

Spraying Effect with "Tomatherm" on Irrigated Olive Trees Productivity

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Abstract: Tomatherm is a concentrated suspension liquid composed of polymers, complex water soluble structures that protect the plants mechanically in sensitive and critical growth stages during which the plant undergoes heat stress or drought. The study was conducted in the season year (2009/2010) and in two different sites on irrigated olive trees in Al-Mafraq governorate (Al-Zaatari and Al-Zubaidiah) in Jordan. The experiments in both sites was laded in a Completely Randomize Design (CRD) in 3 replicates and 2 treatments (sprayed + the control) in each replicate. Spraying was done at a rate of one liter (1) of Tomatherm/ 100 liters of water prior to the date of full blooming in late April. Measurements were taken in terms of production, percentage of increase in length of new shoots, weight and size of fruit, pulp and seeds, in comparison between the control and treated ones. Results of the irrigated areas (Al-Za'tari and Al-Zubaidiah) showed an increase in length of the new shoot growth rates significantly by 110% and 175% ,respectively as compared with the control ; while trees productivity increased significantly by about 32% and 39% , respectively. In addition to that weight of fruits and pulps results in the Za'tari area gave an increase by about 8% and 10% , respectively due to the increase in the fruit size rate by 4%. While results of the same measurements at Al-Zubaidiah area didn't affected by Tomatherm application due to the good management done for the olive orchard.

Keywords: Tomatherm , Olive Production , Shoot growth, Fruits, Stress conditions

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I. Introduction

Olive trees (*Olea europaea*) are commonly grown in the Mediterranean basin, where prolong drought may occur during vegetative period [1], and it is widely cultivated in semiarid areas, where long periods of soil water deficit are usually present during dry season, and it has been traditionally grown under rainfed conditions and considered one of the best adapted species to the semiarid conditions[2]. olive tree has been associated with sustaining human life in many parts of the Mediterranean basin and plays an important social role in reinforcing the subsistence of large population by encouraging their settlement in rural area rather than migration to urban cities [3].

Olive sector in Jordan is considered to be one of the most important agricultural sectors in the Jordanian economy due to the growing interest in this blessed tree, which reflected positively on the agricultural area of the tree, covering about 73.8 % of the fruit trees area and 23.5% of the total planted areas [4]. About 76% of the cultivated olive located under rainfed areas and about 24% under permanent irrigation . In addition to that, about 83% of the production pressed for oil production. This tree is a source of livelihood for a large numbers of farmers and workers in this sector. This blessed tree is also linked to the life and customs of Jordanian society and is part of its history, culture and heritage, where the Jordanian table olives and olive oil is almost used on a daily basis [5].

In recent years, olive cultivation has been extended to the eastern desert areas, which put olive cultivation in these areas in addition to marginal areas, with major challenges, as the fluctuation of precipitation from year to year, limited water resources, soil salinity, irrigation water and climate change. Despite the difficulties and challenges facing the olive sector from the scarcity of rain and the scarcity of water resources, the possibility for development and application of new technologies are present to raise the efficiency of rainwater and maintain it by all possible means, whether inside soil or plant, including the use of evaporation inhibitors from the surface of the soil and water loss inhibitors of the plant, including the "Tomatherm" which was used in this study to measure its effect on the olive trees productivity .

According to the manufacturing company information label , **Tomatherm** is a concentrated suspension liquid composed of polymeric materials that are complex in water, non-toxic, self-degradable after a period of time, depending on the climatic conditions prevailing on the plant (rain, wind and humidity). Sprayed mistily on different plant parts in critical growth stages , when plants are exposed to heat stress or drought. It protects the plants mechanically for 30-40 days, by forming a flexible thin film that encapsulates leaves, buds and plant

flowers. It allows the exchange of gases between the plant and the surrounding environment through the mechanism of limiting or preventing water loss from plant parts To maintain the continuity of vital processes within plants and to safely overcome critical conditions.

The use of various antitranspirants received much attention in the 1960s and 1970s. However, results were highly variable, and many researchers concluded they were economically and practically infeasible. Daily ET could be reduced (e.g., 5% to 10%) after the application of antitranspirant materials (e.g., stomata closing type chemicals such as phenyl mercuric acetate or Atrazine, or reflecting materials such as finely powdered white clays like Kaolin), but efficacy was limited to about two weeks under rainless weather conditions. The purpose of film-type antitranspirants (i.e., various long-chain alcohols) was to block water loss, but they tended to block photosynthesis more than they blocked transpiration [6]. The study was conducted to measure Tomatherm effect on irrigated olive trees productivity even under irrigated conditions in the determined desert areas.

II. Materials and Methods

The study was conducted on the season (2009/2010) on olive trees at two different sites(Al-Za'tari and Al-Zubaidiyah) to the east of Al-Mafraq city (irrigated area) . Spraying for olive trees was done at a rate of one liter (1 liter) of Tomatherm/ 100 liters of water prior to the date of full blooming in late April . Measurements were taken in terms of production, percentage of increase in length of new shoots, weight and size of fruits pulp and seeds, in comparison between the treated and the control treatments, at which the control treatment was sprayed by water only.

