

# **Effect of Mycorrhizae Inoculation on the Growth of Young Date Palm Plants Under Nursery Conditions**

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## **The Sixth International Date Palm Conference (SIDPC)** **Abu Dhabi -UAE: 19 – 21 March, 2018.**

**Abstract:** Two years' experiments were carried out at Al Hamrania Research Station (UAE) during (2015-2016) to explore the role of Mycorrhizal inoculation on the growth of date palm plants from micro-propagation growth under nursery conditions. Uniform plants of four date palm cultivars (Barhi, Khalas, Sultana and Madjool) were planted into 10-L pots. The Randomized Complete Block Design (RCBD) was used in this study experiments which involved application of: (T1) recommended 100% chemical fertilizer only, (T2) 100% of recommended organic fertilizer only, (T3) Mycorrhizae without any fertilization, (T4) Mycorrhizae + 100% recommended chemical fertilizer, (T5) Mycorrhizae + recommended 50% organic fertilizer, (T6) Mycorrhizae + 50% chemical fertilizer and (T7) Mycorrhizae +25% chemical fertilizers +25% organic fertilizers.

The results indicated that the use of Mycorrhizae with 100% of recommended organic fertilizers rate were increased significantly by 23% and 25% of the seedling leave growth rate and leave numbers per seedlings, respectively, when compared with the control treatment (without Mycorrhizae inoculation). This greenhouse study also indicated that half the amount of organic fertilizers application had similar effects when compared with 100% organic fertilizer when mixed with mycorrhiza for number of product leaves for all date palm cultivars.

**Key words:** Mycorrhizae, Date palm, organic fertilizers, Compost, seedling, leave growth rate.

## **INTRODUCTION**

Date palm is important crops in the United Arab Emirates, where numbers of date palm trees planted is increasing annually. Date palm trees are grown under harsh climatic conditions characterized by low rainfall and high evaporation rates and mainly with a weak soil material organic fertility.

Growing of date palm is accompanying with use of large amounts of organic and chemical fertilizers with high water supply. These practices may lead to salinization of

soil and fertilizer salts to leak of deep soil layers which bad impacts on groundwater in addition to the high cost of fertilizers. Since most soils of United Arab Emirates are sandy and light texture, this limit their ability to retain water and fertilizer originally created in clay content and repotting and organic matter and also poor fertilizer formulations elements.

Most farmers in the United Arab Emirates to fertilize date palm trees by sprinkling the compost and organic fertilizer around the tree with global irrigation, but this method may not live up to expectations of higher growth and production because most fertilizers lose by washed away from the root zone or loss of soil surface directly.

Therefore, the use of advanced agricultural suitable techniques may become important in cultivating a sustainable date palm under the environmental conditions prevailing in the region to limit the negative effects of higher use of fertilizer and water scarcity and increased tree growth and productivity of promising technologies. That has drawn worldwide attention in recent years using Mycorrhizae which provides benefits through improvement of use of water and fertilizer by developing the ability of plants to absorb nutrients from the soil and increase their ability to withstand environmental stress factors Such as drought, salinity, etc.

Mycorrhizae can provide benefits to plants through the enormous plant roots volume that stretches into the soil to reach the soil layers away to common rooting zone to absorb minerals and transferred to the plant in addition to protecting the plant from soil pests such Nematodes, and improve soil properties and protected from erosion.

The present paper presents the results of use *Mycorrhizae* with young date palm plants produced by micro-propagation before their final plantation in the field.

Objectives of the study the sustainability and further development of palm cultivation and improve productivity study of saving in irrigation water and fertilizer amounts. additive and protect the environment from pollution and studying the efficiency of fertilizers on the date palm plants. This experiment serves also as filed study for Ministry staff and farmers in employment optimization of natural resources under the prevailing conditions.

## **MATERIAL AND METHODS**

This study was conducted is conducted in Al Hamrania research station in Ras Al Khaima during three years (2015-2017). Plants used are “Khalas”, “Sultana”, “Barhi” and “Medjool” date palm cultivars of one year of age cultivated by micro-propagation. All the four cultivars are grown in Al Hamrania date palm gene bank with other more than 100 date palm accessions.

