ISSN 2515-8260 Volume 09, Issue 07, 2022

UDK 631.3.06

DETERMINATION OF THE ACCEPTABLE VALUES OF THE PARAMETERS OF THE COMBINED MACHINE SOFTENER CLAW USED IN PRE-PLANTING PROCESSING

B.Gaybullayev

Senior lecturer of the Department of Agricultural Machinery and Technical Service Organization of the Andijan Institute of Agriculture and Agrotechnologies, PhD. Andijan, Uzbekistan

R.Mahmudov

Senior lecturer of the Department of Agricultural Machinery and Technical Service Organization of the Andijan Institute of Agriculture and Agrotechnologies, Ph.D. Andijan, Uzbekistan

I.Abdimuminov

Senior lecturer of the Department of Agricultural Machinery and Technical Service Organization of the Andijan Institute of Agriculture and Agrotechnologies, Ph.D. Andijan, Uzbekistan

Annotation. In the article presented the parameters of the softening pad, i.e., its width, angle of entry into the soil, radius of curvature and aggregate movement speed, level of soil compaction, the height of unevenness formed at the bottom of the softened layer, and the height of unevenness formed at the bottom of the softened layer, are at the level of agrotechnical requirements. Multifactorial experiments were conducted according to the Hartley-4 plan. In this case, the level of soil compaction, i.e., the amount of fractions smaller than 50 mm in size, the height of irregularities formed at the bottom of the softened layer, and the tensile strength of the softening pad were taken as evaluation criteria. The data obtained in the experiments were processed by the "PLANEXP" program developed in the experimental-testing department of RIAM, and regression

ISSN 2515-8260 Volume 09, Issue 07, 2022

equations were obtained that adequately represent the evaluation criteria. In this case, Cochran's criterion was used to evaluate the uniformity of variance, Student's criterion was used to evaluate the value of regression coefficients, and Fisher's criterion was used to evaluate the adequacy of regression models. The obtained regression equations are the degree of soil compaction, that is, the amount of fractions smaller than 50 mm in sizeNot less than 80 percent, the height of irregularities formed at the bottom of the softened layer not more than 2 cmand the optimal values of the parameters were determined by jointly solving the conditions of the minimum value of the tensile strength of the softener pawl.

Key words. Combined machine used in pre-planting tillage, softener blade, width of softener blade, angle of entry into the soil, radius of curvature, level of soil compaction, i.e. the amount of fractions smaller than 50 mm in size, height of unevenness formed at the bottom of the softened layer, traction resistance, speed of movement, acceptable values.

Introduction. It is known that land preparation for seeding is carried out by medium BZSS-1.0 and heavy BZTS-1.0 and BZTX-1.0 gear harrows, ChK-3.0, ChKU-4A chisel-cultivators, RVN-8.5 leveler-compacter, VP-8.0 pre-planting leveler, MV-6.0 and MV-6.5 trowel-levelers are used [1-3]. But this leads to deterioration of the physical and mechanical properties of the soil, a lot of moisture loss from the soil, and an increase in fuel consumption and other costs. In addition, the machines used for tilling the land before planting do not meet modern requirements such as minimal and economical tillage.

Based on the above, in the cultivation of cotton, grain and other agricultural crops in RIAM, a combined method that performs all technological processes in one pass through the field for processing the land before planting, that is, loosening the land to a specified depth, forming a soft soil layer on the surface of the field, leveling and ensuring compaction to the required level machine was developed [4, 5]. The machine consists of a frame, a suspension device installed on it, supporting

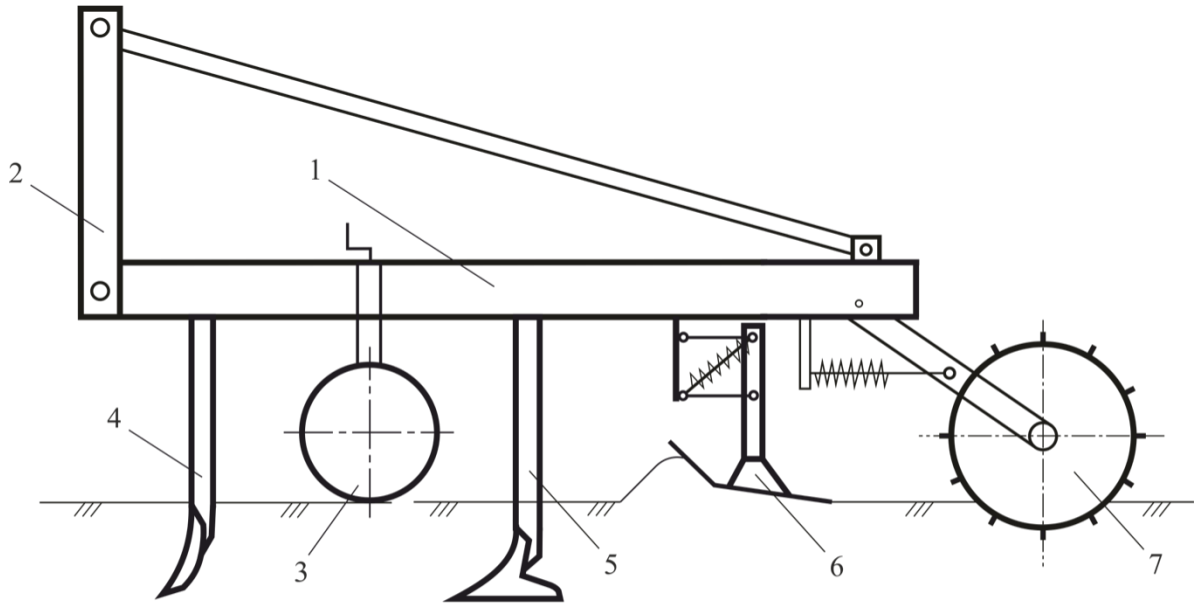
ISSN 2515-8260 Volume 09, Issue 07, 2022

