World Journal of Engineering Research and Technology
WJERT
www.wjert.org
SJIF Impact Factor: 5.924

THE EFFECT OF THERMAL PROCESSING ON THE YIELD OF CHERRY LAUREL JUICE

Dali Surmanidze*[1], Leri Gvasalia[2], Tamar Kacharava[3]

[*1]Ph Student
[2]Emeritus, Doctor of Technical Sciences,
[3]Professor, Doctor of Agricultural Sciences
Georgian Technical University, Tbilisi, Georgia.

Article Received on 15/03/2023 **Article Revised on 05/04/2023** **Article Accepted on 25/04/2023**

***Corresponding Author**
Dali Surmanidze
Ph Student
Georgian Technical University, Tbilisi, Georgia.

ABSTRACT

We have studied the effect of thermal processing on the yield of the juice from fruits of wild-growing cherry laurel. During the steam treatment of whole fruits, the maximum yield (32.4%) was proved when the fruits were heated up to 80°C, while, at the same time, along with the rise of the temperature the organoleptic indicators of the juice were considered to deteriorate. The maximum juice yield (45%) was achieved by infusing mashed fruits for 32 hours at a temperature of 20-30°C. At the same time, the heating of pulp did not lead to an increase in juice yield, and both organoleptic and chemical parameters of the juice worsen.

KEYWORDS: Cherry laurel, Fruit juices, Chemical content, Processing technology.

INTRODUCTION

In 2021, the rain forests of Adjara were included in the list of UNESCO World Heritage Sites. These forests occupy approximately 61% of the territory of the autonomous republic. Trees and bushes of cherry laurel are a significant component of these forests (Kacharava, 2020; Alekcidze et al, 2018). Cherry laurel (*Prunus laurocerasus* L.), the representative of the *Rosaceae* family, bears fruits with a specific aroma. Also, cherry laurel is rich in sugars, vitamins, organic acids, antioxidants, as well as minerals, pectins, and tannins (Minadze, 2006; Celik F. et al, 2011; Macit and Demirsoy 2012). Local farmers consume fruits of cherry laurel's cultural forms as dietary fruits, while they practically refuse to consume the fruits of wild forms of cherry laurel. Because cultural forms of cherry laurel exist as single trees, and the total area occupied by wild forms of cherry laurel adds up to approximately 13 thousand hectares (according to the Forestry Agency of Georgia), the development of the technology of cherry laurel's fruit processing is of great economic importance.

MATERIALS AND METHODS

The purpose of this research was to develop rational and effective methods for obtaining juice from cherry laurel fruits. Since these fruits belong to the raw materials of poor drainage, we have studied the effect of thermal processing: both as the direct/immediate thermal processing of whole fruits, as well as the thermal processing of the pulp obtained from mashed fruits.

We have experimented on ripe fruits of wild cherry laurel plants growing in the Keda and Shuakhevi districts of Adjara, at the altitude of 800 m above sea level. To assess the quality of the juice obtained, its chemical and physical parameters were checked. The dry matter content in the resulting juice was determined with the use of a refractometer (ISO 2173:2003), titrated acidity was assessed by titration (ISO 750:1998), total sugars – by the Bertrand method (Bertrand, 1906), total phenolics were determined colorimetrically using Folin–Ciocalteu reagent (Slinkard, 1977), pectic substances – by the carbazole colorimetric method (Kyriakidis, 2001), and the intensity of juice coloring – by the photoelectrocolorimeter.

RESULTS

The data obtained by studying the effect of temperature on the juice yield, and on the chemical and organoleptic parameters of the juice during the thermic processing of whole cherry laurel fruits are given in Table 1.

Table 1: The effect of Steam Treatment on the Yield of Juice from Whole Fruits of Cherry Laurel.

Fruit Heating Temperature, ^oC	Juice yield in terms of fruit weight	Chemical Composition of Juice, %					Light Conductivity of Juice, %
		Solids	Sugars	Titratable Acidity	Total fenolics	Pectic Agents	
30	19.6	19.2	12.0	0.44	0.46	0.48	45.0
40	22.0	18.7	11.7	0.40	0,41	0.42	50.5
50	25.7	18.5	11.3	0.40	0.30	0.41	53.5

60	27.2	18.3	11.0	0.39	0.37	0.39	55.0
70	30.1	18.0	10.9	0.39	0.35	0.38	60.5
80	32.4	17.9	10.5	0.38	0.30	0.37	67.0
90	31.2	17.6	10.3	0.38	0.29	0.31	67.5
100	30.0	17.3	10.4	0.35	0.21	0.29	70.5

Table 2: The Effect of Temperature on the Yield of Cherry Laurel Juice and the Changes in its Chemical Parameters.

