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Administration of Fundamentals of the Combined Agreement Designed with Discontinent Translation

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ABSTRACT: The article presents the results of multivariate experimental studies to substantiate the optimal values of the rotation frequency of the milling drum, the number of knives, the stiffness of the elastic element of the composite driven gear pulley and the kinematic mode of operation of the proposed combined unit for presowing tillage and sowing of small seeded vegetable crops.

KEYWORDS: Optimization, experimental, composite driven pulley, combined unit, torque, stiffness, speed, planning, knife, traction resistance

I. INTRODUCTION

The aim of the work was to investigate the gravity resistance and cropping quality of the combined pre-sowing and seeding vegetable crops on the soil equipped with an active milling drum with a gear-driven gear transmission mechanism. It is desirable to carry out experimental studies using rubber with different elasticity. According to research and analysis, thanks to the deformation of the rubber drum, the drum drives in the desired mode and improves the quality of soil crushing [1].

Based on theoretical and experimental investigations, the proposed compound bulk gear transmission was applied to the combined aggregate transmission mechanism. The method of mathematical planning of experiments was used to reduce the number of experiments conducted using the new gear-driven gearbox transmission set in the combine unit transmission mechanism [2, 3].

II. METHODOLOGY

At the same time, the following factors were identified as the factors affecting the operation of the combined milling drum and the rotational torque on the shaft: Kinematic operating mode of the milling drum; the number of blades in it; The elasticity coefficient of the elastic element (rubber) in the leading shear structure.

Influencing, that is, the input factors were coded:
X_1 – kinematic operation of the milling drum;
X_2 - number of blades, pieces;
X_3 – Elasticity coefficient of elastic element (rubber), N / m.
The values of the selected input factors are shown in Table 1.

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Table 1. The values of the selected input factors are shown in

Name of the factor	Encoded icon	The real value of the factor			Range of change
		-1	0	+1	
kinematic operation of the milling drum	X_1	3	4	5	1
number of blades, pieces	X_2	3	4	5	1
Elasticity coefficient of elastic element (rubber), 10^5 N/m.	X_3	0,25	0,35	0,45	0,1

The data obtained from the experiments were processed based on regression analyzes. In this case, the Cochrene criterion was used to estimate the uniformity of the dispersion, the Student's criterion for estimation of the regression coefficients, and the Fisher's criterion for evaluating the adequacy of the regression models [4].

III. EXPERIMENTAL RESULTS

The results of the experiment were processed in the prescribed manner and the following regression equations that adequately described the evaluation criteria were obtained:

- torque of the milling drum shaft, *Nm*

$$Y_1=80,1+2,86X_1+0,537X_2+0,808X_1X_2-1,4X_1X_3+1,417X_2^2-1,292X_2X_3-6,3X_3^2 \quad (1)$$

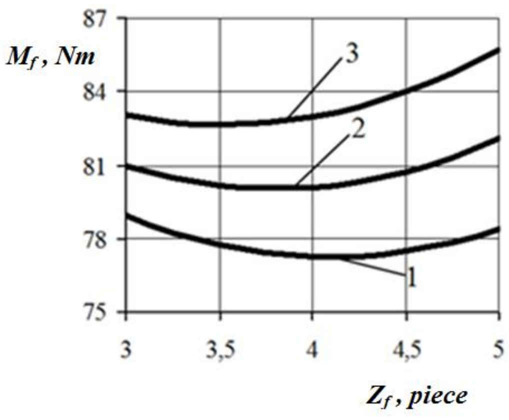
- total resistance of one section of the machine to pull, *N*

$$Y=621,248-82,713X_1-8,05X_2-27,827X_3-68,764X_1^2-49,021X_1X_2+$$
$$+37,004X_1X_3+5,219X_2^2+32,413X_2X_3+9,235X_3^2 \quad (2)$$

- soil separation, %

$$Y_3=80,173-8,44X_1+2,47X_2-3,637X_3+3,377X_1^2-1,404X_1X_2+2,754X_1X_3-$$
$$-2,306X_2^2+2,712X_2X_3+0,760X_3^2 \quad (3)$$

The graph in Figure 1, based on the regression equation (1) that results from the research, shows that the kinematic operation of the milling drum increased the torque of the milling drum, and the increase in the number of blades changed the resistance torque with the parabola law.



1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5

Fig 1. Graph of the momentum resistance of the drum shaft on the number of blades

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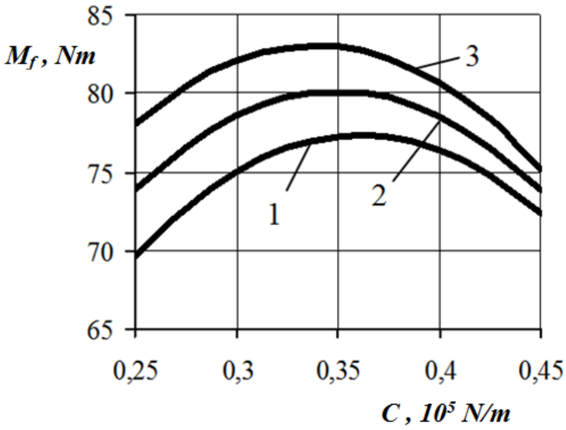
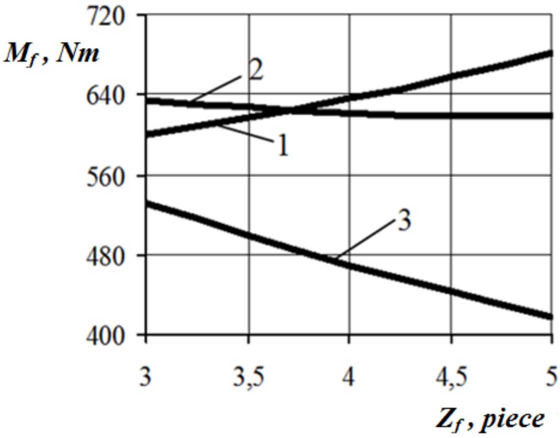
(2) in the regression equation and the graphical links in Figure 2 can be seen that the value of the milling drum shaft resistance torque decreases by the inverse parabola law by increasing the elasticity coefficient of the bulk element by 25000 N / m to 45000 N / m. Here too, the milling drum increased the kinematic operation mode, which increased the value of the torque of the milling drum shaft.



