

“BEHAVIOR OF “MANAKUQ” RED-ROSÉ WINE GRAPEVINE CULTIVAR UNDER CLIMATIC CONDITIONS OF MJEDA, SHKODËR, ALBANIA”

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Abstract

“Manakuq” is a regional red-rosé wine grapevine cultivar selected, preserved and disseminated in vineyards and pergolas of the Balkan Peninsula countries, especially on the triangle Albania-Montenegro-Kosovo, known as “Manakuq” in Albania, “Keci” in Kosovo or “Plovdina” in Podgorica. Study was conducted in three consecutive years, 2010-2012, in a representative sample of 15 vines, in fifteen years old vineyard in Naraç, Mjeda’s Commune, Shkodër, and was focused on the behavior and expression level of the main vegetative and productive characteristics. For evaluation of the main characteristics, the IPGRI International Descriptors of Grapevine was used. Under Mjeda’s specific conditions, the period from blooming to grape maturity and harvest of “Manakuq” was 153 days, with 1321°C sum of active temperatures (>10°C) and 1019 hours with sunlight radiance. Insertion of the first inflorescence starts at 4th node and each shoot generates 2 inflorescences. The flower type was hermaphrodite (male and female fully developed). Size of mature leaf blade was medium (127.6 mm); blade leaf shape was circular with 5 half overlapping lobes distinct by each-other by deep and closed lateral sides, length of petiole was 93.5 mm, depth of lateral sinus was 44.4 mm and length of inferior sinus 40.3 mm. Bunches were compact, dense, with a cylindrical shape. Bunch size was medium (17 cm) and single bunch weight was small (210 g). Bunches contain 115 uniform red-skin round berries. Berries flesh was very juicy with no any special flavor. Must yield was medium (68 ml juice/100 g berries), sugar content of must was medium (20%), and total must acid content was low (5.3 g/L).

Key words: *behavior, climatic conditions, cultivar, descriptor, evaluation, “Manakuq”, vineyard.*

Introduction

“Manakuq” is a regional red-rosé wine grapevine cultivar selected, preserved and disseminated in vineyards of the Balkan Peninsula countries. The large area with “Manakuq” is on the triangle Albania-Montenegro-Kosovo. It is known as “Keci” in Kosovo or “Pllovdina” in Podgorica (Susaj, 2012/b). “Manakuq” belong to the Euro Asiatic grapevine group (*Vitis Vinifera*), in *Proles Pontica* center (Kerridge and Antcliff, 1999).

“Manakuq”, “Kallmet”, “Cëruja”, “Black Shesh”, “White Shesh”, “Pulës”, etc, are being considered as autochthonous grapevine cultivars in Albania and other Balkan countries, which belong to Rhamnales Order, Family Vitaceae, Genus Vitis, Subgenus Euvitis, Species *Vitis vinifera ssp sativa* (Sotiri *et al.*, 1972, Susaj, 2012/a).

Traditionally, in Albania and Kosovo, “Manakuq” has been cultivated in pergolas, but, after 1982, the production of grafted saplings over 140 Ru rootstocks was followed by vineyard cultivation in distances of (2.5 m x 1 m) or 4000 vines ha⁻¹. Keeping form was “bilateral spur cordon”, with a stump of 80-90 cm, sounded over a vertical espalier of 3-4 lines. Grape maturity occurs on September 1-5, with a yield of 120 kv ha⁻¹ (3 kg/vine), and the grape is used for specific red-rosé wine production in the areas of Mjeda, Zadrima, etc, reached on tannins, alcohol and acids. “Manakuq”’s wine is one of the best alcoholic red-rosé wines of Albania, typically produced in the region Lezhë-Shkodër-Koplik, which is being characterized of a typical flowers flavor (Susaj, 2012/a).

Vineyard cultivated area of “Manakuq” over years seems to have a raise tendency. In 2011, cultivated area with “Manakuq” was 52 ha (MoAFP, 2011), mainly in North-western area of Albania, such as Shkodra and Malësia e Madhe districts.

