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THE DETERMINATION OF GUANTITATIVE CONTENT OF ASCORBIC ACID IN SUBLIMATED POWDER OF WATER – MELON, ARONIA, ARTICHOKE

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SUMMARY. The article presents the results of the quantitative content of ascorbic acid in sublimated powder of plants in comparing with dry or fresh plants. It was proved that dry sublimation helps to save substance, which can easy oxidizes – vitamin C.

KEY WORDS: ascorbic acid, sublimated powder of water – melon, aronia, artichoke.

INTRODUCTION: Vitamin C (ascorbic acid) is an important bioactive substance, a water-soluble vitamin that provides normal cellular respiration and density of the walls of blood vessels, promotes healing, increases the body's resistance against different diseases. This vitamin regulates the oxidation-reduction processes, carbohydrate metabolism, blood clotting, participates in the restoring of tissues and converting cholesterol into steroid hormones and procollagen to collagen, which is the main component of the extracellular connective tissue. Ascorbic acid is synergist of the hormone cortisol, gonadotrophins, thiamine, flavonoids and thyroxine antagonist [1,7].

Ascorbic acid improves the growth and healthy development of cells, promotes the absorption of calcium by the body. The body usually spends a lot of it in combating disease or infections, as well as wound healing. Vitamin C is one of the many well-known antioxidants and it helps the body to cope with volatile chemicals - free radicals. The human body does not produce vitamin C and does

not accumulate it, so it is important to include the correct amount of vitamin C in your daily diet [1,7].

A considerable amount of ascorbic acid are found in fresh plants. During the heat treatment of a raw vegetable material or under the normal drying under the influence of the environmental factors, a quantitative content of this thermally labile compound, which can be easily oxidized, has reduced. Therefore, under the production of the fitosubstantsiy there is importantance to use modern methods of drying, particularly a sublimation drying. The process of a rapid cell dehydration at a high pressure is practically the only way to preserve all the nutritional benefits of a cell plant material [3-5,8-14].

The aim of our research was to study the influence of a freeze-drying on the quantitative content of the ascorbic acid in various freeze dried powder plants in comparison with a plant material.

MATERIALS AND METHODS:

The objects of the study were the freeze-dried watermelon powders, chokeberry and artichoke, which were obtained by the lyophilization method with the addition of cryoprotectants and structurals and fresh (a watermelon) or dried raw materials.

For a chromatographic detection of the ascorbic acid we have used an aqueous extract of plants or a plant freeze dried powder: 0.5 g of a minced raw or sublimated powder was placed in a flask, filled up 5 ml of some distilled water at a room temperature and then stirred for 15 minutes and after that it was filtered. With the help of the capillary the filtrate was applied to the plate "Sylufol" and side by side there was a witness (ascorbic acid). The plate was placed in a chamber with a solvent system: the ethyl acetate- ice acetic acid (8:2). After the chromatography the plate was dried in the air in a fume hood. Chromatogram was sprayed with 0.04% sodium 2,6-de chlorinephenolindophenolate in the water [2,7].

In aqueous extracts we have confirmed the presence of the ascorbic acid with the help of the following reactions: to 1 ml of an aqueous solution, prepared as mentioned above, we have added 2 ml of potassium ferrocyanides P and 2 ml of

5% solution of iron (III) chloride to form a blue color, to 1 ml of a water solution we have added 0.2 ml of dilute nitric acid P and 0.2 ml of nitrate arhentumu P2 where there should be a gray precipitate.

The quantitative determination of the ascorbic acid. The quantitative determination of the ascorbic acid in the samples has been carried out according to methods [2,6,7].

2.0 g of the raw material or 0.4 g of the sublimated powder have been placed in a porcelain mortar, where it was thoroughly rubbed, slowly added 30 ml of water and insisted for 10 minutes. The mixture was stirred and the extract was filtered through the filter paper. 0.1 ml of the filtrate was taken and placed in a conical flask 50 ml, then added 1 ml of 2% solution of hydrochloric acid, 13 ml of water, stirred and titrated with a micro dropping glass by the freshly prepared solution of 2,6- dechlorinephenolindophenolate sodium (0.001 mol / L) until the pink color was appeared that remained for 30-60 seconds. Titration was continued not more than 2 minutes.

The content of the ascorbic acid in the terms of an absolutely dry matter in the percentage (%) was determined by the formula:

$$X=\frac{V \cdot 0{,}000088 \cdot 30 \cdot 100 \cdot 100}{m \cdot 1 \cdot (100-h)},$$

where 0,000088 – the amount of the ascorbic acid, which corresponded to 1 ml of 2.6 dechlorinephenolindophenolate sodium solution (0.001 mol / l), g;

V - volume of a solution of 2,6- dechlorinephenolindophenolate sodium solution (0.001 mol / l) which was taken for the titration, ml;

m - mass of the material, g;

h - the loss in weight while drying the substances%.

RESULTS AND DISCUSSION:

To determine the presence of the ascorbic acid there was conducted its preliminary qualitative identification of a plant material and in a freeze dried powder plant with the help of the known qualitative reactions with the appropriate reagents and by the thin-layer chromatography method in a solvent system: ethyl acetate-ice acetic acid (8:2) in comparison with the witness of the working standard models of the ascorbic acid. The results are presented in Table 1 and indicated the presence of the ascorbic acid both in the raw material and in freeze dried powders. It should be noted that the color was different in intensity, with the advantage of the freeze dried powders.

