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Oil Quantity, Chemical and Organoleptic Properties of Three Olive Cultivars Grown under Irrigation at a Typical Arid Region in Jordan as Influenced by Harvesting Method and Date

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ABSTRACT

An experiment was conducted to investigate the influence of harvesting method and harvesting date on the quality and quantity of three olive genotypes. Olive fruits of cultivars "Ayvalik", "Grossa de Spain" and "Nabali" were harvested on October 20 and November 13, 2017, using hand and mechanical (by combs) harvesting methods. Olive fruits were pressed then, olive oil samples were analyzed for acidity, peroxide value, refractive index, olive oil percentage, and sensory properties. The results showed that the harvesting method did not significantly affect oil quantity and chemical analysis, but affected sensory properties of olive oil, where the harvesting method by hand gave the highest (fruity, bitter, and pungent) and the lowest negative attributes (fusty, musty and rancid). Furthermore, as ripening progressed, there was an increase in olive oil percentage, oil acidity and peroxide value. The positive attributes (fruity, bitter and pungent) were significantly decreased while negative attributes (fusty, musty and rancid) were increased as ripening progressed. On the contrary, the refractive index (at 25°C) remains almost constant. The response of olive cultivars to harvesting was inconstant and did not respond similarly, "Ayvalik" had the highest acidity and peroxide value, while "Grossa de Spain" had the highest oil percentage. In addition, "Nabali" had the highest positive attributes. The lowest acidity, peroxide value and negative attributes were obtained for "Nabali". The result proved that olive cultivars and harvesting date and method combine together to influence acidity, peroxide value and sensory properties (fusty, musty, rancid, fruity, and bitter) of olive oil.

Keywords: Ayvalik, Grossa de Spain, Nabali, Ripening, Oil acidity, Peroxide value, Sensory attributes.

INTRODUCTION

Jordan focused on olive tree cultivation which became the most important fruit tree grown in Jordan; since Jordan is a natural habitat for olive growing. Olive cultivation covers about 74% of the total area planted with fruit trees and 24% of the total cultivated area in Jordan (Department of Statistics, 2019). The olive tree plays a great role in the economy of Jordan. More attention and

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care had been given to this tree; this was shown by the increase in cultivated areas, so the total production of olives in the kingdom is increasing from year to year. The olive tree covers about 63883 ha and the annual average of national olive fruit production reached about 200896 tons in the year 2019 (Department of Statistics, 2019). So, olive importance stresses the necessity of studying the olive oil characteristics and the main factors that affect olive oil quality, because olive oil production in Jordan is very important as a national income resource. Studies on olive oil quality in Jordan indicate that the oil is of high quality when oleic acid percent, antioxidant content, and peroxide number are considered (Al-Rousan, 2004; Al-Maaitah *et al*., 2009).

Olive oil percentage and composition are strongly affected by both cultivar and ripening date, giving clear indications about the optimal genotype and optimal harvesting time and opening interesting opportunities for olive oil growers in a perspective of sustainable production to obtain high-quality olive fruits and oils (Trentacoste *et al*., 2020). At present, over 50% of the olive oil produced in the Mediterranean countries has high acidity and poor organoleptic characteristics and is unsuitable for human consumption (Baccouri *et al*., 2008). A variety of factors influence the chemical composition and quality of virgin olive oil, among them, are the geographical production area (altitude, soil composition, latitude), climatic conditions prevalent in the year of production, the cultivar, and the extraction process (Dag *et al*., 2009). The effects of harvest timing on the oil yield, quality, oxidative stability, and sensorial characteristics are of particular interest to the grower (Salvador *et al*., 2001; Hilali *et al*., 2021). Most olive oils produced commercially are of a compromised quality because of improper selection of harvest time (Garcia *et al.,* 1996). Very few studies evaluated the simultaneous effect of harvest time on both yield and quality of olive oil (Beltrán et al., 2004). The method and date of olive picking are among the most significant factors in both the quantity and quality and therefore the value of processed table olives and olive oil (Ferguson *et al*., 2010).

Olive harvesting is the final step in the production of olives, but if performs at the wrong time or in the wrong way, it can markedly influence net return to the farmers. The covenantal methods of harvesting olives are manual (by hand), mechanical (by combs, beating sticks, clamps mounted on tractor vibrating machine) and chemical using compounds like ethylene releasing compounds (ethophon) and 2-chloroethyl-tris(2-methoxy ethoxy) silane (ALOSL). The main reason for using mechanical and chemicals compounds for olive harvesting is the high cost of hand harvesting; currently, the most expensive cost in olive production worldwide, where olive harvesting takes up 40 to 70% of the total labor time and that it represents 30 to 60% of the total production cost (Saracoglu, 2006, AEMO, 2012).

The current study was conducted to explore the influence of harvesting method and timing on olive oil quantity and quality of "Nabali", "Ayvalik", and" Grossa de Spain" olives to ensure the production of abundant quantities of high-quality olive oil, which ultimately contributes to improve the income of growers, satisfy the consumer's appreciation and to increase the international competition chance.

Materials and Methods

Experiment location and climatic conditions

The experiment was conducted on olive trees grown at Al-Tour olive orchard located in Al-Hussaineih, Ma'an district, as a typical arid region that experiences distinctly dry, hot summers and cool winters. The hottest month is August with a mean maximum temperature of 35.3 °C, while the coolest month is January with a mean minimum temperature of 2.5 °C. Ma'an has a mean annual rainfall of 63.1 mm (Jordanian Meteorological Department, 2017).

