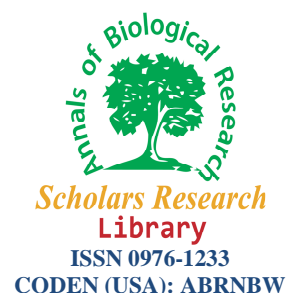




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## Identify of some Iranian apricot with fruit morphological markers (Fruit characteristics)

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### ABSTRACT

In this research thirty seven fruit morphological characters were studied in twenty apricot genotypes. To identify of any cultivars, international descriptor was used [24]. Morphological characters as follows : **Fruit** : Size , Shape in lateral view , Shape in ventral view , Height ,Lateral width , Ventral width , Ratio height/ventral width , Ratio lateral width/ventral width ,Symmetry in ventral view , Suture depth of stalk cavity , Shape of apex , Present of macro , Surface , Pubescence , Glossiness , Ground color , Relative area of over color , Hue of over color , Intensity of over color , Pattern of over color , Color of flesh , Texture of flesh , Firmness of flesh , Ratio weight of fruit /weight of stone , Adherence of stone to flesh , Weight , Volume , PH , Pressure tester ,Carbohydrate , Time of beginning flowering , Time of beginning of fruit ripening .**Kernel** : Shape in lateral view , Bitterness , Weight , Volume .Cultivars names as follows : BN-KB 21 , BN-HS 524 , BN-RE527 , Jahangiri , Shahrood 49 , Shahrood 15 , Shahrood 48 , BN-KB 29 , BN-KB 576 , Shahrood 48 A , BN-KB 31 , Azghandi , BN-NO 512 , BN – KB 7 , Shahrood 31 , BN- SH 723 , Royal , Shahrood 18 , BN-KB 40 , BN-KB 24 . As a result : The differences between fruit morphological characters in almost cultivars were significant and can be used to distinguish of this cultivars .

**Key words** : Apricot , Characters , Fruit, Morphological markers , UPOV

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### INTRODUCTION

Apricot (*prunus armeniaca*) has an important place in health and nutrition of human and it is used as fresh , dried or processed fruit . Information regarding dimensional attributes is used in describing fruit shape which is often necessary in horticultural researches for a range of differing purposes including cultivar description in application for plant variety rights or cultivar registers [22]. Morphological traits of apricot fruit are used to describe and identify cultivars [25]. Studying the relevant characteristics of distinct species pomological/botanical varieties are more important for breeding and other particular classification purposes [3,6]. Many studies were reported about properties of physical and mechanical in apricot fruit that were used in classification [14,11,18]. tabatabaeefar and rajabipour characterised morphological properties of apricot kernels in Budapest university[23] . physical characteristics of apricot are the most important parameters to determine the proper standards of design of grading , conveying processing ,and packaging systems. Felfoldi , used quantitative shape characterisations of fruits and vegetables for evaluation of cultivars [13]. Among these physical characteristics ,mass ,volume and projected area are the most important ones in determining sizing systems [17] . Bayram studied some morphological and pomological characteristics in some apricot germplasts in Turkey [7] . Akca studied fruit characteristics in turkish cultivars of dried apricot[1] . Gezer

studied some physical properties of apricots pit (hacihaliloglu) and its kernel [14]. Nyeki, J studied some morphological and phenological properties in apricot fruit [20]. Morphological characters in studying are base on international descriptive [24]. This information can be used for distinguishing cultivars. Gitonga .et al used leaf and fruit morphology characters to distinguish of apricot cultivars [15]. Fathollahzadeh, H.et al studied some physical properties of apricot pit[12]. Evica Mratinic et al studied some parameters of yield and morphological fruit and stone properties in apricot [10]. OKUT, H.et al studied relations between fruit weight and fruit characteristics with using a path analysis [21]. Cilingir, I. Et al studied some technical properties such as surface area, projected area, mass and dimensions of some apricot varieties that were cultivated in Malatya region and determined relations between these properties [9]. Ledbetter, C.et al evaluated some fruit quality of apricot cultivars [16]. Anonymous analysed some of morphological, pomological and yield characteristics of some apricot germplasm in Turkey [2]. Bircan.M and et al determined some pomological properties of apricots grown in Mediterranean region for export [8]. Mirzaee. E and et al evaluated some fruit physical properties of apricot[19]. Arzani, k and et al used fruit volume and fresh weight of apricot for classification [4].

