

INFLUENCE OF REGIONS ON THE NUTRITIONAL VALUE OF OBLACINA SOUR CHERRY FRUIT DURING FREEZING

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Abstract

During this study the Oblacina cherry cultivars were analyzed as cultivars prevalent in the country. Samples for qualitative parameters were taken from four regions: Pelagonia region (Bitola), Vardar (Sveti Nikole), East (Koçani), Polog (Tetova, Gostivar). The objective of the study is to explore and compare the qualitative parameters of the cherry cultivars of Oblacina from different regions such as: soluble dry matter expressed in degrees °Brix, pH level, total acidity, sugars, and vitamin C. From the obtained results it is seen that the sample of cheery from Polog region had significant differences ($P < 0.05$) during the production processes compared with other regions. Satisfying results have been obtained in the cherry samples from the Polog region. These samples have a good performance on quality parameters such as: total sugars (10.02 %), vitamin C (45.95 mg/100g), and total acidity (0.80). The results of the sour cherry fruit cultivar from Polog geographical region suggested on the better climate soil conditions that these regions possess.

Keywords: freezing, cherries, regions, quality, physico-chemical analysis

1. Introduction

The cherry (*Prunus cerasus*) belongs to the *Rosaceae* family, which belongs to the *Prunus* type, along with cherries and plums. Sour cherries (*Prunus cerasus*) are one of the most popular fruits in almost all regions of the world, due to their taste, sweetness, and beneficial compounds for health (Abrankó et al., 2015). It is widespread in most of Europe and Southwest Asia. The fruit is acidic and slightly bitter. Cherry is from fruit trees, which adapts more easily to different climatic-terrestrial conditions. It tolerates cold and likes cool climates, although it is cultivated in lower areas.

Over the past decade, cherry products have had an increased use in the food market due to their potential health benefits (Khoo et al., 2011; Kirakosyan et al., 2009). Frozen fruits are used as an ingredient in many food formulations, such as jam (jelly), jelly, sauces, purees, syrups, liquid concentrates, as well as bakery and dairy products (Stan et al., 2015). The changes in cherries after-ripening are easily visible seeing the change of their colors from green to red (Pedisić et al., 2009). Fruit ripening is associated with significant chemical changes, and the color change is mainly influenced by the concentration and distribution of various anthocyanins in the skin (Gao & Mazza, 1995). The fruit is juicy red due to the presence of anthocyanin.

In the modern technology of the food industry, cherry fruits during processing are subjected to different treatment conditions. The size of the fruit for processing is not an important feature as stated by, who specifically emphasizes that the size of the fruit in the selection of cherries is less important because almost all the production of this fruit goes to various forms of processing.

Cherry fruits are used for fresh consumption and especially in the food industry for the preparation of juices, compotes, pretzels, jams, special liqueurs, etc. The objective of the study is to analyze the physico-

chemical parameters before and after the process of freezing the Oblacina cherry in the Polog area by comparing it with the same cultivar from different regions such as: Pelagonia, Vardar and East. Therefore, this study aims to study the impact of the freezing process on vitamin C and the physicochemical properties of cherries.

2. Materials and Methods

2.1. Materials

Considering that cherries are very perishable fruits and are only available for a short time during the season, after standard industrial practice the material of all cultivars was frozen to ensure availability for off-season processing according to (Konopacka et al., 2014).

The territory of the Republic of North Macedonia lies in Southeast Europe in the Balkan Peninsula with a geographical position between 40°51 'and 42°22' north latitude and 20 ° 27 'and 23 ° 02' east longitude as seen in Figure 1.



Figure 1. The main cherry fruit regions

Samples of cherry fruit Oblacina were taken from the fruit and vegetable processing factory "Ladilnik - Royal" Tetovo, harvested from different regions such as: Pelagonia, East, Vardar, and Polog (Figure 1).

