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Technology and machine tape preparation soil for seeding

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Abstract. Mutual arrangement is a combined machine that performs strip preparation of the soil for sowing. The scheme and the functional scheme of the combined machine are given. Analytical dependences and mathematical models for determining the distance between the support wheels are obtained. In this case, the methods of theoretical and classical mechanics are used. To conduct experimental studies, a strain gauge laboratory and field installation has been developed with the possibility of changing the sheet casing, the ripper, and the main housings. Machines were determined in experiments. The plowshare of the lister housing and the ripper of at least 40 cm, between the main body and the lister housing of at least 70 cm, high-quality soil preparation for sowing melons of the required degree with minimal traction resistance.

1 Introduction

Cultivation of pulses in Uzbekistan. In 2022, 71.5 thousand hectares of the area were cultivated with a crop of plums. 2% of the watermelon grown worldwide belongs to Uzbekistan. In Uzbekistan, the largest pulses are grown in Jizzakh, Sirdarya, and Khorezm (Fig.1). The expansion of arable land and the high yield from water crops largely depends on the technical means. Currently, plowing of fields for the planting of pulses is carried out with PLN-4-35, PLN-8-45, two-wound plow PYA-3-35 for general work, and reversible plow LD-100. The irregularities produced in the plowing are smoothed using grader-knife GN-4.0, chikeling with CHKU-4A chisel cultivators, boronation with ZBZS-1.0 boron, field molting with MV-6A is carried out, and then irrigation ditches are obtained. The preparation of fields for planting under existing technologies, especially those vacated by a grain, is carried out by 4-6 types of agricultural machinery and weapons. This consumption of labor, fuel, and other material costs, violation of soil, and the dissolution of the deadlines for preparing the soil for planting. Therefore, developing innovative technologies and technical means in cultivating melon crops is considered relevant.

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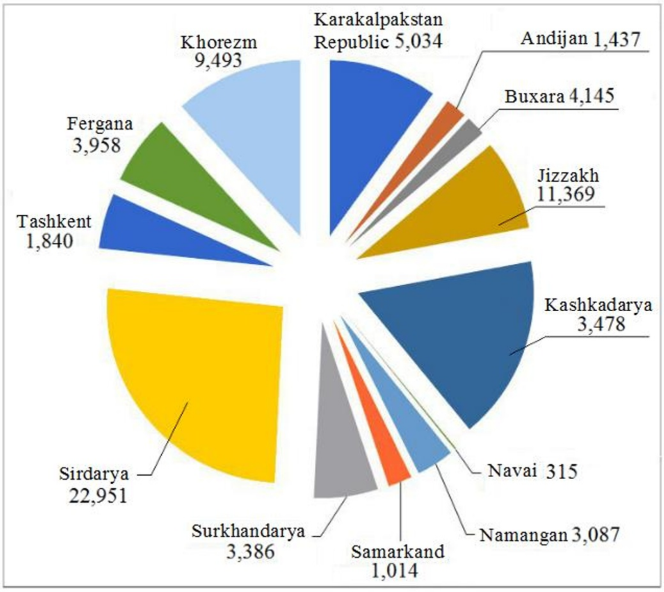

Fig. 1. In 2022, Uzbekistan produced crop of plums of sown area distribution per thousand [2, 6]

V Sakun [1, 10, 12], F Maiviatov [2, 6], K Donald [3], L Kaufman [4], Y Lobachevsky [5], F Mamatov [7], M Nichols [8], J Robert [9] strip processing and soil preparation, V Sackun [10], B Tulaganov [11], substantiation of the design and parameters of housings and rippers Y Lobachevsky [12-16], N Aldoshin [17], A Celik [18], K Romaneckas [19], E Sarauskis [20] and others. These studies mainly aim to substantiate the design of a combined machine that performs strip preparation soil for sowing.

