International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

Morphological Characterization and Analysis of the Oil Chemical Properties of Various Olive Varieties Introduced to the Northwestern Region of Syria, Compared with the Local Sorani Variety

[1]*Prof. Dr. Rida DRAIE, [2]Dr. Hafsa BARAKAT

[1,2]Department of Horticulture, Faculty of Agricultural Engineering, Idlib University, Syria

*Corresponding Author's E-mail: rida.draie@idlib-university.com

***Abstract* - The research was conducted in the northwestern region of Syria (Idlib) during the agricultural season 2023-2024, to evaluate the most important morphological and qualitative characteristics of some foreign varieties introduced to the region (Arbequina, Spanish green, Spanish black) and compare them with the Sorani local variety. The fruits and leaves of the mentioned varieties were collected at the beginning of November, and the required morphological readings were taken (fruit length, diameter, weight, size, petiole length, internodes length, leaf length, and width). Samples of the fruits were also collected to extract oil and study its qualitative specifications (oil ratio, quality, acidity, peroxide value, taste, and color).The results of the study confirmed that the local variety Sorani was superior to all introduced foreign varieties (Arbequina, Spanish green, Spanish black), in fruit length (24.10 mm) and diameter (16.63 mm), length of the internodes (27.10 mm), leaf length (54.67 mm) and width (13.00 mm). The Sorani variety was also superior in the specifications of olive oil extracted from the fruits, oil ratio (25%), peroxide value (2.16 meq O_2/kg), acidity (0.5%), and moisture (0.1976%). The oil ratio in the introduced varieties (Arbequina, Spanish green, Spanish black) was 10, 16, and 16%, respectively. The oil had a pungent taste and a distinctive dark green color in Sorani. It had a sweet taste (not pungent) and a light-yellow color in Arbequina. On the other hand, there were no significant differences in the studied traits between the two Spanish varieties, green and black. As for the Arbequina variety, it was significantly behind the other varieties in the studied traits. According to this study, local varieties like the Sorani variety should be preserved because they are superior to introduced varieties. All necessary agricultural services must be provided to ensure the success of their cultivation. Before planting introduced varieties on a large scale, their productivity and adaptation to the environmental conditions of the area should be thoroughly studied.**

Keywords: Olive, Introduced Varieties, Sorani Local Variety, Morphological Characterization, Oil Properties.

I. INTRODUCTION

Olive (*Olea europaea* L.) is one of the oldest, most widespread, and important crops in the Mediterranean basin, and is currently the second most important oil crop cultivated worldwide (Baldoni *et al.*, 2009). Many olive genotypes are cultivated, which are characterized by a high degree of morphological and biological diversity (Rugini and Lavee, 1992). Olives belong to the olive family Oleaceae, which includes 29 genera, of which the genus Olea is one, with 35 species. Domesticated olive trees belong to the genus *Olea*, the species *O. europaea*, and the subspecies *O. europaea* var. *europaea*, and the number of cultivated varieties is estimated at more than 2500 (Heywood, 1978).

Most of the olive production is devoted to the production of olive oil, which is obtained only from olive fruits by mechanical processes (Connor and Fereres, 2010). The global production and consumption of olive oil have grown significantly in recent decades thanks to its remarkable sensory, technological, and nutritional properties, which are determined by the compounds present in olive oil (Rallo *et al.*, 2018). Among these compounds, fatty acids, the main components, largely determine the technological and nutritional properties of olive oil (Salas *et al.*, 2000). Oleic acid is the main fatty acid in olive oil and represents 55-83% of the total fatty acid content. Olive oil also contains varying amounts of linoleic acid (3-21%) and linolenic acid (<1%). The relative content of these fatty acids depends mainly on the variety, but also on climatic conditions, soil, and management conditions (Beltrán *et al.*, 2004), and is an important quality attribute, used to validate the authenticity of olive oil (IOOC, 2001). Oleic acid reduces the risk of cardiovascular diseases (Sales-Campos *et al.*, 2013), and inhibits tumorigenesis in inflammatory diseases (Yamaki *et al.*, 2005). Conversely, excessive intake of linoleic acid, due to the high proportion of

ISSN (online): 2581-3048
Volume 8, Issue 11, pp 38-48, November-2024
https://doi.org/10.47001/IRJIET/2024.811005

seed oils in the diet, is associated with a higher risk of hypertension, cardiovascular diseases, and cancer (Vos, 2003). Regarding technological properties, the oxidative stability of oleic acid is ten times higher than that of linoleic acid (O'Keefe *et al.*, 1993). Therefore, olive oils with high oleic acid and low linoleic acid content are better from a nutritional and technological point of view. Therefore, the development of new olive varieties that produce oils with a high oleic/linoleic acid content is a priority in olive breeding programs.

There are many olive varieties grown in various Syrian governorates, and they are naturally distributed according to the areas suitable for their growth in terms of soil and rainfall. It is worth noting the need to refer to several scientific and practical foundations to classify the olive varieties spread in Syria, including the morphological description. Many varieties have begun to become extinct by grafting them onto the Sorani and Zeiti varieties. The Sorani (Maari) varieties are spread in Aleppo and Idlib, which is spread at a rate of 85% in Aleppo, Harem, and Jisr al-Shughour, and the ratio of oil in its fruits is 25-32%. The Zeiti variety is also spread in Aleppo, Harem, Jisr al-Shughour, and Jabal al-Akrad, and its rate of spread is 10%, while the ratio of oil is 28-34%. As for the Qalb al-Tayr variety, it is spread in Aleppo and Harem at a rate of up to 5%, and the ratio of oil in its fruits is 10-12%. The Qarmani variety is widespread in Aleppo, Harem, and Jisr al-Shughur, and its prevalence reaches 5%, while the oil ratio is 10-12%. As for the Syrian coast (Latakia and Tartous), the Khederi variety is widespread, and its prevalence reaches 60%, while the oil ratio is 25-30%. The Tamarani (Darmali) variety is also very limited in prevalence, and its oil ratio is 15-20% (Jarad and Huwaijm, 1996; Al-Deiri, 2003).