Experimental olive trees and their maintenance

The study was carried out on 15-year-old olive trees of three cultivars: "Ayvalik", "Grossa de Spain" and "Nabali". The trees were spaced at 4 m ×4 m under intensive cultivation. The trees were irrigated for six months per year (from April to September) using drippers placed around the trees delivering a water flow of 1.2 L/hr. The irrigation water lasted for about 6 hours per week.

Olive fruits harvesting

About 90 Kg of olive fruits were collected from each cultivar. The cultivars included in these experiments were "Grossa de Spain", "Ayvalik" and "Nabali". The fruits were harvested during the 2016/2017 season by two methods: hand and mechanical (manual combs) and two harvesting dates (the first harvesting date was on October 20, 2017, and the second harvesting date was November 13, 2017).

Olive oil production

In order to obtain a good quality olive oil, the selected fruits were healthy, clean and free from pests and diseases. No more than 12 hours elapsed between harvesting and pressing to avoid the risk of fermentation and any possible defect to the oil. Olive fruits were pressed using 3- a phase olive mill.

Olive oil chemical analysis

Titratable acidity:

The titratable acidity (% oleic acid) was measured as follows: A weight of 5.00g of oil sample was dissolved in 500 ml of (1:1 alcohol: petroleum ether). A few drops of phenolphthalein (1%) were added, and the samples were titrated with sodium hydroxide (0.05N) until the color is pink. (AOAC International, 1995).

The % acidity was calculated according to the following equation:

Acidity (% Oleic acid) = $(V1 - V2) \times N \times 0.282 \times 100 / W$

V1: Sample titration in ml.
N: Normality of alkali (NaOH).
V2: Blank titration in ml.
W: Weight of oil sample
0.282: The equivalent weight of oleic acid.

Peroxide value:

The peroxide value (meq O_2/Kg oil) was measured as follows: A weight of 5.00g of oil sample was used in a 250 ml Erlenmeyer flask. Fifty ml of (3:2 Glacial acetic acid and Chloroform) mixture were added. The flask was stopped in darkness and thoroughly shaken. Then half ml of the potassium iodide solution was added, and the flask was shaken again. Fifty ml of distilled water was added to the flask and the sample was titrated with sodium thiosulfate solution (0.01N) until the color just disappeared, using starch as an indicator (AOAC International, 1995).

Peroxide value (meq O_2/Kg oil) = $(V1-V2) \times N \times 1000/W$
V1: Sample titration in ml.
V2: Blank titration in ml.
N: Normality of sodium thiosulfate.
W: Weight of oil sample (g).

Refractive index:

The refractive index was measured by the ABBE refractometer.

Sensory analyses:

The sensory analyses of the samples were carried out by the sensory evaluation team from the Jordanian Society for Sensory Evaluation of Foods (JSSEF). The intensities of the positive (fruity, bitter, and pungent) and negative (fusty, winey, musty, muddy, rancid, metallic, and other) properties were analyzed. Each attribute was rated using a rating scale from 1 to 10 where 1 represented the value for the poorest and 10 the best possible quality for the sample (Favati *et al*., 2013).

Experimental design and treatments

The experimental design was a factorial arrangement within the complete randomized design (CRD) with three factors (cultivar, harvesting date, and harvest method). Each treatment was replicated four times.

Statistical analysis:

MSTAT-C statistical package was used to analyze the data. The analysis of variance (ANOVA) was used to determine significant differences. The Least Significant Difference (LSD) test was used to separate the means. Because the normality assumption was not met, data of negative sensory evaluation were transformed as $\sqrt{(x+0.5)}$ for correcting the non-normal distributions .The level of significance was calculated with an error probability of 0.05 (Lentner and Bishop, 1993). The level of significance was calculated with an error probability of 0.05.

Results and discussion

Oil content percentage

It is evident from fig.1A that olive oil percentage was significantly affected by different olive cultivars. "Grossa de Spain" olives gave the highest olive oil percentage (13.9%), while "Ayvalik" gave the lowest olive oil percentage (8.1%). No significant difference was found in olive oil percentage between the hand or mechanically (manual combs) harvested olives (11.16 and 11.21, respectively) (Fig. 1B). The mechanically harvested fruits gave higher olive content. The fact supports the hypothesis that mechanical harvesting causes internal breakages in the olive tissues, which makes it easier to extract oil (Yousfi *et al.*, 2012). In addition, Tortiglione and Dritta olive cultivars showed clear variation during ripening from September to November 2017 (Flamminii *et al.*, 2021).

It was demonstrated in fig. 1C that oil percentage significantly increased with the progress of the growth period. The oil percentage of fruits harvested in November (11.6%) was considerably higher than that harvested in October (10.7%).

This increase can be attributed to the continuation of the triglyceride-forming biosynthesis pathway until full maturation of olive fruits is reached (Cimato, 1988; Sanchez, 1994).

The decision to produce an acceptable yield with a higher oil percentage or more pungent oil is highly dependent on harvest time, which is the most significant factor for the variations in composition and sensory qualities (Boskou, 2006). There was a significant increase in oil percentage as ripening progressed for "Adana Topagi" and" Gemlik" olives (Keceli, 2013). Total oil content increased progressively from 9 to 16% and 10 to 20% for "Adana Topagi "and" Gemlik" olives, respectively during fruit maturity (Cimato, 1988). Furthermore, the oil percentage increased from October to January by about 45% in high-yield "Barnea" and doubled in high-yield "Souri" olives (Sanchez, 1994). This increase in oil content can be attributed to the continuation of the triglyceride-forming biosynthesis pathway until full maturation of the fruit is reached.

Olive oil-free acidity

Free acidity is the percentage of grams of free fatty acids (expressed as oleic acid) in 100 grams of oil. Although it is one of the most critical indicators of olive oil deterioration; however, it is considered is an important criterion that defines the quality of olive oil and. In fact, the free acidity, resulting from the hydrolysis of triacylglycerol as well as further decomposition of hydroperoxides, (Saglam *et al.*, 2014).

