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Selection of seedling rootstock for apricot

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ABSTRACT

The aim of this study is to select promising wild apricot rootstocks among wild apricot populations propagated by seeds naturally found in Malatya, Erzincan, Nevşehir, Sivas and Elazığ provinces. In the first stage, land scans were carried out between 2007 and 2009 and 756 genotypes were determined which could be suitable for the characteristics of the rootstock by considering the phenotypic characteristics. On land surveys, the wild apricot trees that are healthy, productive, bitter seeds, thornless, dwarf growth habit and smooth trunk structure was selected. Among the marked wild apricot types were selected 240 types in 2008, 262 types in 2009 and 254 types in 2010. Seeds taken from these determined wild apricot trees were planted for 2 years in Erzincan and Malatya locations and germination experiments were carried out. In the study, Hasanbey and Hacıhaliloğlu apricot varieties were used as control plants. Seed germination percentage, seedling diameter, height, diameter and high homogeneity were determined. At the end of three years of germination experiments were evaluated according to weighting ranking score and finally 8 types that has high score selected for Malatya location and 18 types for Erzincan location. In the second step, these 26 types after selected in germination tests, was grafted by cv. Hacıhaliloğlu in Malatya and by cv. Hasanbey in Erzincan. After grafting success, shoot diameter, homogeneity, shoot length and homogeneity were evaluated. Then, the data was selected according to weighting ranking score and finally 7 types (58/6, 58/7, 24/111, 24/7, 24/25, 24/33 and 44/8) that has high score selected for Malatya and Erzincan locations, and transferred to the third stage. In third stage, collection orchards will be established and rootstocks-scion, yield, phenological observations, pomological analysis, tree growth and habit will be evaluated.

KEYWORDS: Wild apricot, rootstock, growth, tree productivity, zerdali

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INTRODUCTION

The seedlings of apricot are more inexpensive and have benefits like physiological compatibility between scion and rootstock, high tolerance to nematodes and hardness to sulphate salts and chlorides [1,2]. Due to these advantages, local rootstocks are widely used in Asian and European countries [2,3,4]. However, they are susceptible to both oak root fungus and *Verticillium* wilt [5]. Therefore, apricot seedlings are not commonly used in commercial plantings. For overcome these problems, plum clonal rootstocks are often used as a rootstock for apricot. But plum clonal rootstocks are not so useful due to incompatibility to cultivars and other local cultivars [6].

New rootstocks and wild sources are recently studied for selecting good quality rootstocks for efficient seedlings [3,7-9]. Examination on apricot rootstocks has been conducted in

many area, but some problems have not still been solved [10]. In order to overcome these problems, in areas where is rich genetic diversity, it has become compulsory to search for new genotypes who might be rootstocks for apricots. Especially, there are numerous local types coming from seeds in Turkey, and this form richness may be important to facilitate the rootstock selection. Rootstocks for apricot cultivars in main apricot growing areas in Turkey use usually wild apricot seedlings. Wild apricot is called 'Zerdali' in Turkish and no problems are faced during seed germination [11]. Though sweet and bitter seeds apricots are generally grown throughout Turkey, about half the crop is produced in Erzincan, Malatya, Icel, Elazığ, Sivas, Kahramanmaraş, Nigde, Kayseri, Hatay and Nevşehir provinces [11]. In the aim of the research, it is to select promising wild apricot rootstocks were selected among wild apricot populations propagated by seeds naturally found in Malatya, Erzincan, Nevşehir, Sivas and Elazığ provinces.

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MATERIAL AND METHODS

In the first selection studies, naturally wild apricot growing areas screened and the promising genotypes were marked according to high fruit yield, bitter seeds, smaller fruits, more health, dwarf growth habit, thornless and wide shoot angle. The seeds were obtained from these types and germination tests in field conditions with 4 replicate including 25 seeds per replicate in randomized block design were carried out in 3 years, at Malatya Apricot Research Institute and Erzincan Horticultural Research Institute. Seed germination percentage, seedling diameter, height, diameter and high homogeneity were evaluated. The data were evaluated according to Weighting ranking score and finally 8 types that has high score selected for Malatya location and 18 type for Erzincan location. In the second step, these 26 types after selected in germination tests, were grafted by cv. Hacıhaliloğlu in Malatya and by cv. Hasanbey in Erzincan. The wild apricot seeds were planted at the institute at 120x20 cm distances, with 4 replicates and 25 seeds per replicate, according to randomized blocks trial design at the two institute's area. In August, and Hacıhaliloğlu and Hasanbey apricot varieties were grafted with these planted wild apricots via T bud grafting. After grafting success, shoot diameter, homogeneity, shoot length, homogeneity, number of shoots in grafting area, plant root development, number of plant lateral shoots were determined (Table 1). In evaluating the weighting ranking score of rootstock candidates, seedling root development, root height and root volumes were separately scored and evaluated by taking the average of three parameters. Also, in apricot seedlings, it is an undesirable feature that the number of lateral shoots in the grafting area is high. Therefore, the seedlings that have fewer lateral shoots were given higher scores. If the coefficient of variation is small, this situation show that there are few deviations from the mean and the work is more reliable and correct. For this reason, the seedlings that have lowest coefficient of variation was scored higher. This experiment was established at the Malatya Apricot Research

