

Effect of Two Stimulating Substances on Fruiting and Fruit Quality of Picual and Manzanillo Olive Cultivars.

Emad Girgis Mikhail and Kamal Girgis Goargiuos
Olive and Semi arid Zone Fruits Dept.
Horticulture Research Institute, Agriculture Research Center, Giza

This study was carried out through 2012 and 2013 seasons to study the effect of mono-potassium phosphate (MKP) 0.3% and Hokley alpha (naphthalene acetic acid (NAA 0.45%) + naphthalene acetamide (NAD 1.2%) as foliar application on fruiting and fruit quality of “Picual” and “Manzanillo” Picual and Manzanillo olive cvs. planted in a private farm in an orchard 9 years old at Cairo Alexandria Desert Road planted at 4X 6 meters apart. Most tested treatments revealed positive effects and improved fruit set, yield, fruit characters and fruit oil content. Moreover, the tested treatments reduced the number of dropped fruits and improved fruit retained. The most effective treatment was the spray of MKP at 1st February + Hokley alpha (NAA + NAD) before flowering then at 40 % flowering through enhancing tree yield and oil content, moreover besides reducing alternate bearing.

Key words: olive “Picual”, “Manzanillo” fruit set, yield, oil content, NAA, MKP.

Introduction

Olive (*Olea europaea L.*) belongs to family *Oleaceae*, is one of the most important fruit crop worldwide due to its nutritional and economical importance. 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 (Taghipour *et al.*, 2011 and Birger *et al.*, 2008). Biennial bearing is a major horticultural and economical drawback of olive cultivation, which particularly affects the olive oil industry (Dag *et al.*, 2009). Using naphthalene acetic acid (NAA) shortly after full bloom is commonly practiced to increase olive fruit thinning but increase fruit size (Birger *et al.*, 2008; Dag *et al.*, 2009; Qureshi *et al.*, 2012 and Barone *et al.*, 2014). Nitrogen, phosphorus and potassium are major elements found in large quantities in different tree organs. Abdolla *et al.*, (1986) showed that P levels in the ovary are at their maximum value just prior to full bloom and are reduced by 62% after the transformation of the flower to a fruitlet. Bar Akiwa *et al.*, (1988) reported that when P is supplied to grape vine increased yield and improved fruit quality. However, Sibbett and Ferguson (2002) observed that, Manzanillo olive trees at “On” season contained higher N and K or B elements than at “Off” season specially as fruits began the maturation process (mid-September and October).

Moreover, many reports stated that mono-potassium phosphate (MKP) was superior to improve nutritional status (Sarrwy *et al.*, 2010), as a fast source of P and K when applied as a foliar spray (Arquero *et al.*, 2002 and Barranco *et al.*, 2010). Also, MKP spray improved olive flowering, fruit set,

yield and oil quality with earlier harvesting dates (Toscano and Casacchia, 2006).

Furthermore Maltoni, (1992) Honeyboren (1993) and Gomand and Gossens (2010) mentioned that, naphthalene acetamide (NAD) reduced fruit set as well as reduced fruit yield of apple. Comai and Dorigoni (1998), Gomand and Gossens (2010) on apple and Taghipour *et al.*, (2011) on apricot showed that NAD spray increased fruit thinning, fruit weight and volume as well as fruit L/D ratio (Rahemi and Atahosseini, 2004 on pomegranate and Taghipour *et al.*, 2011 on apricot).

The present study aimed to determine the impact of spraying mono-potassium phosphate at February, 1st alone or combined with Hokly Alpha (naphthalene acetic acid 0.45 % + naphthalene acetamide 1.2 %) at 1st February, 1st and/or at 40 % flowering on fruit set, fruit thinning and yield fruit characteristics of Picual and Manzanillo olive trees.

Material and Methods

The present study was carried out during 2012 and 2013 growing seasons on 9 years old “Picual” and “Manzanillo” olive trees, planted in a private farm at 90 Kilometer from Cairo (Cairo Alexandria Desert Road). Trees were uniform in shape and size as possible and planted 6 x 4 meters apart on sandy loam soil and irrigated with drip irrigation system from well (underground water). Trees were selected for this study received the normal organic and chemical fertilizers in winter at the beginning of November, and the chemical fertilization program during the growing season. Also, irrigation and pest control program executed according to (Elsayed and Saad El-Din, 2011).

This study is considered a factorial experiment as it included two factors as follows:

1- Olive cultivar.

