

ORIGINAL SCIENTIFIC PAPER

**Characteristics of Petit verdot grape variety (*Vitis vinifera* L.) grown in Tikveš vineyards**Dimovska V<sup>1</sup>., Ilieva F<sup>1</sup>., Neceva Z<sup>2</sup>., Durakova S<sup>3</sup>., Bogeva E.<sup>4</sup><sup>1</sup>Faculty of Agriculture, University "Goce Delčev" – Štip, Republic of Macedonia<sup>2</sup>Winery "BOVIN" - Negotino, Republic of Macedonia<sup>3</sup>Winery "POVARDARIE" - Negotino, Republic of Macedonia<sup>4</sup>Winery "ELENOV" – Demir Kapija, Republic of Macedonia**Abstract**

Research is being performed to the variety of Petit verdot. The vineyards are sited on the Lepovo-Tikveš vineyards, in the property of Bovin winery. Plantation is started in 2008 with certified plantation material, 2.4 m planting distance between rows, and 1.0 m distance between vines in a row. The training system is Guyot two arms, with 20 eyelets leaving the vine. Some optimal agro-technical and ampelo-technical measures are applied. The plantation is under drip irrigation system. During the research period (2011– 2012) the following items were included: yield (kg/vine), chemical composition of grape must (sugar, total acid, pH), and chemical analysis of wine. The results show considerable variation in yield interest (14.48), which is due to the age of the crop, whether it is in the second (2011) or in the third (2012) year of birth. The must contains 230 g/L sugar and 5.5 g/L total acids, average for the test period. The wine has a high content of extract (40 g/L) and 13.11% vol alcohol, which is due to selective grape harvesting and the way of vinification (winemaking).

**Key words:** Petit verdot, yield, must, wine**Introduction**

In most of the vineyards in the Republic of Macedonia, particularly the Tikveš vineyards with continental and partially Mediterranean climates, the agro-ecological conditions are favourable for successful cultivation of wine grape varieties of all epochs of maturity. In the period of invagation, Lepovo mikrolocation is characterized by daily mean air temperatures of 13.7–14.5°C with annual temperature sum of 4998–5366°C and vegetation temperature sum ranging from 4339°C to 4528°C. Total annual precipitation ranges from 320–593 mm, and from 190–268 mm during the vegetative growth cycle. Lack of water, especially during the vegetation is gone, because the vineyards are irrigated with drip irrigation.

The vegetation period lasts on average from 206 to 209 days (Table 1), enough for the grapes to reach technological and full maturity.

**Table 1** Climatic factors in Lepovo mikrolocation (Tikves vineyards)

Vegetative period	in days	209
Period of active vegetation	in days	206-209
Average annual air temperature	in C <sup>0</sup>	13.7-14.5
Sum of annual temperature	in C <sup>0</sup>	4998-5366
Sum of temperature in the vegetative period	in C <sup>0</sup>	4339-4528
Annual precipitation	in mm	320-593
Precipitation in the vegetative period	in mm	190-268

Lately biotypes are spread to small and medium-sized grapes. Clones differ in production characteristics, aromatic-organoleptic characteristics of wines and purpose. For young wines and wines for long aging, clones are characterized by highlighted fruit flavors, balanced tannins and good structure.

Petit verdot is a variety used for red wine production. It originates from Bordeaux, France. The highest concentration of vineyards is being in the St. Emilion district. Later, it appears in many vine-growing regions of southern Europe, America and Australia. The name Petit verdot derives from the berries characteristics, and indicates the small (petit) size of the grape berries, and it is roughly translated as 'green one' and reflects the variety's propensity to under-ripeness, and it looks like the bunch of grapes is speckled with green. It has a high level of anthocyanins in the berry's thick skin, so Petit verdot wines tend to have violet appearance, with high tannin levels. It requires moisten, very drained and fertile soil, it is very alive to drought (ENTAV- INRA 1995, 2001, 2009), and has a high resistance of *Botrytis cinerea*. Petit verdot wines are generally used to blend with Cabernet Sauvignon, or as a 'reserve wine' to improve the flavour, colour and level of tannin in red wines.

### **Materials and methods**

Studies were carried out on the Petit verdot grape production plants located in the Lepovo mikrolocation-Tikveš vineyard. The plantations are owned by "Bovin" winery. The plantation was built in 2008 with certified planting material. The process of cultivation was a fruit-wall with two legged Guyot way of pruning, distance of planting of 2.4m between the lines and 1.m between the grapevines in line with an optimal strain of 20 buds by grapevine. Regular agro-technical and ampelo-technical measures were applied. The vintage is under irrigation drip.

The yield of grapevine by and ha was determined as a representative parameter of the agro-biological and technological characteristics. During the vegetation, regular agro-technical and ampelo-technical measures were applied. 30 grapevines of each clone were included in the studies (three repetitions of 10 grapevines). The yield of grapevine by and ha was determined as a representative parameter of the agro-biological and technological characteristics.