Table 1: Weighting ranking score features for wild apricot rootstock

Features	Coefficient	Classroom Interval	Score
Grafting success (%)	5	100-91	10
		90-81	8
		80-71	6
		70-61	4
		60 ≤	2
Shoot diameter (mm)	15	(20 mm ≥) - 15-20 and (15 mm ≤)	10-6-2
Shoot diameter uniformity (cv)	15		10-6-2
Shoot length (cm)	15	130 cm ≥ Ekstra	10
		120-130 1. quality	6
		120 cm ≤ 2. quality	2
Shoot length uniformity (cv)	15		10-6-2
Plant root development	15	Good-Bad-Medium	10-6-2
Number of shoots in grafting area	10		10-8-6-4-2
Number of plant lateral shoots	10		10-8-6-4-2

Institute and Erzincan Horticultural Research Institute and was carried out during two years.

RESULTS

The grafting success, shoot diameter, shoot diameter uniformity, shoot length, shoot length uniformity, plant root development, number of shoots in grafting area and number of plant lateral shoot of wild apricot rootstock candidates (local, primitive) are given in Tables 2.,3.,4., and 5.

Malatya Location

In first year; the highest grafting success ability was 100% (in rootstock candidates; 24/124, 24/186 and 44/8) and the lowest 86% (in rootstock candidate; Hacıhaliloğlu), whereas in the second year; the highest grafting success ability was 100% (in rootstock candidate; 44/8) and the lowest 82% (in rootstock candidate; Hacıhaliloğlu). The shoot diameter of the researched rootstocks of wild apricot genotypes was from 12.2cm (50/2), to 16.05cm (24/25) in first year. This value was determined from 12.27cm (Hacıhaliloğlu), to 17.6cm (58/6) for the second year. The shoot diameter uniformity of the researched rootstocks of wild apricot genotypes was determined from 8.78cv (58/7), to 23.37cv (24/87) in first year, whereas this value was 6.98cv (24/189), to 25.33cv (Hacıhaliloğlu) for the second year. At results of first year, the lowest shoot length value was found at Hacıhaliloğlu (135cm), while 24/25 (178.09) was found to be the highest. At results of second year, the lowest shoot length value was found at 24/172 (111cm), while 58/6 (156cm) was found to be the highest. In the first year shoot diameter uniformity was the highest at 24/45 (21.36cv) and the lowest at 58/6 (8.36cv), while 24/186 (28.90cv) and 58/6 (4.47cv) rootstock candidates were found according to the results of the second year. In first year, the highest number of plant lateral shoot was 20 (in rootstock candidate; 24/186) and the lowest 11 (in rootstock candidate; 24/7), whereas in the second year, the highest number of plant lateral shoot was 21 (in rootstock candidate; 58/6) and the lowest 14 (in rootstock candidate; 50/9). In first year, the highest number of plant lateral shoot area was 10 (in rootstock candidates; 24/172 and 44/5) and the lowest 6 (in rootstock candidates; 24/11 and 24/45), whereas in the second year, the highest number of plant lateral shoot area was 10 (in rootstock candidate; Hasanbey) and the lowest 7 (in rootstock candidate; 44/5 and 44/8). The plant root development was determined highest at 24/25 in both years (Table 3 and 4). In first year, according to the modified weighted grading score characteristics, the wild apricot rootstock candidates were received from 440 to 780 points. In second year, this scores were determined from 250 to 900 points. According to the two year average, the wild apricot rootstock candidates were rated between 360 and 810 points. The data was selected according to weighting ranking score and finally 6 types (58/6, 58/7, 24/25, 24/33, 24/111 and 44/8) that has high score founded for Malatya location (Table 6).

