Preparing onion (*Allium*) for drying and determination of drying time

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Abstract. In this article, the reasons for the increasing demand of the population for dried onion vegetable products, the use of dried onion products in the food industry, its external appearance, i.e., the structure of the skin layer, the average caliber of the onion raw material being dried, the portion of the cleaned onion that can be used as raw material for drying, the amount of waste in relation to the total weight of the onion head, the chemical composition of onion raw materials, the methods of determining the amount of dry matter, the degree of acidity and the amount of nitrates, the effect of its cut size on the drying process, the temperature of the heat agent during the drying process, the initial moisture content of the yellow product amount, methods of determining critical moisture and the dependence of drying duration on organic indicators are presented.

1 Introduction

It is known that in recent years, with the increase in the number of the world's population, not only the quality indicators of food products, but also the assortment of processed products made from them are increasing day by day [17, 18].

According to statistics provided by the World Food Security Organization (FAO), about 1 billion people around the world do not have the opportunity to eat enough food. Therefore, the task of increasing the amount of food products, including fruit and vegetable products, and delivering them to consumers without killing them remains an urgent issue [13].

Therefore, in recent years, special attention has been paid to providing the population of our Republic with quality food products, as well as to radically increase the export potential. For the development of these activities, in the "Development Strategy of New Uzbekistan for 2022-2026" of the Republic of Uzbekistan, "Through the intensive development of agriculture on a scientific basis, the income of farmers and farmers should be increased by at least 2 times, the annual growth of agriculture should be at least 5%, especially by 2026, food "The program to increase the volume of food products to 7.4 million tons and the processing level of fruits and vegetables to 28%" was adopted. It is an urgent task to ensure the implementation of the tasks set by our government, to carry out scientific and research work on the delivery of the gross harvest from the onion (Allium) vegetable, which is loved by the population, including fruit and vegetable growing to the

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population. According to literature, the homeland of onion is Central Asia, Afghanistan. More than four hundred varieties of onion are known in nature, and more than two hundred of them belong to the CIS countries [9, 10, 15, 16].

According to experts, onion vegetable is in higher demand than other vegetable crops due to its use by the population. In other words, onion is a type of vegetable consumed by almost all people of the world. Therefore, the cultivation areas of this vegetable are also large. In recent years, with the development of new selections of onions, their gross yield is increasing. However, at the same time, the amount of waste generated as a result of not using them wisely is also increasing [6, 7].

According to the research conducted by the scientists of the Russian Federation, every year in the Astrakhan region alone, at least 100,000 tons of fresh onion products are discarded as unfit for sale for various reasons [3].

In our republic, onion vegetables are mainly grown in open fields and in warm rooms. It should be noted that onions grown in hot rooms are mostly picked in the green (bud) state, which allows the population to satisfy their need for greens throughout the year. The part grown in open fields is not only freshly cut, but also delivered to the population through storage and deep processing. According to the given data, the total amount of onion vegetables grown in our Republic by 2023 is more than 2.4 million tons [2].

As we mentioned above, the total volume of onions grown in our republic is exported to the domestic or foreign market, freshly cut or preserved. In addition, according to statistical data, when delivering onion products fresh or stored for certain periods to customers, consumers or the countries to which the products are exported pay great attention to their appearance, dimensions, and levels of mechanical damage. For this reason, usually more than 20-25% of the total volume of onions grown by consumers is discarded as waste [1].

Therefore, due to the relevance of onion drying processes in our Republic, its high export potential, and insufficient scientific research in this direction, we believe that scientific research related to the improvement of onion drying is an urgent issue [8].

The main goal of the research offered by us is aimed at improving the technology of drying onion vegetables by studying the initial quality indicators, chemical composition and organoleptic properties [4, 5, 11].

Dried onions are a great natural spice that adds more flavor and flavor to a variety of foods. This is an additional semi-finished product obtained from yellow onion by drying, while its composition varies in size, it retains useful and taste properties in its composition.