### MATERIALS AND METHODS

This research was carried out in seed and plant improvement research institute of Karaj, Iran. The average of annual temperature in this area is 13.8 °C. Maximum of annual temperature is 26 °C on juley. Minimum of annual temperature is -12 °C on january. The highest temperature was 42 °C since thirthy years ago. The lowest temperature was -12 °C since thirthy years old. Annual rain average is 260 millimeter. The lowest annual rain is 100 millimeter on april. twenty genotypes were evaluated. thirty seven characters on fruit were studied. All cultivars were Iran native including : BN-KB 21, BN-HS 524, BN-RE527, Jahangiri, Shahrood 49, Shahrood 15, Shahrood 48, BN-KB 29, BN-KB 576, Shahrood 48 A, BN-KB 31, Azghandi, BN-NO 512, BN – KB 7, Shahrood 31, BN- SH 723, Royal, Shahrood 18, BN-KB 40, BN-KB 24. This genotypes were six years old. Ten fruits at any genotypes were collected, rondom from spring until summer. Characters were evaluated, base on international descriptor [24] as follow : **Fruit** : Size, Shape in lateral view, Shape in ventral view, Height, Lateral width, Ventral width, Ratio height/ventral width, Ratio lateral width/ventral width, Symmetry in ventral view, Suture depth of stalk cavity, Shape of apex, Present of macro, Surface, Pubescence, Glossiness, Ground color, Relative area of over color, Hue of over color, Intensity of over color, Pattern of over color, Color of flesh, Texture of flesh, Firmness of flesh, Ratio weight of fruit /weight of stone, Adherence of stone to flesh, Weight, Volume, PH, Pressure tester, Carbohydrate, Time of beginning flowering, Time of beginning of fruit ripening. **Kernel** : Shape in lateral view, Bitterness, Weight, Volume. Some characters were measured by “kolis” for example fruit height. Some characters were measured by “scale” for example weight of fruit and some others were evaluated by visual view base on UPOV [24] for example “pattern of over color” and some characters were measured by special instrument for example ph was measured by ph tester or suger was measured by suger tester.

## RESULTS AND DISCUSSION

Data were subjected to analysis of variance (ANOVA) procedures and Mean value of the characters, were determined. results were processed in the statistic program SPSS. One of aims in this research is to develop quantitative methods for description of apricot cultivars.

Table 1 : Fruit characters

Character	unit	Mean	Min	Max
size	milimeter	6.36	4	8.4
shape in lateral view	coding	2.7	1	8
shape in ventral view	coding	2.97	2	5
-Height	milimeter	39.76	31.11	49.72
- lateral width -	coding	35.76	27.15	43.53
-ventral width	coding	33.79	27.42	39
-ratio height/ventral width	milimeter	5.62	5	7
ratio lateral width/ventral width	milimeter	5.26	5	7
-symmetry in ventral view	milimeter	3.7	1	6
- suture	milimeter	2.37	1.2	3
depth of stalk cavity	milimeter	5.11	3.1	6
shape of apex	coding	2.01	1	3
- present of macro	coding	4.77	1	9
-surface	coding	1.05	1	1.5
- pubescence	coding	1.76	1	5
- gloss	coding	1.80	1	2.4
- ground color	coding	3.37	2	4
- relative area of over color	coding	4.36	2.6	5.8
- pattern of over color	coding	1.91	1	5
- intensity of over color	coding	4.82	4	6
- color of flesh	coding	3.02	1	6
- texture of flesh	coding	1.76	1	3.5
- firmness of flesh coding	coding	3.88	2	7
- adherence of stone to flesh	coding	1.36	1	3
Shape in lateral (kernel)	coding	2.96	2	3.3
Bitterness kernel	coding	1.04	1	2
-time of beginning of fruit ripening	coding	5.92	4	8
Fruit weigh	gr	31.04	14.19	50.92
Stone weight	gr	10.7	1.01	179
Stone volume	mm3	2.61	1.5	4.2
Fruit volume	mm3	33.09	13.5	52.1
-PH	--	4.60	3.5	5.4
Suger	percent	17.21	9.9	25.2
-pressure tester	----	29.51	4.9	44.4

