# DETERMINATION OF TECHNOLOGICAL FEATURES AND AMPELOGRAPHIC MOLECULAR CHARACTERIZATION OF SOME LOCAL GRAPE VARIETIES IN LAKES REGION TURKEY

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This study was done to define ampelographic and genetic characterization, technological features of 11 local grape varieties. Ampelographic observations were carried out during two years (2009 and 2010) using 55 descriptors from international grape descriptors and the definitions relevant to each character were performed by the way indicated in the lists. Mature leaf number of lobes, shape of the blade, inflorescence sex of flower, berry skin colour, berry shape, berry flesh firmness were determined.

ISSR analysis was also employed to characterize the genotypes at DNA level. Genetic relations among the genotypes were evaluated at DNA level on dendogram. The lowest similarity index among varieties betweeen Antep Büzgülü and Alyanak while the highest was between Senirkent Dimridi and Burdur Dimridi.

Varieties were evaluated for technological features. Yield, total soluble solids, must yield, acidity, bunch and berry specifications had been determined. Varieties with high must yield and varieties with high economic value and commercial importance had been determined.

Key Words: *Vitis vinifera L.*, grape variety, ampelography, molecular definition, ISSR

## FESTSETZUNG DER TECHNOLOGISCHEN EIGENSCHAFTEN MIT DEN AMPELOGRAPHISCHEN UND MOLEKULAREN CHARAKTERISIERUNGEN DER EINIGEN ÖRTLICHEN TRAUBENSORTEN IN DEM SEENGEBIET

Bei dieser Forschung ist die Charaktersierung mit den ampelographischen und molekularen Verfahren, technologischen Eigenschaften der örtlich erheblichen 11 Traubensorten in dem Seengebiet durchgeführt worden. In der ampelographischen Arbeitsabteilung sind die 55 Eigenschaften, welche aus den Beschreibungslisten von internationalen OIV und UPOV ausgewählt sind, in 2 Jahren (in 2009 und 2010 Jahren) untersucht und erledigt worden. Die Blattlappenzahl, Blattform und Blumenstruktur, Kornschalfarbe, Obstpulpafarbe, Aroma und Reifungszeiten sind festgesetzt worden.

Es ist der Technik SSR (Simple Sequence Repeats DANN) verwendet worden, um die Weinrebenpotential in der Niveau DANN festzusetzen. Die in den Sorten festgestellten Genbeziehungen sind in der Index- und Dendrogramniveau geschafft worden. Die niedrigste Ähnlichkeit zwischen den Traubensorten war in den Sorten Antep Büzgülü-Alyanak und die höchste Ähnlichkeit war in den Sorten Senirkent Dimridi-Burdur Dimridi betrachtet.

Die Sorten sind in den technologischen Eigenschaften in den verschiedenen Richtungen bewertet worden. Die Frucht ist wie Eigenschaften von im Wasser lösbare Trockensubstanz, Traubensaftperformanz, Säuregehalt, Weintraube, Korn untersucht worden. Es sind die Sorten, welche in der Eigenschaft von hoher Traubensaftperformanz sind, festgestellt worden. Die Wirtschafts- und Handelswerte besitzenden örtlichen Sorten festgesetzt worden.

Schlüsselwörter: *Vitis vinifera* L., ampelographische, molekulare Beschreibung, technologische Eigenschaften.

**INTRODUCTION**

Turkey has a long history of viticulture, dating back to 3500 B.C. (Oraman & Ağaoğlu 1969). The country has been suggested as one of the regions where grapes were first cultivated (Winkler *et al*. 1974). Turkey is a center of diversity for grapevines (*Vitis vinifera* L.) and possesses a rich grapevine germplasm (Arroya-Garcia *et al*. 2006, Ergül *et al*. 2006). The Mediterranean region of Turkey with suitable climatic conditions possesses the one of the largest areas devoted to grapevine production in the country, second only to the Aegean region.

This study was done to define ampelographic and genetic characterization of 11 local grape varieties. Ampelographic observations were carried out during two years (2009 and 2010) using 56 descriptors from international grape descriptors and the definitions relevant to each character were performed by the way indicated in the lists. Mature leaf number of lobes, shape of the blade, inflorescence sex of flower, berry skin colour, berry shape, berry flesh firmness were determined. This study aimed to characterize wide groups of grapevines used for different purposes, employing ampelographic and ISSR-PCR techniques, screen discriminative powers of ISSR primers across the genotypes investigated and compared the dendrograms constructed by two different approaches. Also technological features and ampelographic descriptions were evaluated.

Ampelography is a scientific methodology used and approved for a long time to identify grape varieties. Based on the officially defined descriptors, this method has been standardized and extended by several researchers (Galet 1985; Alleweldt & Dettweiler 1986; Santiago *et al.* 2005). Earlier works on grapevine germplasm diversty in Anatolia have involved ampelographic studies mostly done by researchers. Several studies in Turkey have also been conducted on the ampelographic identification of grapes using former definitions (Ağaoğlu *et al*. 1990; Kara, 1990). First ampelographic study was performed on grape cultivars grown in Ankara by Oraman (1937), Fidan et al. (1972) other researchers studied in the same area. Some of the studies were as follows; in Tokat (Kara, 1990), Aegean Region (Kader and Dilli, 2009) and Afyon (Akdeniz and Altındişli, 2009).

Last research about ampelography in Lakes Region was done by (Ecevit and Kelen, 1999). It was done as only a description ampelography. Different than previous research, our research was consisted of description ampelography, genetic characterization and technological features of the varieties.

