

Comparison of Growth, Bearing, Yield and some Quality Characteristics of Different Almond Cultivars under Irrigated Conditions

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Abstract

This experiment was carried out in order to determine the best almond cultivars for irrigated areas in Gaziantep, Turkey. The experimental orchard was established at 3×5 m in spacing in 1998. Twenty almond cultivars and types were used as material based on tree growth, bearing, yield and some quality characteristics. The best diameter growth of trunk was occurred on Yaltinski cultivar. The highest yield per decare (0.1 ha.) was obtained from Ferraduel (572.6 kg), Cristomorto (516.7 kg), Yaltinski (504.9 kg) and 101-23 (500.9 kg) in 2003.

INTRODUCTION

Turkey is the 9th almond producer country in the world with 40.000 tons production (Table 2). Although climatic condition is suitable for almond growing, the production of almond is low in Turkey. Almond gets good income from domestic and foreign markets. To spread almond production, favorable almond cultivars ought to be determined for irrigated areas of the Southeast Anatolia Region in Turkey.

This project has been carried out in order to determine the best almond cultivars suitable for climatic condition of the Southeast Anatolia region.

MATERIALS AND METHODS

In this study, thirteen foreign and seven domestic almond cultivars and types have been used as material (Table 1). The experimental orchard was established at 3×5 m in spacing in 1998. Almond cultivars and types have been investigated as to phenological characteristics, stem diameter, yield, nut weight, kernel ratio and double kernel ratio.

RESULTS AND DISCUSSION

Flowering

All almond cultivars and types started flowering in the Gaziantep location. The earliest flowering was observed in the types 48-5 and 101-13 on 2 April, while the latest was observed in Ferraduel on 10 April (Table 3).

Late flowering cultivars are advantageous for the Southeast region, since they will not be caught in spring frost. The foreign cultivars are more advantageous than domestic types because of late flowering characteristics.

Tree stem diameter

The highest stem diameter was obtained from Yaltinski cultivar as 9.77 cm and the lowest diameter was obtained from 48-5 type as 8.24 cm, and other cultivars' stem diameters were observed between these cultivars in 2003 (Table 4).

Yield

Some almond cultivars started bearing in 2002 with 290 g, 1820 g, 920 g and 1077 g per tree at 17-4, 48-5, 101-13 and Tuono cultivars, respectively. All cultivars started bearing in 2003. The highest yield was obtained with Ferraduel as 572.6 kg/da, and succeeded by Cristomorto (516.7 kg/da), Yaltinski (504.9 kg/da) and 101-23 (500.9 kg/da) cultivars. The lowest yield was observed for 17-4 as 165.0 kg/da (Table 4). Kuden and Kuden (2000) and Felipe (2000) reported that Cristomorto and Ferraduel had a high yield, and Yaltinski had medium yield.

Nut Weight

Among the investigated almond cultivars, 48-1 had 3.91 g nut weight and followed by Ferraduel (3.52 g) and Cristomorto (3.51 g), the lowest nut weight was observed for Nonpareil (1.26 g) and 17-4 (1.00 g) cultivars. According to Kuden and Kuden (2000), nut weight of 48-1 was 3.95 g, and nut weight of Ferraduel was 4.70 g. In our experiment, the nut weight of Ferraduel was low, which might be caused by high yield.

Kernel Ratio

The highest kernel ratio in 17-4 was determined as 59.1%, in Nonpareil as 58.0%, and in Nikitski as 48.2%. The lowest kernel ratio was obtained from D. Largueta as 25.9%. Dokuzoguz and Gulcan (1979) reported that, kernel ratio of 17-4 and Nonpareil were about 60%. These results support our findings.

Double kernel ratio

Among the almond cultivars used in the experiment, double kernel ratio was high in 48-2 (65.0%), and it is followed by Cristomorto (21.7%) Nikitski (16.7%) and Primorski (16.7%). A double kernel was not observed in Nonpareil, Ferragnes, D. Largueta, Garrigues, Tuono, 300-1, Yaltinski and Ferraduel (Table 4). According to Kuden and Kuden (2000), double kernel ratio was observed for 48-2 as 26.6% and Cristomorto as 20-25%. In our experiment, double kernel ratio was high in 48-2.

CONCLUSION

As a preliminary result, Ferraduel, Cristomorto, Yaltinski and 101-23 cultivars may be suggested for the Southeast Anatolia Region. Double kernel ratio was high in Cristomorto, and flowering was early in 101-23, but these cultivars' yield was high.

Literature Cited

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Tables

Table 1. Almond cultivars and type used as material

Foreign Cultivars	Domestic Types
Nonpareil	101-23
Ferragnes	17-4
Cristomorto	48-5
Picantili	48-2
D. Largueta	300-1
Garrigues	48-1
Drake	101-13
Tuono	
Primorski	
Nikitski	
Texas	
Yaltinski	
Ferraduel	

Table 2. Almond production in the world (FAO)