2 Materials and methods

A laboratory-field device was prepared for the experimental justification machine (Fig.1). 2022 in the Kashkadarya region, the Republic of Uzbekistan. To determine the drag resistance, the device was equipped with tensometric fingers. In experiments, the device was 1.66-2.5 m/s. The field is medium-heavy loam soil. Soil moisture, hardness, and density in experiments State standard 20915-11 Agricultural machinery tests. Methods for determining test conditions.

Fig. 2. General species of laboratory-field device

The authors developed a method of lane cultivation soil and a machine for its implementation fields vacated by the gravelly for planting melon crops. The proposed technology, the following overlap terms of tillage and planting in the fields vacated by the autumn wheat; the need for short periods of preparation fields vacated by the wheat for the planting paddy crops; the fact that the working bodies have adapted the work processes to each other. The proposed technology (Fig.2) is carried out using a combination machine (Fig.3) as follows: on the planting area, a steep plane to a (Fig.3*a*), from the right and left part of the cut field to a width of b_1, and at a depth in this case, the bottom of the 2 and 3 pallets is loosened. The rest of the cut off by plast 1 and 4 a_2 depth and b_2 width and the plast that the domes have overturned are rolled left and right, respectively, along with 2 and 3 (3, *c*). Then the bottom area where the seeds are sown with honeycombs is deep softened 6 and 7 (3, *d*). After that, irrigation ditch 8 is formed (3, *e*). As a result, the planting zone is formed under the stepped plow. This, in turn, ensures moisture collection in the area where the bud's melon crop develops.

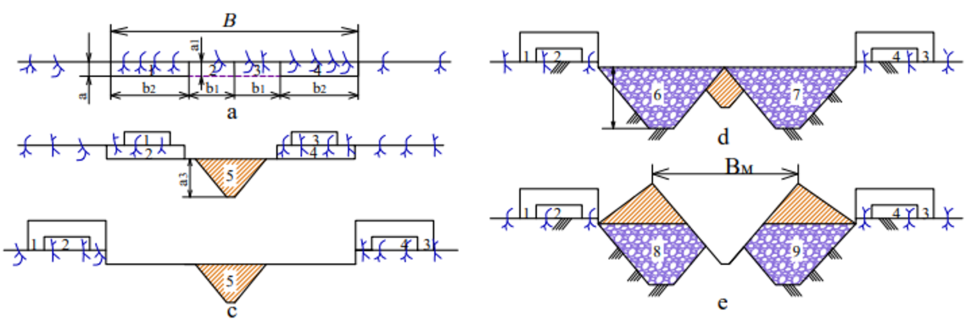

Fig. 3. Technological schematic view of procure fields for planting

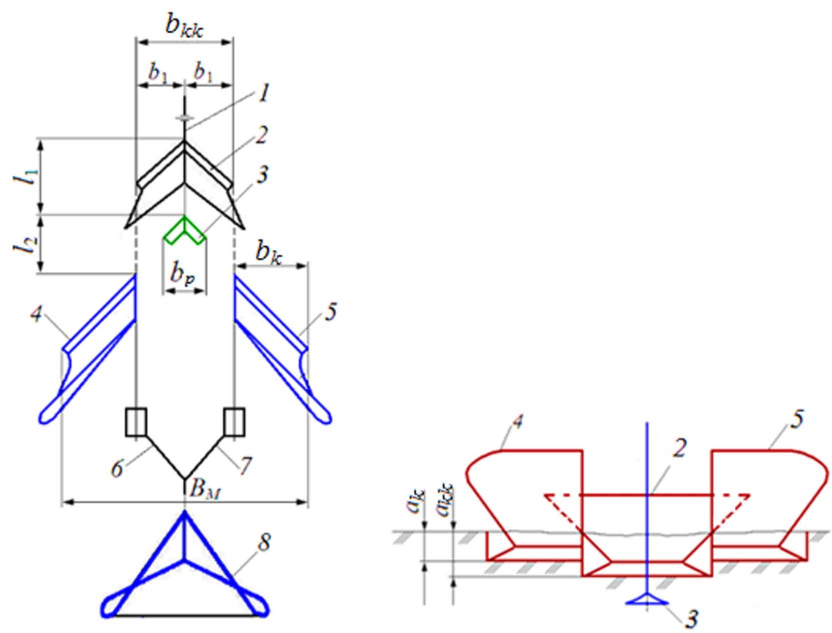

Fig. 4. Functional schematic view of machine: 1 is disc trowel; 2 is listernium housing; 3 is softener; 4 and 5 are bodies; 7 is deepeners; 8 is tool