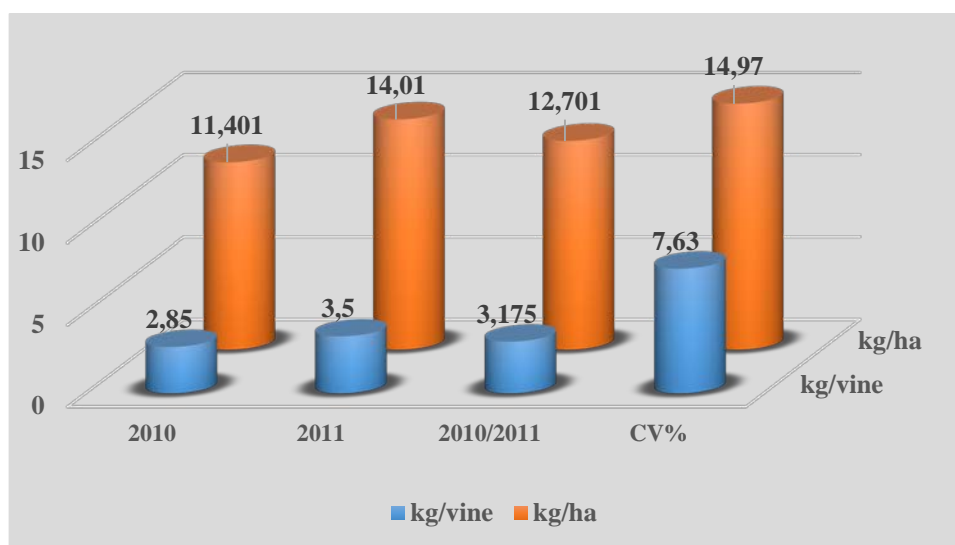
The yield of 30 grapevines by 1ha was mathematically calculated. The content of sugar in the must was determined by help of Oechsle Scale, and the composition of total acids was determined by titration method using solution of N/4 NaOH with factor 1.0000. The pH value on the must and wine, was determined by pH meter PB-11, Sartorius.

For wine production, grapes were harvested at technological maturity transported to the Winery Bovin. The grape mash was sulphated with 80 mg/l liquid SO<sub>2</sub>, and then selected wine yeast Fermol Premier Cru (*Saccharomices cerevisiae*) was added. During the maceration period of 6 days, the grape was pressed mechanically two times per day. After the maceration, wines were separated from the pomace, collected in glasses balloons whereas the alcoholic fermentation finished. The temperature during the alcoholic fermentation was 23-25 °C. The wines produced with these procedure were poured off 2 times, and during every pouring off, a correction of SO<sub>2</sub> was done, to not lower than 25 mg/l free SO<sub>2</sub> and not higher than 100 mg/l total SO<sub>2</sub>. Chemical analysis of the wine was done after the second pouring off and recommended methods of O.I.V (International organization of vine and wine) were used. For determination of the wine specific weight, alcohol and dry extract, a pycnometer method was used.

### **Results and discussion**

The fertility of grape varieties is determined by the degree of birth of the eyelets and the return of it. Besides the characteristics of the tupe and biological potential yield depends on

agro-ekological conditions where the variety is grown (Violeta Dimovska at.al. 2010) of farming systems and the degree of the load of native eyelets (S.Orlandini at al. 2008) etc . In the Graph. 1 presents the results of obtained yields of grapes (kg) for the test period in years, the vine and per unit area (ha). The quantity (yield) of gathered grapes plays an important role in the quality of raw material (grapes) and wine. In the years of testing, the yield ranges from 2.850 kg/vine (2011) to 3.500 kg/vine (2012) or an average of 3.175 kg/vine (2011/2012). After years, significant variation in ratio was found of 14.97, which is due to the aging of the vineyards, because he is in the second (2011) and third year of birth (2012). Although the variety Petit verdot isn't in the period of full birth, the received quantities of grapes indicate that it has high potential and challenge for the agricultural production in the Tikveš vineyards.



**Graph. 1** Yield of grape (kg)

The content of sugar and total acids and their ratio are among the important parameters based on which the quality of one variety or clone is assessed (Alise Wise & Libby Tarleton, 2012). The results for the sugar and total acids content and pH value in the must are presented in table 2. Compared by years, the sugar content in the must in year of examination was quite stable with the coefficient of variation is from 1.81. During the period of study, the average sugar content ranged from 22.8 g/L (2011) to 23.2 g/L (2012), which enabled producing of a medium strong wines. The freshness of the wines depends on the content of total acids in the must. The average content of total acids ranged from 5.0 g/L(2012) to 5.5 g/L (2011). No significant changes of the content of total acids in the must, were observed during the period of two years. The coefficient of variation is 0.35. pH value is stable and within the limits of variety and allows to successfully flowing process of fermentation.