According to Coombe & Dry (2005 & 2007) and Maracchi (1993), the period from bud burst to blooming seems to be the same for all grapevine cultivars in specific climatic conditions, while there very clearly expressed differences for the period from blooming to grape maturity and harvest. Duration of this period depends on the sum of active temperatures (SAT-°C) and sum of sunlight radiance (SSR-hours). SAT must be 900°C for early ripening grape cultivars, 1500°C for medium ripening grape cultivars, and 2000°C for late ripening grape cultivars, while the sunlight radiance is 1000 hours for early ripening grape cultivars, 1500 hours for medium ripening grape cultivars, and 1800 hours for late ripening grape cultivars.

Studies of behavior and evaluation of the expression level of the observed and measurable or quantitative characters must be carried out based on codes and evaluation levels of the IPGRI International Descriptors of Grapevine (IPGRI, 1997).

Observations, biometrical measurements and evaluation of vegetative and productive characters of grapevine cultivars reach out 3 years in a representative sample constituted by 10-15 typical plants (IPGRI, 1997; Susaj, 2009; Çakalli and Susaj, 2004; Susaj, 2012; Susaj, 2012).

Material and Methods

Study for the behavior and the evaluation of expression level of main characters of “Manakuq” grapevine cultivar was conducted in a vineyard of 1.2 ha, under ownership of Jak Pacani, in Naraç village of Mjeda, Shkodër, 32 m above the sea level. Study was carried out during three consecutive years, 2010-2012, on a representative sample, chosen randomly, constituted by 12 vines, 15 years old, planted in distances of 2.5 m x 1 m or 4000 vines ha⁻¹. Observations, measurements and evaluations of characters were based on codes and levels of the International Descriptors of Grapevine (IPGRI, 1997; Susaj, 2009; Gjermani, 2001; Negerul, 1946). Thirty years

data of temperature and sunlight radiance of Shkodra district were collected from the Albanian Hydro Meteorological Institute Bulletin (AHMI, 1981) and daily data over three last years. Evaluation of sunlight and solar radiance requests and time ripening of “Manakuq” was based on (SAT-°C) and (SSR-hours) under climatic conditions of Mjeda, Shkodër. Vines were marked with plastic labels from 1 to 12 that were unmoved over the study period. Characterization of “Manakuq” grapevine cultivar was focused on 50 main characters of young shoot, young leaf, flower, mature leaf, bunch, berries, seeds, productivity characters, etc. Characterization of the features of the tip of young shoot, young leaf and flower, was performed in the period May 10-12. Young shoot and young leaf were evaluated for the form of tip, anthocyanin coloration of tip, density of prostrate hairs on tip and shape; young leaf upper surface color, etc, while the flower was evaluated for the flower type, node were inserts the first inflorescence and the number of inflorescences for shoot, etc. Characterization of the mature leaf features, such as mature leaf shape, number of lobes, length of petiole, main veins lengths (N1, N2, N3, N4), length and width of tooth N2, length of upper and lower lateral sinuses, shape of lateral teething, etc., was performed in the period July 15-20, in a representative sample of 12 intact mature leaves, taken from the first node over last bunch of shoot. Characterization of the bunch characters (shape, weight, length, width) was performed in the period September 1-3, in a representative sample of 5 kg bunches, at the full grape maturity, 2-3 days prior to harvest (IPGRI, 1997; Deshaies, 1993).

Characterization of the berries characters (shape, weight, skin color, number and seeds dimensions, etc.) was performed in a representative sample of 100 berries taken randomly from the middle part of bunches (IPGRI, 1997; Çakalli and Susaj, 2004; Susaj, 2012).

Characterization of chemical and technological characters of grape was based on data analysis of the must yield (ml/100 g fresh grape), and sugar content (%) and total acidity content (g/L) in must, and was performed on a sample of 5 kg fully-ripen grape without pedicels, crushed and centrifuged at 3000 rpm, and was carried out at the Viticulture Lab of Agricultural University of Tirana.

Three-year study period (2010-2012) was considered sufficient to reach right conclusions of “Manakuq” grapevine cultivar behavior under climatic conditions of Mjeda, Shkodër.