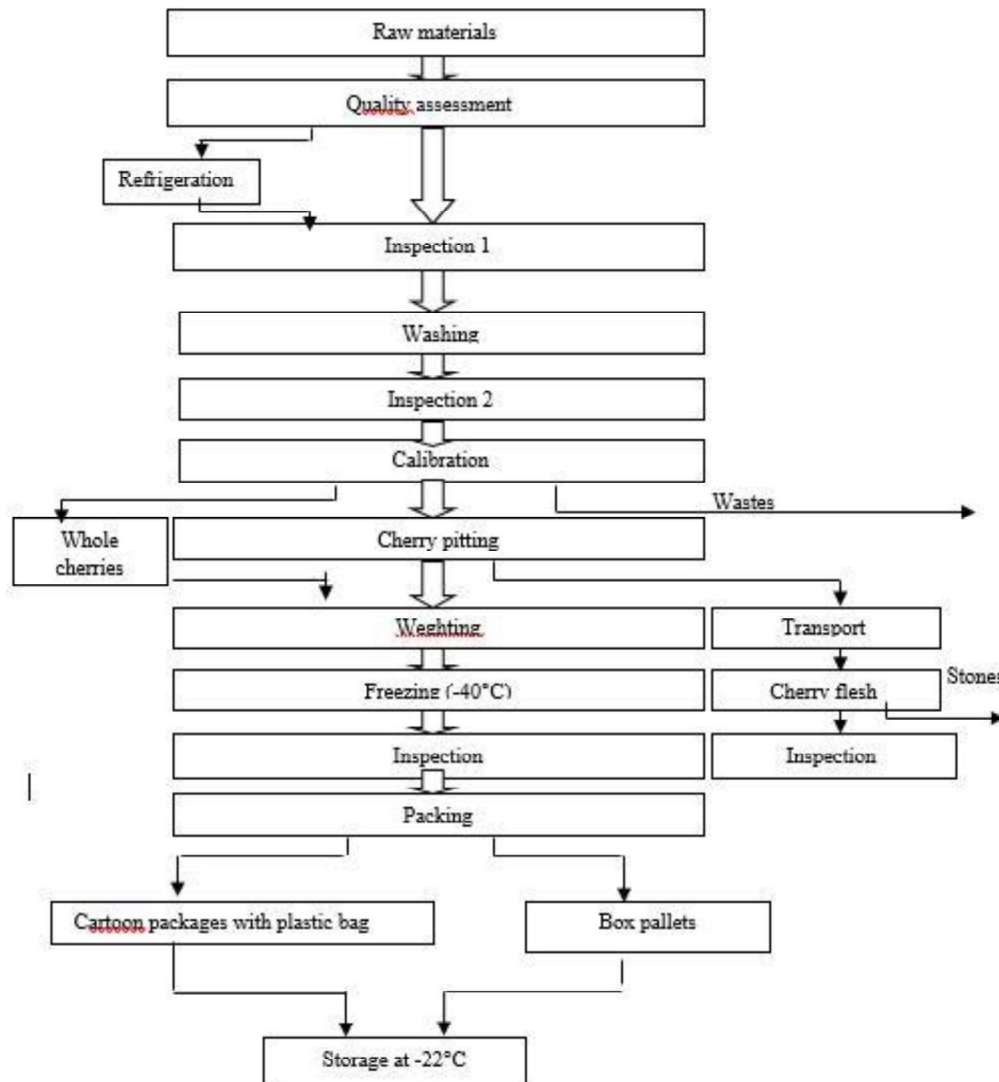


Figure 2. A general flow chart of frozen Oblacina cherry

The samples were analyzed in the laboratory of the Food Technology and Nutrition Department for the physico-chemical parameters. Whole fruits, with approximate ripeness and approximate size, have been used. After harvesting the cherry fruits are sent to the cooling room at a temperature of up to 5 °C, where they then enter the freezing process. It is important to follow the freezing process, including the process before freezing and after freezing, to achieve high- quality products.

