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Determination of Walnut Genotypes with High Fruit Bearing and Quality in Dicle, Hani, Egil and Kocaköy Townships

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Abstract: This study was conducted out to determine of walnut genotypes with high fruit bearing and fruit quality within seedling population in Dicle, Hani, Egil and Kocaköy townships of Diyarbakir province and their villages during years 2004 and 2005. During this research, firstly 800 walnut trees were surveyed and 110 genotypes of them were marked and evaluated. Based on the results of these evaluations, 10 walnut genotypes were selected. Kernel ratio, fruit weight and kernel weight of the selected genotypes changed between 57.2-39.1%, 13.2-9.7 g and 7.13-5.62 g, respectively. The protein, the oil, the moisture, the ash the other matter contents of the genotypes changed between 20.0-13.7%, 66.2-57.8%, 4.9-1.8%, 2.98-1.76% and 20.2-9.0%, respectively. The protandrous, the protogynous and the homogymous of these genotypes were determined to be 5, 4 and 1, respectively. In addition, first leafing time, first bud breaking, fruit bearing in the lateral shoots and harvest time of them were found to be 2-6 April, 6-18 April, 75-90% and 15 September – 10 October, respectively.
Keywords: Walnut, Selection, Fruit and tree properties, Diyarbakır

Dicle, Hani, Eğil ve Kocaköy Yörelerinde Meyve Verim ve Kalitesi Yüksek Olan Ceviz Genotiplerinin Belirlenmesi

Özet: Bu çalışma 2004 ve 2005 yıllarında Diyarbakır ilinin Dicle, Hani, Eğil ve Kocaköy ilçeleri ile bunlara bağlı köylerde tohumdan yetişmiş populasyon içinden meyve verim ve meyve kalitesi yüksek olan ceviz genotiplerini belirlemek için yürütülmüştür. Bu araştırma esnasında, ilk olarak 800 ceviz ağacı survey edilmiştir ve onların içinde 110 genıotip işaretlenmiş ve değerlendirilmiştir. Bu değerlendirmeler sonucunda 10 genotip seçilmiştir. Seçilen genotiplerin iç oranı, meyve ağırlığı ve iç ağırlıkları sırasıyla %57.2-39.1, 13.2-9.7 g ve 7.13-5.62 g arasında değişmiştir. Seçilen genotiplerin protein, yağ, nem, kül ve diğer madde içerikleri sırasıyla %20.0-13.7, %66.2-57.8, %4.97-1.83, %2.98-1.76 ve %20.2-9.00 arasında değişmiştir. Bu genotiplerin protandrous, protogynous and homogymous sırasıyla 5, 4 ve 1 olarak belirlenmiştir. Ayrıca, genotiplerin ilk yapraklanma zamanı, ilk tomurcuk patlaması, yan tomurcuklardaki meyve verimi ve hasat zamanı sırasıyla 2-6 nisan, 6-18 nisan, %75-90 ve 15 eylül – 10 ekim olarak tespit edilmiştir.
Anahtar Kelimeler: Ceviz, Seleksiyon, Meyve ve ağaç özellikleri, Diyarbakır

1. Introduction

Walnut is an significant fruit in the nut species. The walnut (*Juglans regia* L.) is economically very important tree species cultivated throughout the world for their timber and nutritional value. The walnut species are found throughout the world such as in the West Indies, Japan, China, Southern Asia from India and Turkey, in South Eastern Europe to the Carpathian Mountains of Poland, in the eastern and southern parts of the United States, in Mexico and Central America from Colombia to Argentina (Sen, 1986; McGranahan and Leslie, 1990). The Persian walnuts are the most economically significant member of the genus and the species is cultivated for its timber and edible nuts throughout the temperate regions of the world.

This species is probably originated from the Afghanistan-Iran region. Then, it was introduced to China, Russia and Eastern Europe mainly by ancient tribes. Turkey with various eco-geographical regions is one of the major centers for Persian walnut diversity. Native walnut populations are widely present in this region (Jay-Allemand et al., 1996) and are found as scattered individuals or groups of several trees in the borders of agricultural lands, orchards or by the rivers, usually close to human settlements (Fernandez-lopez et al., 2003).

Turkey has a population of 4.926.985 walnut trees (Anonim, 2007), most of which are wild walnut trees grown from seed. With this number of walnut trees, Anatolia is one of the top walnut producers in the world (Germain, E. 1986; Sen, S.M. 1988; Sen, S.M. 1998). Nevertheless, lack of standardization in these products may cause some problems in marketing and some problems even in domestic

consumption of these products will be inevitable in near future. This potential constitutes a very rich genetic source for Turkey. So, the first and the most important thing to do is to select the walnuts with highest fruit bearing and fruit quality properties by using selection method and to promote the plantation of these genotypes throughout the country. In this context, various studies made in several regions of Turkey have started for last years. It was obtained walnut genotypes with high fruit bearing and fruit quality properties by several researchers (Olez, H. 1976; Sen, S.M. 1980; Akca and Sen, 1994; Askin and Gun, 1995; Kuden et al. 1995; Akca and Ayhan, 1996; Akca and Osmanoglu, 1996; Akça and Muratoglu, 1996; Karadeniz and Sahinbas, 1996; Beyhan, 2005; Simsek and Kuden, 2008; Simsek, 2009a; Simsek, 2009b). Similarly, some walnut cultivars like Payne, Corne, Marbot, Parisienne and Sibisel were obtained by means of selection (Germain, 1980; Radicati et al., 1990; Hsu et al., 1969). In addition, these have been grown as standart varieties in several countries up to now.

