**Palestine Technical University Research Journal, 2015, 3(1), 01-11**
(http://www.ptuk.edu.ps)

# Ampelographic characterization of white grapevine cultivars (Vitis vinifera L.) grown in Palestine

Rezq Basheer-Salimia

Faculty of Agriculture, Hebron University, Palestine,

Email. rezqbasheer@hebron.edu

Received 29 September 2014, Accepted 21 December 2014, Published 10 February, 2015

**Abstract:** In Palestine, grape culture consists of ecotypes and cultivars (also called local varieties), for which a large number of homonymous and synonymous designations exist as well as misnaming of cultivars. The present study is the first report using detailed ampelographic characterizations (39 informative traits) to assess genetic diversity and detect similarities among sixteen accessions collected from putative diverse grape genotypes

In general, 30 descriptors presented highly and satisfactory divergent genotypes, whereas the remaining traits showed no or very little ampelographic variation. Based on the similarity matrix and the resulting dendrogram of these ampelographic data, distinguishable genotypes as well as some cases of synonymies and homonymies clearly exist. A synonymy case seemed to be in four genotypes including Jandali-Mfarad, Jan-dali-Mrazraz, Jandali, and Hamadani-Mattar, which indeed showed genetic distances of less than 0.5, sug-gesting their relatedness, and the possibility that they are the same genotype, but with different names. In addition, homonym cases also occur in the following pairs of "Marawi's, Hamadani's, and Zaini's genotypes, in which each pair seems to be two distinctive genotypes.

Finally, among the 16 examined genotypes, the Zaini-Baladi genotype tended to show the highest genetic distance values from the others and thus could be potentially incorporated into any further local or regional breeding programs as well as germplasm conservation.

***Keywords*:** ampelographic, genotypes, Palestine, similarities, variations

.

## Introduction

Grapevine (Vitis vinifera L.) is one of the oldest fruit trees cultivated all over the world. According to the International Organization of Vine and Wine, grapes are grown in more than 80 countries using acreage in excess of 8 million hectares (OIV, 2009), and this area is increasing dramatically by about 2-3% per year.

In Palestine, grapevine is one of the main cultivated fruit crops covering an area of about 7,600 ha (PCBS, 2011). Due to the unique geographical and ecological environment for growing high-quality fruits, grape growing and production are still limited to the southern part of West-Bank, especially Heb-ron and Bethlehem areas (Basheer-Salimia and Hamdan, 2010).

Grape culture consists of ecotypes and cultivars, also called local varieties (landraces), for which a large number of homonymous and synonymous designations, as well as the occurrence of misnam-ing, may exist. In addition, names of these cultivars have been traditionally given on the basis of several traits such as fruit skin color, local geographical origin, names of the vineyard owner, and cluster shape. Moreover, Palestinian grapes are seriously threatened by severe genetic erosion due to biotic and abiotic stresses. Therefore, characterization and discrimination between these cultivars/varieties is an essential stage in the certification program and guaranteeing the trueness-to-type of the propaga-tion materials, improvement and conservation of germplasm and monitoring of the genetic quality (Rout and Mohapatra, 2006).

Varietal discrimination and recognition could be achieved either by morphological and/or molecular markers (Saddoud et al., 2008). Despite the im-portance, accuracy, and efficiency of the molecular markers (Zulini et al., 2005), methods based on morphological traits continue to be the first

 

step for the description and classification of any germplasm as well as useful tools for screening the accessions of any collection (Cantini et al., 1999). Several re-ports demonstrated the usefulness of these traits in documenting variability in grape genotypes (De-Tuda and Sancha, 1999; Ocete et al., 2008; Cunha et al., 2009).

The main goal of the present study is to characterize and quantify the genetic variability among acces-sions of white-table grapes grown in Palestine using ampelographic methods.

## Material and methods

### Study area

This study was carried out during the growing season of 2012. A total of sixteen white grapevine genotypes, with a preference of long-lived individuals (> 30 years old) were surveyed throughout the southern region of West-Bank, Palestine (**Table 1**). The climate of the region is a typical Mediterranean climate, with mild temperatures (18-25°C), rainy weather (580-800 mm/year) in autumn and winter, and hot, dry summers. Generally, all grapevines are cultivated under rain-fed conditions.

### Plant materials and descriptors

From each assumed genotype (biotype), random samples of 20 adult leaves and 10 mature grape clusters were collected from three adult plants per assumed genotype. Sixteen leaf morphological and 23 grape cluster descriptors or traits (**Tables 1, 2,** respectively) were determined according to the grape descriptors (IPGRI, UPOV, OIV. 1997) with some minor modifications that showed high discrimination values.