wheels and working bodies, which, depending on the process performed, consist of a softener and arrow-shaped claws (further softeners), a leveler-compacter, and a planar roller.

This article presents the results of multi-factorial experiments conducted to determine the optimal values of the parameters of the combined machine softener pawl used in pre-sowing tillage.

The developed device consists of a frame, a softener and bullet-shaped claws placed in series, a leveler-compacter and a plate roller.

Figure 1 shows the structural scheme of the device, and Figure 2 shows its front (a) and side (b) views.



1-Frame; 2- suspension device; 3- base wheel; 4 and 5- soft and arrow-shaped claws; 6-leveler-compressor; 7-plate coil

Figure 1. The structural scheme of the device

Materials and research methods. Softener pawwidth*b*, soil penetration angleα, radius of curvature*r*and aggregate movement speed Vthe level of soil compaction, the height of irregularities formed at the bottom of the loosened layeraccording to the Hartley-4 plan, in order to determine the optimal values that ensure the level of agrotechnical requirements with low energy consumption [6, 7] conducted multifactorial experiments. Table 1 lists the factors, their designations, change intervals and levels.

ISSN 2515-8260 Volume 09, Issue 07, 2022

a)

b)

Figure 2. Front (a) and side (b) views of the device

ISSN 2515-8260 Volume 09, Issue 07, 2022

Table 1.

Intervals and levels of change of factors

Factors and their definition	Unit of measure	of factors				
		encoded character	change interval	levels		
				lower (-1)	main (0)	high (+1)
1.The width of the softener pawl	mm	X_1	10	50	60	70
2.The angle of entry (rubbing) of the softener paw into the soil	º	X_2	10	20	30	40
3.The radius of curvature of the damper blade	mm	X_3	10	200	250	300
4. Aggregate speed	km/h	X_4	1.5	6.0	7.5	9.0

The data obtained in the experiments were processed according to the program "PLANEXP" developed in the experiment-testing department of RIAM.

In this case, Cochran's criterion was used to assess the uniformity of variance, Student's criterion was used to assess the value of regression coefficients, and Fisher's criterion was used to assess the adequacy of regression models [6].

Research results and their discussion. The experimental results were processed according to the specified program, and the following regression equations were obtained, which adequately represent the evaluation criteria:

- according to the level of soil fertility (%)

$$Y_1 = 79{,}594 + 0{,}681\ X_1 + 8{,}082\ X_2 + 2{,}405\ X_3 + 0{,}536\ X_4 + 3{,}826\ X_1^2 + + 0{,}0488\ X_1X_2 - 0{,}693\ X_1X_4 - 6{,}622\ X_2^2 - 4{,}808\ X_2X_4 + 2{,}331\ X_3^2 - - 6{,}992\ X_3X_4 + 1{,}318\ X_4^2;$$

(1) - according to the height of irregularities formed at the bottom of the softened layer (cm)

$$Y_2 = 2{,}312 - 3{,}249\ X_1 + 0{,}148\ X_3 - 0{,}387\ X_4 + 1{,}263\ X_1^2 - 0{,}084\ X_1X_2 +$$

ISSN 2515-8260 Volume 09, Issue 07, 2022

$$+ 0{,}033\ X_1X_3 + 0{,}231\ X_1X_4 - 0{,}774\ X_2^2 + 0{,}445\ X_2X_3 - 0{,}152\ X_2X_4 - 0{,}193\ X_2X_3 + 0{,}850\ X_4^2; (2)$$

- according to the tensile strength of the softener pawl (kN)

$$Y_3 = 1{,}635 - 0{,}382\ X_1 + 0{,}440\ X_2 + 0{,}170\ X_3 + 0{,}403\ X_4 + 0{,}197\ X_1^2 - 0{,}145\ X_1X_2 + 0{,}017\ X_1X_3 - 0{,}900\ X_1X_4 + 1{,}361\ X_2^2 - 0{,}264\ X_2X_3 - 0{,}194\ X_2X_4 - 0{,}816\ X_3X_4 + 0{,}255\ X_4^2. \quad (3)$$

It can be seen from the obtained regression equations (1)-(3) that all factors had a significant impact on the evaluation criteria.