Fig. 2A shows a significant variation between "Nabali" and the other two cultivars in terms of olive oil acidity. The results indicated that "Nabali" had significantly the lowest acidity (0.18%), while "Ayvalik " and "Grossa de Spain" had higher % acidity values (0.25 and 0.23 %, respectively). Nevertheless, the acidity value of the oil of three varieties was less than the standard limit (<0.8) (International Olive Council, 2015). No statistically significant difference has been observed in olive oil acidity between "Picual" and "Hojiblanca" olive cultivars Gutierrez *et al.* (1999). However, there were significant differences ($P<0.05$) in acidity% between the examined olive cultivars ("Chemlal", "Sigoise Tableout" and" Frantoio") (Zegane *et al.,* 2015). The results indicated that the order of acidity data was as follows:

"Chemlal" > "Sigoise" > "Frantoio". Similarly, El Sohaimy *et al.* (2016) found a significant difference between the olive cultivars "Manzanilla" and "Kalamata".

The data are shown in fig. 2B indicates that the harvesting method insignificantly influenced olive oil acidity. Fruit mechanical (manual combs) harvesting by combs gave a higher acidity value (0.23%) than the hand method (0.21%) but without a significant difference. Yousfi *et al.* (2012) found that the free acidity of olives was significantly higher in oil from mechanically harvested fruits in comparison with manually harvested fruits. The action of the vibrating combs would favor the harvesting of a higher proportion of mature and rotten fruits than the harvesting by hand, due to their lower resistance to abscission (Dag *et al.*, 2008).

The results showed that there was a significant increase in acidity % value as ripening progressed (Fig.2C). The acidity significantly increased from 0.17% in October to 0.27% in November. Using Tortiglione and Dritta olive cultivars, clear variation in acidity% with progress from September to November 2017 (Flamminii *et al.*, 2021).

Similar results were reported by Al-Rousan (2004) and Tombesi *et al.* (1994). According to Awatef *et al.* (1996), oil oxidative and hydrolytic rancidity begins immediately after the separation of the fruit from the tree and increases significantly after harvesting as a result of the activity of the enzymes present in the fruit tissues but it changes to a little extent when olives remain on the tree. On the contrary, Ranalli *et al.* (1998) pointed out that acidity did not significantly change during the fruit ripening cycle. Furthermore, Gimeno *et al.* (2002) reported that the stage of ripeness was not associated with significant differences in the quality parameters of olive oil including the free fatty acids content. The increase in acidity was attributed to the acidity of native and microbial lipase (Al-Rousan, 2004). The enzyme act on olive fruits, that remained on the tree for a long time, particularly at the advanced ripening stage when the fruits become soft and susceptible to injury (Gutierrez *et al.*, 1999).

A significant interaction was found between olive cultivar and harvesting date on olive oil acidity. Fig. 2D demonstrated that the highest acidity % was obtained in "Grossa de Spain" and "Ayvalik" when their fruits were harvested in November (0.29 and 0.3%, respectively). However, the "Nabali" fruit harvested in October gave the lowest oil acidity (0.15%). The current results are inconsistent with those reported by Gutierrez *et al.* (1999) and Tombesi *et al.* (1994). The increase in oil acidity while the fruits remained on the tree was caused by the activation of lipolytic enzymes present in the fruits (Martinez Suarex, 1973). The latter author related the increase in acidity value to the biosynthesis of triglycerides and some free fatty acids, which may probably be responsible for a high value of acidity.

Olive oil peroxide value

Peroxide value is used as an indicator to reveal enzymatic and oxidative deterioration in olive oil. It is also used to monitor production problems, which occur after harvest and during processing (Ozdemir *et al.*, 2016). The peroxide value was significantly influenced by the olive cultivar (Fig. 4). The highest peroxide value was obtained in "Ayvalik" (4.83 meq O_2/Kg oil), while the lowest value was in "Nabali" (3.65 meq O_2/Kg oil). The peroxide value of the "Grossa de Spain" cultivar was intermediate (3.99 meq O_2/Kg oil). Similarly, the differences in peroxide values among different olive cultivars were statistically significant (Noorali *et al.*, 2014; Asheri *et al.*, 2015).

Fig. 4 shows no significant statistical analysis effect of different harvesting methods (hand and mechanical) on peroxide value. Yousfi *et al.* (2012) and Saglam et al. (2014) reported that the peroxide values of the oils obtained from mechanically (manual combs) harvested olives were significantly higher than the ones obtained from the fruits harvested by hand, even this fact was observed in the samples immediately processed after harvesting, which supports the hypothesis of an initial internal breakdown of the olives as a consequence of mechanical harvesting. This may be due to an internal partial breakage of the cellulose walls of the cells of the olive mesocarp, induced by mechanical harvesting). This breakdown would favor the contact of the olive oil with the atmosphiric xygen and, thus, increase its peroxide value.

The peroxide value increased as the period of harvesting forward progresed. It significantly increased from 3.51 meq O_2/Kg oil in October to 4.80 meq O_2/Kg oil in November (Fig. 4). The Same trend was found in “Verdial de Badajoz” olives by Carrapiso *et al*. (2020). The number of antioxidants compounds declined throughout the ripening stage, and bruising of soft fruit may be occurred during harvesting and handling, particularly at a later ripening stage, this bruising often because damaging tissues, which allow oxygen to come in contact with oil, thus rising oxidative process (Anastasopoulos *et al.*, 2011).