Time of Infusion of Pulp, (hour)	Heating Temperature of fruits (^oC)	Juice yield in terms of fruit weight	Chemical composition of juice, %					Light Conductivity of Juice, %
			Solids	Sugars	Titratable Acidity	Total Fenolics	Pectic Agents	
1	20	21.8	19.0	12.3	0.44	0.89	0.46	46.5
	30	22.9	19.1	12.3	0.44	0.90	0.47	46.0
	40	23.0	19.3	12.4	0.44	0.90	0.49	46.0
	50	23.7	19.4	12.5	0.45	0.91	0.51	45.0
2	20	22.4	19.1	11.8	0.44	0.89	0.46	45.5
	30	23.9	19.2	11.9	0.43	0.89	0.46	45.0
	40	25.0	19.3	12.0	0.44	0.90	0.45	43.0
	50	27.5	19.4	12.3	0.45	0.90	0.45	44.0
4	20	24.5	19.3	12.1	0.44	0.89	0.44	42.0
	30	26.0	19.4	12.2	0.44	0.88	0.45	42.0
	40	28.8	19.5	12.3	0.45	0.87	0.41	43.5
	50	34.1	19.6	12.5	0.45	0.88	0.42	42.5
8	20	27.2	19.6	11.6	0.44	0.87	0.43	42.5
	30	29.1	19.7	11.8	0.45	0.83	0.41	43.0
	40	34.8	20.0	12.3	0.45	0.84	0.41	43.5
	50	39.2	20.1	12.5	0.46	0.82	0.40	44.0
16	20	40.0	18.2	11.4	0.45	0.77	0.40	41.0
	30	42.7	18.6	11.5	0.45	0.76	0.39	40.0
	40	42.6	21.7	14.7	0.47	0.77	0.38	42.0
	50	39.3	21.8	14.9	0.47	0.78	0.39	40.5
32	20	45.6	17.1	10.4	0.46	0.65	0.37	37.0
	30	44.8	17.7	10.8	0.45	0.64	0.36	39.5
	40	39.8	21.8	14.9	0.47	0.76	0.032	41.5
	50	39.7	22.0	15.2	0.47	0.81	0.034	40.5

As Table 1 shows, when whole fruits were heated from 30^{o}C to 80^{o}C, the juice yield increases up to 32.4%. At the same time, as the temperature increases, the amount of water-soluble substances decreases. Solids get from 19.2% down to 17.2%, and sugars – from 12.0% to 10.4%. This is mainly caused by the dilution of the juice with the steam condensate. It turned out that the organoleptic parameters of the juice deteriorate with increasing temperature. The saturated red color turns brown and the light conductivity of the juice increases. Thus, it is impossible to achieve a high yield and good quality of juice by the direct heating of cherry laurel fruits, therefore, we conducted further experiments on mashed fruits.

Mashed pulp together with pips were subjected to thermal processing at different temperatures, for the various duration of infusion. Based on the preliminary experiments, the maximum temperature selected for thermal processing was 50^{o}C. The juice yield and its chemical composition were determined. The data due to this research are presented in Table 2.

The data in Table 2 show that as the temperature increases the yield of juice increases only slightly, while its quality deteriorates. The increased duration of infusion at high temperatures also does not give a significant increase in the juice yield, while the juice gives the top yield, at low temperatures. When the pulp is infused at 20-30°C, the juice yield grows from 22% up to 45%, the resulting juice is dark red, it has a pleasant aroma, and also the amount of sugar is reduced. Thus, to achieve a high yield of juice from mashed cherry laurel fruits, there is no need for thermal processing of the pulp, since during the fruit harvest season the air temperature is in the range of 25-35^{o}C.

DISCUSSION

Some other researchers also worked on the increase of the yield of juice from cherry laurel fruits. Z. Gogolishvili (Gogolishvili, 1970) studied the effect on the yield of juice of different degrees of fruit crushing, pressing under different pressures and with different infusion times. Serbian scientists (Karabegović et al, 2014) have offered microwave processing. Japaridze et al (Japaridze et al, 2005) have suggested separating pips before pressing. However, the optimal option has not yet been found, and so, the issue requires further investigation.

CONCLUSION

Based on this research it can be concluded that thermal processing is impractical to obtain juice from cherry laurel fruits. The maximum yield of juice can be achieved by 32 hours of the infusion of pulp and its further pressing. However, we believe that the results obtained are not the most optimal and in the future, the authors will endeavor to utilize the enzymatic preparations to increase the yield of juice and achieve its best quality.

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