INSTALLATION FOR DRYING RAW MATERIALS OF VEGETABLE ORIGIN

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ABSTRACT

The production of fruits and berries in the Republic of Kazakhstan is almost two times lower than the global consumption norms. The actual consumption of these crops in different years varied depending on the ratio of exports and imports, but it was always below the consumption norms. In most cases, this can be explained by their complexity in the technology of storing the resulting crop. At present, in connection with the transition to small-scale farms and agricultural firms, it becomes economically feasible for commodity producers to store and process fruits and vegetables directly on their farms. This makes it possible to solve many issues of logistics and management, to carry out the processing of products and their trade in the most favorable conditions, the formation of a certain conjuncture and pricing policy. The drying in the process of harvesting raw materials is of great importance, and the observance of proper storage conditions for dried products. However, the installation that is used for drying plants in the existing production structures does not currently meet the necessary requirements. The introduction of new technologies and techniques is the most important way to increase the efficiency of drying units and improve the quality of the processed material. The creation of a plant for drying stem agricultural products and the rationale for its main parameters is described in this article. The purpose of creating such a device and substantiating its parameters was that during natural drying, the products dry unevenly, as a result of which some parts of the product dry out, and some parts rot without completely drying out.

Keywords: drying plant, drying agent, analytical dependence, empirical dependence, stem agricultural products

INTRODUCTION

There are weaknesses in the production of fruit and vegetable raw materials in the Republic:

- a small amount of commodity production;
- the infrastructure of agricultural production is not developed at a sufficient level;
- due to the low population in the country, the spatial movement of products as material and technical leads to significant costs during transportation from the producer to the consumer;
- great difficulties are created by the fact that there is no access to the sea, which would provide access to foreign markets;
- offers in the provision of financial services for the agricultural sector are limited;
- the main means of production are obsolete both morally and physically;
- domestic selection, seed production, as well as agricultural technologies in the field of vegetable and melon crops are not sufficiently developed;
- the used seeds have low genetic potential;

- labor mechanization is low;
- the workload of processing plants due to the lack of good raw materials is insufficient;
- international standards and norms on the level of phytosanitary safety do not comply with the norms [1].

Vegetable products (vegetables, berries, herbs, fruits) play a very important role in the human diet. In reality, about 28% of agricultural products from the producer reach the consumer's table. The storage time for fresh fruits, vegetables and herbs can be different, from 5-6 hours to 6 months. However, in the process of storing fresh vegetables, all nutrients are consumed due to vital processes in the process of storing fruits and vegetables, since these processes are not stopped, but simply slowed down. Based on this, there is a need to preserve products both for the winter period and for a longer period in order to preserve the energy and biological values in food products. There are many preservation methods such as pasteurization, freezing, sterilization, chilling, salting and drying. Pasteurization and sterilization involve heat treatment to destroy microflora. Freezing and cooling slow down the development of microflora. If you take a freeze no higher than 17 ° C, then it retains vitamins, biologically active components, however, the reverse defrosting process leads to a decrease in the quality of products and the content of vitamins decreases. With prolonged consumption of foods preserved with salt, sugar can lead to the causes of the deposition of toxins in the body, as well as the cause of certain types of diseases[4].

During drying, the preservation effect in dry fruit and vegetable raw materials is achieved by reducing humidity, which in turn slows down the development of microflora. Modern drying in the processing of fruit and vegetable raw materials should become one of the main methods. With modern drying, three main requirements are important:

- energy consumption should be low;
- product quality must be high;
- the cost of production should be affordable.

Currently, the share of dried vegetables and fruits in the total range of fruit and vegetable products is increasing. This is explained, first of all, by the fact that manufacturing and trading enterprises, in an effort to increase profits, develop new types of food products. The content of vitamins, fiber and other biologically active substances increases in new products. Vegetable powders are also used in the production of various drinks, cheese, confectionery and other products. Some products, when dried vegetable components are added to them, acquire the status of “dietary and therapeutic and prophylactic”. Dried vegetables and fruits are widely used in the production of dry concentrates for first and vegetable side dishes for first and second courses, breakfast cereals and desserts, combined dry spices intended for the production of canned food and the preparation of certain types of dishes. All dried products can be used for quick cooking both at home and in public catering, for example, in fast food establishments. One of the promising directions for the use of dried fruits and vegetables is the expansion of the assortment base for the production of products for children and school meals. In particular, this may be the development of instant powder mixtures. The advantage of mixtures is that they are conveniently transported over long distances, have a relatively long shelf life, and are quite simple in the preparation process into a finished product that does not require special technological equipment and takes a short time (no more than 30 minutes) [2].