### Data analysis

Each descriptor (quantitative and qualitative) was scored as 1 for presence and 0 for absence. Accordingly, the relatedness among genotypes was estimated based on Jaccard's similarity coefficient using the multilocus fingerprinting data sets containing missing data (FAMD) software version 1.108 beta. Consequently, cluster analysis was made using the un-weighted pair-group method with arithmetic averages (UPGMA) (Schluter and Harris, 2006) and the Tree view software (Win32, version 1.6.6).

## Results

### Plant and leaf descriptors

Sixteen examined traits are shown in **Tables 1**. Bud break of four genotypes was observed on March 20; four genotypes on April 1st, with the remainder oc-curring on May 1st. Among all genotypes tested, anthocyanin coloration of main veins on upper side of blade ranged from absent to weak, blade shape was either wedge-shaped or circular, number of lobes was always more than seven, size of blade fluctuated from very small (Malikat-Libnan) to very large (Zaini-Baladi), leaf area was small, medium, or large (except for Marawi-Taeel and Zaini-Baladi which presented large and very large leaf areas respectively), density of hairs between veins ex-tended from absent to very dense, length of pet-iole compared to middle vein was slightly or much shorter with the exception of Baluti-Abiad genotype which reveled equal length, shape of the upper lat-eral sinus presented either slightly or strongly over-lapping lobes. Depth of upper lateral sinus was very shallow (Malikat-Libnan), shallow (Jan-dali-Mfarad), very deep (Salti-Khdari) however, the reminder genotypes were either medium or deep.

Dabuki genotype exhibited slightly open shape of petiole sinus, Jandali-Mfarad and Jandali-Mrazraz revealed strongly overlapping lobes, whereas the reminder genotypes were half open. The general shape of petiole sinus as well as sinus limited by veins variables were constantly absent, shape of teeth was mixture of both sides straightened both side convex, length of teeth was very small (Ma-li-kat-Libnan) small (Dabuki and Bairuti); however the reminder genotypes presented medium to large length of teeth. Finally, the ratio of length to width of teeth were very small (3 genotypes), small (5 gen-otypes), medium (6 genotypes), large (Ma-ra-wi-Taweel) and very large (Hamadani-Muttar).

### Fruit descriptors

Twenty three fruit (bunch, berry and panel) traits are presented in **Table 2**

### Bunch descriptors

For all examined genotypes, bunch size ranged from small to large with the exception of Hamadani-Muttar and Dabuki-Kurawi genotypes which presented very small bunch sizes and lengths. A similar trend goes also with bunch length parameter. The length of the

**Table 1. Leaf descriptors / white grapevine cultivars**

| 1 | Genotype Name | Malikat-Libnan | Dabuki | Jandali | Miskat-El-Eskandaria | Zaini | Bairuti | Salti-Khdari | Hamadani-Mattar |
|---|---|---|---|---|---|---|---|---|---|
| B | Leaf De-scriptors | | | | | | | | |
| 1 | Bud break | 20-Mar | 20-Mar | 01-May | 01-May | 20-Mar | 01-Apr | 01-Apr | 01-Apr |
| 2 | Anthocyanin colouration of main veins on upper side of blade | Absent | Weak | Absent | Weak | Very weak | Very weak | Weak | Absent |
| 3 | Shape of blade | Wedge-shaped | Wedge-shaped | Circular | Wedge-shaped | Circular | Wedge-shaped | Circular | Wedge-shaped |
| 4 | Number of lobes | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven |
| 5 | Size of blade (cm2) | Very Small | Medium | Medium | Small | Large | Small | Large | Small |
| 6 | Leaf Area | Small | Small | Medium | Small | Medium | Small | Medium | Medium |
| 7 | Density of hairs between veins | Absent | Dense | Dense | Absent | Dense | Absent | Sparse | Very dense |
| 8 | Length of petiole com-pared to mid-dle vein | Much shorter | Much shorter | Slightly shorter | Much shorter | Much shorter | Much longer | Much shorter | Much shorter |
| 9 | Shape of up-per lateral sinus | Lobes slightly overlapping | Lobes strongly overlapping | Lobes slightly overlapping | Lobes strongly overlap-ping | Lobes slightly overlapping | Lobes strongly overlapping | Lobes slightly over-lapping,Lobes strongly overlapping | Lobes slightly overlapping |
| 10 | Depth of up-per lateral sinus | Very shallow | Deep | Medium | Medium | Medium | Medium | Very deep | Medium |
| 11 | General shape of peti-ole sinus | Half open | Slightly open | Lobes half overlapping | Half open | Lobes half overlapping | Half open | Lobes slightly over-lapping,Lobes half overlapping | Half open |
| 12 | Petiole sinus limited by veins | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 13 | Tooth at peti-ole sinus | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 14 | Shape of teeth | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex |
| 15 | length of teeth | Very Small | Small | Medium | Medium | Medium | Small | Medium | Large |
| 16 | Ratio length/width of teeth | Small | Medium | Very Small | Medium | Small | Medium | Small | Very Large |

