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Adaptation of Some Nectarine Cultivars in Aydin Region

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Abstract: Nine cultivars Nectared-4, Nectared-6, Nectared-8, Independence, Cherokee, Fairlane, Armking, Starks Red Gold and Summer Super Star were used in adaptation experiments. Phenologic observations in the years 1998, 1999 and 2000 and pomologic observations in the years 1999 and 2000 were carried out. It was found that Armking was the earliest cultivar and had the highest pH value while Summer Super Star was the latest cultivar and had the lowest pH value. While the highest average fruit weight was obtained from Summer Super Star the lowest average fruit weight was obtained from Armking cultivar. In terms of yield per tree Cherokee and Summer Super Star cultivars showed the lowest values. Nectared-6 showed the highest value. Armking followed Nectared-6. Cumulative yield per 1 cm^2 stem cutting area was also evaluated While Nectared-4 had the highest cumulative yield per 1 cm^2stem cutting area, Fairlane had the lowest value. When phenologic, pomologic and cumulative evaluations were considered, Armking, Nectared-6 and Nectared-8 cultivars were noticeably found as proper cultivars for adaptation in regional ecology.

Key words: Nectarine, adaptation, yield, quality

INTRODUCTION

Nowadays, peach and nectarine growing has been rapidly improving in the world. In this improvement, such characteristic the adaptation abilities of different ecological conditions of cultivars the precocity of trees. The good appearance and taste of fruit the different maturation times of cultivars due to the spreading of production in extended period of time have been playing key role.

In most cities in Turkey, peach trees has been grown. In recent years especially in Aegean and Mediterranean Regions besides peach, growing of nectarines has been also appeared in large plantations (Kaska *et al*., 1991).

When the ecological criteria are considered, although Aydin and its surroundings are very suitable region for nectarine growing. The cultivation of nectarines has not been exceeded from a few amateur gardeners of plant hobbyist. When the important position of tourist activity of this region is included to these appropriate ecological criteria. It can be understood how valuable nectarine cultivation in this areas. In recent years because of the important improvement in our fruit growing the possibility of continuity of this process is forced for gaining knowledge of growth and development stages and their physical and chemical conditions of economically important cultivars (Ozbek, 1978; Kurnaz and Kaska, 1991 and Kaska *et al.,* 1992). While winter chilling does not cause any problem in Aydin Province. The late frost in spring can damage especially early cultivars. Therefore, when establishing an orchard with early cultivars. This issue needs to be considered. Fulfilling of cold requirement plays an important role in mid and late season cultivars in some years in terms of irregular yield. For this respect with this study the proper selection of nectarine cultivars grown in Aydin Province and practical knowledge transfer to the growers in this region was aimed.

MATERIALS AND METHODS

In the adaptation trial 'Nectared-4', 'Nectared-6', 'Nectared-8', 'Independence', 'Cherokee', 'Armking', 'Fairlane', 'Starks Red Gold' and 'Summer Super Star' nectarine cultivars grafted on peach seedlings were used.

The current trial was established with above nine nectarine cultivars with ten replicates planted at 5 x 6 m between and within row spaces in the experimental field plots of Adnan Menderes University, College of Agriculture, Department of Horticulture in January, 1997. During 1998-2000 when the plant started to bear fruit. bud swallow, bud burst and beginning of flowering, full bloom, leaf discoloration, leaf drop evaluations were measured on the marked shoots belonging to the cultivars. In 1999-2000, some phenological observations such as shoot diameter, shoot length trunk diameter; and some pomological observations such as harvest date, yield per tree, fruit width, fruit length, fruit weight, seed weight, flesh/seed ratio, fruit flesh color, seed color, top and bottom color of fruit rind, pH, dry weight and percent titrable acid ratio were recorded.

Besides these the cumulative evaluation was conducted for the years 1999 and 2000.

