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The Results of Experiments the Width of the Soil Deeper Like Crushing Angle and Its Impact on Studying Performance

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ABSTRACT

This article presents the results of experiments on the improvement of the plow, equipped with compacted soil plows in the main tillage, in particular, the loosening of the subsoil with plowing, and the effect of the crushing angle of the soil compactor on its performance.

KEYWORDS: Plug, Soil Deepener, Screed Softener, Drive Underlayment, Berch Compensation, Crushing Quality, Energy-Material Volume, Technology.

INTRODUCTION

Extensive measures are being taken to reduce labor and energy consumption in agricultural production, save resources, care for agricultural crops on the basis of advanced technologies and the development of high-efficiency agricultural machinery and their working bodies. The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 sets out the tasks, including "... the introduction of intensive methods of agricultural production, first of all, modern water and resource-saving agro-technologies, widespread use of high-yield agricultural machinery." .In order to achieve the above objectives, the Action Strategy for the Development of the Republic of Uzbekistan for 2017-2021, including Section 3, Section 3.2, Paragraph 7, states “reduction of energy and resource consumption in the economy, widespread introduction of energy-saving technologies, expansion of renewable energy sources, Section 3, Section 3.3, which focuses entirely on “Modernization and Accelerated Development of Agriculture”, shows the positive work being done to further reform agriculture [1].

One of the distinctive aspects of agriculture in Uzbekistan is that it is based on the cultivation of crops using irrigated lands with a strong agro-irrigation system. Three-quarters of arable lands in the country are irrigated. Therefore, the development of agriculture is associated with the development of mechanized processes in order to increase the productivity of irrigated fields in the future. It is known that in Bukhara region there are more than 140,000 hectares of arable land with gypsum, gravel and sand in the subsoil. processing is required. According to the agro-technical requirements for plowing and deep loosening, the upper fertile part of the crop area should be turned upside down, the lower gypsum, gravel and sandy part should be loosened to a depth of 10-15 cm without overturning [2].

One of the factors influencing the agrotechnical and energy performance of a soil plow is the angle of penetration of this plow into the soil. Based on the results of theoretical research, in experiments, the angle of penetration of the scaffold into the soil of its working excavator was changed from 25 ° to 40 ° (Fig. 2), its width was 70 mm and length was 15 cm. The speed of the device accepted to be 6.0 and 8.0 km / h.

Results of experiments Shown in Table 1. Table 1 and The data in Figure 3 show that an increase in the angle $\alpha_б$ from 25° to 30° at both speeds of the aggregate led to an improvement in the quality of soil compaction, while an increase from 30° to 40° led to a deterioration in this value. This can be explained by the fact that the size of the lumps separated from the soil under the influence of the working body changes in many respects depending on the angle $\alpha_б$. When α=30-35°, the dimensions of the blocks may have a minimum value.

Table 1. The results of experiments on the study of the angle of penetration of the soil, the angle of penetration into the soil

№	Name of indicators	The value of indicators							
		The angle of entry of the working organ into the soil, °							
		25		30		35		40	
		Aggregate speed, km / h							
		6	8	6	8	6	8	6	8
1	Processing depth, cm								
	M_{med}	15,0	14,8	15,2	15,3	14,9	15,0	14,7	14,8
	$\pm\sigma$	1,18	1,04	1,24	1,43	1,17	1,11	1,30	1,24
2	The following dimensions (mm) the amount of additives,%								
	>100	5,9	5,5	4,6	4,5	4,7	5,7	8,2	7,8
	100<50	16,8	15,3	13,6	11,6	15,5	12,6	16,2	14,8
	<50	77,3	79,2	81,8	83,9	79,8	81,7	75,6	77,4
3	Gravity resistance kN	0,80	0,96	0,74	0,86	0,78	0,91	1,00	1,24

а) ***б)*** ***в)*** ***г)***

Figure 1. The angle of entry into the soil 25°(*а*), 30°(*б*), 35°(в) and 40°(*г*) soil deepeners

Increasing the speed from 6 km / h to 8 km / h has led to an improvement in the quality of soil compaction.

Changes in the angle of entry of the working body into the soil in the range of 25^0-40^0 did not significantly affect the depth of tillage.

The gravitational resistance of the working organ varied in the form of a sunken parabola depending on its angle of entry into the soil, i.e. it decreased in the 25-30^0 angle range and increased in the 30-40^0 angle range. This can be explained by the fact that a decrease in the size of the lumps released from the soil under the influence of chisel leads to a decrease in the amount of energy expended to break it down, and an increase in its volume.