**Table 1 continued**

| 2 | Genotype Name | Marawi-Haba-Tawela | Zaini-Baladi | Jandali-Mfarad | Jandali-Mrazraz | Marawi-Taweel | Baluti-Abiad | Dabuki-Kurawi | Hamadani-Kadeem |
|---|---|---|---|---|---|---|---|---|---|
| B | Leaf De-scriptors | | | | | | | | |
| 1 | Bud break | 01-May | 01-May | 01-May | 01-May | 01-May | 01-May | 20-Mar | 01-Apr |
| 2 | Anthocyanin colouration of main veins on upper side of blade | Absent | Weak | Absent | Absent | Weak | Weak | Medium | Absent |
| 3 | Shape of blade | Wedge-shaped | Wedge-shaped | Circular | Circular | Wedge-shaped | Wedge-shaped,Circular | Wedge-shaped | Wedge-shaped |
| 4 | Number of lobes | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven | More than seven |
| 5 | Size of blade (cm2) | Large | Very Large | Large | Large | Large | Large | Medium | Medium |
| 6 | Leaf Area | Medium | Very Large | Medium | Medium | Large | Medium | Medium | Medium |
| 7 | Density of hairs between veins | Very sparse | Sparse | Medium | Medium | Very sparse | Medium | Medium | Very dense |
| 8 | Length of peti-ole compared to middle vein | Much shorter | Much shorter | Much shorter | Slightly shorter | Slightly shorter | Equal | Slightly shorter | Slightly shorter |
| 9 | Shape of upper lateral sinus | Lobes strongly over-lapping | Lobes slightly overlapping | Lobes slightly overlapping | Lobes slightly overlapping | Lobes strongly overlapping | Lobes slightly overlap-ping | Lobes slightly overlapping,Lobes strongly overlap-ping | Lobes slightly over-lapping,Lobes strongly overlapping |
| 10 | Depth of upper lateral sinus | Medium | Deep | Shallow | Medium | Medium | Medium | Medium | Deep |
| 11 | General shape of petiole sinus | Half open | Half open | Lobes strongly overlapping | Lobes strongly overlapping | Half open | Half open,Lobes slightly overlapping | Half open | Half open |
| 12 | Petiole sinus limited by veins | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 13 | Tooth at petiole sinus | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 14 | Shape of teeth | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex | Mixture of both sides straightand both sides convex |
| 15 | length of teeth | Large | Large | Medium | Medium | Medium | Medium | Medium | Large |
| 16 | Ratio length/width of teeth | Medium | Small | Very Small | Very Small | Large | Medium | Small | Medium |

**Table 2. Fruit descriptors / white grapevine cultivars**

| 1 | Genotype Name | Malikat-Libnan | Dabuki | Jandali | Miskat-El-Eskandaria | Zaini | Bairuti | Salti-Khdari | Hamadani-Mattar |
|---|---|---|---|---|---|---|---|---|---|
| **A** | **Fruit Descriptors** | | | | | | | | |
| **A-1** | **Bunch Descriptors** | | | | | | | | |
| 1 | Size (cm2) | Small | Medium | Small | Small | Large | Medium | Medium | Very small |
| 2 | Length (cm) | Short | Very long | Intermediate | Short | Long | Intermediate | Intermediate | Very short |
| 3 | Length of Peduncle (cm) | Short | Medium | Medium | Medium | Long | Medium | Medium | Short |
| 4 | Density | Very loose | Very loose | Very loose | Very loose | Very loose | Very loose | Very loose | Dense |
| 5 | Single Bunch Weight (g) | Low | Medium | Medium | Medium | High | High | High | Medium |
| **A-2** | **Berry Descriptors** | | | | | | | | |
| 6 | Time of Berry Ripining | Medium (15/9-15/10) | Early (15/8-15/9) | Early (15/8-15/9) | Medium (15/9-15/10) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) |
| 7 | Skin Color | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow |
| 8 | Size (mm2) | Small | Medium | Small | Very large | Large | Large | Large | Small |
| 9 | Shape | Elliptic | Obtuse-ovate | Round | Round | Oblong | Narow elliptic | Obtuse-ovate | Round |
| 10 | Pedicel Length (mm) | Intermediate | Intermediate | Short | Short | Intermediate | Intermediate | Intermediate | Short |
| 11 | Firmness of Flesh | Medium | Soft | Medium | Firm | Soft | Firm | Medium | Soft |
| 12 | Single Berry Weight (g) | Medium | Medium | Medium | High | High | High | High | Medium |
| 13 | Ease of Detachment from Pedicle | Slightly Easy | Very Easy | Slightly Easy | Difficult | Slightly Easy | Slightly Easy | Very Easy | Slightly Easy |
| 14 | Anthocyanin Coloration of Flesh | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured |
| 15 | Presence of Seeds | Well developed | Well developed | Well developed | Well developed | Well developed | Well developed | Well developed | Well developed |
| 16 | Seed Length (mm) | Short | Medium | Medium | Short | Medium | Long | Medium | Medium |
| 17 | 100-Seed Weight (g) | Low | Low | Very low | Medium | Low | Very high | Low | Low |
| 18 | Juiciness | Very Juicy | Very Juicy | Very Juicy | Slightly Juicy | Very Juicy | Slightly Juicy | Very Juicy | Very Juicy |
| 19 | Must Yield (mL) | High | High | Very high | High | Very high | Medium | High | High |
| 20 | Sugar Content of Must % | Low | High | High | High | Medium | Medium | Low | High |
| **A-3** | **Panel Test** | | | | | | | | |
| 21 | Firmness | Soft | Soft | Medium | Firm | Soft | Very Firm | Soft | Medium |