The experiment was designed in both sites by the Completely Randomize Design in 3 replicates and 2 treatments in each replicate (the control and the sprayed treatments), where the first time spray was applied about two weeks before full blooming for all the sprayed treatments. Measurements were taken for the new shoot growth in each treatment by identifying 10 shoots in each treatment (5 measurements around the periphery of each tree). The measurements were taken for each shoot in two readings; the first reading in the spring and the second one in the fall, in order to calculate the percentage of increase for each shoot , then calculate the mean in each treatment. The results were statistically analyzed by using The paired t-test analysis.

III. Results and Discussion

Results in Table 1 for 2009/2010 season in Al-Za'tari area showed that the rate of increase in the length of new shoots reached 379%, which is 175% higher than that of the control (204%), while the rate of increase in the average production per tree was significantly about 32% in reference to the control (16.9 kg per tree), which enhances the effect of spraying with Tomatherm and its role in increasing the olive trees productivity . While the results in Al-Zubaidiyah area indicated that the rate of increase in the length of new shoots of the trees that were sprayed with Tomatherm was 349%, which is significantly increase by about 110% in reference to the control (239%). While the rate of increase in olive trees productivity of trees sprayed with Tomatherm reached 39% in reference to the control treatment (23.9 kg / tree). He showed that [7] , during summer droughts, olive trees slow down their physiological mechanisms to conserve water, regardless of amount of water applied.

Table 1: Effect of spraying with tomatherm on the growth rate of new olive shoots and the rate of production per tree in Al-Za'tari and Al-Zubaidiyah areas for the season 2009/2010

	Al-Za'tari		Al-Zubaidiyah	
	Control	Sprayed Treatment	Control	Sprayed Treatment
*Average of the 1 st reading(cm)	4.7	3.4	6.1	5.3
*Average of the 2 nd reading(cm)	14.3	16.3	20.7	23.8
Difference between readings	9.6	12.9	14.6	18.5
% increase in shoot length in reference to the 1 st reading	204	379	239	349
% increase in reference to control	175		110	
**Average production(Kg/tree)	16.9	22.3	23.9	33.3
Difference between treatments	5.4		9.4	
% increase in reference to control	32		39	

* *Average of 3 shoots x 13 trees,*

** *Average of 25 trees*

The results in Table (2) indicated that the weight of fruit and pulp and fruit size improved by 7.8%, 9.6% and 4.2%, respectively, in Al-Za'tari area, while the spraying of Tomatherm had no effect on the measurements mentioned in Al-Zubaidiyah area. The average weight of olive seed in both sites were not affected; This may be due to the fact that the management and service of trees in the Zubaidiyah area was better in terms of nutrition, irrigation and pests control than in Al-Za'tari area. Which enhances the statement that spraying with

Tomatherm has a clear effect in the areas that are subjected to stresses in irrigation and nutrition, leading to protection and conservation of water level and therefore giving positive results. On the other hand, he said that[8], agronomic interest of the olive tree enhanced by the fact that it shows a remarkable response to any improvement in the cropping conditions. And as we know that climatic conditions are very critical for fruit set, especially in our areas as dry winds and high temperatures throughout flowering stage which may affect fruit setting.

Table 2: Effect of tomatherm spraying on fruit weight, pulp weight, seed weight and olive size in Al-Za'tari and Al-Zubaideyah areas for the 2009/2010 season.

		Control Treat.	Sprayed Treat.	Difference	% increase or decrease in reference to control
Average Fruit Wt. (gr.)*	Al-Za'tari	39.9	43	3.1	7.8
	Al-Zubaideyah	42	41	-1	-2.3
Average Fruit pulp Wt. (gr.)*	Al-Za'tari	34.3	37.6	3.3	9.6
	Al-Zubaideyah	37	36	-1	-2.8
Average seed Wt. (gr.)*	Al-Za'tari	5.75	5.5	-0.25	-0.4
	Al-Zubaideyah	5.7	5.1	-0.6	-10.5
Average Fruit size (cm ³)/ml *	Al-Za'tari	42.9	44.7	1.8	4.2
	Al-Zubaideyah	44	43	-1	-2.3

* The above measurements are the result of 10 fruits x 25 trees

IV. Conclusion and Recommendations

Based on the results obtained through the experience of assessing effect of the Tomatherm on the growth and production of olive trees over the season of experimentation. We confirm that the experiment was carried out mainly in the olive groves under irrigation, and was followed up and taking the necessary measurements within the sound scientific foundations. Accordingly, we have reached the following conclusion and recommendations:

1. It is preferable to spray Tomatherm on olive trees about 2-3 weeks before full blooming throughout flowering development to protect them from heat waves stress and Khamaseen winds.
2. Spraying with the Tomatherm lead to:
 - a. Increase the length rate of the olive new shoots, by about 110% and 175% in both Al-Zubaideyah and Al-Za'tari sites, respectively.
 - b. Increase in the trees productivity by about 32 and 39% in both Al-Za'tari and Al-Zubaideyah sites, respectively.
 - c. Weight of olive fruits increased by about 8% and the weight of the fruit's pulp by about 10% due to the increase in the rate of fruit volume by 4% in the Za'tari area, while these measurements were not affected in Zubaidia area due to good care and management of olive orchard.

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