REVIEW ARTICLE

HARNESSING PGPR MECHANISMS, STRATEGIES AND CHALLENGES IN SELECTION OF SUITABLE BACTERIA FOR DROUGHT STRESS

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Abstract: Plants are continuously exposed to a wide array of environmental stresses. Abiotic stress is one of the foremost limiting factors that are responsible for low agricultural productivity. The incidence of extreme events like prolonged drought, salinity, heavy rain and flooding, heatwave, and frost damage, metal toxicities in problematic soils are increasing day by day under the scenario of changing climate. Crop plants need to acclimatize against adverse external pressure created by environmental and edaphic conditions with their intrinsic biological mechanisms. Drought is one of the significant constraints on agricultural productivity worldwide and is likely to increase further. Several adaptations and mitigation strategies are required to cope with drought stress. Here, microorganisms can come to the rescue in an economical and eco-friendly manner to help plants for better fitness against abiotic stressors. Their interactions with compatible microbes evoke various kinds of local and systemic responses that improve the plant's metabolic capability to fight against abiotic stresses. Root-associated bacterial communities play a vital role in maintaining the health of the plant host. Therefore, it is essential to understand better the mechanisms that influence microbial communities composition and structure and what role the host may play in the recruitment and control of its microbiome. Plant growth-promoting rhizobacteria (PGPR) could play a significant role in alleviating drought stress in plants. These beneficial microorganisms colonize the rhizosphere/endo-rhizosphere of plants and impart drought tolerance by producing exopolysaccharides (EPS), phytohormones, 1-aminocyclopropane- 1-carboxylate (ACC) deaminase, volatile compounds, inducing accumulation of osmolytes, antioxidants, upregulation or downregulation of stress-responsive genes, and alteration in root morphology in the acquisition of drought tolerance. In the present review, we elaborate on the role of PGPR and various mechanisms, which in turn helping plants to cope with drought stress.

Keywords: Abiotic stress, Antioxidants, Microbiome, Osmolytes, Phytohormones, Rhizobacteria

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