

Introduction:

The olive (*Olea europaeae* L.) was long known in Syria and the Holy Land, It was introduced to Egypt from Syria Between 3000-1800 BCE. By 2500 BCE, the ancient city "Ebla" in northern Syria had many fields containing between 500- 1000 olive trees, producing and exporting various types of olive oil (11).

Olive genetic resources in Syria are variable and very rich, the Syrian olive varieties estimated at 75 may be of great benefit for quality and quantity production. Some varieties are selected and restricted to one region such as "Zaiti" in Aleppo, "Surang" in Idleb, "Khodeiri" in Lattakia etc.. , and the link between the variety and its region is shown by the adaptation of that variety to the environment, and its preference by local people in this region (3).

Morphological characters have been widely and commonly used for descriptive purposes and have been used to characterize olive accessions and to establish relationships among them (7). recently, much attention has been focused on the application of molecular, chemical markers and artificial neural network, due to their high diagnostic efficiency and independence from environmental and phenological variables (9, 6 and 16), or use

more than one technique together, such as chemical and molecular markers (4 and 10).

Olive varieties and types are classified in most international studies according to the International Olive Council application, which include the study of leaves, fruits and stones characterization (12), e.g. seven olive cultivars planted in the northwest region of Syria were described according to IOC parameters, so the weight of fruits and stones were within the range (0.58 - 4.48 g, 0.17 - 0.68 g respectively), and flush percentage ranged from 70.68% to 84.82%, then these varieties were molecularly labeled using SSR technology (15). The morphological and phenological characteristics of three olive cultivars were studied in a germplasm in Egypt, and they were compared with the international varieties "Coratina" and "Koroniki", the studied cultivars showed cultivars in fruits shape and the period of flowering (8).

The olive cultivation is strongly linked with ancient civilization in Palmyra, and it reflect the richness in the genetic resources of olives in our country, It is therefore necessary to pay attention to the documentation, characterization, preservation and propagation of these sources in order to preserve them from deterioration and extinction, especially that local farmers graft their olive trees with two main cultivars "M-hazam Abou Satel"

and "Jlot", in order to meet the desire of the market and consumers in pursuit of yield and profit, while some cultivars such as "Herqtani", "Abadi al-Murr", "Abadi Hlou", " Abeid Men Umu "have become limited.

Materials and Methods:

Plant material: This research was conducted during seasons 2011 and 2012, to study the olive cultivars planted in Palmyra, which was irrigated in Summer, five trees of each cultivar were described taking into consideration their homogeneity as much as possible in age, strength and size.

location: This study was carried out in the oases of Palmyra/ the province of Homs in central Syria, a desert area in which annual rainfall doesn't exceed 115 mm.

study parameters:

Survey: we do the field tours in order to survey the olive cultivars planted in Palmyra, and to estimate the proportion of each one and the purpose of use.

Fruits and stones properties: A sample of fourty fruit and stones were taken from the middle part of the fruity branch from south side of tree, and were studied according to the International Olive Council application, at the beginning of maturity stage.

Research aimed were Evaluatuion of the genetic resources of olives in Palmyra, and investigate the proportion of each cultivar. Study the morphological and technological characteristics of the studied cultivars.

Technological properties: which considered as an important traits to evaluate the table olive cultivars, and it include the size and weight of fruits and seed stones (average of 100 fruits,seed stones).

Pulp/seed stone: It was measured by weight of 30 fruits and seed stones per tree and then calculating the percentage of pulp / seed stone as follows:

$$\text{Pulp/stone} = \frac{\text{pulp weight (fruit weight - seed stone weight)}}{\text{seed stone weight}}$$
 this valued is classified according to (Program of "Technical assistant for the improvement of olive oil quality in Syria", 2007): low: < 4, moderate: 4-6, high: > 10.