Two olive cultivars namely, Picual and Manzanillo were subjected to this study.

2- Cultural treatments.

The two tested olive cultivars (Picual and Manzanillo) were treated in both seasons with one of the following treatments:-

- a) Control "Tap water" Picual and Manzanillo olive trees were foliar sprayed with tap water as a control treatment.
- b) Mono potassium phosphate (MKP) foliar spray at 0.3 % on February, 1st.
- c) MKP foliar spray at 0.3 % on February, 1st provided with Naphthalene acetic acid (0.45 %) and Naphthalene acetamide (1.2 %) (Hokley alpha) before blooming.
- d) MKP foliar spray at 0.3 % on Feb. 1st supported with Hokley alpha at 40 % blooming.
- e) MKP foliar spray at 0.3 % on Feb. 1st supplemented with Hokley alpha just before blooming and repeated at 40 % blooming.

Furthermore, the control trees were sprayed with tap water and tween 20 was added at 0.1 % as a surfactant to all spray solutions including the control "tap water". Spraying process was carried out using a compression sprays (5 L. solution/tree).

Generally, this experiment is considered a factorial experiment (2 cultivar x cultural treatments). The treatments were arranged in a completely randomized design with three replicates for each treatment and each replicate was represented by one tree.

The response of Picual and Manzanillo trees to the tested treatments was evaluated through the following measurements.

I- Fruiting.

- a- Number of fruitlets at the beginning of May, and number of fruits in mid-June and before harvesting at the beginning of September were calculated per meter.
- b- Yield:** Average yield (Kg/tree) was calculated for each treatment.
- c- Fruit quality:** Thirty fruits per each treated tree were randomly picked for carrying out the fruit quality measurements: Fruit length (cm), fruit diameter (cm), fruit shape index (length/diameter), fruit weight (g), flesh/fruit weight, seed length (cm), seed diameter (cm) and seed weight (g).

d- Biennial bearing index: Biennial bearing index of the different treated trees was calculated according to **Wilcox (1944)** as follows:

Biennial bearing index =

$$\frac{\text{Differences in yield (kg) between successive years}}{\text{Sum of yield (kg) of successive years}} \times 100$$

II- Oil percentage as dry weight, was determined means of Soxhlet extraction apparatus using petroleum ether at 60-80° boiling point as described by **A.O.A. C. (1990)**

Statistical analysis:

The obtained data were subjected to analysis of variance (ANOVA) according to **Snedecor and Cochran (1980)**. Differences between treatments were compared by Duncan's multiple range test (**Duncan, 1955**).

Results**1- Tree fruiting.**

Table, (1) shows the effect of monopotassium phosphate (0.3%) (MKP) and Naphthalene acetic acid and Naphthalene acetamide (Hokly alpha) on fruit characteristics during 2012 and 2013 seasons. It is obvious that Manzanillo olive trees surpassed Picual in fruit set %, fruit set/m and retained fruit/m in both seasons. On the other hand, Picual cv. illustrated the highest drop percentage moreover all combinations of Manzanillo and Picual cvs.

Moreover, foliar tested application of MKP in 1st of February and Hokly alpha before flowering provided with 40 % flowering application on Picual and manzanillo gave the highest significant values of fruit set %, fruit set/m and retained fruit/m compared with the control and other treatments ascendingly during 2012 and 2013 seasons. However, for the fruit drop percentage/m the control showed the highest significant value compared to the other treatments in both seasons.

Concerning the combinations of Manzanillo and Picual cvs. treated with MKP and Hokly alpha foliar applications. Manzanillo cv. treated with foliar spray of MKP 0.3 in the 1st of February and Hokly alpha before lowering in addition to during 40 % flowering showed the superior values compared with the Picual, the other treatments and the control. Manzanillo, other tested combinations showed an intermediate significant value in this concern.

The effect of monopotassium phosphate (MKP) and Naphthalene acetic acid and Naphthalene acetamide (Hokly alpha) on Picual and Manzanillo yield during 2012 and 2013 seasons are illustrated in Table (2).

Table 1. Effect of mono potassium phosphate and Hokleyalpha on fruit set, fruit drop percentage and retained fruit of “Picual and Manzanillo” olive trees during 2012 and 2013 seasons.