From the analysis of equations (1)-(3), it can be seen that the specific resistance of the combined machine, the unevenness of the bottom of the softened layer, and the level of soil compaction have a complex relationship with the studied factors. As the width of the softening pad increases, the level of soil compaction and the unevenness of the bottom of the softened layer decreases, and the relative resistance increases. As the grinding angle of the softener blade increases, the grinding degree of the soil first increases (up to 25-30°), then begins to decrease, the specific resistance of the combined machine first decreases, then increases. As the radius of curvature of the working surface of the softener paw increases, the degree of compaction of the soil decreases, and the specific resistance increases. Increasing the speed of the machine leads to an increase in soil compaction and relative resistance.

When determining the values of the parameters that ensure the quality of work at the required level with low energy consumption, the regression equations (1)-(3) were solved together for speeds of 6 and 9 km/h using the Excel program "search for a solution" on a PK "Pentium IV" computer [8]. When solving the regression equations together, the criterion «Y_1» that is, the size of the treated layer is less than 50 mmthe amount of soil fractions should not be less than 80 percent, the «Y_2» criterion should not exceed 10 percent of the processing depth, that is, 2 cm, and the «Y_3» criterion should have a minimum valueconditions were accepted. The obtained results are presented in Table 2.

ISSN 2515-8260 Volume 09, Issue 07, 2022

Table 2.

Optimal values of the softener pawl of the combined machine

V (X_4)		b(X_1)		a(X_2)		r(X_3)	
Encoded	Natural, km/h	Encoded	Natural, cm	Encoded	Natural, °	Coded	Natural, mm
-1	6.0	0.2182	6.20	0.0029	28º52′	-0.3934	269.35
0	7.0	0.3074	6.15	-0.0045	29º02′	0.3741	246.41
1	9.0	0.4886	6.40	0.0064	30º21′	-0.4869	225.14

So,combined carthe width of the softener blade to ensure the required quality of work with low energy consumption at working speeds of 6-9 km/h Between 6.2-6.4 cm, ground entry angle between 29°-30°, radius of curvature between 225-269 mmshould be. At these values of the factorslevel of soil erosion 80.6-82.2%, the height of the irregularities formed at the bottom of the softened layer was 1.59-1.91 cm, and the tensile strength of the softening pad was 1.53-1.98 kN.

Conclusion. According to the results of the conducted multi-factor experiments, the width of the combined machine softener blade is 6.2-6.4 cm, the angle of entry into the soil is 29°-30° in order to ensure the quality of work at the required level with low energy consumption at working speeds of 6-9 km/h. in the range, the radius of curvature should be in the range of 225-269 mm.

LIST OF USED SOURCES

1. Sokolov F.A. Agronomic bases of complex mechanization of cotton growing. - Tashkent: Fan, 1977.-224p..

2. Model technology cards for care and production of agricultural crops, (Part I). - Tashkent, 2016. - 138 p.

3. Adjustment and efficient use of cotton and grain machinery. - Tashkent: Science, 2012. - 192 p.

4. Tuhtakuziev A., Abdimuminov I. Establishing the Earth Etrange

ISSN 2515-8260 Volume 09, Issue 07, 2022

Corner of CombinedMachine Software and Skin Fingers// IJARSET. International journal of advanced research in science, engineering and technology. – India, Volume 8, Issue 1, January 2021. – pp. 14464-14467 .

5. Tukhtakuziev A., Gaybullaev B., Abdimominov I. Effect of Combined Machine Softward Parameters on its Performance //IJARSET. International journal of advanced research in science, engineering and technology. – India, Volume 8, Issue 1, February, 2021. – pp. 16548-16552 .

6. Augambaev M., Ivanov A.Z., Terekhov Yu.I. Fundamentals of planning a research experiment.. -Tashkent: Teacher, 1993.-336 p.

7. Spirin N.A., Lavrov V.V. Methods for planning and processing the results of an engineering experiment. - Ekaterinburg: GOU VPO Ural State Technical University - UPI, 2004. - 258 p..

8. Kashaev S.M. Office solutions using Microsoft Excel 2007 and VBA. - SPb.: Peter, 2009. 352 p.: il.