THE EFFECT OF THE UPPER SOFTENER OF THE SLOPED COLUMN WORKING BODY WORKING ON THE SOIL OF GARDEN FIELDS ON THE ENERGY INDICATORS

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Abstract. *In the article, the qualitative and energetic parameters of the upper softener attached to the working body with an inclined column, which works between the rows of the garden without a tiller, in soil cultivation are presented with the analysis of the theoretical and experimental studies conducted, and the calculations of the indicators are analyzed through formulas and graphs.*

Keywords: *slope, softener, soil, energy, coverage, resistance, high, experience, parameter, indicator.*

INTRODUCTION. In the world, the use of energy-resource-efficient and high-performance technical tools for the main processing of the garden occupies one of the leading positions. In the world, scientific and research work is being carried out aimed at the development of new scientific and technical solutions of energy-resource-efficient soil protection technologies and weapons that implement them. In particular, it is possible to show the works in the directions of creation, development, technological processes and parameters of ground tillage tools and their working parts.

ANALYSIS AND METADOLOGY OF ANTIQUITIES.

Based on the analysis of the technical tools and weapons that work between garden rows abroad and in our country, as well as the agrotechnical requirements for them, an improved plug-softener for working between garden rows without a tiller was developed. The works carried out by Fayzullayev H., Mirzayev B., Mamatov, F., D. Chuyanov, S. Toshtemirov were analyzed on the theoretical analysis of working soil with inclined columns and the softeners attached to it.

DISCUSSION. The coverage width of the upper softener should be such that there should not be an unsoftened area on the field surface under the influence of neighboring softeners, that is, the field surface should be fully softened.

The soil between the upper softeners can be softened to the required level when the height of the lump formed in the field softened with softeners is at least half of their processing depth.

$$b_{yy} \leq M - a_{yy} ctg\theta.$$

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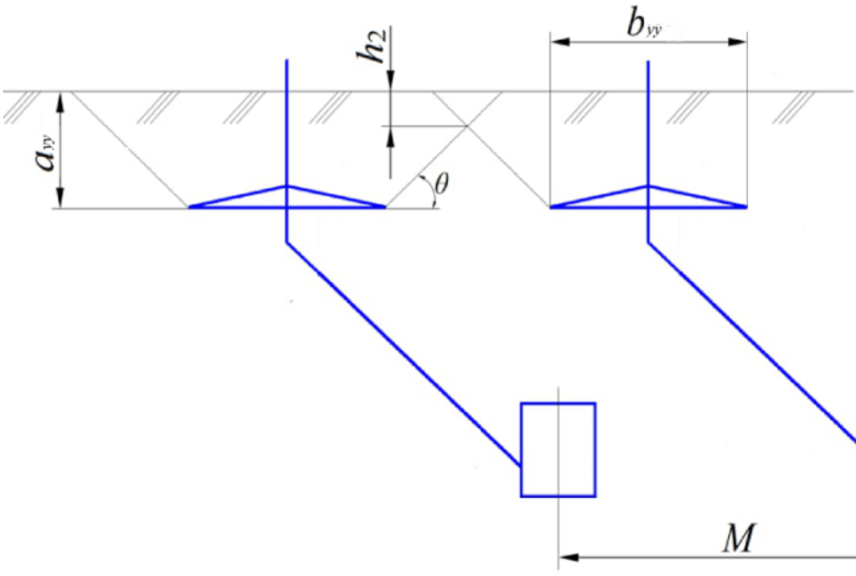


Figure 1. Scheme for determining the coverage width of the upper softener

Taking a_{yy}=8-10 cm M=30 cm and $\theta=45^o$, we determine that the coverage width of the upper softener should be in the range of 20-22 cm.

Using the formula of V.P. Goryachkin, we express the tensile strength of the high softener through the physical and mechanical properties of the soil, the width of the softener coverage and the speed of movement of the weapon during its operation.

$$R_{yx} = (K_y + E_y V^2) b_{yy} a_{yy}, \tag{2}$$

where K_y is the relative resistance of the upper softener, kN;

E_y – Speed to drag resistance of high softener the coefficient that takes into account the effect;

V - movement speed, m/s.

