

# Use of drying methods in productive use of tomato fruit harvest

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**Abstract.** In the agro industrial complex of our country, there are enough favorable conditions for the storage of vegetables, as well as their processing, and for the production of valuable environmentally friendly products from them. This allows increasing economic efficiency by significantly reducing excessive wastage of vegetables during the season. In this article, the selection of drying varieties from tomato varieties grown in our country. Yusuf F<sub>1</sub>, Uzbekistan, Burxon F<sub>1</sub>, TMK-22, Madera, Lodjeyn F<sub>1</sub>, Novichok tomato varieties included in the list of the state register of agricultural crops recommended for planting in the territory of the Republic of Uzbekistan were used during the research. According to the results of the study, the best result in terms of dried product yield was observed in Lodjeyn F<sub>1</sub> and Yusuf F<sub>1</sub> varieties.

## 1 Introduction

One of the main tasks of agriculture today is to meet the needs of the population for vegetables and fruit products, taking into account the growth, and to supply the processing industry with raw materials. Therefore, an important task of specialists in this field is to fully satisfy the needs of the population for agricultural products not only during the season, but throughout the year. The comprehensive establishment of a scientifically based organization of storage and processing of agricultural products is an important factor in solving the issue of continuous supply of fresh food products to the population throughout the year [1-5].

In the agro-industrial complex of our country, there are enough favorable conditions for storing vegetables, as well as organizing their processing and obtaining valuable environmentally friendly products from them. This makes it possible to increase economic efficiency by significantly reducing excessive wastage of vegetables during the season [7-9].

Currently, many new varieties of vegetable crops have been created, including many varieties and hybrids of tomatoes, which have their own biological properties. At the same time, each of them requires a special cultivation technology. This is also important in the processing of vegetables [6].

The optimal mode of storage and processing of fruits and vegetables is a pledge to improve product quality, reduce losses and waste, and reduce costs.

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It is known that he was able to buy all the products in the shopping centers. As a result, some products are left behind. The main solution for this is processing, which will be able to return to trade as a new product and get additional income. Therefore, the main goal and task of our research work is to obtain ecologically clean products that meet the requirements of the standard by using unsold fruits and vegetables or the time of abundance at the time of ripening in order to prevent such waste. Such products can be dried or canned depending on the processing method [20].

One of the methods of processing fruits and vegetables is sun-air drying, that is, drying in the sun according to our literature. Drying in the sun provides an environmentally friendly product. Because in this drying process, sun, wind and relative humidity are used, making maximum use of nature. Sun-dried ready-made products are used in food preparation without much effort and time [19].

During drying, most of the water in the product evaporates, and as a result, it loses 7-10 times its new weight. In the sources, a number of authors determined that during drying, free water, which is 70% of the moisture content of the product, evaporates first, and then the water evaporates in the micro capillaries [8, 11, 12]. Many researchers have stated that excess moisture should be removed in order to maximize the nutritional and flavor properties of the dried product [9-10]. As a result of our research, it was concluded that in the drying process, uniform distribution of external and internal moisture, that is, proportionality, is of great importance. If during the drying process the external evaporation is much faster than the internal evaporation, a crust will form on the surface of the product. This, in addition to deteriorating the quality of the product, will reduce the subsequent evaporation of moisture and cause cracks to form on the surface of the product.

Air temperature, relative humidity, wind speed, shape and size of the product being dried have a great influence on the process of drying in the sun. According to several studies, how quickly water evaporates from the surface of the product depends on the size of its surface [13, 14, 16].

Drying in the sun is mainly carried out in hot and dry regions with low relative humidity. The climatic conditions of our republic allow growing a large amount of various vegetable crops. As we all know, a healthy diet cannot be imagined without vegetables. Vegetables not only give people life force, but are also a therapeutic tool.

Based on the above, it is necessary to use methods other than storing tomatoes in order to eat them throughout the year. Tomatoes are mainly salted and canned. In addition, they are used to prepare various sauces [18].

