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Physiological and Yield Responses of Purple Coneflower to Nitrogen Sources at Different Levels of Irrigation

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Abstract

Purple Coneflower (Echinacea purpurea (L.)) is one of the most important medicinal plants in the world showing different biochemical reactions as affected by drought stress and nitrogen fertiliser sources. The purposes of this study were to determine the effect of nitrogen sources on soluble protein, enzyme activities, carotenoid content, greenness and biological yield of the E. purpurea under different levels of irrigation. The experiment was conducted in a research field in Iran during 2013–2015. Irrigation treatments were irrigation after 25, 50 and 75 % soil water depletion, and nitrogen sources were including no nitrogen (N), nitroxin, 40 kg N ha^{-1}, 40 kg N ha^{-1} + nitroxin and 80 kg N ha^{-1}. Nitroxin is a trade marck bio-fertiliser including Azotobacter and Azospirillum. Interaction of year, Irrigation and nitrogen sources was significant on catalase, polyphenoloxidase and peroxidase activities, so that The activity of catalase (11.9–21.3 m mol $gr^{-1}Fw$ min^{-1}), peroxidase (40.1–48.9 μmol $gr^{-1}Fw$ min^{-1}) and polyphenoloxidase (0.79–3.63 m mol $gr^{-1}Fw$ min^{-1}) have increased in both years under drought stress conditions, however nitrogen sources, especially 40 kg N ha^{-1} + nitroxin, increased antioxidant enzymes activity compared to control. The lowest greenness (50.1–45.9) was achieved from no-consumption of nitrogen in the irrigation after 75 % water depletion. The results demonstrated the beneficial effects of nitrogen sources on physiological reactions, especially peroxidase, polyphenol oxidase and carotenoids metabolism. It is concluded that irrigation of E. purpurea based on 50 % water depletion and 80 kg nitrogen as well as combination of nitroxin and 40 kg nitrogen treatments should be an appropriate choice for two years.

Keywords: Antioxidant enzymes, Biological yield, Carotenoids, Drought stress, Soluble Proteins

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