**PLANT GROWTH PROMOTING MICROBES: Salinity stress alleviation tools**

In order to develop plant adaptation strategies to salinity stress, it is essential to understand the microbe-mediated mechanisms underlying control of salinity responses. These mechanisms include ion transport and homeostasis, osmolytes regulation, hormonal balance, antioxidant machinery, and other stress indicators. In saline soil, using plant-beneficial microorganisms to reduce plant stress is an attractive idea. PGPM offers significant prospective to magnify the plant resilience and crop yields in saline agriculture systems. Mechanisms used by microbes include responses to oxidative stress, osmotic regulation by ion homeostasis and osmolyte accumulation, defence against free radicals through the development of free radical-scavenging enzymes, and maintenance of growth parameters through the synthesis of phytohormones and other metabolites. **(Mishra et al., 2021)** Many microbial species exist in the rhizosphere of plants, and these microbes may be able to adapt to the salinity stress. These PGPBs, or plant growth-promoting bacteria that are tolerant of salinity, help the plants withstand salty environments. These plant-associated bacteria create a variety of chemicals, including extracellular polymeric substance (EPS), 1-aminocyclopropane-1-carboxylate (ACC) deaminase, indole-3-acetic acid (IAA), antioxidants, and volatile chemical compounds (VOC). Moreover, through measures for stress avoidance, tolerance, and resistance, the naturally linked microbiome of plants may be able to defend the host.**(Kumar et al., 2020)**

PGPM inoculation has been shown to influence the management of abiotic stress by both direct and indirect mechanisms that promote systemic tolerance. Many PGPM have been studied for their potential to enhance plant-water relationships, ion homeostasis, and photosynthetic efficiency in plants under salt stress, nevertheless, their amelioration processes are complex and often poorly understood. The plant-microbe interaction, which results in stress reduction, triggers a complex network of signalling events that control these systems. Rhizobacteria which is PGPM, control water potential and stomatal opening by influencing hydraulic conductivity and transpiration rate. Plants are assisted by PGPR-induced osmolyte accumulation and phytohormone signalling to overcome their initial impact from osmotic shock after salinization. Under saline conditions, the compatible solutes taken by plant roots help to maintain osmotic equilibrium and prevent cellular oxidative damage. Bacteria restrict plant salt intake by trapping cations in the exopolysaccharide matrix, modifying root structure with thick rhizosheaths, and controlling the expression of ion affinity transporters. With the significant input of Na+ and Cl ions, PGPR is believed to reduce nutritional imbalance by increasing the mineral nutrient exchange of both macro and micronutrients. Increased plant nutrient availability is achieved by microbially induced nutrient cycling (mineralization), rhizosphere pH alterations (organic acids), and metal chelation (siderophores).**(Ilangumaran & Smith, 2017)**