Phenotypic Correlation between Some Nurserphelogical Traits among 60 Cultivars and the Genotypes of Almond

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Abstract

This research was carried out for evaluating phenotypic diversity and traits correlation in 60 almond genotypes and cultivars in nursery conditions. After preparation land and the bitter seeds of Shahroud22 genotype as seedling rootstocks planted in the autumn 2005. After the seed germination in the spring of the next year, the results of recorded data in 3rd may of 2006 showed that the planted bitter seeds in the nursery had the 90-95 percent of germination. By the end of July 2006, 60 almond genotypes and cultivars in nursery on the considered rootstocks were propagated by budding. The results of recorded data by the end of October 2006 showed %85-90 graft satisfactory. To simplify the study, we gave the code of A1-A60 to 60 genotypes and the cultivars of the almond. Also, the results of obtained data from 9 main vegetative and physiological characters of 60 cultivars and the genotype of almond experimented in clouding the diameter the trunk from the 5 cm above the place of the graft , the height of the plant , the numbers of the branch on the trunk, the number of the leaves on the branch of the current year , the length of the blade of the leaf , the width of the blade of the leaf , the length of the petiole , the amount of the chlorophyll and the contamination by the bloody aphid, in 2007 showed that among 60the cultivars and the genotypes of almond , there was significant difference in the mentioned traits . The biggest diameter of the trunk from upper than 5 cm , the length of the petiole , the percent of the contamination by the bloody aphid, height of the plant, the numbers of the branches on the plant , the numbers of the leaves on the shoot of the current year , the length of the blade of the leaf , the width of the blade leaf , the amount of the chlorophyll were in the cultivars and the genotypes with A16, A5, A39, A24, A1, A16, A43, A2 and A11, respectively and the least diameter of the trunk upper 5 cm, the length of the petiole, the percentage the contamination by the bloody aphid, the height of the plant , the numbers of the branch on the plant , the numbers of the leaves on the branch in the current year , the length of the blade of the leaf, the width of the blade of the leaf , the amount of chlorophyll were in the cultivars and the genotypes with A46, A16, A9, A44, A56, A7, A44, A38 and A29 were observed, respectively. The correlation of the studied traits in 60the cultivars and the genotypes of almond showed that between the length of the blade of the leaf and the length of its petiole at level ^{p}<0.01, there was the positive and significant correlation (r=0/63), and this correlation was the most correlation between the studied traits in 60the cultivars and genotypes of almond.

Key words: the phenotypic diversity, the correlation of the traits, almond and the nursery.

Introduction

Iran is one of the most important centers of the plantation and the production of almond in the world. In Iran, almond has the relatively good benefits because of the suitable ecological conditions and its resistance to the drought and the calcareous conditions. Also, the trees of almond have the long age about 20-40 years, and they begin to bear fruit since 3-4 years old. So besides the selection of the suitable place of the orchard and its management, we must pay attention to select the suitable cultivar carefully.

The recognition and the evaluation of the genotypes of almond can be base for the future studies and for obtaining the desirable cultivars or the cultivars having the special traits including habit of the desirable growth , the resistance to the coldness or the pest or the diseases (kester *et al.*, 1991).Obtaining the suitable seedling rootstocks and recognizing the cultivars have one or some excellent traits and their usage in the programs of the breeding and the cropping is very important (Kester and Asay, 1975; Grasselly, 1986).

Beside the recognizing and collecting the superior genotypes among the native population (seedling orchards) of almond and also making new hybrids , the evaluation and their comparison along with the important and commercial cultivars to obtain the cultivars with the desirable traits can make the great change in the industry of almond .So ,the study of the reaction of two cultivars of almond named Ferragnes and Tuono along with 50 cultivars and genotypes in the ecological condition of the South Italy showed that the phenological traits and performance of cultivars have been different (Barbera *et al.*, 1994). The study of the reaction of 24 cultivars of the self fertility almond in the ecological condition of the South Eastern of French have showed that among 24 cultivars, two cultivars of Steliette and Lauranne were selected as the best self- compatible cultivars from the point of view of the habit of the growth, the late flowering and the excellent performance (Duval and Grasselly, 1994).

