



DETERMINATION OF TECHNOLOGICAL PROPERTIES OF WATERMELON SEEDS

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Abstract:

The article presents the results of a study of some properties of watermelon seeds that affect the processes of their processing: linear dimensions, bulk density, moisture, as well as general characteristics and composition.

The necessity of complex use of watermelon seeds is shown

Keywords: watermelon seeds, technological properties, press oil, cake. core, shell.

Introduction

The oil and fat industry of Uzbekistan has traditionally been focused on the processing of cotton seeds, which were obtained during the processing of raw cotton. Cotton was the main agricultural crop of the republic. At present, cotton crops are decreasing from year to year. Cottonseeds are being replaced by other oilseeds such as safflower, sunflower, soybeans, etc.

The existing largest oil and fat enterprises are focused on the processing of cotton seeds, which differ from other oilseed raw materials in a very dense and extremely durable shell. In addition, they are covered with fibers, which also makes cleaning and peeling difficult.

Non-traditional oilseeds in Uzbekistan include sunflower, safflower, and soybeans. But of particular interest are the seeds of gourds, which occupy about 2% of the total sown area (about 7 thousand hectares).

Watermelon is consumed fresh and canned, jam, juices, marmalade, candied fruit, etc. are prepared from it. As a result of fruit processing, seeds remain, which make up from 4 to 12% by weight of the berry [1, p.38].

The main substances in watermelon seeds (per 100 g): water 5.05 g, proteins 28.33 g, fats 47.37 g, carbohydrates 15.31 g, ash 3.94 g. Dried watermelon seeds contain a large amount of minerals

: calcium, iron, magnesium, phosphorus, potassium, sodium, manganese, zinc. Essential amino acids and vitamins also increase their nutritional value.

A large amount of unsaturated fatty acids was found in watermelon seed oil, it has a positive effect on the state of liver cells, and is used to prevent urolithiasis [2, p.9].

Watermelon is one of the main gourds grown in Uzbekistan. Watermelon fruits contain from 0.7 to 3.5% of seeds. With a typical watermelon yield of 60 hectares, the average seed collection is from 1.2-1.5 q/ha.

Valuable watermelon oil and cake are obtained from watermelon seeds by pressing. From cake you can get semi-fat flour, which is recommended for use as an additive to functional foods.

Research materials and methods

For the study, watermelon seeds of the Uzbek 452 variety, widely distributed in the republic, were selected.

The seeds were dried, then the physical and technological properties were investigated: linear dimensions, bulk density, weight of 1000 seeds. These physical and mechanical properties of watermelon seeds were determined according to generally accepted methods and the average value was taken from four parallel experiments.

To determine the mass fraction of moisture in watermelon seeds and the resulting cake, they were subjected to preliminary crushing, then dried to a constant weight at a temperature of 100-105°C [3, p.18].

The oil content of watermelon seeds was determined in accordance with the requirements of GOST 10857-64 [4, p.1-5].

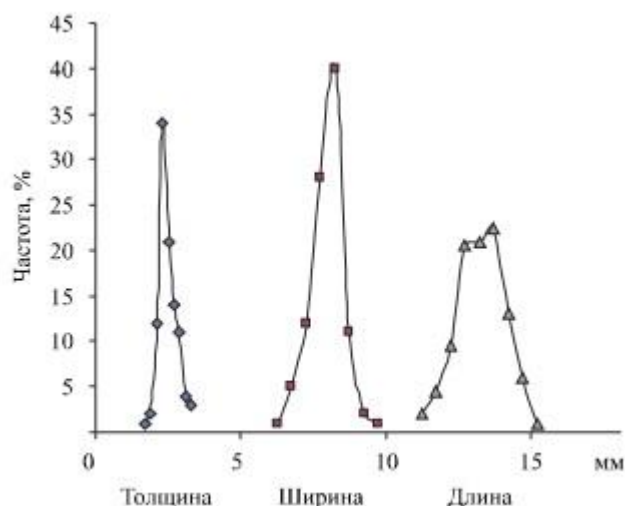
The mass fraction of ash in the seeds was determined according to GOST R 51411-99 [5, p.1-5].

The content of total protein was determined by the known method [6, p.37]

Research results and discussion

When processing oilseeds, in order to select a technological scheme and equipment for their processing, it is necessary to take into account their technological properties, since they affect the yield and quality of the final products.

Calculation and design of the main and auxiliary technological volume Equipment for preparatory operations requires reliable data about the main physical and mechanical properties of watermelon seeds: linear dimensions and shape of seeds, limit and nature of their changes, bulk oil, weight 1000 seeds, and also about the coefficient of external friction.



The object of the study was the seeds of watermelon variety Astrakhan Uroya 2011, in grown in Tajikistan, with a seed moisture content of 6.0%. We measured the length, width and thickness of each seed in a sample of 200 samples with accuracy β to 0.01 mm. Watermelon seeds of the Astrakhansky variety have an elongated shape of the pit, as well as Three sizes noticeably different from each other: length 11.04–14.60 mm, width 6.68–9.12 mm, thickness 1.78–3.39 mm.

The figure shows the variational distribution curves of the linear dimensions seed of watermelon variety Astrakhansky in length, thickness and width, which, as you can see, obeying the law of normal distribution.

The weight of the seed of the watermelon variety Astrakhansky (moisture content 6.0%) is 4 58 kg/m³, weight 1000 seeds 126.38 g.

The range of variation of the angle of friction over the iron for the studied seeds was 26.02–52.43°, for a sieve with a hole diameter of 7 and 4 mm - 29.62–56.30 and 27.57–54.46° corresponding to When changing the moisture content of the seeds from 6 to 43%.