Erzincan Location

In first year; the highest grafting success ability was 96% (in rootstock candidates; 58/3 and 24/72) and the lowest 76%

Table 2: Properties of the wild apricot rootstock candidates for the first year (Malatya location)

Wild apricot rootstock candidates	Shoot diameter (mm)	Shoot diameter uniformity (cv)	Shoot length (cm)	Shoot diameter uniformity (cv)	Number of plant lateral shoots	Number of shoots in grafting area	Root width (cm)	Root width (cm)	Root development (Volume-ml)	Grafting success (%)
24/2	12.75	22.23	170.29	9.37	18	7.0	69.29	44.14	182.1	91
24/7	13.23	20.65	147.90	14.57	11	9.0	50.57	47.00	138.6	99
24/107	14.72	16.65	164.81	13.14	12	8.0	45.29	38.71	93.7	97
24/111	13.82	22.08	164.00	15.81	12	6.0	58.43	46.86	193.6	99
24/124	13.16	18.93	160.67	19.48	12	9.0	58.00	34.71	103.6	100
24/125	13.32	20.30	146.57	22.44	12	8.0	69.71	42.14	145.9	94
24/15	14.68	20.98	158.71	15.59	14	9.0	61.00	44.71	167.9	99
24/169	13.92	19.71	158.33	14.41	12	9.0	49.43	40.29	101.4	98
24/172	14.72	19.98	161.57	15.94	12	10.0	61.14	50.71	182.3	98
24/186	15.94	16.68	158.00	11.79	20	8.0	55.71	42.14	168.6	100
24/189	13.90	21.06	154.10	16.12	12	9.0	58.43	40.57	122.6	96
24/25	16.05	17.65	178.09	16.78	20	9.0	76.57	54.00	205.7	98
24/33	14.05	17.52	157.19	15.62	14	8.0	66.71	55.57	160.7	95
24/45	12.45	21.66	146.62	21.36	12	6.0	55.57	46.00	109.7	97
24/72	14.50	11.87	157.62	18.72	13	8.0	59.00	39.00	171.4	99
24/73	14.36	14.87	165.86	10.91	13	9.0	55.43	46.00	136.4	96
24/87	14.64	23.37	165.00	14.74	19	7.0	70.57	46.71	203.6	95
44/5	14.06	18.83	157.29	15.44	15	10.0	54.57	44.86	122.1	96
44/8	15.05	19.11	160.53	13.95	14	9.0	57.86	51.00	145.7	100
44/9	14.21	15.45	161.71	13.73	16	8.0	64.43	43.29	100.7	99
50/2	12.32	17.18	156.85	10.97	12	7.0	59.00	45.29	114.3	97
50/9	12.87	16.02	153.81	16.37	13	8.0	56.14	42.14	114.3	97
58/3	14.72	14.81	162.43	15.06	13	7.0	50.43	48.86	109.7	99
58/4	14.82	22.75	162.76	15.08	13	7.0	67.57	49.14	128.6	100
58/6	16.93	17.97	173.24	8.39	22	9.0	56.14	45.29	162.7	98
58/7	14.37	8.78	169.86	9.39	13	9.0	71.43	47.29	120.7	99
H. Hallıođlu	12.65	19.94	135.00	15.27	13	9.0	59.57	41.43	106.4	86
Hasanbey	15.06	19.2	163.90	15.27	12	8.0	40.71	40.14	143.6	96

Table 3: Properties of the wild apricot rootstock candidates for the second year (Malatya location)

