Drought Tolerant Enterobacter Cloacae and Serratia Marcescens to Enhance Wheat Growth Under Drought

Over 35% of the world's land is considered as arid or semiarid, experiencing precipitation that is insufficient for most agricultural uses. Drought is considered as major abiotic stress that severely affects plant growth and productivity worldwide as compare to any other abiotic stress. Under drought conditions, plant growth is highly affected in terms of reduced root length, shoot length, deficiency of nutrients such as N, P, K, Fe, Zn, Ca, Mg and S, consequently plants under drought stress are more susceptible for diseases. About two-third of India's population depends upon agriculture, therefore drought conditions are likely to threaten economy of the country. Excessive use of chemical fertilizers and pesticides may also affect nutrient content in soils, responsible for soil infertility and finally made soil unhealthy and inefficient, which leads to low yield as well as micronutrient deficiency in crop and affect human health. Therefore, sustainable approaches are needed to assist plants growth under drought stress in order to mitigate crop losses. One of the revolutionary ways to enhance crop productivity as well as food quality with environmental friendly approach is application of plant growth promoting rhizobacteria (PGPR) as they can confer drought tolerance in plants as well as enrich the micronutrients in plants. PGPR have been considered to assist host plants to cope up with drought stresses. The present technology offer drought tolerant efficiency of two plant growth promoting rhizobacteria namely *Serratia marcescens* and *Enterobacter cloacae* which determined their bio-protective effects on wheat under drought stress. These bacteria significantly promote seedling emergence, vigor and yield by production of ACC deaminase enzyme, siderophore production, inorganic phosphate solubilization, phytohormone synthesis, antibiotics production and by controlling plant pathogens.

Advantages:

1. *Serratia marcescens* and *Enterobacter cloacae* are able to ameliorate drought tolerance in wheat as well as improve crop productivity under drought conditions.
2. *Serratia marcescens* and *Enterobacter cloacae* are capable in terms of exhibiting multiple plant growth promoting traits, and as bio-inoculants they provide better alternatives of chemical fertilizers application.
3. As potential bio-inoculants, they can enhance chlorophyll and carotenoid content to improvelight harvesting capacity of plants.
4. Inoculated plants can exhibit highest level of proline content and relative water content (RWC) which act as osmolyte for the adjustment of osmotic pressure in response to drought.
5. These bacteria confer plantsto exhibit higher level of catalase activity that can quench free radicals and oxidants, hence decreases oxidative damage.
6. The use of these bacteria as a potential bio-inoculants is an easier approach and environmentally safe.