RESULTS

After the second half of the year 1997 bud burst were observed on the small trees. But there was a difference among the replicate plants within the same cultivar along with problems with adaptation. Therefore, the average phenological observations were given at Table 1 for 1998-2000. The earliest bud swallow was recorded on 'Armking' on February 7, 'Independence', 'Nectared-4', Nectared-6', 'Nectared-8, 'Fairlane', 'Summer Super Stark, Starks Red Gold and 'Cherokee' were followed. The first bud swallow was observed again on 'Armking' on February 26. Except 'Fairlane'all other cultivars showed bud swallow between February 26 and February 28. 'Fairlane' was the latest for the year 1999. In 2000, 'Armking' showed the earliest bud swallow on February 7. 'Independence', 'Nectared-4', 'Nectared-6', 'Nectared-8', 'Fairlane', 'Cherokee', 'Stark Red Gold' and 'Summer Super Star' followed 'Armking'.

The bud burst was the earliest on 'Armking' and the latest on 'Starks Red Gold', 'Fairlane' and 'Independence' in all three-observation years.

When the full bloom date was taken in an account. 'Armking' was the earliest according to the trial years the differences were found among the bud swallow, bud burst, beginning of flowering and full bloom dates in all nine cultivars. While all cultivars showed faster phenological development in 1998. They were late for 10 to 20 days in these parameters in 2000. In all three years leaf discoloration occurred between October 11 and October 27. Leaf drop occurred between November 4 and December 7. There were differences among the years for leaf discoloration and drop parameters within the same cultivar.

In 1998-2000, the smallest trunk diameter (27.86 mm) was observed on 'Starks Red Gold' and the biggest (51.63 mm) of that was on 'Summer Super Star'. Similarly, there were differences among the shoot diameter according to the cultivars and years. While the best shoot development was observed on 'Nectared-6' in both years. 'Fairlane', 'Starks Red Gold' and 'Independence' seen for their poor shoot development.

Some pomological characteristics of the cultivars in 1999-2000 was shown in Table 2. The earliest cultivar was 'Armking'. It was harvested between May 25 and June 8. 'Independence' followed 'Armking' the harvest dates on July 8-27. The latest cultivars 'Nectared-6', 'Fairlane', 'Nectared-8' and 'Summer Super Star' were harvested between August 2 and August 27.

When the yield per tree was evaluated the poorest (0.351 kg) was on 'Starks Red Gold'. The richest (2.956 kg) was 'Nectared-6'. Among the cultivars the lowest mean fruit weight was observed on 'Armking'. The highest mean fruit weight was observed on 'Starks Red Gold' and 'Summer Super Star'. The overall bottom colors of the cultivars were changed between variegated red and dark red. The fruit of 'Fairlane' had variegated red color on yellow bottom (8 June 2000). Among the nine cultivars. 'Armking' was the earliest (25 May 1999) but its maturation date was 8-10 days late in 2000. The yield per tree was the highest on 'Nectared-6' (2.956 kg tree^{-1}).

Average cumulative data of varieties were shown in Table 3. The average yield per tree was the highest in 'Nectared-6 and 'Armking'. 'Starks Red Gold' gave the lowest yield per tree. Similar trends were observed in the cumulative data of trunk cross sectional area. Although the cumulative data for the canopy area and canopy volume showed the performance of the cultivar. They were not important due to only one year data. In Table3. the parameters valuable should be the cumulative data from 1999 and 2000. Therefore the highest cumulative yield was obtained from 'Nectared-6'. 'Armking', 'Nectared-8'. 'Nectared-4' and 'Summer Super Star'. The lowest yield was obtained from 'Cherokee'. According to these evaluations 'Nectared-4', 'Nectared-8' and 'Armking' were the highest yielding cultivars when the cumulative yields per the trunk cross sectional area were taken account. While 'Nectared-4' was the highest yielding cultivar for the cumulative yield per canopy volume. 'Armking' which showed poor growing habit was in the second place and 'Nectared-8', 'Nectared-6' and 'Independence' was ranked in descending order.

