Section 8. Agricultural sciences

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SORTER OF COCOONS BY SPECIFIC VOLUME

Abstract. For the determination of the silkiness of live cocoons in 1980 the PTI-1 device was created by Burkhanov Sh.D. with other colleagues, which determined the silkiness by the specific sample volume loaded into the measuring chamber of the device. The device PTI-1 got into the State Register of measuring devices under the number #9878–80.

The error in the operation of the PTI-1 device was associated with low automation of the process of measuring the silkiness, as well as the penetration of cocoons with a dead and sometimes dried caterpillarinto the measured sample. Such cocoons had a large specific volume and overestimated the measured silkiness. In this paper, it is proposed to sort out such cocoons from the sample using an airstream. A diagram of the installation of a cocoon sorter according to the specific volume (CSSV) is given, the results of sorting the cocoons of the Tetrahybrid-3 breed are given. After the rejection of the bad cocoons, the accuracy of determining the silkiness with the PTI-1M device increased from 0.32% to 0.25% on average compared with an incision. It is indicated tha cocoon sorter t the CSSV system can also be applied at the butterfly egg factory to sort the perse from aperse cocons, from which the butter flies did not come out.

Keywords: silkiness, specific sample volume, cocoon sorter, speeds of aerodynamic air flow.

The task of improving the quality of cocoons includes the correct assessment of the quality of live cocoons taken from coco-collectors. The work [1] took into account the percentage of grouse cocoons and their influence on the PTI-1M device when determining the silkworm of live cocoons. The principle of operation of the device PTI-1M consists of the directly proportional dependence of the silkiness to the specific volume of living cocoons. Grouse cocoons with a dead and most often dried-up caterpillar have a significantly larger specific volume, which leads to an overestimation of the measured silkiness and, therefore, they must be separated from the total mass of living cocoons.

Below it is shown how, using the cocoon sorter according to the specific volume (CSSV) [2], and air stream to separate the grouse cocoons from the sample, which will be further loaded into the working place of the PTI-1M device.

Sorting is carried out by oriented supply of cocoons into the air stream with an uneven velocity profile. At the same time, the gradient of air flow velocities is equal to 18–26 m/s * m. In the work [3] the cocoons were divided into groups by specific volume by orientally loading them into the air stream. After separation of cocoons with a large specific volume, samples of living cocoons of the Tetrahybrid-3 breed loaded into the PTI-1M device gave an average deviation from the incision less than 0.25%. Without prior separation of the grouse cocoons, the deviation from the incision was 0.32% on average on the same batches of live cocoons.

Improving the quality of sorting cocoons by specific volume is done by more precise orientation of the supplied cocoons for sorting them in the air flow with a uniformly decreasing velocity profile of the air layers. Below are the graphs of the dependence of the range of flight of the cocoon X in the working place of the CSSV on the specific volume m/V of the cocoons at two speeds of aerodynamic air flow υ :

$$X = \frac{K \cdot \rho \cdot \upsilon^2 \cdot S}{m \cdot g} \cdot (2\sqrt{H} - \sqrt{h}) \qquad (1)$$

Where, K – is the momentum transfer coefficient (= 0.8 $m^{1/2}$ curves 1 and 2), υ – is the horizontal component of the cocoon velocity, approximately equal to the speed of the air flow, S – is the area of the longitudinal section of the cocoon, ρ – air density, H – height of the cocoon falling from the edge of the working place to the upper edge of the receiving cells, h – height of the diffuser.

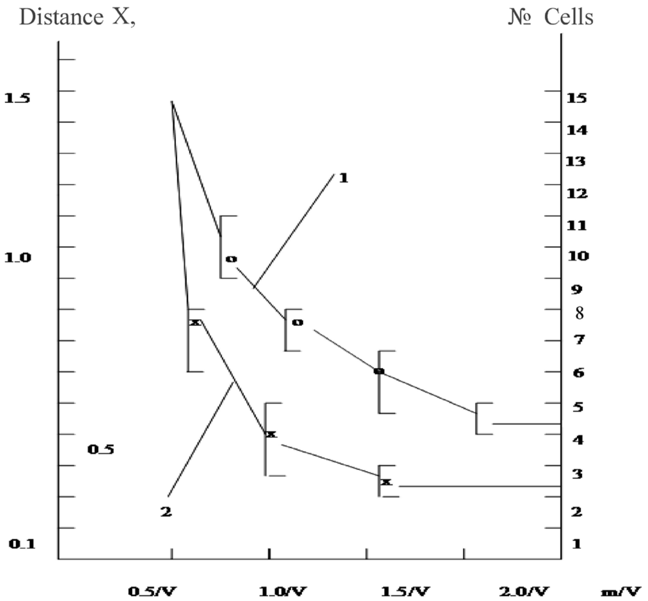

Figure 1. Distribution of cocoons by the cells in the place of CSSV depending on their specific volume m/V: curve 1 – v = 9.2 m/s. k = 0.8 $m^{1/2}$; curve 2– v = 6.7 m/s k = 0.8 $m^{1/2}$

Figure 1 shows the experimental results obtained on the CSSV when tested in the mode of sorting of live cocoons.

