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Based on the length of the tilter wing of combined machine body preparation for potato planting

Almasova Munavvar Abdisamad kizi
student, Karshi Institute of Irrigation and Agrotechnologies of National Research University "TIIAME", Karshi, Uzbekistan

Abstract. The article presents the results of experimental studies on the influence of the length of the tipper wing of the machine body that prepares the soil for planting potatoes on the agrotechnical and energetic performance of the device. The hulls are based on the length of the flipper wing.

Key words: tipper wing, body, push, agrotechnical indicator, energy indicator

Introduction. In the agricultural production of our republic, comprehensive measures have been implemented to reduce labor and energy consumption, save resources, grow agricultural crops based on advanced technologies, and develop high-performance agricultural machines, including using less energy in preparing fields for planting potatoes. special attention is paid to the development of technical tools that ensure quality performance of all technological processes.

In the system of agrotechnical measures that ensure a high yield of potatoes, tillage takes the main place.

It is important to plant the potato plant in soft soil, given its high demand for moisture, air and light. Therefore, it is necessary to ensure that the spatial composition and density of the soil is in an optimal state. In this, favorable conditions are created for the planting of nodules, their growth and the operation of machines with low energy consumption [1; 14-15-б.].

Currently, soil preparation for planting potatoes consists of agrotechnical activities such as plowing, leveling, chipping, grinding and harvesting, which are carried out with separate aggregates, which leads to loss of moisture in the soil, prolongation of planting periods, and increase in operational costs.

Taking into account the above, a machine was developed that prepares the soil for planting potatoes in one pass of the aggregate through the field [2, 3]. Studies were conducted to justify the length of the body and the length of its tipping wing, which is considered the main working body of the machine.

Methods and results. A laboratory-field device was prepared for conducting experimental studies.

Experimental studies were conducted in order to study the effect of the length of the body tippers on the performance of the device. Also, in order to study the influence of the length of the flapper wing on the flapping process, special left and right flappers were prepared (Fig. 1).

For conducting experiments, tippers with wing lengths of 485, 515, 545 and 575 mm were prepared, the speed of the unit was 6-9 km/h, the working depth was 15 cm, and the longitudinal distance between the bodies was set to 400 mm.

The results of the study of the influence of the length of the tipper blade on the agrotechnical and energetic performance of the device are depicted in Figures 2-4.

When the length of the wing of the body increased from 485 to 575 mm at both speeds of the device's working bodies, the height (H) of the formed air profile first increased and then decreased according to the law of the bubble parabola.

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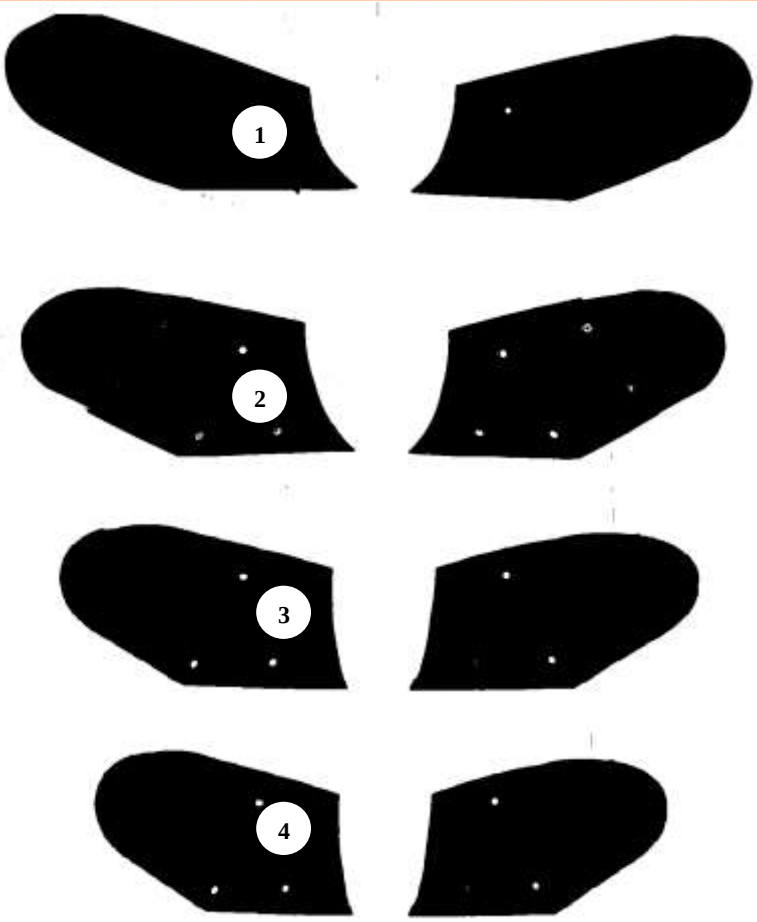
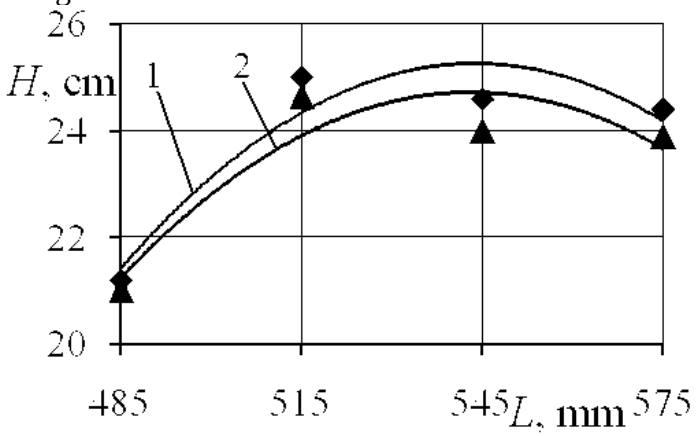


flippers with wing length ℓ = 575 mm (1), ℓ = 545 mm (2), ℓ = 515 mm (3) ℓ = 485 mm (4)