For all treatments when the *Mycorrhizae* was inoculated to plants with fertilizer. The quantity even organic and chemical fertilizer was 100 % of recommended quantity, at 50% and 25% quantity compared with *Mycorrhizae* alone. All treatments with control was seven in total.

All treatments received 25% of the water requirements based on Date palm in the field K<sub>c</sub> irrigation by Allen et al. (1998). *Mycorrhizae* is added 50 cm depths around plant roots before applying fertilizer.

The Randomized Complete Block Design (RCBD) was used in this study experiments which involved application of 7 treatments using *Mycorrhizae* with organic and chemical fertilizers as recommended by the Ministry and applied to the young date palm plants when cultivated directly in field. The composition shown in Table 1 is 100%, 59% and 25% of fertilizer (Organic and chemical) alone or mixed with or without inoculation by *Mycorrhizae*. As control *Mycorrhizae* was inoculated to young plants without any fertilization other than soil content.

## **RESULTS AND DISCUSSION**

The results (Figure 1 and 2) indicated that the use of *Mycorrhizae* with 100% of recommended organic fertilizers rate were increased significantly by 23% of the plants number of leaves and by 25% the growth rate (leaves length after 22 months of growing under nursery conditions. It was related by Shabbir et al. (2011) that inoculation of date palm by *Mycorrhizae* initiate vegetal growth as number of leaves, their length and width and the trunk growth.

When compared with the control treatment (without *Mycorrhizae* inoculation). This study also indicated that half the supply rate (50%) of organic fertilizers application had similar effects when compared with 100% organic fertilizer in the treatment of inoculation of the young plants by *Mycorrhizae* for the leaves numbers for all date palm cultivars. Young date palm plants growth quickly with inoculation by *Mycorrhizae* (Janos, 2007; Meddich et al., 2015).

It is recommended to continue following the plants under field conditions. The shape of plants need to moved them from nursery to plantation in the field.

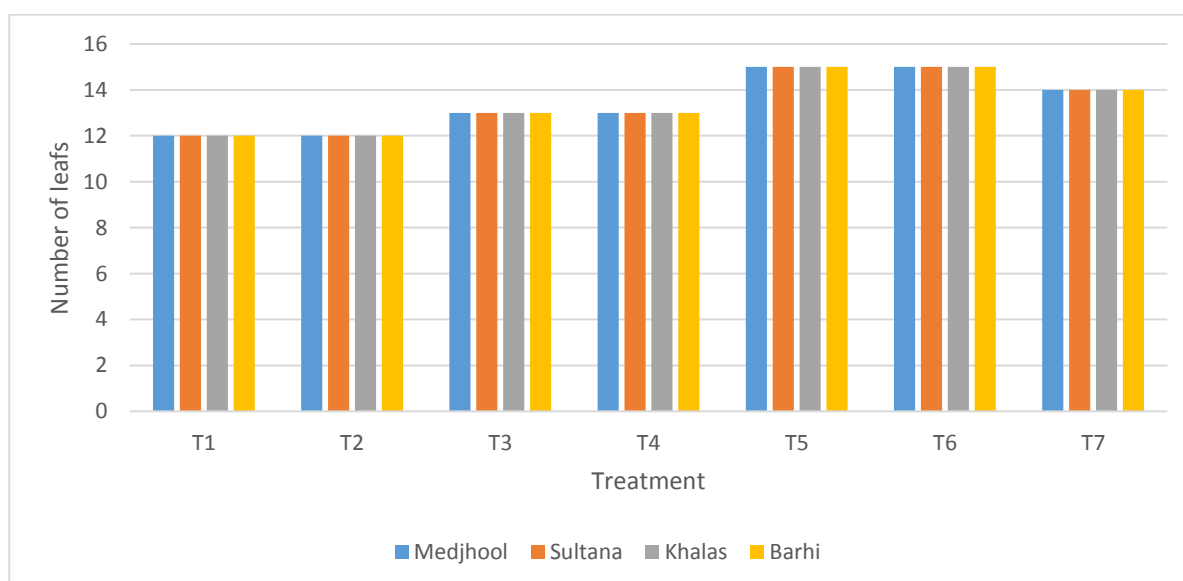
It also recommended to reduce the supply of fertilizer (Organic or chemical) as no significant difference was recorded between 100% and 50% fertilizer supply. This confirmed other results that *Mycorrhizae* improve the roots absorption and use of water and fertilizers (Bouhired et al. 1992; Ghazi et al. 2013).

