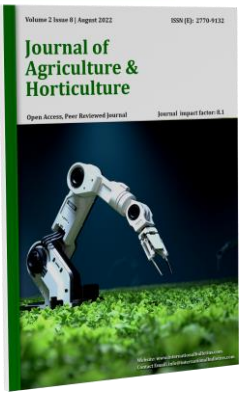

WEIGHT-DIMENSIONAL AND VOLUMERIAN INDICATORS AND PHYSICAL AND MATHEMATICAL PROPERTIES CHARACTERISTIC FOR CENTRAL ASIAN VARIETIES OF MELONS

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Abstract. To calculate the parametric and power characteristics of the technological equipment used for the primary processing of melon fruits, it is necessary knowledge of mass - dimensional and volumetric indicators of its components and physical and mechanical properties.

Key words: Processing technology, melon fruits, spindle-shaped shapes, indicators, determining the quantitative, diameter.

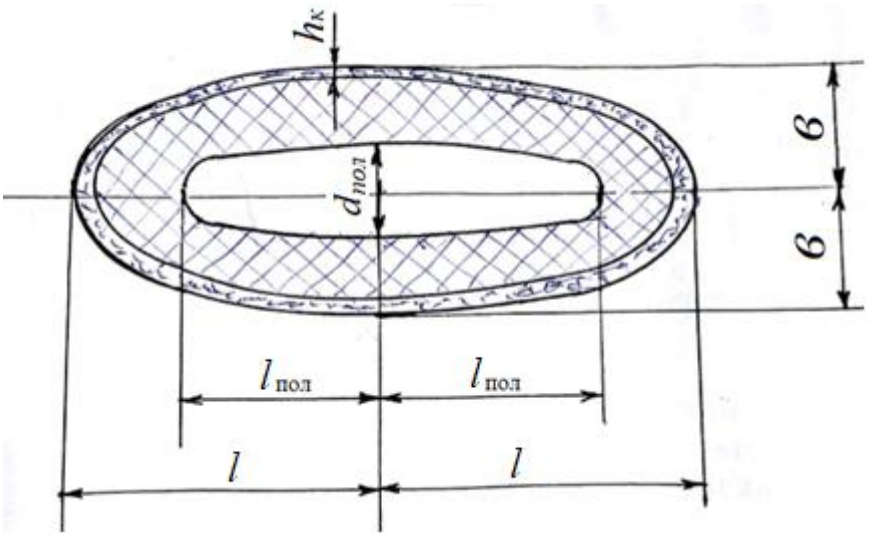
Introduction. The transition to the industrial scale of processing melon fruits requires perfection and increased productivity of such technological processes as peeling the fruit, cutting its pulp into ring segments, removing the testes, etc. From the point of view of mechanization of these processes, it is necessary to consider the various suitability for industrial processing[1].

Since the processing technology we offer is based on the use of turning, melon fruits that have ellipsoidal or spindle-shaped shapes, which are very characteristic of Central Asian varieties, are acceptable for this purpose.

When mechanically processing the fruit, a peel of a certain thickness is removed, which depends on the type of melon, the hardness of the peel and the consistency of the pulp. Of great importance for determining the quantitative yield of target products from melon is the ratio of its constituent parts: pulp, peel and placenta with seeds. To determine these indicators, five varieties of melons were studied (selectively): Ich-kizil, Ameri, Ak-urug, Non-gusht and Shakar-pala.

Determination of weight - dimensional parameters

To derive calculation formulas, consider a longitudinal section of a melon fruit as an object of study (Figure) [2], the data is summarized in Table 1.