The process of characterizing olive varieties has scientific, agricultural, and applied importance. Scientific studies in this field began at the beginning of the last century, relying on the morphological characteristics of the various parts of the tree, in addition to the agricultural, chemical, and biological characteristics and oil specifications. Despite these many studies, there are still some ambiguities in identifying and differentiating varieties and styles (Barranco and Rallo, 1984; Caballero *et al.*, 1990). Al-Deiri and Marouf (2002) conducted a preliminary study to characterize some local olive varieties grown in the genetic complex of olive varieties in Kafr Yahmul, north of Idlib. The Sorani variety was studied by several researchers who viewed it as a homogeneous variety, as it was indicated that it is drought-resistant and that the ratio of oil in its fruits reaches up to 30%, and the sex ratio and fertility of the variety have a direct impact on productivity (Jawad *et al.*, 2001; Corini *et al.*, 2002). Al-Bakeer (2005) showed the existence of genetic differences between cultivated and wild varieties. He also found that the Maari variety is essentially a type of Sorani, as their genetic similarity exceeds 87%. He also highlighted the impact of environmental conditions and climatic factors on the characteristics of the variety.

The weights and sizes of the fruits vary according to the olive variety and genotype, whether wild or cultivated, and are affected by several factors, the most important of which are environmental factors, the year of bearing, and the various agricultural services. Some studies have shown that the weight of the fruit in the olive varieties ranges between 1.5-3 g, and in the Sorani variety, it ranges between 2-4 g (Al-Deiri and Marouf, 2002; Al-Deiri and Abdullah, 2002). Naseer and Abdul-Jawad (1992) found that the pulp ratio in the fruit reached 85% in the olive varieties and 80% in the Sorani variety. Aswad *et al.* (1993) found that the average pulp ratio in the fruit of wild trees growing in Raju (Afrin) ranged between 73-82% and ranged between 71.4-97% in the olive harvest site, while in Faqro it ranged between 66.6-80%, and in Safita it ranged between 75.6-79.6%. They also found that the average fruit weight of wild trees growing in Raju in Afrin ranged between 1.2-2.2g, and in Safita it ranged between 1.2-1.6g.

Quazzani *et al.* (1996) studied the genetic differences between olive genetic resources in Morocco. The results of the study showed significant differences between cultivated and wild olive varieties in Morocco, and that some fruit traits can be invested in genetic improvement programs. Triguii (1996) studied the genetic resources in Tunisia by comparing olive varieties and species in terms of fruit and pulp weight, fruit moisture content, and dry matter, to select strains adapted to the dry environment in Tunisia, and to develop a hybridization program between varieties and species to develop olive cultivation in terms of quantity and quality. Sedgley (2004) studied new strains selected for oil from wild olives spread in South Australia based on oil analysis. The newly selected strains showed good quantity and quality of oil, as the oil ratio in these selected wild strains ranged between 8.5-28.5%. Abdul-Hamid *et al.* (2007) also studied several olive genotypes in the Damascus countryside, where they found that the fruit weight ranged between 2.3-4.13 g, the purity ratio ranged between 75.22-85.98%, the oil ratio ranged between 18-28.49%, and the oleic acid ratio was 67.32-72.46%. The studied genotypes varied between table varieties, oil varieties, and dual-purpose varieties. Caballero (1997) showed that the weight of the fruits of olive varieties in the world ranges between 2-6 g, and there are some varieties whose fruit weight does not exceed 2 g. He also found that the ratio of pulp in the fruit ranged between 80-83.3% in 11% of the olive varieties in the world, between 83.33-88.23% in 53% of them, and between 90.9-91.6% in 4% of the world's varieties. Zaghloula and Abdel-Hamid (1998) identified the areas of wild olive

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

spread in Syria, which were concentrated in Aleppo (Afrin and Raju), Idlib (Harem, Salqin and Jabal al-Wustani), Hama (Sigata, Nafnouf, al-Somaa), and Lattakia (Salnafah, Jabal al-Nabi Yunus, the slopes overlooking the al-Ghab Plain), where the genotypes of wild olive spread in these areas were described and the ratio of oil in their fruits was determined. Al-Bachir (2017) conducted the characterization of Syrian olive fruits (Qaisi variety) and evaluated the physical and chemical properties of the oils during 3 years of production. The mean values of the data for each of the measured and calculated variables of the fruits were: fruit length (21.89 mm), fruit width (17.92 mm), length/width (1.22), fruit weight (3.79 g), pulp weight (3.19 g), seed weight (0.60 g), pulp to seed ratio (5.35), crude oil (17.13%), and moisture content (51.34%).

Ibrahim *et al.* (2013) determined the technological characteristics (fruit weight, seed weight, and net ratio) of eighteen olive varieties grown in the oases of Palmyra (Homs Governorate), discrimination was conducted between these varieties by studying the seeds and processing their images using fractal geometry during the seasons 2009 and 2010. The results of the fruit characterization showed that the varieties Umm Qanani and Tuffahi were significantly superior in their fruit weight over the other varieties studied, while the highest net ratio was in the varieties Jalt and Muhazm Abu Satl, which have high fruit weight, which explains the wider spread of these two varieties in the Palmyra region. The study showed that the fractal geometry technique was able to distinguish between varieties more effectively than the morphological characterization and highlight the diversity between the studied varieties, as the ratio of variation between varieties reached 61% according to the seed appearance and 67% for the surface specifications in the processed images. The value of incompatibility between the studied varieties ranged between 0.1 and 15.23% according to the technological specifications of the fruits, while this value was between 1.96 and 45.15% according to the fractal geometry technique, which showed that the two varieties Shami and Abbadi Khanfsi were the most divergent, while the two varieties Izmirli and Herqtani were largely compatible.

