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Determination of Fine Particles in the Cleaning of Mung Bean Grain on a Cylindrical Milling Machine

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ABSTRACT: The article presents the results of experiments on the study of the mung bean grains. After analyzing the results, we determined the rational parameters of the grid.

KEY WORDS: mung bean, grain mixer, cylindrical sieve, stand, grain cleaning machine, guide screw, slope angle

I. INTRODUCTION

Today, food security and production of environmentally friendly products are becoming a topical issue in the world.

In our country, the cultivation of legumes, in particular mung bean, is growing every year. In order to earn additional income by re-sowing the double crop, farmers and dehkan farms are planting mung bean on the bulk of the land that has been cleared of winter grain. In addition, great attention is paid to the cultivation of soybeans and other legumes.

Mung grain must meet the requirements of FE "Uzbekozikovkatholding" in accordance with the procurement standards and GOST 7758-75, divided into fractions according to purity, moisture and size.

It should be noted that according to the biology of mung bean, the phase of flowering and fruiting lasts a long time. When the temperature is at an optimal level for plant development (22 ° - 25 ° C), the period of flowering, budding and ripening continues [1]. This in turn has a significant effect on the cleanliness and moisture level of the milled grain.

The moisture content of the grain mixture is increased mainly due to foreign compounds, i.e. stem pieces and unripe bean moisture. Due to the high sorbent (moisture absorption) properties of mung bean grain, milled mung bean grain should be quickly cleaned of foreign impurities, especially high-moisture compounds [2,3].

On farms, primitive methods of cleaning and sorting mung bean by size, such as manual natural wind or unscientific hand-held cleaning devices, are being used. This, in turn, leads to an increase in energy and labor costs and an increase in production costs, while the quality of work is not at the required level. Therefore, the development of a scientifically based, modern, simple in structure, energy and resource-saving, labor-intensive, cost-effective farming and farming machine for cleaning and fractionation of grain by size is one of the urgent tasks of today [4].

II. MATERIALS AND METHODS.

In this case, the machine for cleaning the grain and separating it into fractions according to the size of the line must meet the following requirements:

- must clean at least 99% of grains from coarse impurities;
- at least 98% of grains should be cleaned of fine impurities;
- grain yield should not exceed 0.05%;
- The content of grains in the coarse fraction should not exceed 5% of the grain in the fine fraction;
- grain breakage and damage should not exceed 1%.

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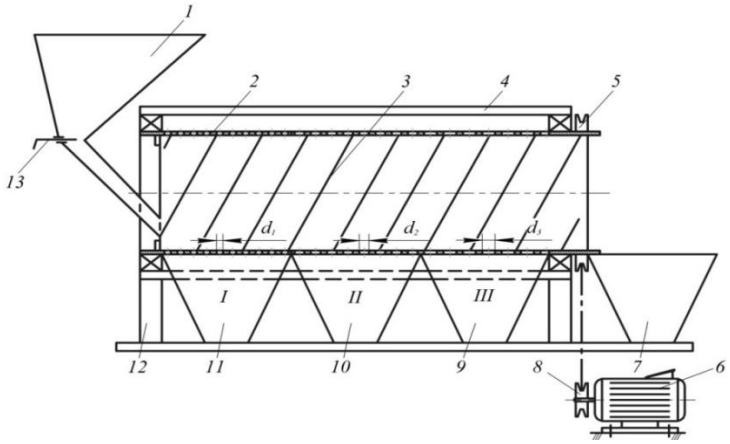
The Research Institute of Agricultural Mechanization has developed a simple, energy and resource-saving, labor-intensive, cost-effective farming and farming machine that separates the grain into fractions at the level of the above requirements (Picture 1).

The working process of the machine, which separates the mung bean grain into fractions, is as follows. The rotary motion of the cylindrical sieve 2 is transmitted by means of a belt drive from the electric motor 6. The grain mixture is then transferred from the bunker 1 to the cylindrical sieve 2 using the metering mechanism 13.

As the cylindrical sieve rotates, the grain mixture moves along the axis of the cylinder. In 1/3 of the cylindrical sieve (section I) the small joints pass through the sieve, the small joints section 11, and in the next 1/3 of the cylindrical sieve (section II) the size is 3.5 mm.

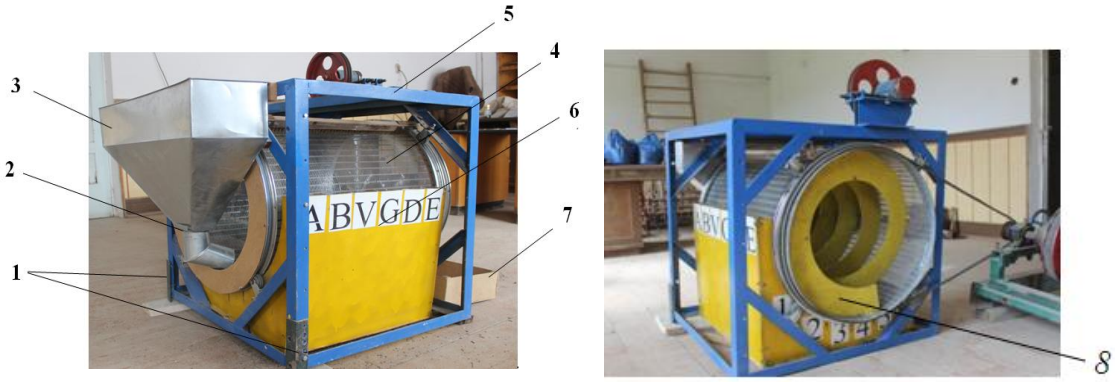


1– bunker; 2 - cylindrical sieve; 3 - screw guide; 4 – basis; Pulleys 5 and 8; 6 - electric motor; 7 - container for large compounds; 9,10 and 11 – calibrated grains and fine compounds compartment; 12– rama; 13-quantification barrier