Today, one of the most promising ways to store tomatoes is to dry them. This method is rarely used in Uzbekistan. Drying of tomatoes is common in the world. Dried tomatoes are used to make powders that are added to food or spices. Tomatoes are mainly dried whole, divided into equal halves or cut into various pieces. Tomatoes are mostly dried in the sun in our conditions. In countries with few sunny days, they are often dried in electric dryers. Dried tomatoes are stored in packaging [15, 17].

## **2 Materials and Methods.**

The research is planned to be carried out at the experimental station of Tashkent State Agrarian University, located in the Tashkent region, and will be conducted on the basis of methodological manuals such as "Technology of storage and processing of crop products With the basics of standardization", "Scientific experiment and processing of experimental data", "Fundamentals of scientific research". The statistical analysis of the data is carried out using the Microsoft Excel program according to the method of B.A.Dospehov "Methodology of field experience".

Our experiments on drying tomato slices in solar panel drying equipment were conducted in the laboratory of the experimental farm of Tashkent State Agrarian University and the Department of Storage and Processing of Agricultural Products. Two experiments were conducted on the equipment for drying tomatoes with solar panels. In the first experimental version, the tomato fruit was cut into slices and dried. Experiments in solar panel drying equipment were conducted in 4 replications and 4 options.

### 3 Results and Discussion

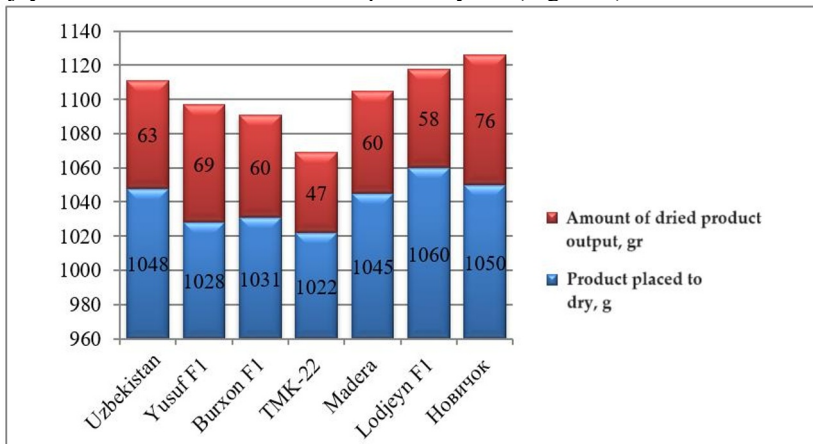
During the analysis of the results of research in the solar panel dryer, a slightly higher productivity compared to the control variety was observed in the hybrid Yusuf F<sub>1</sub> - 50.0 t/ha, and the output of the dried product was also slightly higher, i.e. 111.0%. The yield of the remaining four varieties was slightly lower than that of our control variety Uzbekistan.

**Table 1.** Yield of different varieties of tomatoes and the amount of dried product output, (2022-2023).

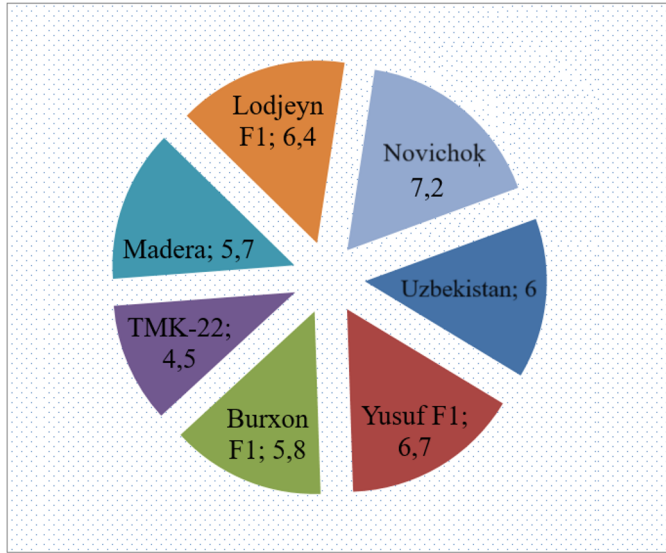
№	Varieties name	The year of the experiment				Product output, %	± the amount of output relative to the control
		2022-2023					
		Dry matter before drying, %	Average yield, t/ha	Product left to dry, gr	Amount of dried product output, gr		
Slice drying in a solar panel dryer							
1	Uzbekistan (control)	5,8	48,0	1048	63	6,0	-
2	Yusuf F <sub>1</sub>	5,1	50,0	1028	69	6,7	111,0
3	Burxon F <sub>1</sub>	4,3	38,0	1031	60	5,8	96,6
4	TMK-22	3,9	42,0	1022	47	4,5	75,0
5	Madera	4,8	35,0	1045	60	5,7	95,0
6	Lodjeyn F <sub>1</sub>	5,5	39,0	1060	58	6,4	90,0
7	Novichok	6,0	38,0	1050	76	7,2	120,0

