

Impact of Sweet Cherry Varieties on Quality Parameters after Harvest and During Storage Period

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Abstract: The study included evaluation of the biological, pomological and chemical parameters and sensory characteristics of the fruits with the aim of pointing differences between varieties and finding the best way to preserve the quality of the fruit, that would guarantee a successful placement on the market.

The research was conducted in the trial orchard of The Extension Service Sombor and included three varieties (cultivars) of sweet cherry Kordia, Ferrovia and Regina, on rootstock Gisela 5. During research we based a part of our study on pomological, biological and chemical features after harvest such as shape, color, weight of the fruit, stone, etc. The other part of research was based on sugar content, soluble solids content and visual evaluation of the fruit before storing, as well as after the storage period.

Key words: *Prunus avium*, sweet cherry, quality parameters, varieties, storage

1. Introduction

Sweet cherry (*Prunus avium* L.) is currently on the sixth place in the world in production among all fruit species, and over 40% of world production is based in Europe. Sweet cherry is one of the earliest fruits that appears on the market and its high-quality fruits achieve a very good price. Also, due to its chemical composition in sugar content, acids, pectin, vitamins, minerals, flavoring materies, coloring materies, flavonoids, anthocyaninsetc sweet cherry fruits have very beneficial effect on human health. Nowadays people are increasingly developing awareness of healthy living and healthy eating, so the fruit becomes one of the most popular products on the world market. These days there are significant number that show increase of growing new sweet cherry orchards, and this is one of the reasons that there are more studies in this area.

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2. Materials and Methods

The research was conducted within the PSS Sombor The Extension Service Sombor, in the trial orchard, that was grown in April 2012, on an area of 1 ha. There are three varieties of sweet cherry included in this orchard Kordia, Ferrovia and Regina on rootstock Gisela 5. A various characteristics were studied, mainly morphological characteristics of fruits, sugar content, soluble solids, fruit firmness, juiciness, tenderness to cracking of the fruit skin, as well as the organoleptic evaluation. After the harvest, changes of these individual parameters were monitored during the storage period in cool chamber.

Characteristics of the fruit were determined by measuring the dimensions of the fruit (width, length), by measuring the weight of the fruit, stone, stalk etc. During this research a laboratory equipment was used, such as laboratory balance, nonius, scalpel. Sugar content was determined using the refractometer, and soluble solids content was determined by drying to constant weight in special laboratory drier.

Organoleptic characteristics, outer appearance of the fruit, taste, firmness, juiciness etc. were evaluated by visual examination. Changes in certain parameters of the quality of the fruit during a period of storage in cool chamber after 7, 14 and 20 days were also monitored. Cool chamber that was used for storage was the most commonly used refrigerator (not ULO), where the fruits are kept at 4 degrees C. This was chosen mainly because the most farmers use such ones. Also the yield that each variety has achieved in this year was measured and noticed.

There is also an automatic meteorological station placed in this trial orchard, so we can monitor most meteorological parameters, and use them in our future years of research, to see their influence on quality of the fruit.

During the flowering period bumblebees were brought in orchard to improve polination and fertilisation.



3. Results and Discussion

3.1. Pomological Characteristics

The average time of flowering of tested varieties at this location, was in the second decade of April, while the ripening period has lasted from the end of May to 20 June. According to the time of flowering and ripening, there was noticed the average amplitude of five days between the earliest and latest variety. Ferrovia was the first variety when it comes to flowering, then, a few days later came Kordia, and the last one flowering was Regina. The same situation was noticed during the ripening period, where the first variety was Ferrovia, than Kordia, and at the end Regina.



As for the visual and organoleptic evaluation is concerned, all the tested varieties have large, extremely well-colored fruit, cordate shape fruit. The average weight of the fruit of variety Kordia was 11.94 g, the fruit of the variety Regina was 11.45 g, while the fruit of the variety Ferrovia was 9.70 g. Stone weight varies from 0.55 g as it was measured in the variety Regina, followed by the 0.46 g in the variety Kordia, to 0.37 g which was the weight of the stone in the variety Ferrovia, which also has the smallest ratio (weight of the fruit / weight of the stone). The position of the stone in ventral view was medium elliptical in tested fruits of varieties Kordia and Ferrovia, a broadly elliptical in fruits of variety Regina.



Color of the skin was marked as a brown red in varieties Kordia and Regina, and a dark red in Ferrovia variety, while the color of the flesh of the varieties Ferrovia and Regina stands out burgundy, dark red, and in fruits of the variety Kordia it was medium red color. Color of the juice in fruits of the varieties Regina and Kordia were red and in the fruits of variety Ferrovia it was purple. When it comes to the fruit firmness, fruits of the variety Kordia have shown medium firmness, and the other two varieties had firm fruits.

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Since the sweet cherry fruits come to the market with the stalk, characteristics and appearance of the stalk are also important. Length, weight, freshness are monitored characteristics.