In order to analyze and verify the results of the theoretical studies, the following were included in the program of experimental studies in order to determine the parameters of the plug-softener, which works between garden rows without a tipper, which ensures the quality of work at the required level while reducing energy consumption:

development and construction of a laboratory-field device for conducting experimental research;

researching the technological scheme of placement of working bodies with inclined columns for working between garden rows on their agrotechnical and energetic indicators (soil compaction quality, tillage depth and traction resistance);

research of the influence of constructions of working bodies with inclined columns on their agrotechnical and energetic indicators (quality of soil compaction, height of scythes at the bottom of the soil, depth of cultivation and resistance to traction);

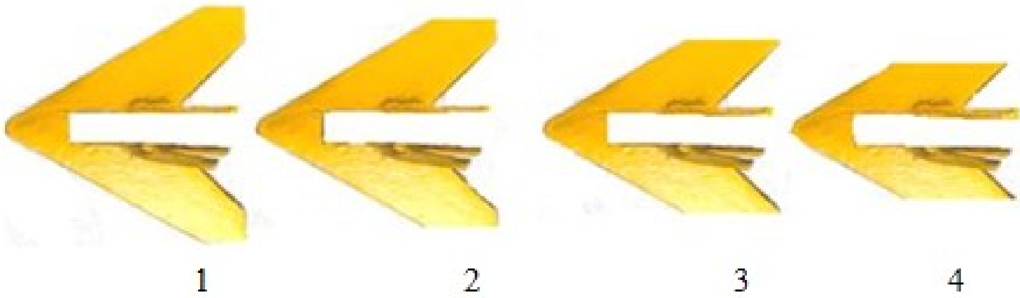
researching the influence of transverse and longitudinal distances between working bodies with inclined columns equipped with high softeners on its agrotechnical and energetic indicators;

to study the effect of the parameters of the upper softener of the inclined column working bodies on their agrotechnical and energetic indicators (the quality of soil compaction, tillage depth, plow unevenness and traction resistance);

to study the influence of the parameters of the bottom softener (width of the softener, grinding angle and speed of movement) on their agrotechnical and energetic indicators (quality of soil grinding, tillage depth, height of scythes at the bottom of the soil, resistance to traction);

using the method of mathematical planning of experiments, justifying the optimal values of parameters of softeners of plug-softener working bodies.

In order to study the influence of the parameters of the high bullet-shaped softener on the agrotechnical and energetic performance indicators, softeners with different coverage widths and grinding angles were prepared (Fig. 2).



b=25 cm (1); b=20 cm (2); 15 cm (3); 10 cm (4)

Figure 2. Bullet-type top softeners prepared for conducting experiments

In experimental studies, the coverage width of the upper softener was changed from 10 cm to 25 cm with an interval of 5 cm. In this case, the movement speed of the unit was 6.0 and 9.0 km/h, the working depth of the working body with an inclined column was 28 cm, the working depth of the upper softener was 10 cm, and its grinding angle was determined as 20º.

THE RESULT. The degree of compaction of the soil and the traction resistance of the working bodies were taken as the criteria for evaluating the performance of the device.

According to the obtained data, it was found that with the increase in the coverage width of the high softener at both speeds of the device, the degree of compaction of the soil increased according to the convex parabola, and the resistance to traction increased according to the law of the concave parabola. After the softener cover width increased to 20 cm, the level of soil compaction did not change, and the resistance of the working bodies increased sharply.

The graphical relationships presented in Figure 3 can be expressed by the following empirical formulas determined by the method of least squares:

according to soil compaction

V_1=6 km/h when $y = -0{,}0615x^2 + 2{,}7343x + 56{,}234$ ($R^2 = 0{,}9989$), %; (3)

V_2=9,0 km/h when $y = -0{,}0519x^2 + 2{,}4243x + 59{,}779$ ($R^2 = 0{,}9999$), %; (4)

in terms of tensile strength

V_1=6 km/h when $y = 0{,}0017x^2 - 0{,}0329x + 3{,}0695$ ($R^2 = 0{,}9999$), kN; (5)

V_2=9,0 km/h when $y = 0{,}0023x^2 - 0{,}0532x + 3{,}3746$ ($R^2 = 0{,}9748$), kN. (6)

Thus, in order to ensure the minimum traction resistance and required level of soil compaction, the coverage width of the upper softener should be in the range of 18-22 cm.

