# Study of some Iranian apricot with leaf morphological markers (leaf characteristics)

**[1]Reza Kamrani and [2]Naser Bouzari**

[1]*Islamic Azad University, Bam Branch, Iran*
[2]*Stone Fruit Research Group Seed and Plant Improvement Research Institute of Karaj, Mahdasht Road, Karaj, Iran*

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## ABSTRACT

*This research was done at seed and plant improvement research institute of Karaj . Iran . In this experiment " Rondom Complet Block " designe with four replications was used , and seventeen leaf characters on twenty of Iran apricot cultivars were studied .The aim of this research was to develop quantitative methods for description of the apricot cultivars . Morphological characters Including : Leaf Blade : (Length , Width , Ratio length/width , Intensity of green colour of upper side , Shape of base , Angle of apex ,Length of tip , Incisions of margin , Undulation of margin , Profile in cross section , Chlorophyll ) .Petiole : ( Length , Ratio length of blade/length of petiole , Thickness , Anthocyanin colouration of upperside , Predominant number of Nectaris ) .Weight of ten leaves . The name of cultivars as follows :BN-KB 21 , , BN-HS 524 , BN-RE527 , Jahangiri , Sharod 49 , Sharod 15 , Sharod 48 , BN-KB 29 , BN-KB 576 , Sharod 48 A , BN-KB 31 , Azgadi , BN-NO 512 , BN – KB 7, Sharod 31 , BN- SH 723 , Royal , Sharod 18 , BN-KB 40 , BN-KB 24 . As a result :The difference between cultivars is significant and the difference between leaf morphological characters will be used to distinguish of cultivars in Iran Apricots .*

**Key words:** Apricot, Charecters, Leaf, Morphological markers, UPOV

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## INTRODUCTION

Apricot is one of important fruits in Iran that are used fresh , dry , is canned or preserved as Jum , Marmalade , or Pulp . The early botanical descriptions of apricot were done based on leaf characters (bailey 1916) . Leaf characteristics were used for classification of apricot species. Even the taxonomy of apricots by Chinese investigators was also based mainly on leaf characteristics (HOU 1983) . Rehder ( 1940 ) distinguished plums from apricots on the basis of ovary pubescence , being or absent globrous in plum and present or pubescent in apricots . Studying of relevant characteristics of distinct species or pomological /botanical varieties are more important for breeding and other particular classification purposes (Asma and ozturk 2005, badenes et al .1998 ) . Mina jamal (2010) used morphological properties to distinguish and to group of apricot cultivars in Afghanistan . Guleryuz (1995) invested about Phenological and morphological properties of apricot and plum .Couranjou (1995) studied some quantitative characters in apricot and used its to group cultivars **.** Bayram (2009) studied some morphological and pomological characteristics in some apricots germplasm in turkey . Gezer (2000) evaluated some physicomechanics properties in apricot . Krichen

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(2008) evaluated nomourous cultivars of apricot in tunisia **.** Krichen (2000) identified and characterized 29 native apricot in three areas of tunisia by morphological properties .The morphological characteristics of apricot difference cultivars showed much higher variability as it is typical in case of other fruit species . Variety of form is easy to observe sensorially however its hard to describe exactly in a quantitative way . The widely accepted international standard ( UPOV, 2008 , Ipgri ,1980 ) . In based on comparison with standard cultivars , The result are given in a special point system , developed for this purpose . The information provided by this evaluation system can be used for identification of the cultivars . The aim of this research was to develop quantitative methods for description of the apricot difference cultivars . Statistically validated quantitative parameters after the possibility of applying them as morphological markers for other genetic analysis without leaning on any standard sample as reference .