Table 2 continued

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 22 | Crashness | Very Small | Small | Medium | High | Small | Very High | Small | Medium |
| 23 | Sweetness | Medium | Very High | Very High | High | Medium | High | Low | Very High |
| **2** | **Genotype Name** | **Marawi-Haba-Tawela** | **Zaini-Baladi** | **Jandali-Mfarad** | **Jandali-Mrazraz** | **Marawi-Taweel** | **Baluti-Abiad** | **Dabuki-Kurawi** | **Hamadani-Kadeem** |
| **A** | **Fruit Descriptors** | | | | | | | | |
| **A-1** | **Bunch Descriptors** | | | | | | | | |
| 1 | Size (cm2) | Small | Large | Small | Small | Small | Medium | Small | Large |
| 2 | Length (cm) | Short | Long | Short | Short | Short | Intermediate | Very short | Long |
| 3 | Length of Peduncle (cm) | Long | Long | Short | Short | Long | Medium | Medium | Short |
| 4 | Density | Very loose | Very loose | Very loose | Very loose | Very loose | Very loose | Very loose | Very loose |
| 5 | Single Bunch Weight (g) | Medium | Very high | Medium | Medium | Medium | Medium | Medium | High |
| **A-2** | **Berry Descriptors** | | | | | | | | |
| 6 | Time of Berry Ripining | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) | Early (15/8-15/9) |
| 7 | Skin Color | Green-Yellow | Green | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow | Green-Yellow |
| 8 | Size (mm2) | Small | Large | Small | Small | Small | Medium | Small | Small |
| 9 | Shape | Elliptic | Oblong-Narrow elliptic | Narrow ellip-tic-Obtuse-ovate | Elliptic | Narrow ellip-tic-Elliptic | Round | Obtuse-ovate | Obtuse-ovate |
| 10 | Pedicel Length (mm) | Long | Intermediate | Intermediate | Short | Intermediate | Intermediate | Intermediate | Intermediate |
| 11 | Firmness of Flesh | Medium | Soft | Medium | Soft | Medium | Soft | Firm | Medium |
| 12 | Single Berry Weight (g) | Medium | High | Medium | Medium | High | High | Medium | Medium |
| 13 | Ease of Detachment from Pedicle | Very easy | Very easy | Very easy | Slightly Easy | Slightly Easy | Very Easy | Slightly Easy | Very Easy |
| 14 | Anthocyanin Col-oration of Flesh | Very slightly Coloured | Slightly Col-oured | Very slightly Col-oured | Very slightly Col-oured | Very slightly Coloured | Very slightly Coloured | Very slightly Coloured | Very slightly Col-oured |
| 15 | Presence of Seeds | Well developed | Well developed | Well developed | Well developed | Well devel-oped | Well developed | Well devel-oped | Well developed |
| 16 | Seed Length (mm) | Long | Medium | Medium | Medium | Long | Medium | Medium | Medium |
| 17 | 100-Seed Weight (g) | Medium | Low | Medium | Low | High | High | Low | Medium |
| 18 | Juiciness | Very Juicy | Very Juicy | Very Juicy | Very Juicy | Very Juicy | Very Juicy | Slightly Juicy | Very Juicy |
| 19 | Must Yield (mL) | High | High | High | High | High | High | High | High |
| 20 | Sugar Content of Must % | Medium | Medium | High | High | Low | Medium | High | Medium |
| **A-3** | **Panel Test** | | | | | | | | |
| 21 | Firmness | Soft | Soft | Medium | Medium | Medium | Very soft | Very Firm | Medium |
| 22 | Crashness | Very Small | Very Small | Medium | Small | Medium | Very Small | Very High | Medium |
| 23 | Sweetness | High | Very High | High | High | Medium | High | Very High | High |

peduncle was short to long, bunch density was al-ways very loose, single bunch weight was low (Malikat-Libnan) to very high (Zaini-Baladi); however the reminder genotypes were medium and or high.