Cultivars	Fruit set (%)			Fruit set/m			Fruit drop percentage/m			Retained fruit /m		
	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean
Treatments												
First season 2012												
Control	2.93f	5.77Cd	4.35C	11.85d	19.87c	15.86D	24.95a	11.65cd	18.30A	2.20e	5.10c	3.65C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February	3.03f	5.90b-d	4.47C	12.19d	24.00b	18.09C	19.48b	10.79de	15.14B	2.43e	5.27c	3.85C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering	5.43de	6.43B	5.93B	20.99c	23.42b	22.21B	14.01c	8.20ef	11.11C	4.67d	5.90b	5.28B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha at 40 % flowering	5.20e	6.43B	5.82B	20.01c	23.06b	21.53B	14.02c	6.06f	10.04C	4.47d	6.03b	5.25B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering + 40 % flowering	6.07bc	7.77A	6.92A	23.26b	27.61A	25.44A	12.63cd	8.16ef	10.39C	5.30c	7.13A	6.22A
Mean	4.53B	6.46A		17.66B	23.59A		17.02A	8.97b		3.81B	5.89A	
Second season 2013												
Control	2.43e	3.70d	3.07E	9.72h	12.52f	11.12D	28.91a	21.57c	25.24A	1.73g	2.90e	2.32E
Foliar spray of mono-potassium phosphate 0.3 % in 1st February	2.70e	3.83d	3.27D	10.92g	12.90f	11.91D	15.31e	19.19d	17.25C	2.30f	3.10de	2.70D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering	3.67d	4.33c	4.00C	14.30e	15.00c	14.65C	21.84c	17.60d	19.72B	2.87e	3.57c	3.22C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha at 40 % flowering	4.20c	4.90b	4.55B	16.02cd	17.02bc	16.52B	25.31b	15.68e	20.50B	3.13ab	4.13b	3.63B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering + 40 % flowering	4.73b	5.87A	5.30A	18.09b	19.93A	19.01A	27.45a	11.87f	19.66B	3.43a	5.17A	4.30A
Mean	3.55B	4.83A		13.81B	15.47A		23.77A	17.18B		2.69B	3.77A	

Means within each column or row followed by the same letter (s) are not significantly different at 5 % level.

Table 2. Effect of mono potassium phosphate and Hokleyalpha on yield and biennial bearing index (2013) of “Picual and Manzanillo” olive trees during 2012 and 2013 seasons.

Cultivars Treatments	Yield (kg/tree)						Biennial bearing index		
	First season 2012			Second season 2013			Picual	Manzanillo	Mean
	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean			
Control	39.00ef	36.67g	37.83E	10.67g	12.33ef	11.50E	57.06a	49.75b	53.41A
Foliar spray of mono-potassium phosphate 0.3 % in 1st February	40.00e	38.00fg	39.00D	11.33fg	13.67de	12.50D	55.92a	47.18c	51.55B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering	44.67c	42.33d	43.50C	14.33d	17.33c	15.83C	51.42b	41.94f	46.68C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha at 40 % flowering	48.00b	43.67cd	45.83B	17.67b	22.00b	19.83B	46.19c	32.98f	39.59D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering + 40 % flowering	55.33a	49.00b	51.17A	20.67b	27.00a	23.83A	44.14d	28.96g	36.55E
Mean	45.00A	41.93B		14.93B	18.47A		50.95A	40.16B	

Means within each column or row followed by the same letter (s) are not significantly different at 5 % level.

The production of Picual surpassed Manzanillo during 2012 season in the positive. Manzanillo gave the highest significant difference compared to Picual in 2013 season. The biennial bearing index was obvious of treatments.

Foliar application of MKP 0.3 % on Feb. 1st supplemented by Hokly alpha before flowering + 40 % flowering on Manzanillo and Picual performed the highest significant difference compared to the control and other treatments. Meantime, the other treatments showed the intermediate values in yield. On the other hand, the control of Picual and Manzanillo gave the highest significant value of biennial bearing index compared to other treatments in descending order according to the treatment arrange.

Furthermore, all combinations of Picual treated with MKP and Hokly alpha enhanced yield and reduced biennial bearing compared to Manzanillo and other treatments during the two seasons of the experiment.

Fruit characteristics

Table (3) shows the effect of foliar application of monopotassium phosphate (MKP) 0.3 % and Naphthalene acetic acid + Naphthalene acetamide (Hokly alpha) in the 1st of February, before flowering and during 40 % flowering on Manzanillo and Picual during 2012 and 2013 seasons. Concerning fruit weight (g.) and fruit shape index showed that Picual cv. gave the highest significant value compared to Manzanillo cv. as affected by MKP and Hokly alpha treatments in both seasons. In regard to fruit length and diameter the opposite was true with Manzanillo cv. which was superior compared to Picual cv. during the two growing seasons.