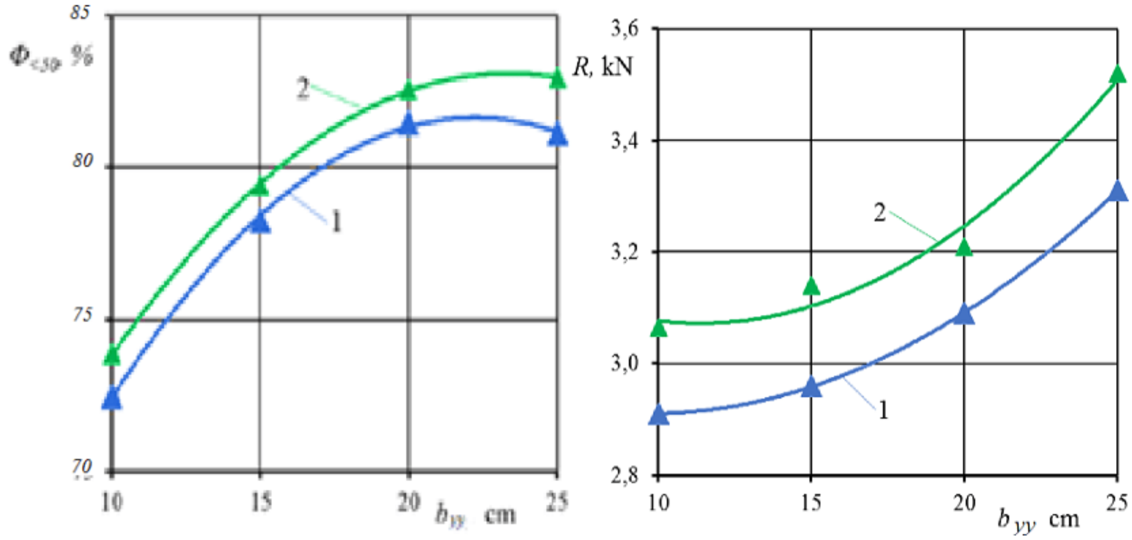


Figure 3. Variation of the degree of soil compaction (*Φ*<50) and the traction resistance *(R)* of the inclined column working body depending on the width of the upper softener coverage (b_{yy})

In experimental studies, the processing depth of the upper softener was changed from 4 cm to 12 cm with an interval of 2 cm. In this case, the movement speed of the unit was 6.0 and 9.0 km/h, the working depth of the working body with an inclined column was 28 cm, the angle of the upper softener was 20º, and the coverage width was 22 cm.

The degree of compaction of the soil in the area where it is processed and the traction resistance of the working bodies were accepted as criteria for evaluating the performance of the device. According to the results of the study, with the increase of the processing depth of the high softener at both speeds of the device, the degree of soil compaction first increases according to the bubble parabola, and then slightly decreases, and the traction resistance increases according to the law of the bubble parabola. After the depth of softening treatment increased to 8 cm, the level of soil compaction decreased.

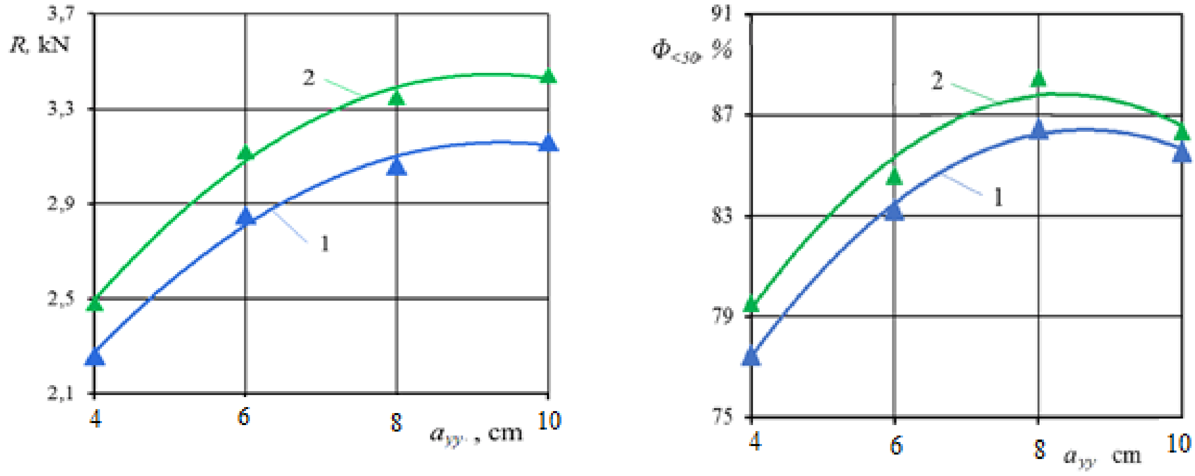


Figure 4. Variation of the degree of soil compaction (*Φ* <50) and the traction resistance (*R)* of the inclined column working body depending on the depth of the high softener tillage (a_{yy})

The graphical relationships presented in Figure 4 can be expressed by the following empirical formulas determined by the method of least squares:

according to the degree of soil erosion

V_1=6 km/h when $y = -0{,}1042x^2 + 1{,}9389x + 77{,}4$ ($R^2 = 0{,}9974$), %; . (7)

V_2=9,0 km/h when $y = -0{,}113x^2 + 1{,}9634x + 79{,}283$ ($R^2 = 0{,}9744$), %. (8)

in terms of tensile strength

V_1=6 km/h when $y = -0{,}0077x^2 + 0{,}1646x + 2{,}2735$ ($R^2 = 0{,}9925$), kN; (9)

V_2=9,0 km/h when $y = -0{,}0086x^2 + 0{,}1809x + 2{,}4935$ ($R^2 = 0{,}9935$), kN. (10)

CONCLUSION. According to the results of the research, it is desirable that the working depth of the upper softener should be in the range of 7-10 cm in order to ensure the minimum traction resistance and the level of soil compaction at the required level.

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