Statistical analysis: The mean and standard deviation values of the studied parameters were calculated, and the olive cultivars were inserted in groups according to cluster analysis based on some morphological and technological characteristics by using a SPSS^{18th} program (5)

Results and Discussion:

1- Survey results: The area of olive cultivation in Palmyra is estimated at 19178 dunums, and the number of trees is 263655 trees whose annual production

ranges from 3 to 5 thousand tons of olive fruits.

During the field tours in the olive farms in Palmyra, 19 olive cultivars were identified as shown in Table (1).

Table (1) Olive Cultivars planted in Palmyra.

No.	Cultivars	No.	Cultivar
1	Abadi Abou Ghabra	11	Bnt Al Kadi
2	Abadi Hlou	12	Jlot
3	Abadi Khinfsi	13	Herqtani
4	Abadi Shelal	14	Mhati
5	Abou Anakeed	15	M- Hazam Abou Satel
6	Abou Akfa	16	Um Qanani
7	Abeid Men Umu	17	Rsasi
8	Abou Chouka	18	Shami
9	Adkam	19	Tuffahi
10	Izmerli		

During the field tours, it was also shown that the two cultivars "M- Hazem Abu Satel" and "Jlot" are the most common and preferred by farmers because of their quality at pickling (90% of the total area),

The approximate percentage of olive cultivars in Palmyra is estimated in terms of area and number of trees as shown in Figure (1).

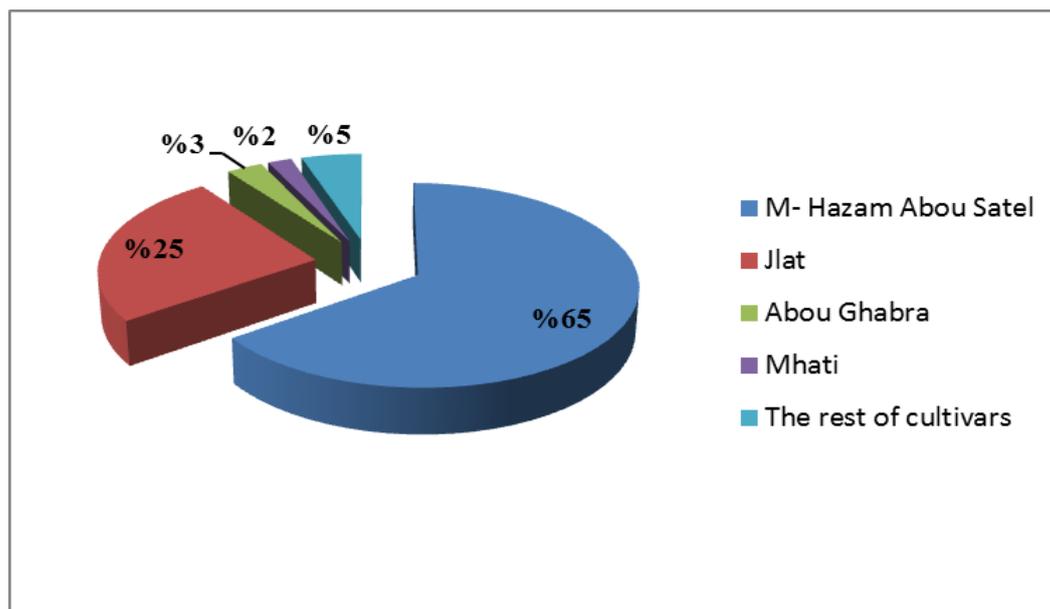


Figure (1) Percentage of the spread of olive cultivars in Palmyra.

Purpose of use:

The production is marketed in the local market as table olive cultivars: 60% for pickling as green fruits and the rest for pickling as black ones, due to the low oil content.

2- Morphological characters for fruits and stones of studied cultivars:

The results of the morphological study for fruits showed a great diversity among them

in terms of weight, symmetry and shape, table (2) has showed that the fruits weight ranged between 2.45 g at the cultivar "Shami" and 7.72 g at " Um Qanani", and the characters of stones as shown in table (3) demonstrated the variation in weight, shape and symmetry among these cultivars, the stones weight were between 0.33 g at "Shami" and 1.12 g at "Mhati" cultivar.

