RESEARCH ON QUALITY PROPERTIES OF THE FRESH AND REFRIGERATED *HIPPOPHAE RHAMNOIDES* FRUITS

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Abstract

Forest berries are the most valuable fruits. This is a consequence of their bioactive compounds, low level of pesticides and other contaminants. This kind of fruits are very valuable because increase the local economies and sustainability of the area and because of their taste and color.

Fruits of Hippophae rhamnoides, there are one very valuable among berries because of high inocuity.

Present study try to monitories the following quality parameters of Hippophae rhamnoides fruits during storage because of very well known issues regarding storage of sea-buckthorn berries.

The parameters taken in to study were: pH, Dry matter, Vitamin C, Polyphenols, Flavonoids, Lycopen.

Key words: *Hippophae rhamnoides, pH, Dry matter, Vitamin C, Polyphenols, Flavonoids, Lycopen*

INTRODUCTION

Hippophae rhamnoides known as sea-buckthorn become in last years one of the most popular berrie in Romania. This fact drive to the necesity to evaluate the sea-buckthorn fruits quality in order to have an overview about the product market evolution and from the issues regarding harvesting, handling and storage of the product as well. The quality is influenced by storage conditions and time, there are diferent ways of mentaining shelf life of sea-buckthorn fruits.

Hippophae rhamnoides is also one of the most harvested and spreaded berrie from Romania. The fruits are very abbundent and plant is cultivated all over the plains and hils, even in the mountains.

There were considered 2 storage systems, fresh in bulk and refrigerated in bulk.

There is important to have this tresholds of temperature because during harvesting in late autumn and even winter the process can be conducted in natural way and until the harvesting fruits can losse important amounts of bioactive compounds and important mass percentage.

In this way parameters taken in study are important from all points of view, innocuity especialy. Methods used for analysis were according with

romanian standards and are quottation in latest studys and international methods.

MATERIAL AND METHOD

For determination the physico-chemical and organoleptic indicators were carefully examined 3 samples from each variant of stored fruits.

The samples were kept fresh (20ºC), refrigerated (0-4ºC) 7 days, parameters were determined in the same day and in the second day.

The samples were examined from the organoleptic point of view, and they analyzed the shape of the exterior, aspect of the section, general aspect, also the consistency, the color, the smell and the taste. The samples that not meet the normal properties of the fruits were considered alterated and were not taken in to study.

The physical-chemical examination consist in following parameters: pH, Dry matter, Vitamin C, Polyphenols, Flavonoids, Lycopen.

The research methods were according Romanian regulation. As following:

Organoleptical parameters:

Were done by scoring the samples from 0 to 10 points.

Vitamin C content: ***Vitamin C*** was extracted using metaphosphoric acid and the extract was titrate with iodine solution starch indicator (Kallner,1986).

Dry matter: was done using force draft oven at 105 ºC for one hour.

pH: was done using a pH-meter, potentiometric method.

The total phenolic (TP) content was determined by using the Folin-Ciocâlteu (1927) colorimetric method developed by Singleton and Rossi (1965). A diluted extract (0.5 ml) or phenolic standard was mixed with 2.5 ml Folin- Ciocâlteau reagent and after 5 minutes 2.0 mL sodium carbonate (7.5%). The absorption was read after 2 h at 20°C, at 750 nm. For the preparation of calibration curve 0.5 ml aliquot of 0.2, 0.4, 0.8 and 1.2 μM/ml aqueous gallic acid solution were used as the standard and expressed as mg of gallic acid equivalent (GAE) (Gergen, 2004).

Flavonoids: The total Flavonoid compounds content (FC) was measured with $AlCl_3$ colorimetric assay (Atanassova et al, 2011). The absorbance was measured at 510nm. As standard we used catechin.

Lycopen: Lycopene extraction from samples was realised with hexane:ethanol:acetone (2:1:1)(v/v) mixture following the method of Sharma and Le Maquer, 1996.

One gram of the homogenized samples and 25 ml of hexane: ethanol: acetone, were placed on the rotary mixer for 30 min., adding 10 ml distilled water and was continued agitation for another 2 min. The solution was left to separate into distinct polar and non-polar layers. The absorbance was

measured at 472 and 503 nm, using hexane as a blank. The lycopene concentration was calculated using its specific extinction coefficient of 3150 at 503 nm. The lycopene concentration was expressed as mg/100g product.

RESULTS AND DISSSIONS

Organoleptic examination did not reveal any significant changes to the conditions of admissibility imposed by legal regulations allowed.