Results of the quantitative determination of the ascorbic acid have been summarized in Table 1 and presented separately for each plant and sublimated powder on its basis in Tables 2-4. The results are summarized in several data series obtained the lyophilized powders and raw materials from different years of collection.

Table 1

The results of the qualitative and quantitative determination of the ascorbic acid in various freeze dried powder plants in comparison with plant raw material

The objects of the research	Qualitative reactions		TLC(solvent system: ethyl acetate-glacial acetic acid (80:20))Developer: 0.001 N solution of 2,6-dechlorinephenolindophenolate sodium.	Quantitative content, %
	A solution of potassium ferrocyanides P	A solution of silver nitrate P2 in an acidic medium		
The fresh juice of a watermelon	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	0.43±0.01
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot	0.42±0.01

			on a blue background	
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	0.46±0.02
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	1.41 ± 0.01
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	0.10 ± 0.01
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	0.39 ± 0.01
Freeze dried watermelon powder	blue color	Drops gray precipitate	Corresponds to the witness ascorbic acid. A white spot on a blue background	0.92 ± 0.01

Table 2

The metrological characteristics of the average result of the quantitative determination of the content of ascorbic acid in powders chokeberry Aronia (In %, in terms of an absolutely dry matter, n = 5):

A. native materials

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P,n)	The confidence interval	ε, %
0.45	0.46	0.000344000	0.008294577	0.95	2.78	0.46 ± 0.02	4.96
0.45							
0.46							
0.46							
0.50							

B. A freeze-dried powder

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P,n)	The confidence interval	ε, %

1.40	1.41	0.000096000	0.00438	0.95	2.78	1.41 ± 0.01	0.86
1.42							
1.42							
1.40							
1.40							

Table 3

Metrological characteristics of the average result of the quantitative determination of the content of the ascorbic acid in powders Artichoke

(In %, in terms of absolutely dry matter, n = 5):

A. The native materials (leaves)

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P,n)	The confidence interval	ε, %
0.10	0.10	0.000104000	0.004560702	0.95	2.78	0.10 ± 0.01	12.19
0.09							
0.12							
0.11							
0.10							

B. The native materials (baskets)

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P,n)	The confidence interval	ε, %
0.40	0.39	0.000136000	0.005215362	0.95	2.78	0.39 ± 0.01	3.69
0.38							
0.41							
0.39							
0.38							

C. The freeze-dried powder

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P, n)	The confidence interval	ε, %
0.91	0.92	0.000024000	0.00219089	0.95	2.78	0.92± 0.01	0.67
0.92							
0.91							
0.92							
0.92							

Table 4

Metrological characteristics of the average result determination of the quantitative content of the ascorbic acid in watermelon

(In %, in terms of absolutely dry matter, n = 5):

A. Fresh Juice

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P, n)	The confidence interval	ε, %
3	4	5	6	7	8	9	10
0.44	0.43	0.000052160	0.003229861	0.95	2.78	0.43± 0.01	2.08
0.43							
0.43							
0.44							
0.42							

B. The freeze-dried powder of a watermelon

X_i	$X_{average}$	S^2	$S_{average}$	P	t(P, n)	The confidence interval	ε, %
3	4	5	6	7	8	9	10
0.43	0.42	0.000116160	0.004819959	0.95	2.78	0.42 ± 0.01	3.19
0.42							
0.43							
0.42							
0.40							

The analysis of data has shown that in the sublimated powder of a watermelon the content of the ascorbic acid is at the level of a fresh juice, with a slight advantage of fresh juice. The possible reduction is due to the fact that during the processing of raw materials we have used the construction with a metal coating that has contributed to some oxidation. Subsequently, it has been considered in the design of an optimal technology. However, the process of a rapid dehydration of a fresh watermelon at the high pressure, has contributed to the preservation of vitamin C.

If we compare the ascorbic acid content in a freeze dried powder of chokeberry, artichoke and dry plant material, which was dried under normal conditions, there is a clear trend towards the advantages of the freeze dried powders in twice or three times. Under the normal drying of a plant material, the ascorbic acid has been influenced by oxygen in the air and the light, under the action of them this unstable compound is oxidized.

The highest content of the ascorbic acid is characteristic for a sublimated chokeberry powder (1.40 + 0.01%), which contains almost 3 times more the studying compound than the dried fruit (0.46 + 0.02%).

According to the results of the research, the quantitative content of vitamin C in a fresh artichoke is moderate, but can be unequal in dry leaves and ripe baskets. The freeze drying helps to preserve stable vitamin C in artichoke, which is 2.3 times larger than in fresh baskets and 8.8 times larger than in fresh leaves.

Comparing the obtained results in lyophilized powders of various plants, they can be arranged in the following order: the freeze-dried powder of chokeberry

fruits >* the freeze-dried powder, artichoke > the freeze-dried powder of a watermelon.

(* where > means “more than”)

CONCLUSIONS. Thus, it should be mentioned that the freeze drying allows to obtain a herbal powders with a high level of the ascorbic acid which can be easily destroyed by using other technological methods. The obtained data have been used to develop the projects QCM (the quality control methods).

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