Table (2) Fruits Olive cultivars characteristics.

The cultivar	Fruits characterization						
	Weight	symmetry	Position Of max diameter	Apex	base	Nipple	Presence of lenticels
Abadi Abou Ghabra	5.04±0.21	slightly asymmetric	central	Rounded	truncate	Obvious	many, large
Abadi Hlou	3.48±0.0	asymmetric	towards apex	Rounded	rounded	Absent	few, small
Abadi Khinfsi	3.54±0.13	asymmetric	central	Rounded	rounded	Absent	many, small
Abadi Shelal	3.6±0.13	asymmetric	towards apex	Rounded	truncate	Absent	many, large
Abou Anakeed	5.1±0.13	asymmetric	towards apex	Pointed	truncate	Tenuous	many, small
Abou Akfa	4.35±0.14	asymmetric	towards apex	Pointed	truncate	Absent	few, small
Abeid Men Umu	5.88±0.23	asymmetric	towards apex	Rounded	truncate	Absent	many, small
Abou Chouka	3.41±0.07	asymmetric	towards apex	Rounded	truncate	Tenuous	many, small
Adkam	6.26±0.08	asymmetric	towards apex	Rounded	truncate	Absent	many, large
Izmerli	3.11±0.08	asymmetric	towards apex	Rounded	truncate	Tenuous	many, small
Bnt Al Kadi	5.31±0.45	slightly asymmetric	central	Rounded	rounded	Absent	few, large
Jlot	5.99±0.09	slightly asymmetric	central	Rounded	truncate	Tenuous	few, small
Herqtani	4.66±0.12	asymmetric	towards apex	Rounded	rounded	Absent	many, small
Mhati	5.78±0.02	symmetric	central	Rounded	rounded	Absent	many, small
M- Hazam Abou Satel	5.63±0.11	slightly asymmetric	towards apex	Pointed	rounded	Tenuous	few, small
Um Qanani	7.72±0.36	asymmetric	towards apex	Pointed	rounded	Tenuous	many, small
Rsasi	2.98±0.14	asymmetric	towards apex	Rounded	rounded	Absent	many, small
Shami	2.45±0.14	symmetric	central	Rounded	rounded	Absent	few, small
Tuffahi	7.25±0.61	symmetric	central	Rounded	rounded	Absent	few, small

Table (3) Seed Stones olive cultivars Characterization

Cultivars	Stones characterization							Termination with the apex position (A)
	weight	Symmetry	Position Of max diameter	apex	base	surface	No. of grooves	
Abadi Abou Ghabra	0.69±0.02	slightly asymmetric	central	pointed	truncate	scabrous	High	without mucro
Abadi Hlou	0.77±0.04	asymmetric	towards apex	rounded	truncate	scabrous	medium	without mucro
Abadi Khinfsi	0.63±0.02	asymmetric	central	rounded	rounded	scabrous	High	without mucro
Abadi Shelal	0.82±0.01	slightly asymmetric	towards apex	rounded	truncate	scabrous	medium	without mucro
Abou Anaheed	0.72±0.04	symmetric	towards apex	rounded	truncate	smooth	medium	without mucro
Abou Akfa Abeid	0.75±0.03	asymmetric	central	pointed	truncate	scabrous	medium	with mucro
Men Umu	0.69±0.01	asymmetric	central	pointed	truncate	scabrous	medium	with mucro
Abou Chouka	0.86±0.04	asymmetric	towards apex	pointed	truncate	smooth	medium	with mucro
Adkam	0.83±0.05	symmetric	central	rounded	truncate	rugose	High	without mucro
Izmerli	0.71±0.02	symmetric	central	rounded	truncate	scabrous	High	without mucro
Bnt Al Kadi	0.81±0.05	slightly asymmetric	towards base	rounded	rounded	rugose	High	without mucro
Jlot	0.67±0.03	slightly asymmetric	central	pointed	truncate	smooth	medium	with mucro
Herqtani	0.78±0.07	slightly asymmetric	central	rounded	rounded	scabrous	medium	without mucro
Mhati	1.12±0.04	Symmetric	towards apex	rounded	rounded	scabrous	medium	without mucro
M-Hazam	0.62±0.03	slightly asymmetric	Central	pointed	rounded	scabrous	medium	with mucro
Abou Satel Um Qanani	1±0.04	asymmetric	Central	pointed	rounded	scabrous	medium	with mucro
Rsasi	0.77±0.06	asymmetric	Central	pointed	rounded	smooth	medium	without mucro
Shami	0.33±0.02	slightly asymmetric	Central	pointed	rounded	scabrous	medium	with mucro
Tuffahi	0.86±0.03	symmetric	central	rounded	rounded	scabrous	medium	without mucro

