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Effect of Water Deficit Stress on Antioxidant Enzyme Activities in Seedlings of Perennial Alfalfa Ecotypes

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Abstract

Water deficit, with the production of active oxygen species, is an important inducer of oxidative stress that plants have been encountered. Some mechanisms such as antioxidant defense systems in plants are known to reduce destroyer effects of active oxygen species. In these systems, enzymes such as superoxide radicals, polyphenol oxidase and catalase can neutralise active oxygen species. Thus, the study of plant response to drought stress via measuring the enzyme activity levels can help to recognise drought resistant plants for breeding programs and the development of the cultivation in dry and semi dry zones.

The current research was conducted as factorial experiment in a randomised complete block design with three replications. The factors were ten perennial alfalfa ecotypes in combination with three drought stress levels. Data analysis showed that there were significant differences among alfalfa ecotypes, drought stress levels and their interaction for activity levels of the studied enzymes. The moderate drought stress (-4 bar) caused the highest activity level for all tested enzymes, while a higher drought stress reduced the activity levels of these enzymes due to damage to the protein synthesis system. The superoxide-desmotase and peroxidase with absorbance of 780,1 and 8,2 units mg^{-1} protein had the most and the least enzyme activity level, respectively. Most ecotypes in this study had the same trend of enzyme level variation at different drought levels, while the trend of peroxidase enzyme activity in foreign ecotypes was different to that in Iranian ecotypes. In foreign ecotypes, the level of peroxidase activity reduced gradually under both moderate and intensity drought stresses, while Iranian ecotypes had high and low enzyme activity at these drought stresses, respectively.

Keywords: Alfalfa, Antioxidant enzymes, drought stress