Results and Discussions

Temperature and sunlight radiation conditions of Mjeda, Shkodër (30 years mean)

Thirty years mean climate data of temperature and sunlight radiance were collected from the Albanian Hydro Meteorological Institute Bulletin (AHMI, 1981) (Table 1).

Table 1. Mean temperature and sunlight radiance of Mjeda region (30 years mean data)

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
|---------------------------|------|------|------|------|------|--------------|--------------|--------------|------|------|------|------|
| Temperature (°C) | | | | | | | | | | | | |
| First decade | 5.8 | 5.2 | 7.7 | 12.7 | 16.6 | 20.5 | 23.9 | 25.8 | 22.7 | 17.5 | 12.7 | 7.4 |
| Second decade | 4.6 | 6.5 | 8.9 | 13.4 | 18.2 | 21.9 | 24.9 | 25.3 | 20.3 | 15.6 | 11.5 | 7.1 |
| Third decade | 4.7 | 6.6 | 11.2 | 14.8 | 19.4 | 23.7 | 25.2 | 23.9 | 19.2 | 14 | 8.7 | 6.4 |
| Sunlight radiance (hours) | | | | | | | | | | | | |
| First decade | 30.0 | 39.4 | 48.0 | 62.3 | 74.3 | 93.1 | 111.0 | 111.8 | 91.9 | 67.3 | 41.2 | 36.7 |
| Second decade | 36.6 | 33.5 | 53.4 | 62.6 | 80.3 | 97.7 | 113.0 | 107.8 | 83 | 63.1 | 36.3 | 35.1 |
| Third decade | 49.6 | 38.4 | 62.8 | 66.9 | 98.8 | 109.0 | 124.0 | 105.8 | 79.2 | 67.1 | 39.7 | 35.2 |

Under climatic conditions of Naraç and Mjedë-Shkodër region, red-rosé wine grapevine cultivar “Manakuq” starts the vegetative period on March 10-15, when the air temperature is 10-11°C, and blooms on May 23-30 (medium blooming cultivar), with a duration 8 days, which is being considered as a normal duration (Maracchi, 1993). Grape maturity and harvest

occur on September 1-5, when sugar content of must is 20%. The sum of active temperatures (>10°C) for the period May 23 to September 5 (from blooming to grape maturity) reach >1321°C and 1019 hours with sunlight radiance, while the vegetative period from bud burst to harvest reach out 153 days. Based on the IPGRI (1997), Code 304, red-rosé wine grapevine cultivar “Manakuq” belongs to early-ripening grape cultivars.

Morphological characters

Young shoot and young leaf characters. Form of tip of young shoot (Code 001) was fully-open (1), anthocyanin coloration of tip (Code 003) was medium (5), density of prostrate hairs on tip (Code 004) was dense (7), young leaf upper surface color (Code 0051) was cooper yellow (6), shoot attitude (Code 006) was semi-erect (3), etc.

Flower characters. Flower sex (Code 151) was male and female fully developed (3), insertion of 1st inflorescence (Code 152) was 4th node (2), number of inflorescences per shoot (Code 153) was 2 (2).

Mature leaf characters. Mature leaf blade color (Code 069) was dark green (4), size of blade (Code 065) was medium (5) with a length of 127.6 mm, shape of blade (Code 097) was circular (4), number of lobes (Code 068) was five (3), length of tooth N2 (Code 077) was short (108.6 mm) (3), lobes were half overlapping (Code 079) (7). Main veins lengths were: N1 (Code 601) 127.6 mm, N2 (Code 602) 108.6 mm, N3 (Code 603) 77.7 mm and N4 (Code 604) 49.8 mm. Length petiole sinus to upper lateral leaf sinus (Code 605) was 44.4 mm (7), and length petiole sinus to lower lateral leaf sinus (Code 606) was 40.3 mm, length of petiole was much shorter than N1 (Code 093) (93.5 mm<127.6 mm) (1) (Table 2).

