

AMF activates PDH 45 and G-proteins Genes to Alleviate Abiotic Stress in Tomato Plants

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Abstract : Global climate change is impacting large agrarian societies, especially those in countries located near the equator. Agriculture, and consequently, plant-based food, is the hardest hit in tropical and sub-tropical countries such as India due to an increased incidence of drought as well as an increase in soil salinity. One method that holds promise is AMF-rich biofertilizers which assist in activating proteins which in turn help alleviate abiotic stress in plants. In the present study, we identified two important species of (arbuscular mycorrhizal fungus) AMF belonging to *Glomus* and *Gigaspora* from the rhizosphere of the important medicinal plant *Justicia adathoda*. These two species have been found to be responsible for the abundance of *Justicia adathoda* in the semi-arid areas of the Jammu valley located in northern India, namely, the Union Territory of Jammu and Kashmir. We isolated the species of *Glomus* and *Gigaspora* from the rhizosphere of *Justicia adathoda* and used them as biofertilizers for the tomato plant. Significant improvements in the growth parameters were observed in the tomato plants inoculated with *Glomus* sp. and *Gigaspora* sp. in comparison with the tomato plants that were grown without AMF treatments. Tomato plants grown along with *Glomus* sp. and *Gigaspora* sp. have been observed to withstand 200 mM of salinity and 25% PEG stress. AMF also resulted in an increased concentration of proline and antioxidant enzymes in tomato plants. We also examined the expression levels of salinity and drought stress-inducible genes such as pea DNA helicase 45 (PDH 45) and genes of G-protein subunits of the tomato plants inoculated with and without AMF under stress and normal conditions. All the stress-inducible genes showed a significant increase in their gene expression under stress and AMF inoculation, while their levels were found to be normal under AMF inoculation without stress. We propose a model of abiotic stress alleviation in tomato plants with the help of external factors such as AMF and internally with the help of proteins like PDH 45 and G-proteins.

Keywords : AMF, abiotic stress, g-proteins, PDH-45

Conference Title : ICAMMB 2022 : International Conference on Applied Microbiology and Microbial Biotechnology

Conference Location : Toronto, Canada

Conference Dates : June 16-17, 2022