Dried vegetable, fruit and berry powders are widely used as flavoring and aromatic fillers. Also, dried vegetables and fruits, dry vegetable garnishes and vegetable concentrates are used to supply expeditions, they are part of dry rations and rations for military personnel and in-flight meals for astronauts. From dried vegetables and fruits, potatoes, carrots, beets,

white roots, white cabbage, onions, dried mixtures from sets of first courses - cabbage soup, borscht, pickles and various mixtures of dried fruits for making compotes are supplied to the troops. Dried vegetables and fruits with lower moisture content are better preserved, but sometimes require packaging in airtight containers. It is possible to create a physiologically complete diet of increased autonomy only if there is a sufficiently wide range of products with long shelf life in unregulated temperature and humidity conditions. Therefore, for fruits and vegetables, this is, first of all, dried products. Let's consider an installation for drying stem agricultural products [3].

MATERIALS AND METHODS

The shape of the air distribution channel should be arcuate in terms of uniform distribution of the drying agent in the stack. We have developed a similarly shaped extractable plant for drying stem agricultural products (AS No. 1746940) [1], which is recognized as an invention (Fig. 1).

The installation for drying stem agricultural products contains a frame 1, which is made of arc-shaped frames 2, and covered with a mesh 3: Under the lower longitudinal rod 4 of the air supply channel, control supports 5 are pivotally installed in the form of a pair of racks forming a flat angle and pivotally connected at the top 6 by longitudinal rods in in the form of threaded axes, forming a screw pair connection with the supports in their middle part. In addition, the unit has wheels 9 installed in the middle of the longitudinal rods with the possibility of contact with the floor at the lowest position of the channel [5].

The technological process of the installation is as follows. The installation is placed at the stack formation site and transferred to the working position, the fan 10 is connected, after which the laying of stem agricultural products begins with the formation of the stack and its drying by the active ventilation method. After 2-3 days of stack ventilation, the control supports 5 are lowered until stack breaks are eliminated, which occur as a result of drying high-moisture (up to 80%) stem agricultural products. To lower the control supports 5, the longitudinal rods 8 are rotated, which are connected by uprights having right and left threaded connections 7. This operation can be repeated several times during the drying process.

Removing the installation from under the stack is carried out as follows. The fan is disconnected from the air supply box and taken to the side. With the help of longitudinal control rods 8, the air supply box is lowered to the end and sits on wheels 9, which are installed to reduce damage to the product when the unit is removed from under the stack. Once removed, the unit is ready to be reused. The height of the adjusting support h_{Po} should ensure uniform drying during shrinkage h_y of stem agricultural products in the stack by lowering the air box. In addition, create conditions for extracting the installation by lowering it to a certain height h_u. To facilitate the extraction of the unit from under the stack, wheels with a diameter D are installed in the middle of the air supply box [6].

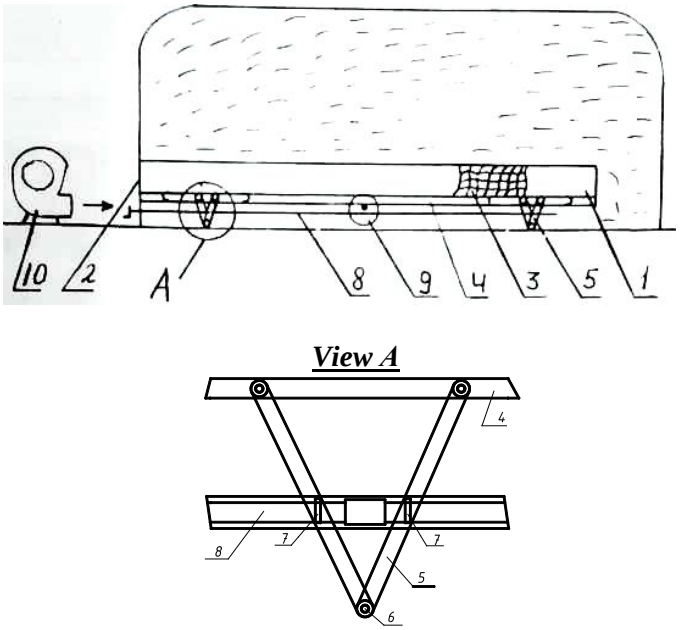

Fig.1 Scheme of installation for drying stem agricultural products

The parameters of the described installation for drying are determined by the calculated design scheme (Fig. 2).

