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Physiological Responses of Safflower (*Carthamus Tinctorius* L.) Seedlings to Water Stress and Chitosan

SEYED ALI MOHAMMAD MODARRES-SANAVY¹, BATOOL MAHDAVI², MAJID AGHAALIKHANI³,
MOZAFAR SHARIFI⁴

¹ Tarbiat Modares University, Agronomy, Iran

² Tarbiat Modares University, Agronomy Department, Iran

³ Tarbiat Modares University, Agronomy, Iran

⁴ Tarbiat Modares University, Plant Science Department, Iran

Abstract

The effects chitosan solutions on seed germination and physiological changes of safflower (*Carthamus tinctorius* L.) seedling were investigated under water stress conditions. Treatments comprised of factorial combinations of four osmotic potential levels (0, -4, -8 and -12 bar, prepared by PEG 6000) and nine chitosan concentrations (0, 0.05, 0.1, 0.2, 0.4, 0.5, 1, 2, 3 %, all dissolved in 1 % acetic acid) along with a additional treatment of distilled water. Result showed that germination percentage, germination index, shoot and root height, shoot and root dry weight and protein content decreased with increasing water stress. Proline and malondialdehyde (MDA) content increased by increasing osmotic potential to -8 bar. The greatest shoot height and dry weight (19.3 and 36 % more than distilled water treatment, respectively) were observed at 0.4 % chitosan concentration. At low concentrations of chitosan (0.05–0.4 %) protein and proline content increased and MDA content decreased. In osmotic potential -8 bar, the highest germination percentage, shoot and root height obtained by 0.4 % chitosan concentration. The mentioned traits had no significant difference with distilled water and acid acetic (0 % chitosan). Also at this osmotic potential the decline MDA and proline content and the increase of the concentrations of protein (in comparison with distilled water treatment) were detected in low concentrations of chitosan. In the highest level of osmotic potential (-12 bar), germination percentage, shoot and root height increased by low concentrations of chitosan in comparison with distilled water treatment. Also at this osmotic potential the least rate of former parameters obtained by 1–3 % chitosan. Thus, it suggests that chitosan concentration at 0.4 % or lower levels may improve germination percentage of safflower seeds and benefit for seedlings growth under water deficit stress.

Keywords: Chitosan, germination, safflower, water stress