No studies have been made about walnut trees in Dicle, Hani, Egil and Kocaköy townships of Diyarbakir province and their villages up to now. Therefore, this study is very significant with respect to be beginning about the walnut genotypes in these areas. In this context, it was selected of walnut genotypes with high fruit bearing and fruit quality in this regions. In addition, it was also determined to physical, chemical and phenologic properties of these genotypes. These genotypes may be used in plant breeding being made in future and the physical, chemical and phenologic properties of them may be guidance to the other studies being made with respect to walnut genotypes and cultivars in next years.

2. Materials and Method

This study was carried out during 2004–2005 on walnut population naturally grown in Dicle, Hani, Egil and Kocaköy townships of Diyarbakır province and their villages. 110 walnut genotypes were marked and evaluated from about 800 walnut trees. In this context, 30 fruits were randomly taken from the each walnut tree in each year. After having taken the fruit samples from the genotypes, their husts were peeled and these fruits were dried in a shade for a week. Then, they were dried in a drying chamber at 30°C for 24 hours in order to homogenise their moisture levels (Szentivanyi, 1990; Solar, 1990). According to specifications of these walnut genotypes, ten genotypes were selected via weighted ranked method (Table 1) of Sen (1980). According to the Table 1, it was multiplied weighting factor with cassification point for each property of the genotypes. Then, the scores of all the properties of each genotype were collected. While determining the selected genotypes, flower habits, opening time of male and female flowers, numbers of protogynous, protandrous and homogamous trees were taken into account in 2005. The fruit weight and kernel weight were measured with a scale sensitive to 0.01 g. The fruit height, the fruit length, the fruit width and the fruit thickness of the genotypes were measured by a digital compass. In addition, dry matter was determined by using a 5±0.01 g sample and drying in a thermostat at 105 ^{o}C (24 h) to a constant weight. The moisture was calculated on a dry weight and fresh weight basis. The ash contents of the genotypes were determined by using a ash furnace at 200 ^{o}C with 24 h and then at 600 ^{o}C with 10-12 h. Protein contents of the samples were determined by using kjeldahl method (Jung et al. 2003). The standard method for analyzing the oil content of the samples was made by hexan extraction in a soxhlet extractor (Seung, 1981). The altitudes and coordinates of the genotypes were determined by using GPS tool in 2005.

3. Results and Discussion

3.1. Pomological Characteristics of The Selected Walnut Genotypes

In this research, Dicle, Hani, Egil and Kocaköy townships of Diyarbakır province and their villages thought to be rich in walnut tree population were visited and about 800 walnut trees were observed and the the fruit samples were taken from 110 trees according to their fruit and tree traits in 2004. In 110 walnut genotypes in the same year, 50 genotypes which have less than 9.50 g of the fruit weight, less than 5.00 g of the kernel weight and less than 37.50% of the kernel ratio were eliminated. Afterwards, data regarding some fruit properties were obtained from 60 walnut genotypes in years 2004 and 2005 were given in Table 2.

Table 1. Fuit quality evaluation of the selected walnut genotypes according to the weighted ranked method

Characteristics	Weighting factor (coeficient)	Classifications and Points		Characteristics	Weighting factor (coeficient)	Classifications and Points	
Fruit weight	25	17 g <	25	Kernel ratio	20	50%<	20
		15-17 g	20			45%-50%	15
		<15 g	15			<45%	10
Shell roughness	15	Smooth	15	Peel Color	15	Light	15
		Medium	10			Dark	10
		Roughness	5			Brown	5
Fruit width	5	35 mm<	5	Shell adhesion	5	Weak	5
		30-35 mm	3			Strong	3
Fullness ratio of kernel	5	90%-100%	5	Wholeness ratio of kernel	5	90%-100%	5
		80%-90%	3			80%-90%	3
		<80%	1			<80%	1
Shell thickness	5	<1.2 mm	5				
		1.2 mm-1.5 mm	3				
		1.5 mm <	1				

Table 1 (Cont'd)