The exclusion from the planting zone surface part field 8-12 cm deep in the planting area when the melon crop is planted in place of autumn wheat as a repeated crop allows it to be cleaned of plant residues and weed seeds. Carrying out work on soil with and without limestone together and deep loosening tapered soil. Performing the above operations in one way will maintain moisture in the fields vacated by the gravelly in which the soil is planted, saving material and energy resources at the expense of an aggregate passing through the field; that is, minimal soil processing is provided. The qualitative implementation crops with a combined machine depend on the mutual arrangement of working organs. Aimed at substantiating the interposition coskorpus and the emollient.

To justify the mutual arrangement of the working organs of the machine, it is advisable to zone to be treated with working organs. Based on the envisaged technology, the machine should process the zone where the seeds of the melon crop are planted after the grain. In this case, the machine must form a watering can so the seed can be planted in a row interval of 70-90 cm. We select the largest row spacing, that is, 90 cm, and the corridor to be processed (Fig.3).

$$B_{\text{ex}} \geq B_{\text{m}} + b_c + \Delta B, \qquad (1)$$

where b_c is the ecchi, m; B_{m} is in which the seed is sown, m; ΔB is the allowable deviation of the row spacing width, cm.

When B_{m}=90 cm, ΔB=2 cm and b_c=16 cm (2), the calculations on the expression showed that the width of the corridor to be processed, i.e., the planting zone, should be at least B_{ex}=108 cm.

The planting zone is treated with a double corpus and tipping bodies to the ten and left. Then their total coverage width is

$$B_{\text{ex}} = b_{kk} + 2b_k \qquad (2)$$

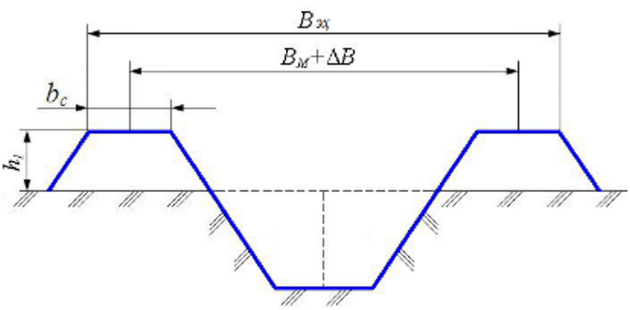

Fig. 5. Scheme for corridor to be processed

We determine the transverse distance between the base wheels from the condition that they move between the existing irrigation ditches in the field. Base wheels should be installed on the left and right sides of the rear panel, based on Fig. 4. In this case, the transverse distance between the base wheels

$$B_m = 2B_k \qquad (3)$$

Putting the value B_k=60 cm, we determine that (3) in terms of expression B_k=120 cm.

The base wheel and the main body are determined by the condition that the soil particles that are overturned by the frame do not touch the base wheel. Drawings 3 and 4 mainly aim

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to install the support wheels cowl.

