Parameters of the furrow cutter with levellers of the combined machine

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Abstract. The purpose of the research is to confirm the plurals of a furrow cutter with levelers of combination machine. Combined machine turns the soil layer of the zone where the root system of field crops develops by 180°, prepares the soil for planting, and forms an irrigation ditch. The combined machine consists of disc knives, reverse-cutting ploughshare housings, roller, thresher and levellers. The conducted theoretic and pilot explore showed height combined machine sweeper should be 0.45 m, length 0.7 m, the opening angle of the wings 30°, the height of the leveller 0.1 m, the installation angle relation to the area of activity motion should be 30° showed. According to the outcome the conducted experimentation analysis, tensile strength slimmer is line of 600-650 N.

1 Introduction

F. Mamatov on investigating of process mutual influence machine-gun furrow, which prepares the soil for planting on the basis of advanced technologies for planting polys crops and its parameters F Maiviatov [1, 2], B Mirzaev [3, 6-10, 12, 13, 21], N Aldoshin [8, 22], Z Uzakov [16, 20]. O Research works were carried out by F Mamatov [9-16, 18, 25], B Tulaganov [9, 12], S Toshtemirov [6, 7] and others. In these studies, taking into account the soil-climatic conditions of the Republic of Uzbekistan, issuance of substantiate the argument furrow, which prepares the soil by turning it over and without turning it, preparing it for planting field crops in one pass, have not been sufficiently studied [1].

2 Method and materials

For the experiments, 15, 25, 35 cm long levellers were made for levelling the bushes along the line of sowing seeds or seedlings at the same time as forming an irrigation ditch. In this case, corner of unit of leveller in relation to the instruction of move was 30°. In experiments, tensile strength non-aligner and aligner (Figure 1) was determined. The results of the conducted studies are presented in Figure 3.

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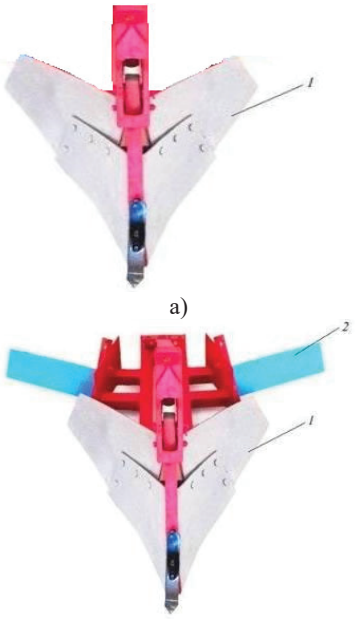

a – a trimmer without a leveller; b – a slimmer with a leveller
1 – slimmer; 2 – leveller

Fig. 1. A straightener with a leveller prepared for conducting experiments.

In the technological work process of the combined machine, the machined area is divided into three equal parts using disk-shaped knives, the blades in the outer parts are turned 180° at the border of their edges, and the middle part is shallow softened without turning over, and the machined area is turned over and softened. the cuts on the surface are crushed and an irrigation ditch is formed along its middle line, and the upper part of the formed ditch is levelled, and the soil is fully prepared for the planting of field crops.

3 Results and discussions

The main parameters of a trapezoidal irrigation canal include: lower base and riding verge canal b_T and V_M, angle tendency its relative to skyline φ, and the height of the egate (Figure 2). In the process of work, the soil is cut from the center of the planting area with a ditch opener and thrown to the side on the surface of the treated soil with casings. On the other hand, since the soil profile is symmetrical, the soil to be cut with a ditch opener is divided into two equal parts, that is, S_1=S_3, from which S_4=S_2.

Based on the proposed technology and conducted studies, the bottom base of the ditch ba is equal to the transverse distance between the heels of the reverse-section ploughshares of the hulls, i.e. $b_a = b_T$.

From Figure 2

$$H = H_a + h_2, \tag{1}$$

$$h_2 = \frac{b_c tg\varphi}{2}, \tag{2}$$

where b_c – is the width of the field for planting seeds or seedlings, cm.

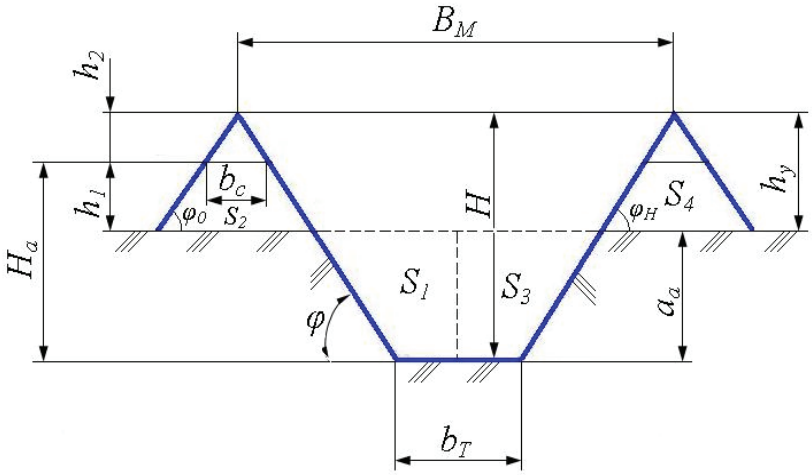

Fig. 2. Geometric dimensions of the irrigation ditch.

