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Almond and pistachio production in the Mediterranean countries

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SUMMARY – Almond and pistachio are two very important and special nuts for the Mediterranean basin countries. Especially almond requires a Mediterranean climate for reliable production. It means that it needs frost-free springs, reasonable rainfall in winters and springs. Dry and hot summers are needed for the realization of the production. Chilling is not a problem for almond in this region. In many aspects pistachio nut is quite similar to almond except for the chilling requirement. It is a drought resistant nut, it needs dry and hot summers for the maturation of its nuts. For the Mediterranean countries low chill cvs of pistachio nut are needed because of the warm winters in the region. In most of the Mediterranean countries there are thousands of wild *Pistacia* trees or bushes which can be turned into bearing pistachio trees within 2-3 years by topworking. For these reasons almost all of the Mediterranean basin countries have given big importance to these two nuts. Both nuts can be grown in poor, rocky, stony, calcareous soils of the Mediterranean region. All these show that almond and pistachio can be considered as special nuts for the Mediterranean basin countries.

Key words: Almond, pistachio, Mediterranean countries, production.

RESUME – *"Production d'amandes et de pistaches dans les pays méditerranéens". L'amande et la pistache sont deux fruits secs très importants et très spéciaux dans les pays du bassin méditerranéen. L'amandier en particulier exige un climat méditerranéen pour une production régulière. Ceci signifie qu'il a besoin de printemps sans gelée, et de précipitations raisonnables pendant l'hiver et le printemps. Des étés chauds et secs lui sont nécessaires pour qu'ait lieu la production. Le froid n'est pas un problème pour l'amandier dans cette région. Pour de nombreux aspects, les pistaches sont tout à fait semblables aux amandes, sauf pour les besoins en froid. Il est résistant à la sécheresse, et nécessite des étés chauds et secs pour la maturation des fruits. Pour les pays méditerranéens, il faut des pistachiers à faibles besoins en froid en raison des hivers doux dans cette région. Dans la plupart des pays méditerranéens, il y a des milliers d'arbres ou d'arbustes de pistachiers sauvages qui peuvent avoir une mise à fruit en 2-3 ans par "topworking". Pour ces raisons presque tous les pays du bassin méditerranéen ont accordé une grande importance à ces deux fruits secs. Tous deux peuvent être cultivés dans des sols pauvres, rocailleux, pierreux, et calcaires, de la région méditerranéenne. Tout ceci montre que les amandes et pistaches peuvent être considérées comme des fruits secs spéciaux pour les pays du bassin méditerranéen.*

Mots-clés : *Amande, pistache, pays méditerranéens, production.*

Introduction

Mediterranean basin countries produce about half of the world almond production (Table 1). As it is seen in this table from 1980 to 1998 this region produced 521-636 thousand tons of almond which corresponds 50.36%-55.46% of world production. In the Mediterranean region Spain is the leading country in almond production with 159 thousand tons in 1995 and 287 thousand tons in 1985. While Italy's almond production was decreasing during the last two decades Algeria's, Jordan's, Libya's, Morocco's, Syria's productions are increasing (Table 1). In the other Mediterranean basin countries including Turkey there are not much changes in almond production. During these years USA's production fluctuated between 240 and 500 thousand tons which corresponds 26% to 37.84% of the world production. Although it is a very drought resistant plant, in very dry years and extremely dry countries such as Cyprus, Libya, Morocco, Spain, Tunisia the yields per trees are rather low. It is interesting to note that in the Mediterranean basin countries the land devoted to almond amounted 1,178,133 ha in 1998 which corresponds 77.86% of the world almond area (Table 2). The biggest almond land in the world is in Spain. In this country the land devoted to almond was increased regularly from year to year (515,600 ha in 1980; 607,000 ha in 1998). Almond area in Italy decreased gradually. While it was 207 thousand ha in 1980 it is decreased down to 89 thousand ha in 1998.