**Berry descriptors**

All studied genotypes were categorized as early ripened (maturated) ones; skin color was always green-yellow except for Zaini-Baladi genotype with green color.

Berry shape, peduncle length, firmness of flesh, and single berry weight presented a wide range of var-ia-tion. Ease of detachment of berries from peduncle was either very or slightly easy with the exception of Miskat-El-Eskandaria genotype (difficult), an-thocy-anin coloration of flesh was always very slightly colored, and presence of seeds was con-stantly well developed.

The majority of the genotypes revealed medium seed length; however two and three genotypes presented short and long seed length respectively. Descriptors of 100-seeds weight, juiciness, must yield, and sugar content of must showed a wide range of deviation.

### Panel test

In terms of firmness parameter, Baluti-Abiad was very soft; Miskat-El-Eskandaria was firm; Bairuti and Dabuki-Kurawi were very firm, however the re-maining genotypes presented soft and medium firmness. All evaluated genotypes presented very small, small, and medium berry crashness except for Miskat-El-Eskandaria (high) as well as Bairuti and Dabuki-Kurawi (very high). A wide range of variation revealed for sweetness trait starting from very small to very high sweetness.

### Dendrogram of relatedness among grape genotypes

The similarity indexes (**Table 3**) were used to build a dendrogram by means of UPGMA analysis in order to determine the cluster of the genotypes (**Fig 1**). As shown in the dendrogram, grapevine genotypes were classified into two clusters. The first (minor) cluster (I) was composed of only two genotypes namely Bairuti and Miskat-El-Eskandaria, and the second (major) cluster (II) consisted of 14 geno-types, which divided into three sub-clusters (IIa, IIb, and IIc).

Sub-cluster (IIa) composed of “Salti-Khdari and Zaini-Addi” related to Baluti-Abiad as well as “Zaini-Baladi and Dabuki” genotypes.

Sub-cluster (IIb) consisted of “Hamadani-Kadeem and Dabuki-Kurawi” as well as “Jandali-Mrazraz and Jandali-Mfarad” linked to Jandali, in which the three genotypes were correlated to Hamadani-Muttar.

Sub-cluster (IIc) included Marawi-Haba-Tawela and Malikat-Libnan associated to Marawi-Addi genotype. Genetic distances ranged from 0.395 to 0.833 with a mean of 0.614 (**Table 3**). The most closely related genotypes were “Jandali-Mrazraz and Jan-dali-Mfarad” followed respectively by “Jan-dali-Mrazraz and Jandali” and “Jandali and Hama-dani-Muttar”. On the contrary, the most dis-tant gen-otypes were “Zaini-Baladi and Jandali” followed respectively by “Zaini-Baladi and Miskat-El-Eskandaria” and “Miskat-El-Eskandaria and Zaini-Addi”.

## Discussion

Despite the small and narrow area of Palestine, its location between three continents (Asia, Europe and Africa) has possessed a wide range of agro-ecological concerns and hosts a large variety of plants. This situation in addition to the long history of grapevine cultivation in Palestine which exceeds 4000 years (Basheer-Salimia and Hamdan, 2009), the intense movement of material between countries and the possibility of vegetative propaga-tion has led to the diffusion of many biotypes and cultivars and accordingly resulted in a great genetic variability in germplasm that often allowed misiden-tification and cases of homonymy and synonymy (Vignini et al., 2002).

Towards this end, identifying different ampe-lo-graphic markers (morphological traits of leaves, bunch, berries, etc), is an essential step and im-portant tool for characterization of grape germplasm (Cantini et al., 1999; Leao et al., 2011), for the pur-poses of protecting, conserving, main-taining, and conducting any future breeding pro-gram.

The present study is the first report using detailed ampelographic characterizations (39 informative traits) to assess genetic diversity and detect similar-ities among sixteen Palestinian table grapes col-lected from putative diverse genotypes. In general, 30 descriptors presented highly and satisfactory divergent genotypes, and accordingly could be po-tentially incorporated to both local and regional breeding

 