Biometrics are widely used in the production of table and oil olives (Giuffrè, 2017), where the quantity and quality of oil, in addition to the qualitative characteristics of the fruits (fruit weight, seed weight, flesh), are among the most important characteristics used to distinguish and classify cultivated or wild olive varieties. These are genetic traits influenced by environmental conditions, soil, and agricultural management (Rallo *et al.*, 2018). The quality and quantity of olives are not only related to pre-harvest factors, but also post-harvest conditions (Mele *et al.*, 2018), and the average fresh fruit weight is a decisive agronomic criterion for the initial selection of cultivars for table olives, oil, or even for both uses. Abdul-Hamid *et al.* (2022) compared wild olive varieties in different regions of Syria, a significant difference was found in seed lengths, widths, and length-to-width ratios. The length of the seeds ranged from 0.86 to 1.63 cm and the width from 0.43 to 0.90 cm. The weight of the seeds ranged from 0.32 to 0.66 g. The morphological characteristics of the leaves indicate that there is a significant difference only in length and width.

A comparative study of morphological characteristics of eight olive varieties grown in Saudi Arabia was conducted and analyzed using NTSYS-PC (Numerical Taxonomy System for Personal Computer), where small fruits were grouped into one group and the rest into two groups. Koroneiki, a Greek variety with small fruits shares a branch with the Spanish variety Arbosana. Morphological analysis using NTSYS-PC revealed that biometric measurements of leaves, fruits, and seeds are reliable morphological characteristics for differentiating between varieties, except for a few olive varieties that are very similar morphologically. Proximate analysis showed significant differences in protein, fiber, crude fat, ash, and moisture contents of different varieties. The study also revealed that fruit size or pulp thickness does not determine the crude fat content of olives (Al-Ruqaie *et al.*, 2016).

Olive oil is a very important product, due to its nutritional value, sensory properties, and antioxidant content. Increased intake of extra virgin olive oil has also been associated with the health properties of some secondary components such as phenolic compounds (Tripoli *et al.*, 2005). National and international regulations define basic quality parameters (such as acidity and peroxide value) to distinguish high-quality oils (extra virgin olive oil) from those of lower quality (Grossi *et al.*, 2014). The quality of olive oil is influenced by various factors, such as seasonal weather, the stage of olive ripeness, and the extraction process, in addition to storage conditions, especially light and temperature (Mignani *et al.*, 2003). The most important parameters that determine the quality of olive oil are acidity and peroxide value. The first, defined as the amount of fatty acids no longer bound to the original triglyceride molecules, is measured as a ratio of oleic acid in 100 g of oil. The latter is an indicator of the initial oxidation of the oil and is expressed in milliequivalents of active oxygen per kg of oil (meq O_2/kg oil). If storage conditions are not suitable, mainly due to lack of protection against heat and light, oxidation of the oil occurs and leads to a deterioration in the quality of the product, according to the European Commission Regulation No. 2568/91, which also proposes to classify olive oils according to their acidity, which is defined in grams of oleic acid per 100 g of oil. According to this regulation, extra virgin olive oil must have an acidity of less than 1, virgin olive oil less than 3.3, and low-quality virgin

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

olive oil more than 3.3. The determination of acidity in extra virgin olive oils is often a necessary procedure during oil production to evaluate the price and quality of olive oils (Mariotti and Mascini, 2001).

Moisture content is one of the main criteria for quality assessment (Gordillo *et al.*, 2011; Hatzakis and Dais, 2008; Ruiz-Domínguez *et al.*, 2013). Freshly produced extra virgin olive oil is naturally cloudy, containing fine droplets of plant water and solid particles from the olive fruit (Brkić Bubola *et al.*, 2012). Although it may be considered less processed by some consumers, even months until complete sedimentation (Gordillo *et al.*, 2011). The high polar phase (water) content may increase the denaturation of extra virgin olive oil during storage at milling plants and the marketing period, by increasing the rate of hydrolysis of triglycerides. This process increases free acidity, which exposes extra virgin olive oil to oxidation in the presence of oxygen, light, or high temperatures (Yun and Surh, 2012). Oxidation is known to lead to the formation of volatile products, which not only alter the initial flavor of extra virgin olive oil but also reduce the nutritional quality and may even lead to the formation of toxic products (Stefanoudaki *et al.*, 2010; Bendini *et al.*, 2013). In addition, the acidity of opaque extra virgin olive oil affects the trajectory of phenolic compounds during storage (Brenes, 2001). On the other hand, the opaque aspect makes sales difficult in some new markets, where consumers tend to prefer bright extra virgin olive oil.

Olives are one of the most important fruit trees planted in Syria. They play a major role in maintaining food security for society, contributing to the income of many families, and supporting the national economy. Recently, many foreign varieties have been introduced, especially dwarf varieties, which have begun to compete with local varieties. Hence, it was necessary to conduct this research work, which aims to describe the shape of some olive varieties introduced to the northwestern region of Syria, study some chemical properties of the oil produced in the studied varieties, and compare them with the local Sorani variety.

II. MATERIALS AND METHODS

2.1 Plant Material

Leaves, fruits, and parts of branches of the following olive varieties were collected: Sorani, Arbequina, Spanish green, and Spanish black on 11/1/2023.

2.1.1 Sorani variety

This variety is mainly spread in Idlib and is also found in Aleppo, Homs, Hama, Daraa, Quneitra, Sweida, and the eastern region of Syria (Raqqa, Deir Ezzor, and Hasaka). The oil content in its fruits ranges between 25-32%. It is grown as a dual-purpose variety, i.e. for oil production and pickling, whether green or black. It is characterized by its low sensitivity to unsuitable environmental conditions. The tree is large, bearing regularly distributed branches, and the leaves are dense, oblong, and lanceolate. The fruits are small, very similar to the fruits of Khadiri, and are characterized by a red or black shine when ripe. The variety is characterized by its high productivity and low resistance. It is a self-pollinating variety and contains a low ratio of flowers with a vestigial ovary. However, its productivity specifications have been improved with the presence of a pollinated variety (Jarad and Huwaijm, 1996). Fig. (1) shows the Sorani olive variety.