We put the value of h_2 in expression (1) according to expression (2).

$$H = H_a + \frac{b_c tg\varphi}{2} = \frac{2H_a + b_c tg\varphi}{2}. \tag{3}$$

The parameters of the thresher include: the width lower border tipper b_a, beginning corner lower edge of tipper 2γ, corner the tipper entering the soil a, the height of the body $H_к$, the length $L_к$ and the width of the wings $B_к$.

It is recommended to determine the height of the ditcher based on the full height of the opened ditch N according to the following formula [3, 4, 5]

$$H_k = (1+\mu)H, \tag{4}$$

where μ – is the factor that undertake within accounting the compaction soil in front drain, μ=0,4-0,6.

Let's add the value of H from expression (3) to expression (4).

$$H_k = (1+\mu)\frac{2H_a + b_c tg\varphi}{2}. \tag{5}$$

According to the expression (8), when H_a= 0,25 m , b_c= 0,01 m φ=35º and μ = 0,5 m the height of the drain body should be H_k = 0.45 m.

Overflow b_a is equal to lower base of the sprinkling dig, i.e. b_a= b_T= 0,1 m.

The length of the skimmer L_k is the sum of the lengths of the lower (l1) and side (l2) edges of the skimmer, i.e.

$$L_k = l_1 + l_2. \tag{6}$$

The length of the lower edge of the flipper is equal to the following

$$l_1 = 0{,}5 b_a ctg\gamma_1. \tag{7}$$

Stipulate the long tipper according to next formula

$$L_k = 0{,}5 b_a ctg\gamma_1 + \frac{(1+\mu)(2H_a + b_c tg\varphi)(f + \sqrt{f^2+1}}{2\sin\varphi}. \tag{8}$$

(8) according to the expression, when H_a = 0,25 m, b_c= 0,05 m, f = 0,5, φ = 35^0, γ_1 = 30^0 ва μ = 0,5 *m*, the length of the eaves L_k = 0,75 m. It should be 75 m.

Inspire down the riding edge gutter should be equal to the alienate among upper the ditch $B_к$, i.e.

$$B_k = B_M = b_a + 2Hctg\varphi, \tag{9}$$

We put the value of N in (10) according to expression (3)

$$B_k = b_a + (2H_a + b_c tg\varphi)ctg\varphi. \tag{10}$$

We determine opening upper tiller, i.e. installation its wings γ_1 according to the following formula, [4] $\gamma = \pi/4-\varphi/2$, where φ_T – overturning wing. According to this expression, when φ_T = 30º, the opening angle of the fan blade should be γ_1 = 30º.

We determine the soil penetration angle α of the tip of the digger claw from the condition that soil particles move along its surface, i.e. $\alpha \le \pi/2-\varphi$.

When φ = 25-30°, the angle of the front edge of the weeder enters the soil is in the range of 60-65º. When α = 60° and γ_1 = 30º, the twist angle of the thinner should be β = 70º. When β = 70° and γ_1 = 30º.

According to the graph change of traction resistance of the straighteners without levelers and with levellers depending on the movement speed of the unit is presented in Figure 3.

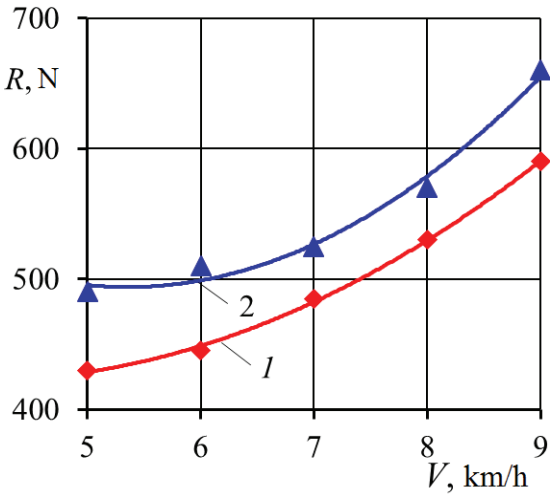

Fig. 3. Work out the tensile resistance (*R*) of the strainer change depending on speed (*V*): 1 – slimmer; 2 – slimmer and straightener.

In general, graph shown in Figure 3, in an increasing in the rate work, drag resistance increased according law the parabola. In doing so, the aricochist had little traction resistance without a straightener. When a straightener was installed in the ditch, its traction resistance increased at a speed of 5 and 9 km/h of the aggregate by 13.8% and 18.7%, respectively. Naturally, in turn, the straightener will have traction resistance to align the owner's paws.

4 Conclusions

According to the outcome theoretic and experienced studies, the height of the combining machine ditcher is 0.45 m, the length is 0.7 m, wings is 30°, height leveller is 0.1 m, installation relative to the leadership movement is 30 °, formation an irrigation ditch at the

level of demand is achieved. Its tensile strength is 600-650 N of work in the technological work process of the combined machine.

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