Characteristics	Weighting factor (coeficient)	Classifications and Points		Characteristics	Weighting factor (coeficient)	Classifications and Points	
Kernel weight	25	8.0 g <	25	Kernel ratio	20	50%<	20
		7-8 g	20			45%-50%	15
		<7.0 g	15			<45%	10
Inward color	20	Light	20	Shell removal	15	Easy	15
		Dark yellow	15			Medium	10
		Brown	10			Hard	5
Fullness ratio of kernel	5	90%-100%	5	Wholeness ratio of kernel	5	90%-100%	5
		80%-90%	3			80%-90%	3
		<80%	1			<80%	1
Ratio of non-sheriveling kernel	5	90%-100%	5				
		80%-90%	3				
		<80%	1				

Table 2. Some fruit properties of the selected walnut genotypes

PROPERTİES	Means (2004)	Range (min-max) (2004)	Means (2005)	Range (min- max) (2005)
Fruit weight (gr)	12.3	9.55-16.2	12.1	9.7-15.9
Fruit length (mm)	38.5	33.1-42.5	37.9	32.9-46.9
Fruit width (mm)	31.8	28.9-35.4	31.1	27.9-33.9
Fruit height (mm)	32.0	27.7-34.9	31.9	28.5-35.2
Shell thickness (mm)	1.54	1.18-1.86	1.52	1.16-1.86
Kernel weight (gr)	6.10	5.02-7.37	6.07	5.02-7.52
Kernel ratio (%)	50.0	37.5-61.5	50.7	35.2-65.3
Shape index	1.21	1.01-1.36	1.20	1.02-1.40

According to the means in the first year, the fruit weight, the kernel weight, the kernel ratio, the shell thickness, the fruit length, the fruit width, the fruit height and the shape index of selected walnut genotypes were determined to be 12.3 g, 6.10 g, 50.06%, 1.54 mm, 38.5 mm, 31.8 mm, 32.0 mm and 1.21, respectively. In the same year, the min. and max. ranges in these figures were changed between 9.55-16.2 g, 5.02-7.37 g, 37.5-61.5%, 1.18-1.86 mm, 33.1-42.5 mm, 28.9-35.4 mm, 27.7-34.9 mm and 1.01-1.36, respectively. In addition, according to the means in the second year, the fruit weight, the kernel weight, the kernel ratio,

the shell thickness, the fruit length, the fruit width, the fruit height and the shape index of the genotypes were determined to be 12.1 g, 6.07 gr, 50.7%, 1.52 mm, 37.9 mm, 31.1 mm, 31.9 mm and 1.20, respectively. Also, in the second year, the min. and max. ranges in these figures were changed between 9.73-15.9 gr, 5.02-7.52 gr, 35.2-65.3%, 1.16-1.86 mm, 32.9-46.9 mm, 27.9-33.9 mm, 28.5-35.2 mm and 1.02-1.40, respectively. These results were similar to mostly those of Beyhan (2005) and Beyhan and Ozatar (2007). Beyhan (2005) determined that the fruit weight, the kernel weight, the kernel ratio, the shell thickness, the fruit length, the fruit width, the fruit height and the shape index of the genotypes were 14.2 g, 7.45 g, 52.7%, 1.09 mm, 43.0 mm, 35.1 mm and 36.9 mm, respectively. Also, Beyhan (2005) determined that the min. and max. ranges in the figures changed between 11.1–16.0 g, 6.18–9.88 g, 43.4%-67.7%, 0.66–1.33 mm, 39.3-44-5 mm, 32.9-37.2 mm and 34.2-40.2 mm, respectively. According to the means of the walnut genotypes in first year, they determined that the fruit weight, the kernel weight, the kernel ratio, the shell thickness, the fruit length, the fruit width and the fruit height changed 14.7 g, 7.08 g, 49.0%, 1.51 mm, 40.2 mm, 33.8 mm and 34,9 mm, respectively. In addition, they determined that the min. and max. ranges in the figures changed between 10.3–23.1 g, 6.05–10.4 g, 40.00-60.08%, 0.91–1.90 mm, 34.9–50.0 mm, 28.2-40.4 mm and 28.9-40.0 mm.

Pomological properties of the selected walnut genotypes were showed in Table 3.

Table 3. Some pomological properties of the selected walnut genotypes (means of years 2004-2005)

