THE INFLUENCE OF THE DIAMETER OF THE ROLLING ROLLERS ON THE UNIFORMITY OF THE DEPTH OF SEALING SEEDLINGS OF PHYTOMELIORANTS OF THE COMBINED TOOL

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ABSTRACT

The article presents the results of experimental studies of rolling rollers of a combined implement for planting seedlings of phytomeliorants.

Keywords: roller, seedling sealing, compaction, angle of inclination.

INTRODUCTION

A huge part of the Republic of Uzbekistan consists of desert and semi-desert pastures. However, the condition of these pastures is deteriorating year after year.

In favorable years, the yield of these pastures does not exceed 1.5...3.6 kg/ha. And in the acutely arid years they decreased by 2-3 times [1, 2, 3].

To date, there are several principles for improving pastures. However, these technological processes are carried out manually, by running flocks or by technical means used in irrigated agriculture. These technical means cannot meet agrotechnical requirements, or are material-intensive and energy-intensive.

MATERIALS AND METHODS

Based on this, we have developed a combined tool (Fig. 1) for tillage and planting seedlings of phytomeliorants designed for strip tillage with a width of 20-25 cm, and plant seedlings of phytomeliorative plants in these strips, as well as seal these seedlings to the required depth.

The combined tool consists of a frame 1, a hinged device 2, a basket for seedlings 3, a seat for the operator 4, a clamp 5, a template 6, a chain 7, a shelf 8 for the operator`s legs, sealing rollers 9, a opener 10, a ripper 11, support wheels 12 and a furrow maker 13.

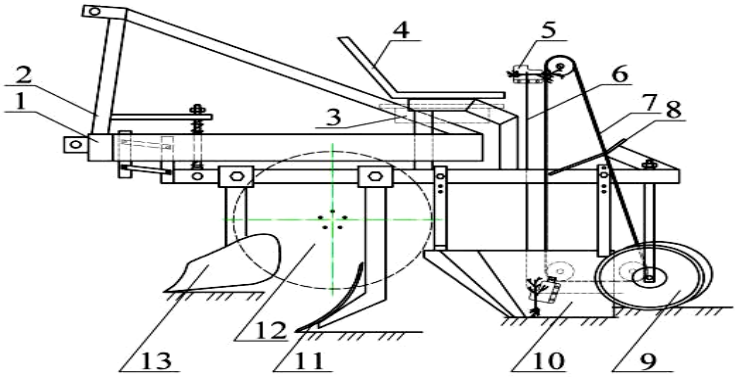


Fig. 1. The design scheme of the combined tool

The principle of operation of the gun is as follows.

When the tool moves, the furrow opener (Fig. 1) 13 cuts through the covered soil layer and wraps it to the sides, forming a groove, the ripper 11 following it processes the soil to the required depth, resulting in a treated strip of soil for planting seedlings. The opener coulter, moving along the treated soil, forms a landing slot. The operator, sitting on the seat 4, takes the seedling from the basket 3, installs it on the clamp 5 and runs away until it is securely fixed. The clamps 5 are mounted on a chain 7, which is driven from the support wheels 12 through intermediate gears. The seedling, together with the clamp 5, descends into the formed landing slot of the opener 10 and is held in an upright position until the soil is sealed around the seedling, the rolling rollers 9 produce soil compaction on both sides of the seedling.

In order to verify the results of theoretical studies, as well as to determine the rational values of the parameters of the rolling working bodies, laboratory studies were conducted.

The experiments were carried out in a special soil channel using a combined tool consisting of a tillage and planting part.

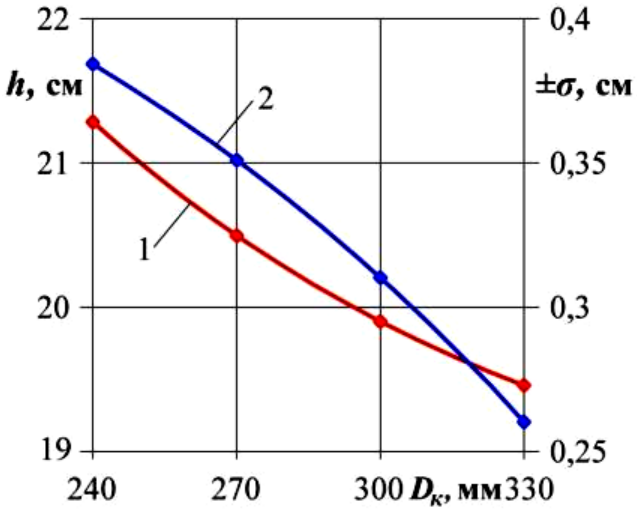
Each time before the start of laboratory studies on the soil channel, the working organs of the tool were adjusted. After that, one pass of the gun in the forward direction was carried out. On this passage, three accounting areas with a length of 1 m were measured for the entire width of the tool processing and the shape of the rolling was determined on them. Each experiment was carried out three times.

To conduct the experiments, rolling rollers with diameters of 240, 270, 300 and 330 mm with a width of 55 mm were manufactured (Fig.2). The remaining parameters were constant: the angle of inclination of the forming rim of the rolling rollers $\alpha_к$ = 20 °, the speed of movement V_{op} = 1.1 m/ s (Fig.4).

1)240; 2)270; 3)300; 4)330 mm.

Fig. 2. Rolling rollers with different diameters

Fig.3. Fragment of the study of the work of the rolling rollers



1-average depth (h) of seedling embedding; 2-standard deviation (±σ) of seedling embedding depth

Fig.4. The dependence of the uniformity of the depth of planting seedlings on the diameter of the rolling roller

RESULTS AND ANALYSIS

The experimental data obtained show (Fig. 4) that with an increase in the diameter of the rolling rollers from 240 to 300 mm, the depth of planting seedlings decreases from 21.5 to 19.5 cm. This is due to the fact that with an increase in the diameter of the rolling roller, their contact area with the soil increases. As a result, the depth of immersion of the rolling roller into the soil decreases. The standard deviation of the depth of planting seedlings with an increase in the diameter of the rolling rollers from 240 to 300 mm decreases from 0.38 to 0.36 cm, and with further increases from 300 to 330 mm, it practically does not change. However, an excessive increase in diameter leads to an increase in the metal consumption and dimensions of the rolling roller, which is undesirable.

CONCLUSIONS

Thus, based on the experimental studies carried out, it can be said that in order to ensure uniform embedding of seedlings in the soil, the diameter of the rolling roller should be within 300-330 mm.

The influence of diameter on the depth of seedling embedding and on its uniformity can be expressed by the following empirical formulas

$$h = 22{,}803 + 0{,}00493D - 0{,}000039D^2 ;$$

$$\sigma = 0{,}435 - 0{,}0008x + 0{,}000012x^2$$

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