Table 1. Almond production in the Mediterranean countries† (t; % of world production) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	t	%	t	%	t	%	t	%	t	%
Algeria	3,900	0.42	9,951	0.86	11,733	0.89	19,869	1.92	20,000	1.58
Cyprus	3,048	0.33	1,600	0.14	1,900	0.14	3,500	0.34	1,700	0.13
France	3,700	0.40	4,000	0.35	4,200	0.32	3,910	0.38	4,500	0.35
Greece	41,000	4.46	57,168	4.98	53,394	4.04	57,575	5.56	34,763	2.74
Israel	3,000	0.33	1,400	0.12	3,335	0.25	3,100	0.30	2,940	0.23
Italy	155,600	16.92	105,650	9.20	94,970	7.19	90,284	8.73	87,958	6.95
Jordan	700	0.08	1,465	0.13	1,260	0.09	2,500	0.24	2,018	0.16
Libya	5,275	0.57	15,000	1.31	33,070	2.50	30,000	2.90	30,000	2.37
Morocco	30,000	3.26	30,500	2.66	57,700	4.37	45,700	4.42	65,700	5.18
Spain	225,300	24.50	287,200	25.01	250,200	18.94	158,900	15.36	217,000	17.12
Syria	10,691	1.16	33,829	2.95	12,500	0.95	33,662	3.25	66,691	5.26
Tunisia	37,000	4.02	51,000	4.44	52,200	3.95	35,000	3.38	58,700	4.63
Turkey	32,000	3.48	38,000	3.31	46,000	3.48	37,000	3.58	34,000	2.68
Med. total	551,214	59.93	636,763	55.46	622,462	47.13	521,000	50.36	625,970	49.38
World	919,624	100.00	1,148,231	100.00	1,320,804	100.00	1,034,651	100.00	1,267,751	100.00
USA	239,858	26.08	352,000	30.66	499,800	37.84	280,000	21.21	409,000	32.26

†Source: FAO web page.

Table 2. Almond area in the Mediterranean countries† (ha; % of world almond area) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	ha	%	ha	%	ha	%	ha	%	ha	%
Algeria	–	–	21,100	1.55	25,010	1.73	24,860	1.66	27,500	1.82
Cyprus	5,084	0.42	4,013	0.30	4,100	0.28	3,050	0.20	3,150	0.21
France	–	–	1,700	0.13	1,700	0.12	1,700	0.11	1,700	0.11
Greece	–	–	42,000	3.09	39,000	2.70	41,500	2.78	39,900	2.64
Israel	3,660	0.30	3,520	0.24	2,747	0.19	2,390	0.16	2,400	0.16
Italy	206,600	17.01	125,835	9.26	120,430	8.35	94,633	6.33	89,432	5.91
Jordan	201	0.02	896	0.07	522	0.04	870	0.06	1,051	0.07
Libya	–	–	30,000	2.21	60,000	4.16	60,000	4.02	60,000	3.97
Morocco	70,000	5.76	94,000	6.92	107,000	7.42	128,000	8.57	137,000	9.05
Spain	515,600	42.45	556,200	40.93	584,100	40.49	602,900	40.36	607,000	40.12
Syria	19,311	1.59	13,200	0.97	16,000	1.11	15,300	1.02	21,000	1.39
Tunisia	155,000	12.76	150,000	11.04	146,000	10.12	168,000	11.25	169,000	11.17
Turkey	19,250	1.59	19,750	1.45	20,200	1.40	19,325	1.29	19,000	1.26
Med. total	994,706	81.90	1,062,214	78.18	1,126,809	78.13	1,162,528	77.82	1,178,133	77.86
World	1,214,483	100.00	1,358,641	100.00	1,442,297	100.00	1,493,863	100.00	1,513,116	100.00
USA	132,300	10.89	165,500	12.18	166,300	11.53	161,900	10.83	172,000	11.36

†Source: FAO web page.

During these years there are not much changes in the almond area of the other Mediterranean countries.

Yield per unit area is very low in Algeria, Cyprus, Libya, Morocco, Spain and Tunisia (Table 3). According to the statistics the yield/decar is quite high in Jordan, Syria, France and Turkey (Table 3). In these last 3 countries the yield/decar is quite similar to that of USA and even in some years they are higher than the USA. Even though the almonds are not irrigated in the Middle East it is surprising to see the higher yield/da than the USA where all almond trees are irrigated.

