CHARACTERISTICS OF CERTAIN OLIVE VARIETIES AT LYALLPUR

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Important characteristics of fourteen olive varieties imported from different countries were studied at Lyallpur. The varieties differed significantly in various morphological characters, including number, size and area of leaf, number of flowers per inflorescence, and fruit characters. Oil percentage of these varieties on the basis of oven dried flesh ranged between 48.858 and 28.611. Quality of oil from all the varieties was good. Pickle of Tunis, Izmir and Erkence was of good quality, that of Morsiolo, Suri and Cakier was of medium quality, whereas that of others was found to be poor.

INTRODUCTION

The olive, *Olea europea* L., is an evergreen plant and has been in cultivation since ancient times. It was introduced in Indo-Pakistan sub-continent towards the end of the last century but the trees mostly remained unproductive.

Probably, the first consignment of one hundred grafted olive plants of various varieties was imported and planted at Rawalpindi in 1866 by Mr. Henderson (Phillips, 1955). These plants died due to lack of attention. Later on, olive plantations were extended to Sran Chari and Chatar by Mr. Frank Mitchell in 1907-10, which were further extended to Kharimurti (District Campbellpur), Sakesar (District Sargodha) and Rakh Ghandala (District Jhelum) in 1910, and later on to Toru in the former N.W.F.R. (Phillips, 1955). These varieties were Ammal, Manha Saree, Walaitee Dunia and Walaitee Paiwand. None of these plants gave results of commercial importance. During 1910-14, olive plants were top worked at Khairmurti, but since the produce was very poor, efforts in this direction were abandoned.

Olive plantations on Rawalpindi-Murree road at miles 17/6, 21/7 and 22 were started in 1935 by top working wild olive trees. The plantations at mile 17/6 bore the first crop in 1947. The highest yield recorded from a single tree was $31/_2$ lbs. and it was observed that most of the fruit had shed before maturity.

A number of varieties were collected over a period of two decades between 1932 to 1952 at the Experimental Fruit Garden, West Pakistan Agricultural University, Lyallpur, but were not studied in detail. The present paper describes important characteristics including oil content, oil quality and pickle quality of these varieties.

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MATERIAL AND METHODS

Four trees each of the 14 varieties, Moraiolo, Franton, Tunis, Frantoio-o-Razzo, Suri, Manzanillo, Mt. Plantation, Lt. Plantation, Chimlali, Izmir, Cakier, Erkence, Ayvalik and Memeli, growing at the Experimental Fruit Garden, West Pakistan Agricultural University, Lyallpur were selected for these studies. Countries of their origin and dates of their planting are shown in Table 1.

TABLE 1.—*Countries of origin and planting dates of olive varieties, grown at the Experimental Fruit Garden, West Pakistan Agricultural University, Lyallpur.*

Veriety	Imported from	Year of planting
Moraiolo	.. Italy	1932
Franton	.. Italy	1932
Tunis	.. Italy	1932
Frantoio-o-Razzo	.. Italy	1932
Suri	.. Palestine	1937
Manzanillo	.. Italy	1937
Mt. Plantation	.. Syria	1950
Lt. Plantation	.. Syria	1950
Chimlali	.. Egypt	1951
Izmir	.. Turkey	1952
Cakier	.. Turkey	1952
Erkence	.. Turkey	1952
Ayvalik	.. Turkey	1952
Memeli	.. Syria	1952

Morphological characteristics including number, size, area, colour, and surface of the leaves; number of flowers per inflorescence, type of flowers; shape, colour, size and weight of the fruit; oil percentage, oil quality and pickle quality were studied.

Twenty leaves from each of the 20 different branches taken at random from four trees of each variety were measured for determining their length and breadth. Average values were then calculated. Similarly, flowers in 20 inflorescences of each variety were counted and average per inflorescence was calculated. Flowers were examined visually and with magnifying lense to determine their sex type.

To determine the length and diameter of the fruit, 100 fruits of each variety were measured in centimeters with Vernier Calipers and averaged. The same fruit, as for size of the fruit, was weighed in grams, and average weight per fruit was calculated.

For determining the oil contents, five grams of oven dried flesh were weighed in a fat extraction thimble which were plugged with medicated cotton. The extraction was carried out in the soxhlet extraction set-up with petrolium ether for 6 hours. The flasks were then removed, and the fat and petrolium ether mixture filtered. The filtrate was received in pre-weighed oven dried fat dishes and were placed over waterbath. When evaporation of petroleum ether was complete, the dishes were dried and re-weighed for calculating the oil percentage. The oil, thus extracted, was studied for saponification value, iodine value, acid value and refractive index, according to the standard methods described in A.O.A.C. (1960).

For pickling, the fruit was immersed in 2 per cent water solution of sodium hydroxide in order to remove the bitterness. This fruit was thoroughly washed in the running water and then put in 2 per cent brine. The percentage of the brine was gradually raised to 4 per cent by adding 0.5 per cent after every 4 days. Two weeks after the proper concentration had reached, the pickles were evaluated for their quality by a panel of judges by organoleptic tests.