Figure 1. Tumblers prepared for conducting experiments

This is due to the change in the distance of the particles of soil coming out of the wing. At small values of the wing length (less than 500 mm), the main part of the soil particles is thrown to a small distance and does not fall into the center of the forming pile. At large values of the wing length (greater than 545 mm), the main part of the soil particles is thrown far, that is, at a distance greater than half the distance between the bodies. As a result, the height of the breast is reduced. At the values of the wing length in the range of 515-545 mm, a wing of the required height is formed.



1 and 2 operating speed is 6 and 9 km/h respectively

Figure 2. The graph of the change of the height of the pusher profile (H) depending on the length of the tipper wing (L)

At both speeds, when the wing length of the hulls increased from 485 to 575 mm, the fraction of soil erosion increased according to the parabolic law, that is, the amount of fractions smaller than 50 mm in size increased.

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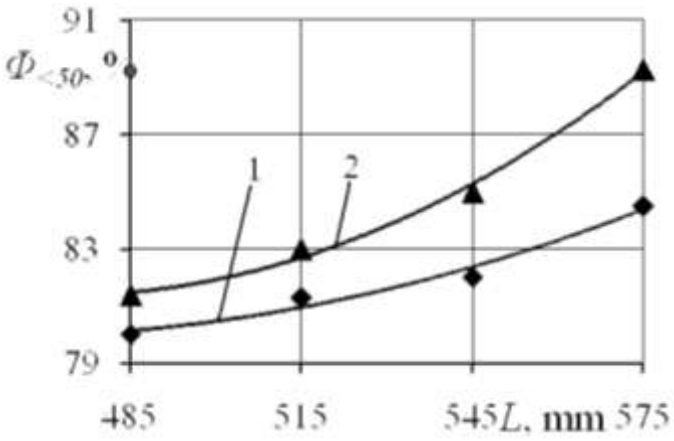


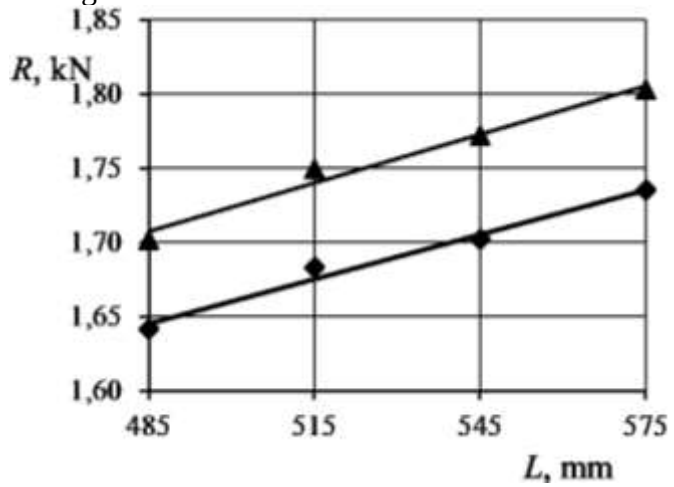
and 2 operating speed is 6 and 9 km/h respectively

Figure 3. The graph of the change of the degree of soil compaction ($F_{<50}$) depending on the length (L) of the tipper blade

This can be explained by the fact that with the increase in the length of the wing, the interaction time with the soil overturner increases.

At values of wing length less than 515 mm, the level of soil compaction does not satisfy agrotechnical requirements.

At both speeds, the drag of the hulls increased proportionally in a straight line as the wing length increased. This can be explained by increasing the frictional forces on the soil overturner as the wing length increases.



and 2 operating speed is 6 and 9 km/h respectively

Figure 4. A graph of the variation of hull drag resistance (R) as a function of the length (L) of the tipper wing

The curves depicted in Figures 2-4 can be expressed by the following empirical formulas determined by the method of least squares [4-5]:

when the working speed is 6 km/h

$H = -0{,}0001x^2 + 1{,}1252x+280{,}75$ ($R^2 = 0{,}8544$), cm;

$\Phi = 0{,}0003x^2 - 0{,}3063x+150{,}12$ ($R^2 = 0{,}9732$), %.

$R = 0{,}0007x + 0{,}7728$ ($R^2 = 0{,}9816$), кN;

when the working speed is 9 km/h

$H = -0{,}00011x^2 +1{,}2084x+303.31$ ($R^2 = 0{,}8948$), cm;

$\Phi = 0{,}0007x^2 - 0{,}7093x+249{,}1$ ($R^2 = 0{,}9948$), %.

$R = 0{,}0007x + 0{,}7858$ ($R^2 = 0{,}9772$), кN;

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Conclusions. Thus, the agrotechnical and energetic performance of the device directly depends on the length of the body tipper wing, and this distance should be in the range of 515-545 mm in order to perform the technological process with high quality of work with low energy consumption.

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