1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5

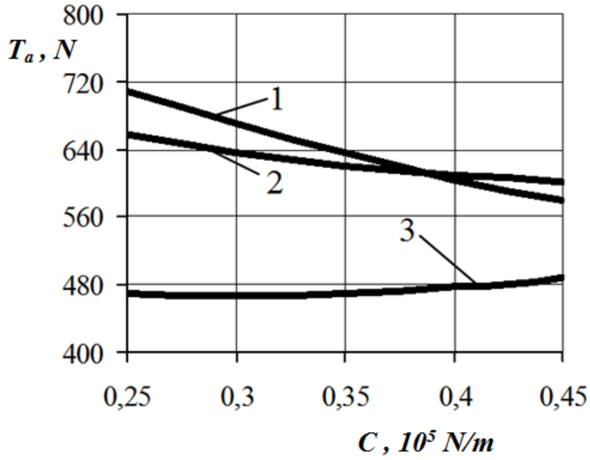
Fig 2. Graph of dependence of the moment of resistance on the drum shaft of the drum with the coefficient of elasticity

(3) with the regression equation and the kinematic operating mode, as shown in Figure 3, the aggregate resistance of the aggregate to the traction decreased with the curve regularity, but the overall resistance to gravity decreased with the number of blades on the milling drum, but increased when the kinematic mode was 3 (Fig. 4).



1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5

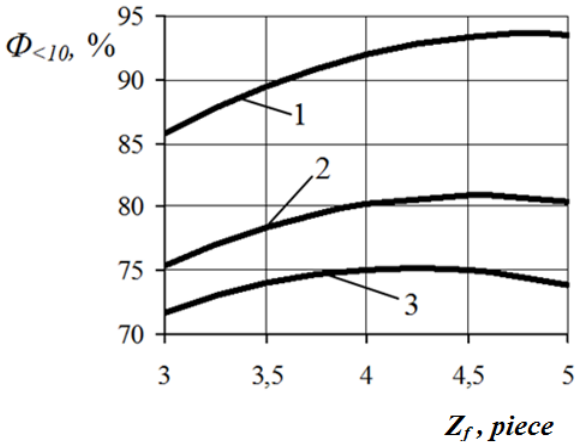
Fig 3. Graph of the total resistance of the aggregate to the number of milling drum knives



1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5

Fig. 4 Graph of dependence of aggregate resistance of aggregate on the coefficient of elasticity of the elastic element

As can be seen from the graph in Figure 5, the soil crunch quality increased with the increase in the number of milling drum knives, and with the increase in the kinematic mode. However, the graph in Figure 6 shows that the soil moisture quality declined with the increase of the elasticity coefficient of the elastic element in the skewness.



1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5
2-
Fig 5. Graph of the quality of soil crushing by the number of blades on the milling drum

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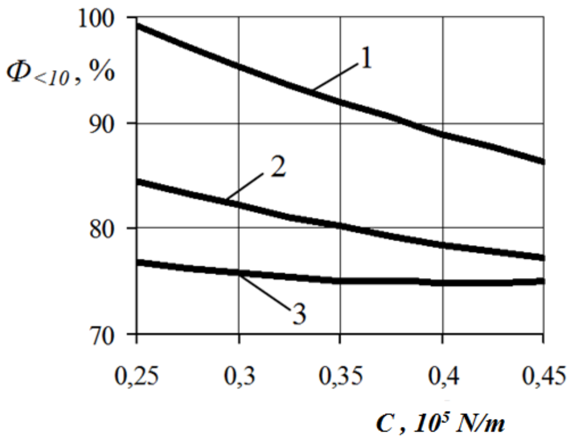

1- kinematic mode 3; 2- kinematic mode 4; 3- kinematic mode 5
Fig 6. Graph of the dependence of soil moisture quality on coefficient of elasticity of elastic elements

(5.1) - (5.3) regression equations $y_1 \rightarrow min$, $y_2 \rightarrow min$, and y_3 Let us determine the optimal parameters of the parameters: milling drum operation mode 4, blade number 4, and elastic element 35000 N / m.

IV. CONCLUSION AND FUTURE WORK

According to full-scale experiments, the kinematic operation of the milling drum is 4, the number of blades in it is 4 pieces, and the elastic element has a coefficient of 35,000 N / m to provide the required soil quality with minimal energy consumption. These results are consistent with the values found in theoretical studies. For example, in theoretical studies it is recommended that the number of blades is 4, the kinematic mode is in the range of 3.9-4.5, and the elastic element elasticity is 32000-54000 N / m.

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