**Table 3. Jaccard's distance index generated for the 16 Palestinian grape genotypes based on 39 ampelographic descriptors.**

| | Malikat-Libnan | Dabuki | Jandali | Miskat-El-Eskandaria | Zaini-Addi | Bairuti | Salti-Khdari | Hamadani-Mattar | Marawi-Haba-Tawela | Zaini-Baladi | Jandali-Mfarad | Jan-dali-Mrazraz | Mara-wi-Addi | Baluti-Abiad | Dabuki-Kurawi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dabuki** | 0.722 | | | | | | | | | | | | | | |
| **Jandali** | 0.717 | 0.722 | | | | | | | | | | | | | |
| **Miskat-El-Eskandaria** | 0.692 | 0.745 | 0.786 | | | | | | | | | | | | |
| **Zaini-Addi** | 0.722 | 0.654 | 0.620 | **0.810** | | | | | | | | | | | |
| **Bairuti** | 0.745 | 0.727 | 0.789 | 0.647 | 0.727 | | | | | | | | | | |
| **Salti-Khdari** | 0.732 | 0.588 | 0.685 | 0.776 | 0.560 | 0.737 | | | | | | | | | |
| **Hamadani-Mattar** | 0.640 | 0.698 | **0.489** | 0.692 | 0.698 | 0.745 | 0.709 | | | | | | | | |
| **Marawi-Haba-Tawela** | 0.553 | 0.647 | 0.741 | 0.692 | 0.698 | 0.647 | 0.635 | 0.640 | | | | | | | |
| **Zaini-Baladi** | 0.704 | 0.608 | **0.833** | **0.814** | 0.660 | 0.754 | 0.596 | 0.704 | 0.654 | | | | | | |
| **Jandali-Mfarad** | 0.698 | 0.679 | 0.500 | 0.768 | 0.679 | 0.750 | 0.588 | 0.592 | 0.620 | 0.776 | | | | | |
| **Jandali-Mrazraz** | 0.612 | 0.745 | **0.419** | 0.786 | 0.592 | 0.745 | 0.608 | 0.553 | 0.612 | 0.793 | **0.395** | | | | |
| **Marawi-Addi** | 0.673 | 0.750 | 0.673 | 0.647 | 0.704 | 0.627 | 0.691 | 0.647 | 0.563 | 0.776 | 0.627 | 0.620 | | | |
| **Baluti-Abiad** | 0.750 | 0.660 | 0.704 | 0.679 | 0.608 | 0.660 | 0.596 | 0.704 | 0.571 | 0.642 | 0.580 | 0.600 | 0.608 | | |
| **Dabuki-Kurawi** | 0.673 | 0.627 | 0.592 | 0.698 | 0.679 | 0.654 | 0.691 | 0.592 | 0.698 | 0.732 | 0.627 | 0.532 | 0.627 | 0.635 | |
| **Hamadani-Kadeem** | 0.704 | 0.551 | 0.627 | 0.750 | 0.709 | 0.660 | 0.623 | 0.571 | 0.542 | 0.615 | 0.521 | 0.600 | 0.580 | 0.588 | 0.521 |