According to Alowaiesh *et al.* (2016), the peroxide value in virgin olive oil of cv. "Manzanilla" decreased significantly ($p \leq 0.05$) with ripening progressed (from 6.65 to 3.28 meq O_2 Kg^{-1} in 2013 and from 3.28 to 5.31 meq O_2 Kg^{-1} in 2014). The lowering of peroxide value might be ascribed to the decreased activity of lipoxygenase enzymes which have been reported by Baccouri *et al.* (2008) and Anastasopoulos *et al.* (2011).

A significant interaction was found between olive cultivars and harvesting date on olive oil peroxide value. The data are shown in fig. 3D indicates that the peroxide value of "Ayvalik" increased from 3.83 meq O_2/Kg in October to 5.83 meq O_2 /Kg in November. The peroxide value of "Grossa de Spain" increased significantly from 3.53 in October to 4.45 in November. Regarding" Nabali", the same trend was observed. The behavior of increased peroxide value during olive ripening could be explained by an increase in the activity of the enzyme lipoxygenase (De Mendoza *et al.*, 2013).

Refractive index

The Refractive index is a considerable tool for the detection of the adulteration of oils. The Refractive index ranged from (1.4677-1.44705) which was within the permitted limits for olive oils (International Olive Council, 2015). El Sohaimy *et al.* (2016) reported that the refractive index parameter indicates the freshness of the oil and is not stored for a long time after harvesting. This finding revealed that the simple laboratory measurement of the refractive index could be used as a quality control technique for finding the adulteration of the oils.

Figure 4 reveals the absence of significant differences among olive cultivars ("Ayvalik", "Grossa de Spain", and "Nabali") in terms of olive oil refractive index value. Similarly, fig. 3 indicated no significant influence of the harvesting method on olive oil refractive index value. Both harvesting methods (hand and mechanical) gave the same value of the refractive index (1.47).

Regarding the harvesting date, it was noticeable from fig. 4C that harvesting olives on October 20 have no superiority over November 13, 2017 on olive oil refractive index value. This result confirms the finding of Al-Rousan (2004).

Olive oil sensory properties

Positive attributes

Fig. 5A shows a significant difference among the three studied cultivars in terms of olive oil’s positive attributes. The results indicated that "Nabali" had the highest positive attributes (fruity, bitter, and pungent) (3.8, 2.9, and 3.2, respectively), while "Ayvalik " and "Grossa de Spain" had lower positive attributes.

The distinctive aroma of virgin olive oil is attributed to a large number of chemical compounds of different chemical classes, i.e., aldehydes, alcohols, esters, ketones, and probably, to other unidentified volatile compounds (Vichi *et al.*, 2003; Kalua *et al.*, 2007). The volatile composition of virgin olive oil depends on the levels and activities of the enzymes involved in the various pathways (Angerosa, 2002). The increase in the concentration of the desired intensity of sensory attributes (fruity, bitter, and pungent) is directly related to 1-penten-3-one and ethylbenzene (Shaker and Azza, 2013).

The positive attributes decreased as the period of harvesting forward (Fig. 5B). The positive attributes (fruity, bitter, and pungent) significantly decreased from (4.0, 3.1, and 3.4) in October to (2.5, 2, and 2.3) in November, respectively (Fig. 5B). The early harvested fruit produces an oil with a high polyphenol concentration that contributes to the level of bitterness and pungency (Dag *et al.*, 2011). During the ripening process, the chemical composition of the oil and enzyme activities change significantly in the fruits, these parameters affect the ease of sensory properties of the fruit (Dag *et al.*, 2011). At the beginning of the season, early harvest olive oil is produced from younger and greener olives, they have a bitter flavor based on their higher polyphenol content and less oil than black olives, and they have pungent, astringent, grassy, and green leaf flavors.

The data are shown in fig. 5C indicates that the harvesting method significantly influenced olive oil positive attributes. Fruit mechanical harvesting by combs gave lower values of fruity, bitter, and pungent. However, the highest oil-positive attributes were observed in the olives harvested by hand. In fact, the mechanical (manual combs) harvesting led to internal damage to the fruits, as a consequence of this, the legally established criteria to evaluate the level of commercial quality of virgin olive oils deteriorated in these oils (Yousf *et al.*, 2012), thus, the oils from mechanically harvested olives presented lower levels of tocopherols and phenolic compounds, this caused the stability against oxidation of oils.

A significant interaction was found between olive cultivar and harvesting date on olive oil positive attributes (fruity and bitter). Fig. 6A demonstrated that the highest olive oil positive attributes were obtained in "Nabali" when their fruits were harvested in October. The ripeness of the olives affects the quality attributes of virgin olive oil even though none of the defects were found. Similar variations in the sensory profile of olive oils have been reported by Angerosa *et al.* (2004), Kalua *et al.* (2007), Bendini *et al.* (2007), and Delgado and Guinard (2011). According to Alowaiesh (2015), the chemical composition of the fruit affects the sensory properties, and higher phenol content in the fruit of." Manzanilla" olives may be ascribed to higher bitterness and pungency.

The flavor is an important quality criterion for virgin olive oils. The identification of the compounds causing the flavor or off-flavor is therefore the key to quality control. A significant interaction between harvesting method and harvesting date on olive oil positive attributes was found. The data shown in fig 6B indicates that the oil extracted from olives harvested by vibration in November showed significantly lower olive oil positive attributes than the oils obtained from hand-harvested fruits in October.

Negative attributes

Results of negative attributes of the olive oil showed significant differences in the fusty, musty, and rancid (Table 1). The fusty, musty, and rancid attributes were significantly highest in olive oil obtained in "Ayvalik" harvested by vibration in November compared to other cultivars harvested by hand in November and October. This finding can be explained as the mechanical (manual combs) harvesting led to of the virgin olive oils were deteriorated in these oils, thus, the oils from mechanically harvested olives presented lower contents of tocopherols and phenolic compounds. This caused the stability against the oxidation of oils (Yousf *et al.*, 2012). In addition, the impact of the cultivar on the olive oil profile depends on the activity of enzymes, where the enzymatic levels differ from one genotype to another (D'Imperio *et al.*, 2010).