The longitudinal distance from the softener muzzle to the frame plowshare muzzle is determined by the softener deformed soil zone does not touch the elements frame (Fig.5) From Fig. 5.

$$l_k = b_1 ctg\gamma, \quad (5)$$

$$l_{1y} = a_y ctg\psi_1, \quad (6)$$

where ψ_1 is fracture longitudinal direction, the degree.
Soil decomposes at the expense of displacement

$$\psi_1 = \frac{\pi}{2} - \frac{\alpha + \varphi_1 + \varphi_2}{2} \quad (4)$$

where φ_1, φ_2 are the external and internal friction angles of soil, respectively, °; α is the smoothing angle, degrees.

$$L_k \geq b_1 ctg\gamma + a_y ctg\left(\frac{\pi}{2} - \frac{\alpha + \varphi_1 + \varphi_2}{2}\right). \quad (8)$$

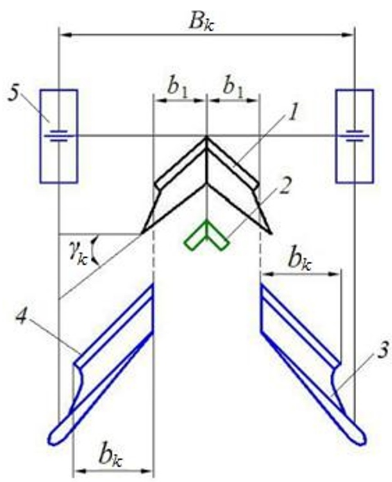

Fig. 6. Scheme for determining mutual location of machine work organs

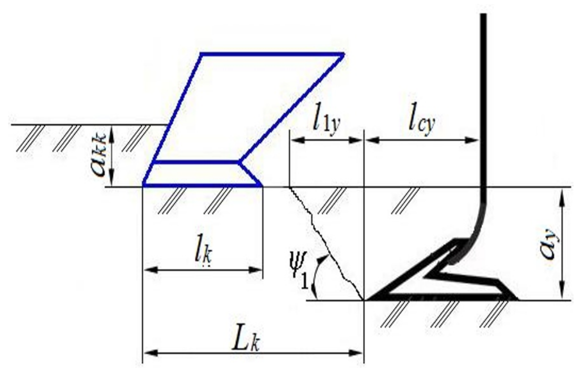

Fig. 7. Scheme for determining longitudinal distance from emollient to frame

$$L_k \geq l_k + l_{1y} \quad (4)$$

(8) we determine that the longitudinal distance from the emollient muzzle to the emollient muzzle must be at least 0.37 m by putting α=25°, φ_1=25°, φ_2=35°, a_y=0,12 m, b_1=0,23 m, γ=42°ва ψ=45° to the emollient muzzle.

3 Results and discussion

Emollient and the frame 50 cm with an interval of 10 cm. In this case, the aggregate was determined to be 6.0 and 9.0 km/h; the softener was determined to be 12 cm, couplers were determined to be 45 cm. As a criterion for assessing the performance indicators of the softener, it was accepted to weigh the soil abrasion and softener level. The results obtained softener and the frame at both speeds, the soil abrasion bubble parabola level, while softener decreased according to the bottleneck parabola. At small values of longitudinal distance, there were cases of clogging between the joint with a deformed soil loosener. A deterioration in the level soil abrasion tensile resistance softener. And when this distance is greater than 35 cm, the soil deformed with the softener does not reach the structural elements frame in front of it, soil utilization is improved, and softener to pull is reduced. After the longitudinal distance had increased from 40 cm, the softener remained unchanged, while the level of soil abrasion did not change significantly. Emollient and the frame should not be less than 40 cm level of soil loosening.

