РАЗДЕЛ VII. СЕЛЬСКОХОЗЯЙСТВЕННЫЕ НАУКИ

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Increasing the efficiency of raw material preparation processes in fruit processing

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doi: 10.18411/scienceconf-06-2021-11

Abstract

The paper describes the current state of dried fruits' production in the Republic of Kazakhstan, the value of dried fruits obtained from fruits of South Kazakhstan. The results of the analysis of promising technologies for dried fruits' production, in particular the line for fruits preparation for dried fruits' production, are presented, a description of the proposed equipment is presented: a washing bath for preliminary soaking and primary, easy washing.

Introduction. Fruit and vegetable raw materials are a valuable raw material base for obtaining natural and high-quality healthy food products. Fruits, being a source of easily digestible carbohydrates, vitamins, dietary fibers and natural antioxidants, contribute to the regulation of the most important physiological functions of the body [1, 2, 3]. Therefore, fruit processing technologies should be focused on the rational use of raw materials with the maximum preservation of physiologically valuable components of raw materials and an increase in the guaranteed shelf life of finished products.

An increase in the production of dried fruits by the end of 2025 and the creation of our own competitive industry is impossible without the introduction of new technologies for the production of dried fruits. From this point of view, improving the technology for the production of dried fruits using modernized equipment for washing fruits is an urgent task, the solution of which will allow obtaining high-quality dried fruits.

The purpose of this work is to simplify the design of equipment for washing fruits, increase the efficiency of washing fruits, increase the productivity of equipment.

In this paper, the authors have carried out a patent review on the existing baths for washing fruits.

There is a washing bath, consisting of at least a one-section container with a drain hole, installed on a table top with a wall rim, and the washing container is made seamless and lined on the outside, characterized in that it is installed on adjustable collapsible legs [4].

In work [5], the authors proposed a washing bath, which belongs to the field of processing agricultural raw materials, in particular to machines for washing harvested fruits. The machine includes a drive, a shower device, rolls located in two concentric arcs of circles and rotating around their axes at different speeds, with an elastic comb-shaped band. The machine is also equipped with arcuate cages, in which the rolls are installed for rotation to one side. A comb-shaped band is wound on adjacent rolls at different angles of the helix rise. The ridges of the band on each roll are positioned opposite the depressions between the ridges of the band of adjacent rolls. The use of the invention will improve the efficiency of the washing process for a wide range of agricultural raw materials.

The disadvantage of the above equipment is its unprofitability, especially in low-tonnage processing of fruits, a large number of pieces of equipment for its implementation, which complicates its practical use. Thus, the above features of fruits and equipment make it

unprofitable to process small quantities of fruits in small production conditions and in many cases simply lead to the loss of a part of the crop due to the impossibility of processing it. All this makes us look for such technical and technological solutions that would make low-tonnage processing of fruits profitable.

We have considered a technological line for the preparation of fruits for the production of dried fruits, consisting of an apparatus for sorting different fruits complete with sieves and guides, a unified washing apparatus, combined with a blanching process, with various accessories and fittings, a universal cutting machine for various types and varieties of fruit and berry crops with replaceable knives and auxiliary units.

In this line, we have modernized a washing bath that can be used for washing vegetables and fruits. The technical result is the creation of a compact product during transportation, as well as a decrease in metal consumption, labor intensity and, accordingly, the cost of manufacturing the product as a whole. The technical result is achieved by the fact that in a known washing bath, consisting of at least a single-section container with a drain hole, installed on a table top with a wall rim, the washing container is made seamless and lined on the outside, a cylindrical mesh basket with fruits is inserted into the container, the washing bath is equipped with elastic elements with a diameter of 10 mm and a length of 10 cm. The shelves are collapsible, and the bath is installed on adjustable collapsible legs. The leg can be made from a square tube. The legs of the bath are adjustable in height, which allows them to eliminate unevenness in the floor when they are installed. The height adjuster feet are made of galvanized steel, which protects them from corrosion.

The washing bath of periodic action is intended for preliminary soaking and primary, “light” washing of root crops, vegetables, fruits and berries, often used for washing fruits and vegetables that are sensitive to shock, such as apples, tomatoes, cucumbers, etc.

The essence of the work is illustrated by drawings, where Figure 1 shows a general view of the washing bath with a three-section container; Figure 2 shows the washing bath from the top; Figure 3 is a cut of one section of the washing bath.

Figure 1. Washing bath with a three-section container, general view

Figure 2. Washing bath with a three-section container, top view

Figure 3. Cut of one section of the washing bath

The washing bath with a three-section container consists of a washing container 3 welded to the table top 1, forming a single structure. The table top 1 is equipped with a wall rim 6 to prevent water from leaking behind the bath and splashing liquid along the wall. The bath from the outside on three sides – in front and on the sides has a cladding 2 with sides inward at 90° from above and below (not shown). The table top 1 is fixedly mounted on the upper sides of a shell 2. The table top 1 is also equipped with a regular place 7 for the mixer. The washing bath is equipped with a device for rinsing fruits, on which a frame for attaching the device 12, a retainer 13, a handle 14, a guide 15, an electric motor 16, a brush 17 with a diameter of 10 mm and a length of 10 cm, a basket 18. At the bottom of the washing container there is a drain hole 8 for siphon 9. The washing bath is installed on four legs 4, made removable for compactness and ease of transportation. The legs 4 are made of a square tube of a very robust construction that can withstand heavy loads and have a long service life. The legs 4 are equipped with adjustable supports 5 with rubber inserts at the bottom, which allows to level the washing bath on an uneven floor.

The principle of operation: the product is loaded into the washing bath equipped with elastic elements in the form of brushes with a diameter of 10 mm and a length of 10 cm. In the bath there is an intensive soak and primary, easy washing of the product, as well as the removal of floating organic plant debris. Removal of excess water and floating organic impurities occurs through the overflow. Slow rotation of the paddle (6 revolutions in 1 minute) during the washing process avoids mixing while maintaining the primary shape of the raw material.

From the washing bath, the washed product is taken out to the area where the blancher is located, where the product is briefly processed with boiling water. This will preserve the color of the fruit, remove the bitterness and specific smell of the product.

Figure 4 shows the dependence of the degree of product cleaning due to the number of elastic elements and the twisting turn in the device. Figure 5 shows the dependence of product cleaning due to the number of elastic elements. Figure 6 shows the dependence of the degree of product cleaning on the time of its implementation.

Figure 4 – Degree of product cleaning due to the number of elastic elements and the twisting turn in the device

Based on the data in Figure 4, the degree of product cleaning increases due to the number of elastic elements and the twisting turn in the device. This is due to the change in the square appearance of the plane from green to rich red.

Figure 5. Dependence of product cleaning due to the number of elastic elements

Figure 5 shows the dependence of cleaning on the number of elastic elements. With an increase in the number of elements, the degree of product cleaning increases. After the installation of the elastic element 12, the degree of cleaning is 85%.

1 – number of revolutions – 3 rpm; 2 – 4 rpm; 3 – 6 rpm

Figure 6. Dependence of the degree of product cleaning on the time of its implementation

Figure 6 shows the dependence of the product cleaning efficiency on the rotation speed of elastic elements. When the speed of rotation of the elastic elements is increased to 6 rpm, a high cleaning efficiency is provided, which reaches 97%.

Thus, the use of a mixing device increases the efficiency of fruit washing and also increases the productivity of the washing process.

This work was realized through the grant financing of the project No. AP08855596 “Development of a technology for complex processing of fruits to obtain dried fruits, activated carbon, cosmetic and edible oil” organized by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan.

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