2.1.2 Arbequina variety

A Spanish olive variety, the oil content in its fruits ranges between 15-22%. It is a variety that can adapt perfectly to the intensive cultivation method, due to its strong characteristics in terms of resistance, durability, and the small structure of the tree. The leaf is small, short, medium-width, and oval. The fruit is small, spherical, symmetrical, and black when ripe. High-quality virgin oil can be obtained, even with low stability for about a year. One dunum needs about 200 trees of the Arbequina variety, with a planting distance of (3×2). The tree needs irrigation at a rate of 80 liters every week, and high phosphorus fertilization at a rate of 50 g for a 3-year-old tree in sustainable soil. In the second month, it needs a spray of zinc and boron foliar fertilizer three times every 15 days. The 3-year-old tree produces about 7.5 kg, and the appropriate harvest date is the end of November (Mouallem, 2013). Fig. (1) shows the Arbequina olive variety.

2.1.3 Spanish green and black varieties

Two varieties were recently introduced to northern Syria, and there is not much information about the source of these two varieties. Suppliers and olive growers refer to these two varieties as Spanish varieties. Fruiting begins at an early age of about 3 years with an average productivity of more than 5 kg per tree. The black variety is early maturing, and the fruits turn black from the beginning of October approximately, while the Spanish green variety is late maturing, and the fruits turn black from mid-November. The Spanish green variety is characterized by its large fruit size, while the Spanish black variety has a smaller fruit size. Both varieties are characterized by heavy annual yield and a high need for irrigation throughout the fruiting season, but the oil content is low in these varieties (about 15%). Fig. (1) shows the green and Spanish black olive varieties.

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

Sorani **Arbequina** **Spanish green** **Spanish black**

Figure (1): Studied olive varieties

2.2 Measurements studied

2.2.1 Morphological characteristics

The following morphological Measurements were taken for the olive varieties mentioned above:

1. Fruit length, diameter, and length of the fruit petiole (mm).
2. Fruit weight (g), size (cm^3), and flesh thickness (mm).
3. Seed length, width (mm), and weight (g).
4. Leaf length, width, and length of the petiole (mm).
5. Internodes length (mm).

2.2.2 Oil properties

1 kg of fruits of each variety were pressed using a laboratory press, and the following chemical properties of the oil were studied:

1. Oil ratio (%)
2. Oil taste
3. Oil color
4. Peroxide value
5. Acidity (%)
6. Moisture content (%)

2.3 Oil extraction

Olives were harvested from the studied varieties. The fruits of these varieties were ground separately using a small laboratory mill. After the grinding process, 500 g of the ground of each variety was weighed separately using a precision balance (accuracy 0.001), and the weighed quantities were placed in stainless steel containers, in preparation for putting them in the mixer. After that, a water bath was heated to a temperature of 35 °C, and the containers containing the dough were placed in the water bath and the dough was stirred for 45 minutes until the oil was partially separated from the pulp and the shine of the oil inside the containers became clear in the dough mixing machine. The oil is then separated from the fruit residue (dregs) by a centrifugal separator at a speed of 3500 rpm, where the dregs stick to the separator wall. The oil comes out with the remaining water, which is filled inside a cylinder and left for some time so that the water settles to the bottom, and the oil floats to the top (sedimentation), then the reading is taken.

2.4 Chemical analysis

2.4.1 Acidity (%)

To determine the acidity of the oil, the necessary solutions were prepared for this purpose as follows: A 0.1potassium hydroxide solution with a volume of 500 ml was prepared. 2.8 g of potassium hydroxide is placed in a beaker, and a portion of water is placed in it, then stirred until completely dissolved, then distilled water is added up to 500 ml. Alcohol and phenolphthalein indicators are also required. Then the following is followed to measure the acidity: An empty, dry beaker is weighed, then the balance is zeroed, and the weight of the empty beaker is recorded. 3-5 g of the oil sample whose acidity is to be determined is placed. 10 ml of alcohol is added to the oil sample. A few drops of phenolphthalein indicator are added. The

ISSN (online): 2581-3048
Volume 8, Issue 11, pp 38-48, November-2024
https://doi.org/10.47001/IRJIET/2024.811005

titration continues until the sample turns pink and remains stable for at least two minutes. The volume of potassium hydroxide solution consumed is recorded. The acidity ratio is calculated using the following equation:

$$\text{Acidity (\%)} = (V-0.1)\times 0.1\times 282 / W\times 1000\times 100$$

Where: V = volume of potassium hydroxide consumed, 0.1 = solution concentration constant, 282 = oleic acid equivalent of oil, W = weight of oil sample in (g). This process was repeated three times for each variety, then the average was calculated for each sample.

2.4.2 Moisture content (%)

To determine the moisture content of the oil, eight troughs were brought, and the weight of each empty trough was recorded separately, then two duplicates of the oil samples of the studied varieties were placed in each pair of troughs. Then each trough was weighed with the oil sample before drying. The eight troughs were placed in an oven at a temperature of 105 °C for 5 hours until the weight was stable. They were taken out of the oven, and weighed after drying, then by subtracting the weight of the trough with the sample from the weight of the empty trough, the weight of the sample before drying was obtained as follows:

Weight of the sample before drying = Weight of the trough with the sample - Weight of the empty trough

Then to obtain the weight of the dry sample, the weight of the empty trough was subtracted from the weight of the trough with the dry sample as follows:

Weight of the dry sample = Weight of the trough with the sample after drying - Weight of the empty trough

To determine the moisture content, the following relationship was applied:

$$\text{Moisture content (\%)} = \left(\frac{\text{Weight of the wet sample - Weight of the dry sample}}{\text{Weight of the wet sample}}\right) \times 100$$

2.4.3 Peroxide value

The peroxide value was estimated according to the method approved by the International Olive Council, expressed as ($meqO_2/Kg$), (IOC, 2017), by titrating the iodine released from the reaction of oil dissolved in a mixture of chloroform and glacial acetic acid, in the dark, with saturated potassium iodide using a 0.01 N sodium thiosulfate solution, and in the presence of cooked starch as an indicator for the end of the titration.