Among the Mediterranean basin countries Turkey, Syria, Greece are the leading countries in pistachio nut production (Table 4). Because of the alternate bearing yearly production of these countries fluctuates. For instance Turkey's pistachio nut production changed between 7500 tons and 40 thousand tons during the years of 1980 and 1998. In Syria this changes occurred between 7814 tons and 36 thousand tons. Greece's production is quite lower than Turkey and Syria but it is also subjected to change (the lowest 2.5 thousand tons and the highest 5.5 thousand tons). Italy comes 4th after Greece with about 1.5 to 2.5 thousand tons. During the last 20 years Tunisia's pistachio nut production is increased from 50 tons to 1200 tons.

When the Table 4 is studied it will be seen that Iran's and USA's pistachio nut productions during the last 20 years were much higher than those of the Mediterranean basin countries. In Iran the highest production figure was obtained with 239 thousand tons in 1995. The USA figures are not subjected too much fluctuation, they are showing a tendency to increase gradually. In fact while it was 12 thousand tons in 1980 it became 85 thousand tons in 1998.

The area devoted to pistachio nut is the highest in Turkey (35 thousand ha in 1998) in comparison to the other Mediterranean basin countries (Table 5). It is followed by Syria (22 thousand ha) and Tunisia. In this last country the figures are not very reliable because it is rather difficult to believe that the land devoted to pistachio nut is 39 thousand ha and after 3 years it is decreased to almost half of it (22 thousand ha). However, one can see that in Tunisia the pistachio area is an increasing trend. As in the production picture, the biggest pistachio area in the world is in Iran but the statistical figures are in contradiction. Because it is given as 218 thousand ha in 1995 and as in the case of Tunisia, it is decreased to half of it (120 thousand ha) in 1998. In USA the pistachio area is steadily increasing. When it was 11 thousand ha in 1980 it is increased to 26.6 thousand ha. In general it can be said that about 50% of the world pistachio area is in Iran and it is followed by Turkey, USA, Syria and Tunisia with 14%, 10%, 9% and 9% respectively. In the world pistachio production the main bottle neck is the low yield per unit area. In fact the average world figure is 43.75 kg/da (Table 6). There are quite big fluctuations in the yield figures of the Mediterranean basin countries. These changes are because of the weather conditions in different years and alternate bearing. Since the pistachio trees are grown as rain fed trees it is quite natural that the yields are low in dry years. There are still fluctuations in Iran, USA and Greece where the pistachio trees are irrigated. These changes can be attributed to alternate bearing. Quite surprisingly the highest yield/da of pistachio nut is in Jordan (about 200 kg/da), in the Mediterranean basin countries. It is followed by Syria (165.6 kg/da in 1998), Turkey (135 kg/da in 1985) and Greece (111 kg/da in 1985) (Table 6). During the years between 1980 and 1998 Iran's pistachio yield/da is fluctuated between 20.5 kg/da and 109.5 kg/da. However during the last 15 years the figures are around 100 kg/da. When the USA figures are studied, during the same years the yield/da increased from 94 kg to 320.6 kg. This is a world record in the pistachio production. One can see that by taking all the cultural measures pistachio can be an important economical crop for the countries it can be grown.

How to improve the yield of almond and pistachio in the Mediterranean basin countries

In modern almond growing irrigation water is the main requirement to increase the yield. If there is no water available, the grower is dependent upon the annual rainfall. If the rainfall is very low the growers should not expect a profitable yield. Then comes the selection of the rootstock and the cultivar. For almond many new rootstocks (such as peach x almond hybrids, nemaguard, nemared, monclar, montiso, etc.) were started to use in Europe. During the last years the most widely used almond rootstock seemed to be GF-677 which is a peach x almond hybrid.