The degree of soil compaction, ie the proportion of small soil fractions of 50 mm and the change in gravity of the working body depending on its angle of entry into the soil can be expressed by the following empirical formulas:

a) when the unit speed is 6.0 km / h

$$\Phi_{<50} = -5{,}935 + 5{,}513\,\alpha - 0{,}087\,\alpha^2,\ \% \quad (R^2 = 0{,}9587) \quad (1)$$

$$R = 3{,}3513 - 0{,}1734\,\alpha - 0{,}00287\,\alpha^2,\ \text{kN} \quad (R^2 = 0{,}9716) \quad (2)$$

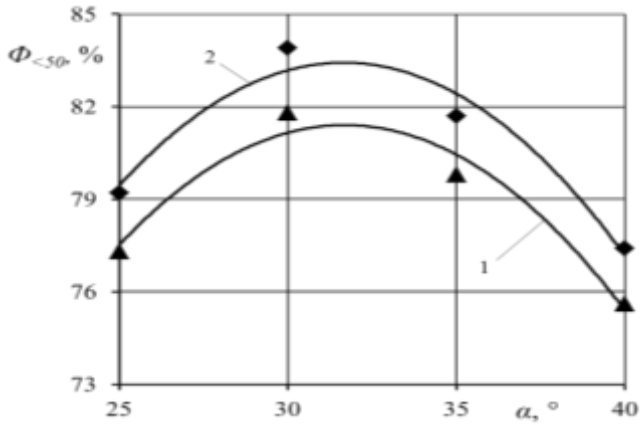
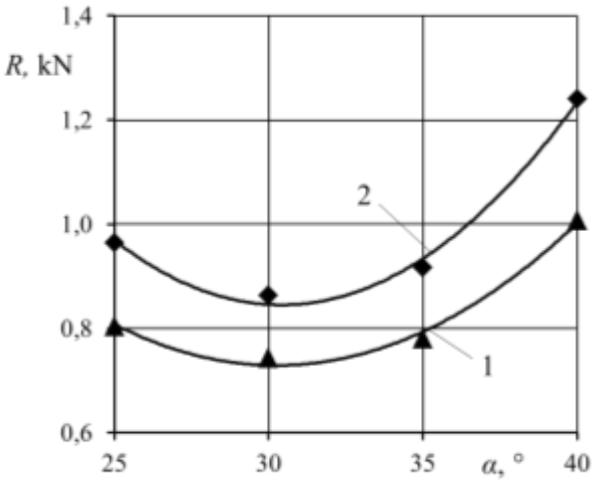


Figure 2. Graph of the change in the quality of soil compaction depending on the angle of penetration of the excavator into the soil



1-6 km / h; 2-8 km / h

Figure 3. Graphs of change of gravity resistance of the device depending on the angle of penetration of the excavator into the soil

б) when the unit speed is 8.0 km / h

$$\Phi_{<50} = -6{,}76 + 5{,}698\,\alpha - 0{,}09\,\alpha^2,\ \%\quad (R^2 = 0{,}9526) \qquad (3)$$

$$R = 4{,}7608 - 0{,}2575\,\alpha + 0{,}00423\,\alpha^2,\ \text{кН}\quad (R^2 = 0{,}9309) \qquad (4)$$

in this α – the angle of penetration of the excavator shaft into the soil

(α = 25-40° interval).

After studying the degree of soil compaction and the gravitational resistance of the excavator to the extremum [3,4,5], the maximum value of the soil compaction level and the minimum gravity resistance should be in the range of 30-35^0.

Laboratory-field device has been developed to study the issues identified in the experimental research program. This device is designed to be able to soften the subsoil during the plowing process itself. After the main plug body, the sinker is installed 10-15 cm deeper than it, and through it the body lemexi is cut and the "plug heel" is broken (Fig. 4).

The device is made of suspension for tractors of 3-4 classes (Magnum 8940, MX-135, MXM-140, MXM-240, New Holland T7060) [6.7.8].

Figure 4. General view of the developed soil deepening plug.

Equipped with an experimental soil plow hoist, base wheel, housings and soil deepeners equipped with an experimental soil deepening plug hoist, the longitudinal distance between the body of the plow and the soil pit mounted on the back of it, the distance between the ground pit mounted on the back of the tractor wheel and the first body of the plow, and the working depth of the soil pit can be changed over a wide range. (Figure 4).

The purpose of the proposed technical solution is to improve the reclamation of the soil by loosening the topsoil .(plowing with simultaneous loosening of the subsoil layer) and reduce the pull resistance of the plug during plowing [9.10].

Scientific studies show that this device simultaneously achieves energy savings by softening the subsoil layer and improving the movement stability of the plug.

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