3. The most important technological characters for olive fruits cultivars:

a- fruits and seed stones size: Depending on the size of the fruits and stones, the olive studied cultivars were inserted in to five groups as shown in table (4), The third

group, which includes dividid (Jlot, Abou Satel, Abadi Khinfsi, Abeid Men Umu and Abou Anakeed) cultivars, is the most important one because they are medium-sized fruits and relatively small stones, this group represents the most suitable cultivar for the manufacture of table olives.

Table (4). The groups of studied cultivars according to fruits and stones size.

groups	The description	The cultivars
Group 1	Big- sized fruits and stones.	Um Qanani, Abou Akfa, Abou Chouka.
Group 2	Big – sized fruits and medium stones.	Abadi Hlou, Abadi Abou Ghabra, Abadi Shelal, Izmerli.
Group 3	Medium – sized fruits and medium stones.	Jlot, M- Hazam Abou Satel, Abou Anakeed, Abadi Khinfsi, Abeid Men Umu.
Group 4	Medium – sized fruits and stones.	Herqtani, Rsasi, Shami, Tuffahi
Group 5	Small sized fruits and stones.	Bnt Al Kadi, Adkam, Mhati.

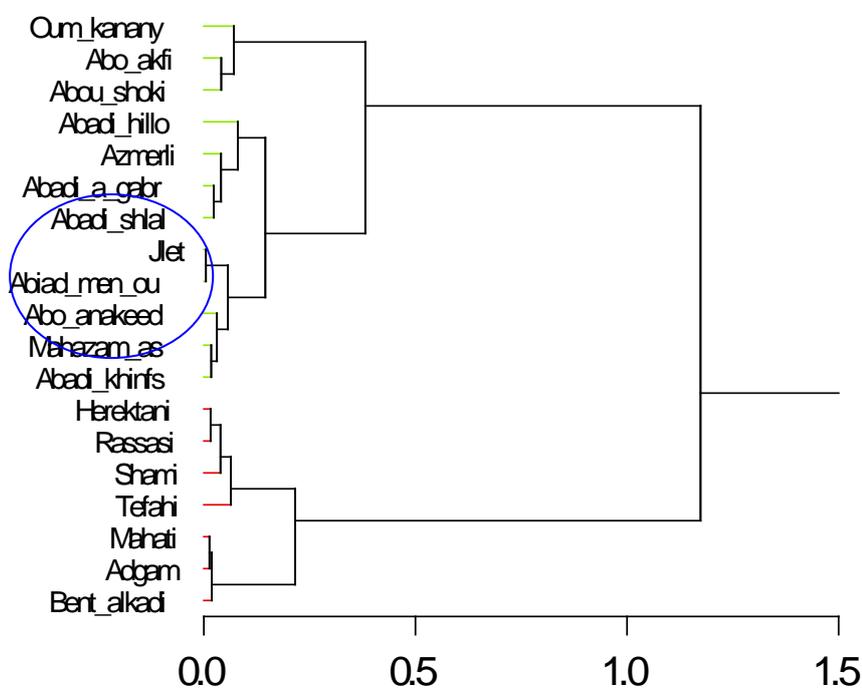


Figure (2). The cluster analysis of cultivars according to size of fruits and stones.