Picture 1. Schematic diagram of the device for separation of mung bean grain into fractions

The largest grains are completely separated in the third part of the cylindrical sieve (section III) without passing through the sieve, the large grains that do not pass through the sieve, the large compounds that move down the cylindrical sieve and fall into the large joints. Collected at 7 p.m. As a result, the technological processes of cleaning and calibration of mung bean grain are carried out simultaneously.

A laboratory stand was prepared to study the separation of fine compounds in the machine and to study the parameters of the cylindrical sieve in experiments (Picture 2).



1 - a base that changes the angle of inclination of the ridge; 2 - quantification mechanism; 3 - bunker; 4 - cylindrical sieve; 5 - frame; 6 - square cell sampler; 7 - grain container; 8-guide screw.

Picture 2. Laboratory stand of the device for separation of mung bean grain into fractions

The laboratory stand consists of a sieve angle adjusting base 1, a weighing mechanism 2, a bunker 3, a cylindrical sieve 4, a frame 5, a square cell base 6, a grain tray 7 and a guide screw 8. The experiments on this stand

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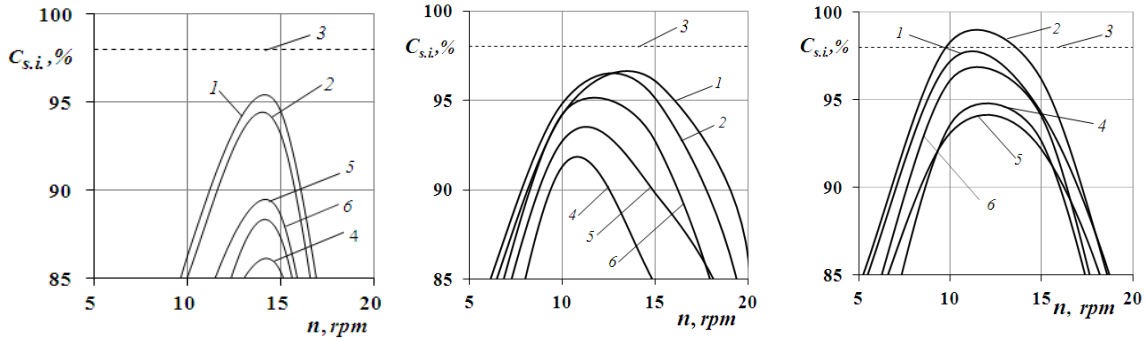
were performed with a cylindrical roller angle of 0 ° to 8 ° to 2 °, the number of revolutions from 5 rpm to 20 rpm and 5 rpm, and the pitch of the guide screw from 10 cm to 20 cm to 5 cm. The results obtained are shown graphically in Figure 3.

III. RESULTS AND THEIR ANALYSIS

According to the experimental results, the optimal number of revolutions for the separation of small compounds was 9-15 rpm, and the completeness of the separation of small compounds was observed in the range of 85.1% -98.3%, depending on the slope and screw pitch. When the sloping angle of the sieve was 2 ° -4 °, the completeness of the separation of small joints was slightly higher than other sloping angles, ranging from 94.3% to 98.3% depending on the number of revolutions of the sieve and the change of screw pitch.



a) guide screw pitch Sv = 10 cm; b) guide screw pitch Sv = 15 cm; c) guide screw pitch Sv = 20 cm

Picture 3. Complete separation of small joints depending on the number of revolutions of the cylindrical sieve, the angle of inclination and the pitch of the guide screw

When the angle of inclination of the 1st ridge is 4 °; When the angle of inclination of the 2nd ridge is 2 °; 3 is the required separation completeness limit; 4 when the angle of inclination of the beam is 8 °; When the angle of inclination of the 5th ridge is 6 °; 6 when the angle of inclination is 0 °.

The main factor influencing the separation of small joints is the pitch of the guide screw, the optimum number of turns and the pitch of the small joints at a slope angle of 10 cm, 15 cm is 85.1%, 94.2%, respectively, exceeding the required separation fullness. noted a low figure. During the experiments, changing the screw pitch to 20 cm, the separation of fine compounds increased to 98.7%, which resulted in a 0.7% higher than the required separation fullness.

IV. CONCLUSION

Based on the results of the experiment, the number of revolutions of the machine for separating the grain from the fractions in the range of 10 - 15 rpm, the angle of inclination - 2 ° - 4 ° and the pitch of the guide screw is set at 20 cm / min.

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