2.2.Methods

To determine the quality and nutritional value of fresh and frozen cherries, the following chemical parameters were analyzed: - dry soluble matter was determined by measuring the liquid density of cherry fruit Oblacina with a refractometer (Zeiss, Germany) and expressed in ° Brix.

The pH value is determined by the potentiometric method using the digital pH meter (Mettler Toledo MP120 FK), Titrated acidity - was determined using the volumetric method, where 0.1 M NaOH solution was used as

a titration solvent; the total sugars were determined by the gravimetric method with the Felling solution and Vitamin C was determined by the titration method using the 0.1 N (I₂) solution according to Vračar et al. (2001).

2.3. Statistical analysis

The experiments were performed in three repetitions and the results presented in the tables and figures were shown with standard deviations. All data were statistically evaluated using SPSS software. A significant statistical test was based on general error criteria with a confidence level of 95.0% ($p < 0.05$).

3. Results and Discussion

The results of physico-chemical analyzes such as: dry matter, acidity, total sugars and vitamin C. in cherry fruits before the freezing process, frozen cherries after the production process, in different regions are presented in Table 1.

Table 1. Physico-chemical parameters before the freezing process

Samples	pH	°Brix	nD
Vardar	3.05±0.01 ^a	11.0±0.10 ^b	1.364±0.00 ^a
Pelagonia	3.18±0.01 ^c	14.97±0.45 ^d	1.364±0.00 ^a
Eastern	3.13±0.01 ^b	12.13±0.23 ^c	1.362±0.00 ^a
Polog	3.06±0.02 ^a	10.97±0.15 ^a	1.356±0.00 ^a

Means ±SD within a column with different superscripts (lower case) differ significantly ($P < 0.05$).

The value of dry soluble matter ranges from 10.97 in the Polog region, to 14.97 % in the Pelagonia region, while after freezing the dry matter has higher values in cherry samples from Pelagonia 18.03 % and lower values in cherry samples from East 11.10 %. These samples have significant differences between them, i.e. cherry samples are significant. Our results are in accordance to the results from the authors such as Nikolić et al. (2011), Ansari & Davarynejad (2008) and Khorshid & Davarynejad (2010).

The lowest pHs are cherries from Polog and Vardar 3.05, while the highest pH is found in cherries from Pelagonia 3.18 and the Vardar region and 3.05 for the cherry cultivar from the East region. If we compare the regions we will notice that in cherry samples in all regions we have changes before and after the freezing process this means that after the freezing process we have a decrease in pH, which means that the freezing treatment process has affected.

Table 2. Physico-chemical parameters after the freezing process

Samples	pH	°Brix	nD
Vardar	2.09±1.72	13.07±0.06	1360±0.00
Pelagonia	3.01±0.01	18.03±0.10	1364±0.00
Eastern	3.05±0.01	11.10±0.15	1362±0.00
Polog	3.03±0.01	10.13±0.15	1364±0.00
Anova	NS	*	*

NS-non significant ($P < 0.05$).

The overall acidity of cherries based on the results according to the table is lower in the East region 1.04mg / 100g and Polog 0.80mg / 100g, before freezing and 1.31 and 1.10 mg / 100g after freezing, while the highest acidity is found in cherries from Vardar region 1.35 for the freezing process.

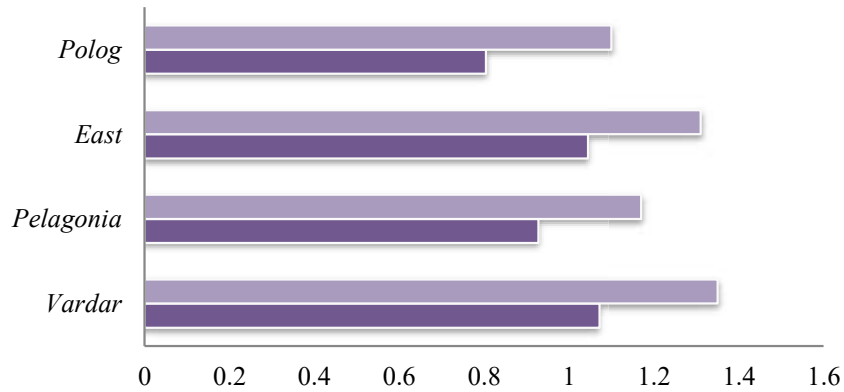


Figure 2. Total acidity before (dark) and after freezing (light)

