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Theoretical Justification of the Parameters of the Combined Unit Winding Improvement

Buriyev Muhridin Dehkhan son

Supporting doctoral student

Karshi Institute of Engineering and Economics, Karshi s., Uzbekistan.

International Institute of engineering and economics, Qarshi sh., Uzbekistan.

ABSTRACT: In order to implement the proposed technology based on the analysis of the Patent and research work, it was found that in a combined aggregate it is necessary to apply a roller with a balloon attached to the frame.. Application of the spool the planting God flattens the surface of the field, grinding the incisions on the surface and compacting the soil. The article is theoretically based on the parameters of the combined aggregate reel, which prepares the soil for planting melon crops.

KEYWORDS: Melon crops, combined aggregate, Corps, coils, soil, quality of work, procina, irrigation ditch, unevenness of the field, planting God.

I.KIRISH.

The problems of high-quality tillage of the soil with minimal energy costs for planting cash crops have been considered in many scientific works [1]. Researches were carried out by V.G. Abezin [2], V.I. Malyukov, A.D.Em, V.N. Zhukov [3] and others on the creation of machines for police, justification of their construction and justification of the parameters of their working bodies.. The construction and parameters of the machines that till the soil before planting and planting in the cultivation of polys crops are based on V.G. Abezin, N.V. Aldoshin and V.I. Malyukov, Y.P. Lobachesky, F.M.Mamatov and I.T.Ergashev studied the processes of 180-degree turning of palakhsa in Uzegat ichegara [4]. These studies did not consider the issues of preparing the soil for planting rice crops in one pass with minimal tillage. The purpose of the research is to theorize the parameters of the combined aggregate roller that prepares the soil for the planting of cash crops.

II.PROBLEM STATEMENT AND RESEARCH METHOD.

Scientists of the Institute of Engineering and Economics of Karshin proposed a combined unit (machine) that works the soil and prepares it for planting in one pass [5]. Combined machine (Fig. 1) disk-shaped blades 1, softeners (flat cutters) 2, left and right screw housings 3 and 4 installed on the axis of symmetry, screw guides 5, housings handle It consists of installed pit softeners 6, a seed feeding device equipped with slats, a softener-leveling roller 7, a ditch opener and support wheels. The reel is hinged to 7 frames.

Based on the provided technology [6,7], the aggregate should process a field 2.8 m wide in one pass. In this case, it is necessary to turn the plows into the soil of the aggregate planting area within the limits of its edge, and at the same time soften the soil and form an irrigation ditch. The soil of the rest of the row interval is softened with flat knives at a depth of 8-10 cm and weeds are killed. The width of the row spacing in which polys crops are planted can be 60, 70 or 90 cm

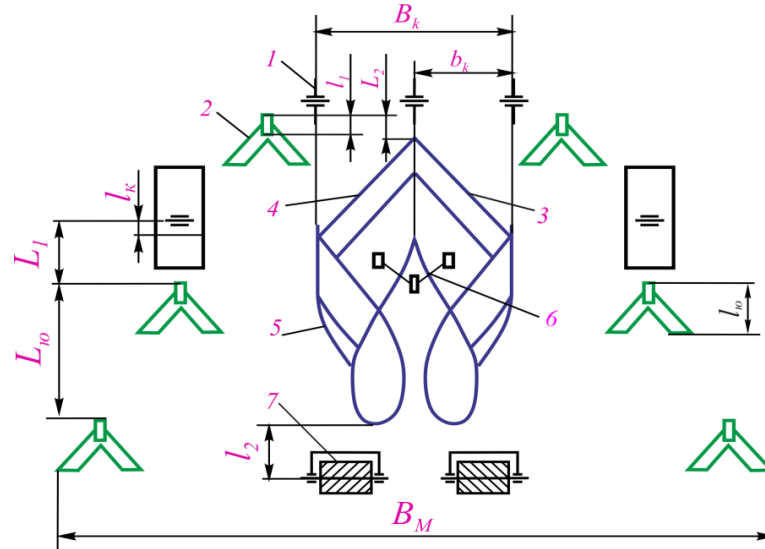


Figure 1. Scheme of mutual arrangement of working bodies in a combined machine

- 1 – disc-shaped blade; 2 – flat; 3 and 4 - housings that turn to the right and left;
- 5 – guide plate; 6 – deep softener; 7 - reel.

The following requirements are imposed on the reel:

- the reel should be light;
- the coverage width of the roller should be equal to the width of the planting area;
- the roller must be hinged to the frame of the unit;
- on the surface of the roller, it is necessary to level the area where the planting device works. The height of irregularities (should not exceed 5 cm);
- the roller should not resist the deep softener being fully immersed to the specified depth.

