FOOD TECHNOLOGY

METHODS OF OPTIMIZATION OF THE FRUIT DRYING PROCESS

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МЕТОДЫ ОПТИМИЗАЦИИ ПРОЦЕССА СУШКИ ФРУКТОВ

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ABSTRACT

In recent years, to maximize the nutritional value and taste of food, the technology of production of dried fruits in accordance with the requirements of market conditions should provide a certain economic efficiency. When choosing a product for drying, it is necessary to consider not only the large amount of dry matter in it, but also the varieties that are rich in physiologically valuable substances, vitamins and carbohydrates.

АННОТАЦИЯ

В последние годы для максимального повышения пищевой ценности и вкусовых качеств продуктов технология производства сухофруктов в соответствии с требованиями рыночных условий должна обеспечивать определенную экономическую эффективность. При выборе продукта для сушки необходимо учитывать не только большое количество в нем сухих веществ, но и сорта, богатые физиологически ценными веществами, витаминами и углеводами.

Keywords: productivity, cost, optimization, balance, water molecules, heat flux, wavelength, irradiance.

Ключевые слова: производительность, стоимость, оптимизация, баланс, молекулы воды, тепловой поток, длина волны, освещенность.

Research in recent years has focused on improving drying methods to maximize the nutritional value and taste of products, as well as ensuring high process efficiency.

No. PP-3077 of June 21, 2017 of the President of the Republic of Uzbekistan "On measures to further support local exporting organizations and improve foreign economic activity", "On further liberalization of foreign trade and entrepreneurship No. PQ-3351 of November 3, 2017 "On measures to support the subjects of In order to ensure the implementation of the Resolution No. PQ-3377 of November 6, 2017 "On additional measures to support" the technology of production of dried fruits in accordance with the requirements of market conditions should ensure economic efficiency. Research in recent years has focused on maximizing the nutritional value and taste of products, as well as improving drying methods that ensure high process efficiency. Significant intensification of heat and mass transfer is typical of modern drying methods, which can be achieved in a variety of ways: by enlarging the contact surface between the product to be dried and the drying agent; by reducing the relative humidity of the drying agent; by increasing the relative velocity of the affected phases; dewatering and freezing, blasting, dispersing, foaming, etc. using combined power transmission and various technological processes.

The main indicator is the profit from dried fruits.The benefit is determined by the price of dried fruit, the cost of the finished product and productivity.

Equipment efficiency:

$$F = f(N, TN, U_b),\ U \geq U_{belgilangan},$$

$$N = N_{belgilangan}$$

Here, U is productivity, N is price.

The main indicator is cost (TNb):

$$TNb \rightarrow \min$$

To dry the fruit, the main focus should be on the cost components (costs of the technological system).

Costs (X) are energy costs (Xe), depreciation costs (Xa), service personnel (Xp) and other (Xb) costs.

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Xa = Ye1 · Xj + Ye2 · For the construction of buildings Xe = Hissing - Hashing

Here, Xa is the depreciation charge;

Xj is the cost of the equipment;

For the construction of buildings - the cost of construction of buildings;

Xe - energy costs;

Heating - heating costs;

Htashish - transportation costs.

The problem of optimizing the drying process of fruits is reflected in the reduction of technological costs.

In solving this problem, it is advisable to consider the optimization of functional cases.

Functional case 1: In this case, the apparatus for drying the fruit is studied by itself.

Functional condition 2: In this case, the process of initial processing of fruits and IR-convective drying is studied. The issue of optimization focuses on reducing processing time and energy costs.

$$Q_1 = \int N_{pred.} \cdot d\tau \rightarrow \min \text{ i } Q_2 = \int N_{sushka} \cdot d\tau \rightarrow \min.$$

Here: Q is the total work done

$$\text{Then, } Q = (Q_1 + Q_2) \rightarrow \min$$

Functional state 3: The process of heating, conveyor and fruit processing is studied. This involves the even transfer of energy to the surface of the fruit.

Function 4: Reflectors are considered. In this case, the uniform distribution of light, the shape of the reflector, the choice of height are considered.

