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Triacontanol 'TRIA' application to mitigate the adverse effects of drought and salinity stress under *in vitro* culture of date palm plants

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Abstract

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This study was conducted to attempt adaptation to combined drought and salt stresses (DS) (PEG- 6000 + NaCl) in date palm cv. Barhee implanted *in vitro*, keeping in mind the detrimental influence of DS. *In vitro* experimentation was executed on *P. dactylifera* L. to examine the efficacy of the application of triacontanol (TRIA), on growth attributes, and some biochemical constituents under DS. The optimal treatment was 10 µg l^{-1} TRIA. Such treatment under DS improved the callus growth and increased its weight to 215.0 mg. This treatment also showed the highest response rate and the number of shoots per jar (72.23% and 10.30 shoots, respectively) under DS stress. TRIA enhanced DS tolerance by increasing the contents of osmoregulatory substances such as proline, total soluble carbohydrates, and total soluble proteins, were obtained by adding 20 and 10 mg l^{-1} TRIA. This treatment was also more effective under DS in increasing Ca^{2+}, Mg^{2+}, and K^{+}, as well as Fe^{2+}, and chlorophyll pigment. These results also indicate that using 10 µg l^{-1} TRIA as a supplement under DS can increase SOD, APX, and PAL activity, to 31.68, 3.377 unit g–1 min^{-1}, and 33.78%, respectively. Data analysis also indicated that the application of 10 µg l^{-1} TRIA countered the DS-induced harmful effects by reducing the content of malondialdehyd (MDA) and H_2O_2 in stressed tissues to 1.06, and 1.278 µMg of fresh weight (FW). Our work could reveal detailed changes in the quantity and number of protein bands by SDS-PAGE. New protein bands appeared in both stressed with TRIA-treated plants. The result of the present study will be useful for rapid clonal propagation of date palm which can be used to enhance the tolerance of plants to drought and salt stress.

Keywords

abiotic stress, callus induction, growth regulator, multiple shoots, nutrients, protein patterns

Introduction

Date palm (*Phoenix dactylifera* L.), which belongs to the Arecaceae family, is a multipurpose tree with nutritional, medicinal, and ornamental importance, and today its worldwide production, utilization, and industrialization are continuously increasing. Due to the increasing demand for date palm plantlets, production is carried out in large areas (Jasim et al., 2009). Various climate changes greatly affect agricultural systems around the world (Goharrizi et al., 2021). Drought and salinity are known to be the two most important abiotic stresses affecting plant growth, development, and productivity (Ma et al., 2020). The focus on plant stress-related research has gained substantial momentum over the past decades. Screening plants for different stress conditions is essential in breeding and se-

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