I J PS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume 7 | Issue 2 | July, 2012 | 413-425

A REVIEW

Responses of crops towards water stress mitigation through plant growth regulators and Vasicular Arbuscular Mycorrhizae

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SUMMARY

Plants in nature are continuously exposed to several biotic and abiotic stresses. Among these stresses, drought stress is one of the most adverse factors of plant growth and productivity and considered a severe threat for sustainable crop production in the conditions on changing climate. Drought triggers a wide variety of plant responses, ranging from cellular metabolism to changes in growth rates and crop yields. Understanding the biochemical and molecular responses to drought is essential for a holistic perception of plant resistance mechanisms to water-limited conditions. This review describes role of plant growth regulator and vascular arbuscular mycorrhize on mitigation of drought as well as some aspects of drought induced changes in morphological, physiological and biochemical changes in plants. Drought stress progressively decreases CO_2 assimilation rates due to reduced stomatal conductance. It reduces leaf size, stems extension and root proliferation, disturbs plant water relations and reduces water-use efficiency. It disrupts photosynthetic pigments *i.e* chlorophyll molecule and reduces the gas exchange leading to a reduction in plant growth and productivity. The critical roles of osmolytes accumulation under drought stress conditions have been actively researched to understand the tolerance of plants to dehydration. In addition, drought stress-induced generation of active oxygen species is well recognized at the cellular level and is tightly controlled at both the production and consumption levels, through increased anti-oxidative systems. This review focuses on the ability and strategies of higher plants to respond and adapt to drought stress.

Key Words : Drought stress, PGR, VAM, Photosynthetic pigments, Osmolytes, Growth, Yield

How to cite this article : Meena, M.K., Naik, M.C. and Chetti, M.B. (2012).Responses of crops towards water stress mitigation through plant growth regulators and Vasicular Arbuscular Mycorrhizae. *Internat. J. Plant Sci.*, **7** (2) : 413-425.

Article chronicle : Received : 31.01.2012; **Accepted :** 30.05.2012

Moisture stress is one of the major constraints for growth and productivity of crop plants. The adaptation of plants and their ability to tolerate different abiotic stresses is of greater relevance for genetic manipulation to develop improved genotypes for higher productivity under these conditions. Moisture stress affects many metabolic aspects of plant sand induce anatomical and morphological changes resulting in reduced growth. The use of plant growth regulators (PGR) and VAM (Vesicular Arbuscular Mycorrhizae) are an alternative approach to ameliorate the effect of moisture stress on crops. Crop productivity is decreasing due to detrimental effects of various biotic and abiotic stresses; therefore, minimizing these losses is a major area of concern to ensure food security under changing climate. Environmental abiotic stresses, such as drought, extreme temperature, cold, heavy metals, or high salinity, severely impair plant growth and productivity worldwide. Drought, being the most important environmental stress, severely impairs plant growth and development, limits plant production and the performance of crop plants, more than any other environmental factor. Plant experiences drought stress either when the water supply to roots becomes difficult or when the transpiration rate becomes very high. Available water resources for successful crop productions have been decreasing in recent years. Furthermore, in view of various climatic change models scientists suggested that in many

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