The study of the bioagronomical reaction of 22 famous cultivars of the world in Italy showed that the late flowering cultivars have better efficiency in the years that there was late frost of the spring and the index of the fertility was higher in the cultivars of the self compatible with the adverse conditions of the pollination (Viti and Loreti, 1994).

The study 30 superior genotypes and cultivars in California showed that the cultivars and the genotypes be have differently because of the vegetative traits particularly the habit of the growth (Ledbetter and Palmquist, 2002). The evaluation of the biotic diversity of 88 cultivars and the genotypes of almond in the collection of the university of Bari in Italy showed that the cultivars and genotypes because of the reproductive and vegetative traits have the different characteristics and these diversity indices are very important

in helping to choose of the breeder(De Giorgio and Polignano, 2001).Lansary *et al.* (1994) could obtain the indices to distinguish the present cultivars and the present closes in the collections of almond of California by the analysis of multivarians of the biochemical and the morphological parameters .The study of the history of the search in Iran also shows that some cultivars are better than other cultivars in the experimental conditions , so in the primary study of the native and foreign cultivars in the Station of Sahand after 14 years of studies revealed one native cultivar Sahand and 5 foreign cultivars (Nonpareil , Ne Plus Ultra , Ferragnes, A 200 and A230) and 2 hybrid (Azar and Shokoufeh) as the superior cultivars .Also study of some commercial cultivars in Shahrekurd(Rabie, Mamaie and Sefid cultivars), shahrood (Shahrood 12, 15, 16, 17, 18 and 21) and Karaj [(Genco, Falsa Bares, Philip Ceo, Feragilo, Super nova and Tuono imported from Italy as the self compatible cultivars and Marcona as self incompatible cultivar from Spain) and 35 superior selective genotypes from almond breeding programs in Karaj (specially resistant to the cold)] showed that some cultivars had performance better than other cultivars((Imani *et al*, 2006). But up to now, inside the country about the phenotypical behavior of these almond cultivars in a similar environmental condition of the nursery haven't been performed, because in some of the cultivars of almond, they are used as the suitable seedling rootstock due to the habit of the vertical growth and being the single trunk and good characters other. The aim of this study was to consider the phenotypic behavior and the correlation of the traits of 60 genotypes and the selective cultivars of almond in the similar conditions of nursery.

Materials and Methods

The research works of this study were begun by preparation and the plantation of the bitter seeds of Shahroud22 genotype as rootstock seedlings in the autumn 2005. In this research for the phenotypic diversity, the number of 60 superior genotypes and the cultivars of the almond were studied in a similar environmental condition of the nursery. For this, after providing of the field and its preparation, the bitter seeds were planted in the autumn of 2005 in the nursery to produce the necessary seedling rootstocks. After the seed germination in the spring of the next year, in 3rd May of 2006, percent of germination of planted bitter seeds in the nursery was recorded. By the end of July 2006, 60 almond genotypes and cultivars in nursery on the considered rootstocks were propagated by budding. Percent of graft satisfactory recorded by the end of October 2006. To simplify the study, we gave the code of A1-A60 to 60 genotypes and the cultivars of the almond (Table 5). Also, the results of obtained data from 9 main vegetative and physiological characters of 60 cultivars and the genotypes of almond experimented in clouding the diameter the trunk from the 5 cm above the place of the graft , the height of the plant , the numbers of the branch on the trunk , the number of the leaves on the branch of the current year , the length of the blade of the leaf , the width of the blade of the leaf , the length of the petiole , the amount of the chlorophyll and the contamination by the bloody aphid were recorded in 2007. In order to evaluation of characteristics of 60genotypes and cultivars, 10 samples of plants were used for every genotype and cultivar by3 replication.

The statistical analysis was performed using Microsoft Excel (2007) and SPSS (14.0) Statistical Software.

Results and Discussion

The results of obtained data from 9 main vegetative and physiological characters of 60 cultivars and the genotypes of almond experimented in clouding the diameter the trunk from the 5 cm above the place of the graft , the height of the plant , the numbers of the branch on the plant ,the number of the leaves on the branch of the current year , the length of the blade of the leaf , the width of the blade of the leaf , the length of the petiole , the amount of the chlorophyll , the contamination by the bloody aphid , the color of two end leaves and the color of the tip of the branch were shown in tables 1, 2.3and 4. Also To simplify the study, we gave the code of A1-A60 to 60 genotypes and the cultivars of the almond (Table 5).