Type no	Fruit Weight (g)	Fruit length (mm)	Fruit width (mm)	Fruit height (mm)	Shell thickness (mm)	Kernel weight (g)	Kernel ratio (%)	Shape index
DC-1	13.5± 0.35	41.6 ±0.46	30.6±0.88	32.6±0.52	1.71± 0.06	7.13±0.25	52.5±0.65	1.32±0.03
DC-14	10.9 ±0.06	34.2 ±0.54	30.4±0.67	30.5±0.18	1.28±0.01	6.26±0.48	57.2±4.24	1.12±0.02
DC-25	15.9±0.27	39.2 ±0.09	32.7±0.46	33.7±0.39	1.64±0.02	6.25±0.28	39.1±2.31	1.18±0.01
EG-12	10.3 ±0.19	34.6 ±0.83	30.6±0.84	29.1±0.61	1.63±0.02	5.62±0.33	54.2±3.78	1.16±0.01
EG-20	11.9 ±0.53	40.1 ±0.61	31.5±0.62	32.6±0.69	1.66±0.02	5.89±0.15	49.4±1.33	1.25± 0.01
EG-33	12.3 ±0.09	45.8 ±0.70	33.1±0.10	34.6±0.50	1.42±0.04	5.87±0.16	47.8±1.74	1.35±0.03
KO-15	12.1 ±0.15	37.6 ±0.88	33.7±0.59	32.8± 0.21	1.57±0.04	6.36±0.31	52.3±2.10	1.13±0.02
KO-16	9.75 ±0.23	38.9 ±0.85	28.9±0.82	29.6±0.69	1.50±0.04	5.24±0.34	53.8±4.39	1.33±0.02
KO-20	13.2 ±0.07	35.6 ±0.47	30.9±0.02	30.6±0.65	1.33±0.04	6.31±0.42	47.5±2.93	1.16±0.03
HA-18	11.8 ±0.39	33.9 ±0.53	32.2±0.62	33.2±0.62	1.56±0.04	5.89±0.17	49.8±3.03	1.04±0.02

Table 3 (Cont'd)

Genotype no	Shell roughness	Internal core status	Ratio of non-Shriveling kernel (%)	Kernel colour	Peel Colour	Shell removal	Shell adhesion
DC-1	Medium	Coreless	90	Light	Light	Easy	Weak
DC-14	Smooth	Coreless	100	Brown	Dark	Easy	Weak
DC-25	Medium	Smooth	90	Brown	Dark	Medium	Strong
EG-12	Smooth	Smooth	100	Light	Light	Easy	Weak
EG-20	Medium	Smooth	90	Light	Dark	Easy	Weak
EG-33	Smooth	Smooth	100	Light	Light	Easy	Weak
KO-15	Smooth	Coreless	90	Light	Light	Easy	Weak
KO-16	Smooth	Smooth	100	Brown	Dark	Easy	Weak
KO-20	Smooth	Coreless	100	Brown	Dark	Easy	Weak
HA-18	Medium	Coreless	90	Light	Dark	Easy	Weak

The fruit weight, the fruit length, the fruit width, the fruit height, the shell thickness, the kernel weight, the kernel ratio and the shape index of the selected walnut genotypes changed between 13.2±0.07-9.7±6.23 g, 45.8±0.70 mm - 33.9±0.53 mm, 33.7±0.59 mm – 28.9±0.82 mm, 34.6±0.50 mm–29.1±0.61 mm, 1.71±0.06 mm - 1.28±0.01 mm, 7.13±0.03-5.62±0.02 g, 57.2±4.24-39.1±2.31% and 1.35±0.03 - 1.04±0.02, respectively. The results in this research were partly different from those of Akça and Sen (2001), Kuden et al. (1995),

Beyhan and Ozatar (2007) and Oguz and Askın (2007). Akça and Sen (2001) determined that the fruit weight, the kernel weight, the shell thickness, the fruit width and the fruit length were changed between 7.49 g - 13.9 g, 2.61 g - 5.73 g, 1.32 - 2.45 mm, 22.3 - 32.2 mm and 32.9 - 49.2 mm, respectively. Kuden et al. (1995) determined that the kernel ratio changed between 51.2 and 56.25% except D-1 (41.4%). Beyhan and Ozatar (2007) determined that the form index changed between 1.03 and 1.52. Oguz and Askın (2007) determined that the fruit height changed between 27.9 and 33.2 mm. The fruit weight, the fruit length, the fruit width, the fruit height, the shell thickness, the kernel weight, the kernel ratio and the shape index of walnut genotypes and cultivars can chance according to properties such as genetic characteristics, the maintenance requirements and the ecolojical conditions.

The shell roughness is one of the most significant criteria for the fruit quality properties. In this study, the shell roughnesses of six genotypes were smooth and four genotypes were medium. The kernel colours of the genotypes were light or brown. The peel colours of the genotypes were light or dark. The internal core status of them were smooth or coreless. The ratio of non-shriveling kernel were 90% or 100%. Shell removal of the genotypes were easy or medium. Shell adhesions of the genotypes were strong or weak. The results in this study were mostly similar to those of Beyhan and Ozatar (2007). They determined to be fair or smoorh of shell roughness, dark or light of peel color, light yellow, yellow, yellow brown and brown of kernel colour and the higher than 90% of internal ratio of non-shriveling of types. In addition, it was determined that all the genotypes had easy shell removal, strong shell adhesion, 0.00% empty fruit ratios, 100% wholeness and fullness ratios of kernel and no internal decayness. Kernel colour and peel colour of walnut genotypes and cultivars can change according to the genetic properties and light density.

