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Analysis of Sieve Sizes to Improve the Accuracy of the Walnut Kernel Sorting Process

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Annotation: 100 pieces of nuts of different sizes grown in local areas were selected. The nut was separated from the nut shell in its entire position and the nut dimensions were measured in diameter on the long side. A mathematical statistical analysis was carried out in order to determine the range of the main dimensions of the measured oars. This article presents the work and results of mathematical statistical analysis. The purpose of determining the core size range of the core is to base the size of the sieve hole, which is the working part of the sorting machine.

Keywords: Nut kernels, size, mathematical statistical analysis, dispersion, frequency

The world is leading in the sorting of hard-shelled fruits, including sorting and processing into certain types without damaging the yield of nuts and cereals, resurstejamkor and productivity high technology, as well as the introduction of low-cost devices and machines to the production of manual labor. "Since 2012/2013, worldwide nut production has increased by over 46%. As of 2021/22, worldwide production is about 2.31 million tons and is projected to reach 2.6 million tons in 2022/23" in this regard, special attention should be paid to the effectiveness, quality indicators and sorting accuracy in the development of devices and machine structures used in nut processing [1]. Therefore, the use of machine constructs with high sorting accuracy, which do not injure in the process of interaction, allocate it to types in terms of performance and size, is becoming more important.

As a result of the rapid development of food and agricultural machinery in the world with pictures, research is being carried out aimed at creating new generations of energy-efficient, manual labor - enhancing and high work performance technical equipment used in the processes of sorting walnut kernels. In this direction, special attention is paid to reducing the cost of maggies and similar products by creating structures of machines with low energy requirements, which, with little damage to the Maggies, sort them into fractions by volume in high accuracy, and substantiating their technological work processes and parameters of working bodies, as well as by the widespread introduction of modern technical means into production.

In our republic, comprehensive measures are being implemented to reduce labor and energy consumption, save resources and develop resurstejamkor technologies and

technologies with high efficiency in the selection of nuts and its kernels. PD-113 of April 5, 2023 in the decision of the president of the Republic of Uzbekistan "on additional measures to expand and support the production, processing of agricultural products in 2023", incl... the planned planting of agricultural crops on 373,000 hectares of lalmi lands " will determine the tasks of increasing the number of Pines [2]. One of the important issues in the implementation of these tasks, including the technical and technological modernization of machines that, together with energy and resource savings, accurately sort the Maggies without damaging them.

The yon'ak Magi sorter sorts the Magi in three dimensions. It is required to know the dimensions of the cornea in order to ensure the dimensions of the part of the tubule in the sieve, which will be sorted out.

The kernels of nuts brought from local areas were separated from the bark, 100 kernels of different sizes in the whole state were separated for experimentation, and the dimensions were determined with a measuring instrument.

Based on the dimensions of the given sample nut kernels, we expel random quantities and set the exact size. To do this, we estimate the prime dispersion by calculating the sample mean and sample dispersion in a way that transitions to conditional variants [3-4].

Table 1.
Walnut kernel size dispersion

Int d	h_i	x_i	u_i	$u_i \times h_i$	$u_i^2 \times h_i$	W_i
22 – 25	8	23,5	-2	-16	32	0,08
25 – 28	20	26,5	-1	-20	20	0,20
28 – 31	28	29,5	0	0	0	0,28
31 – 34	26	32,5	1	26	26	0,26
34 – 37	18	35,5	2	36	72	0,18
	100			$A_u = 26$	$B_u = 150$	

x_i, of the initial options u_i moving to conditional options this

$$u_i = \frac{x_i - C}{n} \qquad (1)$$

equality is achieved by
in this:

C – the value of the sample in the variant with the greatest frequency in the statistical distribution [50; 37-39-b, 51; 327-330-b.].

C = 30 PCs.

n – step between options. $n = 3$ ta
x_i– selected walnut size options.
h_i– frequency of suitable options.
A_u - the product of suitable variant frequencies to conditional variants is the total sum.
B_u - the total sum of the product of suitable variant frequencies to the squares of conditional variants.

$$A_u = \sum_{i=1}^{n} u_i \cdot h_i \qquad (2)$$

$$B_u = \sum_{i=1}^{n} u_i^2 \cdot h_i \qquad (3)$$

The first order conditional moment is with the following tension

$$\bar{u} = \frac{A_u}{h} = \frac{26}{100} = 0{,}26$$

will be found.
in this:
h – total number of selected nuts.

Sought sample dispersion S_u^2 and the average value of the sample $\bar{x}$ we find:

$$S_u^2 = \frac{B_u}{h} - \bar{u}^2 = \frac{150}{100} - 0{,}26^2 \approx 1{,}43 мм$$

$$\bar{x} = \bar{u} \times n + c = 0{,}26 \times 3 + 29{,}5 = 30{,}28 мм$$

Then, the mean quadratic deviation is as follows:

$$S_x^2 = S_u^2 \times n^2 = 1{,}43 \times 3^2 = 12{,}87$$

$$S_x = 3{,}58 мм$$

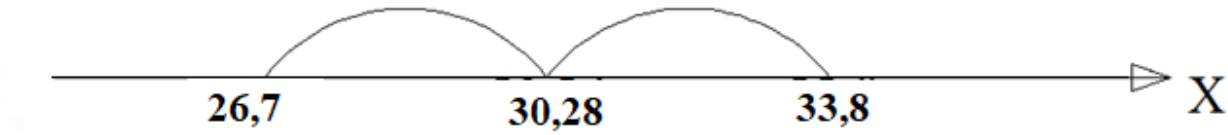

Figure 1. Walnut kernels size range

$$F(x)=\frac{h_i}{h}=\begin{cases} x<22; & 0 \\ 22<x\le 25; & 0{,}08 \\ 25<x\le 28; & 0{,}28 \\ 28<x\le 31; & 0{,}56 \\ 31<x\le 34; & 0{,}82 \\ 34<x\le 37; & 100 \\ x>37; & 0 \end{cases}$$