Genetic characterizations of grapes have been done in Turkey. Isoenzyme studies were also used to distinguish grapevine cultivars grown in Turkey (Ağaoğlu *et al*. 1995, 1998, 1999, Söylemezoğlu *et. al,* 1998, 2001; Türkben *et. al*, 2002) with differing results in terms of the enzyme systems that help distinguishing varieties. After the development of Polymerase chain reaction (PCR), molecular markers have helped distinguishing grape cultivars and accessions on DNA level. Some moleculer identification studies on grape were done by RAPD technique by (Ergül *et. al*. 2002), AFLP technique by (Ergül *et. al*. 2004), (Aras *et. al*, 2005), (Şelli *et. al*, 2007), SSR technique by (Karataş *et. al*, 2007), (Dilli, 2008), (Sabır, 2009), (İşci *et.all*. 2009, 2010), (Hizarcı, 2010). In our study it was the first genetic identification study on local grape varieties in Lakes Region.

Technological features (yield, total soluble solids, must yield, acidity, bunch and berry specifications) were determined. In the study local grape varieties technological features, ampelographic descriptions and moleculer identification had been evaluated together for the first time in Lakes Region and the varieties with commercial importance and economical value had been evaluated with 3 different evaluation and description method.

## MATERIAL AND METHOD

Eleven grapevine cultivars (Burdur Dimriti, Siyah Gemre, Akgemre, Antep Büzgülü, Şam Büzgülü, Kuş Böreği, Akdimrit, Senirkent Dimriti, Devegözü, Tilki Kuyruğu and Alyanak. Technological features (phenology stages, soluble solid (%), titratable acidity (g/l), pH, pruning weight (kg/vine), yield (kg/vine) data had been obtained in vineyard for two years. These data were analyzed to determine their ampelographic and genetic identification relationships in Lakes Region.

Lakes Region has an important vineyard areas and grape production between Middle Anatolia and Mediterranean Region. Vineyards are located in Isparta and Burdur mostly. Table grape drying grape and wine production are one together by small farmer groups (Baydar, 1998).This study was carried out in Eğirdir Horticultural Research Institute farmlands. Eğirdir is a district of Isparta. Its altitude is 920 m high and it represents passing zone climate and ecological conditions. Geographical coordinates of Eğirdir district; are 37º 50′ 41″, 38º 16′ 55″ N latitude, 30º 57′ 43″, 30º 44′ 39″ E latitude (Gargın, 2010).

**Figure. 1** World Map **Figure. 2** Turkey Map

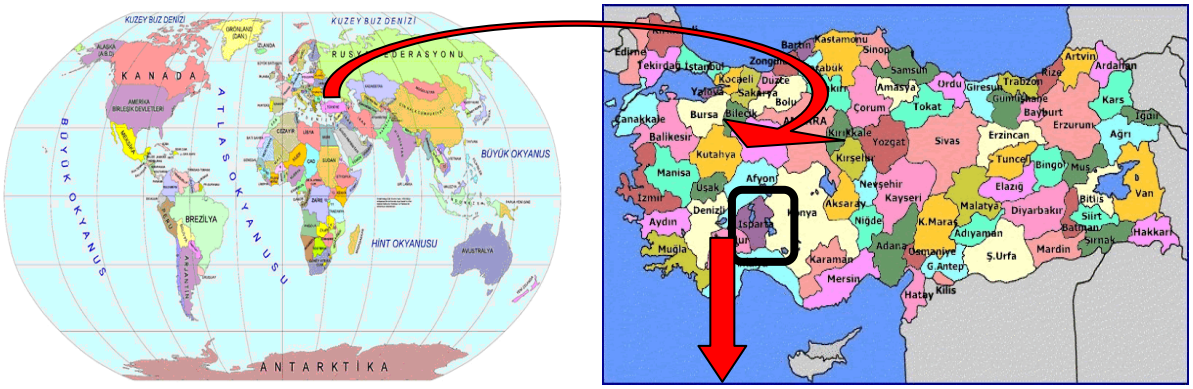


**Figure. 3** Lakes Region Map


Ampelographic characterization of cultivars, the IBPGR publication Grape Descriptors (Anonymous, 1983) and the revised Descriptors for Grapevine (*Vitis* spp.), (Anonymous, 1997) were followed and used. Highly discriminating characters were selected mainly according to the recommendation of the Office International de la Vigne et du Vin (OIV). Descriptors used in this study and their OIV codes are presented in Table 1. 56 descriptors

from the list were chosen. The ampelographic observations were carried out during two consecutive vegetation periods in 2009 and 2010. The characters of represented vines were defined/measured according to OIV descriptors.

The shoot tips were investigated when they were 10 – 30 cm long; the investigations on young leaves were recorded on the first four distal leaves; the mature leaf descriptions were made between berry set and veraison (beginning of berry maturity) on leaves above the cluster within the medium third of shoot; the clusters were measured when matured; the berry characteristics were obtained at ripening ones located in the middle of the bunches and ten average canes per variety were analyzed after the fall of leaves.

