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# Drought Stress: A Major Environmental Constraints in Agriculture

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Agriculture is the most important sector of the economy of many countries of the world. Crop production of many of the regions is hampering due to climate change either by sudden flood and/or no rain and/or inadequate rain during growing season. Water shortage is one of major constraint in world agriculture. Water deficit commonly termed as drought is the absence of adequate soil moisture for a crop to grow normally and complete their life cycle. The lack of sufficient soil moisture leading to drought stress is a common phenomenon in rain fed areas, brought about by infrequent rain and insufficient irrigation (Wang et al. 2005). Drought is a critical environmental factor which initiates water stress in crops and a major constraint on plant growth and productivity (Rampino et al., 2006). It is the most damaging abiotic stress affecting today's agriculture (Zhang et al., 2006).

In general most of the cultivated crops are comparatively sensitive to even mild water stress (Mundree et al., 2002). The deficiency of water may become even more severe in the future due to worldwide climate change. One of the major consequences of water shortage in crops is the loss of protoplasmic water leading to the concentration of ions such as $Cl^-$ and $NO_3^{-}$. As a result at this high concentrations these ions eventually effectively inhibit metabolic functions (Hartung et al., 1998). Moreover, the concentration of protoplasmic constituents and the loss of water from the cells lead to the formation of what is termed a glassy state. In this state whatever liquid is left in the cell has a very high viscosity, increasing the chances of molecular interactions that can cause protein denaturation and membrane fusion (Hartung et al., 1998; Hoekstra et al., 2001). It is also reported that water stress limits photosynthesis through stomatal and non-stomatal limitations. Even under mild water stress a reduction in stomatal and leaf mesophyll conductance has been observed which can lead to the restrictive diffusion of CO2 from the outside into leaf carboxylation sites (Chaves et al., 2003; Flexas and Medrano, 2002). In case of legume crops, nitrogen fixation is severely affected due to soil drying. In drought condition, soybean not only suffers losses of CO2 accumulation and reduced leaf area development but its nitrogen fixation is interrupted (Sinclair and Serraj, 1995).

However, drought-induced loss in crop yield probably exceeds losses from all other environmental factors, since both the severity and duration of the stress are critical (Farooq et al., 2009). The reduction of crop yield due to drought stress at various growth stages has been reported in many field crops such as potato (Kawakami et al., 2006), common bean (Martinez et al., 2007), soybean (Samarah et al., 2006), maize (Monneveux et al., 2006), barley (Samarah, 2005), rice (Lafitte et al., 2007). In commercial nursery production systems frequent and severe drought stress of container grown plants can reduce crop quality, delay marketing and consequently profitability (Egilla et al., 2005). Beside the above reported consequences of drought stress on crops it may become more detrimental in whole agriculture systems including fisheries and livestock. Therefore, it is inevitably important to develop drought tolerant crop genotypes through selection or breeding program.

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