b- fruits and seed stones weight: In order to show the diversity among the studied olive cultivars, and to show the results more clearly, we sorted these cultivars into four groups according to the weight of their fruits and stones:

groups	Fruts weight (g)	Seed stons weight(g)
1	7	1
2	6	0.8
3	5	0.75
4	lowest weight	relatively moderate

The most important group is the second one - figure (3)- the evidence of the validity of the standard used in the division of the groups is that: the two cultivars "Jlot", "Abied Men Umu" which is the most common and favored by the local farmers are listed into same group (the second one).

Table (5). The groups of studied olive cultivars according to fruits and stones weight.

Groups	The description	Mean and standard deviation	The cultivars
Group 1	Big size fruit and high- weight stone.	7.49± 0.33 0.93±0.10	Um Qanani, Tuffahi.
Group 2	Big size fruit and moderate- weight stone	5.91±0.24 0.79±0.20	Mhati, Adkam, Jlot, M-Hazam Abou Satel, Abeid Men Umu.
Group 3	Medium size fruit and moderate- weight stone.	4.89±0.38 0.75±0.05	Bnt Al Kadi, Abou Anakeed, Abadi Abou Ghabra, Herqtani, Abou Akfa.
Group 4	Small size fruit and moderate- weight stone.	3.27±0.42 0.74±0.13	Rsasi, Izmerli, Abou Chouka, Abadi Hlou, Abadi Khinfsi, Abadi Shelal.

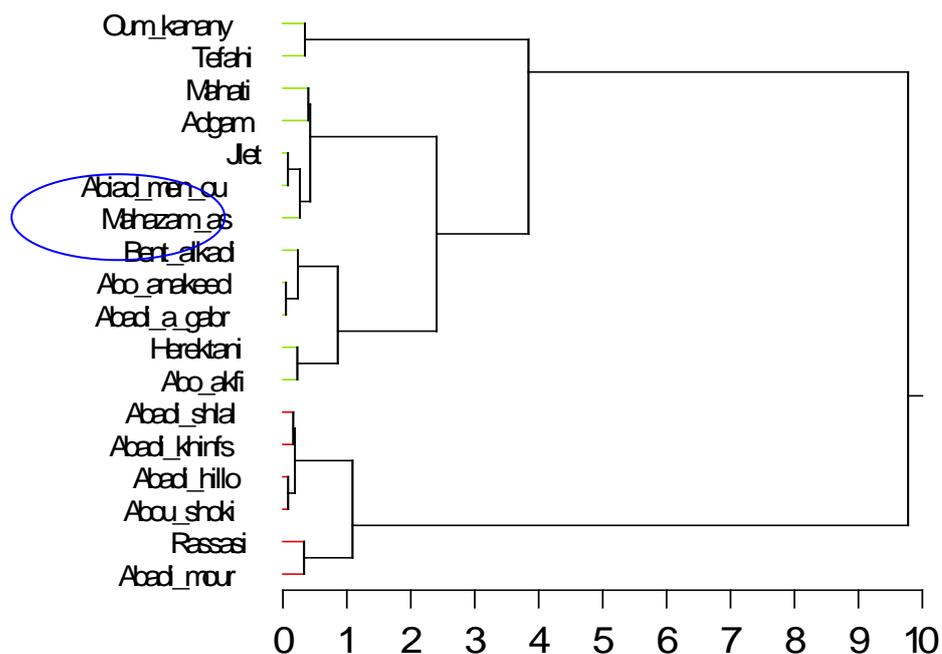


Figure (3). The cluster analysis of olive cultivars according to weight of fruits and stones.

c- pulp/stone ratio: The weight of the fruits and their stones is affected by weather conditions and farming practices (irrigation, fertilization, pruning), while the pulp / stone ratio is a genetic characteristic that plays an important role in assessing olive genetic resources (14), especially for selecting appropriate cultivars suitable as table olives.