Dried onions can be squared (cubes) and granular, that is, cut into certain sizes, depending on the drying process. At the same time, the use of dried onion products in the food industry is very high, as can be seen from the following information: in the production of food concentrates; in the production of sausage products; in the production of bakery products; in the production of canned vegetables and meat processing; in catering establishments, etc.; in the production of semi-finished products; it can be used in the production of various spices and other products [12].

It is known that the primary and post-drying quality indicators of the raw materials used for drying are the main factors that determine the quality indicators of any dried products, including onion vegetables [14].

2 Materials and Methods.

The amount of dissolved dry matter in the onion vegetable is determined by the "Refractometric" method according to ISO 2113-2013 adopted by the "International Metrology and Certification" Council, the amount of active acid according to GOST 26188-2016, the determination of the amount of nitrate according to GOST 34570-2019, physical, chemical and organoleptic quality indicators were conducted using the methods of E.P.

Shirokov. At the same time, the moisture content of drying and dried onion products was determined according to GOST 12325-98, determination of the moisture content of dried onions for export.

Studies related to the drying of onion vegetables were conducted in the scientific laboratory of the Department of "Preservation and Processing of Agricultural Products" at the Tashkent State Agrarian University.

The late variety of onion vegetable was selected as the research object. The research object was subjected to the storage process for a certain period, and at the initial stage, the quality parameters of the onion before drying were studied. In laboratory conditions, the quality indicators of spring onions before drying were determined and studied.

In the course of research, the following indicators of onion vegetables were studied: the average caliber of onion vegetables being dried, the total mass of onions taken for drying, the mass after cleaning, the amount of waste produced during the cleaning process, the amount of dissolved dry matter in the content, the pH of onion juice, the amount of nitrates, the peel of onion vegetables the state of the layers and initial moisture levels were determined.

3 Results and Discussion

The results obtained based on the experiments are presented in Table 1 below.

Table 1. Physico-chemical parameters of onion raw materials for drying process

№	The overall caliber of the onion is mm	Total massкг	Mass of peeled onion kg	Amount of output kg	Dry matter content %	pH-quantity	Amount of total nitrates mg/kg	The number of peel layers of the onion	Initial humidity %
1	60-65	10	8,560	2140	8,5±03	6,4 ±03	30 below	5	92,87

As can be seen from the above table, the physical size of the raw material plays an important role in the drying process, the average size of the onion taken as the subject of our experiment was 60-65 mm. After refining 8,560 kg, the output was found to be 2,140 kg. In addition, it was found that the amount of dissolved dry matter in the juice of onion vegetable is 8.5±03%, the level of acidity is 6.4±03, i.e. it is almost neutral, and the amount of nitrates in it is below 30 mg/kg, i.e. it is not higher than the specified limit. In addition, in order to determine the part of the onion vegetable suitable for processing, when its skin layer was studied, it was found that the first 3 layers of the total 5 layers are made of special hard and the next two layers are made of relatively elastic layers.

Another key factor in onion drying is the amount of initial moisture in its content, and the results of the experiments showed that the initial moisture content of the part of the onion suitable for drying is 92.87%, using special equipment.

At the next stage of our research, it was determined that the onion vegetable drying process depends on its size and drying time. The experiments were carried out in a small-scale special laboratory drying equipment. The results of the conducted experiments are presented in Table 2.

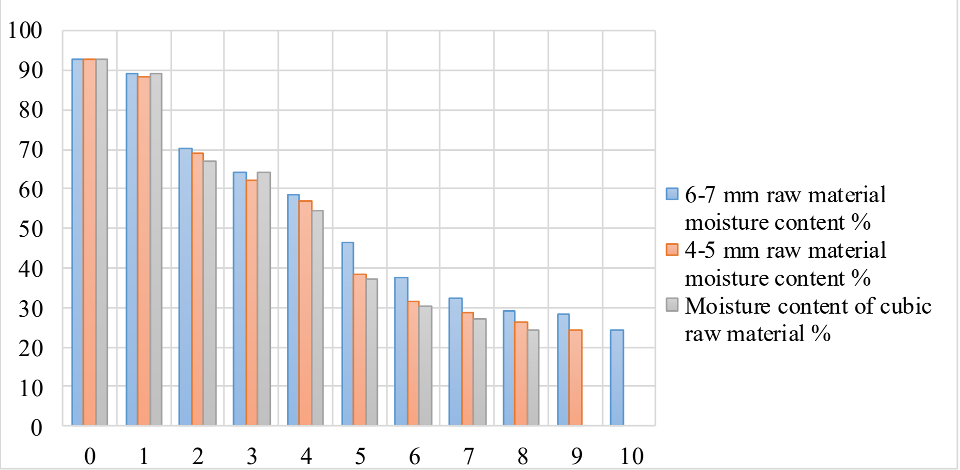
During the drying process, the initially peeled onion vegetable was cut into the following three sizes, namely, 6-7 mm, 4-5 mm, and cube shapes. The cut onion raw materials were placed on the special shelves of the drying equipment and placed in the drying process. During the drying process, the temperature of the heat agent was set at 60°C. This temperature was determined based on the information provided in the literature. The average amount of raw materials placed on shelves is 1 ± 01 kg.

