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SUBSTANTIATION OF THE ARRANGEMENT OF SUBSOILERS ON THE MACHINE FRAME

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Annotation:
The article studies the influence of the arrangement of subsoilers on the machine frame on its agro technical and energy performance indicators. The layout of subsoilers on the machine frame is grounded.

Keywords. Combined machine, melons and gourds, subsoiler, plow scheme, frontal scheme, inclined stand, traction resistance.

Introduction

The development and application of energy-saving and high-yield soil tillage and preparation for planting is a world leader [1-13]. At the same time, great attention is paid to the development and application of combined machines, which combine all the technological processes of tillage and preparation for planting in one pass from the field to plant crops under the film.

The aim of the study is to substantiate the layout on the machines for preparing the soil for sowing melons under the tunnel film.

Literature review

The problems of the location of the working bodies on the frame of tillage machines are considered in many scientific works [1-13]. Research on improving soil preparation technologies for sowing melons, creating machines for melon growing, substantiating the structures and parameters of their working bodies were carried out by F. Mamatov, B. Mirzaev [1-8, 10-12], D. Chuyanov [7] and others. F. Mamatov, B. Mirzaev [1-8] substantiated and developed working bodies for the main tillage for sowing melons and other crops. D. Chuyanov's research [7] is devoted to soil preparation for sowing melons in autumn in open ground. N. Aldoshin and I. Ismailov [13] substantiated the design and parameters of the machine leveler. Thus, all these studies are aimed at substantiating the design schemes of technical means of processing for preparing the soil for sowing melons in open ground. The results of these studies cannot be applied when preparing the soil for sowing melons under a tunnel-type film.

Materials and methods

The basic principles and methods of classical mechanics, mathematical analysis and statistics were used in this study.

Research results

New energy-saving method of soil preparation for planting melons under closed tunnel film prepares the row for planting in the fall [2]. To implement this method, a constructive scheme of the combined machine was developed. The main working body of this machine is the sinker. It is known that there are a number of design schemes for the placement of sinkers in the frame. Applying certain design schemes to develop a machine for planting melons directly under a tunnel-covered film can lead to a reduction in the basic performance of the machine. The pits are basically made according to one technological scheme: the working bodies are mounted in

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a row by moving in the direction of movement and width of coverage relative to each other. In such a scheme, the overall dimensions and mass of the weapon increase, which in turn can lead to a number of technological shortcomings.

To substantiate the scheme of placement of deep softeners in the frame, experimental tests of four technological schemes of their placement in the frame were conducted [1]: 1 - scheme of working bodies with right and left softeners (Fig. 1a); 2 - plug-type scheme (Fig. 1b); 3 - frontal opposite working organ (Fig. 1c); 4 - frontal oblique working organ (Fig. 1d). The total coverage width of the pits was taken to be 70 cm, taking into account the constructive coverage width of the pits.

In the experimental studies, the longitudinal distance between the pits was 70 cm in the classical method mounted on the machine frame, i.e. in the plug-type scheme and in the right and left softening working body schemes where the working surfaces were placed opposite each other.

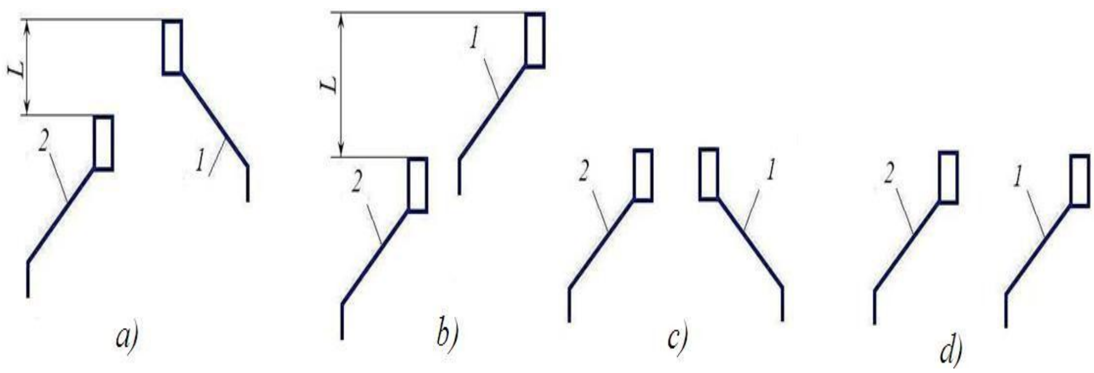

Figure 1. Schemes of mutual arrangement of working bodies in a frame: a - right and left working organ placed opposite each other by sliding relative to each other; b - plugsimon; c- frontal opposite working organ; d - frontal oblique working organ

At the same time, the speed of the machine was set in the range of 6-9 km / h, the maximum processing depth was set at 30 sm. The results of the experiments are presented in Table 1.