Concerning the effect of the treatments, although there weren't any significant difference of fruit weight, fruit length of Manzanillo and Picual in both seasons, beside fruit diameter and fruit shape index during 2013 only, fruit diameter was affected significantly with foliar application of MKP 0.3 % and Hokly alpha at 40 % flowering followed by other treatments. Meantime, foliar spray of MKP 0.3 % in the 1st of February and Hokly alpha before flowering + 40 % flowering surpassed other treatments during 2012 only.

As for the combinations of the effect of the treatments and the two cultivars on fruit weight the foliar spray of MKP in the 1st of February performed the highest significant value compared with other treatments. Foliar spray of MKP 0.3 % in the 1st of February and Hokly alpha before flowering + 40 % flowering gave the highest significant values of fruit length in both seasons besides foliar spray of MKP in 1st of February and Hokly alpha 40 % flowering during 2013 season. All the treatments on Manzanillo cv. gave the superior values of fruit diameter without any significant differences between treatments compared to Picual in both seasons. On the other hand, Picual treatments surpassed

Manzanillo treatments regarding fruit shape index in both seasons without any significant difference between treatments in 2012 and 2013 seasons.

In regard to flesh weight and seed characteristics of Manzanillo and Picual in Table (4) as affected by aforementioned treatments. It is obvious that, Picual cv. Gave the highest significant values compared to Manzanillo in both 2012 and 2013 seasons. The effect of treatments showed that, the spray value compared to the other treatments during 2012 season, although in 2013 there weren't any significant difference of all treatments. As for the interaction of treatments and the two cultivars the control and the application of MKP 0.3 % in the 1st of February and the control gave the highest significant values, meanwhile, the control only in 2013 gave the same analogous effect on Picual cv. only.

Concerning seed characteristics, the MKP at 0.3% in 1st of February and Hokly alpha before flowering, MKP 0.3 % in the 1st February and Hokly alpha at 40 % flowering and MKP 0.3 in 1st of February and Hokly alpha before flowering + 40 % flowering surpassed other treatments in seed weight during 2012. However, foliar spray of MKP 0.3 % in 1st of February and Hokly alpha at 40 % flowering gave analogous results during 2013 season. In regard to seed length there weren't any significant difference between treatments during 2012, while as foliar application of MKP 0.3 % in the 1st of February and Hokly alpha before flowering in addition to 40 % flowering gave the highest significant value compared to the control and other treatments. Meantime, the MKP 0.3 % in 1st of February and Hokly alpha before flowering and at 40 % flowering gave the superior values of seed diameter 2012 and 2013 seasons, respectively.

Concerning the combination of treatments and cultivars, Picual cultivar treated with foliar application of MKP 0.3 % in the 1st February and Hokly alpha before flowering gave the highest significant value of seed weight in 2012 and MKP 0.3 % in 1st of February and Hokly alpha at 40 % flowering during 2013 gave the same effect. As for seed length during 2013 all treatments surpassed on Picual without any significant difference, whereas, MKP 0.3 % in 1st of February and Hokly alpha before flowering in addition to 40 % flowering gave the superior value during 2013, in regard the seed diameter MKP 0.3 % in the 1st of February and Hokly alpha at 40 % flowering gave the highest values in both seasons.

Fruit oil content.

Table (5) shows the moisture %, fresh oil (%), dry oil (%) and oil yield/tree (kg) Picula and Manzanillo cvs. as affected by monopotassium phosphate (MKP) and Naphthalene acetic acid and Naphthalene acetamide (Hokly alpha) before flowering and at 40 % flowering during 2012 and

2013 seasons, it is clear that, although there weren't any significant difference between two cultivars during 2013, Manzanillo cv. surpassed Picual during 2012 in moisture %. While as, for oil as fresh and dry weight Picual cv. gave the highest significant values in both seasons, oil yield/tree (kg) of Picual surpassed Manzanillo during 2012 and the opposite cv. in yield of oil (kg)/tree.

