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Beneficial Plant Microbe Interaction in Adverse Climatic Condition

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Opinion

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There are two well-known old American and Japanese quotes "snug as a bug in a rug" and 'Tade kuu mushi mo suki-zuki' which means very comfortable and everyone has their own tastes respectively, both quotes are best fit for beneficial plant-microbes (PM) interactions. Most of the plants interact largely with diverse microorganisms in their surrounding environment but the question arises why PM interaction exist everywhere in agroecosystem with sustainability? PM interactions were occurred from the evolutionary time scale which is considered in existing literature. PM interactions are intricate system of communication and judge each other for sustainability in different ecosystem. Number of microbes interacts with anthosphere, caulosphere, carposphere, phyllosphere and rhizosphere while most of the beneficial microbial diversity exists in rhizosphere and it depends on condition. It mainly includes plant growth promoting bacteria, fungi and nematodes. Microbial diversity in rhizosphere mainly occurred due to abundant availability of nutrients and soil C which also arise from the plant root exudates and degradation of old plant roots from microbial activity and other environmental process like rock weathering and soil formation processes.

Beneficial PM interactions is common fact, it stimulate plant growth productivity and protect from abiotic stress and pathogens. Most beneficial plant associated known bacterial genera: *Azospirillum*, *Bacillus*, *Pseudomonas*, *Rhizobium*, *Serratia*, *Stenotrophomonas* and *Streptomyces* and among fungi micorrhizal fungi is most common. Presently, known example of beneficial plant microbe interactions is Legume-*Rhizobium* interactions for nitrogen fixation and maintenance of soil C/N ratio. Similarly many other beneficial plant microbe interactions exist in sustainable ecosystem which is intricate and not well understood.

From the last century abiotic stress is increasing day by day due to burning of fossil fuels, increasing population, modernization and industrialization which is leading towards the alterations in the environment. Recently, most of the studies focused on climate change and predict how the plant microbe interactions is effected in elevated level of CO₂, temperature and heavy metal pollution. In general opinion some factors induce change in plant physiology and increase metabolic rate which lead to increase in root exudation and C/N ratio. Most of the rhizosphere composition and associated microbial diversity and activities should be altered predicted with changed in signal compounds of root exudation.

The effect of climate change on beneficial plant microbe interaction is variable and it depends on certain factors. Initially if these factors temperature, elevated atmospheric C level and soil heavy metal pollutions are increased within certain limits it strengthen the communication between plant and microbes and develop good interactions. To understand the beneficial plant microbe interaction in ecosystem by using conventional and proteomic, metagenomic, meta- transcriptomic approach of high-throughput molecular techniques.

Plant growth promoting rhizobacteria and fungi which are able to tolerate climate change are necessary to introduce and inoculate in agroecosystem to support the plant growth performance with better interactions and soil fertility maintain for future crop cultivation in adverse climatic condition.

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