Wild apricot rootstock candidates	Shoot diameter (mm)	Shoot diameter uniformity (cv)	Shoot length (cm)	Shoot diameter uniformity (cv)	Number of lateral shoots	Number of shoots in grafting area	Root width (cm)	Root width (cm)	Root development (Volume-ml)	Grafting success (%)
24/2	13.68	20.13	125.43	24.54	15	9.0	60.71	42.14	159.29	98
24/7	14.54	16.44	132.71	17.63	18	9.0	55.14	51.86	115.71	98
24/107	14.10	16.17	128.86	22.02	16	8.0	55.29	37.86	84.71	93
24/111	15.78	10.45	149.19	10.17	18	8.0	58.57	54.86	164.29	98
24/124	13.80	22.22	116.48	28.48	16	9.0	50.29	39.29	99.29	94
24/125	14.18	21.43	118.81	24.41	16	9.0	59.71	46.29	126.43	92
24/15	14.66	21.16	131.38	22.99	17	8.0	52.00	48.86	121.43	96
24/169	14.90	21.88	116.14	27.88	16	9.0	53.57	45.29	91.57	94
24/172	14.28	17.80	111.00	26.95	15	9.0	58.00	45.29	176.43	94
24/186	14.50	23.82	122.19	28.90	16	9.0	53.14	52.00	145.71	99
24/189	14.83	6.98	141.95	8.49	20	8.0	58.29	54.29	155.00	99
24/25	15.18	7.56	137.29	11.22	17	8.0	61.00	52.00	182.14	99
24/33	17.12	8.41	147.00	5.42	19	8.0	69.43	56.86	169.29	99
24/45	14.00	24.85	120.05	33.30	16	8.0	57.71	47.14	97.14	90
24/72	12.80	19.14	117.52	26.76	15	8.0	58.86	42.57	142.14	90
24/73	13.83	18.65	130.95	27.53	16	8.0	51.43	48.86	117.86	90
24/87	12.85	20.09	122.24	25.91	15	8.0	65.00	48.14	172.14	95
44/5	12.72	11.71	112.62	17.10	15	7.0	58.29	53.86	100.71	96
44/8	14.92	7.94	150.19	6.83	20	7.0	64.57	56.43	130.00	100
44/9	12.40	24.68	117.29	26.14	16	8.0	59.71	52.14	94.00	92
50/2	14.15	17.54	121.95	18.96	16	9.0	57.14	52.86	99.29	95
50/9	12.18	24.88	100.00	23.98	14	9.0	55.57	41.29	106.71	91
58/3	14.51	21.11	121.38	21.50	16	9.0	53.00	47.29	92.14	98
58/4	13.64	22.47	119.86	20.58	15	9.0	55.71	50.43	113.57	99
58/6	17.16	7.82	156.62	4.47	21	8.0	63.14	56.00	152.14	99
58/7	15.27	7.32	153.10	5.71	19	8.0	69.43	53.00	156.71	98
H. Haliloğlu	12.27	25.33	115.41	31.58	15	9.0	41.71	43.29	102.86	82
Hasanbey	14.44	21.65	123.33	25.52	16	10.0	57.71	45.00	131.43	88

Table 4: Properties of the wild apricot rootstock candidates for the first year (Erzincan location)

Wild apricot rootstock candidates	Shoot diameter (mm)	Shoot diameter uniformity (cv)	Shoot length (cm)	Shoot diameter uniformity (cv)	Number of plant lateral shoots	Number of shoots in grafting area	Root width (cm)	Root width (cm)	Root development (Volume-ml)	Grafting success (%)
24/2	11.00	15.65	103.54	18.73	23	8.0	28.7	27.1	78.5	80.0
24/7	11.26	7.03	120.63	12.71	24	7.0	22.0	28.2	54.8	90.0
24/107	11.00	19.06	104.47	20.57	24	7.3	37.3	26.2	90.0	79.0
24/111	10.70	7.18	126.52	10.57	19	7.6	33.6	27.1	82.3	93.0
24/124	10.81	12.89	114.23	14.02	24	7.2	30.2	27.8	54.6	85.0
24/125	8.94	18.01	86.76	18.13	20	8.0	36.5	29.4	62.3	95.0
24/15	8.22	10.70	81.76	21.26	19	7.3	22.7	25.5	47.3	79.0
24/169	10.44	8.79	104.76	13.96	20	7.0	26.0	24.7	54.6	87.0
24/172	15.03	8.96	142.85	11.64	29	9.0	35.9	25.2	123.8	94.0
24/186	9.09	12.34	97.76	20.66	22	6.8	28.3	25.5	70.0	88.0
24/189	9.51	21.21	93.23	21.86	21	9.4	27.1	22.6	63.0	83.0
24/25	11.40	12.62	117.61	14.26	22	8.0	37.1	28.2	74.1	95.0
24/33	10.99	10.87	119.61	12.19	23	6.1	37.2	24.6	83.8	91.0
24/45	13.15	7.45	135.23	10.72	26	7.2	32.9	25.2	100.4	94.0
24/72	11.63	10.35	113.14	10.58	24	8.0	34.1	28.3	137.1	96.0
24/73	13.49	6.22	128.28	16.42	26	8.1	32.1	26.6	88.5	88.0
24/87	11.74	14.23	124.42	18.27	21	8.0	26.5	27.2	64.2	87.0
44/5	8.79	13.18	89.14	20.54	22	8.0	36.9	25.3	60.9	91.0
44/8	12.78	15.46	123.00	16.29	25	7.0	30.7	26.5	64.3	92.0
44/9	8.12	15.27	76.47	19.19	20	8.0	27.2	25.5	47.7	86.0
50/2	9.77	8.90	106.38	19.39	18	8.0	28.9	25.8	50.8	91.0
50/9	9.92	17.79	98.04	22.10	20	8.0	29.1	26.1	65.5	76.0
58/3	11.59	22.07	110.47	20.14	26	9.0	43.6	29.8	126.2	96.0
58/4	9.68	13.98	98.57	20.54	22	8.0	41.9	29.3	71.4	93.0
58/6	15.99	7.37	160.71	11.26	33	7.0	43.5	25.9	118.5	91.0
58/7	14.08	5.11	143.03	13.82	23	7.0	42.3	29.2	131.5	93.0
H. Hatiloğlu	13.45	9.92	119.89	16.68	21	9.5	46.8	23.4	122.3	89.0
Hasanbey	14.99	11.2	141.94	14.27	29	7.0	36.7	27.3	136.8	78.0