VARIETY NAME	KORDIA	FERROVIA	REGINA
FRUIT: SHAPE	CORDATE	CORDATE	CORDATE
FRUIT: PISTIL END	FLAT	FLAT	FLAT
FRUIT: COLOR OF SKIN	BROWN RED	DARK RED	BROWN RED
FRUIT: COLOR OF FLESH	MEDIUM RED	DARK RED	DARK RED
FRUIT: COLOR OF JUICE	RED	PURPLE	RED
FRUIT: FIRMNESS	MEDIUM	FIRM	FIRM
FRUIT: ACIDITY	LOW	LOW	LOW
FRUIT: SWEETNESS	HIGH	HIGH	HIGH
FRUIT: JUCINESS	MEDIUM	STRONG	MEDIUM
FRUIT: WEIGHT g	11.69	10.50	11.30
FRUIT: LENGTH mm	24.05	26.83	27.16
FRUIT: WIDTH mm	28.51	28.44	29.18
RATIO WEIGHT OF FRUIT/WEIGHT OF STONE %	4.08	4.18	4.55
STONE: SIZE	MEDIUM	MEDIUM	LARGE
STONE: SHAPE IN VENTRAL VIEW	MEDIUM ELLIPTIC	MEDIUM ELLIPTIC	BROAD ELLIPTIC
STONE: WEIGHT g	0.44	0.39	0.51
STALK: LENGTH mm	69.70	64.80	59.68
STALK: THICKNESS mm	1.16	1.15	1.16
STALK: WEIGHT g	0.10	0.13	0.20

Fig. 1. Pomological Characteristics

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3.2. Soluble Solids and Sugar Content

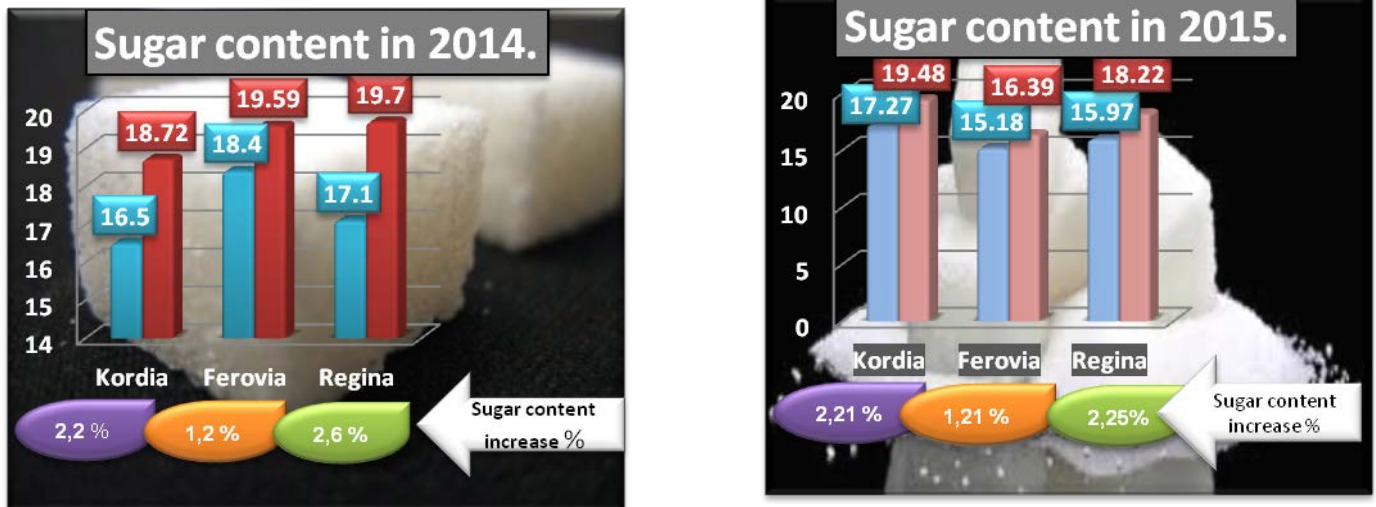


Fig.2. Sugar Content in 2014 and 2015, Blue – After Harvest, Red – After 20 Days Storage

In year 2014 the highest content of sugar was in fruits of Kordia variety and it was 17.27% ,in the Regina variety it was 15.97%, and 15.18% in the fruits of Ferrovia variety. When it comes to the soluble solids the highest percentage had variety Kordia and it was 18.9%, then comes the variety Ferrovia with 18.3%, and with 18.2% Regina variety. In year 2015. the highest content of sugar was in fruits of Ferrovia variety and it was 18.40% ,in the Regina variety it was 17.10%, and 16.50 % in the fruits of Kordia variety. When it comes to the soluble solids the highest percentage had variety Regina and it was 22.5%, then comes the variety Kordia with 21.9%, and with 18.8% Ferrovia variety.