Table 1. Reserch results regarding Dry matter of the fruits

No.	Sample	Fresh (%)	Refrigerated (%)	Loss percentage (%)
1	Sample 1	25,02	24,20	3,28
2	Sample 2	25,81	24,02	6,94
3	Sample 3	25,34	23,94	5,52
	Average	25,39	24,053	5,26

Because of morphological aspects the biggest dry matter was recorded to fresh fruits.. After refrigerations because of methabolism and morphological particularities the dry matter decrease significant. The sample 3 recorded the smallest dry matter percentage. This is important to be known because the percentage of losses that affect the economical outputs.

Table 2. Reserch results regarding Vitamin C of the fruits

No.	Sample	Fresh (mg%)	Refrigerated (mg%)	Diferences (%)
1	Sample 1	239,00	212,35	11,15
2	Sample 2	236,50	210,60	10,95
3	Sample 3	241,30	214,20	11,23
	Average	238,93	212,38	11,11

The highest Vitamin C content was recorded in fresh *Hippophae rhamnoides* fruits. The Vitamin C content after cooling is lower in fruits, especialy because low quantity of cellular juice drained during cooling.

Table 3. Research results regarding Total amount of Poliphenolic content of the fruits

No.	Specie	Fresh (mg GAE/100g)	Refrigerated (mg GAE/100g)	Diferences (%)
1	Sample 1	488,00	366,50	24,90
2	Sample 2	488,11	365,90	25,04
3	Sample 3	488,02	365,01	25,20
	Average	488,04	365,80	25,05

Comparing with vitamin C the ratio of decreasing of Total amount of poliphenolic compound is much higher in fruits. The highest Total amount of poliphenolic compound content was recorded in fresh fruits. There is also evident the decreasing of the level coresponding of cooling and storage process.

Table 4. Research results regarding pH of the fruits

No.	Sample	Fresh	Refrigerated	Diferences %
1	Sample 1	3,00	3,15	-5,00
2	Sample 2	2,96	3,08	-4,05
3	Sample 3	3,02	3,20	-5,96
	Average	2,99	3,14	-5,01

The pH evolution shown that during cooling and storage there were no significant alteration process for all samples. That allow us to suggest that high bioactive compounds level provide protection for fruits in the presence of sugar. The values recorded were according to our data relativ stabile. Thia allow us to enphasis that storage of *Hippophae rhamnoides* fruits for short time can be conducted in refrigerated spaces without alterations.

Table 5. Research results regarding Flavonoids content of the fruits

No.	Sample	Fresh, mg CAT%	Refrigerated, mg CAT%	Diferences, %
1	Sample 1	81,22	78,83	2,94
2	Sample 2	81,19	78,81	2,93
3	Sample 3	81,21	78,84	2,92
	Average	81,21	78,83	2,93

The flavonoid content in fruits of *Hippophae rhamnoides* was recorded a descendent trend. In this way it was noticeable that the decreasing was not significant, the amounts were under 3%. Product was safe stored in cooled spaces from this point of view.

Table 6. Research results regarding Licopen content of the fruits

No.	Sample	Fresh, mg %		Refrigerated, mg %		Diferences, %	
		472 nm	502 nm	472 nm	502 nm	472 nm	502 nm
1	Sample 1	7,551	1,517	7,938	1,707	-5,13	-12,52
2	Sample 2	7,552	1,519	7,942	1,709	-5,16	-12,50
3	Sample 3	7,554	1,520	7,944	1,711	-5,16	-12,57
	Average	7,552	1,517	7,941	1,709	-5,15	-12,53

The Lycopen content amounts were increasing because of the evaporation process from the fruits. This shown the importance of storage after harvestig for maturation process.

CONCLUSIONS

The specie that shown the biggest level of bioactive compounds according with our data was in fresh *Hippophae rhamnoides* fruits.

The results shown that the fruits taken in to study can be cooled and stored at low temperature without alteration for seven days.

Dry matter percentage decrease significant in refrigerated fruits due to methabolism.

The bioactive compounds level it was quite stabile excepting Vitamin C and Total phenolic content level that decrease severe in *Hippophae rhamnoides* refrigerated fruits.

In this way we suggest collecting, cooling and storing *Hippophae rhamnoides* fruits according with the purphose of using them after in order to have the smallest losses from quantitative and qualitative point of view. In this way for consuming as fruits we recomand fresh fruits an for processing we recomand refrigerated fruits. The next step is the comparative assesing of the storage also in freezers.

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