Table 2. Results of determination of onion vegetable drying process depending on its size and drying time

Drying time, hours	6-7 mm raw material moisture content %	4-5 mm raw material moisture content %	Moisture content of cubic raw material %
0	92,87	92,87	92,87
1	89,31	88,42	89,1
2	70,12	69,22	67,2
3	64,24	62,24	64,3
4	58,72	56,82	54,5
5	46,52	38,52	37,3
6	37,41	31,41	30,2
7	32,26	28,6	27,1
8	29,1	26,2	24,2
9	28,2	24,1	
10	24,3		

The results of the conducted research showed that according to the organoleptic characteristics of the dried products, i.e. depending on the changes in its appearance, including color and taste, the critical moisture content of our research object was determined as 24%, and the state of onion vegetables being dried, according to their cut sizes, was carried out for a total of 10 hours. That is, it was found that the extension of the drying period of the product leads to the deterioration of the quality of the product.

Figure 3. Diagrammatic representation of onion vegetable drying process



The diagram presented above shows that the duration of drying of onions during the drying process depends on the moisture content of onions, the duration of the drying process, the temperature of the heat carrier (heated air) and the cut sizes of the raw materials. According to the results of the experiments, it was found that the moisture content of dried onion is 24 ± 03%, which is the optimal moisture content according to organoleptic indicators. The results of the experiments showed that when the drying temperature is constant at 60 °C, the sample cut into cubes in 8 hours, the 4-5 mm sample in 9 hours, and the 6-7 mm sample in 10 hours will have the specified moisture content.

was determined. According to this, it was determined that 9-12% of the dried onion samples after drying from 1 kg of the sample taken as the total amount of the sample.

4 Conclusion

In short, the average caliber of the onion being dried is 60-65 mm, the onion vegetable taken as raw material for drying is cleaned and dried, that is, on average, 85% is suitable for drying, and the remaining 15% is waste, the amount of dry matter in it is 8.5±03% It was found that the acidity is 6.4 ±03, i.e. almost at a neutral level, and according to its physical and chemical parameters mentioned above, the drying of onion slices cut in 3 different ways is determined according to the temperature of the drying agent, the drying time, the initial moisture of the raw material and the organoleptic indicators. it was determined that it depends on the amount of moisture.

If we can conclude from the results of the experiments, from the raw materials cut into various sizes at a constant temperature of 60 °C, 15% of the sample cut into cubes in 8 hours, 12% of the sample of 4-5 mm in 9 hours, and 9% of the sample of 6-7 mm in 10 hours.