Table.1 Analysis variance of deferent traits in 60almond genotypes and cultivars

The source of the variance	Degree of freedom	Mean Square				
		The numbers of the leaves on the shoot of the current year	The length of the blade of the leaf	Width of the blade leaf	Length of the petiole	Bloody aphid
Genotype	59	183.5422	4.8618	1.2518	1.2518	48.6915
Error	120	3.47778	0.3215	0.2922	0.2922	0.0000
Coefficient of the variances		3.2302	7.2210	22.0943	13.1627	0
The source of the variance	Degree of freedom	Mean Square				
		Chlorophyll	Diameter of the trunk	Height of the plant	The numbers of the branches on the plant	
Genotype	59	47.3160	0.1838	35370.324	566.9476	
Error	120	0.0000	0.0328	0.0328	2.5944	
Coefficient of the variances		13.2931	13.8007	3.230	8.2335	

As it was shown in Table 1, there was a significant difference between genotypes and the cultivars of the almond according to the studied traits in the ecological conditions of the nursery. In Table 2, the comparison of the average of the different traits in 60 cultivars and the selective genotype of almond was presented.

Table.2 Mean comparison of traits in 60almond genotypes and cultivars

trait							
2.11 Height of the plant		2.5 Width of the blade leaf(cm)		2.6The length of the blade of the leaf (cm)		2.7 The numbers of the leaves on the shoot of the current year	
Mean	var	Mean	var	Mean	var	Mean	var
135.333a	A24	6.0333 a	A2	10.8333a	A43	75.000 a	A16
130.000b	A40	3.4667b	A3	10.2667ab	A4	74.667a	A40
126.333c	A16	3.4000bc	A4	10.1667abc	A41	68.000b	A50
120.000d	A43	3.3333bcd	A7	10.0000abcd	A3	64.000c	A21
120.000d	A17	3.1000 bcd	A9	9.9333abcde	A4	63.333c	A28
115.667de	A32	3.0333 bcdef	A33	9.8667abcde	A5	62.000c	A26
110.333ef	A30	3.0333 bcdef	A54	9.4333 bcdefg	A54	62.000c	A55
109.667ef	A13	3.0000 bcdefg	A43	9.2000 acdefgh	A45	62.000c	A18
107.667efg	A41	2.9333 bcdefgh	A24	9.2000 acdefgh	A45	58.000d	A17
106.333 efgh	A15	2.9000 bcdefgh	A30	9.1667 cdefgh	A40	57.000de	A2
106.333efgh	A4	2.8333 bcdefghi	A45	9.1667 cdefgh	A14	7.000de	A20
106.333efgh	A20	2.8333 bcdefghi	A58	9.0000 defghij	A2	56.333def	A31
105.775efghi	A49	2.8000 bcdefghij	A5	8.9333 defghij	A32	56.333 def	A3
105.667efghi	A21	2.7667 bcdefghij	A36	8.9333 defghij	A10	5.667defg	A49
105.123efghi	A60	2.7667 bcdefghijk	A52	8.8667 efghij	A33	55.333defgh	A23
104.000fghij	A52	2.7000 bcdefghijk	A10	8.8333 fghij	A6	55.000 defghi	A53
103.333ghijk	A7	2.7000 bcdefghijk	A37	8.6667ghijk	A36	55.000 defghi	A8
102.000ghijkl	A35	2.6000 bcdefghijk	A40	8.6000 ghijkl	A42	54.333 defghij	A30
102.000hgijkl	A2	2.5000 bcdefghijk	A60	8.6000 ghijkl	A21	54.000 defghij	A60
101.333hgijklm	A42	2.5000 bcdefghijk	A15	8.5000 ghijkl	A37	54.000 defghij	A15