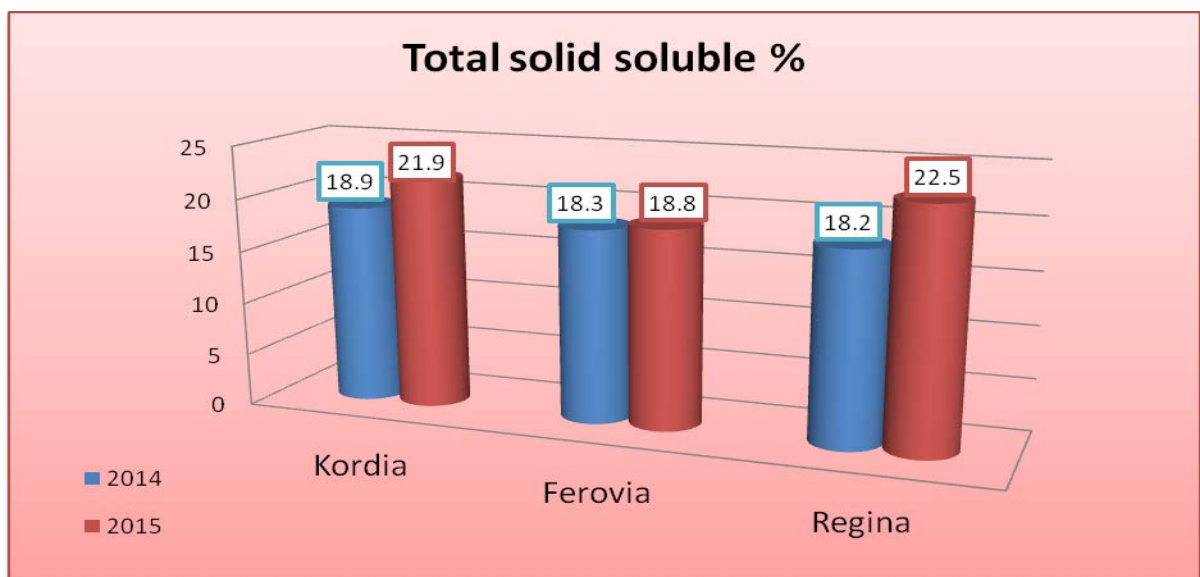


Fig.3. Soluble Solids

When it comes to sensitivity to cracking of the fruit skin, which can be a significant problem in growing cherries, these varieties, grown on the same ground and in the same agroecological conditions, variety Ferrovia has shown the greatest sensitivity to cracking of the fruit skin.

3.3. Storage Period

The research covered also the storage of the fruits of these varieties in refrigerators at a temperature of 4 degrees C, the refrigerator is not ULO, but common cooling chamber. After 7 days of storage, by visual inspection it was found that the fruits of the variety Regina kept firmness and fresh look, just in certain fruits, in some places around the stalk recess we might notice mild wrinkles on the epidermis, which was also the case with the fruits of other varieties. After 14 days, the fruits of variety Regina were partially retained the firmness, the skin of the fruit was slightly wrinkled, while the other two varieties fruits were considerably softer, with wrinkled skin and slightly dry stalk.

After 20 days of storage the fruit weight was measured to determine how big are the losses in weight. It was found that all three varieties did not lose more than 1.26 g, as much as it was measured in Ferrovia variety, in variety Kordia the loss in weight was 1.20 g, and the weight loss of the fruits in variety Regina was 1.15 g. As sugar content is concerned, it was increased by 2.25% in Regina variety, 2.21% for the variety Kordia and 1.21% at Ferrovia variety. The same methods and devices were used for these measurements, laboratory balance and refractometer.





Fig 4. Weight Loss in 2014 and 2015




Variety name	Kordia	Ferrovia	Regina
			
Storing in the cool storage after 7 days	Partially lost firmness, slightly wrinkly skin mostly around the stalk	Partially lost firmness, slightly wrinkly skin	Firmness mostly preserved,
Storing in the cool storage after 14 days	Softer fruits, Partially lost firmness, slightly wrinkly skin	Considerably softer fruits, lost firmness, wrinkly skin	Partially lost firmness, slightly wrinkly skin

Fig. 5. Visual Evaluation After Storage

Acknowledgment

On the base of earlier research and testing of this three varieties of sweet cherry on rootstock Gisela 5, on location Karavukovo, in agroecological conditions of the Vojvodina, northern Srebia, all three varieties showed very good results and could be recommended for growing.

There are some similarities in results of all three tested varieties in both years of research, but there are also some differences in sugar content, soluble solids. Our plan is, in years to come, to continue research and to monitor meteorological parameters and detect their influence on each variety.

In 2014 year variety Ferrovia had the highest sugar content, the most tasteful fruits, but also sensitive to cracking of the skin.

The the highest sugar content in year 2015 was determined in variety Kordia, Ferrovia variety is noted for its exceptional juiciness and flavor of the fruit, but also by the greatest sensitivity to cracking of the fruit skin, while the variety Regina recorded the highest content of soluble solids, the greatest firmness of the fruit and the smallest change in quality during the storage period, so it can be concluded that this variety has the best transportability and storage performances.

On the other hand during the investigation, it was concluded that there are certain similarities among this three tested varieties of sweet cherry, and thus may be noted that all three varieties have large, firm, well-colored and delicious fruit, which are also very important parameters, bearing in mind that the fruits of sweet cherry are intended mainly for table use in fresh state.

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