**Table 1**. Descriptor list investigated in the study

| OIV code Vine part description of the character |
|---|
| OIV 001 young shoot form of tip |
| OIV 002 young shoot disruption of anthocyanin coloration of the tip |
| OIV 004 young shoot density of prostrate hairs on tip |
| OIV 005 young shoot density of erect hairs on tip |
| OIV 006 shoot attitude (habit) |
| OIV 007 shoot color dorsal side of the internodes |
| OIV 008 shoot color ventral side of the internodes |
| OIV 009 shoot color dorsal side of the nodes |
| OIV 010 shoot color ventral side of the nodes |
| OIV 015 shoot anthocyanin coloration of the bud |
| OIV 016 shoot number of consecutive tendrils |
| OIV 051 young leaf colour of upper surface |
| OIV 053 young leaf density of prostrate hairs between veins |
| OIV 054 young leaf density of erect hairs between veins |
| OIV 055 young leaf density of prostrate hairs on main veins |
| OIV 056 young leaf density of erect hairs on main veins |
| OIV 067 mature leaf shape of blade |
| OIV 068 mature leaf number of lobes |
| OIV 070 mature leaf anthocyanin coloration of the main veins on the upper side of the blade |
| OIV 074 mature leaf profile |
| OIV 076 mature leaf shape of teeth |
| OIV 077 mature leaf length of the teeth |
| OIV 078 mature leaf length of the teeth compared with their width at the end of the base |
| OIV 079 mature leaf general shape of petiole sinus |
| OIV 080 mature leaf shape of the petiole sinus |
| OIV 081 mature leaf particularities of the petiole sinus |
| OIV 083 mature leaf shape of base of upper sinuses |
| OIV 084 mature leaf density of prostrate hairs |
| OIV 085 mature leaf density of erect hairs between the veins |
| OIV 090 mature leaf density of prostrate hairs on petiole |
| OIV 091 mature leaf density of erect hairs on petiole |
| OIV 151 inflorescence sex of flower |
| OIV 202 bunch size |
| OIV 203 bunch length |
| OIV 204 bunch density |
| OIV 205 bunch number of berries |
| OIV 206 bunch length of peduncle |
| OIV 220 berry size |
| OIV 221 berry length |
| OIV 222 berry uniformity of size |
| OIV 223 berry shape |
| OIV 225 berry color of the skin |
| OIV 226 berry uniformity of color skin |
| OIV 230 berry color of flesh |
| OIV 236 berry particular flavor |

| |
|---|
| OIV 237 berry classification of flavor |
| OIV 238 berry length of the pedicel |
| OIV 241 berry presence of seeds |
| OIV 242 berry length of seeds |
| OIV 243 berry weight of the seeds |
| OIV 502 bunch single bunch weight |
| OIV 503 berry single berry weight |
| OIV 504 bunch weight kg/ha |
| OIV 505 berry (must) sugar content |
| OIV 506 berry (must) total acid content |

Genetic characterization was done by Inter Simple Sequence Repeat (ISSR) technique, composed of microsatellite sequence between two SSR priming sites oriented on opposite DNA strands, was approved as a simple, quick and reliable tool used in various grape materials for certain purposes (Zietkiewicz *et al*. 1994; Moreno *et al*. 1998; Dhanorkar *et al*. 2005; Sabır *et al*. 2008). Steps of ISSR metod are DNA extraction and genetic analysis.

**DNA extraction:** DNA was extracted using the procedure described by Lefort et al. (1998) and Ağaoğlu et al. (2001). Concentration and purity of the extracted DNA were analyzed using a NanoDrop® ND- 1000 spectrophotometer.

**Genetic analysis of simple sequence repeats:**

We analyzed 19 SSR markers, of which 6 belonged to the so-called "core set" (i.e., VVS2, VVMD5, VVMD7, VVMD27, VrZAG62, and VrZAG79) of markers that are recommended for the direct comparison of results from different laboratories (This et al. 2004). PCR amplifications were performed as described by Şelli et al. (2007). PCR products were diluted in sample loading solution (SLS) and standards from the Genomelab DNA Standard Kit-400 were included. The amplified fragments were analyzed at least twice using a CEQ 8800XL capillary DNA analysis system (Beckman Coulter, Fullerton, CA) to ensure reproducibility. Allele sizes were determined for each SSR locus using the Beckman CEQ fragment analysis software. In each run, Cabernet Sauvignon and Merlot were included as reference cultivars.

The number of alleles (n), allele frequency, expected (He) and observed (Ho) heterozygosity, estimated frequency of null alleles (r), probability of identity (PI), and presence of identical genotypes were determined for each locus using IDENTITY version 1.0 software (Wagner and Sefc 1999), as described by Paetkau et al. (1995). Microsat version 1.5 (Minch et al. 1995) was used to calculate the proportion of shared alleles with the ps option [i.e., option 1 (ps)] (Bowcock et al. 1994) selected to assess genetic dissimilarity. Data were then converted to a similarity matrix, and a dendogram was constructed via the unweighted pair group with arithmetic mean (UPGMA) method (Sneath and Sokal 1973), using the numerical Taxonomy and Multiware Analysis System (NTSYSpc) Software.

## RESULTS AND DISCUSSION

**SSR analysis:** 19 SSR markers from 11 grapevine cultivars grown in Lakes Region and neighboring regions (in addition to two reference cultivars) were analyzed. Many researchers have used SSR markers to identify synonyms and homonyms of grapevine genotypes. Genetic relationship was given in figure.1 dendrogram and similarity index chart. When the genetic similarity of the genotypes was analyzed, among the grape cultivars analyzed in this study, four cases of identity were found. Ak Gemre, Kuş Böreği, Ak Dimrit, Siyah Gemre were identified in a group, Antep Büzgülü, Şam Büzgülü, Devegözü, Tilki Kuyruğu were identified in a group, Senirkent Dimridi, Burdur Dimridi were identified in a group and Alyanak, Merlot, Cabarnet Sauvignon were in other group. The lowest similarity index among varieties between was Antep Büzgülü and Alyanak while the highest were between Senirkent Dimridi, Burdur Dimridi varieties. There were no synonyms and homonyms. The dendrogram shown in figure.1 reveals that the reference cultivars used in this study are distantly related

to the Turkish cultivars studied here. The distribution of cultivars within the dendrogram appears to be independent of their ecogeographical distributions.