101.000hgijklm	A51	2.4667 bcdefghijk	A46	8.4333 ghijklm	A35	53.667 efghij	A13
101.000hgijklm	25	2.4333 bcdefghijk	A42	8.3333 ghijklmn	A9	53.333 fghij	A11
100.667hijklm	A54	2.4333 bcdefghijk	A22	8.3333 ghijklmn	A18	53.000 fghij	A32
100.000hijklm	A6	2.4333 bcdefghijk	A14	8.1667hijklmno	A12	53.000 fghij	A43
98.667ijklmn	A28	2.4000 bcdefghijk	A48	8.1000 ghijklmnop	A46	53.000 fghij	A35
97.667jklmno	A29	2.3667 bcdefghijk	A53	8.1000 hijklmnop	A19	53.000 fghij	A51
97.667jklmno	A3	2.3667 bcdefghijk	A19	8.0667 hijklmnop	A20	52.667 fghij	A4
95.333jklmnop	A55	2.3667 bcdefghijk	A49	8.0333 ijklmnop	A25	52.667 fghij	A9
95.333jklmnop	A31	2.3667 bcdefghijk	A6	7.9333 jklmnopq	A39	2.667 fghij	A25
94.667klmnopq	A5	2.3333 cdefghijk	A35	7.9333 klmnopq	A38	52.333 ghij	A34
94.333klmnopq	A11	2.3333cdefghijk	A51	7.5667 klmnopqr	A23	52.333 ghij	A54
94.333lmnopq	A18	2.3000cdefghijk	A32	7.5000 lmnopqr	A15	.333 ghij	A38
93.667mnopq	A47	2.3000cdefghijk	A21	7.5000 lmnopqr	A48	52.333 ghij	A39
93.000nopqr	A14	2.2667 defghijk	A20	7.5000 lmnopqr	A24	51.667 hij	A29
92.667nopqr	A9	2.2667 defghijk	A25	7.5000 lmnopqr	A53	51.667 hij	A47
92.000opqr	A19	2.2333 defghijk	A1	7.5000 lmnopqr	A58	51.333 ij	A42
92.000opqr	A36	2.2000 efghijk	A11	7.3333lmnopqrs	A1	51.333 ij	A52
91.667opqr	A50	2.1667 efghijk	A56	7.3333 mnopqrs	A49	51.000 jk	A41
91.667opqr	A53	2.1667 efghijk	A12	7.3333 mnopqrs	A47	48.000 lk	A14
91.333opqr	A1	2.1000 efghijk	A59	7.3000 mnopqrs	A16	47.333 lk	A19
90.667pqrs	A34	2.1000 efghijk	A23	7.2333 nopqrs	A27	47.333 lk	A1
90.000opqrst	A26	2.0667 efghijk	A57	7.1667opqrst	A30	47.000mnl	A48
90.000qrstu	A23	2.0667 efghijk	A39	7.0000 pqrst	A26	47.000 mnl	A5
90.000qrstu	A58	2.0667 efghijk	A18	6.9000pqrstu	A55	46.000 mnlo	A37
90.000rstu	A38	2.0333 efghijk	A27	6.8333 pqrsu	A17	45.667 mnop	A59
89.000stuv	A10	2.0333 efghijk	A29	6.8333 pqrstu	A34	45.000 mnlopq	A24
89.000tuv	A59	2.0333 efghijk	A44	6.8000 pqrstu	A11	45.000 mnlopq	A46
88.667uvw	A37	2.0000 efghijk	A31	6.8000 qrstu	A8	44.333 mnopqr	A10
88.333uvw	A45	2.0000 efghijk	A23	6.7667rstu	A51	44.000 mnopqr	A57
88.000uvw	A12	1.9667 fghijk	A34	6.7667rstu	A29	43.667 nopqr	A44
87.333vwx	A46	1.9333 fghijk	A17	6.7333rstu	A31	43.000 opqr	A12
87.333vwx	A57	1.9000ghijk	A26	6.6667rstu	A22	43.000 opqr	A45
86.667vwxyz	A22	1.9000 ghijk	A16	6.5000rstuv	A52	42.667 opqr	A56
86.000wxyz	A39	1.9000 ghijk	A55	6.4333 rstuv	A59	42.333pqr	A36
85.333xyz	A56	1.8667hijk	A13	6.3333stuv	A60	42.333pqr	A6
85.000yz	A8	1.8333 hijk	A47	6.3333 stuv	A50	42.000qr	A58
85.000yz	A48	1.7667ijk	A50	6.0667tuv	A56	42.000 qr	A22
84.000yz	A33	1.7000ijk	A8	5.8333vu	A57	2.000 qr	A27
79.333z	A27	1.6667k	A28	5.6000v	A28	41.000r	A33
75.000z	A44	1.6667k	A38	4.5000w	A44	37.333s	A7

