SUBSTANTIATION OF THE MAIN DESIGN PARAMETERS DISMEMBRATOR PLATE FOR OBTAINING SUSCEPTIBLE GRAPES IN A LABORATORY INSTALLATION

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Annotation. The article substantiates theoretical and experimental research, studied some parameters of energy and resource-saving device with small size for drying grapes, proposed for preparation of dried grapes.

Key words: grapes, berries, flight, angle, trajectory, range, height, fruit, board, disembrator, skull separator.

Introduction. At present, grape growing and processing of grapes is developing on a wide world scale, including in the United States, France, Spain, Portugal, Russian Federation, Ukraine, Republic of Belarus, Republic of Moldova, Turkey, China, India, Australia and other countries have achieved certain successes and in them “special attention is paid to the development of technical and technological modernized resource-saving technical means for processing and drying of grapes” [1].

In our republic, large-scale activities are carried out to reduce labor and energy costs, save resources in the production of ecologically clean dried fruits by advanced processing technologies, in particular, special attention is paid to the development of resource-saving technologies and technical means of cleaning grapes and fruits and vegetables with high productivity, while preserving all natural and useful elements [2].

Methods and research. When developing the kinematic scheme of the plant for cleaning dried grapes we proceeded from the considerations to create a compact small-sized apparatus, with a diameter of no more than 700 mm. We explain our considerations by the fact that at the accepted diameter of the plate it is possible to select such a rational frequency of its rotation, which will provide the necessary flight path of grape berries at some angle to the horizon, i.e. the range and height of their flight after detachment from the disk disembrator. Having thus determined the critical speed of rotation of the main working shaft, it is possible to find the rational frequency of rotation of pins, providing optimal destruction of dried grape bunches[3, 4].

From the conducted laboratory researches it was found out that for dried grapes the rotation frequency of the plate shaft varies within 250-300 min-1. Based on this, we proposed the following kinematic scheme of the comb separator (Fig.1). The scheme includes a

synchronous electric motor 9, working with a frequency inverter, V-belt transmission 12 with pulleys 10 and 11, friction transmission of the first stage, consisting of a leading roller 6 and fixed ring bandage 7 and a pair of friction rollers 8, 9, mounted on the rotating disk of the disembrator 4.

Rotation from the electric motor 9, through the pulley 10, V-belt 12 and pulley 11 is transmitted to the shaft 3 of the discembrator. Taking the ratio of the belt transmission , we determine the approximate speed of rotation of the electric motor

$$n_1 = n_2 i_p = (250-300)\cdot 3 = (750-900)\ мин^{-1}. \quad (1)$$

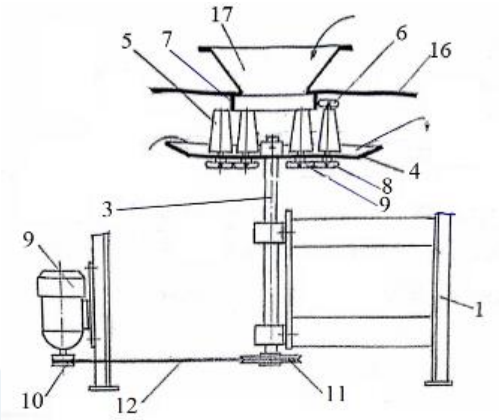

Fig. 1. Kinematic diagram of the drive of the working bodies of the laboratory installation for the purification of dried grapes

Since the pin of the outer circular row is mounted on the rotating disembrator 4 and by means of the friction roller 6 is in contact with the annular bandage 7, then taking the diameters of the bandage and rollers 6, 8, 9 constructively, it is possible to determine their rotation frequency.

For constructive reasons, the diameter of the annular band 7 is assumed to be equal to $d_б = 240мм$, and the diameter of the roller 6 - $d_p = 100мм$. Then the transmission ratio is equal to

$$i = \frac{d_б}{d_p} = \frac{240}{100} = 2{,}4 \quad . \quad (2)$$

At average speed of rotation of the disembrator plate $n_g = 250-300мин^{-1}$, the roller 6 will rotate with frequency

$$n_p = n_g \cdot i = (250-300)\cdot 2{,}4 = (600-720)мин^{-1}.$$

The average circumferential velocity of the taper pin 5 is equal to

$$\upsilon_{шт} = \frac{\pi d_{ср} n_p}{60} = \frac{3{,}14\cdot 0{,}05\cdot 660}{60} = 0{,}879 м/с, \quad (3)$$

Where $d_{ср} = 0{,}5(d_{max} + d_{min}) = 0{,}5(0{,}07+0{,}03) = 0{,}05м$

$$n_p = 0{,}5(n_{max} + n_{min}) = 0{,}5(360+312) = 336мин^{-1}$$

Under these conditions, the range of grape berries is equal to

$$\ell = \frac{\upsilon_{um}^2 \sin 2\alpha}{g} = \frac{0{,}879^2 \cdot \sin 90^o}{9{,}81} = 0{,}08\,м = 80\,мм$$

i.e. the berry, having flown 80 mm will fall on the disk of the disembrator, or will fly to the next pin.

Based on the above it follows that when the arrangement of rollers 8 and 9 in a circle and forming a friction connection between themselves, the distance between the axes of their rotation can be less than 80 mm.

Of the range of standardized rollers produced by the industry, the most suitable is a plastic roller 75x30, which has the following characteristics:

outer diameter - Dn=75 mm;

width of rings - Vk=30 mm;

bearing No. 204 double row

diameter of rotation axis - d=10 mm

If we take the diameter of the annular bandage Db=160 mm, we can place ten 75x30 rollers around it with a small boring of the outer diameter [5].

Inputs

It is established that to ensure the quality of crushing dried grapes the rotation frequency of the working shaft of the dismembrator should be on average 130-150 min-1 at the moisture content of sultanas W=19-21 %. At the gear ratio of the belt transmission speed of the electric motor should be 390-450 min-1, the diameter of the ring bandage , and the diameter of the roller 6 - . At arrangement of rollers on a circle forming friction connection between each other, the distance between axes of their rotation should be not less than 80 mm.

Taking the diameter of the ring bandage Db=160 mm it is possible to place around it ten rollers 75x30 with the following characteristics: outer diameter - Dn=75 mm; width of rings - Vk=30 mm; bearing No. 204 two-row with axis of rotation diameter - d=10 mm.

Foydalanilgan adabiyotlar/Используемая литература/References:

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