Almonds Production (000 Mt)	Years									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
USA	276,0	385,5	549,0	393,0	631,0	533,0	609,1	800,0	755,9	818,1
Spain	158,9	242,3	388,8	220,4	279,1	225,2	254,6	299,2	197,3	95,6
Italy	90,2	84,1	104,4	87,9	103,1	104,7	112,8	104,8	91,3	91,0
Iran	79,5	91,1	74,3	111,9	95,9	89,6	97,1	107,0	105,0	110,0
Syrian	33,6	55,0	26,3	67,1	57,6	62,2	49,4	139,0	139,0	139,0
Morocco	45,7	33,6	52,7	52,7	81,3	65,0	81,8	82,4	70,8	70,8
Greece	57,5	51,3	56,0	40,3	46,3	47,1	55,2	37,3	33,8	34,0
Tunisia	35,0	42,0	51,0	58,7	58,0	60,0	32,0	18,5	40,0	50,0
Turkey	37,0	43,0	33,0	36,0	43,0	47,0	42,0	41,0	38,0	38,0
Pakistan	48,9	49,3	49,0	49,1	50,0	32,3	33,2	26,1	23,6	23,6
Libyan	30,0	29,0	29,5	30,0	30,5	30,5	31,0	31,0	31,0	31,0
Algeria	19,8	33,5	19,3	21,6	25,6	26,4	25,1	32,2	32,0	32,0
Lebanon	28,0	37,3	31,2	32,5	28,6	24,7	23,9	23,0	23,0	23,0
China	19,0	22,0	23,0	20,0	22,5	17,0	20,0	22,0	22,0	22,0
Portugal	7,1	8,3	12,1	7,5	11,3	27,0	15,7	30,8	23,8	17,0
Australia	10,0	10,0	11,7	13,7	17,9	17,4	9,4	10,0	9,5	10,0

Table 3. Phenological Characteristics of Some Almond Cultivars

CULTIVARS	Flowering Dates				
	Pink	First	Full	Last	Harvest
17-4	01-04	04-04	06-04	08-04	23-08
Nonpareil	02-04	05-04	08-04	10-04	18-08
Ferragnes	08-04	09-04	11-04	14-04	27-08
Cristomorto	07-04	08-04	10-04	13-04	01-09
101-23	02-04	05-04	08-04	11-04	01-09
48-5	30-03	02-04	06-04	09-04	29-08
Picantili	06-04	08-04	10-04	13-04	30-08
D. Largueta	05-04	08-04	10-04	14-04	27-08
48-2	01-04	03-04	06-04	08-04	01-09
Garrigues	06-04	08-04	10-04	13-04	25-08
Drake	05-04	06-04	08-04	10-04	05-09
Tuono	01-04	03-04	05-04	08-04	28-08
300-1	03-04	05-04	08-04	10-04	30-08
Primorski	06-04	08-04	09-04	11-04	30-08
48-1	01-04	03-04	05-04	08-04	05-09
Nikitski	03-04	06-04	08-04	09-04	30-08
101-13	30-03	02-04	04-04	07-04	05-08
Texas	05-04	07-04	09-04	10-04	05-08
Yaltinski	07-04	09-04	10-04	12-04	01-09
Ferraduel	08-04	10-04	13-04	15-04	29-08

Table 4. Growth, Yield and Some Pomological Characteristics of Some Almond Cultivars (2003).

Cultivars	Stem Diameter (cm)	Yield (kg/da)	Pomological Characteristics			
			Softness of the shell	Nut Weight (g)	Kernel Ratio (%)	Double Kernel Ratio (%)
17-4	9.71 ab	165.0 l	Soft	1.00 k	59.1 a	10.0
Nonpareil	8.65 ab	307.0 i	Soft	1.26 k	58.0 a	0
Ferragnes	8.91 ab	430.9 d	Hard	2.96 cd	31.1 f-j	0
Cristomorto	9.57 ab	516.7 b	Hard	3.51 b	30.8 f-j	21.7
101-23	9.00 ab	500.9 b	Hard	2.03 hi	36.4 d-g	10.0
48-5	8.24 b	388.5 ef	Hard	2.19 gh	32.4 e-j	6.7
Picantili	8.99 ab	344.2 g	Hard	2.63 ef	35.7 d-h	11.7
D. Largueta	9.11 ab	462.1 c	Hard	2.79 cde	24.3 j	0
48-2	9.05 ab	297.0 ij	Intermediate	2.65 e	45.9 bc	65.0
Garrigues	8.87 ab	407.9 de	Hard	2.37 fg	34.5 d-h	0
Drake	9.33 ab	335.8 g	Intermediate	1.89 ij	42.1 bcd	1.7
Tuono	9.49 ab	274.3 j	Hard	2.20 gh	32.9 e-i	0
300-1	8.89 ab	371.2 f	Hard	3.00 c	28.4 g-j	0
Primorski	9.00 ab	337.2 g	Hard	2.72 de	37.1 def	16.7
48-1	8.90 ab	332.0 gh	Hard	3.91 a	34.3 d-h	3.3
Nikitski	8.36 ab	307.7 hi	Soft	1.75 j	48.2 b	16.7
101-13	8.55 ab	320.9 ghi	Hard	2.80 cde	27.7 hij	3.3
Texas	8.49 ab	245.4 k	Intermediate	2.28 gh	39.4 cde	1.7
Yaltinski	9.77 a	504.9 b	soft	2.13 ghi	46.4 bc	0
Ferraduel	8.81 ab	572.6 a	Hard	3.52 b	25.9 ij	0
Tukey %5	0.273	4.47		0.050	1.50	