Con.Table.2 Mean comparison of traits in 60almond genotypes and cultivars

traits									
2.10 The numbers of the branches on the plant		**2.1 f chlorophyll level**		**2.2 The numbers aphid on plant**		**2.3 Diameter of the trunk (cm)**		**2.4 Length of the petiole(mm)**	
Mean	var	Mean	var	Mean	var	mean	var	Mean	var
31.67a	A1	27.367a	A11	21.00a	A39	2.3000a	A16	2.6333a	A5
25.00 b	A16	24.600ab	A7	14.00b	A15	2.0333ab	A2	2.4333a	A54
19.67c	A28	23.433bc	A6	12.00c	A12	1.8000bc	A18	2.2667bc	A43
17.67bcd	A50	23.133bc	A59	11.00d	A23	1.7667bcd	A9	2.1667bcd	A33
16.67bcde	A11	22.933 bc	A54	11.00d	A17	1.6867bcd	A32	2.1667bcd	A36
15.00bcdef	A18	19.933dc	A1	11.00d	A34	1.6100cdef	A60	2.0667ecde	A35
15.00 bcdef	A20	19.133de	A10	11.00d	A24	1.5667 cdefg	A8	2.0667 cde	A4
15.00 bcdef	A32	18.733def	A23	10.00e	A11	1.5333 cdefgh	A10	2.0667 cde	A25
14.67 bcdef	A17	18.600def	A44	9.00f	A14	1.5033 cdefghi	A58	2.0333f cde	A2
14.25 bcdef	A29	18.433def	A15	9.00f	A21	1.5000 cdefghi	A4	2.0000 fcdeg	A41
14.11 bcdef	A55	18.300defg	A3	9.00f	A40	1.4633 cdefghij	A56	1.9667 cefdeg	A3
14.00 bcdef	A31	17.700 defgh	A20	9.00f	A16	1.4600 cdefghij	A41	1.9000 cefdegh	A19
13.67 bcdef	A12	17.500 defghi	A16	8.00g	A13	1.4533 cdefghij	A52	1.8667defgih	A7
13.00 bcdef	A40	17.100 defghij	A2	8.00g	A20	1.4400 defghijk	A59	1.8000 defgijh	A45
13.00 bcdef	A26	16.867 defghijk	A39	8.00g	A35	1.4000 efghijkl	A20	1.7667 degfijkh	A42
13.00 bcdef	A36	16.733 defghijk	A27	7.00h	A43	1.3767 efghijkml	A50	1.7667degfijkh	A15
12.56 cdef	A19	16.567 defghijk	A17	7.00h	A41	1.3700 efghijkml	A38	1.7333 degijkh	A18
12.41 cdef	A8	16.100 defghijkl	A47	7.00h	A31	1.3667 efghijkml	A12	1.7000 egfijghkm	A28
12.11 cdef	A13	16.067 defghijkl	A37	6.00i	A25	1.3500 efghijklmn	A55	1.6667 ehgfijgklmn	A6
12.11 cdef	A9	15.967 efghijklm	A60	6.00i	A32	1.3467 efghijklmn	A54	1.6333hgfijgklmno	A40
12.11 cdef	A23	15.867 efghijklm	A4	6.00i	A19	1.3333 efghijklmn	A5	1.6333h gfijgklmno	A37
12.11 cdef	A7	15.867 efghijklm	A12	6.00i	A33	1.3333 efghijklmn	A29	1.6333hgfijgklmno	A48
12.11 cdef	A48	15.800 efghijklm	A49	5.00j	A10	1.3233 fghijklmn	A53	1.6333hgfijgklmno	A8
12.00 cdef	A49	15.767 efghijklm	A14	5.00j	A38	1.3200 fghijklmn	A36	1.6333hfijgklmno	A9
11.67 cdef	A22	15.733 efghijklm	A29	5.00j	A22	1.3100 fghijklmn	A40	1.6000hfijgklmno	A52
11.00 cdef	A53	15.667 efghijklm	A50	5.00j	A18	1.3033 fghijklmn	A57	1.5333hijklmnoqp	A16
10.33 cdef	A21	15.567 efghijklm	A8	5.00j	A48	1.3000 fghijklmn	A24	1.5333hijklmnoqp	A53
10.00 cdef	A52	15.567 efghijklm	A51	5.00j	A36	1.3000 fghijklmn	A43	1.5000hijklmnoqpr	A39