3.2. Chemical and Phenological Properties of The Selected Walnut Genotypes

According to the Means values of years 2004-2005, the chemical properties of the selected walnut genotypes were given in Figure 1 and 2. According to the Figure 1, the moisture and the ash ratios of the genotypes were changed between 4.97-1.83% and 2.98-1.76%. According to the Figure 2, the oil ratio of the genotypes were changed between 64.61 and 57.87%. The protein and the other matters ratios also were changed between 20.05-13.76% and 20.29-9.00%. In this research, the results with respect to the protein, the oil, the moisture and the ash contents of the genotypes were mostly similar to the results of Dogan and Akgul (2005) and Oguz and Askın (2007). Dogan and Akgul (2005) determined that the oil contents of the walnut genotypes changed between 65.00 and 70.00%. Oguz and Askın (2007) determined that the protein, the oil, the moisture and the ash contents of the walnut genotypes changed between 12.11-20.75%, 54.07-67.63%, 2.70-3.79% and 1.00-2.22%, respectively. The protein, the oil, the moisture and the ash contents of walnut genotypes and cultivars can change according to the genetic properties, the maintenance requirements and the ecological conditions.

Phenological properties of the selected genotypes were given in Table 4. According to the Table 4, it was determined that first leafing time, the opening time of male and female flowers, the date of the first bud breaking and the time of full flowering, the fruit breaking in the lateral shoots and the harvest time of the selected genotypes were changed between 2-3 April and 5-6 April, 11 April and 18 April, 7 April and 18 April, 5-6 April and 18 April, 12-13 April and 26-27 April, 90-75% and 15-25 September and 1-10 October, respectively. In addition, it was determined that numbers of the protandrous, the protogynous and the homogomous of the selecte genotypes were determined to be 5, 4 and 1, respectively. The results in this study were partly different from the those of Beyhan and Ozatar (2007). They determined that the flowering habits were found to be 58.59% protandrous, 28.30% protogynous and 13.20% homogomous. Many phenological properties of walnut genotypes and cultivars can change according to the genetic characteristics and the climatic conditions. In addition, both flowering properties and dates of them can be determined by altitudes and geographical locations of trees.

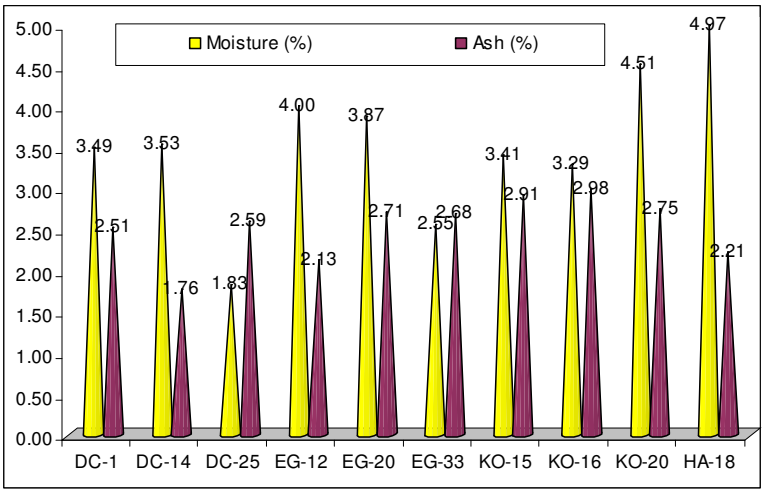

Figure 1. Moisture and ash contents of the selected walnut genotypes

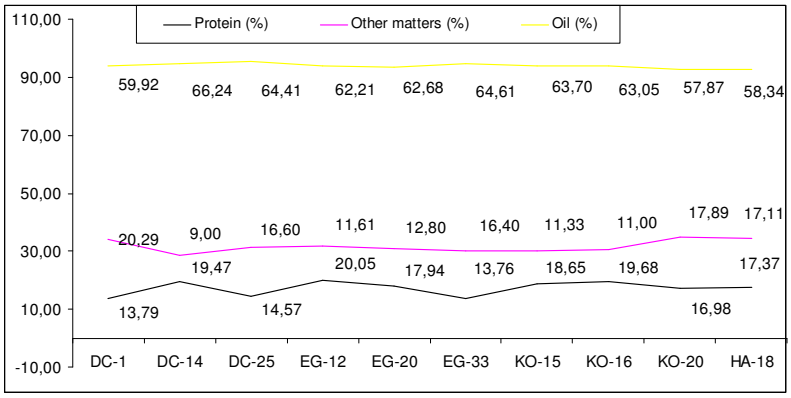

Figure 2. Protein, oil and other matters contents of the selected walnut genotypes

