STUDY OF PROCESSES OF FRUIT AND VEGETABLE DRYING IN INFRARED LIGHT DRYING DEVICE

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ABSTRACT

In this article, experimentally obtained samples are given, and all samples were dried in an infrared drying oven. The difference between the samples taken in this device and the samples dried in other ways is that the fruits retain microbiological substances, and it is possible to prevent dust and other substances from entering the fruit and changing its properties.

Keywords: *ceramics, quartz tube, heat capacity, heat exchange, convection,*

АННОТАЦИЯ

В данной статье приведены экспериментально полученные образцы, и все образцы были высушены в инфракрасной сушильной печи. Отличие проб, отобранных в этом устройстве, от проб, высушенных другими способами, состоит в том, что плоды сохраняют микробиологические вещества, и можно предотвратить попадание пыли и других веществ в плоды и изменение их свойств.

Ключевые слова: *керамика, кварцевая трубка, теплоемкость, теплообмен, конвекция,*

INTRODUCTION

Nowadays, the introduction of innovative technologies is required due to the increasing demands of the food industry, consumers and the labor market.

In recent years, drying equipment using infrared rays has become widespread. The positive aspects of drying in this way are that the product retains its original natural quality well and the consumption index is high.

The technical and economic characteristics of infrared drying devices of different designs recommended for drying, the biological effect of infrared radiation on fruit and vegetable products and living organisms are analyzed in detail. Scientific articles devoted to drying mainly focus on optimizing the technical characteristics of drying devices and physical processes observed in the construction of products, physical mechanisms of interaction of infrared rays with products, and products focused on the process of interaction of the radiation spectrum have not been studied.

In dryers recommended for drying fruits and vegetables, infrared radiation is obtained by heating ceramic material using electric spirals. To do this, take a glass tube made of quartz, put a spiral in it and apply a specially prepared ceramic material to the surface of the tube. The ceramic material emits infrared radiation when heated by a spiral electric current. The chemical composition of effective ceramic materials used to generate radiation should be selected in such a way that the infrared radiation spectrum of such materials fully corresponds to the region of the absorption spectrum of water molecules.

The internal structure of the infrared drying device based on functional ceramics: length 1 meter, height 1.70 meters, width (width) 0.6 meters, drying temperature 50-65 0C, consumption power 5 kWh.

Figure 1. The process in which the sample is dried in an infrared radiation device based on functional ceramics.

The main task of the device is to reduce the humidity of agricultural products without causing mechanical damage to the appearance of the product, without changing the composition of the product.

In the working area of the device, the height is 1.70 meters, the width is 0.6 meters, and the length is 1 meter. A total of 12 1200 mm thick glass tube radiators are located in the upper and lower parts of the device. In the back of the lamps, a stainless tin is installed in the form of.

The temperature and relative humidity in the working zone of the device are monitored depending on the type of sample in order to prevent damage to the fruits and vegetables in the sample being dried:

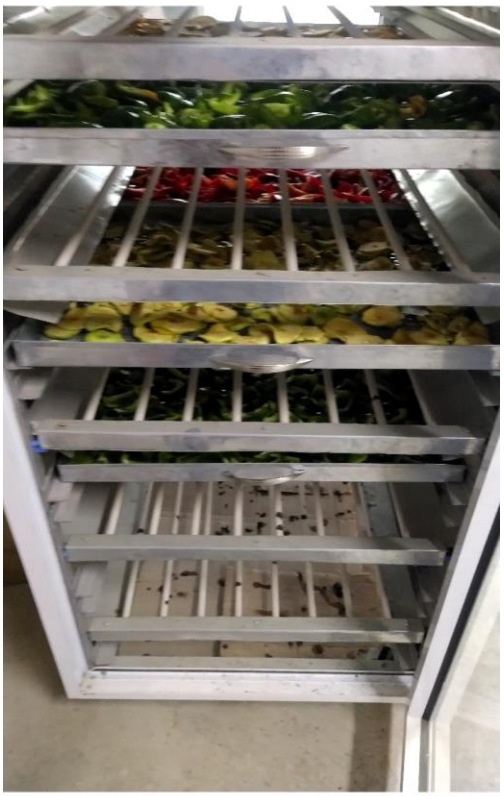

Figure 2. Front view of the infrared radiation device based on functional ceramics.

The temperature in the working zone of the device was between 50 0C and 65 0C, and the relative humidity was 40-45%. In the monitoring, infrared thermometer devices in the form of a gun "Victor 303 B (IR thermometer)" were used with the help of a thermocouple sensor that simultaneously determines the temperature and relative humidity of the air "Operation manual for temp. & humidity meter".

Focusing on the monitoring results, it shows that the temperature of the working zone of the device is around 55 0C, and this temperature does not adversely affect the product quality index or structural changes. In addition, the feature of emitting infrared rays during drying of the product prevents the formation of mold, that is, the sterilization process takes place in a natural state.

At the same time, drying the product using sunlight, light and ultraviolet rays, which have a higher frequency and energy than infrared rays, remove water molecules from the product and also have a positive effect on chain bonding. Decomposition of organic hydrocarbon molecules in which the product is present,

disruption of the structure of the product molecule. This changes the biological composition of the product and, simply put, it loses its natural state.

