



## EVALUATION OF SOUR CHERRY CULTIVARS GROWN IN LATVIA FOR PRODUCTION OF CANDIED FRUITS

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### Abstract

Different sour cherry cultivars are grown in Latvia suitable both for fresh market and for processing. Fresh local sour cherry fruits are available for consumers only in July. Sour cherries are favourite fruits because of pleasant taste, juicy flesh and attractive dark red color. Fruits are rich in natural antioxidants – vitamins and polyphenols, but are low in calories. One of processing methods preserving valuable nutrients in products in significant quantities is drying. Dried cherry fruits or candied fruits can be used as energetic delicacy and healthy goody. It is a great alternative for people liking sweets and caring for their health. A priority of dried fruits is their long keeping time, as well as their use in preparing other dishes. The aim of the study was to evaluate suitability of sour cherry cultivars grown in Latvia for production of candied fruits. Five sour cherry cultivars were chosen: ‘Bulatnikovskaya’, ‘Orlica’, ‘Shokoladnica’, ‘Tamaris’ and ‘Zentenes’. To evaluate suitability of sour cherry cultivars for drying, candied fruits and syrup, sensory estimation establishing the level of liking was performed and biochemical parameters: content of soluble solids, total acids and phenolic compounds were determined. As a result of the study it was found that higher level of liking had candied fruits and syrup made from the cultivar ‘Shokoladnica’, regardless of their higher acidity. On the other side, the highest content of polyphenols was ascertained in candied fruits of the cultivar ‘Orlica’ and their by-product, while the highest content of soluble solids was found in candied fruits and syrup made from the cultivar ‘Bulatnikovskaya’.

**Key words:** sour cherries, drying, candied fruits

### Introduction

Orchards in Latvia are not imaginable without sour cherries. Horticulturists enjoy flowering cherries in spring and the attractive ruby fruits in summer. Consumers like cherries because of their appearance as well as their pleasant and fresh taste. Due to high cherry quality they are sometimes called “diamond fruits” (Ruisa, 2008).

The most popular sour cherry cultivar grown in Latvia is ‘Latvijas Zemais’, followed by cultivars ‘Bulatnikovskaya’, ‘Shokoladnica’, ‘Tamaris’, ‘Orlica’, ‘Zentenes’.

Recent research has proven that fresh and candied cherries are rich in antioxidants influencing health favourably as they neutralize harmful radicals and reduce the risk of several diseases. The content of  $\beta$ -carotene in cherries is 19 times higher than that in strawberries and high-bush blueberries. Cherry fruits contain vitamins C, B<sub>1</sub> and PP, folic acid, organic acids, glucose, fructose, pectin, several minerals like K, Fe, Cu. Melatonin, a natural regulator of sleep which helps to fall asleep easy as well as prevent aging processes, is also found in cherries (Russel, 1996). Sour cherry fruits are used mainly for processing therefore it is essential to keep them fresh for a longer time. Different methods are employed to preserve fruits, of which the most common are freezing and drying. According to data of the World Trade Organization, the USA is the largest producer of frozen sour cherries; however, the most important country of export is Poland. Nearly 92% of the cherries exported from Poland go into the market of EU Member States. Dried cherry fruits can be used both as a delicacy and a healthy goody with high nutritive value. It is recommended by researchers to eat dried cherries 100 g per day, as they work as effective prophylactic means against heart and coronary disease – the leading reason of mortality in Europe and in Latvia (Kask, 1998).

In the process of making dried cherries up to 50% of initial water is removed from the product by osmotic pressure (Shi, 2008), and as a result cherry syrup is obtained. It can be used as a natural remedy to relieve pain, especially for reducing muscular pain (Audriņa, 2008). Reduced amount of water shortens the drying time, improving the sensory qualities of the product and preventing nutrient losses in the further drying process.

In this study the suitability of sour cherries grown in Latvia for production of candied fruits is evaluated.

### Materials and Methods

The research was performed at the Fruit and Berry Experimental Processing Department of the Latvia State Institute of Fruit-Growing. Five sour cherry cultivars grown in Latvia were included in the study: 'Bulatnikovskaya', 'Orlica', 'Shokoladnica', 'Tamaris' and 'Zentenes'. These cultivars are suitable for commercial growing in our country and are characterized by good winter-hardiness of trees, good productivity and dark red fruit colour.