Table 4. Some phenological properties of the selected walnut genotypes in 2005

Genotype no	First leafing time	Flower habit	Opening time of male flowers	Opening time of female flowers	First bud breaking	Time of full flowering	Fruit bearing in the lateral shoots (%)	Harvest time
DC-1	2-3 April	Protandrous	11 April	17 April	14-15 April	21-22 April	90	25-30 September
DC-14	4-5 April	Protogynous	11 April	8 April	5-6 April	13-14 April	75	20-25 September
DC-25	3-4 April	Protogynous	13 April	10 April	8-9 April	15-16 April	80	25-30 September
EG-12	3-4 April	Protandrous	11 April	17 April	14-15 April	22-23 April	80	15-25 September
EG-20	4-5 April	Protandrous	12 April	18 April	15-16 April	23-24 April	90	20-25 September
EG-33	5-6 April	Protogynous	14 April	10 April	8-9 April	16-17 April	75	1-10 October
KO-15	4-5 April	Protogynous	10 April	7 April	6-7 April	12-13 April	90	20-25 September
KO-16	4-5 April	Protandrous	10 April	17 April	13-14 April	21-22 April	88	20-25 September
KO-20	2-3 April	Protandrous	10 April	18 April	14-15 April	20-21 April	90	25-30 September
HA-18	5-6 April	Homogomous	18 April	18 April	18 April	26-27 April	75	15-20 September

3.3. Scores, Botanical Properties, Coordinates and Altitudes of The Selected Walnut Genotypes

Scores, botanical properties coordinates and altitudes of the selected genotypes were shown in Table 5. It was determined that estimated age, branching height and trunk circumferences of the genotypes were changed between 15–70, 180-430 cm and 80-390 cm, respectively. In addition, the tree habits were

determined to be Upright for 2 types, semi-upright for 3 types, dropping for 3 genotypes and spreading for 2 genotypes. Ozatar (1996) determined that ages, the brancing height and the trunk circumference of the walnut genotypes were determined to be 9–35, 104–350 cm and 67–150 cm, respectively. The branching height, the tree habit and the trunk circumference of walnut genotypes and cultivars can chance according to the genetic characteristics, the maintenance requirements and the ecolojical conditions.

In this research, DC-1, DC-14 and DC-25 genotypes were selected from Dicle, EG-12, EG-20 and EG-33 genotypeswere selected from Egil, KO-15, KO-16 and KO-20 genotypes were selected from Kocaköy and HA-18 type also was selected from Hani. The coordinates of DC-1 genotypes were 37595205E-4247043N and the coordinates of HA-18 were 37618283E-4247826N. In addition, according to Figure 3, the altitudes of selected walnut genotypes were changed between 824 m and 895 m. According to the means in the two years, the total scores of walnut with shell and with kernel were changed between 1320–1060 and 1600–1000, respectively. The results of the scores in this research were similar to mostly those of Ozatar (1996). He determined that the total scores of walnut with kernel and shell of the selected genotypes were found to be between 1320–1475, 1070–1290, respectively. Scores of walnut genotypes and cultivars can chance according to the genetic characteristics, the maintenance requirements and the ecolojical conditions.

Table 5. Scores, botanical properties coordinates and altitudes of the selected walnut genotypes

Genotype no	Estimated Age of tree	Branching height (cm)	Tree habit	Trunk Circum ference (cm)	Scores According to quality factors of walnut with shell	Scores according to quality factors walnut with kernel	Coordinate (East)	Coordinate (North)
DC-1	70	410	Dropping	240	1245	1600	37595205	4247043
DC-14	35	430	Upright	150	1255	1275	37595640	4248415
DC-25	35	180	Spreading	125	1085	1000	37595606	4248458
EG-12	60	350	Dropping	390	1320	1475	37594487	4233900
EG-20	50	400	Upright	170	1070	1375	37594795	4232790
EG-33	15	180	Semi-Upright	80	1230	1375	37594863	4234672
KO-15	20	300	Spreading	115	1320	1475	37630273	4240267
KO-16	60	390	Dropping	212	1245	1275	37633380	4239215
KO-20	45	290	Semi-Upright	160	1155	1175	37630313	4240200
HA-18	17	230	Semi-Upright	110	1060	1375	37618283	4247826