Table 2. Mean values of ampelometric characters of the “Manakuq” mature leaf

| Plant | Length of petiole and main veins (mm) | | | | | Tooth N ₂ (mm) | | Sinuses length mm) | | |
|-------|---------------------------------------|--------------|--------------|-------------|-------------|---------------------------|-----------|--------------------|-------------|-------------|
| | Petiole | N1 | N2 | N3 | N4 | Length | Width | Petiole | Upper | Lower |
| 01 | 120 | 121 | 104 | 75 | 46 | 15 | 15 | 0 | 31 | 36 |
| 02 | 85 | 131 | 115 | 75 | 55 | 12 | 12 | 0 | 48 | 45 |
| 03 | 83 | 123 | 107 | 87 | 56 | 12 | 10 | 0 | 37 | 36 |
| 04 | 103 | 127 | 109 | 76 | 45 | 13 | 13 | 0 | 41 | 36 |
| 05 | 78 | 118 | 93 | 65 | 46 | 10 | 10 | 0 | 48 | 45 |
| 06 | 92 | 137 | 118 | 85 | 56 | 11 | 11 | 0 | 48 | 44 |
| 07 | 90 | 118 | 102 | 60 | 38 | 20 | 12 | 0 | 38 | 32 |
| 08 | 110 | 125 | 108 | 78 | 46 | 13 | 13 | 0 | 34 | 30 |
| 09 | 90 | 146 | 115 | 82 | 55 | 10 | 10 | 0 | 55 | 50 |
| 10 | 92 | 117 | 102 | 71 | 42 | 12 | 12 | 0 | 58 | 44 |
| 11 | 96 | 124 | 116 | 85 | 51 | 12 | 12 | 0 | 50 | 46 |
| 12 | 83 | 145 | 114 | 94 | 62 | 13 | 13 | 0 | 45 | 40 |
| Mean | 93.5 | 127.6 | 108.6 | 77.7 | 49.8 | 12.7 | 12 | 0 | 44.4 | 40.3 |

There is no anthocyanin coloration of main veins on upper side of blade; petiole sinus was closed because of lobes overlapping, leaf profile (Code 074) was flat, and upper surface of blade (Code 075) was with weak blistering, shape of teeth (Code 076) was one side concave, one side convex, length of teeth (Code 077) was short, etc (Table 3, 4).

Bunch characters. Under climatic conditions of Mjeda, Shkodër, red-rosé wine grapevine cultivar “Manakuq”, express good productivity characters. Bunch length (Code 202) was medium (170 mm), single bunch weight (Code 502) was small (210 g), bunch density (Code 204) was dense and berries were not readily movable, number of berries/bunch (Code 205) was medium (115 berries/bunch), length of peduncle (Code 206) was short (15 mm), and

lignification of peduncle (Code 207) was more than the middle (Table 3 and 4). Three years mean yield of “Manakuq” was 120 kv ha⁻¹ or 3 kg/vine.

Berry characters. Each bunch contained an average of 115 round uniform berries. Berries size (Code 221) was medium (17 mm), berry shape (Code 223) was round. Skin color (Code 225) was red. Flesh was very juicy and soft. Must yield (Code 233) was medium (68% or 68 ml juice/100 g berries), sugar content of must was medium (20%), and total acid content of must was low (5.3 g/L). Each berry contains 2-3 medium size well-developed seeds (6 mm x 4 mm) without transversal ridges on side (Table 3 and 4).

Table 3. Expression levels of the main characters of the young shoot, young leaf, bunch and berry



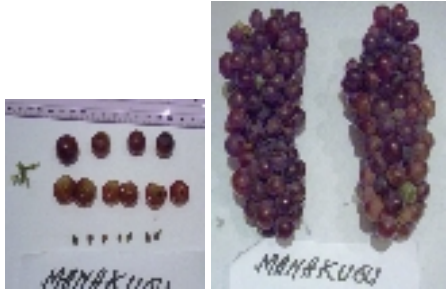
| | Characters | IPGRI Code | Evaluation |
|----------|---|--|--|
| I | Young shoot characters | | |
| |  | 001 003 004 006 053 152 153 | Fully open (5) Medium (5) Dense (7) Semi-erect (3) Medium (5) 4 th node (2) 2 inflorescences/shoot (2) |
| 2 | Mature leaf characters | | |
| |  | 065 067 068 069 070 076 077 079 093 | Medium (5) Circular (5) Five lobes (3) Dark green (4) Absent (0) One side concave, one side convex (4) Short (12.7 mm) (3) Lobes half overlapping (7) Much shorter (1) |
| 3 | Bunch and berry characters | | |
| |  | 202 203 204 206 222 223 225 231 505 506 | Medium (170 mm) (5) Cylindrical (1) Dense (7) Short (15 mm) (3) Uniform (2) Round (4) Red (3) Very weak (1) Medium (5) Low (3) |