Reference

1. Abduvasikov, A., Khurramova, M., Akmal, H., Nodira, P., Kenjabaev, J., Anarkulov, D., Kosimova, S., Xurshida, K., Dildora, M., Sapaev, B., Sullieva, S., & Kurbonalijon, Z. The concept of production resources in agricultural sector and their classification in the case of Uzbekistan. *Caspian Journal of Environmental Sciences*, ***22*****(2),** 477-488 (2024). Doi: 10.22124/cjes.2024.7740
2. Azimov, J., & Azimov, B. Methodology of conducting experiments in vegetable growing, rice growing and potato growing. - *Mekhnat*, 160-164 (2002).
3. Azizov, A., & Toshmatov, B. "Methods for comparing and improving the quality of local storage of grapes in Uzbekistan". *IOP Conference Series: Earth and Environmental Science*. **1068**, 012013 (2022).
4. Basov, P., & Khamdamov, G. New elements of onion and carrot cultivation technology. *Scientific and Production Association for Horticulture, Viticulture, Vegetable Growing and Potato Growing*. **8**, 33-36 (1990).
5. Bobrov, L. et al. Development of highly efficient technologies for storing potatoes, vegetables and their processing. *Thematic collection of scientific papers on potato, vegetable and melon growing in Kazakhstan*, 120-142 (1997).
6. Bogolepova, I., Bogolepov, G. Vegetable growing. Modern highly productive techniques and methods for growing garden crops. *Sovetskaya Kuban*, 128-147 (2000).
7. Buriev, K., & Zokirov, K. Seasonal and daily blooming rhythm of cucumber (Cucumis sativus) belonging to Cucurbitaceae family. *E3S Web of Conferences,* Vol. **452**, 01015 (2023). https://doi.org/10.1051/e3sconf/202345201015
8. Buriev, K., & Zokirov, K. Seasonal and daily blooming rhythm of watermelon (Citrullus lanatus) belonging to Cucurbitaceae family. *E3S Web of Conferences,* Vol. **452**, 01014 (2023). https://doi.org/10.1051/e3sconf/202345201014
9. Buriyev, Kh., Jorayev, J., & Alimov, A. Storage and preliminary processing of fruits and vegetables, *Tashkent* (2002).

10. Khalikov, B., Mukhamatzanova, R., Sullieva, S., Zokirov, K., & Nishonova, A. Effect of planting time and seedling feeding area on leek (Allium porrum) plant biometric parameters. *BIO Web of Conferences*, Vol. **93**, 02020 (2024). https://doi.org/10.1051/bioconf/20249302020
11. Khalikov, B., Zokirov, K., Sullieva, S., & Nishonova, A. Effect of planting time and seedling feeding area on changes in the number and area of leek leaves. *BIO Web of Conferences*, Vol. **93**, 02021 (2024). https://doi.org/10.1051/bioconf/20249302021
12. Mirsaidov, M., Nimchik, A., Khodjiyev, O., Jesfar, M., Zokirov, K., Shamatov, S., & Kambarov, A. Analysing the chemical standards of the Fergana Mekhmash wastewater treatment plant and environmental processing. *E3S Web of Conferences*, Vol. **498**, 02016 (2024). https://doi.org/10.1051/e3sconf/202449802016
13. Nematov, N. et al. Study of the effect of chitozan and its products based on viral and bacterial diseases in agricultural practise, *E3S Web of Conferences*, **284**, 02007 (2022).
14. Rifky, M., Abdusalomova, D., Dissanayake, K., Zokirov, K., Harris, J. M., Jesfar, M., & Samadiy, M. Seaweed as a functional ingredient and emulsifier in dairy processing. *BIO Web of Conferences,* Vol. **108**, 18001 (2024). https://doi.org/10.1051/bioconf/202410818001
15. Shaumarov, Kh., & Islamov, S. "Technology of storage and primary processing of agricultural products". *Tashkent* (2011).
16. Sullieva, S., Zokirov, K., Khalikov, B., Nishonova, A., & Negmatova, S. Varieties and hybrids of leek (Allium porrum) in the conditions of Uzbekistan. *BIO Web of Conferences*, Vol. **93**, 02019 (2024). https://doi.org/10.1051/bioconf/20249302019
17. Sullieva, S., Zokirov, K., Nishonov, N., Atamuratova, N., & Abdullayev, B. Effect of planting time and seedling feeding area on the yield and biochemical composition of leek (Allium porrum L.). *BIO Web of Conferences*, Vol. **93**, 02006 (2024). https://doi.org/10.1051/bioconf/20249302006
18. Zokirov, K., & Sullieva, S. Effect of storage conditions and periods on the quality of watermelon (Citrullus lanatus). *E3S Web of Conferences*, Vol. **452**, 01016 (2023). https://doi.org/10.1051/e3sconf/202345201016