When the product is dried under the influence of infrared radiation, it interacts only with water molecules and displaces them from the composition of the product. The organic hydrocarbon molecules of the main component are not affected by infrared radiation, so they retain their original molecular structure and the natural biological composition of the product remains unchanged. This is because infrared rays have a lower frequency and energy than light and ultraviolet rays, so they are not enough to break down the constituent molecules.

Information about fruits, vegetables and agricultural products dried in an infrared drying device

No	Name of products	The height of the product in the container (cm)	Build time (hour)	Operating temperature of the device °C	Tension Volt	Weight before drying kg	Weight after drying kg	Lost weight kg
1	Onion	4	12	68.4	210	4.035 gr	345 gr	3690 gr
2	Dill	4	3.5	63	210	-	-	-
3	Kashnich	4	4	63	210	-	-	-
4	Carrot (chopped into straws)	4	7	64.2	220	3705 gr	395 gr	3310 gr
5	Bulgarian pepper (Dutch variety)	4	8	60	211	2205 gr	210 gr	1995 gr
6	Cherry	3.5	36	65	213	3,400 gr	815 gr	2585 gr
7	Apple (2.2 mm thick)	4	10	61	205	3400 gr	520 gr	2880 gr
8	Pear (2.2 mm thick)	3.8	14	58	210	3520 gr	546 gr	2974 gr
9	Banana (2.5 mm thick)	3.6		62	217	6000	820 gr	5180 gr

In conclusion, when drying fruits, vegetables and agricultural products under the influence of infrared rays based on functional ceramics, the temperature is stable, the radiation is uniformly absorbed on the surface of the product, and it dries uniformly and does not suffer mechanical damage. At the same time, the preservation of microbiological useful substances contained in the products dried in the infrared drying device, and their ecological cleanliness, differ sharply from the products dried in a natural way. In addition, the short time of production of the product allows drying of the product quickly and in large quantities.

REFERENCES

1. Abbasi S, Azari S (2009). Novel microwave-freeze drying of onion slice. International. Journal of Food Science and Technology 44(5):947- 979.
2. Verma A, Singh SV. (2015). Spray drying of fruit and vegetable juices-a review. Critical Reviews in Food Science and Nutrition 55(5):701-719.
3. Онарқулов, К. Э. (2022). пахта ҳом-ашёсини қуритишда инфрақизил нурланишнинг қиёсий таҳлили. Инновацион технологиялар, 1(1 (45)), 65-70.
4. Rahmonberdievich, R. G. (2016). Installation of the IR dryer of raw cotton. European science review, (5-6), 185-186.
5. Rakhmatov, G., & Sobirov, M. (2018). The effect of leading molecules IN the spectra of the drying process of fruit vegetable products. Scientific-technical journal, 22(2), 91-94.
6. Рахматов, Г. Р. (2018). некоторые физические методы сушки сельскохозяйственной продукции. in инновационное развитие и потенциал современной науки (pp. 94-98).
7. Рахматов, Г. Р. (2017). Некоторые изменения в сушке волокна (Doctoral dissertation, Белорусско-Российский университет).
8. Rahmonberdievich, R. G. (2016). Physical principles of dry vegetables fruit products under the influence of Infrared. European science review, (9-10), 203-205.
9. Рахматов, Г. Р. (2016). Влияние импульсного ИК-излучения на процесс сушки и качество волокна хлопка-сырца. European research, (10 (21)), 24-25.
10. Рахматов, Ғ. Р. Инфракрасная технология сушки сельскохозяйственной продукции. Ўзбекистон республикаси олий ва ўрта махсус таълим вазирлиги Заҳириддин Муҳаммад Бобур номидаги Андижон давлат университети, 239.
11. Онарқулов, К., & Рахматов, Ғ. Намликни камайтиришда айрим усуллар. Ўзбекистон республикаси олий ва ўрта махсус таълим ВАЗИРЛИГИ термиз давлат университети, 293.

12. Саидов, Р. М., Рахимов, Р. Х., Юсупов, Б. Д. У., & Холдоров, М. К. Б. У. (2020). Эффективность сушки и прокалки сварочных электродов в печах с использованием излучения наноструктурированной функциональной керамики (НФК). *Computational nanotechnology*, (2), 64-70.
13. Холдоров, М. Б. Ў. (2022). Основные физико-химические принципы получения высокочастотной конденсаторной керамики. *Scientific progress*, *3*(1), 412-418.
14. Саидов, Р. М., Рахимов, Р. Х., Юсупов, Б. Д. У., & Холдоров, М. К. Б. У. (2020). Новый метод сушки и прокалки сварочных электродов с использованием излучателей из функциональной керамики1. *Computational Nanotechnology*, (1), 44-51.
15. Egamberdiyevich, O. K., Malikovna, Z. S., Ugli, X. M. B., & Abdusattor-Ugli, E. E. (2021). Used for effect interpretation abnormal photo voltage. *Academicia: an international multidisciplinary research journal*, *11*(2), 783-786.
16. Холдоров, М. Б. Ў. (2022). Основные физико-химические принципы получения высокочастотной конденсаторной керамики. *Scientific progress*, *3*(1), 412-418.
17. www.ziyonet.uz
18. www.researchgate.com