



# Agro-biological and technological characteristics of 'Rkatsiteli wine grape variety, grown in Tikveš vineyards

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## ABSTRACT

Research is being performed to the 'Rkatsiteli wine grape variety. The vineyards are sited on the Smilica-Tikveš vineyards. Plantation was started in 1996 with standard plantation material, 2.4 m planting distance between rows, and 1.2 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. During the research period the following items were included: phenophases on development, fruiting of buds, weight of cluster (g), chemical composition of grape must (sugar, total acid, pH), and chemical analysis of wine. On the basis of obtained results we can conclude that the variety Rkatsiteli belongs to the group of native varieties (coefficient of fertility 1.10) with an average weight of cluster. The must grape contains 223 g/L sugar and 6.4 g/L total acids, The wine is a medium content of alcohol (12.33% vol) and low content of reducing sugar (1.7 g/L), which is due to selective grape harvesting and the way of vinification (winemaking).

## INTRODUCTION

The territory of the Republic of Macedonia is located between 40°deg 51' and 42°deg 21' north latitude. According to its climate features and EU classification, Republic of Macedonia is considered as III-C-b zone for growing vineyards. There is a vineyard region in the Republic of Macedonia which is in accordance with the whole territory of the Republic of Macedonia. The name of the geographic area of the region is Macedonia. The basic feature of this zone is that wines may have acidification, not to be enriched, which corresponds with the law and current practice of the production of wine in the country.

White wines are characterized by mild sourness, and they do not have the features of "terroir", while red wines are mainly of dark-rubine-red colour, with the smell of red and mountain fruits and full structure.

In the region Macedonia, there are 16 sub-regions which are characterized by different production conditions and different intensity of production. Namely, the Tikvesh region is an area to which the greatest part of grapes and wine production belongs (around 40%).

The Tikveš vineyard region with continental and partially Mediterranean climates, the agro-ecological conditions are favourable for successful cultivation of table grape varieties of all epochs of maturity. The Tikveš vineyard is characterized by daily mean air temperatures of 12.4 – 14.5°C with annual temperature of 4500 – 5300°C and vegetation temperature sum ranging from 3950°C to 4764°C. Total annual precipitation ranges from 440 – 740 mm, and from 250 – 310 during the vegetative growth cycle (Table 1).

Table 1. Climatic factors in Tikvesh vineyard

Vegetative period	in days	229-239
Period of active vegetation	in days	207-229
Average annual air temperature	in C <sup>0</sup>	12.4 – 14.5
Sum of annual temperature	in C <sup>0</sup>	4500-5300
Sum of temperature in the vegetative period	in C <sup>0</sup>	3950-4767
Annual precipitation	in mm	440-740
Precipitation in the vegetative period	in mm	250-310

The 'Rkatsiteli wine group is an old Georgian type. According to the national wine group list, it belongs to the group of highly recommended wine groups for the Tikvesh region. According to David Maghradze et al., 2012, 'Rkatsiteli does not support wet climate and it is quite resistant to cryptogamic diseases, and it is resistant to winter low temperatures (-18°C to -21°C). It provides wine production, brand distillates and grape juice.

## Results and Discussion

The goal of the phenological research is to define the beginning and the duration of certain phenophases of the development of the vine, which affects the quantity and quality of the grapes (Mirošević N., et al., 2008). The beginning and duration of the phenophases is pre-conditioned by the genetic features of the type and ecological conditions in the environment. (Nendel C., 2010).

Table 2. Phenophases of development during vegetation

Bleeding	Bud break and short of canes	Flowering		Veraison	Full ripeness (harvest)
		beginning	end		
20.03	5.04	15.05	25.05	5.08	10.09

In table 2, the phenological research of 'Rkatsiteli is shown. The bleeding starts as a result of the activity of the root at a temperature of around 8-10°C. A liquid at the transaction made with the cutting appears. It usually lasts for 14-20 days. In the conditions of the Tikvesh region, this phenophase starts on the 20.03. The bud break and the growth of the vine begins when the daily temperature is 10°C, in such a way that first the main grow of secondary buds. In the research period, in this wine type, the phenophase bud break and short of canes on the 5.04. The blossom begins by removing the flower cap and removing the pollen of the filament. The temperature should be over 20°C with humidity of 40%. The growth of the grapes starts with the filament and lasts until complete ripeness. The phenophase veraison on the 5.08, and the harvest type is on 10.09. At this period, crucial morphological and physiological changes: it changes its tenderness – it becomes softer, the colour changes, the skin becomes soft and less elastic, and there is a change in the sugar content and total acids.

Table 4. Dynamics of the ripeness of grapes

Test	Sugar (brix)	pH	Total acids (g/L)
I 14.08	18.4	2.29	9.96
II 19.08	20.4	3.07	7.71
III 24.08	21.3	3.03	7.84
IV 29.08	21.4	3.15	6.79
V 03.09	22.0	3.21	6.56
VI 10.09	22.3	3.23	6.40

In table 4, the results of the dynamic of the growth of the grapes is given. The growth dynamics was monitored through the sugar content, total acids and pH, starting from the slight growth to the harvest, i.e. reaching technological ripeness. We concluded that every 5 days the sugar contents it raised averagely for 2 g/L, and the content of total acids among the first and second check is considerably decreased about 2 g/L and then for only 1 g/L. In the technological phase of ripeness, the sugar content is 22.3 brix, and the total acids 6.4 g/L, which is in the boundaries of the features and these are optimal for the production of quality wine. In the conditions of Nish (BranislavaSivčević et al., 2004), it consists of lower amount of sugar (19.4 brix) but more total acids (8.2 g/L).