Table 6 : characters mean in apricot fruit

Genotypes	Size	Shape in lateral view	Shape in ventral view	Height	Lateral width
BN-KB 21	8	2	4	48.47	43.53
BN-HS524	5	2	2	34.88	32.88
BN-RE527	6.8	2	2	43.87	33.64
Jahangiri	5	2	2	37.73	29.9
Shahrood 49	7	2.5	2.5	42.67	37.53
Shahrood 15	8	6	4.5	40	38.96
Shahrood 48	6	1.5	2	43.48	34.28
BN-KB 29	6	5	5	39.23	38.32
BN-KB 576	7	1	2	49.72	37.79
Shahrood 48 A	3.2	2	2	28.64	27.15
BN-KB 31	5	2	2	31.11	35.8
Azghandi	7	1.5	5	41.5	38.8
BN- NO512	5	2	2	34.51	29.94
BN-KB 7	7	4	4	37.34	34.99
Shahrood 31	4	3.5	3.5	34.59	30.01
BN-HS 723	7	1.5	2	45.35	35.58
ROYAL	7	3.5	5	33.42	32.64
Shahrood18	7.5	1.7	2	46.19	39.64
BN-KB40	7	2	5	41.17	41.38
BN-KB24	7.8	2	2	38.37	38.46

Genotypes	Ventral width	Ratio height/ ventral width	Ratio lateral width/ ventral	Symmetry in ventral view	Suture
BN-KB 21	38.97	6	6	1.7	2.1
BN-HS524	32.64	5	5	2.5	2.8
BN-RE527	33.25	6	5	1.5	2.5
Jahangiri	27.96	6	5	2.3	2.9
Shahrood 49	32.61	6.6	5	2	2.6
Shahrood 15	35.64	5	5	2	4
Shahrood 48	35.23	6	6	1.4	1.9
BN-KB 29	38.61	5	5	2	2.8
BN-KB 576	35.57	7	7	1.2	2
Shahrood 48 A	27.75	5.2	5	5	2.2
BN-KB 31	27.42	5	5	5	3
Azghandi	38.83	5	5	5	2.3
BN- NO512	28.17	7	5	5	2.6
BN-KB 7	34.46	5	5	5	2.7
Shahrood 31	30.64	5	5	5	2
BN-HS 723	33.86	7	6	6	2.5
ROYAL	31.96	5	5	5	2.5
Shahrood18	36.56	6.6	5.6	5.6	2.4
BN-KB40	39	5	5	5	2.4
BN-KB24	33.93	3.1	5		1.2

Genotypes	Depth of stalk cavity	shape of apex	Presen macro	Surface	Pubescence	Glossiness
BN-KB 21	5.8	2	3	1	7	50.92
BN-HS524	6	1	3	1	8	24.57
BN-RE527	6	1	3	1	7	29.47
Jahangiri	5	1	3	1	6	21.5
Shahrood 49	6	1	3	1	6	40
Shahrood 15		1	2	1	5	35.79
Shahrood 48	5.6	1.4	3	1	6	31.49
BN-KB 29	5	1	3	1	7	30.33
BN-KB 576	3.1	1.7	3	1	5	40.19
Shahrood 48 A	5.4	1.2	3.3	1	4	14.19
BN-KB 31	5	3	3	1	5	15.37
Azghandi	5.4	1.3	3	1	5	41.18
BN- NO512	5	1	3	1	5	18.94
BN-KB 7	5	1.8	3	1	6	28.67
Shahrood 31	5	1	3	2	6	19.76
BN-HS 723	6	1.6	3	1	6	33.64
ROYAL	5	1	3	1	7	22.36
Shahrood 18	5	1.4	3	1	6	40.39
BN-KB 40	3.8	1.8	3	1	5	40.21
BN-KB 24	5.3	1	3	1	7	32.51