Experimental data showed that with the same power of the air flow at the moment when cocoons get into it, it should be as powerful as possible and weaken gradually as the cocoons fall under the action of gravity, i.e. the gradient of the speed of the air flow should be such that the air flow weakens from the upper to the lower layers. This allows the cocoon to impart a force impulse corresponding to its specific volume, and, accordingly, more or less acceleration in the horizontal direction. Then, meeting in its movement with the rest of the air layers, which have a gradually decreasing velocity, the cocoon gains an additional acceleration, and, coming out of the range of the air flow, continues free falling in the sorter receiving-distribution chamber already sorted by its specific volume. Thus, the initial position of the cocoons at the entrance to the sorting chamber plays a decisive role in effectively sorting them by specific volume [2].

(Figure 2) presents a schematic diagram of the mechanism of the dosed supply of cocoons to the sorting node, side view. The device consists of a bunker 1 with pitched walls, a detachable attachment 2, which is adjacent to the corpus 3 of the elevator 4, made in the form of a belt conveyor with bars 5, located at an acute angle to the elevator belt, pitched tray 6 with snare drum 7 and horizontal drum 8 with cell-grooves for supplying cocoons in the oriented state to the sorting unit through the slotted window 9 in the corpus 10 under the air stream from the fan 11 through the diffuser 12, ensuring the distribution of the cocoons in the corresponding storage capacity of reception and distribution chamber 13, depending on their size and weight. On the path of the air jet perpendicular to it in the diffuser 12, a device 14 is installed, ensuring the creation of a velocity gradient of the air flow over its cross section.

The air flow rate is measured by an anemometer.

The device works as follows. The cocoons are loaded into the bunker 1, from where they arrive at the dismountable console 2, where they are cleaned of cotton wool – to remove flowability, then to the elevator, made in the form of a belt conveyor 4, where they are caught by strips 5, which are removed from the conveyor belt by excess and accidentally hooked cocoons and ensure their single-layer distribution. Next, the cocoons fall on the snare drum 7, roll down the inclined tray 6 into the slot cells of the drum 8, being caught by the blades, which orientally load them into the receiving-distribution chamber 10 through a slotted window 9 with a capacity of approximately 200 pcs/min. They are going here into the CSSV working place through a device for regulating the speeds of the air flow and, meeting with the air flow, are sorted by specific volume.

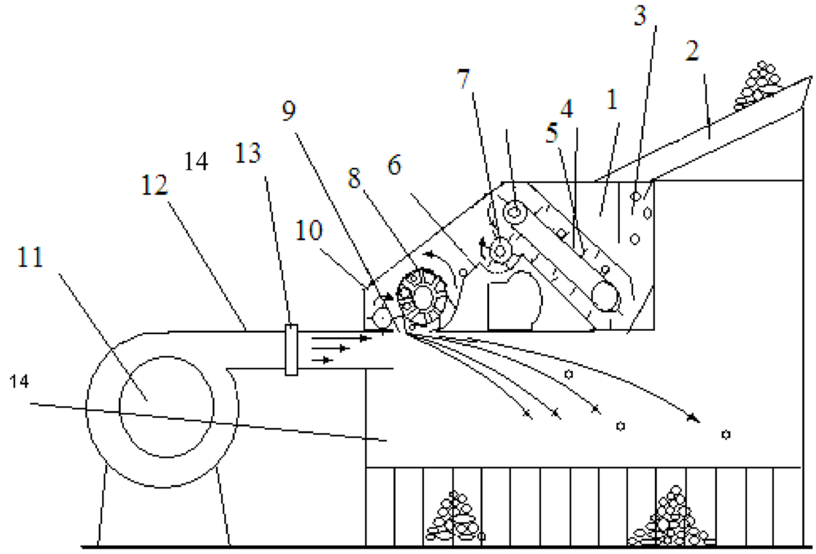

Figure 2. The device sorter cocoons by specific volume

The CSSV device is serviced by one operator.

The CSSV was also tested on the Tavaksai butterfly egg factory to separate whole cocoons – aperse from the total mass of the perse, i.e. cocoons from which butterflies came out.

The economic effect was 15 million soums per year, as 1 CSSV replaced the work of 5–6 sorters for separating aperse from the total mass of the perse.

Conclusion: To improve the accuracy of the PTI-1M device, it is necessary to separate the grouse cocoons with a large specific volume from the sample to be measured. For this you can use the proposed cocoon sorter by specific volume (CSSV). In addition, the CSSV can be used at the butterfly egg factory to separate entire cocoons –aperse, out of which butterflies did not come out from the holey empty shells – perse.

References:

1. Mirsaatov R. M., Burkhanov S. D. The influence of grouse cocoons on the results of the determination of the silkiness of live cocoons with the PTI-1M device. Set of articles on materials of the XLVI International Conference. Internauka, Scientific Discussion: Questions of Technical Sciences,– No. 5. (35),– M., 2016.– 83 p. (in Russian).
2. Burkhanov Sh. D., Kadyrov B. Kh. A device for calibrating cocoons, USSR Copyright Certificate – No. 1583480 as of April 8. 1990. (in Russian).
3. Mirsaatov R. M., Burkhanov S. D., Kadyrov B. Kh. Sorting cocoons in the air flow, Collection of scientific articles TITLP,– Tashkent, 2012. part 1.– 55 p. (in Russian).