

Evaluation of some characteristics of raspberry cultivars grown in Timiș county

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Abstract

Red raspberry is one of the world's most popular berries. For consumers, raspberry fruit is very interesting because of its pleasant aroma and color, high nutrient content, low calories, and health benefits that manifest in the high number of antioxidants. In this study, we examined the morphological properties (fruit weight, fruit height, fruit diameter, and number of fruits/branches) and chemical properties (sugar content) of four raspberry cultivars (Glen Ample, Radiova, Laszka, Polka) grown in the Sănnicolau Mare region under the climatic conditions of 2022 and 2023. The Laszka variety had the best morphological properties, with an average fruit diameter of 1.67 cm, fruit height of 2.28 cm, and fruit weight of 9.10 g. This cultivar was followed by the Glen Ample and Polka cultivars. The fruit sugar content was between 23.06(°Brix) in Glen Ample and 25.84(°Brix) in Polka cultivar in 2023. Among the cultivars, the Polka cultivar was noted for its high sugar content, followed by the Laszka cultivar.

Keywords: red raspberry, sugar content, fruit characteristics.

Introduction

Red raspberry (*Rubus idaeus* L.) is a major small fruit and the most profitable fruit species. Red raspberry contains numerous organic and non-organic compounds (sugars, acids, pectines, anthocyanins, phenol compounds, mineral matter, etc.). Their content varies among cultivars [4, 6], and depends on various issues viz. environmental factors (temperature, rainfall, soil type), irrigation, yield efficiency, ripeness of harvested fruits [9], agrotechniques, control of pests and diseases, etc. Growing raspberries continues to be one of the most profitable small-scale farming businesses. The high antioxidant capacity of raspberry and blackberry fruit is widely recognized and has led to increased global consumption and by implication agricultural production [5, 7, 8, 12, 15]. Introduction of raspberry cultivars that possess higher nutritive and antioxidant values could increase fruit consumption for beneficial health purposes without decreasing the commercial effect of production. Both red and black raspberry as well as blackberry fruits are rich in important dietary phytochemicals such as phenolic compounds, vitamin C, folic acid and β -sitosterol [1]. Flavonoids, as well as ellagitannins and ellagic acid which are present in higher amounts in raspberries than in other berries, are mainly responsible for their broad health-promoting activity [2, 13]. The nutritional value of raspberry and blackberry fruits (soluble solids (SS), titratable acidity (%) (TA), total phenolic content) has been widely studied [10, 11]. Raspberry production that can be obtained per hectare reaches 12 tons, if the chosen variety is a productive one, but also if the plantation is well cared for. Apart from fruit production, raspberry leaves and stems can also be used in the medicinal tea industry, as they have therapeutic properties in combating diarrhea, dysentery, angina and tonsillitis [14].

Material and Method

In this study, four raspberry varieties were analyzed (Glen Ample, Radiova, Laszka, Polka), cultivated in the Sănnicolau Mare region, Timis county (Figure 1). In these varieties, we examined their morphological

properties (fruit weight, fruit height, fruit diameter and number of fruits/branches) and sugar content. The sugar content was determined using a portable refractometer.



Glen Ample

Radiova

Polka

Laszka

Figure 1. Raspberry varieties cultivated in the Sănnicolau Mare region

The average monthly temperatures from May-July presented variations of: 18.2-25.4 °C in 2022 and 15.2-24.9 °C in 2023. The amount of rainfall during the vegetation period was 65 mm in 2022 and 195 mm in 2023.

To determine the significance of the differences between the varieties for each character, the processing of the experimental data was done by variance analysis and the t-test. The meanings were expressed based on symbols [3].

Results and Discussion

Considering the results regarding the height of the fruit, it can be observed that, for 2022 year, the height of fruits registered was between 2.25 cm in Radiola and 2,61cm in Laszka cultivar. The height of the fruits in the cultivars analyzed was between 2.11 cm for the genotype Radiola and 2.28 cm for Laszka in 2023 years. None of the cultivars significantly outperformed the Polka control.

Table 1. The results regarding the height of the fruit in experimental periods

Genotypes	Average (cm) 2022	Relative value %	Difference/ Significance	Average (cm) 2023	Relative value %	Difference/ Significance
Polka	2.400	100.000	0.000	2.183	100	0
Glen ample	2.358	98.264	-0.042	2.227	102.03	0.044
Laszka	2.614	108.912	0.214	2.280	104.452	0.097
Radiova	2.250	93.750	-0.150	2.11	96.183	-0.083
		LSD 5%	0.495		LSD 5%	0.709
		LSD 1%	1.558		LSD 1%	1.075
		LSD0.1%	1.204		LSD0.1%	1.727

It can be observed that fruit diameter varied from 1.40 to 1.67 for Radiola and Laszka in the climatic conditions of 2022 year. The Laska genotype registered the highest diameter, but the result is not statistically assured. In the conditions of the 2023-year highest value of diameter was registered to the Laska genotype (1.63 cm).