*Technology of obtaining candied fruits.* Stones were removed, 40% of sugar from fruit mass was added, then put into temperature of  $+4\pm 1$  °C for 48 hours. After then the syrup was poured off and fruits were dried in a drying chamber with forced air circulation at the temperature 45 to 50 °C, until the humidity of the product decreased to 40–43%. Fruits were mixed periodically during drying.

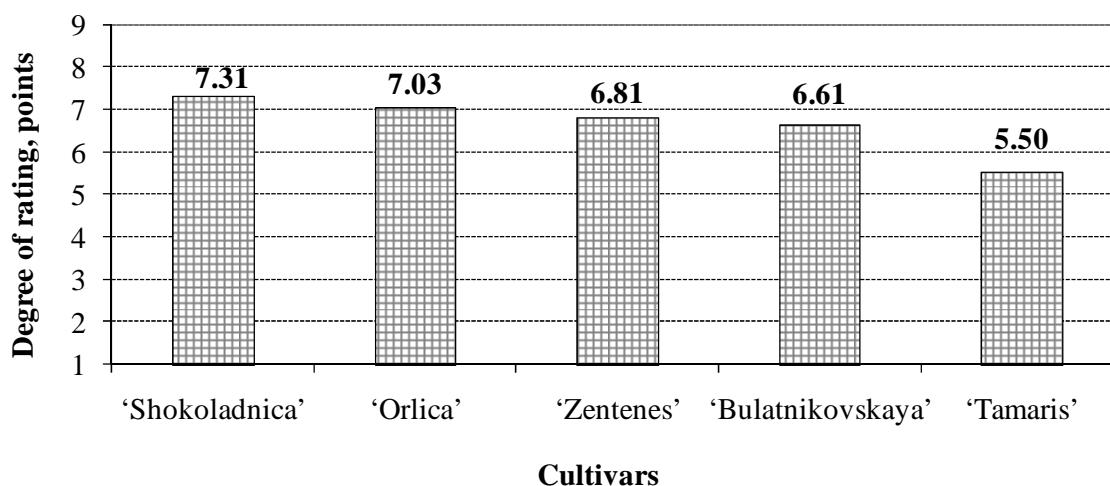
*Biochemical analyses.* Physical and chemical parameters of fruits and berries alter after processing (Gūtmanis, 1961). To clear up which cultivars are more suitable for the chosen way of processing, as able to preserve the physical and chemical parameters to a maximal extent, the following analyses were carried out: the content of soluble solids (Brix%), accordingly to standard LVS EN 12147: 2001; the content of total acids (%), accordingly to standard LVS EN 12147: 2001; the total content of phenols ( $\text{mg } 100 \text{ g}^{-1}$ ) by the method of spectrometry (Singlotion, 1990).

*Sensory evaluation.* The hedonic evaluation method was used based on ISO 4121:2003. Taste and the liking degree were evaluated for the samples (Cliff, 1999).

*Statistical analysis.* The results obtained in the experiments were summarized and analyzed by MS Excel program. Data were ranged, groups were analyzed by the descriptive statistical method *Description statistic*, the significance was determined for validity of 95%. The obtained groups of data were compared using the mean (arithmetical) value and the mean validity range (the mean  $S_x$ ; the mean  $+S_x$ ). Standard deviation was used for the characterization of dispersion of the obtained data. Correlation analysis was used for the evaluation of results to establish the closeness of relationships between chemical parameters and sensory evaluation.