1 – table. Variation of agrotechnical and energy performance of deep softeners depending on the scheme of their placement in the frame

T/p	Name of indicators	Scheme of placement of deep softeners							
		Option 1		Option 2		Option 3		4-option	
1	Travel speed, km / h	6,3	7,5	6,3	7,5	6,3	7,5	6,3	7,5
2	Processing depth, sm; M average. ±σ	28,6 1,07	29,9 1,06	28,8 1,08	29,2 1,05	28,5 1,33	29,3 1,28	28,7 0,95	29,1 1,11
3	The amount of fractions of the following size (mm), % >50 50 -25 <25	5,0 6,6 88,4	4,1 5,3 90,6	5,9 5,7 88,4	5,2 4,8 90,0	8,2 11,7 80,1	5,7 11,4 82,9	9,2 14,6 76,2	8,4 12,4 79,2
4	The height of the unevenness of the field surface, sm	2,3	2,7	2,5	2,8	3,9	4,4	3,8	4,2
5	Gravity resistance of sinks, кН	6,10	6,41	6,13	6,46	7,6	7,78	7,6	7,78

It is clear from the data provided that all options on agro-technical indicators ensure the quality of tillage. Schemes a and b on the plane of the field surface have a slight advantage. In the c and d - schemes of the weapon, cases of accumulation of soil between the working bodies during the work were observed. Therefore, in these variants, an increase in gravity resistance, a decrease in the degree of soil compaction, and an increase in the height of the unevenness of the field surface were observed. According to schemes 1 and 2, the height of the ridges on the field surface ranged from 2.3 to 2.8 sm.

According to the results of experiments on the study of the stable movement of the weapon on the working depth, when the soil is loosened to a depth of 28-29 cm, all options meet the agro-technical requirements at different speeds. The arithmetic mean deviation of the machining depth is ± (0.95-1.33) sm. In the experiments, the right and left side variant pits with opposite working surfaces have the best traction resistance.

Figure 2 shows the results of energy evaluation of different layout schemes. As can be seen from the graphs in Figure 2, in all speed modes the right and left working body circuit and the plug-

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type circuit, which are placed opposite each other by sliding the working bodies relative to each other from the studied positioning schemes, have the lowest traction resistance. This is explained by the fact that when the working bodies are placed frontally, all working bodies work in a closed cutting condition, only the anterior working body of those in the plug scheme and the right and left working bodies placed opposite each other sliding relative to each other.

The resistance of the variant in the right and left working body circuit, which is placed opposite each other by sliding relative to each other, is slightly less than the drag resistance of the variant in the plug circuit. This is because in the scheme of the right and left working bodies, which are placed opposite each other by sliding relative to each other, the lateral constituents of the forces acting on the working organs are directed in opposite directions. This leads to a decrease in the resistance to falling on the field board and, accordingly, the resistance to total traction.

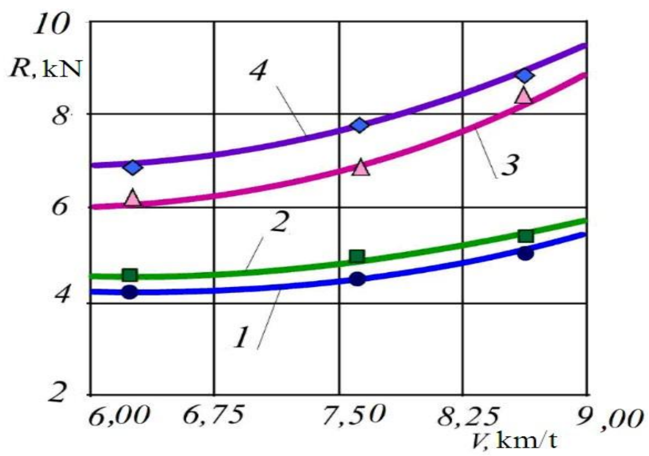

Figure 2. Graphs of velocity-dependent changes in the gravity resistance of sinks: 1 - right and left working organ placed opposite each other by sliding relative to each other; 2 – plug type; 3 - frontal opposite working organ; 4 - frontal oblique working organ

Studies have shown that recesses have a gravitational resistance of 1.5–1.7 times greater under closed cutting conditions than under semi-closed cutting conditions.

In a combined machine, it is advisable to use a scheme with a working body with right and left bevel handles, which are placed opposite each other by sliding relative to each other. The agro technical and energy performance of the working bodies in this scheme depends on the rational values of the longitudinal and transverse distances between them.

CONCLUSIONS

The pits of the combined machine are bent to the right and left, their working surfaces and bent parts are oriented to each other and the pair is placed relative to each other in the longitudinal plane.

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