Genotypes	Ground color	Relative area of over color	Pattern of over color	Intensity of over color	Color of flesh	Texture of flesh
BN-KB 21	3.36	3.8	47.4	4.47	13.7	16.2
BN-HS524	1.17	2	25.9	4.45	21	44.2
BN-RE527	1.17	2	25.9	4.45	21	44.2
Jahangiri	1.33	2.2	25.8	4.52	25.2	20.3
Shahrood49	2.06	3.1	52.1	4.53	19.9	44.4
Shahrood15	2.65	4.2	37.8	4.77	14.6	42.9
Shahrood48	1.62	2.8	37.8	4.65	17.9	33.5
BN-KB 29	2.14	2.3	24.9	4.78	21.1	24.2
BN-KB 576	1.7	3.2	44.2	3.52	13.2	28.6
Shahrood 48 A	1.71	2.4	13.5	3.67	11.8	33.7
BN-KB 31	1.35	2.2	12	3.76	21.4	36.4
Azghandi	2.84	2.9	39.9	4.92	15	4.9
BN- NO512	1.49	2	22.7	5.26	19.99	27.8
BN-KB 7	1.35	2.1	30.2	5.26	15.6	37.4
Shahrood31	1.64	2.2	22	4.83	19.5	38.7
BN-HS 723	1.44	2.4	33.9	4.58	16.2	28.6
ROYAL	1.01	1.5	27.3	5.26	21.7	30
Shahrood18	2.54	3.3	43	4.58	15	30.7
BN-KB 40	3.34	3.1	41.3	4.5	15.6	20
BN-KB 24	179	2	35.2	5.4	9.9	27.8

Genotype	Firmness of flesh	Adherence of stone to fles	Shape in lateral (kernel)	Bitterness	Time of beginning of fruit ripening	Fruit weigh	Stone weight
BN-KB21	4	2	3	1	7	50.92	3.36
BN-HS524	4	1	3	1	8	24.57	1.17
BN-RE527	3	1	3	1	7	29.47	1.58
Jahangiri	4	1	3	1	6	21.5	1.33
Shahrood 49	5	1	3	1	6	40	2.06
Shahrood 15	5	1	2	1	5	35.79	2.65
Shahrood 48	2.6	1.4	3	1	6	31.49	1.62
BN-KB 29	4	1	3	1	7	30.33	2.14
BN-KB 576	2	1.7	3	1	5	40.19	1.7
Shahrood 48 A	3.6	1.2	3.3	1	4	14.19	1.71
BN-KB 31	7	3	3	1	5	15.37	1.35
Azghandi	3	1.3	3	1	5	41.18	2.84
BN- NO512	3.4	1	3	1	5	18.94	1.49
BN-KB 7	4	1.8	3	1	6	28.67	1.35
Shahrood 31	3	1	3	2	6	19.76	1.64
BN-HS 723	4	1.6	3	1	6	33.64	1.44
ROYAL	3	1	3	1	7	22.36	1.01
Shahrood 18	5	1.4	3	1	6	40.39	2.54
BN-KB 40	4	1.8	3	1	5	40.21	3.34
BN-KB 24	3	1	3	1	7	32.51	1.79

Genotype	Stone volume	Fruit volume	PH	Tss (suger)	Pressure tester
BN-KB 21	3.8	47.4	4.47	13.7	16.2
BN-HS524	2	25.9	4.45	21	44.2
BN-RE527	2	35	4.39	18	18.8
Jahangiri	2.2	25.8	4.52	25.2	20.3
Shahrood 49	3.1	52.1	4.53	19.9	44.4
Shahrood 15	4.2	37.8	4.77	14.6	42.9
Shahrood 48	2.8	37.8	4.65	17.9	33.5
BN-KB 29	2.3	24.9	4.78	21.1	24.2
BN-KB 576	3.2	44.2	3.52	13.2	28.6
Shahrood 48 A	2.4	13.5	3.67	11.8	33.7
BN-KB 31	2.2	12	3.76	21.4	36.4
Azghandi	2.9	39.9	4.92	15	4.9
BN- NO512	2	22.7	5.26	19.99	27.8
BN-KB 7	2.1	30.2	5.26	15.6	37.4
Shahrood31	2.2	22	4.83	19.5	38.7
BN-HS 723	2.4	33.9	4.58	16.2	28.6
ROYAL	1.5	27.3	5.26	21.7	30
Shahrood 18	3.3	43	4.58	15	30.7
BN-KB 40	3.1	41.3	4.5	15.6	20
BN-KB 24	2	35.2	5.4	9.9	27.8

### CONCLUSION

There was a significant difference between cultivars. The different between leaf morphological characters can will be used to distinguish of cultivars in this Iran Apricot cultivars and almost qualitative and quantitative characters will be applied as morphological markers for other genetic analysis. Some fruit characters are not different between cultivars and cannot will be used to distinguish of cultivars in this genotypes including: Ratio lateral width/ ventral width, Present of macro, Surface, Kernel shape and bitter of kernel.

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