**Table 2** Content of sugar, total acids in the must (g/L)

Element	2011	2012	2011/2012	CV%
Sugar (g/L)	22.8	23.2	23.0	1.81
Total acids (g/L)	5.5	5.0	5.25	0.35
pH	3.34	3.37	3.36	0.63

There were very small changes of the alcohol content in the wine with coefficient of variation. 0.55. That's a result from the same content of sugar in the must and the completed

alcoholic fermentation. In addition, the sugar-free extract (dry extract) in wine is a characteristic parameter for each variety. In the period of study, values for the dry extract ranged from 38.7 g/L (2011) to 41.0 g/L (2012). The wine has a value of pH (3.40) which is very stable, which means that the wine has a high level of natural acidity.

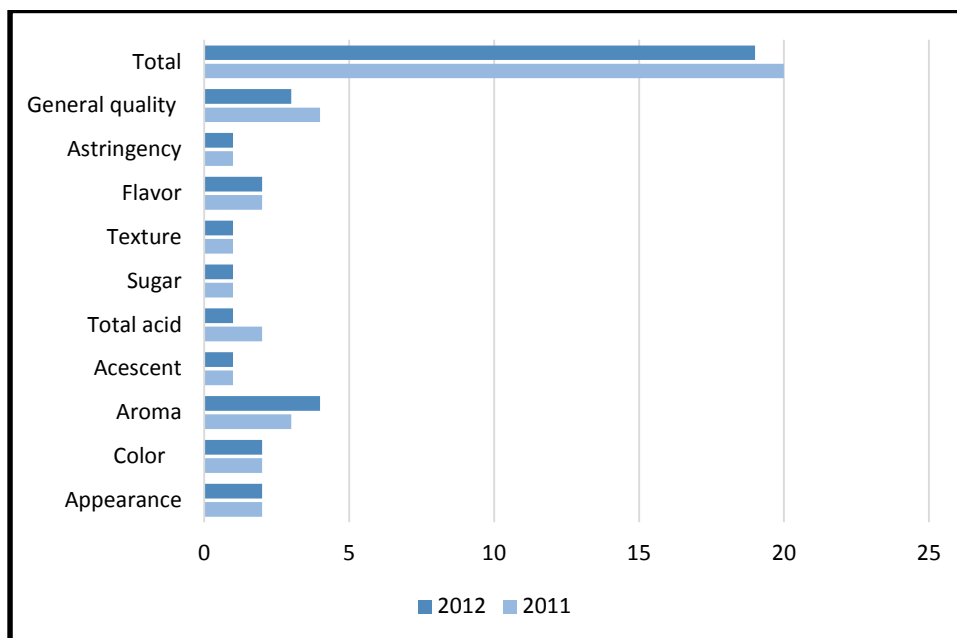
Furthermore, another very important parameters which determine the quality of red wines are color of the wine and anthocyanins. The colour intensity affected by a number of factors, including vintage, grape, composition, fermentation and storage condition (A. Versari et al. 2007, J. Robinson et al. 2012).

Besides chemical analysis, organoleptic evaluation (tasting) is an important indicator for determining the quality of the wine. When tasting the wine Petit verdot the following elements are evaluated: appearance, color, aroma, total acid, sugar, flavor and astringency. The sum of the calculated values gives the total evaluation of wine.

Wine-tasting points of the examined wine are given in Graph. 2. Average wine-tasting grades range is 19.5 point. In the years of testing, wine from this variety, were characterized by high stability assessment, i.e. the coefficient of variation ranges is 3.63. Based on the results of chemical analysis and tasting evaluation, the Petit verdot wine belongs to the group of wines of high quality.

**Table 3** Chemical analysis on wine

Element	2011	2012	2011/2012	CV%
Alcohol vol %	12.88	13.34	13.11	2.48
Dry extract (g/L)	38.7	41.0	39.85	4.08
pH	3.38	3.41	3,40	0.62
Total acids (g/L)	5.3	4.9	5.10	5.55
Sugar free (g/L)	7.3	4.2	5.75	38.12



**Graph. 2** Degustation rating of wine (points)

## Conclusion

The results of this study give us knowledge of production and technological characteristics of the Petit verdot grape variety, grown in agro-ecological conditions in Lepovo-microlocality from Tikveš wine region.

As a newly introduced variety (2008), in the years of testing showed high stability of the quality of grape must and wine. Greater variation was found in yield, and it is a result of the age structure of the vineyards. It is in the second (2011) and third (2012) year of birth when the vine is not yet in full maturity. This gives us the right to say that variety Petit verdot interests the vine and wine sector in the Tikveš vineyard.

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