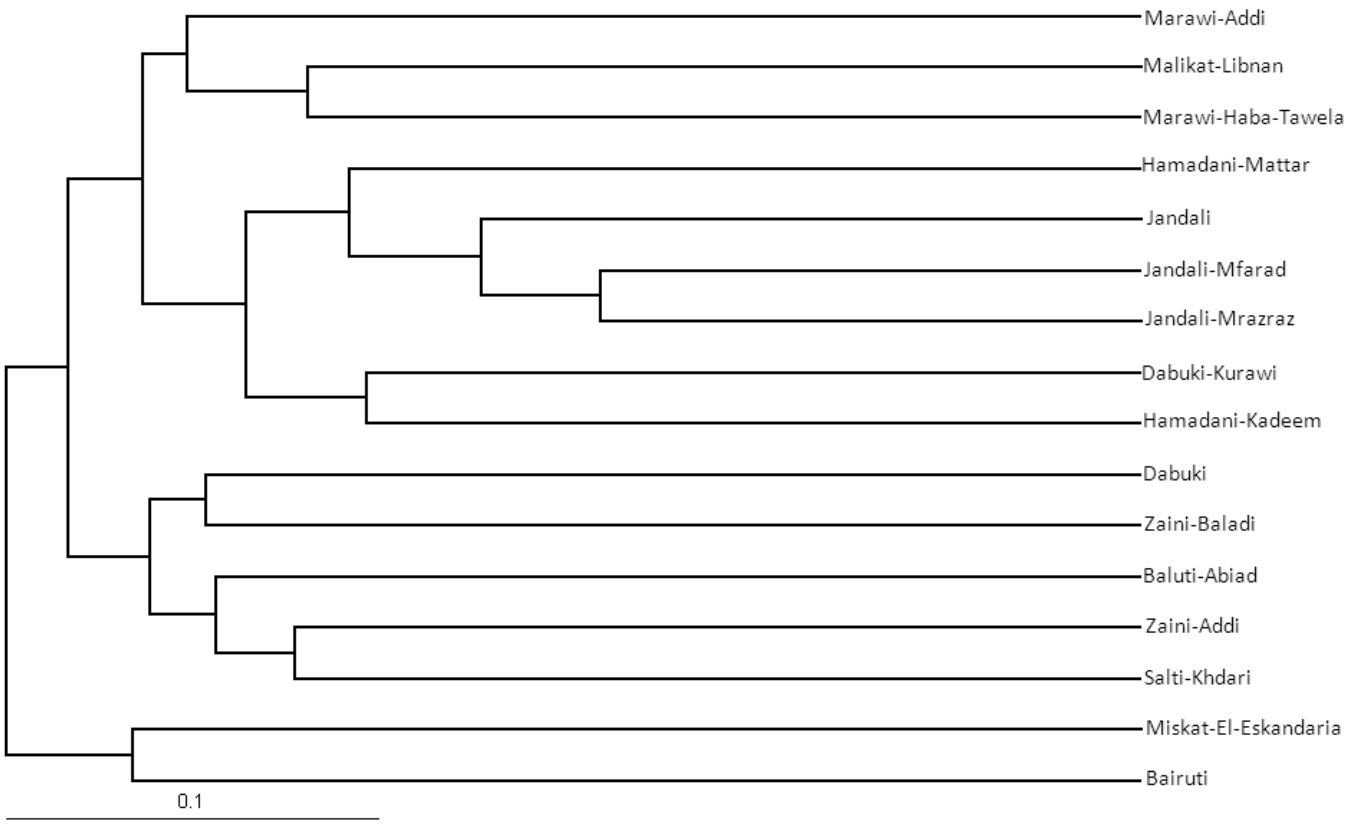


**Figure 1. Dendrogram of 16 Palestinian white grape genotypes constructed by UPGMA based on some ampelographic descriptor**

programs (Bandelj et al., 2002; Borges et al., 2010), whereas the reminder traits showed no or very little ampelographic variation.

Based on the similarity matrix and thereby the con-structed dendrogram of these ampelographic data, distinguishable genotypes as well as some cases of synonymies and homonymies clearly exists (**Fig. 1**). Several studies showed the existence of confusion in grapevine nomenclature, in addition numerous putative synonyms and homonyms cases were also reported in many Mediterranean countries such as Italy (Alba et al., 2011), Spain (Asensio et al., 2002), Tunisia (Zoghlami et al., 2009); Egypt (Hassan et al., 2011) and Turkey (Cangi et al., 2006).

Here, a synonymy case seemed to be in four geno-types (Jandali-Mfarad, Jandali-Mrazraz, Jan-dali, and HamadaniMattar), which showed genetic distances of less than 0.5 suggesting their close relatedness, and possibly might be the same geno-type, but with different names. In addition, homonym cases also occur in the following pairs of "Marawi's, Hamada-ni's, and Zaini's genotypes, in which each pair seems to be two distinctive genotypes (**Table 3, Fig. 1**).

The occurrence of these cases, which is indeed frequent among genotypes of the same cultivar, might relate to the environmental influences on the expression of several phenotypic traits (Ghaffari and Ferchichi, 2011), as a mechanism of adaptation to local environmental conditions (Martinez de Toda, 1991; Ocete et al., 1999).

In addition, grapevine cultivars are often spread via vegetative propagation and this usually leads to the diffusion of numerous genetically identical copies of a specific plants. During this process, somatic mu-tation could occur and this results in a plant char-acterized by unique genomic traits that could lead to a unique phenotype (Alba et al., 2011).

Finally, among the 16 examined genotypes, the Zaini-Baladi genotype tends to show the highest genetic distance values from the others thus could be potentially promised and incorporated into any further breeding programs and germplasm con-ser-vation. In fact, this genotype is the most widely grown in Palestine. It possesses drought re-sistance and is successfully cultivated under differ-ent soil types and therefore we anticipate high adaptability to a wide range of environmental conditions. Further-more, it receives its name based on the appealing shape of the clusters, as ''Zain'' in the Arabic lan-guage reflects beauty and sweetness, and "Baladi" means locally.

## References

Alba V, Anaclerio A, Gasparro M, Caputo AR, Montemurro C, Blanco A and Antonacci D (2011). Ampelographic and Molecular Char-acterisation of Aglianico Accessions (Vitis vi-nifrra L.) Collected in Southern Italy. South Afri J Enol Vitic 32 (2): 165-173.

Asensio ML, Valdes E and Cabello F (2002). Char-acterization of some Spanish white grapevine cultivars by morphology and amino acid analysis. Sci Hortic 93: 289–299.

Bandelj D, Jakše J and Javornik B (2002). DNA fingerprinting of olive varieties by microsatellite markers. Food Techn Biotech 40(3): 185-190.