RESULTS AND DISCUSSION

The summarized data on the various characters studied are shown in Tables 2, 3 and 4. According to the analysis of variance, the differences among varieties in respect of all the morphological characteristics studied were highly significant.

The varieties behaved differently with regard to the length, breadth and area of the leaf. The leaves of the Memeli were as long as 2.577 inches and those of variety listed as Mt. Plantation were the smallest, (1.550 inches) indicating a difference of about one inch on the whole. Varieties Memeli, Suri, Izmir, Frantoio-o-Razzo, Moraiolo, Erkence and Manzanillo are long-leaf varieties, all others had smaller leaves. Broadest leaves were those of Suri which had 0.809 inches breadth while leaves of Manzanillo were the narrowest, with an average of 0.411 inches. The differences in respect of leaf area were more apparent. The leaves of Memeli were the largest and averaged 1.333 sq. in.; smallest leaves were of Manzanillo (0.228 sq. in.). Leaves of Franton, Frantoio-o-Razzo and Izmir were of fairly large size and those of other varieties were medium or small size.

TABLE 2.—*Length and breadth and area of the leaf, number of flowers per inflorescence and fruit shape of different olive varieties.*

Variety	Leaf			No. of flowers per inflorescence	Fruit shape
	Length (in)	Breadth (in)	Area (sq. in)		
Morajolo	2.070	0.527	0.688	9	Long oblique oval
Franton	1.720	0.643	0.841	8	Oval oblong
Tunis	1.915	0.505	0.650	15	Oval oblong
Frantoio-o-Razzo	2.047	0.568	0.767	15	Long oblique oval
Suri	2.517	0.809	0.650	13	Oblong oblique
Manzanillo	2.195	0.411	0.228	15	Broad ovate
Mt. Plantational	1.550	0.541	0.433	..	
Lt. Plantation	1.825	0.476	0.619	..	
Chimlali	1.840	0.469	0.549	9	Broad ovate
Izmir	2.375	0.459	0.746	7	Round oval
Cakier	1.860	0.417	0.408	8	Long oblique oval
Erkence	2.005	0.505	0.480	16	Long oblique oval
Ayvalik	1.847	0.425	0.575	..	Elongated depressed
Memeli	2.577	0.595	1.333	7	Broad ovate
CD at 5% level	0.89	0.017	0.019		

TABLE 3.—*Yield per plant, length, diameter and weight of the fruit and stone of different olive varieties.*

Varieties	Yield per plant (lb.)	Fruit			Stone		
		Length (cm)	Diameter (cm.)	Weight (gm.)	Length (cm.)	Diameter (cm.)	Weight (gm.)
Morafolo	4.00	1.976	1.193	1.770	1.701	0.738	0.570
Franton	4.75	2.090	1.226	1.880	1.492	0.734	0.657
Tunis	3.00	2.134	1.182	1.764	1.337	0.701	0.651
Frantoio-o-Razzo	2.00	1.034	1.151	1.903	1.301	0.655	0.746
Suri	2.50	2.134	1.261	1.951	1.259	0.584	0.671
Manzanillo	4.00	1.364	1.151	1.149	1.298	0.485	0.632
Chimlali	2.00	1.612	1.134	1.271	1.072	0.456	0.411
Izmir	5.50	2.102	1.172	2.704	1.422	0.710	0.668
Cakier	2.50	2.205	1.152	1.651	1.471	0.571	0.607
Erkence	3.25	2.050	1.191	1.529	1.237	0.489	0.558
Ayvalik	2.00	2.061	2.491	1.751	1.192	0.501	0.631
Memeli	4.75	1.593	1.091	1.119	1.154	0.573	0.486
CD at 5% level	..	0.005	0.106	0.002	0.028	0.002	0.002

TABLE 4.—*Oil percentage, acid value, saponification value, iodine value and refractive index of the oil extracted from different varieties of olive.*

Variety	Oil percentage	Acid value	Saponification value	Iodine value	Refractive index
Moraiolo	39.914	0.61	190.75	95.90	1.4664
Franton	40.131	0.85	189.22	87.30	1.4665
Tunis	42.214	0.67	194.32	84.90	1.4666
Frantoio-o-Razzo	45.938	0.91	186.62	85.96	1.4395
Suri	47.557	0.96	192.45	89.70	1.4583
Manzanillo	37.729	0.66	192.67	92.11	1.4640
Chimlali	48.858	0.98	190.65	92.76	1.4655
Izmir	48.041	0.87	187.70	89.52	1.4653
Cakier	38.608	0.89	194.12	85.86	1.4663
Erkence	28.611	1.18	201.90	90.30	1.4753
Ayvalik	36.452	0.85	189.67	87.11	1.4661
Memeli	39.392	0.79	186.80	88.18	1.4554
CD at 5% level	1.045	0.05	2.67	0.85	0.0005

All varieties had distinctive foliar characteristics, which may be used for their identification. Khan (1955) and Mazhar (1959) described the mandarin varieties using similar characters. Chandler (3) stated that the leaves of different trees differ in length and breadth in so far as their varieties are concerned, so that the leaves of some varieties are as long as three inches and more, than half an inch wide and those of others shorter and narrower. He further stated that leaves of wild seedling trees tend to be still shorter and narrower.