Using the method [2], we experimentally obtained the values of the coefficients of the external friction of watermelon seed variety Astrakhansky at different moisture content W , %, and equations e to calculate the coefficients of external friction yami diameter 7 and 4 mm:

$$f_{\text{тп.ж}} = 0,356 + 0,021W, \quad (1)$$

$$f_{\text{тп.с7}} = 0,403 + 0,024W, \quad (2)$$

$$f_{\text{тп.с4}} = 0,372 + 0,023W. \quad (3)$$

Differences between the calculated values in equations (1)-(3) and our experiment data does not exceed $\pm 6.06\%$.

Obtained experimental data on the main physical and mechanical properties m watermelon seed of the Astrakhan variety recommended for use in engineering plants accounts of the main and auxiliary technological equipment operations, as well as transport conveyors.

The main technological properties of seeds that affect the processes of storage, transportation, cleaning, etc., are the shape, size, volumetric weight of seeds. When processing seeds, it is also necessary to take into account their moisture content, the content of the kernel and shell.

Cream-colored watermelon seeds of the Uzbek 452 variety have an oval shape and are characterized by high mechanical strength. The length, width, and thickness of the samples were measured with an electronic caliper with an accuracy of 0.01 mm. The mass of 1000 seeds, the bulk mass was measured on an electronic scale with an accuracy of 0.001 g.

The seeds had the following dimensions: length 9.5...15.8 mm; width 6.0...8.6 mm; thickness 1.8 ... 2.9 mm. The average values were: length 13.9 mm; width 8.3 mm; thickness 2.4 mm.

The volumetric weight of watermelon seeds of the Uzbeksky 452 variety was 463...472 kg/m³, the average value was 468 kg/m³, the weight of 1000 seeds was 65 g on average.

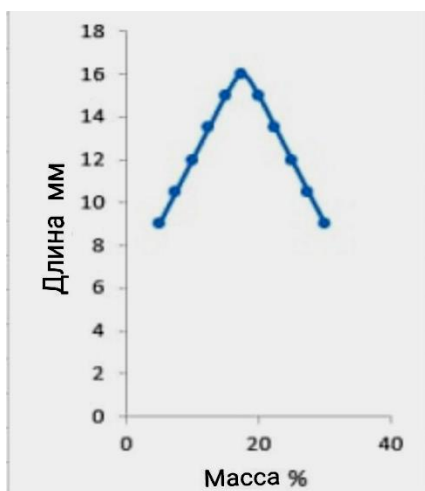


Figure 1. Variation curves of the length distribution of watermelon seeds.

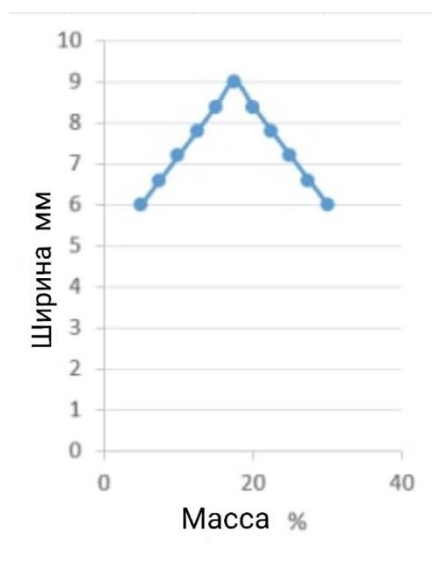


Figure 2. Variation curves of the distribution of watermelon seeds in width.

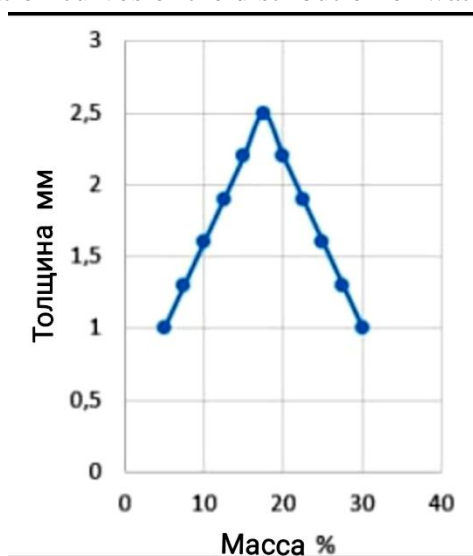


Figure 3. Variation curves of distribution of watermelon seeds by thickness.

To select the methods and parameters of an effective technology for obtaining high-quality pressed oil and cake from watermelon seeds, the general characteristics and chemical composition of the core and shell were studied (Table 1).

Table 1
General characteristics and chemical composition of the kernel and shell of the seeds of watermelon varieties "Uzbek 452"

The name of indicators	Core	Shell
Content in seed, %	45,3 ...47,1	54,7...52,9
Oil content*, %	50	9,2
Total protein content	32,5	4,3
Fiber content	1,4	28,5
Mineral content (ash content)	3,2	

* in seeds - 47,8

Conclusion

The results obtained show that the oil is contained in both the kernel and the shell of the seeds, and its amount is quite high. Therefore, it is necessary to process the seeds together with the shell.

The processing of watermelon seeds without separating the shell will also make it possible to appropriately use all those valuable substances that are contained in all their parts.

Thus, the studies have shown that watermelon seeds can be considered as sources of lipids and proteins, they are a valuable raw material for the production of gourmet oil and cake, which is a source of trace elements.

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