Basheer-Salimia R and Hamdan A (2009). As-sessment of preliminary grafting compati-bil-ity-incompatibility between local Palestinian table-grapevine cultivars and different Phyl-loxera (DaktulosphairaVitifoliae) resistant root-stocks. An-Najah Univ. J Res (Nat Sci) 23: 49-71.

Basheer-Salimia R and Hamdan A (2010). Grape-vine scion-rootstock combinations of Palestin-ian local cultivars and rootstocks resistant to grape phylloxera Daktulosphaira vitifoliae (Fitch), Under publication in Dirasat, Agricul-tural Sciences, University of Jordan, Amman, Jordan. Jordan J Agric Sci 6 (1): 1-10.

Borges RME, Alves EOS, Gonçalves NPS, Gomes APO, Andrade DCL and Albuquerque TCS (2010). Phenotypic divergence among wine grape accessions in the semi-arid region of Brazil. Crop Breed. Appl. Biotechnol 10: 260-265.

Cangi R, Çelik H and Köse B (2006). Determination of ampelographic characters of some natural foxy grape (Vitis labrusca L.) types grown in Northern Turkey (Ordu and Giresun Province). International J Botany 2(2): 171-176.

Cantini C, Cimato A and Sani G (1999). Mor-pho-logical evaluation of olive germplasm present in Tuscany region. Euphytica 109:173–181.

Cunha C S, et al. (2009). Influência da textura e do sabor na aceitação de cremes de aveia por indivíduos de diferentes faixas etárias. Ali-mentos e Nutrição 20(4): 573-580.

 

De Toda FM and Sancha JC (1999). Characterization of wild vines in La Rioja (Spain). American J Ecology and Viticulture 50(4): 443-446.

Ghaffari S and Ferchichi A (2011). Characterization of Tunisian grapevine (Vitis vinifera L.) Cultivars Using Leaves Morphological Traits and Mineral Composition. Romanian Biotechnological Letters 16(5): 6556-6563.

Hassan N, El-Homosany A, Gomma A and Shaheen M (2001). Morphological and ISSR polymor-phisms in some Egyptian grapes (Vitis vinefera L.) collection. World Applied Sci J 15(10): 1369-1375.

IPGRI, UPOV, OIV. 1997. Descriptors for Grapevine (Vitis spp.). International Union for the

Protection of New Varieties of Plants, Geneva, Switzerland/Office International de la Vigne et

du Vin, Paris, France/International Plant Genetic Resources Institute, Rome, Italy.

Leao PC, de S, Cruz CD and Motoike SY (2011). Genetic diversity of table grape based on morphoagronomic traits. Sci Agrícola Pi-racicaba. 68: 42-49.

Martínez de Toda F (1991). Biologia de la vid. Fundamentos biologicos de la viticultura. Ed. Mundi-Prensa, Madrid.

Ocete R, Lopez MA and Cantos M (1999). Ecolo-gia, ampelogarafia e estado sanitario de alugmas populacoes de videria Silvestre do Alentejo. Enologia. 33(34): 8-17.

Ocete R, Lopez MA, Gallardo A and Arnold C (2008). Comparative analysis of wild and cultivated grapevine (Vitis vinifera) in the Basque region of Spain and France. Agriculture, Ecosystems and Environment 123: 95–98.

OIV. (2009). 2nd edition of the OIV descriptor list for grape varieties and Vitis species. Organisation Intemationale de la Vigne et du Vin, Paris, France, International Plant Genetic Resources Institute, Rome, Italy (www.oiv.org ).

PCBS. (2011). Publications of Palestinian Central Bureau of Statistics, Ramallah, Palestine. http://www.pcbs.gov.ps .

Saddoud O, Baraket G, Chatti K, Trifi M, Marrakchi M, SalhiHannachi A, and Mars M (2008). Morphological variability of fig (Ficus carica L.) cultivars. International J Fruit Sci 8: 35-51.

Rout GR, Mohapatra A and Jain SM (2006). Tissue culture of ornamental pot plant: a critical review on present scenario and future prospects. Bi-otechnol Adv 24(6): 531–560.

Schlüter PM and Harris SA (2006). Analysis of mul-ti-locus fingerprinting data sets containing missing data. Molecular Ecology Notes 6: 569-572.

Vignani R, Scali M and Masi E (2002). Genomic variability in Vitis vinifera L. "Sangiovese" as-sessed by microsatellite and non-radioactive AFLP test. Electronic J Biotechnol 5 (1): 1-11.

Zulini L, Fabro E and Peterlunger E (2005). Char-acterization of the grapevine cultivar picolit by means of morphological descriptors and mo-lecular markers. Vitis 44: 35-38.

Zoghlami N, Riahi L, Laucou V, Lacombe T, Mliki A, Ghorbel A and This P (2009). Origin and genetic diversity of Tunisian grapes as revealed by microsatellite markers. Sci Hortic. 120: 479–486.

 