Table 1: Negative sensory attributes of olive oil of three genotypes as influenced by the interaction between cultivar, harvesting method, and harvesting date.

Negative attributes	Cultivar	Harvesting method			
		Hand		Mechanical	
		Oct.	Nov.	Oct.	Nov.
Fusty	Ayvalik	0 c	0 c	0 c	3.1a
	Grossa de Spain	0 c	0 c	0 c	1 b
	Nabali	0 c	0 c	0 c	0.5 bc
Musty	Ayvalik	0 d	0 d	0d	1.5 b
	Grossa de Spain	0 d	0 d	0 d	2.25 a
	Nabali	0 d	0 d	0 d	0.38 c
Rancid	Ayvalik	0 b	0 b	0 b	1.85 a
	Grossa de Spain	0 b	0 b	0 b	0.5 b
	Nabali	0 b	0 b	0 b	0.38 b

*Data were transformed as $\sqrt{(x + 0.5)}$

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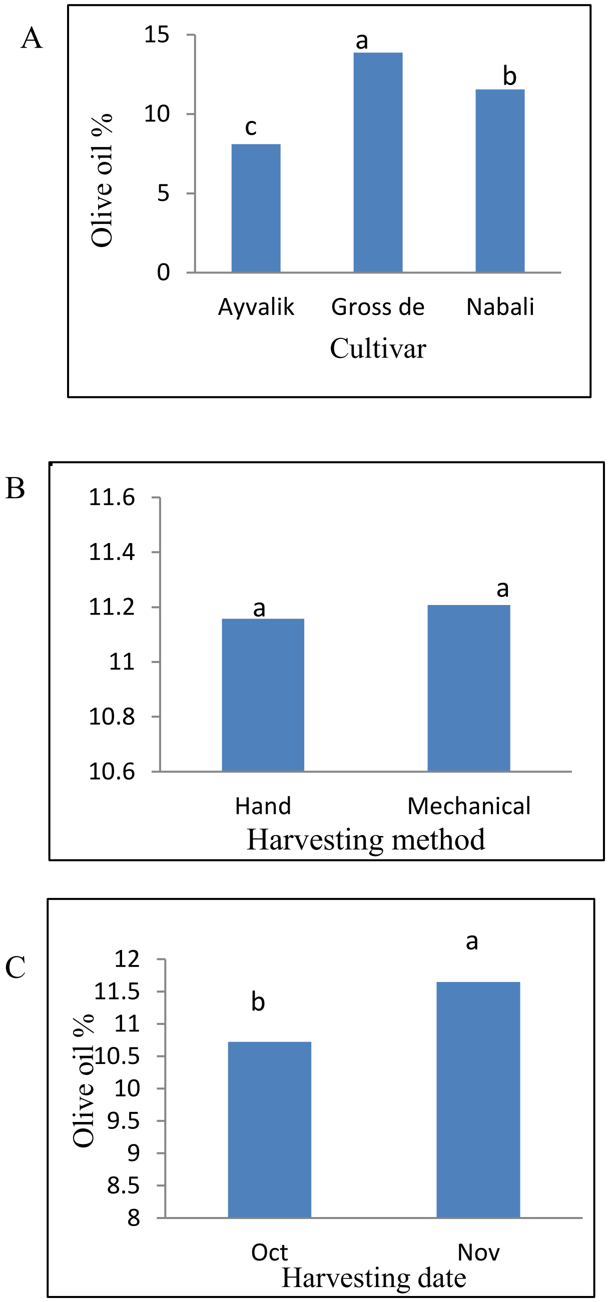


Fig 1: Olive oil percentage as influenced by olive cultivar (A), harvesting method (B) and date (C).