Concerning the effect of treatments on moisture %, although all treatments didn't perform any significant difference on both cultivars during 2013, MKP 0.3 % in the 1st of February and Hokly alpha before flowering treatment and the same treatment beside 40 % flowering date gave the highest values during 2012. In regard to oil as fresh weight % all treatments didn't give any significant difference in both seasons. Meantime, the foliar application of MKP 0.3 % in 1st of February treatment in addition to the Hokly alpha before flowering + 40 % flowering gave the highest significant value of oil % as dry weight. Meanwhile, MKP 0.3 % 1st of February and Hokly alpha before flowering during 2013 gave the superior value in oil % as dry weight compared to the control and other treatments in 2013. The foliar spray of MKP 0.3 % in 1st of February + 40 % flowering gave the highest significant values of oil yield/tree (kg) in both seasons. In regard to the combination of the effect of treatments and cultivars the foliar application of MKP 0.3 % in 1st February and Hokly alpha before flowering + 40 % flowering on Manzanillo cv. gave the highest values compared to Picual and other treatments in 2012, meantime the same treatment without 40 % flowering application gave the same affect in 2013. As for the interaction of oil % as fresh weight the treatments didn't give any significant differences on both cultivars during the two growing seasons.

Concerning the oil % as dry weight Picual in 2012 didn't take definite trend while, Manzanillo was highly affected by MKP 0.3 in the 1st of flowering and Hokly alpha before flowering + 40 % flowering. Meantime, during 2013 foliar spray of MKP 0.3 % in 1st of February and Hokly alpha before flowering on Manzanillo cv. surpassed Picual.

In regard to combinations of treatment and cultivars, the MKP 0.3 % in the 1st of February and Hokly alpha before flowering + 40 % flowering surpassed other treatments on Manzanillo and Picual cvs. in both seasons.

The Discussion

The present data shows that, control trees of Picual and Manzanillo olive cvs. had the least fruit yield and the highest fruit drop percentage/meter. Accordingly, all the studied treatments have a positive effect and improved fruit set, yield, fruit characteristics and fruit oil content. Foliar spray of mono-potassium phosphate (MKP) 0.3 % at 1st February increased Picual fruit dimensions and its

dry oil content. Foliar spray of MKP + Hokly Alpha (NAA + NAD) before flowering induced the highest fruit moisture of Picual (in the 1st season) and Manzanillo olive cvs. (in the 2nd season), the highest fresh oil content of Picual fruits (in 2013 season) as well as the highest dry oil content of Picual fruits (in 2012 season) and of Manzanillo cvs. (in 2013 season). The most effective treatment was the spray of MKP + Hokly Alpha before flowering and at 40 % flowering. This treatment gave the highest percentage of fruit set and fruit yield. It increased number of fruits and retained fruits/meter as well as the highest oil yield/tree. Moreover, minimized fruit drop alleviate biennial bearing especially in Manzanillo more than Picual cv. Thus, we can recommend olive growers to apply this treatment to increase fruit set, yield and oil yield/tree subsequently increase their income.

Our results are in harmony with; former investigations of **Toscano and Casacchia (2006)** who reported that mono-potassium phosphate (MKP) improved olive flowering, fruit set, yield and oil quality may be as a result of improvement of nutritional status (**Sarrwy et al., 2010**) as foliar spray was considered as a fast source of P and K elements (**Barranco et al., 2010**).

Spray of naphthalene acetic acid (NAA) induced an adequate fruit thinning and increased profitability (**Ebert and Kreuz, 1987**) as well as improved apple fruit weight and size (**Ebert, 1987**). Also, using NAA shortly after full bloom is commonly practiced to decrease olive fruit thinning bud increase fruit size (**Qureshi et al., 2012 and Barone et al., 2014**).

Besides, Gomand and Goossens (2010) showed that, naphthalene acetamide (NAD) reduced apple fruit set while increased pomegranate fruit thinning, fruit, size and fruit shape index, may be as a result of improving root formation, root length and root weight (**Bekaard et al., 2005**).

Thereupon, it is preferable to spray Picual and Manzanillo olive trees with mono-potassium phosphate at 0.3 % on February, 1st and Hokly alpha before blooming and again at 40 % blooming to enhance tree fruiting and fruit quality.

Table 3. Effect of mono potassium phosphate and Hokley alpha foliar spray on fruit properties of “Picual and Manzanillo” olive trees during 2012 and 2013 seasons.