The main parameters of the slatted roller include the following (Figures 1 and 2): the radius of the roller r_{km} , the angle of installation of the slat γ_{ms} , the number of slats n_{ms} , the covering width of the roller B_k , the number of sections n_s , the width of the section b_c , between the sections distance b_0 ,

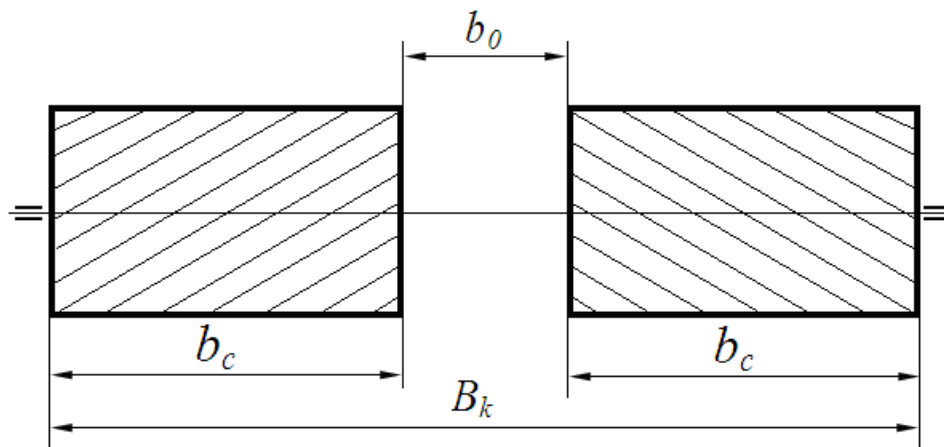


Figure 2. Parameters of the winding

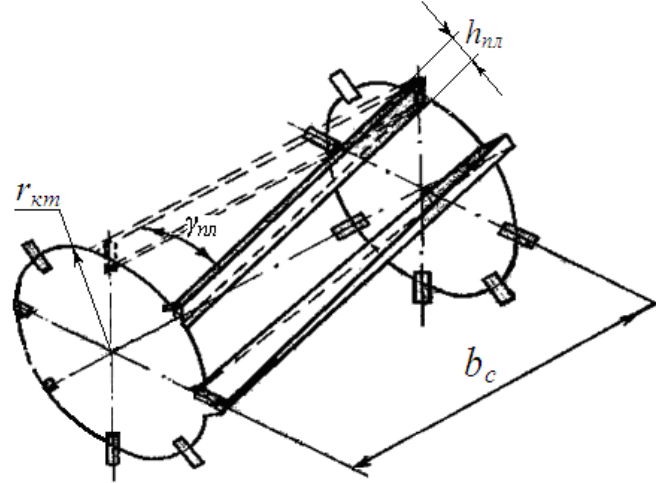


Figure 3. Parameters of the winding section

Research results and their discussion. Based on the analysis of the patent and scientific research work, it was found necessary to use a slatted roller attached to the frame with a hinge in the combined unit for the implementation of the proposed technology. The use of a roller flattens the surface of the field near the planting area, breaks the lumps on the surface and compacts the soil. The roller works on the planting area, i.e. on both sides of the formed watering edge. Therefore, the number of sections is two, and we determine the coverage width of each section according to the following expression:

$$b_c = (B_{\text{эк}} - b_a) / 2, \tag{1}$$

where b_a – is the largest width of the irrigation ditch, m; $B_{\text{эк}}$ – the width of the planting area, m.

(1) according to expression $B_{\text{эк}} = 106$ sm and $b_a = 45$ sm when $b_c = 31$ sm should be. We accept 35 sm.

The radius of the roller (3-rasm) we will determine according to the following formula [8, 9]

$$r_{km} \geq r_{km} \cdot ctg^2 \frac{(\varphi + \varphi_1)}{2} + \frac{h_1 - h_2}{1 - \cos(\varphi + \varphi_1)}, \tag{2}$$

where r_{km} – the average radius of the cut, m;

h_1 – the immersion depth of the reel, m;

h_2 – cutting depth, m;

φ – angle of friction of the roller with the cut, grad;

φ_1 – the angle of friction of the cutting with the soil, grad.

(2) according to the expression $r_{km} = 5$ sm, $h_1 = 5$ sm, $h_2 = 2$ sm, $\varphi = 25^\circ$ va $\varphi_1 = 35^\circ$ when $r_k \geq 14,3$ sm. We accept $r_k = 15$ sm.

We determine the number of planks in the roller according to the following formula [8, 9]

$$n_{nl} = \frac{2\pi}{\pi - 2 \arcsin \frac{r_{km} - h_1}{r_{km}} - 2 \cos \left(\arcsin \frac{r_{km} - h_1}{r_{km}} \right)}, \tag{3}$$

(3) according to the expression $r_{km} = 15$ sm, $h_1 = 50$ mm when $n_{nl} = 7,78$ dona. We accept $n_{nl} = 8$ piece.

