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Effectiveness of Water-Saving Superabsorbent Polymer in Soil Water Conservation for Oat Based on Ecophysiological Parameters

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*The objective of the study was to study soil water conservation and physiological growth of oat (*Avena sativa *L.) using water-saving superabsorbent polymer (SAP) at 60 kg ha^{-1}. The effectiveness of SAP was studied under three irrigation levels (adequate, moderate, and deficient) using a new type of negative hydraulic pressure—controlled auto-irrigator. Seven weeks after sowing (WAS), the number of tillers and leaves increased significantly by 33 and 40%, respectively, under deficient irrigation due to application of SAP. The SAP had little effects on shoot dry mass (SDM) and root dry mass (RDM) under adequate and moderate irrigation but increased both parameters significantly (59 and 45%) under deficient irrigation. As a result, the water-use efficiency (WUE) increased substantially (50%) under deficient irrigation. Leaf water potential (ψ_l) under adequate irrigation exceeded that under moderate and deficient irrigation by 26.4 and 39.6%, respectively, and the application of SAP further increased it by 7.2%. The superior growth and WUE of oat treated with SAP under deficient irrigation was ascribed to maintenance of greater relative water content (RWC) in leaves as well as intercellular carbon dioxide concentration (Ci), net photosynthesis (P_N), and transpiration rate. It is suggested that the application of SAP is a suitable soil management practice for locations characterized by severe water stress.*

Keywords Auto-irrigation, drought stress, oat, soil water, superabsorbent polymer, water-use efficiency

Introduction

There has recently been renewed interest in using water-saving superabsorbent polymers (SAP) for soil water conservation and crop production under drought stress (Woodhouse and Johnson 1991; Yazdani, Allahdadi, and Akbari 2007). Northern China is now seriously

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