### Results and Discussion

*Sensory evaluation of candied cherry fruits.* Sensory aspect is one of the determinative parameters in consumer choice of product and its further purchasing. Candied fruits of the cultivar 'Shokoladnica' received the highest rating: 7.30 points from 9.0 (Figure 1). As found by experts, these fruits had mild sweet-and-sour taste and good structure. American researchers also have found that at taste panels cultivars of this type are preferred (Turner, 2004). When eating candied fruits consumers are sometimes bothered by the astringent taste caused by tannins. Research has demonstrated that with increase of astringency the product gets lower rating in sensory evaluation (Guyer, 1993). Candies made from the cultivar 'Orlica' were rated negatively because of smallish fruits and a relatively high content of tannins. Their rating was 7.03 points, and they were also marked as something over-sweet, yet the texture of candies was accepted as good and the overall taste as pleasant. Fruits of cultivars 'Tamaris' and 'Zentenes' are characterized by a relatively tight skin (Ruisa, 2008). So, their total structure after drying was made up mainly by skin, while the flesh was least tangible. Candied cherries of these cultivars were rated as too dry and firm. Candies made from the cultivar 'Zentenes' received 6.8 points and were accepted as more suitable for glazing. Candied cherries made from 'Tamaris' had the lowest rating and received 5 points because of the strongly tangible tannins. Candies of the cultivar 'Bulatnikovskaya' had good texture; however, their rating reduced because the consumers found them as too sweet.



**Figure 1. Results of sensory evaluation of candied cherry fruits**

*Biochemical content of candied fruits and its influence on sensory parameters.* Candied fruits containing higher content of total acids received higher sensory evaluation, and a close positive correlation was found in this aspect ( $r=0.42$ ). Candied fruits of the cultivar 'Shokoladnica' had the highest content of total acids: 2.53 % (Table 1). This cultivar was recognized as the most suitable for producing candied fruits. The lowest content of total acids was observed for the cultivar 'Zentenes': 2.16%. Yet no statistically significant differences were found among cultivars in the content of total acids. This is also demonstrated by the fact that the ratio of soluble solids and total acids was equal for all cultivars: 0.02, except 'Shokoladnica' with 0.03. However, the last difference also was not statistically significant. The highest content of total phenols was ascertained for candied cherries of the cultivar 'Orlica': 657.17 mg 100g<sup>-1</sup>, and no significant difference was observed for the cultivar 'Tamaris' – 653.78. Tannins are included in the content of total phenols, so, the higher that content, the lower are the sensory parameters as it was found by Bernalte et al. (Bernalte, 2009).

Table 1

**Biochemical parameters of candied cherries**

Cultivars	Content of total acids, %	Content of total phenols, mg·100g <sup>-1</sup>	Content of soluble solids Brix %	Ratio of soluble solids and total acids
<b>Shokoladnica</b>	2.53	257.29	96.23	0.03
<b>Tamaris</b>	2.32	653.78	100.67	0.02
<b>Bulatnikovskaya</b>	2.45	609.60	104.69	0.02
<b>Zentenes</b>	2.16	515.23	98.31	0.02
<b>Orlica</b>	2.51	657.15	97.41	0.02

Negative interrelationships were ascertained between the content of total phenols and sensory evaluation ( $r=-0.32$ ), as well as between the content of soluble solids and sensory evaluation ( $r=-0.39$ ). It can be explained by the high sensory rating of 'Shokoladnica' candied fruits which also had the lowest content of total phenols: 257.29 mg 100g<sup>-1</sup> and soluble solids: 96.23 Brix %. The highest content of soluble solids was observed for candies from 'Bulatnikovskaya' and 'Tamaris'; difference between these cultivars was not significant: 104.69 Brix % and 100.67 Brix % respectively.

A medium close positive correlation was established between the content of total phenols and the content of total acids. In the dry mass of candied cherries increased content of total acids

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was observed if the content of total phenols was higher ( $r=0.69$ ). Positive correlation ( $r=0.53$ ) was ascertained between the content of soluble solids and total phenols. This correlation is not close, but a tendency was observed that with increasing content of total phenols and soluble solids sensory evaluation decreases.

Statistical evaluation of the data showed that there are no significant differences among the candied cherries from different cultivars ( $p=0.98$ ).

Estimating the biochemical and sensory parameters of cherry syrup, it was found that they are similar to the parameters of candied cherries.

### Conclusions

1. 'Shokoladnica' was the most suitable cultivar for candied fruit production because of its mild sweet-and-sour taste and good structure.
2. There was a tendency that the highest sensory evaluation had candied cherries containing the highest amount of total acids.
3. Negative interrelationships were ascertained between the content of total phenols and sensory evaluation ( $r=-0.32$ ), as well as between the content of soluble solids and sensory evaluation ( $r=-0.39$ ).
4. Significant differences among the candied cherries from different cultivars were not established.

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