We determine the angle of installation of the plank from the condition of soil displacement. For this, the following condition must be met [10].

$$\gamma = \frac{\pi}{4} - \frac{\varphi}{2}. \tag{4}$$

(4) from the expression $\varphi = 25^\circ$ when $\gamma_{nl} = 32^\circ$.

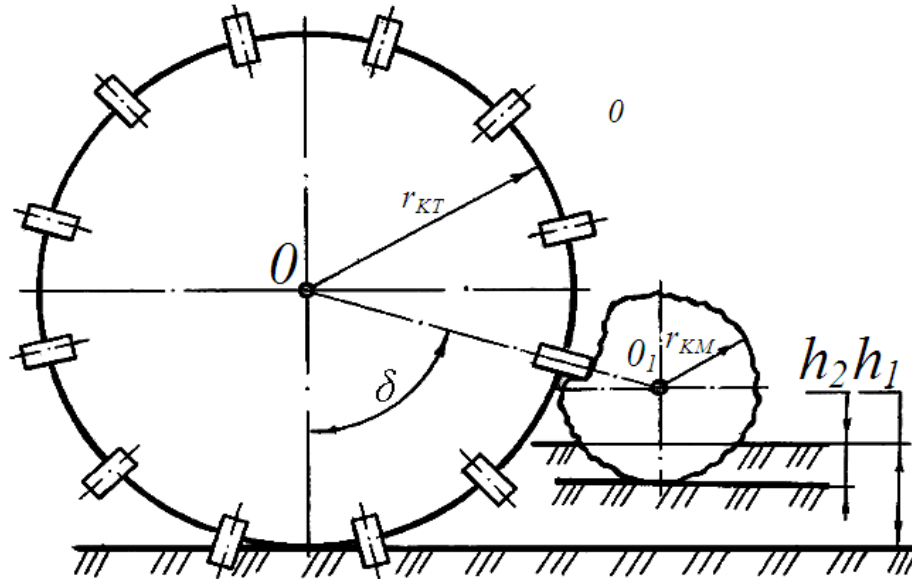


Figure 4. The scheme for determining the radius of the winding.

During the movement of the combined aggregate roller, due to the unevenness of the field and the change in the physical and mechanical properties of the soil, it works with forced vibration in the longitudinal-vertical plane relative to the point (hinge) attached to the frame, that is, it has angular vibrations in this plane during its operation. This leads to uneven compaction of the soil. Therefore, in theoretical studies, the uniform movement of the roller according to the processing depth was studied.

The following expression was used to determine the angle of deviation of the pulley from the equilibrium position:

$$\alpha(t) = \frac{\Delta R_z \sin(\omega t - \delta_1)}{m_z l \sqrt{\left[\left(\left(N_x + C_{mz} B_k l + C_n \frac{l_n^2}{l} \right) l / (m_z l^2) \right) - \omega^2 \right]^2 + \left(\frac{b_{mz} B_k}{m_z} \right)^2 \omega^2}}, \quad (5)$$

when N_x – horizontal component of soil reaction force, N; m_z – the mass of the coil, kg; l – the length of the reel, m; l_n – the distance from the point where the tensioner is attached to the spool to the point where the spring compressive force is applied, m; C_{mz} – the uniformity of the soil brought to a unit coverage width of the working body, N/m²; B_k – coverage width of the reel, m; ΔR_z – amplitude of alternating force, N; δ_1 – deviation angle of the reaction force, degrees; ω – frequency of alternating power, s⁻¹; b_{mz} – the resistance coefficient of the soil per unit coverage width of the roller N·s/m²; C_n – coefficient of elasticity of the pressure spring, N/m.

(5) the analysis of the expression shows that the uniformity of the depth of immersion of the roller into the soil and, therefore, the density of the soil depends on its mass, the length of the tie connecting it to the frame, the uniformity of the pressure spring, the amplitude of the variable force, and the physical and mechanical properties of the soil. , and the quality of work at the required level for the given working conditions is achieved due to the correct selection of the mass of the coil and the thickness of the compression spring.

III.SUMMARY

1. The use of some two-section slatted roller, the slats of which are installed obliquely in the opposite direction to the direction of movement, in the combined unit, provides a high-quality preparation of the soil of the planting area for planting.
2. According to the results of the theoretical studies, the diameter of the roller is at least 30 cm, the width of each section is 35 cm, the angle of inclination of the plank is at least 17, the number of planks should be 8, the soil should be well-grounded at the depth where the seeds of the poly crops are thrown, and the requirement allows to concentrate at the level of.



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