10.00 cdef	A14	15.533 efghijklm	A26	5.00j	A42	1.2933 fghijklmn	A33	1.4667 ijklmnoqprs	A13
10.00 cdef	A60	15.500 efghijklm	A34	5.00j	A7	1.2900 fghijklmn	A31	1.4667 ijklmnoqprs	A20
9.67 cdef	A51	15.133 efghijklm	A13	5.00j	A29	1.2700 fghijklmn	A48	1.4667 ijklmnoqprs	A12
9.33 cdef	A6	14.933 fghijklmn	A40	5.00j	A50	1.2667 fghijklmn	A3	1.4333 jklmnoqprs	A55
9.00 cdef	A34	14.900 fghijklmn	A43	4.00k	A3	1.2667 fghijklmn	A13	1.4333 jklmnoqprs	A32
9.00 cde	A4	14.733 fghijklmno	A48	4.00k	A46	1.2667 fghijklmn	A17	1.4333jklmnoqprs	A30
9.00 cdef	A42	14.300 ghijklmnop	A9	4.00k	A49	1.2667 fghijklmn	A14	1.4333 jklmnoqprs	A10
9.00 cdef	A5	14.100 hijklmnopq	A30	3.00l	A37	1.2333 ghijklmn	A7	1.4000 jklmnoqprst	A22
9.00 cdef	A3	13.800 hijklmnopqr	A5	3.00l	A53	1.2300 ghijklmn	A35	1.4000 jklmnoqprst	A38
8.33 cdef	A41	13.433 ijklmnopqr	A21	3.00l	A45	1.2167 ghijklmno	A51	1.3667 klmnoqprst	A29
8.33 cdef	A15	13.267jklmnopqrs	A18	3.00l	A8	1.2067 ghijklmno	A30	1.3667 klmnoqprst	A31
8.00 def	A58	12.867 klmnopqrs	A33	3.00l	A27	1.2067 ghijklno	A45	1.3667 klmnoqprst	A21
8.00 def	A59	12.833klmnopqrs	A42	3.00l	A60	1.2033 ghijklno	A6	1.3333lmnoqprst	A60
8.00 def	A27	12.467 lmnopqrst	A36	3.00l	A54	1.2000 ghijklmno	A19	1.3333lmnoqprst	A1
8.00 def	A57	12.433 lmnopqrst	A46	3.00l	A58	1.2000 ghijklmno	A49	1.3333 lmnoqprst	A27
8.00 def	A54	12.333lmnopqrst	A57	2.00m	A44	1.2000 ghijklno	A21	1.3000 mnoqprst	A51
8.00 def	A33	12.200 lmnopqrst	A52	2.00m	A28	1.1767 hijklmno	A47	1.3000mnoqprst	A23
7.33 def	A30	12.167 lmnopqrst	A22	2.00m	A30	1.1667 hijklmno	A11	1.2667noqprst	A11
7.00 def	A45	12.067lmnopqrst	A31	2.00m	A51	1.1667 hijklmno	A1	1.2667noqprst	A49
7.00 def	A24	12.033 lmnopqrst	A25	2.00m	A2	1.1367 ijklmno	A34	1.2667 noqprst	A56
7.00 def	A47	11.900 mnopqrst	A38	2.00m	A59	1.1333 ijklmno	A22	1.2333 oqprst	A14
7.00 def	A35	11.100 nopqrst	A53	2.00m	A52	1.1333 ijklmno	A27	1.2333oqprst	A47
700 def	A38	10.767opqrst	A55	2.00m	A56	1.1333hijklmno	A23	1.2333oqprst	A34
6.00 ef	A10	10.667 pqrstu	A19	2.00m	A6	1.1000 jklmno	A26	1.2000 qprst	A46
5.00 ef	A44	10.567 pqrstu	A41	1.00n	A5	1.1000jklmno	A15	1.1667 qrst	A24
5.00 ef	A2	10.233 qrstu	A35	1.00n	A47	1.0967jklmno	A44	1.1667 qrst	A17
5.00 ef	A39	10.100 qrstu	A28	0.00o	A57	1.0667 klmno	A25	1.1333 qrst	A57
5.00 ef	A43	9.933 rstu	A58	0.00o	A26	1.0567lmno	A37	1.1000 st	A26
4.00 ef	A37	9.300stu	A56	0.00o	A1	1.0133mno	A42	1.0667 st	A59
4.00 ef	A25	8.800tu	A45	0.00o	A4	1.0122no	A28	1.0000t	A44
3.67 ef	A46	8.533tu	A32	0.00o	A55	1.0033o	A39	1.0000t	A50
3.67 ef	A56	7.13U	A29	0.00o	A9	1.0000o	A46	1.0000t	A16