Table 4. Expression levels of the main characters of red-rosé wine grapevine cultivar “Manakuq” and evaluation, according to IPGRI Descriptor of Grapevine (1997)

| | Characters | Code | Levels | Exp. level | Evaluation by words |
|-----------|--|------|---------------|------------|-----------------------|
| I | Young shoot and leaf characters | | | | |
| 1 | Form of tip | 001 | 1,3,5 | 5 | Fully open |
| 2 | Anthocyanin coloration of tip | 003 | 0,1,3,5,7,9 | 5 | Medium |
| 3 | Density of prostrate hairs on tip | 004 | 0,1,3,5,7,9 | 7 | Dense |
| 4 | Young leaf upper surface color | 051 | 1,2,3,4,...,7 | 5 | Cooper yellow |
| 5 | Density of prostrate hairs between main veins on lower side of blade | 053 | 1,3,5,7,9 | 5 | Medium |
| II | Shoot characters | | | | |
| 1 | Attitude (habit) | 006 | 1,3,5,7,9 | 3 | Semi-erect |
| 2 | Colour of dorsal side of internode | 007 | 1,2,3 | 2 | Green and red striped |

| | | | | | |
|------------|---|-----|-------------|---|-----------------------------------|
| III | Mature leaf characters | | | | |
| 1 | Size of blade | 065 | 1,3,5,7,9 | 5 | Medium (127.6 mm) |
| 2 | Shape of blade | 067 | 1,2,3,4,5 | 4 | Circular |
| 3 | Number of lobes | 068 | 1,2,3,4,5 | 3 | Five |
| 4 | Anthocyanin coloration of main veins on upper side of blade | 070 | 0,1,3,5,7,9 | 0 | Absent |
| 5 | Colour of the upper side of blade | 069 | 3,5,7 | 7 | Dark green |
| 6 | Mature leaf profile | 074 | 1,2,3,4,5 | 1 | Flat |
| 7 | Blistering of upper side of blade | 075 | 1,3,5,7,9 | 3 | Weak |
| 8 | Shape of teeth | 076 | 1,2,3,4,5 | 4 | One side concave, one side convex |
| 9 | Length of teeth N ₂ | 077 | 1,3,5,7,9 | 3 | Short (12.7 mm) |
| 10 | Ratio length/width of teeth N ₂ | 078 | 1,3,5,7,9 | 5 | Medium (1.06) |
| 11 | General shape of petiole sinus | 079 | 1,3,5,7,9 | 7 | Overlapped |
| 12 | Depth of upper lateral sinus | 605 | 1,3,5,7,9 | 7 | Deep (44.4 mm) |
| 13 | Density of erect hairs between the main veins on lower side | 085 | 0,1,3,5,7,9 | 5 | Medium |
| 14 | Length of petiole compared to N1 | 093 | 1,2,3,4,5 | 1 | Much shorter (93.5 mm < 127.6 mm) |
| IV | Bunch characters | | | | |
| 1 | Number of inflorescences/shoot | 153 | 1,2,3,4 | 2 | 2 inflorescences/shoot |
| 2 | Weight of a single bunch | 502 | 1,3,5,7,9 | 3 | Small (210 gr) |
| 3 | Bunch size (length) | 202 | 1,3,5,7,9 | 5 | Medium (17 cm) |
| 4 | Bunch density | 204 | 1,3,5,7,9 | 7 | Dense |
| 5 | Length of peduncle | 206 | 1,3,5,7,9 | 3 | Short (15 mm) |
| 6 | Lignification of peduncle | 207 | 1,5,7 | 7 | More than the middle |
| V | Berry characters | | | | |
| 1 | Number of berries/bunch | 205 | 1,3,5,7,9 | 5 | Medium (115 berries) |
| 2 | Berry size | 221 | 1,3,5,7,9 | 5 | Medium (17 mm) |
| 3 | Berry shape | 223 | 1,2,3,4,,9 | 4 | Round |
| 4 | Uniformity of berry size | 222 | 1, 2 | 2 | Uniform |
| 5 | Berry crosscut shape | 224 | 1, 2 | 2 | Circular |
| 6 | Presence of seeds | 241 | 1,2,3 | 3 | Well developed (2-3 seeds/berry) |
| 7 | Skin color | 225 | 1,2,3,4,5,6 | 3 | Red |
| 8 | Uniformity of skin color | 226 | 1, 2 | 1 | Not uniform |
| 9 | Anthocyanin coloration of flesh | 231 | 1,3,5,7,9 | 1 | Very slightly colored |
| 10 | Juiciness of flesh | 232 | 1,2,3 | 3 | Very juicy |
| 11 | Firmness of flesh | 235 | 1,2,3 | 1 | Soft |
| 12 | Must yield (ml juice/100 g berries) | 233 | 1,2,3,4,5 | 3 | Medium (68 ml/100 g) |
| 13 | Sugar content of must | 505 | 1,3,5,7,9 | 5 | Medium (20%) |
| 14 | Total acid content of must | 506 | 1,3,5,7,9 | 3 | Low (5.3 gr/L) |
| 15 | Particular flavor of flesh | 236 | 0,1,2,3 | 0 | None |
| 16 | Particular fragrance of flesh | 237 | 0,1,2,3 | 0 | None |
| 17 | Easy of detachment from pedicel | 240 | 1,2,3 | 3 | Very easy |
| 18 | Pedicel length | 238 | 3,5,7 | 3 | Short (6 mm) |
| 19 | Visibility of hilum | 229 | 1,2,3 | 1 | Unclear |
| VI | Seed characters | | | | |
| 1 | Length | 242 | 3,5,7 | 5 | Medium (6 mm) |
| 2 | Width | 243 | 1,3,5,7,9 | 7 | Wide (4 mm) |
| 3 | Transversal ridges on side | 244 | 0,1 | 0 | Absent |
| V | Grape maturity | | | | |
| 1 | Time of physiological stage of full maturity of the berry | 304 | 1,3,5,7,9 | 3 | Early (153 days) |