2.5 Statistical analysis

The results were analyzed using the statistical analysis program (Genstat-7), and the comparison between the means was made using the least significant difference (L.S.D.) test at the 1% significance level.

III. RESULTS AND DISCUSSION

3.1 Fruit Properties

Table (1) and Fig. (2) show the results of the study of fruit characterizations in the olive varieties (Sorani, Arbequina, Spanish Green, and Spanish Black).

Table (1): Fruit properties in the studied olive varieties

Variety	Fruit length (mm)	Fruit diameter (mm)	Fruit weight (g)	Fruit size (cm^3)	Fruit petiole length (mm)	Flesh thickness (mm)	Seed length (mm)	Seed width (mm)	Seed weight (g)
Sorani	24.10[a]	16.63[a]	3.53 [a]	3.4 [a]	16.43[a]	4.7 [a]	17 [a]	6.9 [b]	0.7 [b]
Arbequina	13.42[c]	11.80[b]	3.53 [a]	3.6 [a]	4.45[c]	2.4 [b]	10.4 [b]	6 [c]	3.46 [a]
Spanish green	21.45[b]	16.83[a]	3.79 [a]	3.6 [a]	16.20[ab]	4[a]	18.04 [a]	12.4 [a]	0.7 [b]
Spanish black	21.38[b]	16.88[a]	4.36 [a]	3.6 [a]	14.25[b]	4.5 [a]	18.12 [a]	12.4 [a]	0.7 [b]
Mean	20.09	5.53	3.8	3.55	12.83	3.9	15.89	9.45	1.4
L.S.D. (1%)	0.72	0.54	1.73	0.37	1.95	1.07	4.32	1.90	0.92
C.V. (%)	5.70	5.50	0.67	0.64	24.30	0.57	2.19	0.25	0.18

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

Table (1) shows the diversity of the studied varieties and their differences in fruit characteristics. As for the characteristics of fruit length, the Sorani variety outperformed the other studied varieties with highly significant differences, with a value of (24.10) mm, followed by the Spanish Green and Spanish Black varieties without significant differences between them, but they outperformed the Arbequina variety. The length of the fruit in them was (21.45, and 21.38) mm, respectively, and the length of the fruit in the Arbequina variety was the least, with a value of (13.42). Table (1) also shows the existence of significant differences in the value of the fruit diameter between the Spanish Green, Spanish Black, and Sorani varieties with values of (16.83), (16.88), (16.63) mm, respectively, and these varieties outperformed the Arbequina variety, where the value in it was (11.80).

It is noted from Table (1) that there were no significant differences between the studied varieties in the trait of fruit weight and size, where the average values were 3.8 g and 3.55 mm³, respectively. As for the trait of fruit petiole length, the Sorani variety outperformed both Spanish black and Arbequina by a value of (16.43) mm, and the length of the fruit petiole in them was (14.25, and 4.45) mm, respectively. There were no significant differences between the Sorani and Spanish green varieties (in which the length of the fruit petiole was 14.20 mm), and there were also no significant differences between Spanish green and Spanish black, while Spanish black outperformed Arbequina significantly. As for the thickness of the fruit flesh, all varieties outperformed the Arbequina variety, as the values of the thickness of the fruit flesh reached 4.7, 4.5, and 4.7 mm in the varieties Sorani, Spanish black, and Spanish green, respectively, without any significant differences between them, while the thickness of the fruit flesh was 2.4 in the Arbequina variety.

As for seed characteristics, the Arbequina variety outperformed the other varieties in seed weight with a value of 3.46 g, while the seed weight in all other varieties was 0.7 g. As for seed length, the Spanish Black, Spanish Green, and Sorani varieties outperformed the Arbequina variety, with values of 18.12, 18.04, 17, and 10.4 mm, respectively, without significant differences between the three varieties. Table (1) shows that in the fruit diameter characteristic, the Spanish Green and Spanish Black varieties outperformed both Arbequina and Sorani with significant differences without any differences between them, as the fruit diameter in each of them reached 12.4 mm. The Sorani variety also outperformed the Arbequina variety significantly, with values of 6.9 mm and 6 mm, respectively.

Sorani **Arbequina** **Spanish green** **Spanish black**

Figure (2): Fruit shape in the studied olive varieties

The results showed that the average fruit length of the studied varieties was 20.09 mm, and this result is close to what was reached by Al-Bachir (2017), who obtained an average fruit length of 21.89 mm. As for the average fruit width (fruit diameter), it was 5.53 mm in our study, which is far from the value reached by Al-Bachir (2017), which was 17.92 mm. According to Caballero (1997), the fruit weight of olive varieties in the world ranges between 2-6 g, and all our results are consistent with what was confirmed by this study, as the average fruit weight was 4.36 g, 3.79 g, 3.53 g, and 3.53 g, in the varieties Spanish Black, Spanish Green, Sorani, and Arbequina, respectively. On the other hand, Al-Bachir (2017) showed that the average seed weight in the varieties he studied was 0.60 g, which is consistent with our study for the varieties Spanish Green, Spanish Black, and Sorani, where the average seed weight in these varieties was 0.7 g, while our results regarding the seed weight of the variety Arbequina (3.46 g) did not agree with what this study reached.

3.2 Leaf Properties

Table (2) and Figure (3) show the results of the study of leaf characterizations in the olive varieties (Sorani, Arbequina, Spanish Green, and Spanish Black).