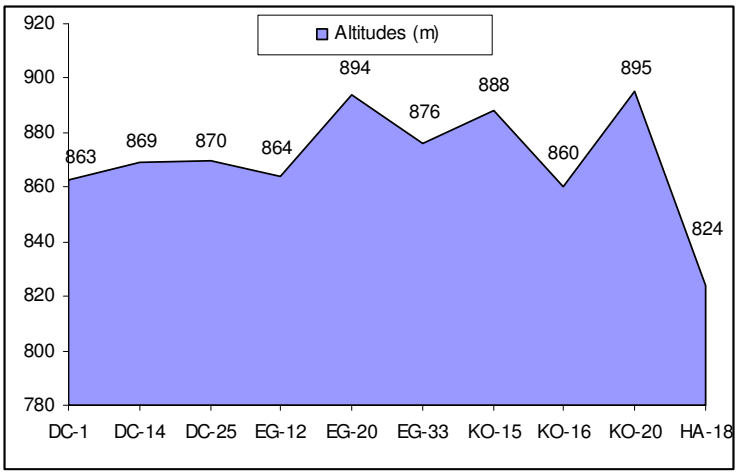

Figure 3. The altitudes of the selected walnut genotypes

4. Conclusions

In the research, the walnut genotypes within seedling population of Dicle, Hani, Egil and Kocaköy districts of Diyarbakir province and their villages were seen their outperform in point of the properties and some important results were been obtained with regard to the pomological properties which had important measures as "selection criteria". This could be explained by the fact that ecological factors do not solely affect the composition of walnuts, genetic factors and horticultural applications might also be responsible for their composition. In addition, these genotypes should be done of their adaptations in the same ecological conditions with standard walnut genotypes and cultivars. Then, as a result of adaptation, superior walnut genotypes and cultivars can produce and may contribute to the economy of our country. As a conclusion, I believe that if the production and growing processes of walnut genotypes with high fruit bearing and fruit quality are controlled scientifically, these results can be much more satisfactory.

References

Anonim, 2007. http://www.tuik.gov.tr/bitkiselapp/bitkisel.zul.

Akca, Y. and Ayhan, C., 1996. Adilcevaz Ceviz (*J. regia* L.) Populasyonu İçinde Genetik Degiskenlik ve Üstün Özellikli Ceviz Tiplerinin Seleksiyonu Üzerinde Bir Araştırma. Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu, Samsun, Turkey: 379 – 387.

Akca, Y. and Muratoglu, F., 1996. Ahlat Ceviz Populasyonu (*J. regia* L.) İçinde Üstün Nitelikli Tiplerin Seleksiyon Yoluyla Islahı Üzerinde Araştırmalar. Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu, Samsun, Turkey: 394 – 401.

Akca, Y. and Osmanoglu, A., 1996. Gevaş Ceviz Populasyonu İçinde Üstün Nitelikli Ceviz Tiplerinin (*J. regia* L.) Seleksiyonu Üzerinde Bir Araştırma. Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu, Samsun, Turkey: 388 – 393.

Akca, Y. and Sen, S.M., 1994. Studies on Selection of Walnut (*J. regia* L.) in Gürün, Turkey, Progress in Temperate Fruit Breeding: 179 – 181.

Aksin, A. and Gun, A., 1995. Çameli ve Bozkurt Cevizlerinin (*J. regia* L.) Seleksiyon Yolu ile Islahı Üzerinde Araştırmalar. Turkiye II. Ulusal Bahçe Bitkileri Kongresi, Adana (Turkey) Cilt I: 461 – 463.

Akca, Y. and Sen, S.M., 2001. Study on The Selection of Superior Walnut Trees in Hizan (Bitlis) Populations. Proc. IV Int. Walnut Symp. Ed. E. Germain, D. Calvi Acta Hort. 544, ISHS 2001.

Akyuz, N. and Kaya, I., 1992. Gıda Kimyası Laboratuarı Ders Notları.Yüzüncü Yıl Üniv. Fen-Edeb. Fak. Kimya Böl., Van.

Beyhan, O., 2005. Darende Cevizlerinin Seleksiyon Yoluyla Islahı Üzerinde Araştırmalar. Sakarya Üniv. Fen Bilimleri Enstitüsü Dergisi, Cilt.9 (1) 35-42, Sakarya.

Beyhan, O. and Ozatar, H.O., 2007. Breeding by Selection of Walnuts (*Juglans regia* L.) in Kahramanmaras. International Journal of Natural and Engineering Sciences 2(3); 93–97, ISSN, 1307–1149.

Dogan, M. and Akgül, A., 2005. Fatty Acid Composition of Some Walnut (*Juglans regia* L.) Cultivars from East Anatolia. Grasasy Aceites 328 Vol. 56. Fasc. 4 (2005), 328-331

Ferna´ndez-lopez, J., Aleta, N. and Ricardo, A., 2003. Walnut (*Juglans regia* L.) Genetic Resources. European Forest Genetic Resources Programme. International Plant Genetic Resources Institute. http://www.ipgri.cgiar.org/networks/euforgen/Networks/Scattered_Broadleaves/NHStrategies/JuglansSppConsStrategy.htm.

Germain, E., 1980. Walnut Production and Industry in Europa. The Middle East and North Afrıca, Nut Productıon and Ind. Near East and North Arr. Reur Tech.Series.13, Mafra Atatürk Cent. Hort. Res. Enst. June.19-22,119-131, Yalova/Turkey.

Germain, E., 1986.Walnut Breeding in France, Survey And Outland Camptes-Rendus- Des-Scances De-Academie Agriculture De France 72:4, 253-301, 9Ref. FRANCE.

Hsu,W.Y., Chu, H.Y. and Hu G.L., 1969 Improved Walnut Varieties for Our Country Obtained By Selection Studies of Superior Indıvidual Plants in Nonpiencheng in The Fenyang District of Shinasi.Pl. Breeding Abs. 39(2),448 (3310).