As it was shown in Table2, the biggest diameter of the trunk from upper than 5 cm , the length of the petiole , the percent of the contamination by the bloody aphid, height of the plant, the numbers of the branches on the plant , the numbers of the leaves on the shoot of the current year , the length of the blade of the leaf , the width of the blade leaf , the amount of the chlorophyll were in the cultivars and the genotypes with A16, A5, A39, A24, A1, A16, A43, A2 and A11, respectively and the least diameter of the trunk upper 5 cm, the length of the petiole, the percentage the contamination by the bloody aphid, the height of the plant , the numbers of the branch on the plant , the numbers of the leaves on the branch in the current year , the length of the blade of the leaf, the width of the blade of the leaf , the amount of chlorophyll were in the cultivars and the genotypes with A46, A16, A9, A44, A56, A7, A44, A38 and A29 were observed, respectively.

The results of the correlation of the studied traits in 60 cultivars and genotypes of almond have been shown in Table3 that between the length of the blade of the leaf and the length of its petiole at level $p<0.01$, there was the positive and significant correlation (r=0/63), and this correlation was the most correlation between the studied traits in 60 the cultivar and genotype of almond. Also the correlation of between the length of the leaf and its width of the leaf was positive (%49.15) that showed important leaf and its area in increasing assimilation in fruit, because of most almonds with larger leaves have bigger fruits (Kester and Gradziel, 1996; Ledbetter and Palmquist, 2002; De Giorgio and Polignano, 2004).

The studied traits in 60 cultivars and the selective genotypes of almond base on the minimum, maximum, the deviation of the standard, the mean, and their index of diversity has bean presented in Table 4.

Table 3 The traits correlation among studied 60almond genotypes and cultivars in nursery condition

Trait	The diameter of the plant (cm)	The height of the plant (cm)	The numbers of the branch on the plant	The numbers of the leaves on the current year branch	The length of the blade of the leaf (cm)	The width of the blade of the leaf (cm)	The length of the petiole (cm)	The amount of chlorophyll	The numbers of the bloody aphids
The diameter of the plant (cm)	1.00000								
The height of the plant (cm)	0.03517ns	1.00000							
The numbers of the branch on the the plant	0.15680*	-0.01938 ns	1.00000						
The numbers of the leaves on the current year branch	0.24632**	-0.01047 ns	0.25747**	1.00000					
The length of the blade of the leaf (cm)	0.11000 ns	-0.06225 ns	-0.15427*	-0.06225 ns	1.00000				
The width of the blade of the leaf (cm)	0.25500**	0.10418*	-0.17927*	-0.12789 ns	0.49152**	1.00000			
The length of the petiole (cm)	0.13680 ns	-0.07787 ns	-0.14359*	-0.07787 ns	0.63844**	0.41464**	1.00000		
The amount of chlorophyll	-0.03916 ns	-0.05348 ns	0.07557 ns	-0.02776 ns	0.04252 ns	0.07547 ns	-0.08756 ns	1.00000	
The numbers of the bloody aphids	-0.15101*	0.21785**	-0.02867 ns	0.15390*	0.11151 *	-0.13708 ns	-0.05813 ns	0.10442*	1.00000