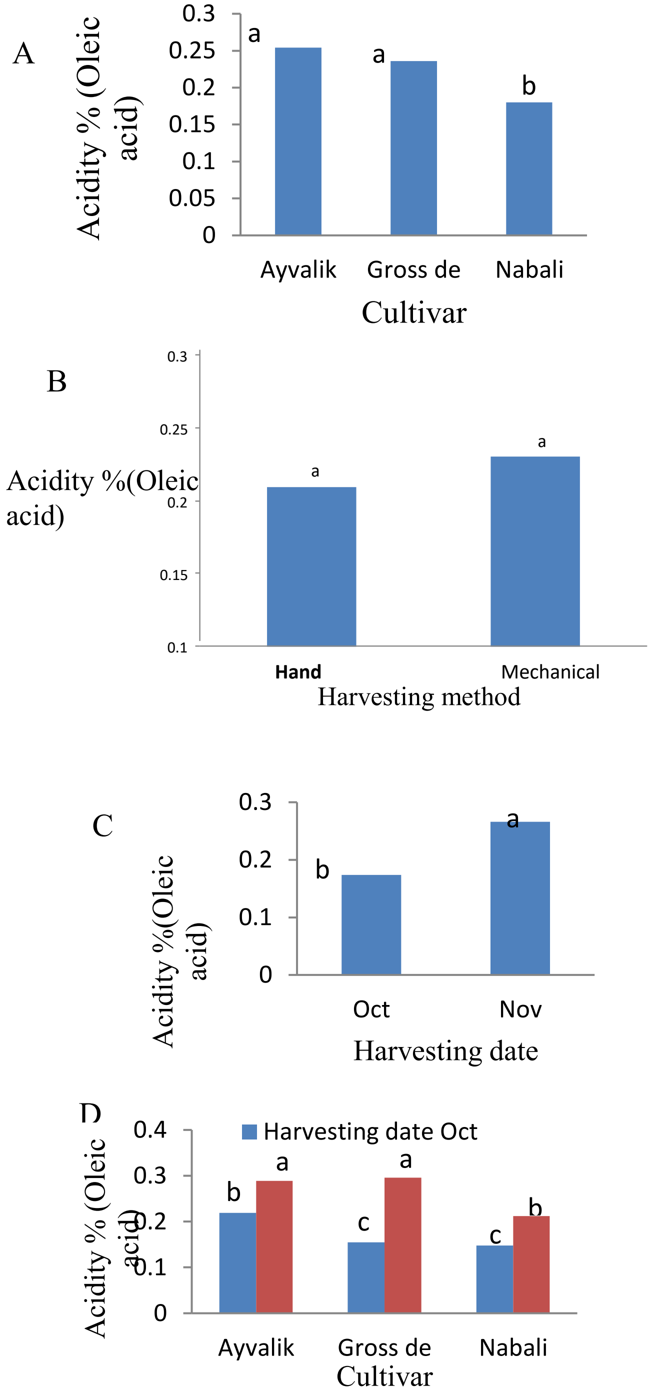


Fig. 2: Olive oil acidity as influenced by cultivar (A), harvesting method (B) harvesting date (C) and the interaction between genotype and harvesting date (D).

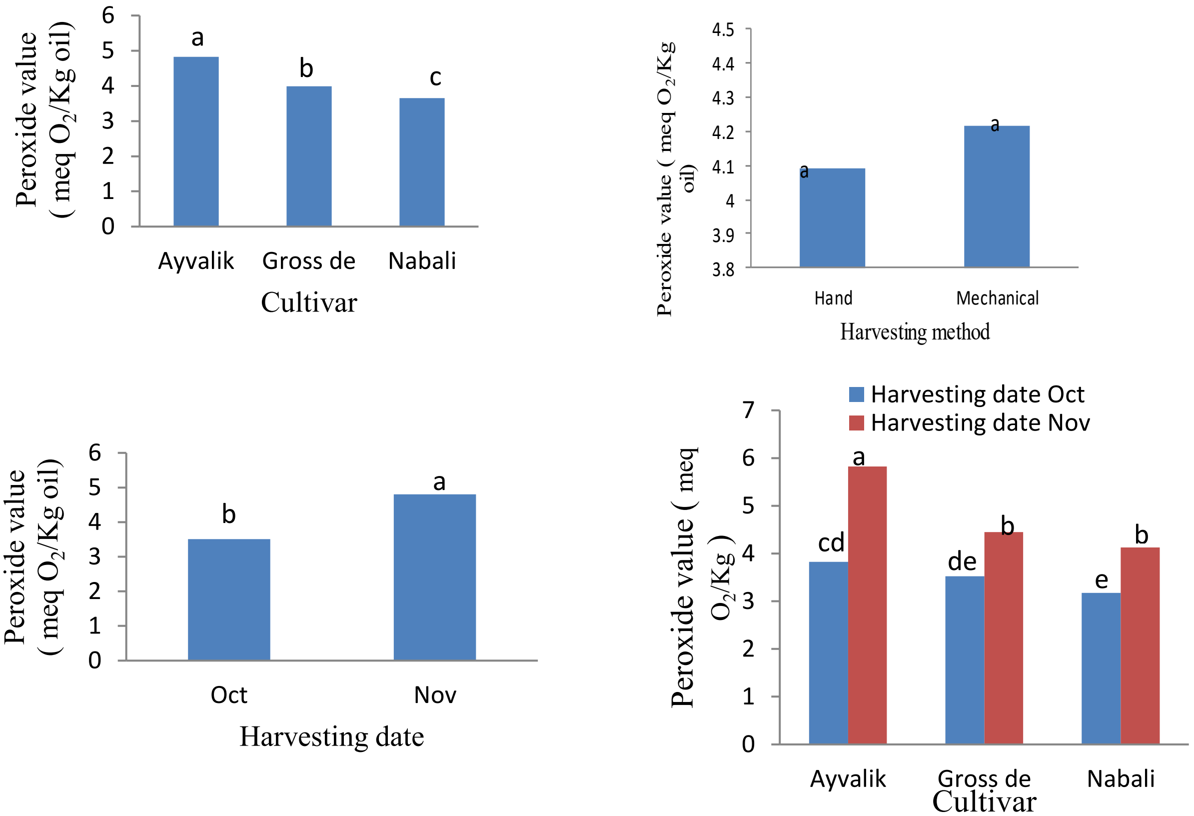


Fig 3: Olive oil peroxide value as influenced by cultivar, harvesting method, harvesting date and the interaction between cultivar and harvesting date.