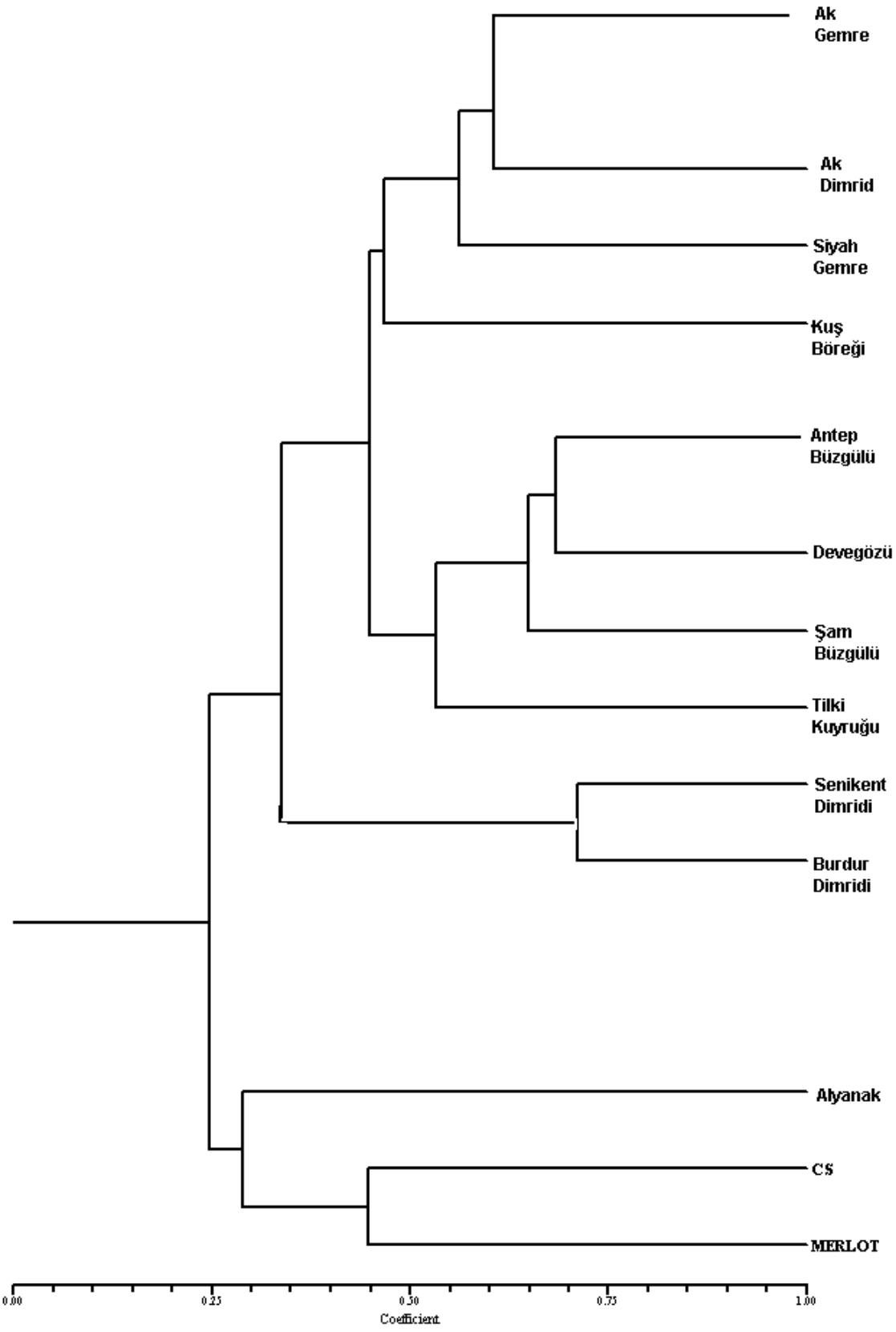
Ak Gemre
Ak Dimrid
Siyah Gemre
Kuş Böreği
Antep Büzgülü
Devegözü
Şam Büzgülü
Tilki Kuyruğu
Senikent Dimridi
Burdur Dimridi
Alyanak
CS
MERLOT
0.00
0.25
0.50
0.75
1.00
Coefficient

**Figure 4** . Genetic relationships among cultivars

**Table. 2** Some of the ampelographic characters determined of the varieties grown in Lakes Region

| Characters | Ak Gemre | Kuş Böreği | Akdimrit | Siyah Gemre |
|---|---|---|---|---|
| **Young Shoot** | | | | |
| Form Of Tip | Opened | Opened | Opened | Half opened |
| Density Of Prostrate Hairs | Very sparse | Very sparse | Dense | Medium |
| Density Of Erect Hairs | Very sparse | Sparse | Very dense | Very sparse |
| **Shoot** | | | | |
| Anthocyanin Col. Of The Bud | Weak | Absent | Absent | Absent |
| Number Of Consec. Tendrils | Discontinuous | Discontinuous | Discontinuous | Discontinuous |
| **Mature Leaf** | | | | |
| Shape Of Blade | Pentagonal | Pentagonal | Pentagonal | Pentagonal |
| Number Of Lobes | Five | Five | Seven | Five |
| Shape Of Base Of Upper Sinuses | V shaped | U shaped | U shaped | V shaped |
| Inflorescence Sex Of Flower | Hermaphrodite | Hermaphrodite | Hermaphrodite | Hermaphrodite |
| **Bunch And Berry** | | | | |
| Bunch size | Large | Large | Small | Medium |
| Bunch density | Medium | Very loose | Medium | Large |
| Bunch Weight Kg/Ha | Medium | Low | High | High |
| Berry Size | Large | Large | Medium | Medium |
| Berry uniformity | Not uniform | Not uniform | Uniform | Not uniform |
| Berry Shape | Rounddisch | Short elliptic | Rounddisch | Rounddisch |
| Berry Colour Of The Skin | Green-yellow | Rose-yellow | Green-yellow | Black-blue |
| Berry Colour Of The Flesh | Not colored | Not colored | Not colored | Colored |
| Presence of Seed | present | present | present | present |