**: significant (at level p<0.01); * significant (at level p<0.05); ns: no significant

Table.4 Minimum, maximum, standard deviation, mean, diversity index of traits in 60almond genotypes and cultivars

Dependent variable	Number of observations	Minimum	Maximum	Standard deviation	Mean	Diversity index (%)
Diameter of the trunk (cm)	180	0.81	2.60	0.28	1.31	21.37
The height of the plant (cm)	180	62.00	166.00	13.02	97.22	13.39
The numbers of the branch on the plant	180	0	51.00	14.29	18.29	78.13
The numbers of the branches on the plant	180	35.00	76.00	7.92	51.83	15.78
Length of the petiole(mm)	180	3.50	11.20	1.34	7.85	17.07
The width of the blade of the leaf (cm)	180	1.50	4.20	0.78	2.44	31.96
The length of the petiole (mm)	180	0.80	3.00	0.39	1.56	25
chlorophyll level	180	6.50	29.50	4.27	15.10	28.27
The numbers of aphid on plan	180	0. 00	21.00	4.00	5.20	76.92

As in table 4 has been shown, the highest and lowest deviation of standard were the numbers of the branch on the plant (14.29) and diameter of the trunk (0.28). In table 4, diversity index can be important to help the breeder selection. The highest and lowest diversity index relate to the numbers of the branch on the plant (%78.13) and diameter of the trunk (%21.37).

These results concord with other results from phenotypic diversity investigation of almond cultivars and genotypes in California (Ledbetter and Palmquist , 2002), bio diversity of 80 almond cultivars in Italy (De Giorgio and Polignano, 2004). Anyway, these diversity indexes can help to breeder selection in areas of heredity studies and molecular markers. Lansari, *et al.*, (1994),using morphological variation within collections of Moroccan almond clones and Mediterranean and North American cultivars; Kodak and Socias i company (2005) phenotypic correlation between some agrochemical traits of the almond kernel and Daneshvar and Sardabi (2006) variation of flowering period among 60 almond genotypes obtained the indexes for distinguishing of almond cultivars and genotypes. The results of present research obtained indexes and different habitats of growth in various almond cultivars and genotypes in nursery conditions

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Table.5 Codes of 60almond genotypes and cultivars

code	Var./geno.	code	Var./geno.	code	Var./geno.
A1	K-6-8	A21	Shahrood13	A41	K7-17
A2	K-4-6	A22	K-14-a4	A42	K-10-11
A3	K-5-27	A23	K-11-10	A43	Flipe Ceo
A4	K-2-34	A24	K-16-30	A44	K-5-13-2
A5	K-4-14	A25	Shahrood16	A45	K-4-7
A6	K-1-21	A26	Shahrood21	A46	Falsa Bares
A7	K-1-32	A27	K-10-2	A47	Genco
A8	D-101	A28	ﻳﺎﻻ9	A48	Fragilo
A9	K-16-25	A29	8-a34	A49	tuono
A10	K-8-4	A30	Shahrood8	A50	Marcona
A11	K-13-1	A31	K-9-2	A51	Supernova
A12	K-16-8	A32	K-9-24	A52	Mamaie
A13	K-15-5	A33	Shahrood15	A53	Rabie
A14	K-14-7	A34	K-9-20	A54	Sifid
A15	K-8	A35	K-11-8	A55	Azar
A16	K-13-22	A36	K-10-14	A56	Nonpareil
A17	K-16-23	A37	K-10-16	A57	Sahand
A18	K-11-9	A38	K-9-36-32	A58	A-230
A19	K-13-40	A39	Shahrood12	A59	Shekofeh
A20	K-9-7	A40	K-9-37	A60	A-200

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