DISCUSSION

The first priority in the nectarine growing was cultivar selection and adaptation which are considered some of the basic principles of nectarine growing in Great Meandrous Basin and Aydin Province as well as Aegean Region. Our country's nectarine growing culture needs to be established on the scientific knowledge for considering the high through output of economical importance of tourism sector's demand such as in the Mediterranean Region. The phenological and pomological performances of the cultivars highlight play a very important role in the adaptation programs. In this sense, the response of the cultivars used in this trial is important. The precocity is very important for Aydin Province. When the overall phenological development of cultivars are taken to account, in 'Armking' the bud swallow start in the second

Table 1: Phenological characters obtained from average data of 1998 and 2000 years

	Cultivars								
Phenological observations	Nectared 4	Nectared 6	Nectared 8	Independence	Cherokee	Armking	Fairlane	Starks red gold	Summer super star
Date of bud swallow	18.02	18.02	18.02	14.02	21.02	7.02	18.02	21.02	20.02
(% 70) (Date.month)	26.02	27.02	28.02	27.02	27.02	20.02	06.03	06.03	26.02
Date of bud burst	08.03	08.03	08.03	08.03	08.03	22.02	07.03	08.03	03.03
(% 70) (Date.month)	11.03	16.03	17.03	18.03	17.03	02.03	18.03	18.03	17.03
Date of begining of blooming)	09.03	09.03	09.03	09.03	09.03	25.02	09.03	09.03	06.03
(Date.month)	30.03	01.04	30.03	26.03	26.03	09.03	28.03	30.03	24.03
Date of full bloom	13.03	13.03	13.03	13.03	13.03	27.02	13.03	12.03	08.03
(% 90) (Date.month)	06.04	11.04	10.04	08.04	08.04	20.03	06.04	06.04	03.04
Average trunk diameter (mm)	36.23	41.02	42.97	41.65	51.06	46.81	32.38	27.86	51.63
Average shoot diameter (mm)	4.06	4.55	4.24	3.57	4.11	4.08	3.47	3.57	4.14
Average shoot length (cm)	26.19	31.23	26.64	24.78	29.36	31.77	19.89	20.04	28.65
Date of leaf discoloration	11.10	13.10	13.10	15.10	15.10	13.10	13.10	13.10	15.10
(% 70) (date. month)	25.10	25.10	25.10	27.10	27.10	27.10	25.10	26.10	27.10
Date of leaf drop	9.11	4.11	6.11	8.11	9.11	4.11	6.11	5.11	9.11
(% 70) (date. month)	23.11	28.11	30.11	01.12	30.11	30.11	01.12	28.11	07.12

Table 2: Pomological characters obtained from average data of 1999 and 2000 years

	Cultivars								
Phenological observations	Nectared 4	Nectared 6	Nectared 8	Independence	Cherokee	Armking	Fairlane	Starks red gold	Summer super star
Harvest date (date. month)	13.07	19.07	02.08	08.07	08.07	25.05	16.08	19.07	02.08
	02.08	16.08	16.08	26.07	26.07	08.06	27.08	26.07	11.08
Average yield (kg)	1.497	2.956	1.115	0.919	0.979	2.153	0.700	.351	0.567
Average fruit width (cm)	5.10	5.15	5.38	5.16	5.06	4.54	5.33	5.49	5.68
Average fruit length (cm)	4.18	4.50	4.70	5.04	4.58	4.00	5.02	5.17	5.18
Average fruit weight (gr.)	65.88	85.15	90.05	67.25	73.90	34.80	88.80	98.70	101.6
Average seed weight (gr.)	5.36	5.86	6.60	5.80	6.15	4.70	9.60	6.20	5.00
Flesh / seed ratio	11.43	13.43	12.39	10.53	11.31	6.59	8.25	14.82	19.38
Flesh color	yellow	yellow	yellow	yellow	yellow	yellow	yellow	yellow	yellow
Seed color	brown	brown	brown	brown	Brown	light brown	brown	brown	brown
Bottom color	Red bottom color and variegated dark yellow	Red bottom color and variegated yellow	Red bottom color and variegated yellow	Dark red bottom color and variegated yellow	Red bottom color and variegated yellow and light red	Red bottom color and variegated dark yellow	Yellowish red bottom color and variegated yellow	Red bottom color and variegated	Redbottom color and variegated yellow and red
Average pH	3.73	3.84	3.84	3.60	3.64	4.17	3.63	3.40	3.46
Average total soluble solids (%)	18.23	17.70	17.20	15.10	14.70	15.13	17.30	16.50	17.50
Average titreable acidity (%)	0.93	0.74	0.74	0.73	0.93	0.57	0.89	1.263	0.955

NOT: 0.1 N NaOH. F=0.8700 were considered

Table 3 : Cumulative data about yield obtained in end of 2000 trial year.

