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Mitigating abiotic stress consequences with improved tolerance and crop productivity through physiological strategies

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Abiotic stresses, viz., drought, salinity, heat, flooding and others are expected to be more frequent in future due to disturbances in global climate, posing a serious challenge for plant scientists to ensure food supply for the growing world population. Besides pulses, intricate molecular physiology and biochemistry need to be understood in economic plants by devised cutting edge technologies for developing climate resilient genotypes and predictably enhanced productivity. For a quantum jump in yield potential, we must explore the possibilities of breaking the yield barriers to augment yield stability. To combat stress effects, plants develop some common tolerance mechanisms and stressor specific mechanisms to cope up with stress. Though, the degree of tolerance varies from plant to plant, from low to high. The hardened seeds of chickpea and Field pea followed by foliage applied Salicylic Acid (SA), methyl and 24-epibrassinolide considerably alleviated negative effects of drought stress minimizing lipid peroxidation, maintenance of relative water content, accumulation of sugar, proline, ascorbic acid and enhanced antioxidative ezymes activity in leaves. SA contributed for increased growth and development, flower, pod retention and effective nodulation in different pulse crops with improved Nitrogen Use Efficiency (NUE) and yield under stress. Maximum reduction was noticed in two chickpea varieties. SA @1.5 mM was more effective than @1.0 mM in improving NR activity Evolved tolerant and susceptible cultivars were examined at critical developmental stages of seedling growth, reproduction and seed development duly treated with 24-epibrassinolide @0.05mM for mitigating salinity effects identically. Paclobutrazol alleviated harmful effects of flash flooding in mungbean through improved water use efficiency, antioxidant enzymes activity and synthesis of antioxidants of compatible nature. Conclusion and Significance: Stress tolerance may be achieved by enhanced function of physiological systems. Information on stress-inducible genes, genetic control of stress responses, signaling pathways leading to adaptations are needed for ultimate mitigation.

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