**Table. 3** Some of the ampelographic characters determined of the varieties grown in Lakes Region

| Characters | Şam Büzgülü | Devegözü | Tilki Kuyruğu | Antep Büzgülü |
|---|---|---|---|---|
| **Young Shoot** | | | | |
| Form Of Tip | Opened | Opened | Opened | Opened |
| Density Of Prostrate Hairs | Very sparse | Medium | Sparse | Sparse |
| Density Of Erect Hairs | Medium | Medium | Strong | Medium |
| **Shoot** | | | | |
| Anthocyanin Col. Of The Bud | Medium | Strong | Strong | Medium |
| Number Of Consec. Tendrils | Discontinuous | Discontinuous | Discontinuous | Discontinuous |
| **Mature Leaf** | | | | |
| Shape Of Blade | Cordate | Pentagonal | Pentagonal | Pentagonal |
| Number Of Lobes | Seven | Seven | Seven | Five |
| Shape Of Base Of Upper Sinuses | U shaped | V shaped | U shaped | U shaped |
| Inflorescence Sex Of Flower | Hermaphrodite | Hermaphrodite | Hermaphrodite | Hermaphrodite |
| **Bunch And Berry** | | | | |
| Bunch size | Medium | Large | Medium | Large |
| Bunch density | Medium | Loose | Large | Dense |
| Bunch Weight Kg/Ha | High | Low | Medium | High |
| Berry Size | Medium | Large | Large | Medium |
| Berry uniformity | Uniform | Not uniform | Not uniform | Uniform |
| Berry Shape | Short elliptic | Short elliptic | Long elliptic | Short elliptic |
| Berry Colour Of The Skin | Black-blue | Yellow-red | Yellow-green | Black-blue |
| Berry Colour Of The Flesh | Not colored | Not colored | Not colored | Not colored |

| | | | | |
|---|---|---|---|---|
| Presence of Seed | present | present | present | present |

**Table. 4** Some of the ampelographic characters determined of the varieties grown in Lakes Region

| **Characters** | **Burdur Dimridi** | **Alyanak** | **Senirkent Dimridi** |
|---|---|---|---|
| **Young Shoot** | | | |
| Form Of Tip | Half Opened | Opened | Opened |
| Density Of Prostrate Hairs | Medium | Absent | Dense |
| Density Of Erect Hairs | Dense | Medium | Dense |
| **Shoot** | | | |
| Anthocyanin Col. Of The Bud | Absent | Strong | Medium |
| Number Of Consec. Tendrils | Discontinuous | Discontinuous | Discontinuous |
| **Mature Leaf** | | | |
| Shape Of Blade | Pentagonal | Pentagonal | Pentagonal |
| Number Of Lobes | Five | Three | Seven |
| Shape Of Base Of Upper Sinuses | U shaped | U shaped | V shaped |
| Inflorescence Sex Of Flower | Hermaphrodite | Hermaphrodite | Hermaphrodite |
| **Bunch And Berry** | | | |
| Bunch size | Small | Large | Small |
| Bunch density | Dense | Medium | Medium |
| Bunch Weight Kg/Ha | Medium | Low | High |
| Berry Size | Medium | Medium | Medium |
| Berry uniformity | Not uniform | Not uniform | Not uniform |
| Berry Shape | Rounddsich | Long elliptic | Rounddisch |
| Berry Colour Of The Skin | Pink-red | Yellow | Pink-red |
| Berry Colour Of The Flesh | Colored | Not colored | Colored |
| Presence of Seed | present | present | present |

Ampelographic characters described in 11 varieties are presented in Table 2. The forms of the tips on the young shoots were observed generally as opened. The density of prostrate and erect hairs on tip showed differences according to varieties. Dimrid varieities (Senirkent Dimridi, Burdur Dimridi and Ak Dimrid) showed dense erect and prostrate hairs on tips, Gemre varieities (Siyah Gemre, Ak Gemre) showed sparse erect and prostrate hairs on tips. Anthocyanin Col. of The Bud of varieties showed difference Devegözü and Tilki Kuyruğu had the strong coloration. Number of consecutive tendrils was discontinuous in all varieties.
Mature leaves had three, five and seven lobes and generally pentagonal shaped only Şam Büzgülü variety was in cordate form. General shape of petiole sinus was of 11 varieties were in V and U shaped. Sex of flowers in all varieties was hermaphrodite.
Bunch sizes were determined small, medium and large and bunch density varied form loose to large. Burdur Dimridi and Senirkent Dimridi had the smallest bunch density. Shape of the bunch was cylindrical and conic and winged. The size of berry was determined medium to large. Ak Gemre, Tilki Kuyruğu, Devegözü, Kuş Böreği were determined with large berry size. Shape of the berry at in all varieties was in round and short elliptic form. Berry uniformity and berry colour of the skin were generally in not uniform. Except three varieties (Burdur Dimridi, Senirkent Dimridi, Siyah Gemre) colour of the flesh juice were not colored. All varieties have present seed.

