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The Effect of Worn Hinges of the Cultivator Section on the Quality of Row-To-Row Processing of Cotton

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Annotation: The installation of the cultivator's working bodies at a relatively large distance from the row axis is due to a number of reasons: poor handling of the tractor in rows, the placement of working bodies relative to the wheel, large transverse fluctuations due to increased gaps in the hinges of the cultivator section, the type of working bodies, speed of movement, etc. in practice, protective zones are determined mainly by the greatest deviation of plant shoots and working bodies.

Keywords: Mechanization, row-to-row processing, cotton, tractor, cultivator, protective zones, rotary bodies.

The degree of mechanization during row-by-row processing of cotton crops depends mainly on the width of the processed strip in the row-by-row and the size of the protective zones, which is currently assumed to be 12-15 cm.

The installation of the cultivator's working organs at a relatively large distance from the row axis is due to a number of reasons: poor handling of the tractor in rows, the placement of working organs relative to the wheel, large transverse fluctuations due to increased gaps in the hinges of the cultivator section, the type of working organs, speed of movement, etc. in practice, protective zones are determined mainly by the greatest deviation of plant shoots and working bodies.

Under the same conditions, the amplitude of the transverse vibrations is directly dependent on the gaps in the hinges of the four-link suspension mechanism.

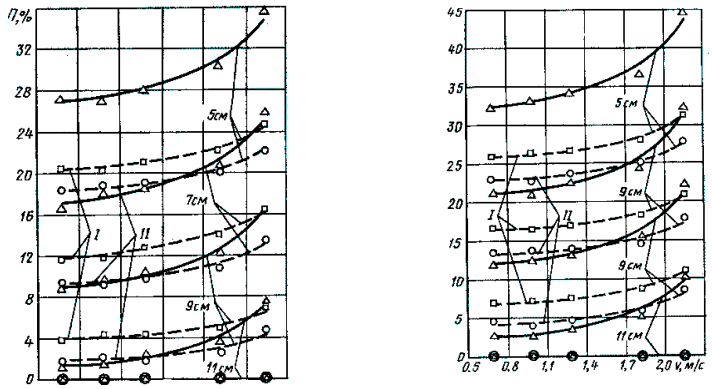
In this regard, we have studied the effect of transverse vibrations of the working organs of a cultivator with different gaps in the hinges of a four-column on the hardenability of cotton during row-by-row processing. For this purpose, the bushings of the hinges of the four-link mechanism of various diameters were made.

The gaps ΔS = 0.11 and 1.83 mm were installed in the hinges of the four links (simultaneously in all four). Of these, 0.11 mm is factory-acceptable on cultivators during manufacture, and 1.83 mm is increased after two years of operation (according to the results of a study of the reliability of cotton machines in the conditions of the Fergana Valley).

In order to determine the reliability indicators of the four-link mechanism, the operation of cultivators was monitored for two years: the rear frame–14 times, the front frame – 65, the steering pin - 25, the stretching of the front frame- 24, the lower link -12, and the upper link - 14 times.

The size of the protective zone was determined in the field at unit speeds of 0.7, 1, 1.3, 1.8, and 2 m/s. The damage to the plant was taken into account in each plot before and after the first and second cultivation. The moisture and hardness of the soil corresponded to the agrotechnical requirements. The first row-by-row treatment was carried out with 2-3 real leaves on each plant, and the second with 7-8. We studied the operation of conical rotary organs with diameters of 300mm and 260mm in combination with razors and razors without discs separately.

During the first and second cultivation of cotton, with an increase in the speed of movement of the unit with an increased clearance ΔS = 1.22mm and a distance L2 = 300 mm, the number of plants damaged by the cultivator's working organs increases significantly (Fig.1).



a) b)

FIG.1. Damage rate of cotton P depending on the speed of movement of the V unit during the first (a) and second (b) cultivation and different widths of the protective zone: I-diameter 300mm, II – diameter 260mm (ΔS=I,22mm; L2=300mm; razors, ----- conical rotary organs).

This is explained by a sharp increase in the amplitude of the transverse oscillations of the latter.

It can be seen from Fig.2 that the standard deviation σ of the working organs at ΔS=1.22mm is greater than at ΔS=0.0mm. With a change in the speed of the unit during the first row-to-row processing and ΔS=I.22mm, σ increases from 3.1 to 3.5 cm, and with the second-from 3.5 to 4 cm. The growth of the crop during the second cultivation will be explained by the curvature of the irrigation furrows, which worsens the tractor's driving conditions.

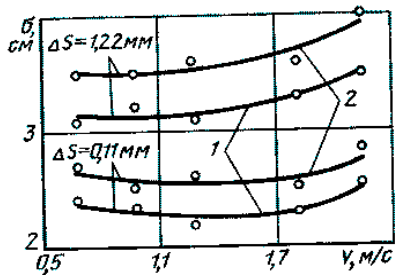


Fig.2. Standard deviation σ of the working organs depending on the speed of movement V of the unit at the first (I) and second (2) cultivations.

With an increase in the speed of movement of the unit from 0.7 to 1.8 m/s, the ability of the cultivator to copy curved rows of cotton improves, therefore, the probability of maintaining a given protective zone at these speeds is also higher. With further changes in the speed of movement, the copying ability of the unit decreases, which is explained by a number of reasons: deterioration of tractor driving conditions, severe shaking, lack of skill in driving the unit at increased speeds, rapid fatigue of the tractor driver, etc.

Thus, despite the steady movement of the cultivator at speeds of I-I,8 m/s, an increase in the gap in the hinges of the four-leaf to 1.22mm (compared to the existing 0.11-0.3mm) leads to greater damage to the cotton. To reduce the amount of damage to the limits specified in the agrotechnical requirements, it is necessary to increase the protective zone to 11 cm when working with conical rotary organs in combination with razors and up to 13 cm when working with razors alone. However, this reduces the degree of mechanization of yard-to-yard processing. During the operation of the cultivator, it is necessary to know in advance the degree of deterioration of the articulation of the four-link joints and to restore them as the permissible limits are exceeded.

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