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JUSTIFY THE LONGITUDINAL DISTANCE BETWEEN THE BODIES OF THE COMBINED MACHINE

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ABSTRACT

The article presents the results of experimental studies to study the effect of the longitudinal distance between the bodies of machines for preparing the soil for planting potatoes on its agrotechnical and energy indicators. The longitudinal distance between the bodies has been substantiated.

Keywords: machine, potatoes, soil, housing, agrotechnical indicator, energy indicator, technology.

Introduction

The world's leading manufacturer of energy-efficient and high-yielding soil tillage and planting machines [1-13]. In this regard, the development of a constructive scheme of the device for preparing fields for potato planting and substantiation of the technological process, targeted research to ensure resource efficiency in the interaction of working parts with the soil are among the urgent issues. It is known that the potato is a plant for soft soils. It needs more deeply loosened soil, water, air and heat than other crops. Therefore, it is necessary to ensure that the spatial composition and density of the soil are in optimal condition. This creates favorable conditions for planting tubers, their growth and operation of machines with low energy consumption [1-5].

Preparation of soil for planting potatoes in the country consists of basic and pre-sowing tillage on the basis of traditional technology. The main tillage involves two agrotechnical methods - fertilization and plowing, pre-sowing tillage includes four agrotechnical methods - leveling, chiseling, mulching and germination [2]. These operations are carried out as a result of individual machines passing through the field several times. As a result, along with an increase in energy and resource consumption, the structure of the soil is disrupted, and ultimately productivity is reduced.

Taking into account the above, a machine was developed to prepare the soil for planting potatoes in one pass of the unit through the field [14, 15]. Studies have been conducted to substantiate the mutual arrangement of the body's main working body in the optimal scheme of the frame.

Literature review.

The problems of processing and preparing soils for sowing potato are considered in many published scientific works [1-13]. F. Mamatov, B. Mirzaev were engaged in research on the creation and use of machines for processing and preparing soil for sowing on ridges, studying their performance indicators and substantiating parameters, as well as studying the processes of interaction of working bodies with the soil [2-7, 10-12] , N. Aldoshin [8, 9], D. Chuyanov [7], I. Ergashev [5, 12], H. Ravshanov [7], and others. Machines and implements created as a

result of these studies are used in agricultural production with certain positive results. However, these studies have not sufficiently studied the issues of soil cultivation for sowing potatoes with the simultaneous formation of ridges, providing high quality work with minimal energy consumption. The aim of the study is to substantiate the longitudinal distance between the bodies of the machine for preparing the soil for sowing potatoes on the ridges.

Materials and methods

Theoretical mechanics, agricultural mechanics, laws and rules of mathematical statistics, mathematical planning of experiments and methods of tensometry were used in the research process. A laboratory-field device has been developed for experimental research. The basis of the laboratory-field device was a special frame made at the Research Institute of Agricultural Mechanization. In addition, special left and right housings were prepared to study the effect of the longitudinal distance between the device housings on the overturning process during the experiments.

During the experiments, the laboratory-field device was combined with a tractor MTZ-80 and used at speeds of 6 and 9 km / h. The soil of the experimental fields is gray soil with medium-heavy loam mechanical composition. Prior to the experiments, the moisture, density and hardness of the soil in layers of 0-5, 5-10, 10-15, 15-20 and 20-25 cm were determined by existing methods. The average moisture content of the soil in the 0-25 cm layer was 11.26%, hardness 3.27 MPa and density 1.56 g / cm^3. The quality of crushing of the treated layer soil was determined by taking samples from the area of 0.25 m^2 in six repetitions at the depth of cultivation.

Research results

In experiments, the effect of the longitudinal distance between the housings on the performance of the device was studied. Experimental studies were carried out by varying the longitudinal distance between the housings of the device from 0 to 600 mm with an interval of 200 mm. At the same time, the speed of the unit was set at 6 and 9 km / h, the width of the enclosures was 200 mm, and the working depth was 15 cm. During the experiments, the

longitudinal distance between the housings was changed by sliding them 10 and 11 across the longitudinal beams 5 and 7 (Fig. 1).

The experimental results are shown in Figures 2-4.

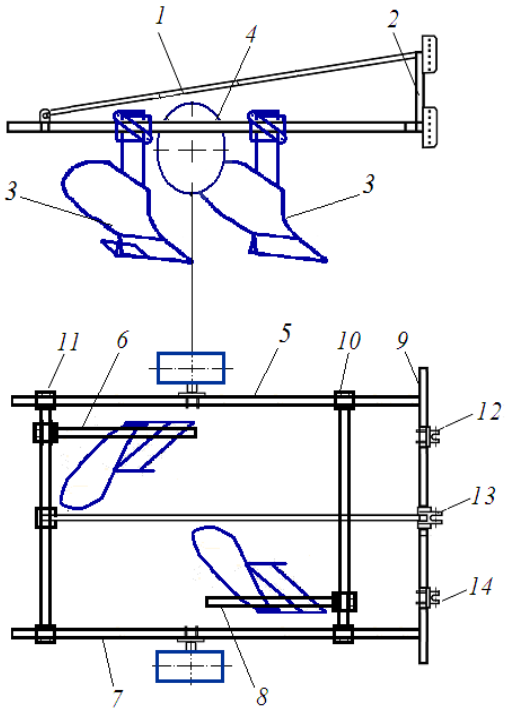

Figure 1. Design scheme of laboratory-field device: 1 - frame; 2 - hanging device; 3 - left and right bodies; 4 - base wheel; 5, 6, 7 and 8 - longitudinal beams; 9, 10, 11 - transverse beams; 12, 13 and 14 - brackets of the suspension device