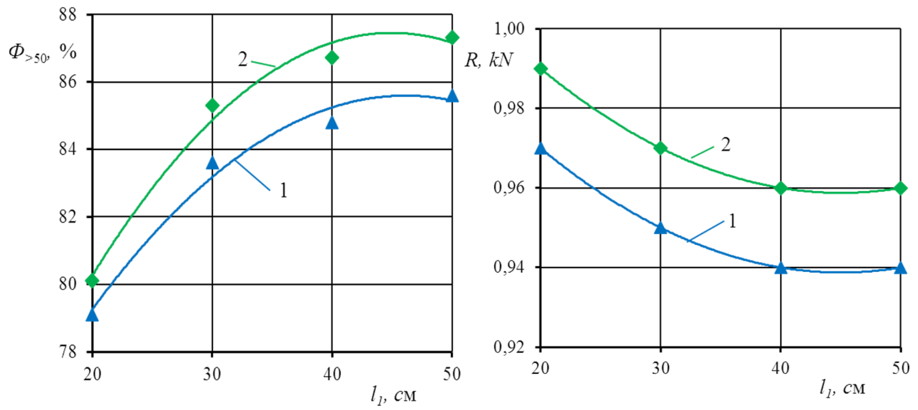

Fig. 7. Graphs of change depending on the degree of soil abrasion (Φ<50) and the longitudinal distance (l_1) between the joint with the softener's drag resistance: 1 and 2 working speeds (6 and 9 km/h), respectively

In experimental studies, the coverage width and processing depth of the double body were determined to be 45 cm and 12 cm, respectively, and the coverage width and processing depth right and left tipping bodies were determined to be 35 cm and 12 cm, respectively. When basing the distance between the double hull and the main hull, their total drag resistance was taken as an evaluation criterion. The obtained results are presented in Fig.7. Double body at both speeds, their total resistance to drag decreased according to a concave parabola. It can be explained overturned slab cut by the double hull at small values longitudinal distance falls into the deformation zone of the overturned slab hull. In this case, before the double hull can be completely overturned, the main body will affect the zone where it is laid. The traction resistance does not change after the main body and the double body exceeds 70 cm.

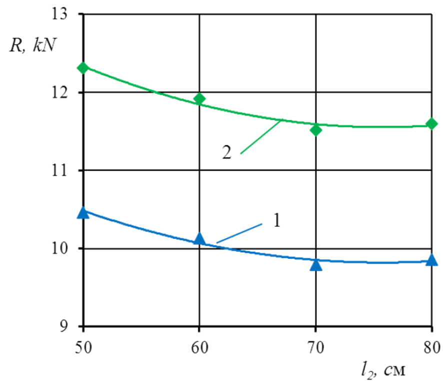

Fig. 8. Graphs of variation of double body and main body depending on longitudinal distance between them (l2): 1 and 2 operating speed respectively (6 and 9 km/h)

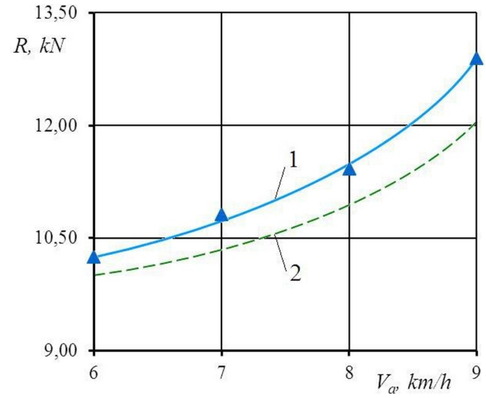

Fig. 9. Variation experimental and theoretical studies, respectively

According to the information above, the case and the double case should not be less than 70 cm to perform the technological process at the required level with low energy consumption. According to Fig.8, the device, which consists of a double body and softener, increased according to a concave parabola with increasing speed.
The machine's traction resistance is presented in Fig.9, the car, device bubble parabola. In this case, according to the expression (12).

4 Conclusions

Energy and resource-saving technology of strip preparation of fields empty of grain for planting pulse crops. The planting zone is to lay the plows on the its outer parts, and the outer part of the plows is placed on the sides along with the plows laid on them. Threshing, and then deep softening of the plow bottom of the area where the seed is planted, and creates opportunities for forming an irrigation ditch. Based on theoretical studies, analytical connections and mathematical models were obtained that allow the longitudinal and transverse distances between the support wheels and the housing. The minimum longitudinal distance from the blade nose of the combined machine body to the softener is 40 cm, the support wheels are located double body, the transverse distance between them is 120 cm, the double body, and the right and left cutting bodies of 70 cm allows the field to be prepared at the required level for planting rice crops.

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