Table 5: Properties of the wild apricot rootstock candidates for the second year (Erzincan location)

Wild apricot rootstock candidates	Shoot diameter (mm)	Shoot diameter uniformity (cv)	Shoot length (cm)	Shoot diameter uniformity (cv)	Number of lateral shoots	Number of shoots in grafting area	Root width (cm)	Root width (cm)	Root development (Volume-ml)	Grafting success (%)
24/2	11.67	18.82	132.4	16.00	21	7.0	32.6	30.7	46	85.0
24/7	15.83	6.03	162.7	8.41	32	4.0	23	26	137	91.0
24/107	12.36	22.00	108.7	18.67	23	6.0	21.3	33.8	96	81.0
24/111	15.62	6.72	152.6	8.76	26	6.0	32.8	38.4	123	94.2
24/124	10.73	17.91	123.6	16.43	23	5.0	30.5	32.4	69	85.1
24/125	9.46	19.60	98.7	21.48	18	6.0	38.4	32.6	72	93.5
24/15	8.93	19.96	120.6	19.38	17	7.0	24.8	26.6	54	88.6
24/169	12.33	15.81	119.6	15.41	16	7.0	28.4	26.8	63	81.8
24/172	12.53	15.57	140.4	16.49	27	8.0	21.4	24.5	94	92.3
24/186	15.03	17.86	107.4	16.73	22	6.0	26.8	23.2	73	87.5
24/189	11.61	20.70	122.6	19.76	17	9.0	23.6	21.8	67	84.6
24/25	12.30	15.56	116.8	15.87	21	6.0	32.7	28.6	112	80.0
24/33	15.49	8.76	161.4	9.21	26	5.0	32.8	28.6	97	90.0
24/45	11.32	19.26	125.6	18.42	23	6.0	30.6	24.2	129	87.5
24/72	15.01	17.60	102.4	19.46	24	5.0	33.2	28.6	92	92.6
24/73	12.61	14.82	123.8	17.24	20	6.0	30.8	32.7	73	83.9
24/87	10.64	22.41	122.4	17.26	22	5.0	23.8	24.6	63	95.5
44/5	10.78	18.38	96.6	20.52	20	5.0	21.3	24.8	139	90.9
44/8	15.22	7.68	152.7	8.12	28	7.0	34.6	38.4	129	93.4
44/9	12.26	15.54	93.7	18.22	19	5.0	21.4	28.6	73	82.6
50/2	10.76	16.81	120.6	18.93	20	7.0	28.2	31.5	64	93.1
50/9	10.46	17.82	106.4	20.62	19	6.0	21.4	28.2	72	75.0
58/3	10.68	15.82	110.7	18.63	24	6.0	24.6	26.4	68	90.0
58/4	10.26	20.41	110.4	16.06	22	8.0	26.8	31.8	118	87.5
58/6	16.82	6.98	158.3	10.32	31	7.0	33.8	29.7	133	89.5
58/7	15.66	7.62	162.4	8.34	26	6.0	46.4	31.8	97	96.7
H. Haliloğlu	10.21	18.76	120.2	18.62	21	8.0	23.6	36.2	74	76.9
Hasanbey	12.62	19.62	105.4	15.72	24	5.0	32.6	38.6	93	81.8

genetic characters and variety features [6]. The influence of the rootstocks on lateral shoots is evaluated frequently as the vigor, which they stimulate to the scion [14,15,16,17].

