# IMPACT OF IRRIGATION WATER MANAGEMENT AND SPRAYING OF SOME GROWTH REGULATORS ON FULFILMENT OF CHILLING REQUIREMENTS OF OLIVE TREES

By

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B.Sc. Agric.Sc. higher Institute for agricultural cooperation. 1998

M. Sc. Agric. Sci. Tebbin Institute for Metallurgical Studies .2007

**A Thesis Submitted in Partial Fulfillment**
**Of**
**The Requirements for the Degree of**

## MASTER IN AGRICULTURE SCIENCE
## (Agriculture in Desert and Salt Affected Areas)

**Arid Land Agricultural Graduated Studies and Research Institute**
**Faculty of Agriculture**
**Ain Shams University**

**2016**

**Approval Sheet**

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# ABSTRACT

**El- Sayed Mohammad Amin . Impact of Irrigation Water Management and Spraying of some Growth Regulators on Fulfilment of Chilling Requirements of Olive Trees. Unpublished Ph.D. thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2016.**

The present study was carried out during 2013and 2014 seasons on Picual olives to evaluate the effect of three irrigation water management and four spraying of cytokinin and IAA as alternative treatments for fulfillment of chilling requirements on yield and quality of Picual olives.

High shoot length was recorded with T2 of irrigation water management (25, 25 , 25, 25) and spraying IAA at 100 and 200 ppm. Number of leaves / shoot was improved with T2 of irrigation water management and spraying cytokinin at 5 or 10 ppm in November . However , equal frequency of irrigation water at the four physiological stages of olive trees (25, 25 , 25, 25) was effective than the other two water managements in incensing leaf area and spraying 5 ppm of cytokinin .The highest fruit set in Picual olive were obtained with T2 of irrigation water management and spraying 10 ppm of cytokinin Additionally , equal frequency of irrigation water during the fourth stages of picual olive tree was more effective than the other two managements in increasing total and estimated yield . this treatment of irrigation water gives 69.39 and 49.23 Kg / tree and 6.44 and 4.92 ton / fed for both studied seasons .

Also, 10 ppm of cytokinin in November was effective in producing high total yield and estimated yield . High values of N % was obatuned with first and third irrigation water managements. Also, an evident increase in N% was obtained with spraying of IAA at 100 without significant differences than control. On contrary , no significant effect to irrigation water management or spraying growth regulators or unteraction

between them in affecting P content of Picual olive . However K content 10 ppm cytokinin . From the obtained data , it could be recommended that equal frequency of irrigation water management at the four physiological stages of Picual olive trees and spraying 10 ppm cytokinin in November considered a good irrigation practices for increasing olive yield

**Key words:**

Olives , irrigation water management , growth regulators , fruit set , yield

## ACKNOWLEDGEMENTS

I would like to express my sinncere thanks and appreciation to **Prof. Dr. Nazmy Abd El-Hamed Abd El-Ghaney,** Dean of Fac of Agric.Professor of Pomology, Faculty of Agriculture, Ain Shams Universsity for suggesting the current study and his supervation and help during the caurse of this study and during preparation the manuscript.

I wish to offer my sincere gratitude to **Prof. Dr. Ayman Abo Hadid** professor emeritus of vegetable crops , Horticulture Department, Faculty of Agriculture, Ain Shams University, Cairo, Egypt for his supervision guidance, encouragement, valuable suggestions, endless advice and constructive criticism during the whole work.

Great thanks are offered to **Dr. Samah Nasr** Researcher at the Higher Institute for Cooperation on Agriculture - Shubra Al Khaimah - Cairo – Egypt for her supervision, valuable suggestions, guidance and the preparation of this manuscript during the whole work .

I am also extremely thankful to friends and colleagues in Dept. of Horticulture, Faculty of Agriculture, Ain Shams Univ., for their help, encouragement, co-operation and friendly atmosphere throughout the period of my study.

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# INTRODUCTION

Olive tree (*Olea europaea* L.) of the Oleaceae family has a high economic value and considered one of the important fruit crops in Egypt. Olive is very well adapted to the high temperature; tolerate dry weather, high soil salinity levels and infertile soil. The size of the fruit is important, not only because it is a component of productive yield, but also determines the acceptance by the consumer as conserved fruits. **( Ramezani and Shekafandeh . 2009) .** Two kinds of flowers are produced in olive: a perfect flower containing both male and female parts, and a staminate flower with stamens only. There are self incompatible varieties that do not set fruit without other varieties nearby, and there are varieties that are incompatible with certain others **(Hartmann *et al*., 1980).** Incompatibility can also occur for environmental reasons such as high temperatures (**Klein,*et al* 1994** and **Faisal *et al* , 2012** ).

Fruit set is an important component of yield, unfruitfulness in olive has frequently been observed which may be attributed to numerous factors. Some of them are probably related to the internal imbalance of growth regulators and other physiological factors. According to the nutritional diversion hypothesis .Certain endogenous hormones are involved in the regulation of fruit setting in many fruits. (**Faisal *et al* , 2012**)

Due to limitation of water availability for irrigation in large reas of the world, there is a probability increase the loosing of irrigated land. However, for mature fruit trees reducing applied water to a certain limit could improve water use efficiency **(Espana. 2006)** Applying water to fruit tree crops is a widely used practice but efficient water use has become important only in recent years due to the rapid depletion of available water resources in many areas of the world **(Glenn, 2000)**.Many technologies to improve water efficiency and the management of scarce water resourceare available.s (**Attalla et al 2011)**

**INTRODUCTION**

**D'Andria (2008)** in studies conducted on Italian olive varieties concluded that applications of water in excess of 66% ETc during the whole season neither led to increases in production nor to better fruit quality, a clear indication of the benefits of deficit irrigation regimes.