Table 3. Almond yield in the Mediterranean countries† (kg/da; % of world average yield) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	kg/da	%	kg/da	%	kg/da	%	kg/da	%	kg/da	%
Algeria	–	–	47.2	55.86	46.9	51.20	79.9	115.30	72.7	86.75
Cyprus	59.9	79.13	39.9	47.22	46.3	50.55	114.8	165.66	54.0	64.44
France	–	–	235.1	278.22	247.1	26.98	230.0	331.89	264.7	315.87
Greece	–	–	136.1	161.07	136.9	149.45	138.7	200.14	87.1	103.94
Israel	82.0	108.32	39.8	47.10	121.4	132.53	129.7	187.16	122.5	146.18
Italy	75.3	99.47	84.0	99.41	78.9	86.14	95.4	137.66	98.4	117.42
Jordan	348.3	460.10	163.5	193.49	241.4	263.54	287.4	414.72	192.0	229.12
Libya	–	–	50.0	59.17	55.1	60.15	50.0	72.15	50.0	59.67
Morocco	42.9	56.67	32.4	38.34	53.9	58.84	35.7	51.52	48.0	57.28
Spain	43.7	57.73	51.6	61.07	42.8	46.72	26.4	38.10	35.7	42.60
Syria	55.4	73.18	256.3	303.31	78.1	85.26	220.0	317.46	317.4	378.76
Tunisia	23.9	31.57	34.0	40.24	35.8	39.08	20.8	30.01	34.7	41.41
Turkey	166.2	219.60	192.4	227.69	227.7	248.58	191.5	276.33	178.9	213.48
World	75.7		84.5		91.6		69.3		83.8	
USA	181.4	239.60	212.7	251.69	300.5	328.05	172.84	249.41	237.79	283.76

†Source: FAO web page.

Table 4. Pistachio nut production in the Mediterranean countries† (t; % of world production) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	t	%	t	%	t	%	t	%	t	%
Cyprus	3	–	10	0.01	20	0.01	30	0.01	33	0.01
Greece	2,514	3.31	4,067	2.12	3,439	1.26	5,591	1.43	5,000	1.52
Italy	1,560	2.05	2,000	1.04	200	0.07	2,200	0.56	100	0.03
Jordan	51	0.07	30	0.02	30	0.01	30	0.01	30	0.01
Morocco	–	–	–	–	50	0.02	50	0.01	50	0.02
Syria	7,814	10.28	12,028	6.28	13,000	4.76	14,538	3.71	36,437	11.10
Tunisia	50	0.07	120	0.06	600	0.22	900	0.23	1,200	0.37
Turkey	7,500	9.86	35,000	18.26	14,000	5.13	36,000	9.18	40,000	12.19
Med. total	19,492	25.64	53,255	27.79	31,339	11.47	59,339	15.12	82,850	25.24
World	76,029	100.00	191,624	100.00	273,135	100.00	392,322	100.00	328,185	100.00
Iran	23,000	30.25	104,657	54.62	162,831	59.62	238,778	60.86	130,000	39.61
USA	12,247	16.11	12,290	6.41	54,430	19.93	67,130	17.11	85,280	25.99

†Source: FAO web page.

Table 5. Pistachio nut area in the Mediterranean countries† (ha; % of world pistachio nut area) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	ha	%	ha	%	ha	%	ha	%	ha	%
Cyprus	55	0.03	80	0.04	145	0.05	200	0.06	220	0.09
Greece	–	–	3,650	1.91	3,840	1.40	4,900	1.36	5,100	2.00
Italy	–	–	3,300	1.72	3,672	1.33	3,500	0.97	4,000	1.57
Jordan	33	0.02	15	0.01	15	0.01	15	–	15	0.01
Syria	18,721	10.77	7,400	3.86	14,900	5.42	16,800	4.66	22,000	8.63
Tunisia	4,400	2.53	11,000	5.74	27,703	10.07	39,000	10.81	22,000	8.63
Turkey	23,071	13.28	25,857	13.50	29,121	10.58	34,071	9.44	34,981	13.73
Med. total	46,280	26.63	51,302	26.78	79,396	28.86	98,486	27.30	88,316	34.66
World	173,774	100.00	191,522	100.00	275,113	100.00	360,781	100.00	254,826	100.00
Iran	112,000	64.45	107,371	56.06	154,276	56.08	218,000	60.42	120,000	47.09
USA	10,930	6.29	13,070	6.82	21,730	7.90	24,400	6.76	26,600	10.44

†Source: FAO web page.

Table 6. Pistachio nut yields in the Mediterranean countries† (kg/da; % of world average yield) (1980-1998)