**Table 5**. Phenologic stages of varieties in 2009

| VARIETY | BUD BURST TIME | INFLORESCENCE TİME | BERRY COLOUR SET TIME | HARVEST TIME |
|---|---|---|---|---|
| **Ak Gemre** | 18.04 | 15.06 | 26.08 | 30.09 |
| **Antep Büzgülü** | 22.04 | 14.06 | 06.08 | 26.09 |
| **Şam Büzgülü** | 22.04 | 16.06 | 02.08 | 17.09 |
| **Kuş Böreği** | 21.04 | 16.06 | 25.08 | 30.09 |
| **Ak dimrid** | 17.04 | 13.06 | 26.08 | 12.09 |
| **Senirkent Dimridi** | 18.04 | 12.06 | 30.07 | 25.08 |
| **Devegözü** | 24.04 | 15.06 | 19.08 | 02.10 |
| **Tilki kuyruğu** | 20.04 | 15.06 | 25.08 | 03.10 |
| **Burdur Dimridi** | 20.04 | 12.06 | 29.07 | 27.08 |
| **Siyah Gemre** | 19.04 | 10.06 | 10.08 | 25.09 |
| **Alyanak** | 21.04 | 14.06 | 20.08 | 26.09 |

**Table** 6. Phenologic stages of varieties in 2010

| VARIETY | BUD BURST TIME | INFLORESCENCE TİME | BERRY COLOUR SET TIME | HARVEST TIME |
|---|---|---|---|---|
| **Ak Gemre** | 14.04 | 13.06 | 12.08 | 16.09 |
| **Antep Büzgülü** | 15.04 | 06.06 | 04.08 | 25.09 |
| **Şam Büzgülü** | 12.04 | 13.06 | 02.08 | 29.09 |
| **Kuş Böreği** | 16.04 | 15.06 | 27.08 | 22.09 |
| **Ak dimrid** | 13.04 | 05.06 | 05.08 | 27.08 |
| **Senirkent Dimridi** | 12.04 | 05.06 | 05.08 | 27.08 |
| **Devegözü** | 17.04 | 17.06 | 19.08 | 20.09 |

| | | | | |
|---|---|---|---|---|
| **Tilki kuyruğu** | 18.04 | 15.06 | 19.08 | 23.09 |
| **Burdur Dimridi** | 13.04 | 05.06 | 31.07 | 26.08 |
| **Siyah Gemre** | 18.04 | 13.06 | 08.08 | 16.09 |
| **Alyanak** | 18.04 | 12.06 | 13.08 | 21.09 |

**Table 7**. Technological features of varieties in 2009

| VARIETY | FRESH GRAPE YİELD (kg/vine) | AVERAGE BUNCH WEIGHT (g) | 100 BERRY WEIGHT (g) | TOTAL SOLUBLE SOLIDS (%) | TITRATABLE ACIDITY (g/l) | MUST RATIO (%) |
|---|---|---|---|---|---|---|
| **Ak Gemre** | 12.00 | 640 | 469 | 15.0 | 6.6 | 64 |
| **Antep Büzgülü** | 14.66 | 533 | 507 | 17.6 | 6.7 | 57 |
| **Şam Büzgülü** | 21.66 | 622 | 427 | 17.8 | 16.6 | 58 |
| **Kuş Böreği** | 16.00 | 600 | 652 | 16.4 | 4.8 | 62 |
| **Ak Dimrid** | 21.00 | 230 | 144 | 15.5 | 7.5 | 60 |
| **Senirkent Dimridi** | 17.00 | 322 | 218 | 15.9 | 7.6 | 57 |
| **Devegözü** | 7.33 | 368 | 461 | 15.4 | 6.1 | 52 |
| **Tilki kuyruğu** | 10.66 | 540 | 362 | 17.0 | 4.6 | 54 |
| **Burdur Dimridi** | 21.63 | 375 | 456 | 18.5 | 6.9 | 64 |
| **Siyah Gemre** | 24.00 | 383 | 360 | 172 | 7.3 | 58 |
| **Alyanak** | 12.00 | 365 | 347 | 16.8 | 5.8 | 60 |

**Table 8**. Technological features of varieties in 2010

| VARIETY | FRESH GRAPE YİELD (kg/vine) | AVERAGEBUNCH WEIGHT (g) | 100 BERRY WEIGHT (g) | TOTAL SOLUBLE SOLIDS (%) | TITRATABLE ACIDITY (g/l) | MUST RATIO (%) |
|---|---|---|---|---|---|---|
| **Ak Gemre** | 4.7 | 326 | 570 | 18.8 | 4.8 | 60 |
| **Antep Büzgülü** | 8.6 | 386 | 511 | 17.9 | 3.8 | 56 |
| **Şam Büzgülü** | 15.3 | 355 | 482 | 17.9 | 5.1 | 59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Kuş Böreği** | 12.0 | 236 | 386 | 14.1 | 3.4 | 67 |
| **Ak dimrid** | 15.0 | 356 | 213 | 16.8 | 8.1 | 55 |
| **Senirkent Dimridi** | 17.6 | 228 | 178 | 16.0 | 5.7 | 57 |
| **Devegözü** | 13.3 | 266 | 333 | 14.1 | 4.5 | 50 |
| **Tilki kuyruğu** | 8.0 | 412 | 387 | 15.9 | 4.9 | 41 |
| **Burdur Dimridi** | 17.8 | 392 | 381 | 16.1 | 6.3 | 62 |
| **Siyah Gemre** | 5.3 | 244 | 436 | 17.7 | 5.4 | 52 |
| **Alyanak** | 7.1 | 373 | 395 | 16.7 | 6.1 | 59 |

Evaluations, findings and observations were obtained as a result of these analyses and measurements related to two varieties in 2009 and 2010 are given in tables 2,3,4,5,6,7,8. Grape varieties which were evaluated in the study, all phonological stages were determined. Buds burst time, Full blossom time, verasion period and harvest time were given in 2009 and 2010 years in table 5, 6. All varieties buds burst time was mid of the April in two years data. The earliest varieties were Senirkent Dimridi, Ak Dimrid and Şam Büzgülü were determined. Full blossom time in all varieties were second and third week of the June in two years observation. Harvest time of varieties were late August and beginning of September in 2009 and mid of the September in 2010 year. It occurred earlier in 2009 because of climate conditions but generally all varieties are harvested in September.