## MATERIALS AND METHODS

This research was done at 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 is100 millimeter on april .Twenty genotypes were evaluated. Trees were six years old .All cultivars are Iran native and cultivars were collected from seed and plant improvement research institute at Karaj, Kamalabad . The root stocks of this trees are wild Apricot . In this experiment " Rondom Complet Block" Designe was used with four replications. In this research 17 leaf morphological characters was studied on twenty genotypes of Iranian apricots. Ten leaf were collected in any cultivar random on summer. Characters were measured based on international descriptor (UPOV) as follows : Leaf Blade : (Length , Width , Ratio length/width , Intensity of green colour of upper side , Shape of base , Angle of apex , Length of tip , Incisions of margin undulation of margin , Profile in cross section , Chlorophyll ) . Petiole : ( Length , Ratio length of blade/length of petiole , Thickness ,Anthocyanin colouration of upperside , Predominant number of nectaris ) ,Weight of 10 leaf . The name of cultivars as follows : BN-KB 21 , BN-HS 524 , BN-RE527 , Jahangiri , Sharod 49 , Sharod 15 , Sharod 48 , BN-KB 29 , BN-KB 576 , Sharod 48 A , BN-KB 31 , Azgadi , BN-NO 512 , BN – KB 7 , Sharod 31 , BN- SH 723 , Royal , Sharod 18 , BN-KB 40 , , BN-KB 24 . Some characters were measured by ruler for example length or width of blade . Some characters were measured by scale , for example leaf weight and some characters were evaluated by coding (base on UPOV) for example shap of base or intensity of green colour of upper side ( by visual view ) **.** Mean value of the studied properties were calculated . Results were processed by ANOVA in the statistic program "SPSS".

## RESULTS AND DISCUSSION

Data were subjected to analysis of variance (ANOVA) procedures and in table of Anova :
Leaf blade length: A significance value(0.853 ) of a=0.05 is used to distinguish significance differences of means within the varieties. Leaf blade length is maximum in (Royal)(8.92) while Minimum is in (Shahrod31)( 6.17).

Leaf blade width : A significance value(0.7015) of a=0.05 is used to distinguish Significance differences of means within the varieties. Leaf blade width is maximum in (jahangiri)( 7.9) while Minimum is in (azghandi)( 3.52)

Ratio length/width : A significance value(1.8496) of a=0.01 is used to distinguish significance differences of means within the varieties. Ratio length/width is maximum in( Azghandi)( 7) while Minimum is in (Shahrod 31, bn-kb21)(2)

Intensity of green colour of upper side : A significance value(2.1132) of a=0.01 is used to distinguish significance differences of means within the varieties. Intensity of green colour of upper side is maximum in(Bn-kb21,Bn-Hs524 , Bn-re527)(7) while Minimum is in (Shahrod49)( 3.41).

Shape of base : A significance value(1.4470) of a=0.01 is used to distinguish significance differences of means within the varieties. Shape of base is maximum In (Bn-kb31)( 4.25) while Minimum is in( Bn-re527 ,Azghandi)( 2).

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Angle of apex : A significance value(1.3415) of  a=0.01  is  used  to distinguish significance differences of means within the varieties. Angle of apex  is  maximum In (Bn-kb31)( 3.25) while Minimum is in(Azghandi)( 1).

Length of tip : A significance value(1.1457) of  a=0.01  is  used  to distinguish  significance differences of means within the varieties. Length of tip is  maximum In (Azghandi,Shahrod 48)( 7) while Minimum is in(Jahangiri)( 2).

**Table : Leaf  characters**

| Character | unit | Mean | Min | Max |
|---|---|---|---|---|
| Leaf blade  length | millimeter | 7. 164 | 6.17 | 8.92 |
| Leaf blade  width | millimeter | 6.374 | 3.52 | 7.9 |
| Ratio length/width | _ | 3.625 | 2 | 7 |
| Intensity of green colour Of upper side | code | 5.717 | 3.41 | 7 |
| Shape of base | code | 3.189 | 2 | 4.25 |
| Angle of apex | code | 2.388 | 2 | 3.25 |
| Length of tip | code | 4.507 | 2 | 7 |
| Incisions of margin | code | 3.193 | 2 | 4 |
| Undulation of margin | code | 4.349 | 3 | 6 |
| Profile in cross section | code | 1.772 | 1 | 2.5 |
| Petiole length | millimeter | 3.734 | 2.5 | 5.17 |
| Ratio length of (blade/petiole) | code | 5.734 | 4.5 | 7 |
| Thickness | millimeter | 5.039 | 3 | 7 |
| Anthocyanin number of nectaris | code | 3.951 | 3 | 5 |
| Predominant number of nectaris | code | 1.289 | 1 | 2 |
| Colorophyll | _ | 12.61 | 5.81 | 17.9 |
| Weight of 10 leaf | gr | 7.687 | 4.31 | 12.65 |

