

DETERMINATION OF POLYPHENOLS AND ANTHOCYANINS IN LESSER KNOWN GEORGIAN GRAPES AND EVALUATION OF THEIR USEFULNESS

Luka Kuchukhidze¹, Rati Kaldani², Lizi Kuprashvili³, Ana Khukhia⁴

Email: ¹ luka.kuchukhidze07@gmail.com, ² kaldanirati@gmail.com, ³ lizakuprashvili13@gmail.com, ⁴ anaanaanat1@gmail.com

Abstract—The aim of our work was to determine the basic parameters of grapes, polyphenols and anthocyanins in white and colored grape varieties of Georgian vines that have not been studied before and to evaluate the potential of making high antioxidant non-alcoholic beverages from these varieties.

The study grape varieties were taken from the collection of the village Skri (Gori district) during the vegetation period of 2021 (autumn). 6 varieties of grapes were taken for the study, in the amount of 6 bunches for each variety, which was divided into 3 replications (2 clusters in each replication). We studied their carpological data and determined the quantitative content of polyphenols, anthocyanins and other chemicals in them.

As the research showed, Georgian vine varieties are characterized by significant variability of carpological and biochemical signs. Such diversity is particularly interesting in characterizing the technological potential of individual, less common, and lesser-known (or rare or unique) varieties.

IndexTerms—Phenols, Antioxidants, polyphenols, anthocyanins, free radicals

1. INTRODUCTION

The production of free radicals in the body is a natural process of metabolism, but environmental pollution and unhealthy diet contribute to the production of free radicals in the body that can eventually destroy a living cell by destroying its major functional macromolecules: DNA, proteins and lipids.

Antioxidants are substances that protect the cell from free radicals. Therefore, strengthening the human body's immune system with natural antioxidants is one of the topical issues in the modern reality, which is why the interest and demand for natural antioxidants is growing day by day.

Vegetables and fruit products are rich in antioxidant compounds, they contain polyphenols and anthocyanins. Polyphenols and anthocyanins are plant pigments that have strong antioxidant properties. There are more than 8000 polyphenolic compounds isolated from various plant organs.

Their number in the plant depends on the degree of plant maturity and environmental conditions. The red, purple and black color of the plant fruit indicates the presence of polyphenols and anthocyanins in them. Polyphenols are found in the fruits of plants such as tomatoes, black rice, blueberries, raspberries, blackberries, red beans, pomegranates, cocoa powder, grapes and more.

2. AIM

The aim of our work was to determine the basic parameters of grapes, polyphenols and anthocyanins in white and colored grape varieties of Georgian vines that have not been studied before and to evaluate the potential for making high antioxidant non-alcoholic beverages from these varieties.

3. MATERIALS AND METHODS

The study grape varieties were taken from the collection vineyard of the village of Skri (Gori district) during the vegetation period of 2021 (autumn). Six varieties of grapes were taken for study: Beglar grapes, Ingilouri, Mirzaani white, Kumsi black, Machkvaturi and Tskobila in the amount of 6 bunches for each variety, which was divided into 3 repetitions (2 bunches in each repetition). The following parameters were studied for carpological analysis: grain color, grain weight, skin weight, grain weight, bunch weight, number of grains per grain, grain length, grain width. Total solubles (OBrix) were determined by digital refractometer, and the titratable acidity of grape juice was determined by (0,1 N) NaOH alkali. For each replication of the variety, the skin and grape pips were fixed separately in a solution of acidified ethanol (70% Et, 29% H₂O, 1% HCl (38%)).

The study of grape pips and skin extracts were performed on a spectrophotometer to determine common anthocyanins and common polyphenols. Totalanthocyanins were determined in mg / kg of grapes using a spectrophotometer equivalent to malvidin-3-0-glucoside. Total polyphenols were detected in skin and bean extracts separately in mg / kg grape (+) catekhin equivalent.