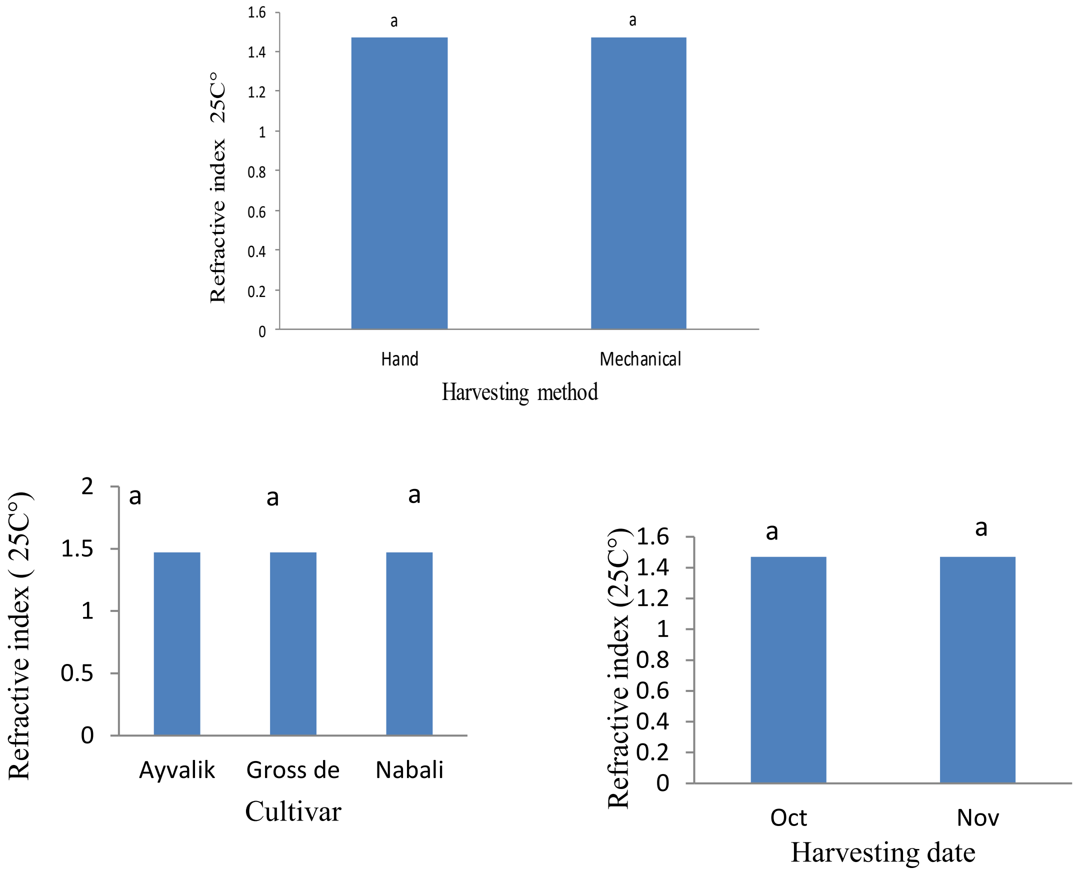


Fig. 4: Olive oil peroxide value as influenced by cultivar, harvesting method and date.

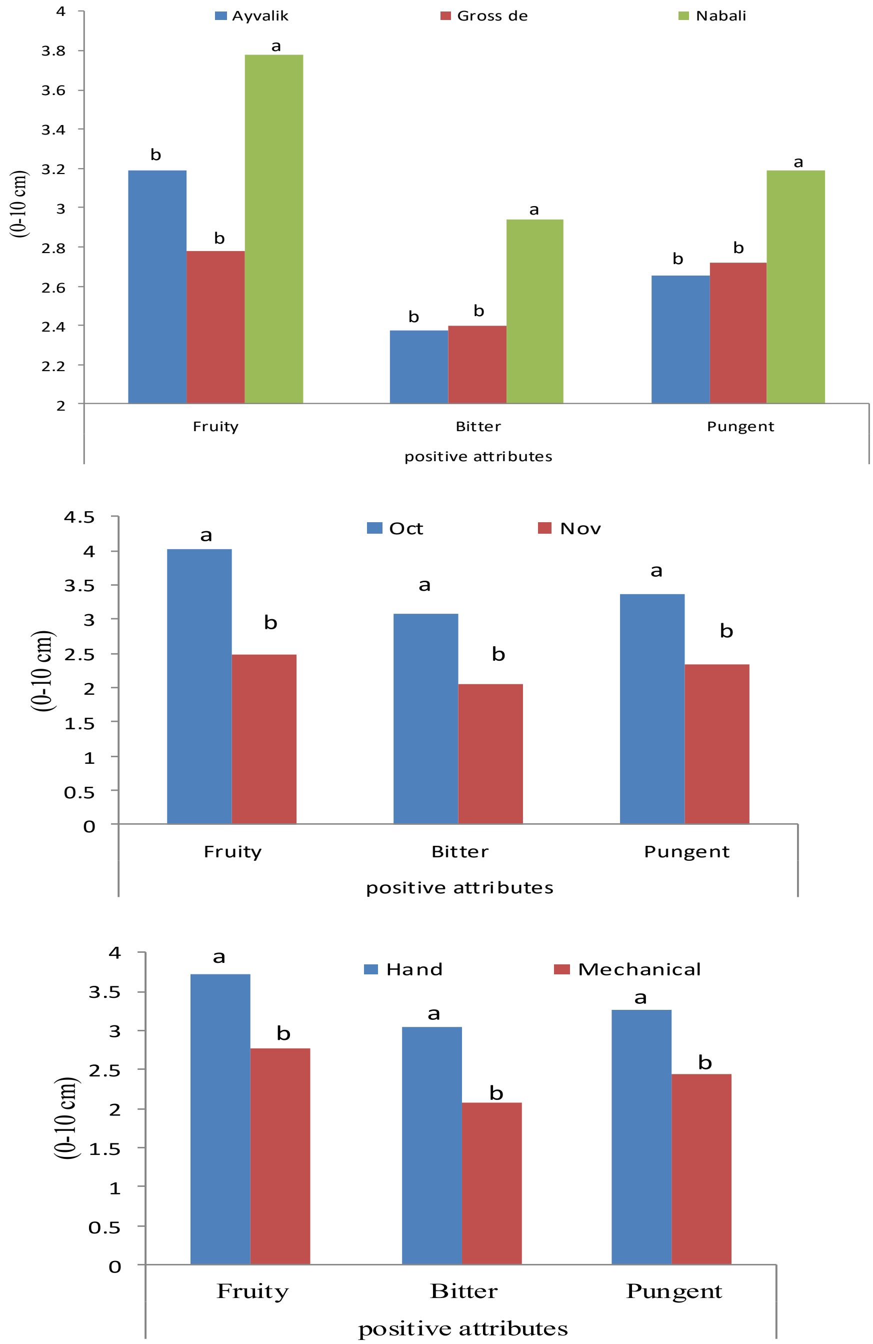
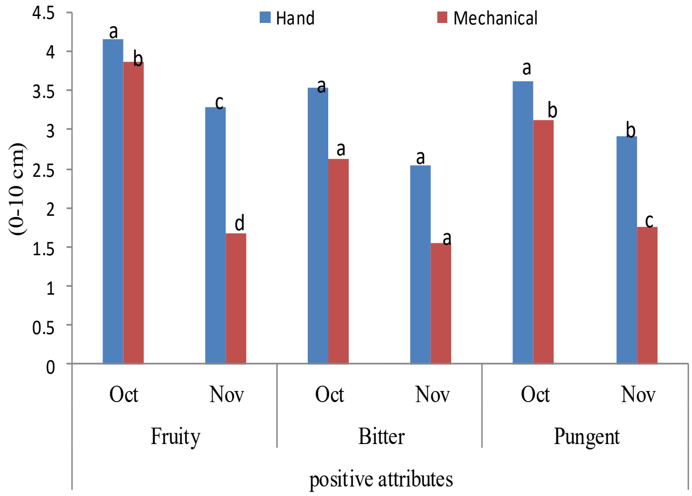