CONCLUSION

The best part of the germplasm resources has never been exposed to proper germplasm conservation research study. Also, a lots of local types of genetic apricot genotypes have already disappeared or will be lost in the next few years without any probability of recovery. In this study, it was select promising wild apricot rootstocks among wild apricot populations propagated by seeds naturally found. In the research, 7 types were determined, that has highest score in Malatya and Erzincan locations and transferred the third step. In the third stage, wild apricot rootstock candidates (58/6, 58/7, 24/111, 24/7, 24/25, 24/33 and 44/8) will be grafted with the Hasanbey and Hacihaliloğlu apricot varieties. After grafting, collection orchards will be established and rootstocks- scion, yield, phenological observations, pomological analysis, tree growth and habit will be evaluated in Malatya and Erzincan Locations.

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REFERENCES

- Bernhard R. La selección de los patrones para el albaricoquero y el ciruelo. 1990; p. 41- 72. In: Estado actual de los patrones frutales. ITEA, vol. Extra, n^o9.
- Orero G, Cuenca J, Romero C, MartinezCalvo J, Badenas ML, Llacer G. Selection of seedling rootstocks for apricot and almond. Acta Hort. 2004;658: 529-533.
- Vachun Z. Rootstocks for apricot – the current situation and main problems. Acta Hort. 1995;384: 459-465.
- Indreias A, Stefan I, Dutu I. Apricot rootstocks created and used in Romania. Acta Hort. 2004;658: 509-511.
- Felipea J. Patrones para frutales de pepita y hueso. Ediciones Técnicas Europeas. Barcelona, Spain. 1989;181 pp.
- Licznar-MaáaĘczuk M, Sosna I. Growth and yielding of the several apricot cultivars on the 'Somo'seedling and vegetative rootstock Pumiselect@.2013. 12(5);85-95.
- Rom RC. Apricot Rootstocks. Prospective, Utilization and Outlook. Aĉta Hort. 1991;293 (2): 343-353.
- Indreias A, Trandafirescu M. The behaviour in the nursery field of some generative rootstock genotypes for apricot. Acta Horticulturæ. 1999;488, 421-426.
- Chokoeva MD, Marinow PM. New apricot rootstocks. Acta Horticulturæ. 1999;488, 433-436.
- Indreias A. The breeding programme of peach rootstocks at the fruit research station in Constanta, Romania. In *International Symposium on Rootstocks for Deciduous Fruit Tree Species*. 2002;658 (pp. 501-504).
- Ercisli S. Apricot culture in Turkey. *Sci. Res. Essays*. 2009;4(8), 715-719.
- Slowinski A, Sadowski A. Growth and cropping of „Elstar” apple trees depending on the kind of nursery stock used for planting/Wzrost i owocowanie jabloni „Elstar” w zaleznosci od rodzaju drzewek uzytych do zalozenia sadu. *Zeszyty Naukowe Instytutu Sadownictwa i Kwiaciarnictwa w Skierniewicach*, 2000;8:59-66.
- Sadowski A, Bernackh A, Zoltowski T. Effectiveness of use of different types of trees for establishment of apple orchards. Proceedings of the international scientific conference: Environmentally friendly fruit growing. Polli, Estonia, 7-9 September. Tartu: Tartu University Press. 2005;pp. 36-43.
- Poniedziatek W, Poreski S, Gastol M. Korelacje miedzy pomiarami fitometrycznymi okulantow odmiany „Melrose” i „Gloster” a ich wzrostem i plonowaniem w sadzie. Proceedings of the 34th Scientific Conference of Fruit Growing, Skierniewice. 1996; 1, pp. 101-110.
- Sitarek M, Jakubowski T. Bud-take and maiden tree parameters of two apricot cultivars budded on different seedling rootstocks. *Sodininkyste ir Darzininkyste*. 2006;25(3):47-51.
- Bielicki P, Pąsko M. Effect of the rootstocks on the quality of apricot maiden trees produced in the organic nursery. *Journal of Research and Applications in Agricultural Engineering*. 2013; 58(3):11-14.
- Yordanov IA, Tabakov GS, Kaymakanov VP. Comparative study of Wavit® rootstock with two plum and two apricot cultivars in nursery. *Journal of Agricultural Sciences*. 2015;60(2), 159-168.