

Impact of Different Concentrations of Aluminum Chloride on Callus Induction and Organogenesis in Date Palm (*Phoenix dactylifera* L.) cv. "Barhi"

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Abstract

The present study was conducted in the Plant Tissue Culture Laboratory, Date Palm Research Center, University of Basrah, Basrah, Iraq for the years 2023 and 2024. The investigation aims to test the effect of adding different concentrations of aluminum chloride (0, 15, 30, and 45mg L⁻¹) to the MS medium prepared to induce callus and indirect shoot regeneration of date palm (*Phoenix dactylifera* L. cv. Barhi) grown using an *in vitro* culture technique. The results showed that the aluminum chloride treatment at a concentration of 45mg L⁻¹ significantly outperformed the 15 mg L⁻¹ treatment of aluminum chloride and the control treatment in response to callus induction (%), fresh and dry weight (mg). The control treatment recorded the lowest values in response to callus induction and fresh and dry callus weight. The results indicate that the aluminum chloride treatment at a concentration of 45mg L⁻¹ significantly outperformed the 15mg L⁻¹ treatment of aluminum chloride and the control treatment in response to shoot regeneration, number of shoots per culture, shoot length, and number of leaves per shoot. The control treatment recorded the lowest values in these characteristics.

Keywords: Indirect shoot, *in vitro*, induction, callus, organogenesis.

I. INTRODUCTION

Date palm (*Phoenix dactylifera* L.) belongs to the family Arecaceae and the order Palmae (Ibrahim *et al.*, 2018). It is a family of monocotyledonous, dioecious flowering vascular plants and is a semi-tropical evergreen fruit tree (Al-Khayri, 2007). Date palm trees are characterized by their ability to grow vegetatively in various climatic conditions. They are also widely cultivated in arid and semi-arid areas and North Africa (Ibrahim, 2019). They are one of the oldest Asian and African plants, grown for their sweet-tasting, edible fruits and their industrial and medicinal benefits (Echegaray *et al.*, 2020). Date palms reproduce in two ways: sexually, by seeds, and by offshoots. This is the traditional method of vegetative propagation and is common in palm propagation (Ibrahim *et al.*, 2013). The second propagation is genetically similar to the mother plants. However, it is a strenuous and difficult process because it requires a lot of care and its survivor rate is low (Ibrahim *et al.*, 2017; Ibrahim *et al.*, 2021). In addition, the one date palm production ranges from 1-30 offshoots, especially in high-quality cultivars (Al-Mssallem *et al.*, 2024). Barhi cultivar is distinguished by low production of offshoots and difficulty in obtaining them because of the costly prices of offshoots. Therefore, many researchers have resorted to propagating rare, high-quality, and seductive date palm cultivars through tissue culture techniques to overcome the low production of offshoots and their high prices (Ibrahim *et al.*, 2013; Hashem *et al.*, 2018; Ibrahim *et al.*, 2018). Through plant tissue culture technology, a large number of plants can be obtained in a short time. The plants produced in this way are free of pathogens, so they can be exported without resorting to agricultural quarantine. They are also easy to transport and trade. They can produce many offshoots. They are characterized by a high degree of genetic compatibility with the