Among the 11 variety evaluated yield and quality properties data had been obtained in vineyard. Soluble solid (%), total titratable acidity (g/l), Pruning weight (g), pH, Average bunch weight (g), 100 berry weight, yield were determined. Two years data were given in table 4 and 5. Highest total yield were evaluated from Burdur Dimridi and Ak Gemre varieties by two years data. Highest bunch weight was evaluated from Ak Gemre and Tilki Kuyruğu varieties same with the data in ampelographic description. All varieties were good in must ratio. Generally must ratios were at % 60 or more. Kuş Böreği and Dimrit varieties (Burdur Dimridi, Senirkent Dimridi, Ak Dimrid) have high must ratios. Titratable acidity had varied 3.1-8.1 g/l in two years observations. Some varieties were evaluated for good for must ratios and yield characterics.

## CONCLUSİONS

In this study genetic characterization, molecular definition, classic ampelographic definition and phenologic and technologic features of Lakes region's varieties had been researched. Only one research had been done before about these varieties in 1999 concerning classic ampelographic description. By these study varieties had been researched with three different description methods.

Genetic characterization showed that these varieties were not synonyms and homonyms. This was a good feature for breeding works. Breeding new varieties from local varieties will be possible because of wide genetic expression in varieties. Also ampelographic definitions had been done description data was updated. Phenologic stages and technological features had been evaluated some important features of varieties had been noticed. Must ratio and

yield had been significantly determined important in some varieties. Kuş Böreği and Dimrit varieties (Burdur Dimridi, Senirkent Dimridi, Ak Dimrid) have high must ratios and Burdur Dimridi variety is good for must ratio and fresh consumption. Şam Büzgülü, Antep Büzgülü, Siyah Gemre varieties were evaluated good for fresh consumption. These varieties can be advised to growers. Hopeful varieties with high must ratio and fresh consumption quality must be researched by other treatments. Cropload management and pruning studies will be done in near future. These data will be useful in the studies that will be planned for future studies about the varieties especially in breeding new varieties.

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## BIBLIOGRAPHY

Ağaoglu Y.S., Celik H., Gökcay E. 1990. Brief ampelographic characters of indigenous grapevine cultivars subjected to clonal selection in Turkey. 5th Int. Symp. on Grape Breeding. September 12–16, 1989, St. Martin Pfalz, Vitis Special Issue, 532–537.

Akdeniz, B., D., and Altındişli, A., 2009. Ampelography of some native grape varieties which tend to diseppear in Afyonkarahisar region. Proceedings of the 7th National Vit and techonology symposium,Oct, 5-7, Manisa

Akkurt, M., 1998. Viticulture in Meram province and determination of ampelographic characters of grape varieties grown in the distirict. Proceedings of the 4th National Vit and techonology symposium,Oct, 20-23, Yalova

Alleweldt G., Dettweiler E. 1986. Ampelographic studies to characterize grapevine varieties. Vignevini, 13: 56–59.

Anonymous 1983. Grape Descriptors. InternationalBoard for Plant Genetic Resources, Rome.

Anonymous 1997. Descriptors for Grapevine (*Vitis* spp.). International Plant Genetic Resources Institute, Rome.

Arroyo-Garcia, R., L. Ruiz-Garcia, L. Boulling, R. Ocete, M. A. López, C. Arnold, A. Ergul, G. Söylemezoglu, H. I. Uzun, F. Cabello, J. Ibáñez, M. K. Aradhya, A. Atanassov, I. Atanassov, S. Balint, J. L. Cenis, L. Costantini, S. Gorislavets, M. S. Grando, B. Y. Klein, P. McGovern, D. Merdinoglu, I. Pejic, F. Pelsy, N. Primikirios, V. Risovannaya, K. A. Roubelakis- Angelakis, H. Snouss, P. Sotiri, S. Tamhankar, P. This, L. Troshin, J. M. Malpica, F. Lefort and J. M. Martinez- Zapater. 2006. Genetic evidence for the existence of independent domestication events in grapevine. Mol. Ecol. 15: 3707-3714.

Baydar, G. N., 1998. The Current Situation and Problems and Ecology Conditions of Isparta's Viticulture 4th National Viticulture Symposium 20 -23 October Yalova.

Bowcook, A. M., A. Ruiz- Linares, J. Tomfohrde, E. Minch, J. R. Kidd and L. L. Cavalli –Sforza. 1994. High resolution of human evolutionary trees with polymorphicmicrosatellites. Nature 368: 455-457.

Dhanorkar V.M., Tamhankar S.A., Patil S.G., Rao V.S. (2005): ISSR-PCR for assessment of genetic relationship among grape varieties cultivated in India. Vitis, 44: 127–131.

Dilli, Y., 2008. Researchs on the characterization ofsome important grape varieties, types and clones in Aegean region by using microsatellite (SSR) markers Ph. D. Thesis Graduate scholl of Natural and applied sciences, Ege University.