Empirical function for the selected Magee

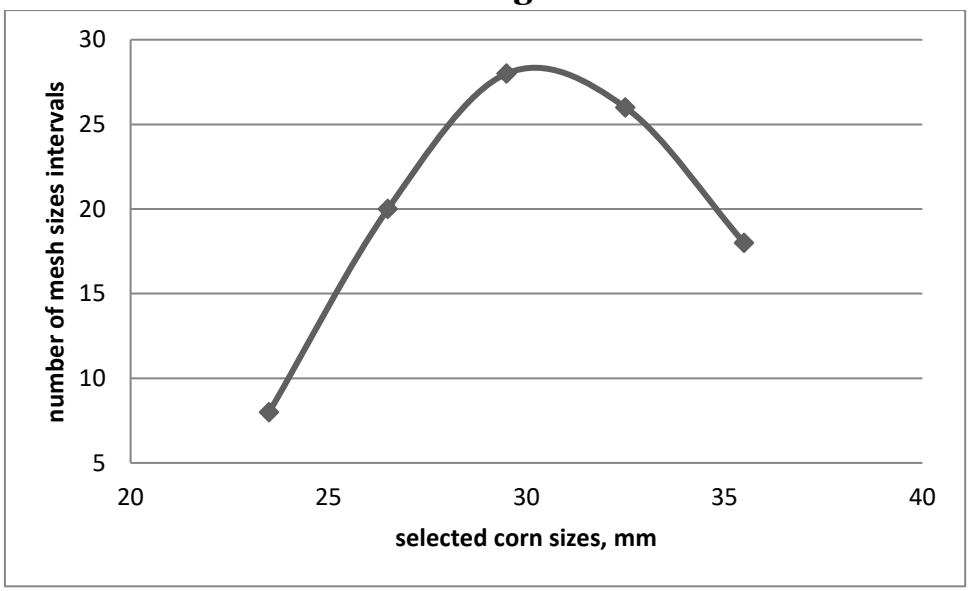

Figure 2. Scale range graph of the selected Magee.

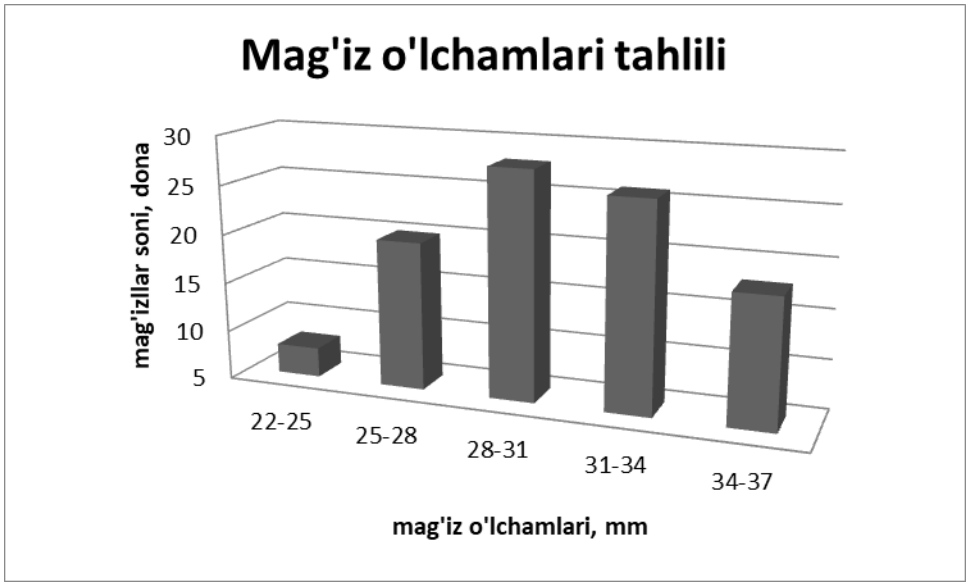

Figure 3. Selected Maggie size frequency histogram.

So, from the above equations, we see that the average size value of the corn is 30.28 mm, and the deviation from it is 3.58 mm.

Thus, from these calculated mathematical distributions, it was determined that the basic dimensions of the Magee allocated for the experiment correspond to the intervals of 26.7 – 30.28 and 30.28 – 33.8 mm. [5-6]

In conclusion, it can be said that the scientific research carried out was developed based on the methods of statistical analysis of mathematical expressions generated from the measurement process to describe the expressions in the general character in mathematical statistics, as well as to provide the dimensions of the holes in the sieve of the sorting machine. In the work carried out, the first issue was to specify methods for determining and grouping the dimensions of the maggot, while the second issue was to create methods for analyzing these selected dimensions in a statistical way.

As a result of the above analysis, it is advisable to specify the slit part of the sieve in the range of 25-40 mm for the descent of the entire kernels

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