Fig. 5: Olive oil positive attributes as influenced by cultivar, harvesting date and method.



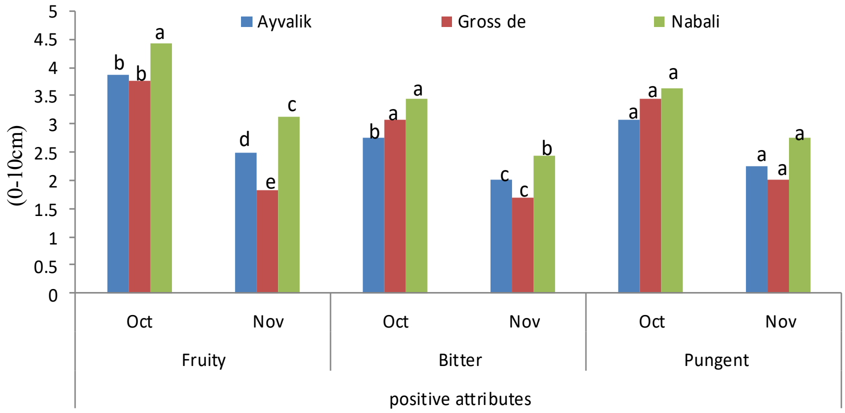


Fig. 6: Olive oil positive attributes as influenced by interaction between cultivar and harvesting date (A) and interaction between harvesting method and date (B).

كمية الزيت والخصائص الكيميائية والحسية لثلاثة أصناف زيتون مزروعة تحت الري في منطقة جافة نموذجية في الأردن حسب تأثرها بطريقة وموعد الحصاد

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ملخص

تمت دراسة تأثير موعد وطريقة قطاف ثمار الزيتون للأصناف: إيفلاك، جروسادي الإسباني ونبالي على كمية الزيت ونوعيته وخصائصه الحسية للأصناف الثلاثة. تم قطاف ثمار أصناف الزيتون (إيفلاك، جروسادي الأسباني ونبالي) في موعدين (20 تسرين أول و13 تشرين ثاني) وباستخدام طريقتين من القطاف لتحديد تأثير الصنف وطريقة وموعد القطاف على نوعية وكمية الثمار والزيت. تم عصر الثمار في معصرة، وأجري تحليل لعينات زيت الزيتون لدراستها من حيث: الحموضة، رقم البيروكسيد، معامل الإنكسار، نسبه الزيت في الثمار والتقييم الحسي. أظهرت النتائج أن طريقة الحصاد لا تؤثر على كمية الزيت وخصائصه الكيميائية، ولكنها أثرت على الخصائص الحسية، حيث أعطت طريقة الحصاد باليد أعلى خصائص حسية إيجابية (فاكهي، مرارة ولاذع) وأقل خصائص حسية سلبية (عفن,عفن- رطب وتزنخ). في حين أنه مع تقدم نضج الثمار وتأخر موعد القطاف ازداد كل من: الحموضة والبيروكسيد، لكن انخفضت الخصائص الحسية الإيجابية وازدادت الخصائص الحسية السلبية بشكل معنوي مع تقدم النضج، بينما لم يتأثر عامل الإنكسار في جميع مراحل القطاف. هناك اختلاف في استجابة الأصناف، حيث أن صنف إيفلاك أعطى أعلى نسبه حموضة ورقم بيروكسيد، بينما أعطى صنف الجروسادي الإسباني أعلى كمية زيت، بالإضافة إلى أن صنف النبالي أعطى أعلى خصائص حسية إيجابية. لوحظت أقل نسبة حموضة ورقم البيروكسيد وخصائص حسية سلبية في صنف النبالي. أظهرت النتائج أن الصنف وطريقة وموعد القطاف يشتركان في التأثير على نسبة حموضة والبيروكسيد لزيت الزيتون والخصائص الحسية (عفن، عفن-رطب، تزنخ، فاكهي ومرارة).

الكلمات الدالة: إيفلاك، جروسادي الأسباني، نبالي، النضج، حموضة الزيت، رقم البيروكسيد، الخصائص الحسية.