



## AGRO-BIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF 'RKATSITELI WINE GRAPE VARIETY, GROWING 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 winter buds per 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 a 235 g average weight of cluster. The must grape contains 223 g/L sugar and 6.4 g/L total acids. The wine has 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 vinification technology (winemaking).

**Key words:** 'Rkatsiteli, grape, wine

### INTRODUCTION

The territory of the Republic of Macedonia is located between 40° 51' and 42° 21' north latitude. According to its climate features and EU classification, Republic of North Macedonia is considered as III-C-b zone for growing vineyards. In Republic of North Macedonia, all agricultural land under vineyards is considered as one vine region. 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 a smell of red and dark fruits and full structure too.

In the region Macedonia, there are 16 sub-regions which are characterized by different production conditions and different intensity of production. Namely, the Tikveš 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 favorable for successful cultivation of wine 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 Tikveš vineyard.

Vegetative period	days	229-239
Period of active vegetation	days	207-229
Average annual air temperature	C°	12.4 – 14.5
Sum of annual temperature	C°	4500-5300
Sum of temperature in the vegetative period	C°	3950-4767
Annual precipitation	mm	440-740
Precipitation in the vegetative period	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 vine varieties 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, grape brandy and grape juice.

### MATERIAL AND METHODS

The research was conducted in the vineyards in the production areas of SOZSU Gjorche 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 ampelotechnical measures.

### MATERIAL

The 'Rkatsiteli is an old Georgian vine variety 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 cluster 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 the epoch, a medium late variety and it's highly

vigorous. The vine is quite wild with high vine sprouts. It belongs to the group of medium profitable varieties. The grape is 200 - 235 g (Bozinovikj Z, 2010). 'Rkatsiteli is a vine variety with high biological potential and a great area 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.

### METHODS

The research was conducted on a total number of 30 vines, i.e. 3 repetitions of 10 vines. The pruning system was double Guyot load with twenty buds, two canes with eight buds. After blossoming, we counted how many of the flowers in the inflorescences were fertilized, and how many were not, and mathematically we got the coefficient of fertility, i.e. the number of grapes per buds.

defined by measuring the sugar content and level of total acid content. The sugar content is defined with Exlos' device (a measuring device). This defines the Oechsle unfermented wine's density by the help of the Salernon table, which also defines the percentage of sugar. Oechsle degree defined the density of the water and the unfermented wine density. The total acids content is defined by titration with 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 acids (g/L), pH and volatile acids content (g/L).

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 removed were taken and a chemical analysis of the unfermented wine was done in the laboratory. The chemical content was



Picture 1. 'Rkatsiteli grape variety

## 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	and		
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. It usually lasts for 14-20 days. In the conditions of the Tikvesh region, this phenophase starts on the 20.03. The bud breaks and the growth of the vine begins when the daily temperature is 10°C. In the research period, the phenophase bud breaks and short of canes starts on 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 starts on 5.08, and the harvest remove 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 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
1-3	64.50	1.10	235	5.1
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%.

According to Sivčev et al. (2004), when shoots of variety Rkaciteli, in agroecological conditions of Radmilavac, were cut on 30 buds, leaves and coefficient of fertility were 51.48% and 0.54, respectively.

In our research, the highest coefficient 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 group of wines with a very high coefficient of fertility (Bozinovikjč, 2010). The removing weight of grapes is from 213 g to 239 g or 235 g on 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 average, where a statistically important variation of 13.68 is given.

**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 are given. The growth dynamics was monitored through the sugar content, total acids and pH, starting from the berry softening to the harvest, i.e. reaching technological ripeness. We concluded that every 5 days the sugar contents increased 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 (Sivčev 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 has 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.

Parameters	'Rkatsiteli wine
Alcohol vol%	12.33
Reducing of sugar g/L	1.7
Total acids g/L	5.66
pH	3.33
Volatile acids g/L	0.32

## CONCLUSION

According to the results given, the 'Rkatsiteli grown in the Tikvesh region belongs to the group of fertile wine groups. The coefficient of fertility of the buds is 1.1, and the average weight of the grapes is 235 g and 5.1 kg/vine average yield.

The sugar content and the total acids is in the boundaries of the features for production of high-quality white wines.

The wine consists 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.

## REFERENCES

- Божиновиќ, З. (2010). Ампелографија. Агринет. Скопје.
- Бошков, С., Јевтимова, В. (1994). Родност на окцата, остварени приноси и квалитет на грозјето кај сортите 'ркацителите и јуни блан при различна резидба и должина на кроење на родните ластари. Годишен зборник на Земјоделски институт, Скопје.
- Sivčev, B., Cvetković, D., Petrović, N., Popadić, I. (2004). Comparative studies of some white cultivars in the sub-region of Belgrade and Niš. *Journal of Agricultural Sciences*, 49(1), 49-57.
- Maghradze, D., Rustioni, L., Turok, J., Scienze, A., Failla, O. (2012). Caucasus and Northern Black Sea Region Ampelography. *Vitis*.
- Mirošević, N., Karoglan-Kontić, J. (2008). *Vinogradarstvo*, Nakladni Zavod Globus, Zagreb.
- Nendel, C. (2010). Grapevine bud break prediction for cool winter climates. *International Journal of Biometeorology*, 54:231-241.

## АГРОБИОЛОШКИ И ТЕХНОЛОШКИ КАРАКТЕРИСТИКИ НА СОРТАТА 'РКАЦИТЕЛИ ОДГЛЕДУВАНА ВО ТИКВЕШКОТО ВИНОГОРЈЕ

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### Резиме

Истражувањата беа вршени кај винската сорта 'ркацителите. Лозовиот насад се наоѓа во локалитетот Смилица - Тиквешко виногорје. Насадот е подигнат во 1996 година со стандарден саден материјал, со растојание 2,4 m помеѓу редови и 1,2 m лозите во редот. Системот за одгледување е двокрак Гиов, а секоја лоза беше оптоварена со по 20 окца. Применувани се оптимални агротехнички и ампелотехнички мерки. За време на периодот на истражување беа вклучени следниве елементи: фенофази на развој, родност на окцата, маса на гроздот (g), хемиски состав на ширата (содржина на шеќер, вкупна киселина и рН) и хемиска анализа на вино. Врз основа на добиените резултати можеме да заклучиме дека сортата 'ркацителите припаѓа на групата сорти со висока родност (коефициент на плодност 1,10) со просечна маса на гроздот од 235 g. Ширата содржи 223 g/L шеќер и 6,4 g/L вкупно киселини, виното е со оптимална содржина на алкохол (12,33 vol%) и остаток на неферментиран шеќер од 1,7 g/L, а е резултат на селективно собирање на грозје и начинот на винификација.

**Клучни зборови:** 'ркацителите, грозје, вино