Cultivars	Fruit weight (g.)			Fruit length			Fruit diameter			Fruit shape index		
	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean
Treatments												
First season 2012												
Control	6.18ab	5.28d	5.73A	2.80ab	2.57e	2.68A	1.94b	2.28a	2.11AB	1.44a	1.13c	1.29B
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February	6.21a	5.32d	5.77A	2.82ab	2.60e	2.71A	1.95b	2.30a	2.13A	1.44a	1.13c	1.29B
Foliar spray of mono-potassium phosphate 3 % in 1 st February and hokley alpha before flowering	6.04c	5.35d	5.70A	2.81ab	2.67c-e	2.74A	1.89b	2.33a	2.11AB	1.49a	1.15bc	1.32AB
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha at 40 % flowering	6.11bc	5.28d	5.74A	2.74b-d	2.77a-c	2.76A	1.90b	2.35a	2.12A	1.45a	1.18bc	1.31AB
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering + 40 % flowering	6.05c	5.36d	5.71A	2.64de	2.88a	2.76A	1.77c	2.35a	2.06B	1.49a	1.22b	1.36A
Mean	6.12A	5.34B		2.76A	2.70B		1.89B	2.32A		1.46A	1.16B	
Second season 2013												
Control	6.57a	5.58c	6.08A	2.92b-e	2.95a-d	2.93A	1.96b	2.35a	2.15A	1.49a	1.26b	1.38A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February	6.57a	5.60c	6.09A	2.91c-e	2.96a-d	2.94A	1.98b	2.36a	2.17A	1.47a	1.25b	1.36A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering	6.50ab	5.61c	6.06A	2.90de	2.99a-c	2.94A	1.90bc	2.38a	2.14A	1.52a	1.25b	1.39A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha at 40 % flowering	6.46b	5.59c	6.02A	2.85ef	3.00a	2.93A	1.92bc	2.39a	2.15A	1.48a	1.26b	1.37A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering + 40 % flowering	6.48ab	5.59c	6.04A	2.80f	3.00a	2.90A	1.85c	2.39a	2.12A	1.51a	1.25b	1.38A
Mean	6.52A	5.60B		2.88B	2.98A		1.92B	2.38A		1.50A	1.26B	

Means within each column or row followed by the same letter (s) are not significantly different at 5 % level.

Table 4. Effect of mono potassium phosphate and Hokley alpha foliar spray on flesh weight and seed properties of “Picual and Manzanillo” olive trees during 2012 and 2013 seasons.

Cultivars	Flesh weight (g.)			Seed weight			Seed length			Seed diameter		
	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean
First season 2012												
Control	5.10a	4.52d	4.81AB	1.080b	0.753e	0.917B	1.57a	1.35b	1.46A	1.000ab	0.950f	0.975C
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February	5.16a	4.56d	4.86A	1.050c	0.757e	0.903C	1.58a	1.36b	1.47A	0.997bc	0.960ef	0.978BC
Foliar spray of mono-potassium phosphate 3 % in 1 st February and hokley alpha before flowering	4.93c	4.59d	4.76B	1.107a	0.767e	0.937A	1.61a	1.38b	1.50A	1.010ab	0.980cd	0.995A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha at 40 % flowering	5.02b	4.58d	4.80B	1.093ab	0.797d	0.945A	1.59a	1.37b	1.48A	1.017a	0.977de	0.997A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering + 40 % flowering	4.97bc	4.55d	4.76B	1.080b	0.810d	0.945A	1.61a	1.37b	1.49A	1.010ab	0.970de	0.990AB
Mean	5.04A	4.56B		1.082A	0.777B		1.59A	1.37B		1.007A	0.967B	
Second season 2013												
Control	5.46a	4.82c	5.14A	1.113b	0.767de	0.940C	1.57b	1.38c	1.47B	1.017ab	0.963cd	0.990BC
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February	5.43ab	4.83c	5.13A	1.143a	0.776c-e	0.960AB	1.40c	1.37c	1.38C	1.007b	0.953d	0.980C
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering	5.37ab	4.85c	5.11A	1.127ab	0.763e	0.945BC	1.63a	1.40c	1.52A	1.007b	0.973c	0.990BC
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha at 40 % flowering	5.31b	4.80c	5.06A	1.143a	0.787cd	0.965A	1.61ab	1.40c	1.50AB	1.033a	0.973c	1.003A
Foliar spray of mono-potassium phosphate 0.3 % in 1 st February and hokley alpha before flowering + 40 % flowering	5.36ab	4.80c	5.08A	1.117b	0.797c	0.957AB	1.63a	1.41c	1.52A	1.020ab	0.970cd	0.995AB
Mean	5.39A	4.82B		1.129A	0.778B		1.57A	1.39B		1.017A	0.967B	

Means within each column or row followed by the same letter (s) are not significantly different at 5 % level.

