more affected by water stress compared to cell division because of reduction in plant growth through impairing different physiological and biochemical processes like photosynthesis, respiration, translocation, ion uptake, carbohydrates and nutrients metabolism. Due to low turgor pressure cell growth and expansion rate is severely suppressed. Certain strategies are adopted by plants in response to different environmental stresses such as maintenance of turgor through osmoprotectant accumulation, decrease in transpiration rate and stomatal closure plays a key role to minimize the adverse effects of drought stress. Nonetheless, such limitations like stomatal closure also reduce concentration of CO_2 between the cells which prevents the Calvin-cycle at moderate water and therefore the potential yield of the crop plants is finally reduced.

Various changes that occurs due to water stress are biochemical changes (Reduction in rubisco efficiency, declined photochemical efficiency, produced Reactive Oxygen Species (ROS), Oxidation damage, antioxidant defence, ABA generation, diminished Chlorophyll content, proline production, polyamines generation, increase in antioxidative enzymes, carbohydrates production, ABA accumulation), Morphological changes (small plant size, early



maturity, reduced leaf area, reduced yield, limited leaf extension, diminished leaf size, decreased number of leaves, reduced leaf longevity, increased root-to-shoot ratio, reduced total shoot length & decreased plant height) and Physiological changes (stomata closure, diminish in photosynthesis, increase in oxidative stress, cell wall integrity changes, leaf water potential reduction, decrease in stomata reduction, diminished growth rates, decline in transpiration, developed water use efficiency, enhance of AOX pathway & reduced relative water content).

To overcome the adverse effect of drought stress classical genetic methods like responsible genes detection and transgenic plants production which lead to over expression of compatible solutes in transgenic plants to improve stress tolerance, manipulation of genes improved plant breeding techniques (water extraction efficiency, water use efficiency, hydraulic conductance, osmotic and elastic adjustments, and modulation of leaf area) and appropriate agronomic practices.

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