**D'Andria *et al.* (2004)** had shown that the production and quality of olive fruit of five studied cultivars benefited from deficit irrigation and had high yield when only 66% of ETc was supplied with irrigation. **Grattan *et al*. (2006),** in a study carried out on high density olive trees of cv. Arbequina I-18 in California reported maximum productivity when 75% of ETc was supplied with irrigation. They argued that the best oil chemical quality is obtained from irrigation regimes supplying 33–40% of ETc water. **Moriana *et al.* (2007)** in a study conducted on low-density olive trees subjected to one of four treatments: rain-fed, 100% ETc, 125% ETc and a deficit irrigation treatment with 60 mm of water, obtained no significant statistical differences between treatments for fruit yield or oil production. However, **Grattan et al. (2006)** report that increases in yield due to irrigation water application can be largely offset by reductions in the percent of oil extracted. Concerning oil quality**, Patumi *et al*. (1999, 2002)** found fatty oils, acid composition, peroxide levels and shelf life not being affected by the amount of irrigation. Conversely, **Go´ mez-Rico *et al.* (2005)** report that oils of trees that undergo regulated deficit irrigation (RDI) regimes are of superior quality but similar in composition to ones under fully irrigated regimes. They argue that olive oil bitterness, spiciness and fruitiness are affected by irrigation, with a slight but more noticeable decrease in bitterness with increases in water application. Similarly,

Plant growth regulating chemicals may be used to increase fruit set of certain fruit crops like tomatoes, apples, dates, citrus and several other herbaceous plants. PBZ response in flowering induction under non inductive conditions, such as the occurrence of drought stress or cold in period before flowering, can be variable due to factors pertaining to concentrations

## INTRODUCTION

Naphthaleneacetic acid, commonly abbreviated NAA is an organic compound, which is a plant hormone in the auxin family and is an ingredient in many commercial horticultural products; it is also a rooting agent and used for the vegetative propagation of plants from stem and leaf cutting **(Dimitrios *et al.*, 2008).** NAA has been reported to be useful for thinning of fruits **(Agusti *et al.*, 2000).** It has important role in fruit formation, abscission cell elongation, apical dominance, photoperiod and geotropism **(Haidry *et al.*, 1997)**. NAA application at (100, 150) mg L-1 15 days after full bloom has been used to chemically thin olives in various countries, **(Lavee, 2006)**

IAA concentration and/or transport may be linked to the inhibition of floral induction in nnual plants **(Bernier *et al.*, 1993)** and further relate to correlative effects such as apical dominance. An increase in apical dominance in a tree means that the IAA stream of the inhibitory organ increases at the expense of the IAA streams of inhibited organs **(Bangerth, 1989).** A smaller IAA stream goes hand-in-hand with a general smaller transport system for assimilates, water, minerals and other compounds necessary for floral induction **(Daie, 1985).**

Further convincing evidence that IAA is a floral induction inhibitory signal was obtained with the observation that application of IAA-transport inhibitors, such as 2,3,5-triiodobenzoic acid (TIBA), stimulated floral induction in annual as well as perennial plants **(Tsujikawa *et al.*, 1990).**

**Rotundo and Gioffre (1984)** reported that GA3 treatments increased the weight, length, width of olive fruits and flesh weight in comparison to control. Also, fruit thinning using thinning materials such as NAA at different concentrations improved fruit quality and reduced alternate bearing in various crops **(Link, 2000).** Fruit thinning approximately two weeks after full bloom (FB) increased vegetative growth, flower bud differentiation, fruit size and cumulative yield of consecutive years in various table and oil olive cultivars **(Dag *et al.*, 2009) .** Application of plant growth regulators such as Gibberellic acid

and Naphthalene acetic acid individually or in combinations on olive trees may improve cropping potential and fruit quality. Therefore, this study aimed to explore the effect of application GA 3 and NAA on controlling fruit drop and improving yield and fruit quality of Manzanillo olive trees under semi arid conditions in Egypt

Cytokinins are a large group of plant hormones that regulate various processes of plant growth and development. **Shudok , (1994)** reported that chemical structure of cytokinin active substances has determined two groups of adenine cytokinins and urea cytokinins with similar physiological effects, it has pronounced effect of cotyledon growth and expansion and other processes. Cytokinins appeared to play an important role in the regulation of cell division, differentiation and organogenesis in developing plants, enhancement of leaf expansion, nutrient mobilization and delayed senescence and benzyladenine (BA) is one of the most active cytokinins **Buban, (2000)** It has been identified as a natural cytokinin in number of plants **Van Staden and Crouch, 1996. & Abou Rayya *et al* (2015)** . Cytokinins stimulate floral induction in annual as well as perennial plants. These hormones have been shown to be positively involved in floral induction **(Bernier *et al.* 1993).**

Optimum concentration of cytokinins is necessary to enable the meristem to produce flowers, probably due to the stimulatory effect of cytokinins on meristematic activity (cell division). Too low activity generally results in some kind of dormancy, while too high activity may give rise to a new vegetative flush .It seems that a critical cytokinin concentration in a resting, but not dormant, meristem is needed for floral induction **(Bangerth, 2006).**

Cytokinins may be produced in any plant tissue, but the majority are produced in root tips, seeds, and growing fruits. They are used by the metabolically active parts of the plant including meristems, fruits, storage organs, and seeds. The rate of cytokinin production in the roots is regulated by auxins generated in the shoot tips which travel to the roots

and inhibit production. A drop in auxin flow to the roots causes an increase in cytokinin production **(Abou Rayya *et al* 2015**)

The aim of this study was to evaluate the effect of supplemental irrigation and growth regulators on productivity and quality of Manzanillo olive under semi arid conditions in Egypt.