Table 2. The results regarding the fruit diameter in experimental periods

Genotypes	Average (cm) 2022	Relative value %	Difference/ Significance	Average (cm) 2023	Relative value %	Difference/ Significance
Polka	1.602	100	0	1.508	100	0
Glen ample	1.630	101.733	0.027	1.527	101.289	0.019
Laszka	1.677	104.679	0.075	1.630	108.103	0.122

Radiova	1.402	87.521	-0.2	1.308	86.740	-0.2
		LSD 5%	0.302		LSD 5%	0.261
		LSD 1%	0.951		LSD 1%	0.396
		LSD0.1%	0.735		LSD0.1%	0.636

The cultivar Laszka recorded significantly positive results for fruit weight 9.25 g. in 2022 year. In the experimental year 2023 the same genotype registered the best results from this parameter (9.10g.) presenting very significant positive results.

Table 3. The results regarding the fruit weight in experimental periods

Genotypes	Average (g) 2022	Relative value %	Difference/Significance	Average (g) 2023	Relative value %	Difference/Significance
Polka	7.566	100	0	7.380	100	0
Glen ample	7.834	103.535	0.267	7.742	104.911	0.362
Laszka	9.259	122.367	1.692***	9.100	123.305	1.72***
Radiova	7.492	99.019	-0.074	7.178	97.271	-0.201
		LSD 5%	0.529		LSD 5%	0.673
		LSD 1%	1.666		LSD 1%	1.020
		LSD0.1%	1.287		LSD0.1%	1.639

From the data of table 4, it can be seen that, in 2022, the highest sugar content was recorded by the Polka variety (23.15°Brix), while the Glen ample variety recorded the lowest sugar content (23.15°Brix). The genotype Glen ample recorded the lowest sugar content in 2023 the result obtained was very significantly negative. The genotype Laszka (23.61°Brix) and Radiova (24.89°Brix) recorded a higher sugar content, but without significantly exceeding the genotype Polka (25.84°Brix).

Table 4. The results regarding the sugar content of fruits

Genotypes	Average (°Brix.) 2022	Relative value %	Difference/Significance	Average (°Brix.) 2023	Relative value %	Difference/Significance
Polka	25.358	100	0	25.847	100	0
Glen ample	23.155	91.313	-2.202 °	23.069	89.253	-2.777 °°
Laszka	24.870	98.076	-0.487	23.613	91.359	-2.233 °
Radiova	24.316	95.890	-1.042	24.897	96.324	-0.95
		LSD 5%	1.382		LSD 5%	1.614
		LSD 1%	4.349		LSD 1%	2.445
		LSD0.1%	3.362		LSD0.1%	3.928

From the point of view of the number of fruits / branching, the values obtained in 2022 were between 5.58-9.38, for the genotypes Gleen Ample and Polka, respectively. In 2023, the number of fruits/branches was between 5.11 for the Gleen Ample genotype and 9.02 for the Polka genotype. From the results obtained, none of the analyzed genotypes exceeded the Polka control.

Table 5. The results regarding the number of fruits/ branching

Genotypes	Average 2022	Relative value %	Difference/Significance	Average 2023	Relative value %	Difference/Significance
Polka	9.388	100	0	9.027	100	0

Glen ample	5.583	59.467	-3.805 °	5.111	56.615	-3.916 °
Laszka	6.972	74.260	-2.416 °	6.444	71.384	-2.583
Radiova	7.416	78.994	-1.972	6.888	76.307	-2.138
		LSD5%	2.125		LSD5%	2.691
		LSD1%	6.687		LSD1%	4.076
		LSD0.1%	5.169		LSD0.1%	6.548

Conclusions

The Laszka variety had the best morphological properties, with an average fruit diameter of 1.67 cm, fruit height of 2.28 cm, and fruit weight of 9.10 g. Laszka cultivar was followed by the Glen Ample and Polka cultivars.

The fruit sugar content was between 23.06(°Brix) in Glen Ample and 25.84(°Brix) in Polka cultivar in 2023. Among the cultivars, the Polka cultivar was noted for its high sugar content, followed by the Laszka cultivar.

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