Rice. Longitudinal section of a melon fruit

The volume of a melon fruit is

$$V_{пл} = \frac{4}{3}\pi\, l\, в^2 \cdot \qquad (1)$$

Seminal cavity volume

$$V_{пол} = \frac{4}{3}\pi\, l_{пол}\, d_{пол}^2 \cdot \qquad (2)$$

Volume of removed peel thickness hк

$$V_{кож} = \frac{4}{3}\pi\left[l в^2 - (l - h_к)(в - h_к)^2\right] \cdot \qquad (3)$$

Then from the total volume of the fruit, subtracting the volumes of the seed cavity and peel, we obtain the volume of pulp

$$V_{мяк} = \frac{4}{3}\pi\left[(l - h_к)(в - h_к)^2 - l_{пол}\left(\frac{d_{пол}}{2}\right)^2\right] \cdot \qquad (4)$$

Table 1

Weight - overall and volumetric indicators of some varieties of melon fruits

Name parameters	Unit measurements	Melon fruit varieties				
		Ich-kizil	Ameri	Ak-urug	Non-gusht	Shakar-pala
Fruit weight	kg	6,40	5,90	9,20	5,20	7,10
Fruit length	mm	340	375	400	320	330
Fruit diameter		190	180	210	180	195
Cavity diameter		90	90	100	90	105
Cavity length		250	285	270	230	270
Peel thickness		5,2	5,0	6,0	7,5	7,2

Peel density	gr /sm^3	1,30	1,29	1,25	1,32	1,3
Pulp density	gr /sm^3	1,18	1,16	1,27	1,21	1,17
The full amount	sm^3	6430	6280	9240	5430	7490
Cavity volume		1062	1210	1410	916	1560
Peel volume		830	755	1270	1080	1300
Pulp volume		4540	4315	6560	3370	4630

From Table 1 it can be seen that the yield of useful pulp for different melon varieties varies from 62% to 71%, the highest is for the Ak-urug variety, and the lowest for Shakar-para and Non-gusht and Shakar-para, for the rest - from 5 to 6 mm, respectively: Ameri, Ich-kizil and Ak-urug.

Waste from thick-skinned melons is preferable for the production of pectin and feed protein flour. From 1000 kg of fresh melon fruits you can get from 20 to 23 kg of feed flour. The content of melon seeds varies from 2.5 to 3.2% and their oil content depends on the variety and ripening period.

The ratio of the length of the fruit to its diameter is characterized by a shape index varying from 1.77 to 2.08, and all of them belong to the cylindrical-ellipsoid class. The shape index is more important when choosing technical means for removing the peel and cutting the melon fruit into slices. The higher the shape index, the easier it is to mechanize the process of their processing.

It was also found that the specific density of melon pulp is not the same throughout the entire volume of the fruit and its decrease is observed from the layers adjacent to the peel to the center.

Study of physical and mechanical properties

To justify the operating parameters of turning a melon fruit and determining the cutting force, it is necessary to know its resistance to longitudinal load, since as the peel is removed, the ellipsoidal shape of the melon weakens and can fall out of the collets of the debarking machine. For this purpose, we examined some melon fruits for longitudinal load. For this purpose, a laboratory lathe was used, between the working collets of which a manual expander (power dynamometer) was installed, the measuring system of which was converted to small loads and calibrated in the SI(N) system. The data results are summarized in table 2.

Table 2

Axial loads on a melon fruit under longitudinal compression

Melon variety	Fruit destruction force, H		
	Unpeeled fruit	The fruit is peeled by 0.5	Fruit opening polnostyu
Ich-kizil	253 ± 10	165 ± 10	126 ± 10
Ameri	254 ± 10	158 ± 10	120 ± 10
Ak-urug	275 ± 10	170 ± 10	140 ± 10
Non-gusht	262 ± 10	165 ± 10	138 ± 10
Shakar-pala	260 ± 10	160 ± 10	136 ± 10

Analyz eksperimentalnykh dannyx pokazyvaet, chto po mere udaleniya kojury rezko teryaetsya prodolnaya jestkost ploda dyni i pri overvyshenii nagruzki bolee 100 H dlya mnogix sortov ona sopredelnaya.

Conclusions and recommendations:

1. When using mechanical means of peeling melon fruit and cutting it into slices, it is necessary to take into account their physical and mechanical properties.

2. The most suitable varieties for mechanical processing of melon fruits are thick-skinned ones with a hard bark structure and a dense pulp consistency.

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