Jay-Allemand, C., Faby, B. and Becquery, J., 1996. Walnut Trees for Woodland use in Mediterranean Countries: Current Situation and Prospects. FAO NUCIS Newsletter, vol. 5, pp. 10–13.

Jung, S., Rickert, D. A., Deak, N. A., Aldin, E. D., Recknor, J., Johnson, L. A. and Murphy, P. A., 2003. Kjeldahl and Dumas Methods for Determining Protein Contents of Soybean Products, Journal of the American Oil Chemists' Society, Volume 80, Number 12 pp. 1169-1173, DOI: 10.1007/s11746-003-0837-3.

Karadeniz, T. and Sahinbaş, T., 1996. Çatakda Yetiştirilen Cevizlerin (*Juglans regia* L.) Meyve Özellikleri ve Ümitvar Tiplerin Seçimi. In: Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu, Samsun, Turkey, pp. 317–323.

Kuden, A., Kaska, N. and Turemis, N., 1995. Walnut Selection in Middle Taurus Mountains. III. International Walnut Congress, 13 – 16 June, 1995, Alçobaça, Portugal. Acta Hort. 442 :117-119.

McGranahan, G. and Leslie, C., 1990. Walnuts (Juglans). In: Moore, J.N., Balington, J.R. (Eds.), Genetic Resources of Temperate Fruit and Nut Crops, vol. 2. ISHS, Wageningen, The Netherlands, pp. 907–951.

Oguz, H.A. and Askın, A., 2007. Ermenek Yöresi Cevizlerinin (*Juglans regia* L.) Seleksiyon Yoluyla Islahı Üzerine Bir Araştırma. Yüzüncü Yıl Üniv. Ziraat Fakültesi Tarım Bilimleri Dergisi (J. Agric. Sci.), 17(1): 21–28, Van.

Olez, H., 1976. Marmara Bölgesi Cevizlerinin Seleksiyon Yoluyla Islahı Üzerinde Araştırmalar. Bahçe Kültürleri Araştırma ve Eğitim Merkezi Dergisi, 4, (1/4); 7-21, Yalova.

Ozatar, H.O., 1996. Kahramanmaraş Merkez İlçe Cevizlerinin (*Juglans regia* L.) Seleksiyon Yoluyla Islahı Üzerinde Araştırmalar. (Basılmamış Yüksek Lisans Tezi) Kahramanmaraş Sütçü İmam Üniv. Fen Bilimleri Enstitüsü. 60s, Kahramanmaraş.

Radicati, L., Vergano, G. and Zannını, P., 1990, Vegetatıve and Productıve Evaluatıon of 19 Walnut Cultivars in Pıamonte (Italy). Fırst Int. Symp. On Walnut Prod. Acta Hort.Sept. 25-29, Budapeşt/Hungary.

Solar, A., 1990. Phenolgical and Pomological Characteristics of Walnut Cultivars In Northeastern Slovenia First Int. Symp. of Walnut Prod. Acta Hort. Sept.284-293, Budapeşt/Hungary.

Seung, K. L., 1981. Methods for Percent Oil Analysis of Avocado Fruit, California Avocado Society 1981 Yearbook 65: 133-141.

Szentivanyi, P., 1990. Breeding Early Fruiting High Producing Walnut Cultıvars Leafing after Late Spring Frosts. First Int. Symp. of Walnut Prod. Acta Hort. Sept.25-29, Budapeşt/Hungary.

Sen, S.M., 1980. Kuzeydoğu Anadolu ve Doğu Karadeniz Cevizlerinin Seleksiyon Yoluyla Islahı Üzerinde Araştırmalar. Doçentlik tezi, Basılmamış, Atatürk Univ., Erzurum.

Sen, S.M., 1986. Ceviz Yetiştiriciliği. In: Eser Matbaası, Samsun, 229 pp.

Sen, S.M., 1988. Anatolia is A Walnut Garden I. Inter. Cong. On Walnuts. Atatürk Central Hort. Resarch Enst. Sept. 19-23,21-27 Yalova/Turkey.

Sen, S.M., 1998. Production and Economics of Nut Crops Courses Booklets. 18-29 May. Adana.

Simsek, M., 2009a. Evaluation of selected fig genotypes from Southeast Turkey. African Journal of Biotechnology, Vol. 8 (19), PP.4969-4976, 5 October, 2009, ISSN 1664-5315Q2009 Academic Journals.

Simsek, M., 2009b. Fruit performances of the selected fig genotypesin Turkey. African J. of Agricultural Research, Vol. 4 (11), pp. 1260-1267, November, 2009, ISSN 1991-637XQ2009 5315Q2009 Academic Journals.

Simsek, M., A.B. Kuden, 2008. Diyarbakır koşullarında incir genetik materyalinin seleksiyonu ve tanımlanması. Çukurova Üniv. *Fen Bil. Enst. Dergisi,* Cilt 18, Sayı 2, Adana, Türkiye.