Our results are lower than previously reported in the literature (Ansari and Davarynejad, 2008). The reasons for these changes in TA may be due to changes in growing areas (Pedišić et al., 2007)

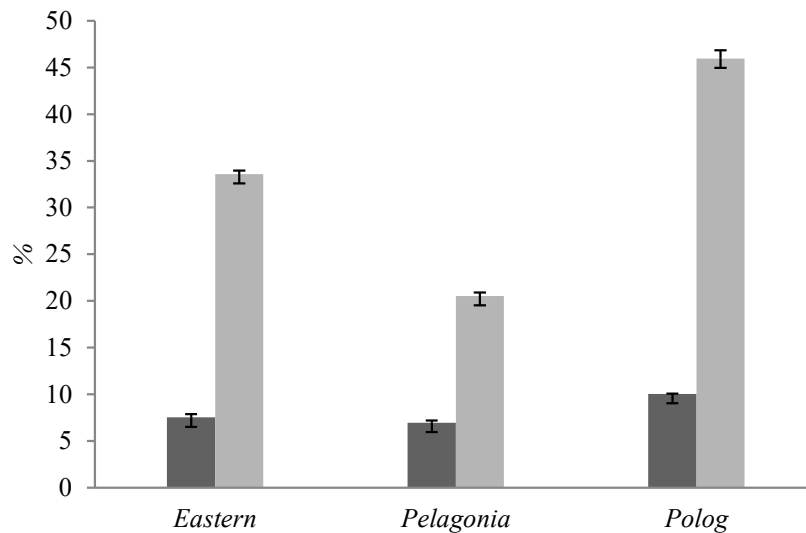


Figure 3. Total sugar (%), dark columns) and vitamin C (mg/100g, white columns) content.

The sugars in the cherry of the Oblacines cultivar in the study regions range from 6.94 in the Pelagonia region to 10.02 in the Polog region (Figure 2). It is observed significant differences in the content of sugar between them.

In general, fruits and vegetables show a gradual decrease in vitamin C content as well as the storage temperature or duration increases (Koyuncu & Dilmaçunal, 2010). In Figure 2, vitamin C ranges from 20.51

in the Pelagonia region and 45.95 mg / 100g in the cherry sample from the Polog region, so the value of the vitamin ranges from 45.95-20.51mg / 100g.

It is concluded that the Oblacina cultivar can be cultivated in agro-climatic conditions of four regions and that this cultivar is suitable for processing and fresh consumption and freezing (Nyeki J. et al., 2005). However, many authors reported that cultivation, climatic conditions, environmental factors, harvest, and maturity stage may affect the chemical properties of cherries.

4. Conclusion

The obtained results have shown that cherry samples from the Polog region in the physicochemical parameters showed significant changes before and after the freezing process compared to other regions. Based on results for quality determination of raw material before and after freezing, it is concluded that the Oblacina variety is characterized with dry matter (14.97 %), pH value (3.18), total acidity (1.07%), and vitamin C (45.98 mg /100g), meanwhile after freezing the value of a dry matter and sugars are higher with 18.03% and 10.02%, respectively. During freezing and storage at -22 °C of a sour cherry collected from four regions were not found significant changes in nutritional value. It is a priority for our country of interest to look for ways to increase production and improve the quality of cherries since cherries are fruit in demand in the European market as frozen.

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