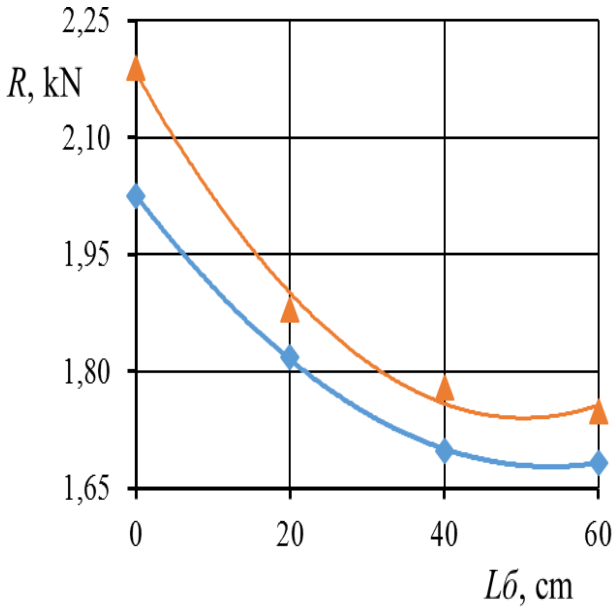

Figure 2. The change in the tensile strength (R) of the housings depending on the longitudinal distance (Lб) between them is shown in Figures 1 and 2, respectively, with operating speeds of 6 and 9 km / h.

The data show that at both speeds of the device, when the longitudinal distance between the bodies increases from 0 to 40 cm, the gravitational resistance decreases according to the law of the sunken parabola, and when it increases from 40 to 60 cm, this figure is almost unchanged.

This is mainly due to the occurrence of clogging of the processed blades between the housings.

An increase in the longitudinal distance between the working bodies from 0 to 60 cm at both speeds of movement of the working bodies of the device led to a decrease in the height (H) of the formed ridge profile according to the law of the concave parabola. This can be explained by the fact that as the longitudinal distance increases, the free overturning of the soil slabs under the influence of the hulls results in an increase in the lateral throwing distance of their fragments.

It was observed that the height of the ridge profile formed at both speeds was less than 24 cm at 35–60 cm values of the longitudinal distance between the bodies, i.e., below the required level.

In this case, the speed of movement of the device (at values of 6 and 9 km / h) did not significantly affect the height of the ridge profile.

The increase in the longitudinal distance between the bodies from 0 to 60 cm at both speeds of movement of the device led to a decrease in the degree of soil compaction, ie the amount of fractions with a mortality of less than 50 mm according to the laws of sunken parabola. The increase in longitudinal distance from 40 to 60 cm had little effect on this figure.

At values of splitting distances less than 40 cm, it was observed that the blades touched each other during the inversion with the right and left bodies. This improves the crushing of the soil at small values of longitudinal distance.

At both speeds, the degree of abrasion at all values of the longitudinal distance was more than 80 percent.

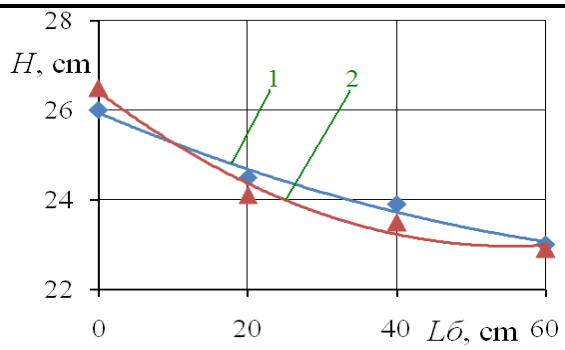

Figure 3. Depending on the height (H) of the ridge profile and the longitudinal distance (Lb) between the bodies, the change in graphs 1 and 2, respectively, the operating speed is 6 and 9 km / h.

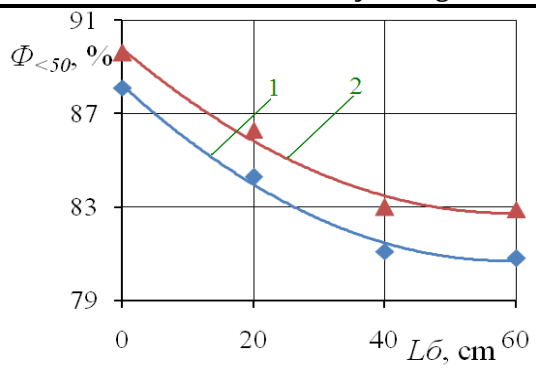

Figure 4. Depending on the degree of soil compaction (Φ <50) and the longitudinal distance (Lб) between the bodies, the change in graphs 1 and 2 is 6 and 9 km / h, respectively.

From the given data, it can be seen that at both speeds of the device, when the longitudinal distance between the housings is greater than 350 mm, the height of the pile profile, the degree of soil compaction is at the required level, no violation of the technological process of the machine was observed. When this distance is greater than 400 mm, the above values are almost unchanged. When the housings were installed in a line and the working surfaces were installed opposite each other, a sharp decrease in the degree of soil erosion and the height of the pile profile was observed due to the clogging of the overturned soil slab.

CONCLUSIONS

The agrotechnical and energy performance of the combined machine, which prepares the soil for planting potatoes, depends on the longitudinal distance between the hulls, and this distance should be in the range of 35-40 cm to ensure high quality of work with low energy consumption.

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