## **References**

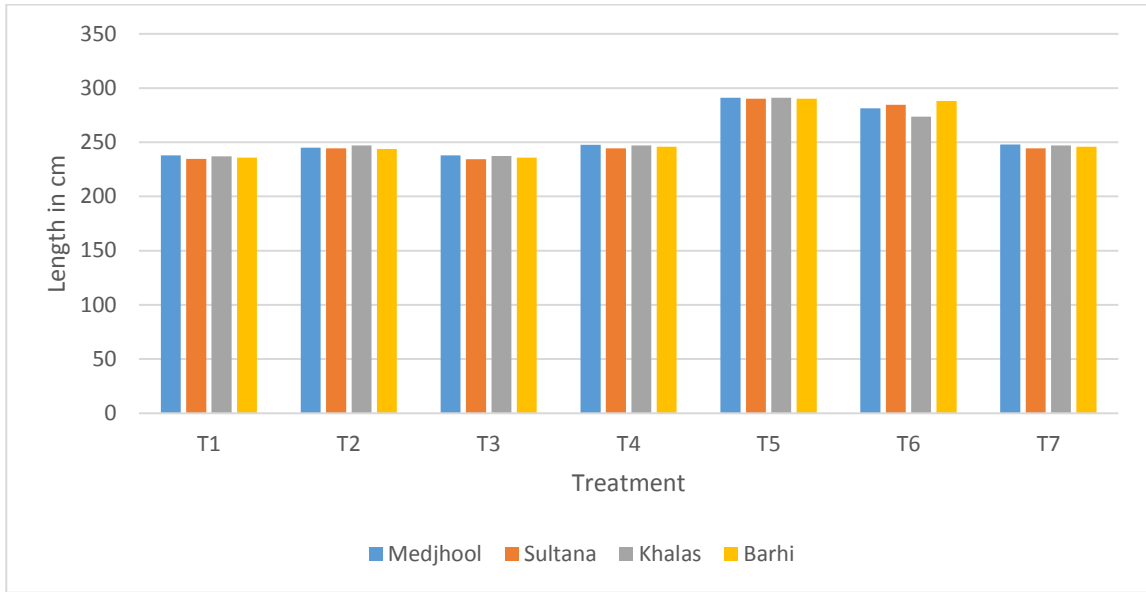
- Allen R.G., Pereira L.S., Raes D., and Smith M. 1998. Crop Evapotranspiration guidelines for computing crop water requirements-FAO Irrigation and drainage paper 56. FAO, Rome. 1998; 300(9): D05109
- Bouhired, L., S. Gianinazzi and V. Gianinazzi-Pearson. 1992. Influence of endomycorrhizal inoculation on the growth of *Phoenix dactylifera*. In: Micropropagation, root regeneration and mycorrhizas. Joint meeting Plant Nutr. 46:291-297.
- Ghazi N. Al-Karaki. 2013. Application of mycorrhizae in sustainable date palm cultivation. Emir. J. Food Agric. 2013. 25(11): 854-862doi: 10.9755/ejfa. v25i11.16499
- Janos, D.P. 2007. Plant responsiveness to mycorrhizas differs from dependence upon mycorrhizas. Mycorrhiza 17:75–91.
- Meddich A., F. Jaiti, W. Bourzik, A. El Asli and M. Hafidi. 2015. Use of mycorrhizal fungi as a strategy for improving the drought tolerance in date palm (*Phoenix dactylifera*). *Scientia Horticulturae*. Volume 192, 31 August 2015, Pages 468-474.
- Shabbir, G., A. J. Dakheel, G. Brown, M. C. Rillig. 2011. Potential of arbuscular mycorrhizal technology in date palm production. In: S. M. Jain, J. M. Al-Khayri and D. V. Johnson (Eds.), pp. 449-476. Date Palm Biotechnology, Springer, Dordrecht.