ISSN (online): 2581-3048

Volume 8, Issue 11, pp 38-48, November-2024

https://doi.org/10.47001/IRJIET/2024.811005

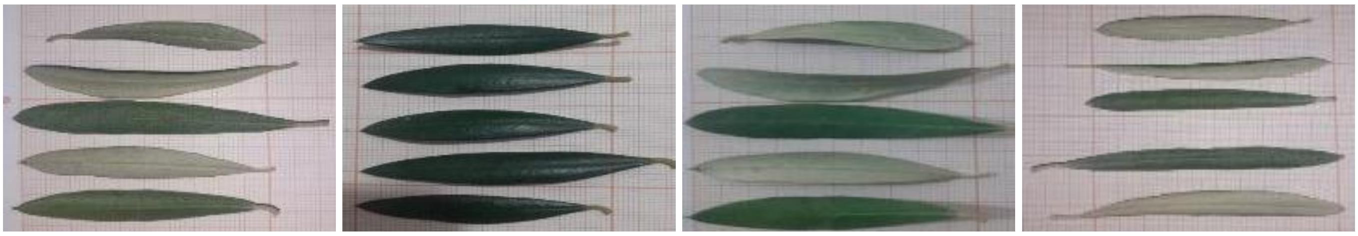
Table (2): Length of internodes and leaf properties in the studied olive varieties

Variety	Internodes length (mm)	Leaf length (mm)	Leaf width (mm)	Leaf petiole length (mm)
Sorani	27.10^{a}	54.67^{a}	13.00^{a}	4.67^{a}
Arbequina	3.70^{c}	48.00^{b}	11.17^{b}	4.67^{a}
Spanish green	19.70^{b}	48.17^{b}	10.50^{b}	4.33^{a}
Spanish black	23.00^{b}	49.92^{b}	10.92^{b}	4.50^{a}
Mean	18.38	50.19	11.40	4.54
L.S.D. (1%)	3.82	4.46	1.72	0.70
C.V. (%)	22.70	7.20	12.30	12.40

Table (2) and Fig. (3) show that the leaf shape in all varieties is oval with a tapering end, the length is generally medium, and the width is medium with a slight difference between varieties. As for the longitudinal curvature, it was noted that the leaf is flat or sometimes curved, and the most curved variety was the Spanish black variety.

It is also noted from Table (2) that the studied varieties varied in the length of the internodes, as the Sorani variety outperformed the other varieties with significant differences with a value of (27.10 mm). The Spanish Black and Spanish Green varieties outperformed Arbequina significantly. There were no significant differences between them, and the values in the varieties were, in order, (23.00, 19.70, 3.70) mm.

The Sorani variety also outperformed the other varieties in leaf width by a value of (54.67), while there were no significant differences between the other varieties. The Sorani variety also outperformed the other varieties by a value of (13.00 mm), and there were no significant differences between the other varieties. There were no significant differences between all studied varieties in leaf petiole length, as shown in Table (2).



Sorani **Arbequina** **Spanish green** **Spanish black**

Figure (3): Leave shape in the studied olive varieties

3.3 Oil properties

Table (3) shows the results of the study of oil specifications in the olive varieties (Sorani, Arbequina, Spanish Green, and Spanish Black).

Table (3): Oil properties in the studied varieties

Variety	Oil ratio (%)	Oil taste	Oil color	Peroxide value meq O_2/kg	Acidity (%)	Moisture content (%)
Sorani	25^{a}	Pungent	Dark Green	2.16^{b}	0.56^{b}	0.20^{a}
Arbequina	10^{c}	Not Pungent	Light Yellow	6.30^{a}	1.05^{a}	0.32^{a}
Spanish green	16^{b}	Medium	Light Green	3.22^{ab}	0.40^{b}	0.31^{a}
Spanish black	16^{b}	Medium	Light Green	2.48^{b}	0.41^{b}	0.40^{a}
L.S.D. (1%)	3.2	-	-	1.86	0.24	0.31
C.V. (%)	9.1	-	-	16.5	12.2	32.2

Table (3) displays that the Sorani variety significantly outperformed the two varieties, Spanish green and Spanish black, in the ratio of oil, which in turn significantly outperformed the Arbequina variety, and the values were (25, 16, 16, and 10%) respectively. There were no significant differences between the two varieties, Spanish green and Spanish black. It is also noted that the Arbequina variety is ready for immediate consumption due to the absence of a pungent taste at all, while the taste of the oil was pungent in the Sorani variety and medium pungency in the two varieties,

ISSN (online): 2581-3048
Volume 8, Issue 11, pp 38-48, November-2024
https://doi.org/10.47001/IRJIET/2024.811005

Spanish green and Spanish black. As for the color of the oil, it was dark green in Sorani, and light yellow in Arbequina, while it was light green in both Spanish green and Spanish black.

The peroxide value test measures the extent of rancidity in the oil in its early stages. The international standard specifications have determined that the peroxide value of olive oil used in food should not exceed 20 milli equivalents of oxygen peroxide/kg of oil. It is noted from Table (3) that the highest peroxide value was in the Arbequina variety, and the lowest peroxide value was in the Sorani variety, which means that the Sorani variety is better than the introduced varieties in the peroxide value.

The oil is classified as extra virgin oil only if its acidity is less than 0.8%, and the lower it is, the better the value of the oil. It is noted from Table (3) that the acidity in the studied varieties, Sorani, Spanish Green, and Spanish Black is less than 0.8% (0.5, 0.4, and 0.4%) respectively, while in Arbequina, the acidity was found to be higher (1.05), which means that it cannot be classified as extra virgin olive oil. Table (3) also shows that the lowest moisture content was in the Sorani variety (0.20%), while the moisture content was high in the introduced varieties Arbequina, Spanish green, and Spanish black (0.32, 0.31, and 0.40) respectively.

The previous results show that the oil of the Sorani variety is superior in quality characteristics and standard specifications of the oil to the introduced varieties (Arbequina, Spanish Green, and Spanish Black). Also, the oil ratio obtained for the Sorani variety was 25%, which is consistent with what was indicated by (Al-Deiri, 2003) that the oil ratio in the Sorani variety ranges between 25-32%, and close to what was indicated by (Jawad *et al.*, 2001; Corini *et al.*, 2002) that the oil ratio in the Sorani reaches 30%.

IV. CONCLUSIONS

The Sorani local variety outperformed the introduced varieties in fruit length and diameter, internode length, leaf length and width, and oil content. The Sorani variety also outperformed the characteristics of olive oil extracted from the fruits (peroxide value, moisture content, and acidity), making it healthier for consumption and better for marketing. There were no clear significant differences in the studied characteristics between the two Spanish varieties, green and black. Finally, the Arbequina variety lagged significantly behind the other varieties in all studied characteristics, except for its oil which does not have a pungent taste, which makes it suitable for direct consumption after pressing. Based on this study, local varieties, such as the Sorani variety, must be preserved because of their superiority over introduced varieties, and all agricultural services must be provided for the success of its cultivation. Introduced varieties must also be studied before planting them on a large scale, in terms of their productivity and adaptation to the environmental conditions in the area where they are to be planted.