*Note:* The average time it took to dry a tomato cut into quarters was 5 days, i.e. 120 hours.

Compared to the control variety, Burxon F<sub>1</sub> - 96.6%, TMK-22 - 75%, Madera - 95.0%, and Lodjeyn F<sub>1</sub> - 90.0% in terms of dried product yield (Figure 1).



**Figure 1.** Product yield in slice drying in a solar panel dryer.



**Figure 2.** The amount of product output during slice drying in a solar panel dryer, %

The results of the experiment on the drying of tomato fruits in the solar panel drying equipment were almost no different from our previous experiments, i.e. dried in the form of slices. In this experiment, only the drying time accounted for slightly less time. Our experiments on drying tomatoes cut into thin slices lasted 3 days, i.e. 72 hours, at an average temperature of 40-50 °C in solar panel drying equipment.

**Table 2.** Sliced and dried tomatoes in solar panel drying equipment, 2020-2023

№	Varieties name	Product placed to dry, g	Amount of dried product output, gr	Product output, %	Drying time, hours
1	Uzbekistan (control)	1090	60	5,5	72
2	Yusuf F <sub>1</sub>	1050	62	5,9	72
3	Burxon F <sub>1</sub>	1025	58	5,6	72
4	TMK-22	1042	50	4,7	72
5	Madera	1060	55	5,1	72
6	Lodjeyn F <sub>1</sub>	1042	62	5,9	72
7	Novichok	1035	78	7,5	72

In our research carried out in the solar panel drying equipment, when the tomato fruit is dried, the product yield of our tomato varieties and hybrids is higher than the control variety, i.e. Yusuf F<sub>1</sub> - 5.9 %, Lodjeyn F<sub>1</sub> - 5.9 %, Novichok - 7.5 %. The rest of our varieties and hybrids participating in this study had slightly lower results compared to the Uzbekistan control variety: Madera - 5.1 %, Burxon F<sub>1</sub> - 5.6 %. The lowest dried product yield was TMK-22 - 4.7%.

## 4 Conclusion

Today, it is important to use fruits and vegetables rich in natural vitamins, micro- and macroelements, including tomatoes, with maximum preservation of natural components, to ensure the competitiveness of the finished product, and to reduce its cost.

Artificial drying technologies can take a worthy place in small farmers and family farms, as well as in large tomato processing enterprises. Artificially dried or sun-dried

tomatoes in the open air are suitable products for the food industry and for public consumption. According to the results of the tomato drying experiment, the following were recommended for production.

Thus, the cultivation and processing of tomatoes not only satisfies the population's need for tomato products, but also creates an opportunity to use its processed waste as valuable feed in medicine and animal husbandry.

It is necessary to establish vegetable processing enterprises in farms, instead of growing only raw materials;

Today, the range of products made from tomatoes is increasing day by day, therefore it is necessary to introduce modern foreign technologies for the preparation of such products and export them to foreign countries as a result of increasing the amount of tomato processing.

When drying tomatoes, farms and entrepreneurs are recommended to use Novichok and Lodjeyn F<sub>1</sub> varieties and hybrids in solar panel drying equipment.

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