**Table 1.** Treatments applied on date palms plants of 1-year age from micro-propagation

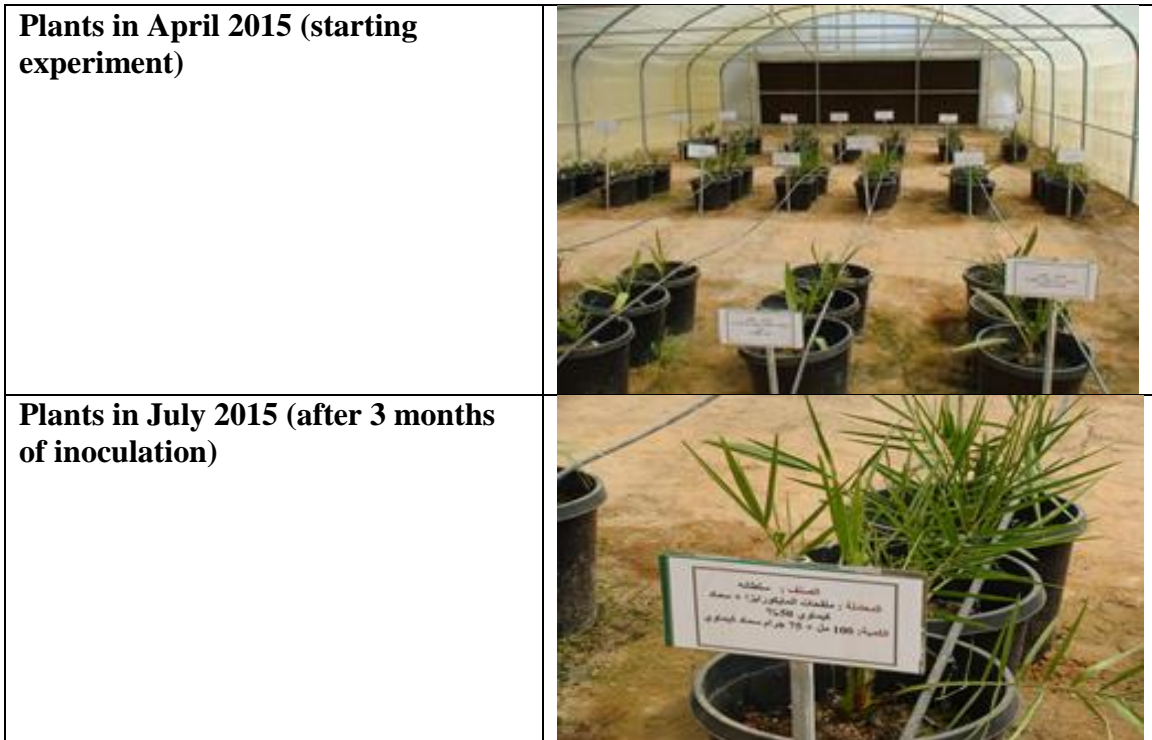
Treatment	Composition
T <sub>1</sub>	Chemical fertilizer alone (100%)
T <sub>2</sub>	Organic Fertilizer alone (100%)
T <sub>3</sub>	Mycorrhizae alone
T <sub>4</sub>	Mycorrhizae + 50% of Chemical fertilizer
T <sub>5</sub>	Mycorrhizae + 50% of Organic Fertilizer
T <sub>6</sub>	Mycorrhizae + 100 % Organic Fertilizer
T <sub>7</sub>	Mycorrhizae + Chemical fertilizer 25%+ Organic Fertilizer 24%



**Fig. 1.** Length of date palm leaves of 4 cultivars of date palm inoculated and no inoculated by *Mychorrizae* after 2 years' cultivation under nursery



**Fig. 2.** Number of date palm leaves of 4 cultivars of date palm inoculated and no inoculated by *Mychorrizae* after 2 years' cultivation under nursery



**Plants in January 2016 (after 9 months of inoculation)**



**Plants in February 2017 (after 24 months)**



**Fig. 3.** Evolution of the date palm plants growth under nursery conditions in Al Hamrania Research Station-UAE (2005-2007).