REFERENCES

[1] Abdul-Hamid R., Hag Husein H., Bäumler R. (2022). Characteristics of some wild olive phenotypes (oleaster) selected from the western mountains of Syria. Sustainability Journal, 14(9): 5151.

[2] Abdul-Hamid R., Hamed F., Ibrahim A. (2007). Survey and characterization of genetic and environmental patterns of the Dan olive cultivar in the Damascus countryside. Master’s thesis, University of Damascus, Syria, 137p.

[3] Al-Bachir M. (2017). Comparison of fruit characteristics, oil properties, and fatty acid composition of local Syrian Kaissy cv olive (*Olea europaea*). Journal of Food Measurement and Characterization, 11: 1011-1018.

[4] Al-Bakeer S. (2005). Genetic differences and production quality between some cultivated and wild olive cultivars (*Olea europaea* L.) in the northern region of Syria, PhD thesis, Department of Horticulture, Faculty of Agriculture, University of Aleppo, 230p.

[5] Al-DeiriN. (2003). Evergreen Fruit Trees, Faculty of Agriculture, Aleppo University Publications, 500p.

[6] Al-Deiri N., Abdullah G. (2002). Variation in the oil content of fruits during their development stages in some local and introduced olive (*Olea europaea* L.) cultivars grown in the genetic complex of Kafr Yahmul - Idlib. Symposium on the status and prospects of the olive tree and its oil in Syria and Lebanon, the Syrian-Lebanese Research Days, Faculty of Agriculture, Tishreen University, February 16-18, 194p.

[7] Al-Deiri N., Marouf A. (2002). A preliminary study to characterize some local olive varieties grown in the genetic complex of olive varieties - Kafr Yahmul - Idlib. Symposium on the reality and prospects of the olive tree and its oil in Syria and Lebanon, the Syrian-Lebanese Research Days, Faculty of Agriculture, Tishreen University, February 16-18, 194p.

[8] Al-Ruqaie I., Al-Khalifah N.S., Shanavaskhan A.E. (2016). Morphological cladistic analysis of eight popular Olive (*Olea europaea* L.) cultivars grown in Saudi Arabia using Numerical Taxonomic System for personal computer to detect phyletic relationship and their proximate fruit composition. Saudi Journal of Biological Sciences, 23: 115–121.

[9] Aswad M.W., ShalabiM.N., AbdeenM., LababidiM.W. (1993). Contribution to the study of some biological characteristics of wild olives in their different

ISSN (online): 2581-3048
Volume 8, Issue 11, pp 38-48, November-2024
https://doi.org/10.47001/IRJIET/2024.811005

environments in Syria. Aleppo University Research Journal, Agricultural Sciences Series, Issue 19.

[10] Baldoni L., Cultrera N.G., Mariotti R., Ricciolini C., Arcioni S., Vendramin G.G. (2009). A consensus list of microsatellite markers for olive genotyping. Mol. Breed. 24: 213–231.

[11] Barranco D., Rallo L. (1984). Las variedades de olivocultivadas en Andalucia. Minestario de Agricultura, Madrid.

[12] Beltrán, G., Del Rio, C., Sánchez, S., &Martínez, L. (2004). Influence of harvest date and crop yield on the fatty acid composition of virgin olive oils from cv. Picual. Journal of agricultural and food chemistry, 52(11): 3434-3440.

[13] Bendini, A., Valli, E., Rocculi, P., Romani, S., Cerretani, L., &GallinaToschi, T. (2013). A new patented system to filter cloudy extra virgin olive oil. Current Nutrition & Food Science, 9(1): 43-51.

[14] Brenes M., García A., García P., Garrido A. (2001). Acid hydrolysis of secoiridoid aglycons during storage of virgin olive oil. Journal of agricultural and food chemistry, 49(11): 5609-5614.

[15] Brkić Bubola K., Koprivnjak O., Sladonja B., Lukić I. (2012). Volatile compounds and sensory profiles of monovarietal virgin olive oil from Buža, Črna and Rosinjola cultivars in Istria (Croatia). Food Technology and Biotechnology, 50(2): 192-198.

[16] Caballero J.M.; Del Rio C.; Eguren E. (1990). Further agronomical information about a world collection of olive cultivars. Acta Hort. 286:45-48.

[17] Caballero M.J. (1997). The olive world Germplasm Bank (junta de andalucia-Ina of Cida, Cordoba-Spain. Proceedings of the international Semminar on olive growin, Chania, Crete-Greece. 18-24-May: 40-43.

[18] Connor D.J., Fereres E. (2010). The physiology of adaptation and yield expression in olive. Hortic. Rev, 31: 155-229.

[19] Corini A.R., Khaizaran A.M., Issa N. (2002). A Study of the Identity and Characteristics of Syrian Olive Oil. Symposium on the Reality and Prospects of the Olive Tree and its Oil in Syria and Lebanon, Syrian-Lebanese Research Days, Faculty of Agriculture, Tishreen University, February 16-18, 194p.

[20] Giuffrè A.M. (2017). Biometric evaluation of twelve olive cultivars under rainfed conditions in the region of Calabria, South Italy. Emirates Journal of Food & Agriculture, Emir. J. Food Agric., EJFA, 29(9): 696–709.

[21] Gordillo B., Ciaccheri L., Mignani A.G., Gonzalez-Miret M.L., Heredia F.J. (2011). Influence of turbidity grade on color and appearance of virgin olive oil. Journal of the American Oil Chemists' Society, 88(9): 1317-1327.

[22] Grossi M., Di Lecce G., Toschi T.G., Riccò B. (2014). A novel electrochemical method for olive oil acidity determination. Microelectronics Journal, 45(12): 1701-1707.