	Cultivars								
Cumulative evaluations	Nectared 4	Nectared 6	Nectared 8	Independence	Cherokee	Armking	Fairlane	Starks red gold	Summer super star
Total yield of sample trees in 1999 and 2000 (kg / tree)	5.996	10.882	8.626	2.204	2.301	8.682	0.800	1.082	3.252
Canopy height (m)	0.91	1.75	1.26	.72	1.49	1.22	0.75	0.95	1.55
Average canopy diameter (m) North-south East-west	1.25	1.88	1.48	1.05	1.98	1.53	0.94	0.99	1.79
Trunk diameter under first branch (cm)	3.42	6.53	4.49	3.17	6.84	3.86	2.89	3.10	5.65
Trunk diameter in 5 cm above of graft side (cm)	3.95	5.82	4.31	3.46	6.66	5.46	3.18	3.73	6.27
Average canopy area (m^2)	1.22	2.35	1.91	1.02	3.07	1.83	0.69	0.80	2.55
Average canopy volume (m^3)	0.37	1.36	1.04	0.29	1.53	.74	0.18	0.28	1.33
Trunk cross sectional area (cm^2)	10.63	30.37	16.86	9.21	35.77	17.05	7.64	9.33	27.93
Cumulative yield for per 1 cm^2 trunk cross sectional area (kg/cm^2)	0.564	0.358	0.512	0.239	0.064	0.509	0.105	0.116	0.116
Cumulative yield for Per 1 m^2 canopy area (kg m^2)	4.915	4.631	4.516	2.161	.749	4.744	1.159	1.353	1.275
Cumulative yield for Per 1 m^3 canopy volume (kg m^3)	16.205	8.001	8.294	7.600	1.504	11.732	4.444	3.864	2.445

and third weeks of February. The first bloom was in the late February and early March harvesting completed between the second part of May and the first part of June and the yield per canopy area and volume is acceptable for this cultivar. 'Nectared-4', 'Nectared-6', 'Nectared-8', 'Independence', 'Cherokee', 'Fairlane', 'Starks Red Gold'and 'Summer Super Star' are considered to be mid-season cultivars according to the full bloom time between the end of March and the beginning of April and the harvesting time between the end of July and the beginning of August. Among these cultivars 'Summer Super Star' seems to be later maturing than the others. When the cultivars evaluated according to their yield they can be clearly separated from one to another. When they lined up according to their maturity times. 'Nectared-6' and 'Nectared-8'. mid-season cultivars and 'Armking' an early cultivar. find to be superior. These evaluations are in an agreement with the programs conducted in the Mediterranean Region (Kurnaz and Kaska, 1991 and Kaska *et al*., 1992).

In this adaptation trial including nine cultivars 'Armking' is the cultivar to be suggested for future nectarine orchard plantings for both its precocity and the cumulative yield per the canopy volume. 'Nectared-4', 'Nectared-6', 'Nectared-8' and 'Independence' are the cultivars also to be suggested as mid-season cultivars. Especially low average fruit weight in all cultivars can be attributed to the young age (three-years old) of the trees. It could be possible to obtain better results from the trees grown under optimum husbandry conditions.

Furthermore, it has been decided that 'Armking' the early maturing cultivar has a better performance of both fruit and pomological development than mid-season cultivars under Aydin Province's ecological conditions. This can be comparable with the study conducted by Kurnaz and Kaska (1991) of the small fruit size of the nectarines grown under Adana Province's ecological conditions. Besides this, during the trial, fruit color, dry weight and acidity values obtained from the fortunate cultivars have not been any problem or negative effect.

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