Ergül, A., K. Kazan, S. Aras, V. Çevik, H. Çelik and G. Söylemezoglu. 2006. AFLP analysis of genetic variation within the two economically important Anatolian grapevine (*Vitis vinifera* L.) varietal groups. Genome 49: 467-495. Galet P. (1985): Precis D'ampelographie Practique.5th Ed., Dehan, Montpellier.

Gargın,S., Göktas, A., Altındişli, A., 2010. Quality And Yield Performance Of Popular Turkish Wine Varities (Kalecik Karasi And Narince) In Lake Region Ecological Conditions. 33rd World Congress of Vine and Wine 21-27.06.2010,Georgia.

Hizarcı, Y., 2010. Description of ampelographic characterics and determine genetic relations by using SSR markers among grapevine cultivars grown in Yusufeli district. Ph. D. Thesis Graduate school of Natural and applied sciences, Atatürk University.

İşçi, B., A. Altındişli, G. Söylemezoğlu and C. Özer., 2010. Genome Mapping İn F1 Population of Crossbred Italia and Mercan Grape Varieties: Establishment Of AFLP and SSR Linkage Groups Towards Significant Morphological Characters and Fungal Diseases'. - African Journal of Biotechnology Vol. 9(36), PP. 5879-5886, 6.

İşçi, B., H. K., Yıldırım, A. Altındişli. 2009. A Review of the Authentication of Wine Origin by Molecular Markers.' Journal of the Institute of Brewing 115 ISSUE 3
Kara Z. (1990): Determination of the ampelographic characters of grape varieties in Tokat. [Ph.D. Thesis.] Ankara.

Karataş, H., Değirmenci, D., Velasco R., Vezzulli, S., Bodur C. and Ağaoğlu, Y.S. 2007. Microsatellite fingerprinting of homonymous varieties neihghboring regions of Southeast of Turkey, Sci. Hort., 114:164-169

Lefort, F., M. Lally, D. Thompson and G. C. Douglas. 1998. Morphological traits microsatellite fingerprinting and genetic relatedness of a stand of elite oaks (*Q.robur* L.) at Tuallynally, Ireland. Silvae Genet. 47: 5-6.

Mınch, E.; Ruız-lınares, A.; Goldsteın, D. B.; Feldman, M.; Cavallısforza,l. L.; 1995. Microsat (version 1.4d): a computer program for calculating various statistics on microsatellite allele data. Stanford, California, Stanford University. Moreno S., Martın J.P., Ortız J.M. (1998). Intersimple sequence repeats PCR for characterization of closely related grapevine germplasm. Euphytica, 101: 117–125.a.

Oraman M.N., Agaoglu Y.S. (1969). Some characteristics of Turkey's viticulture and the composition of its districts in viticulture. Ankara University Agriculture Faculty Yearbook, Ankara.

Paetkau, D., W. Calvert, I. Stirling and C. Strobeck. 1995. Microsatellite analysis of population structure in Canadian polar bears. Mol. Ecol. 4: 347-354.

Sabır A., Kafkas S., Tangolar S., Buyukalaca S. (2008). Genetic relationship of grape cultivars by ISSR (Inter-simple sequence repeats) markers. European Journal of Horticultural Sciences, **73**: 84–88.

Sabır A., Kafkas S., Tangolar S., Buyukalaca S. (2009). Ampelographic and molecular diversity among grapevine cultivars. Czech. J. Genet. Plant breed, 45;160-168.

Santiago J.L., Boso S., Martınez M.C., Pinto- Carnide O., Ortiz J. M. (2005). Ampelographic comparison of grape cultivars (*Vitis vinifera* L.) grown in Northwestern Spain and Northern Portugal. American Journal of Enology and Viticulture, **56**: 287–290.

Sneath, P .H. A. and R. R. Sokal. 1973. Numerical taxanomy. San Francisco, CA: Freeman.

Selli, F., M. Bakır, G. Inan, H. Aygün, Y. Boz, A.S. Yasasın, C. Özer, B. Akman, G. Söylemezoglu, K. Kazan and A. Ergül. 2007. Simple sequence repeat-based assessment of genetic diversity in Dimrit and Gemre grapevine accessions from Turkey. Vitis 46:182-187.

This, P., A. Jung, P. Boccacci, J. Borrego, R. Botta, L. Costantini, M. Crespan, G. S. Dangl, C. Eisenheld, F. Ferreira-Monteiro, S. Grando, J. Ibanez, T. Lacombe, V. Laucou, R. Magalhaes, C. P. Meredith, N. Milani, E. Peterlunger, F. Regner, L. Zulini and E. Maul. 2004. Development of a standard set of microsatellite reference alleles for identification of grape cultivars Theor. Appl. Genet. 109: 1448-1458.

Türkben C., Söylemezoglu G., Ergül A., and Ağaoglu Y. 2002. Isoenzymatic polymorphism differentiation of Turkish grapevine cultivars by polyacrylamide gel electrophoresis. Biotechnology and Biotechnological Equipment 16: 148–151.

Zietkiewicz E., Rafalski A., Labuda D. (1994). Genome fingerprinting by simple sequence repeat (FSR)- anchored polymerase chain reaction amplification. Genomics, **20**: 176–183.

Wagner, H. W. and K. M., Sefc. 1999. Identity 1.0. Centre for Applied Genetics, University of Agricultural Science, Vienna.

Winkler, A. J., J. A. Cook, W. M. Kliewer, L. A. Lider, 1974. General Viticulture. University of California Press, Berkeley and Los Angeles. 633p.