[23] Hatzakis E., Dais P. (2008). Determination of water content in olive oil by 31P NMR spectroscopy. Journal of agricultural and food chemistry, 56(6): 1866-1872.

[24] Heywood V.H. (1978). Flowering Plants of the World. Oxford, London, Melbourne: Oxford University Press.

[25] Ibrahim A., Al-RashidM.M., Qatma, G., Bari, A. (2013). Morphological characteristics of olive fruits grown in the Palmyra-Homs area, and qualitative discrimination between them using image processing technology. Damascus University Journal of Agricultural Sciences, 29(2): 9-21.

[26] IOC. (2107). Determination of peroxide value. In (Vol. Coi/T20/Doc. No 35/ Rev. 2). Madrid – España.

[27] IOOC (2001). IOOC Trade standard applying to olive and olive pomance oil. COI/T.15/NC no. 2/Rev. 10.

[28] Jarad A.E., HuwaijmZ.H. (1996). Perennial Fruit Trees - Second Faculty of Agriculture - Aleppo University Publications.

[29] Jawad M.A., Khaizran A.M., Issa N. (2001). A chemical study of olive oil and a comparison of some quality standards with international specifications. Aleppo University Research Journal, Issue 39.

[30] Mariotti E., Mascini M. (2001). Determination of extra virgin olive oil acidity by FIA-titration. Food chemistry, 73(2): 235-238.

[31] Mele M.A., Islam M.Z., Kang H.M., Giuffrè A.M. (2018). Pre-and post-harvest factors and their impact on oil composition and quality of olive fruit. Emirates Journal of Food and Agriculture, 30(7): 592-603.

[32] Mignani A.G., Smith P.R., Ciaccheri L., Cimato A., Sani G. (2003). Spectral nephelometry for making extravirgin olive oil fingerprints. Sensors and Actuators B: Chemical, 90(1-3): 157-162.

[33] Mouallem R. (2013). Efecto de la temperature de conservaciondelaceite de oliva virgen extra en los parametros de Calidady sus components minoritarios.

[34] Naseer P., Abdul-Jawad I. (1992). Study of the specifications of Syrian olive varieties and their evaluation. League of Arab States, Arab Center for the Study of Arid Zones and Dry Lands, ACSAD, Department of Plant Studies.

[35] O'keefe S.F., Wiley V.A., Knauft D.A. (1993). Comparison of oxidative stability of high-and normal-oleic peanut oils. Journal of the American Oil Chemists' Society, 70(5): 489-492.

ISSN (online): 2581-3048
Volume 8, Issue 11, pp 38-48, November-2024
https://doi.org/10.47001/IRJIET/2024.811005

[36] Quazzani N., Lumaret R., Villemur P. (1996). Genetic variation in the olive tree (*Olea europaea* L.) cultivated in Marocco. Euphytica, 91(1): 9-20.

[37] Rallo L., Díez C.M., Morales-Sillero A., Miho H., Priego-Capote F., Rallo P. (2018). Quality of olives: A focus on agricultural preharvest factors. Scientia horticulturae, 233: 491-509.

[38] Rugini E., S. Lavee (1992). Olive. Biotechnology of Periennal Fruit crops. Biotecnologi In Agriculture, C.A.B International, Wallingford, 8: 371–382.

[39] Ruiz-Domínguez M.L., Raigón M.D., Prohens J. (2013). Diversity for olive oil composition in a collection of varieties from the region of Valencia (Spain). Food Research International, 54(2): 1941-1949.

[40] Salas J.J., Sánchez J., Ramli U.S., Manaf A.M., Williams M., Harwood J.L. (2000). Biochemistry of lipid metabolism in olive and other oil fruits. Progress in Lipid Research, 39(2): 151-180.

[41] Sales-Campos H., Reis de Souza P., Crema Peghini B., Santana da Silva J., Ribeiro Cardoso C. (2013). An overview of the modulatory effects of oleic acid in health and disease. Mini reviews in medicinal chemistry, 13(2): 201-210.

[42] Sedgley M. (2004). Wild olive selection for quality oil production, RIRDC Publication No 04:101.

[43] Stefanoudaki E., Williams M., Harwood J. (2010). Changes in virgin olive oil characteristics during different storage conditions. European Journal of Lipid Science and Technology, 112(8): 906-914.

[44] Triguii A. (1996). Improving the quality of the olive oil production in Tunisia. Olivae, no. 61.

[45] Tripoli E., Giammanco M., Tabacchi G., Di Majo D., Giammanco S., La Guardia M. (2005). The phenolic compounds of olive oil: structure, biological activity and beneficial effects on human health. Nutrition research reviews, 18(1), 98-112.

[46] Vos E. (2003). Linoleic acid "vitamin F6"-is the western world getting too much? probably. Lipid Technology, 15, 81-84.

[47] Yamaki T., Nagamine I., Fukumoto K., Yano T., Miyahara M., Sakurai H. (2005). High oleic peanut oil modulates promotion stage in lung tumorigenesis of mice treated with methyl nitrosourea. Food Science and Technology Research, 11(2): 231-235.

[48] Yun J.M., Surh J. (2012). Fatty acid composition as a predictor for the oxidation stability of Korean vegetable oils with or without induced oxidative stress. Preventive nutrition and food science, 17(2): 158

[49] ZaghloulaM.A., Abdel-HamidR. (1998). Technical Report of the Olive Department, Ministry of Agriculture and Agrarian Reform, Directorate of Agricultural Scientific Research, Tree Horticulture Research Division, Olive Research Department, Damascus, Syria.

Citation of this Article:

Prof. Dr. Rida DRAIE, & Dr. Hafsa BARAKAT. (2024). Morphological Characterization and Analysis of the Oil Chemical Properties of Various Olive Varieties Introduced to the Northwestern Region of Syria, Compared with the Local Sorani Variety. *International Research Journal of Innovations in Engineering and Technology - IRJIET*, 8(11), 38-48. Article DOI https://doi.org/10.47001/IRJIET/2024.811005

****