Shape and size of the fruit is also an important character for describing different varieties. In fact these characters are used to identify varieties of plants. Colour of the ripe fruit, as judged by the Horticultural Colour Charts (Anonymous, 1941) was aconite violet in all cases.

The differences among varieties in so far as fruit length, fruit diameter and fruit weight is concerned, were highly significant (Table 3). Fruit of Cakier variety were the longest with a mean value of 2.205 cm. The minimum length of fruit was for Manzanillo variety, *i.e.*, 1.364 cm. Tunis, Suri, Izmir, Franton, Erkence and Frantoio-o-Razzo were next in order of merit with mean values of 2.134, 2.134, 2.102, 2.090, 2.050 and 2.034 cm., respectively. The maximum fruit diameter of 1.401 cm, for Ayvalik was followed by Suri and Franton with mean values of 1.261 and 1.226 cm., respectively. The least diameter of

1.091 cm., was recorded for Memeli, other varieties were statistically not different from Memeli. Maximum fruit weight of 2.704 gm. was obtained with variety Izmir, followed by Suri weighing 1.951 gm. and Frantoio-o-Razzo which weighed 1.903 gm. The minimum weight was in case of Memeli, *i.e.*, 1.191 gm.

Trees of olive varieties studied here differed in respect of yield, which varied from 2 to 5.5 lbs. per plant. Maximum yield (5.5 lbs. for a single plant) was obtained from Izmir variety, followed by Franton and Memeli each giving 4.75 lbs. per plant. Lowest yield (2 lbs. per plant) was observed for varieties Frantoio-o-Razzo, Chimlali and Ayvalik. Other varieties yielded between 2.5 lbs. and 3.25 lbs. per plant. Number of inflorescence per plant was highest in case of Erkence followed by Tunis, Frantoio-o-Razzo, Manzanillo and the least number of inflorescence was observed in Izmir. Varieties Mt. Plantation and Lt. Plantation did not flower during the period of these studies. Since the trees of various varieties differed considerably in age, their comparison in respect of yield and number of inflorescence per tree may not be a faithful one.

Many factors may be associated with the low-productivity of these plants in general and non-productivity of the varieties Mt. Plantation and Lt. Plantation in particular. Firstly, they have never been cultured well as manuring and irrigation were not cared for. Likewise, pruning and training aspects were also neglected. Secondly, environmental conditions under which these trees were growing may have been unfavourable for setting good crops. Chandler (1958) stated that the trees of some varieties and probably nearly all require a winter period with a mean temperature of below 50°F. in order to induce flowering. The mean temperature at Lyallpur during the winter has been 67°F. Thirdly, the crop failure in these trees may be attributed to problems of self and cross incompatibility as is the case with Moraiolo, Levino and others in the province of Florida in Italy (Chandler, 1958). Fourthly, the crop failures may also be attributed to comparatively warm and dry weather at the time of blossoming. Such conditions may cause defects in pistil or the pollen or both as reported by Chandler (1958). Chimlali which is considered to be the most dependable also did not bear regular crops at Lyallpur.

Oil contents of the varieties ranged between 28.611 and 48.959 per cent of the oven dried flesh. Varieties Chimlali Izmir, Suri, Frantoio-o- Razzo, Tunis and Franton all yielded more than 40 per cent oil. Chandler (1951) described up to 29 per cent oil to be rather high in Mission variety, reporting 18 to 24 per cent as average for Manzanillo and 12 to 18 per cent for Sevillano.

Maximum acid value of 1.18 was found to be for Erkence followed by Chimlali, 0.98; Suri, 0.96 and Frantoio-o-Razzo, 0.91. The minimum acid value of 0.61 was for Moraiolo although there was no difference among

Moraiolo, Manzanillo and Tunis. Highest value of 201.90 for saponification was recorded in case of Erkence while the minimum of 186.62 was observed in respect of Frantoio-o-Razzo. Differences among varieties were highly significant in respect of iodine value of the oil, which ranged between 92.76 and 84.90 for Chimlali and Tunis, respectively. The maximum refractive index was observed for Erkence and the least in case of varieties Frantoio-o-Razzo.

Pickle quality of Tunis, Izmir and Erkence was found to be good, that of Moraiolo, Suri and Cakier was adjudged as medium and that of Frantoio-o-Razzo, Manzanillo, Ayvalik, Chimlali, and Memeli was poor in this respect.

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