High levels of phenolic compounds on the skin and medium sugar content of must are two reasons why this cultivar is one of the most popular cultivars for red-rosé wine production.

Conclusions

Climatic conditions of Mjeda, Shkodër, provide over 1321°C SAT and 1019 hours SLR, and, in these conditions, red-rosé wine grapevine cultivar “Manakuq” behaves as an early-ripening grapevine cultivar, with a vegetative period from bud burst to grape maturity and harvest up to 153 days.

Destination of “Manakuq” product is red-rosé wine production, a special wine, with special characteristics, because of the cultivar and geographical area of selection and dissemination. Yield (kv ha⁻¹) “Manakuq” was 120 kv ha⁻¹ (3 kg/vine).

“Manakuq” forms two cylindrical shape bunches/shoot with a length of 17 cm and a weight of 210 g. Berries are round, red and uniform. Flesh is soft and very juicy. Each berry contains 2-3 medium size well-developed seeds without transversal ridges on side. Must yield is medium (68 ml juice/100 g berries), sugar content of must is medium (20%), and total acid content of must is low (5.3 g/L).

Some ampelographic characters which distinguish and facilitate the identification of “Manakuq” during vegetation period are the cooper yellow color of young leaf upper surface, semi-erect attitude of shoot, absence of anthocyanin coloration of main veins on upper side of blade, flat mature leaf profile, teeth shape in one side concave and one side convex, weak blistering of upper side of blade, shorter petiole compare to N1, etc.

Acknowledgements

The authors are thankful to Jak Pacani, owner of the vineyard and the Winery “ERSI” for the use of his vineyard and extraordinary cooperation in this study. We gratefully acknowledge his family for their generous contribution.

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