The height of the control support $h_{c.s}$ includes the height of the possible regulation h_p and the height of the non-adjustable part $h_{n.a}$:

$$h_{c.s} = h_p + h_{n.a} \tag{1}$$

The height of the possible regulation h_p, taking into account the position of the angle β of the dependence of the maximum and minimum state, we write:

$$h_{c.s} = l_p \left[\cos\left(\frac{\beta_{\min}}{2}\right) - \cos\left(\frac{\beta_{\max}}{2}\right) \right], \tag{2}$$

where l_p - the length of the racks of the control supports, m;

βmin, βmax - angles between the posts, respectively, in the minimum and maximum position of the control supports, deg ($\beta_{\min} = 20°$; $\beta_{\max} = 140°$).

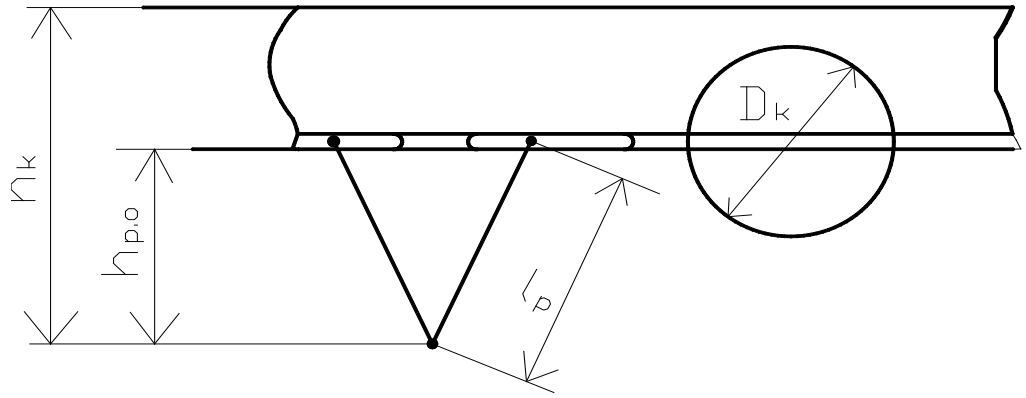

Fig.2 Calculation scheme for determining the height of the control support and the diameter of the installation wheel

The height of the possible regulation will be:

$$h_p = h_y + h_u\,, \tag{3}$$

where h_y is the shrinkage height of the dried material during the drying process, m;

h_u - height to ensure the extraction of the installation from under the stack, m.

The shrinkage height of the dried material is determined from the following ratio:

$$h_y = K_y \cdot h_K \tag{4}$$

where K_y is the coefficient of shrinkage of stacks of stem agricultural products was determined experimentally.

Substituting formula (4) into (3), and its into (2), through some transformations, the length of the support post will be:

$$l_p = \frac{K_y \cdot h_K + h_u}{\cos\left(\frac{\beta_{\min}}{2}\right) - \cos\left(\frac{\beta_{\max}}{2}\right)} \tag{5}$$

The diameter of the wheel for extracting the installation from under the stack is determined from the following expression:

$$D = \frac{l_p}{2}\left[\cos\left(\frac{\beta_{\min}}{2}\right) + \cos\left(\frac{\beta_{\max}}{2}\right)\right] \tag{6}$$

where D - the diameter of the wheel, m.

RESULTS AND DISCUSSION

As you can see, the diameter of the wheel is directly related to other technological and design parameters of the stack [7].

Analytical dependencies are obtained that determine the rational parameters of stacks and installations for drying stem agricultural products.

CONCLUSION

The analysis of the state of production and processing of fruit and vegetable products in the Republic of Kazakhstan was carried out. A low level of consumption is shown due to a lack of storage capacity in the industry.

Drying is one of the main ways of supplying the population with fruit and vegetable products during the absence of fresh products.

Traditional drying of fruits and vegetables has more expensive technologies and technological means using liquid, gaseous fuels and electrical energy (from 1.5 to 2.5 kW).

More promising for drying is the usage of solar energy, which has low costs, quality indicators of dried vegetables and fruits, refers to an ecological production method. However, it has poor performance.

A deeper study of the physical, mechanical and thermal properties of raw materials should be carried out to increase the intensification of the solar dryer, the drying process should be improved by using modern research methods.

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