1) The IR heating element is considered. In this case, the appropriate element for the wavelength of IR-rays is selected. The optimum wavelength is 2.8 μm.

2) The elements of the conveyor are considered. In this case, the element that ensures the maximum incidence of IR rays is selected.

3) Fruits are considered. Many criteria can be noted:

a) maximum moisture loss W → 15-19%;

b) the quality of the fruit should be as high as possible K → max;

c) processing time is small. To ensure the high quality of dried fruits, the temperature of the fruit should not exceed the specified value; D → max; dW / dh→ min; where D is the diffusion coefficient.

In addition, a "fruit and air" system is formed. In it, the moisture in the dried fruit is in equilibrium in the air: a) air; b) moisture and other compounds.

Functional condition 5: The chemical composition of the dried fruit is taken into account. It looks at the amount of sugar, vitamins, water, trace elements and proteins.

In it: G→Gnom., Gvitamin → max, W → W designated, Gmik. Must be → max.

The solution of the problem is determined by observing the temperature limit in the process: t → t is set to → 650S.

The analysis shows that energy consumption depends on the following parameters: layer thickness, shape, heating element, its geometric location, the distance between the fruit and the irradiator.

The values of the above factors were determined by mathematical processing of the results. For example, in ensuring a uniform distribution of heat flow and loss of moisture from the fruit, the heat flux density q = 0.9-1.5, the distance from the surface of the fruit to the irradiator N = 0.10-0.20 m, layer thickness 3 -10 mm, product temperature 55-650S, heat flux density in the pulse-pause zone q = 25-30, wavelength λ = 1.1 mkm, wavelength for energy absorption of water molecules in accelerating moisture loss λ = 2.8 mkm.

Influence of initial treatment with IR, OYC and IQ-OYC on the process of mass transfer

Considering that the initial treatment accelerates the drying process, we plan to implement this method with IR, IR and IR-IR rays. The two-stage drying process is called cascade drying. The essence of the initial processing is a short-term processing with a strong energy flow of 15-20 times more than necessary in the selected method. Short-term processing is carried out in multi-stage, increasing, continuous and decreasing modes of exposure.

The output of the dry product depends on the amount of dry matter in the initial product. But dry matter is primarily a carcass composed of minerals and klechatka. Proteins, carbohydrates, amino acids, minerals, vitamins, etc., dissolved or chemically bound water remain in the dried matter.

When choosing a product for drying, consider only the varieties that contain large amounts of dry matter, and more physiologically valuable substances, vitamins and carbohydrates.

References:

1. Douglas J. Arent, Alison Wise, Rachel Gelman. The status and prospects of renewable energy for combating global warming // Energy Economics, Volume 33, Issue 4, July 2011, Pages 584-593.
2. Bahrus D. Solar drian drying // Crops and soils. -№4 (30). - P. 14-15.
3. Lowand T.A. Solar catined drues // Solar energy. - № 4. -P. 32-36.
4. Niles P.W., Carnegie E.J., Pohl J.G., Cherne J.M. Design and performance of an aircollector for indusrial croop dehydration // Solar energy. - №1 (20). -P.19-23.
5. Norkulova K.T., Iskandarov Z.S., Jumaev B.M. Issledovanie kombinirovannoy sushilnoy ustanovki. International Scientific Conference Innovation Tashkent 2016. P. 96-97.
6. Bala B. et al. Solar drying of pineapple using solar tunnel dryer Renewable Energy, 2003. Vol. 28. p. 183-190.
7. Safarov J.E., Sultanova Sh.A., Jumaev B.M. Texnologicheskiy protsess proizvodstva sushenyx lekarstvennyx trav. // Vestnik TashGTU, №2. 2015. S.164-167.
8. Kholdorov Bakhodir Baratovich, Irmatov Otabek Saidovich, Issaqov Shokir Allaberdi o'g'li, Sadullaev Jasur Mansur o'g'li. Drying products with infrared rays. «Universum: технические науки» 5(98). Москва 2022.