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CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF SAMPLES DRIED BY SUBLIMATION METHOD

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Abstract: In the next stages of the study, in order to determine the effectiveness of the obtained result, the content of heat-sensitive elements - ascorbic acid and total carbohydrates - was checked in the composition of objects dried by the sublimation method without pre-treatment and without pre-treatment in the traditional way, after preliminary treatment with electromagnetic waves in the HF range with a heat flux density of 10,000 W/m 2 .

The study of these heat-sensitive elements helps to determine the extent to which the initial processing process is being carried out correctly or has been correctly selected.

Key words: vitamin, drying, sublimation, food storage, fruit and vegetable storage, taste, color, quality, technology, protein, moisture, carbohydrate, ascorbic acid.

the samples (beets and onions, for example) dried in the conventional sublimation method without pretreatment and with preliminary treatment in electromagnetic waves in the HF range with a heat flux density of 10,000 W/m 2 are presented in Table 1.

The ascorbic acid content in samples dried with preliminary treatment in the microwave range does not differ significantly from samples obtained using the traditional (without preliminary treatment) method.

The amount of carbohydrates in the selected samples is almost unchanged in the samples dried by pre-treatment in electromagnetic waves in the XX range and without pre-treatment by the traditional method.

It can be seen that pretreatment drying in electromagnetic waves in the XX range does not change the quality of the product, shortens the drying period to 5-6 hours .

Table 1
Sublimation dried samples
chemical analysis

No.	Sublimation dried samples	The amount of ascorbic acid, mg/100 g	Sugar content, g/100g	Total carbohydrate content, g/100g

1	Onions dried by preliminary treatment in electromagnetic waves in the XX range	62	43.8	67.6
2	Dried onions without preliminary processing	68 .2	44.8	68
3	Beetroot dried by preliminary treatment in electromagnetic waves in the XX range	58.7	51.6	78.9
4	Dried beets without preliminary processing	68	54.8	83

Since the sublimation drying technology is carried out under low temperature and deep vacuum, it is also a more expensive (requires a lot of energy) and longer drying period than other drying methods. According to the results of the conducted research, in the sublimation drying technology, preliminary treatment in the ULTRA-EMF range with a heat flux density of 10,000 W/m ^{2} reduces the drying period and ensures that the quality of the dried product samples is maintained in the same way as in the traditional (sublimation drying) method.

It is explained that the initial treatment in the LOW electromagnetic range expands and opens the exit channels for the moisture to evaporate during the drying process [1].

Chemical properties of dried product samples, in particular ascorbic acid, carbohydrate content and residual moisture indicators were determined. It can be seen from the results of the research that in the technology of sublimation drying of fruits and vegetables, UYuCh shows that by using the pretreatment process in the electromagnetic range, the content of ascorbic acid is preserved up to 96% (usually, the amount of ascorbic acid is much lower in samples dried by other methods, for example, up to 10% was observed in onion and 13% in beetroot by convective method).

Analysis of carbohydrates, especially sugars, which make up the bulk of the dry matter of vegetables after the drying process shows that the amount of carbohydrates in the samples selected by both methods is almost the same. This indicates that the use of the initial processing process in the LOW electromagnetic range in the drying technology prevents the carbohydrates, especially sugars, in the product from caramelizing or melonizing and remains native.

As part of the research, heavy metal impurities in dried vegetables were compared with the norms established in the Sanitary Rules, Norms and Hygienic Standards of the Republic of Uzbekistan (SanQvaM dated May 25, 2019 No. 0366-19 “ Hygienic Standards for Food Safety”) (Table 2).

Analysis of the data obtained allows us to conclude that dried vegetables meet the requirements for the content of toxic elements. It was observed that the norms in the vegetable samples taken for the study corresponded to the above norms.

Table 2

Heavy on freeze-dried vegetables amount of metals, mg/kg

Product name	**Margumush (As)**	**Lead (Pb)**	**Cadmium (Cd)**	**Mercury (Hg)**
Norm	Less than 0.2	Less than 0.5	Less than 0.03	Less than 0.02
Onion	0.011	0.021	0.003	0.002
Beetroot	0.007	0.013	0.001	0.001

Table 3 shows the results of the analysis of pesticides and radionuclides in sublimation-dried vegetables.

Table 3

Sublimation dried the amount of pesticides and radionuclides in the samples

Product name	Pesticides, mg/kg		Radionuclides, Bk/kg(l)	
	GXTsG (a, b, g - isomers)	DDT and its metabolites	Cesium-137	Strontium-90
Norm	Less than 0.5	Less than 0.1	Less than 80.0	Less than 40.0
Onion	0.01	0.01	12.3	1.2
Beetroot	0.03	0.02	7.0	0.6

The concentration of pesticides and radionuclides in dried vegetables did not exceed the values specified in the Decree of the Ministry of Agriculture and Rural Development No. 0366-19 of May 25, 2019 “ Hygienic Standards for Food Safety” .

Table 4 shows the results of microbiological analysis of dried vegetables.

In terms of microbiological indicators, all dried vegetables met the standards set by SanQvaM " Hygienic norms of food safety" No. 0366-19 . Pathogenic microorganisms, including salmonella and Escherichia coli bacteria, were not identified. It was found that the drying method does not significantly affect these indicators.

Table 4

Microbiological indicators of sublimation - dried products

Product name	Bacteria of the coliform group (BGKP, coliforms), in 0.01 g	Pathogens, sh.j. salmonella in 25 g
Norm	not allowed	not allowed
Onion	not determined	not determined
Beetroot	not determined	not determined

Another main indicator of dried products is the residual moisture, which determines the standard shelf life of the product.

Conclusion

The use of freeze- drying with preliminary processing in the electromagnetic range allows reducing the drying time by 5 hours for beets and 6 hours for onions, thereby reducing energy consumption by 22-25% for beet drying and 20-22 % for onions .

UYuCh reduces the risk of caramelization of carbohydrates in the chemical composition of samples during the sublimation drying process by pre-treatment in the electromagnetic range , and ensures high product quality.

of the research objects (beetroot and onion) in the process of sublimation drying with preliminary treatment in the OUCH electromagnetic range are close to each other, the electricity consumption is also close, that is, beetroot is dried for 16 hours, onions for 15 hours. At the same time, the period of sublimation drying with preliminary treatment of the products in the OUCH electromagnetic range is significantly reduced compared to the traditional method.

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