4. RESULTS AND GENERALIZATION

Carpological parameters for the studied varieties showed significant variability (Table 1) As can be seen from the table, the grain weight ranges from 1.3 to 3.0 grams. The smallest grains were found to be Machkvaturi for

the variety, and the largest - Beglari grapes for the variety. The largest cluster weight was shown by Ingilouri (374.5) and the smallest by Machkvaturi (115.0). The total soluble substances (OBrix) in the varieties were in the range of 10.2 - 23.1: among them the variety Tskobila (23.1) showed the highest rate of this parameter, while Ingilouri (10.2) showed the lowest rate. Titric acidity was highest in Machkvaturi (9.6 g / l) and lowest in Mirzaani white (3.9 g / l).

Common anthocyanins were studied in 3 colored grape varieties and its content was in Kumsi black 417.5 mg / kg, Machkvaturi 756.5 mg / kg, Tskobila 540.5 mg / kg.

Among the skin extracts of the studied varieties showed the highest content of polyphenols: Machkvaturi (1902.3 mg / kg). Among the white grape varieties, the lowest content of polyphenols in the skin is characterized by Beglar grapes (1132.1 mg / kg), and the highest content - Mirzaani white (1715.8 mg / kg).

As the study showed, in general the amount of polyphenols extracted from grape seed of all varieties is significantly lower compared to the skin (Table 2). The amount of polyphenols in white grape varieties ranged from 38.1 to 240.3 mg / kg, in red grape varieties the amount of polyphenols in Kumsi black was 44.3 mg / kg - 59.6 mg / kg in Machkvaturi.

(Table 2) Common polyphenols are represented as the sum of polyphenols extracted from the skin and bean. For most varieties, the total polyphenols range from 1170.2 mg / kg (Beglar grapes) to 1961.9 mg / kg (mackerel). We also determined the content of polyphenols in grape juice, it was found that after a certain period of time their content was maintained in it.

5. CONCLUSION

As the research showed, the lesser known grape varieties in Georgia are distinguished by high content of antioxidants, particularly phenolic compounds, which is the best natural material for the production of soft drinks with high antioxidant properties, which are characterized by high anti-radical properties and can be consumed without age.

Table 1. Carpological parameters of Georgian vine varieties (Skri Collection 2021)

Sort	Grape Grain color	Grape Grain Weight (kg)	Grape Skin Weight (g)	Number of grape stones in grain	Weight of grain stone (mg)	Grape Grain length (mm)	Grape Grain Width (mm)	Bunch Weight
Beglar's Grapes	White	3,0	0,54	2,8	39,4	16,3	15,1	344,3
Ingilouri	white	1,9	0,52	2,3	52,8	13,8	13,3	374,5
MirzaanuliTetri	white	2,7	0,59	2,5	46,0	16,0	14,9	319,5
Kumsishavi	red	2,0	0,55	2,3	38,7	13,9	13,2	192,2
Machkvaturi	red	1,3	0,41	1,1	61,1	13,3	11,9	115,0
Tskobila	red	2,3	0,83	2,1	67,0	14,8	13,9	311,5

Table 2. Biochemical parameters of Georgian vine varieties. Common Solvents (TSS), Titrated Acid (TA), Total Anthocyanins (Tant) and Total Polyphenols (TP) (Scree Collection 2021)

Sort	Grape Grain color	TSS ⁰ (Brix)	TA(G / l) Tartaric acid	Tant(Mg / kg) Grapes	SkinTP(Mg / kg) Grapes	Grape grain stonesTP (Mg / kg) Grapes	Common polyphenolsTP (Mg / kg) Grapes
Beglar grapes	white	18,3	6,8	—	1132,1	38,1	1170,2
Ingilouri	white	10,2	8,5	—	1376,9	54,3	1431,2
MirzaanuliTetri	white	20,5	3,9	—	1715,8	240,3	1956,1
Kumsishavi	red	18,2	6,4	417,5	1716,6	44,3	1760,9
Machkvaturi	red	19,2	9,6	756,5	1902,3	59,6	1961,9
Tskobila	red	23,1	6,6	540,5	1864,3	43,0	1907,3

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