At study of pulp / stone parameter, it was found that the cultivar "M-Hazam Abou Satel" gave the highest value followed by the cultivar "Jlot", and also the "Tuffahi" and "Abeid Men Umu" cultivars were classified in the same group, as shown in fig.(4).

Table (6). The groups of studied olive cultivars according to pulp/ stone ratio.

Groups	The description	Mean and standard deviation	The cultivars
Group 1	Pulp/stone: very high > 7.	7.74±0.33	M-Hazam Abou Satel, Jlot, Abeid Men Umu, Tuffahi.
Group 2	Pulp/stone: high: 6-7.	6.38±0.32	Um Qanani, Adkam, Shami, Abadi Abou Ghabra, Abou Anakeed.
Group 3	Pulp/stone: moderate: 4-6.	4.82±0.70	Bnt Al Kadi, Herqtani, Abou Akfa, Abadi Khinfsi, Mhati.
Group 4	Pulp/stone: low < 4.	3.21±0.37	Abadi Hlou, Abadi Shelal, Izmerli, Abou Chouka, Rsasi.

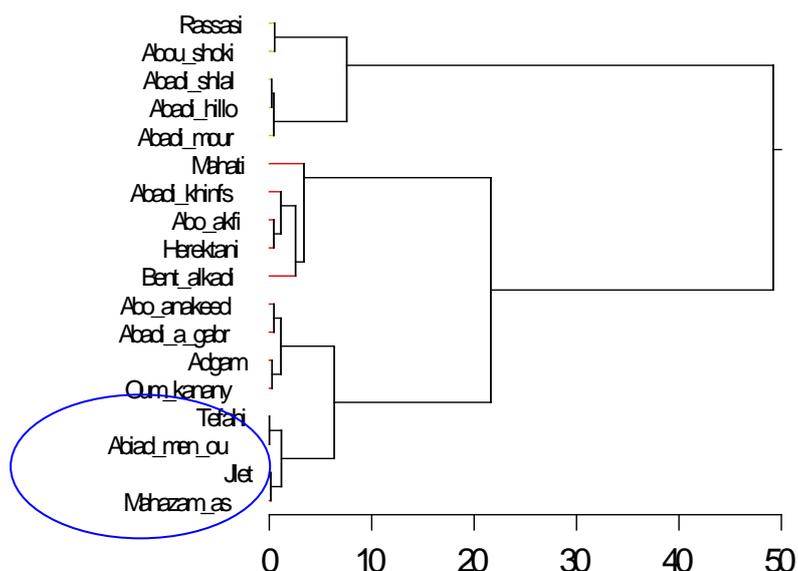


Figure (4). The cluster analysis of olive cultivars according to pulp/stone ratio.

It should be noted that in previous study it has been used an image processing technique or fractional geometry in description the stones of olive cultivars of Palmyra (2), and the results of the study agree with the current one to show the diversity among studied plant material.

Conclusion: The results of this study indicate the richness in the olive genetic resources in Palmyra, which makes it a

Recommendations:

- Expanding the study of the technological characteristic of table olives, and the study of the most appropriate pickling methods.
- Issuing a catalog containing identified characters of these

promising genetic basis for future selection and genetic improvement programs for olives, particularly in the field of selecting suitable varieties for pickling. All modern trends in the Arab region and the world focus on selecting suitable cultivars in areas with low or limited rainfall, as in the area of Palmyra, where olive oases are located and are considered as a distinctive scene of this city.

cultivars accompanied by documentary images.

- Propagation and cultivation of these varieties in other parts of Syria to assess their characters in areas of other climatic zones.

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