The chemical analysis results of the wine are given in Table 5. The 'Rkatsiteli wine consists of 12.33 vol% alcohol and total acids 5.56 g/L. According to the content of non-fermented sugar (1.7 g/L), the wine is in the group of dry wines. The wine is of low content of volatile acids of 0.32 g/L, which shows that the wine is healthy and well kept.

Table 5. Chemical analysis of the wine

Element	
Alcohol vol%	12.33
Reducing of sugar/L	1.7
Total acidsg/L	5.66
pH	3.33
Volatile acidsg/L	0.32

## Material and Methods

The research on this wine group of 'Rkatsiteli was conducted in the vineyards, in the production areas of SOZSU Gyorche Petrov – Kavadarci, locality Smilica. The vineyard is 23 years old, founded in 1996, and it is grown on trellis with the implementation of regular agro-technical and ampelo-technical measures.

## Material

The 'Rkatsiteli is an old Georgian wine group and it belongs to an ecological geographic group Convarietas pontica, subconvarietas georgica. The leaf is of medium dimension with slightly curved ends, in 5 or 3 parts. The grapes is of medium size with tubular or tubular-conical shape, and it has a separated medium wing which is set to a quite long top. It grows in III epoch. A medium late wine group. The vine is quite wild with high vine sprouts. It belongs to the group of medium profitable groups. The grape is 200 - 235 g (BozinovikjčZ., 2010). 'Rkatsiteli is a group of wines with high biological potential and a great areal of prevalence. It provides white wines of high quality. It is best in warm places due to its high content of acids. In our region, it can survive in places of warmer climate, too.



Picture 1. 'Rkatsiteli grape variety



Picture 2. Bottle of wine 'Rkatsiteli

## Methods

The research was conducted on a total number of 30 vines, i.e. 3 repetitions of 10 vines. Twenty buds were left to each vine in such a way that 2 fertile vine sprouts with 8 buds and 2 arms with two buds for substitution, i.e. we implemented manner of cutting. After blossoming, we counted how many of them were successful, and how many were not, and mathematically we got the constant of fertility, i.e. the number of grapes per buds.

The dynamics of the growth of the grapes was being monitored through the sugar content and the total acids, so that every 5 days samples of the 'Rkatsiteli wine group were taken and in the laboratory, a chemical analysis of the un-ermented vine was done. The chemical content was defined by measuring the sugar content and the total number of acids. The sugar content is defined with Exlos'device (a measuring device). This defines the un-ermented vine's density by the help of the Salernon table, which also defines the percentage of sugar. Exlos'degrees is define the density of the water and the un-ermented vine density. The total acids content is dedined by treating co 0.1 NaOH and brom thymol blue as an indicator. The following parameters have been analyzed from the chemical content: alcohol (vol%), sugar (g/L), total number of acids (g/L), pH and volatile acids content (g/L).

Table 3. Elements of fertility and yield of grape

Repetition	Shoots (%)	Coefficient of fertility	Grape weight (g)	Yield (kg/vine)
1	62.73	1.04	213	4.4
2	65.94	1.15	253	5.8
3	66.29	1.1	239	5.2
<b>1-3</b>	<b>64.50</b>	<b>1.10</b>	<b>235</b>	<b>5.1</b>
CV%	3.02	5.02	8.64	13.68

In table 3, the results of fertility of buds and the average weight of the grapes of the 'Rkatsiteli are given. The percentage of shoots of buds is from 62.73% to 66.29% or averagely 64.50%. In conditions of Radmilovac (BranislavaSivčević et al., 2004) in setting 30 buds, the wine group 'Rkatsiteli grows to 51.48%, and the fertility is 0.54. In our research, the highest constant of fertility is given in the second repetition from 1.15, and the lowest 1.04 in the first or 1.10 on the average. The 'Rkatsiteli belongs to the wine groups of very high constant of fertility. (BozinovikjčZ., 2010). The average weight of grapes is from 213 g to 239 g or 235 g on the average which belongs to the group of middle grapes. The benefit is from 4.4 kg to 5.8 kg or 5.1 kg on the average, where a statistically important variation of 13.68 is given.

## CONCLUSION

► According to the given results, the 'Rkatsiteli grown in the Tikvesh region, belongs to the group of fertile wine groups. The constant of fertility of the buds is 1.1, and the average weight of the grapes is 235 g while the benefit from 5.1 kg.

► The sugar content and the total acids is in the boundaries of the features of nice wine groups and it provides production of quality white wines.

► The wine consist of 12.33 vol% alcohol, 5.56 g/L total acids, 1.7 g/L non-fermented sugar and it belongs to the group of dry wines.

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