Countries	1980		1985		1990		1995		1998	
	kg/da	%	kg/da	%	kg/da	%	kg/da	%	kg/da	%
Cyprus	–	–	12.5	12.62	13.79	13.89	15.00	13.85	15.00	11.64
Greece	–	–	111.42	112.55	89.56	90.21	114.10	105.36	98.04	76.12
Italy	–	–	60.61	61.22	5.45	5.49	62.85	58.04	2.50	1.94
Jordan	154.50	353.14	200.00	202.02	200.00	201.50	200.00	184.69	200.00	155.29
Syria	41.49	95.31	162.54	164.18	87.24	87.87	86.54	79.92	165.62	128.60
Tunisia	1.14	2.61	1.09	1.10	2.64	2.66	2.30	2.12	5.45	4.23
Turkey	32.50	74.29	135.36	136.73	48.08	48.43	105.66	97.57	114.34	88.78
World	43.75	100.00	99.00	100.00	99.28	100.00	108.29	100.00	128.79	100.00
Iran	20.54	46.95	97.47	98.45	105.54	106.31	109.53	101.15	108.33	84.11
USA	112.05	256.11	94.03	94.98	250.48	252.30	275.12	254.06	320.60	248.93

†Source: FAO web page.

With the effects of GREMPA high yielding, high quality, late flowering [such as Masbovera, (Vargas and Romero, 1993)], self fertile [such as Guara, (Felipe and Socias i Company, 1987)], [Lauranne, (Grasselly and Duval, 1997)] very low rate of twin-kernelled almond cvs were found (Grasselly and Duval, 1997). By the use of new cvs almond yield and almond production in Europe will be increased in the near future.

In contrast to almond main pistachio cvs (such as Iranian, Turkish and American) require high chilling (about 1000 h under 7°C) in order to perform regular flowering. However, Mateur of Tunisia, Larnaka of Cyprus, Halebi of Turkey and Syria require less chilling and they can be grown in the Mediterranean basin countries. On the other hand all pistachio cvs' heat requirement is high. Therefore for the maturation and filling the kernels they need dry and hot summers; autumn rains should not be early, otherwise aflatoxin damage may increase (Ka_ka, 1990).

In order to increase the yield pistachio trees should be irrigated providing that irrigation water is available. Positive results of irrigation can easily be seen in the pistachio production of USA (Ferguson, 1995). Since pollination is a must, suitable pollinators should be planted in the orchards in the ratio of 1 male for 8 female (Ka_ka, 1990). Each country has its own cvs and do not other cvs of different origins. However, it will be beneficial to try high yielding, high splitting, big sized, early maturing regular bearing (i.e. no alternate bearing) cvs. In case of rootstocks, *P. atlantica*, *P. terebinthus*, *P. integerrima* or *P. atlantica* x *P. integerrima* hybrid (UCB-1) (Ka_ka, 1996) type of rootstocks can be recommended for the coastal areas of Mediterranean basin countries. The chilling requirements of these species or types can be satisfied in these areas. If irrigation is possible these rootstocks will not be or little affected by *Phytopthora* (Banihashemi, 1995).

In pistachio culture one of the biggest problem is the difficulty in budding (Ayfer, 1990). The percentage of bud take is rather low and to produce nursery plants takes a long time. The situation is worse if the seedlings are not irrigated. Therefore the pistachio researchers should pay too much attention to this subject. If they are successful in obtaining container grown nursery plants of pistachio nut it will be an excellent success.

References

Ayfer, M. (1990). Nut production in Turkey. In: *Nut Production and Industry in Europe, Near East and North Africa*, Menini, U.C., Olez, H., Büyükyılmaz, M. and Ozelkok, S. (eds), pp. 317-325.

Banihashemi, Z. (1995). The present status of Pistachio gummosis in Iran. In: *First National Workshop on Pistachio Nut*, Rafsanjan (Iran), pp. 13-14.

Felipe, A.I. and Socias i Company, R. (1987). Ayles, Guara and Moncayo almonds. *HortScience*, 22: 961-962.

Ferguson, L. (1995). Pistachio in California. In: First International Symposium on Pistachio Nut, Ka_ka, N., Kuden, A.B., Ferguson, L. and Michailides, T. (eds). *Acta Horticulturae*, 419: 169-173.

Grasselly, C. and Duval, H. (1997). *L'Amandier*. CTIFL, Paris.

Ka_ka, N. (1990). Pistachio research and development in the Near East North Africa. In: *Nut Production and Industry in Europe, Near East and North Africa*, Menini, U.C., Olez, H., Büyükyılmaz, M. and Ozelkök, S. (eds), pp. 133-160.

Vargas, F.J. and Romero, M. (1993). Mas Bovera, Glorieta and Francoli, three new almond varieties from IRTA. *Acta Horticulturae*, 373: 75-82.