**Table :  Characters  mean  in  apricots  leaf**

| Genotypes | Length | Width | Length/width | Intensity of Green colour | Shape of base |
|---|---|---|---|---|---|
| BN-KB 21 | 7.02 | 6.75 | 2 | 7 | 3.5 |
| BN-HS524 | 8.35 | 6.84 | 4.16 | 7 | 2.5 |
| BN-RE527 | 6.92 | 6.75 | 3 | 7 | 2 |
| Jahangiri | 8.01 | 7.9 | 2.5 | 5.5 | 4 |
| Shahrood 49 | 6.53 | 5.34 | 3.16 | 3.41 | 2.83 |
| Shahrood 15 | 7.62 | 6.45 | 3.83 | 6 | 3.16 |
| Shahrood 48 | 7.47 | 6.05 | 6.5 | 6.5 | 2.25 |
| BN-KB29 | 6.92 | 6.4 | 3 | 5.5 | 3.5 |
| BN-KB  576 | 6.7 | 6.17 | 2.5 | 5.5 | 4 |
| Shahrood 48 A | 6.57 | 6 | 2.83 | 5.34 | 2.33 |
| BN-KB 31 | 6.6 | 5.95 | 4 | 5 | 4.25 |
| Azghandi | 6.32 | 3.52 | 7 | 6.5 | 2 |
| BN- NO512 | 6.92 | 6.02 | 4 | 5 | 3.25 |
| BN-KB 7 | 6.7 | 5.91 | 3.66 | 5.83 | 2. |
| Shahrood 31 | 6.17 | 6.22 | 2 | 5 | 3.75 |
| BN-HS723 | 7.45 | 6.57 | 4 | 7 | 3.5 |
| ROYAL | 8.92 | 7.55 | 6 | 7 | 2.25 |
| Shahrood 18 | 7.65 | 6.45 | 5.5 | 4.5 | 4 |
| BN-KB  40 | 7.7 | 7.71 | 2 | 5 | 4 |
| BN-KB24 | 6.72 | 6.45 | 2 | 5.5 | 2.5 |

Profile in cross section  :
A significance value(0.7933) of  a=0.05  is  used  to distinguish significance  differences of means within the varieties. Profile in cross section  is maximum in (Shahrod31)( 2.5) while Minimum is in(Bn-kb576 ,Bn-kb31, Shahrod 48 A)( 1).

Petiole length  : A significance value(1.2114) of  a=0.01  is  used  to distinguish significance differences of means within the varieties. Petiole length  is  maximum In (Bn-kb31)( 5.17) while Minimum is in( Shahrod15)( 2.5).

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Ratio length of (blade/petiole): A significance value(0.8855) of a=0.05 is used to distinguish significance differences of means within the varieties. Ratio length of (blade/petiole) is maximum in (Azghandi,Noori)( 7) while Minimum is in(Jahangiri,Bn-kb40)( 4.5).

Thickness Petiole:
A significance value(0.6147) of a=0.05 is used to distinguish significance differences of means within the varieties. Thickness Petiole: is maximum In (Royal)( 7) while Minimum is lowest in Azghandi (3).

**Table**

| Genotype | Angle of apex | Lengt of tip | Incision of margin | Undulation of Margin | Profile in cross section | Petiol length |
|---|---|---|---|---|---|---|
| BN-KB 21 | 2.75 | 2 | 2.5 | 3 | 2 | 4.7 |
| BN-HS524 | 2.5 | 2.66 | 2.33 | 4 | 1.75 | 3.79 |
| BN-RE527 | 2.5 | 1.66 | 3 | 3 | 2 | 3.67 |
| Jahangiri | 3 | 2 | 4 | 5 | 1.66 | 5.13 |
| Shahrood 49 | 2.25 | 3 | 4 | 3.83 | 1.5 | 2.7 |
| Shahrood 15 | 2.58 | 2.33 | 4 | 3.5 | 1.5 | 2.5 |
| Shahrood 48 | 2 | 7 | 3.75 | 5 | 2 | 3.58 |
| BN-KB29 | 3 | 5 | 4 | 5 | 2 | 3.67 |
| BN-KB  576 | 2 | 5 | 4 | 5 | 1 | 3.42 |
| Shahrood 48A | 2.66 | 3.33 | 2 | 3 | 1 | 2.72 |
| BN-KB 31 | 3.25 | 6.25 | 4 | 5 | 1 | 5.17 |
| Azghandi | 1 | 7 | 3 | 3 | 2 | 2.75 |
| BN- NO512 | 2 | 6.5 | 4 | 5 | 2 | 3.3 |
| BN-KB 7 | 2.41 | 1.83 | 3.16 | 3.5 | 1.66 | 3.02 |
| Shahrood 31 | 2.5 | 3 | 2 | 5 | 2.5 | 3.77 |
| BN-HS723 | 2 | 6 | 4 | 5 | 2 | 3.9 |
| ROYAL | 2 | 7 | 2 | 5 | 2 | 3.62 |
| Shahrood 18 | 2.5 | 6 | 3 | 4 | 2 | 4.82 |
| BN-KB  40 | 3 | 2.5 | 2.33 | 4.5 | 1.66 | 3.75 |
| BN-KB24 | 2 | 5 | 3 | 5 | 2.25 | 4.25 |