Table 5. Effect of mono potassium phosphate and Hokley alpha foliar spray on fruit, moisture content (%), oil content (%) and yield of “Picual and Manzanillo” olive trees during 2012 and 2013 seasons.

Cultivars	Moisture (%)			Fresh oil (%)			Dry oil (%)			Oil yield/tree (kg)		
	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean	Picual	Manzanillo	Mean
Treatments												
First season 2012												
Control	63.76cd	65.39a-c	64.57AB	19.00a	17.37b	18.19A	52.43ab	50.23c	51.33B	7.41d	6.37e	6.89D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February	64.25b-d	63.03d	63.64B	18.94a	17.57b	18.26A	53.03ab	52.29ab	52.66A	7.58d	6.68e	7.13D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering	64.60b-d	65.77ab	65.19A	18.77a	17.52b	18.15A	53.03ab	51.20bc	52.11AB	8.38c	7.40d	7.90C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha at 40 % flowering	64.15b-d	65.15a-c	64.65AB	18.81a	17.45b	18.13A	52.50ab	50.10c	51.30B	9.02b	7.62d	8.32B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering + 40 % flowering	63.99b-d	66.54a	65.26A	18.87a	18.03ab	18.45A	52.43ab	53.88a	53.15A	10.06a	8.83bc	9.45A
Mean	64.15B	65.18A		18.88A	17.59B		52.69A	51.54B		8.49A	7.38B	
Second season 2013												
Control	64.78b	65.59ab	65.19A	18.43a	17.59a	18.01A	52.35c	51.32b	51.83B	1.96g	2.17fg	2.07D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February	64.46b	65.75ab	65.10A	18.43a	17.53a	17.98A	51.86d	51.32bc	51.54B	2.88fg	2.40ef	2.24D
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering	64.55b	66.84a	65.69A	18.86a	17.52a	18.19A	53.20b	54.30a	53.75A	2.70de	3.04cd	2.87C
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha at 40 % flowering	64.87b	65.43ab	65.15A	18.80a	17.54a	18.17A	53.55b	50.80cd	52.17B	3.32c	3.86b	3.59B
Foliar spray of mono-potassium phosphate 0.3 % in 1st February and hokley alpha before flowering + 40 % flowering	65.74ab	65.26ab	65.50A	18.54a	17.63a	18.08A	54.21a	50.74d	52.48B	3.83b	4.76a	4.30A
Mean	64.88A	65.77A		18.61A	17.56A		53.03A	51.68B		2.78B	3.24A	

Means within each column or row followed by the same letter (s) are not significantly different at 5 % level.

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تأثير مادتي من المنشطات على إثمار وصفات جودة ثمار صنفى الزيتون البيكوال والمنزانيللو

عماد جرجس ميخائيل وكمال جرجس جورجوس

قسم بحوث الزيتون وفاكهة المناطق شبه الجافة- معهد بحوث البساتين- مركز البحوث الزراعية - الجيزة

أجريت هذه التجربة على أشجار الزيتون صنفى بيكوال ومنزانيللو عمرها 9 سنوات لدراسة تأثير رش الأشجار بـ 3 % فوسفات أحادى البوتاسيوم (MKP) فى أول فبراير وكذلك رش مركب هوكلى ألفا (نفتالين حمض الخليك 0.45% NAA + نفتالين أسيتاميد 1.2% NAD) فى مواعيد مختلفة خلال عامى 2012 و 2013.

لوحظ أن كل المعاملات تحت الدراسة حسنت عقد الثمار والمحصول وصفات الثمار ومحتوى زيت الزيتون عن أشجار المقارنة. وكانت أفضل المعاملات هي رش الأشجار بمركب MKP + مركب هوكلى ألفا (نفتالين حمض الخليك NAA + نفتالين أسيتاميد NAD) قبل التزهير ثم عند 40 % تزهير. هذه المعاملة تمكن مزارعى الزيتون من زيادة نسبة عقد الثمار والمحصول ومواصفات الثمرة ومحصول الزيت بالإضافة إلى تقليل تبادل الحمل وبالتالي زيادة الدخل.