**Table**

| Genotype | Ratio length blade/ petiole | Thickness | Antho cyanin | Nectaris number | Chlorophyll | Leafweight |
|---|---|---|---|---|---|---|
| BN-KB 21 | 5 | 3.5 | 3 | 1 | 15.5 | 7.47 |
| BN-HS524 | 5.66 | 6.66 | 3.33 | 1.5 | 17.7 | 6.6 |
| BN-RE527 | 6 | 5 | 4 | 1 | 15.75 | 7.46 |
| Jahangiri | 4.5 | 6 | 3 | 1.08 | 13.1 | 12.05 |
| Shahrood 49 | 6.33 | 3.5 | 3.33 | 1 | 17.1 | 4.31 |
| Shahrood 15 | 5.6 | 6 | 3.5 | 1.5 | 17.9 | 4.58 |
| Shahrood 48 | 6 | 5 | 3 | 1 | 14.62 | 6.81 |
| BN-KB29 | 5.5 | 5.5 | 3 | 2 | 17.62 | 8.97 |
| BN-KB  576 | 6 | 5.5 | 4.5 | 2 | 15.75 | 8.95 |
| Shahrood 48 A | 6 | 5.5 | 4.5 | 1.25 | 14.19 | 5.89 |
| BN-KB 31 | 5 | 5 | 5 | 1.25 | 19.87 | 6.34 |
| Azghandi | 7 | 3 | 5 | 1.5 | 18.1 | 5.71 |
| BN- NO512 | 7 | 6 | 5 | 1 | 18.5 | 5.04 |
| BN-KB 7 | 5.83 | 5.16 | 3.33 | 1 | 12.65 | 12.65 |
| Shahrood 31 | 5 | 3.5 | 5 | 1 | 10 | 5.37 |
| BN-HS723 | 6 | 4.5 | 3 | 1 | 15.25 | 8.68 |
| ROYAL | 7 | 7 | 5 | 2 | 13 | 10.35 |
| Shahrood 18 | 5.5 | 4.5 | 5 | 1 | 12.25 | 7.6 |
| BN-KB  40 | 4.5 | 4.5 | 3 | 1 | 13.75 | 10.86 |
| BN-KB24 | 5.5 | 4.5 | 4.5 | 1 | 19.5 | 7.62 |

Weight of 10 leaf : A significance value(1.3677) of a=0.01 is used to distinguish significance differences of means within the varieties. Weight of 10 leaf: is maximum in (Bn-kb31)( 19.87) while Minimum is in( Shahrod31)(10 )

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Chlorophyll :A significance value(0.5889) of  a=0.05  is  used  to distinguish significance differences of means within the varieties. Chlorophyll  : is  maximum in (Bn-kb7)( 12.65) while Minimum is  in( Shahrod49)( 4.31) .Some characters that were not involved in cultivars differentiation , including

Incisions of margin , Undulation of margin, Anthocyanin number of nectaris  and Predominantnumber of nectaris .Other characters were effective in cultivars differentiation .

## CONCLUSION

There was  a significant difference in cultivars   and  the difference  between leaf morphological characters can will  be used   to distinguish of cultivars in this Iran Apricot cultivars and  all qualitative and   quantitative characters will  be  applied  as  morphological  markers  for  other  genetic  analysis .

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