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Study of Straight Depth in Rows of Autumn Wheat There is a Seeding Line Between on Cotton Grain Ways

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ABSTRACT: The article describes the development of a special drill for sowing the seeds of autumn cereals between rows of cotton and the longitudinal traction of the parallelogram mechanisms on which the working bodies forming its sowing sinks sink to a certain depth and move steadily at the same depth. They must be horizontal or close to each other and must be at least 12 cm wide.

KEYWORDS:cotton row spacing, seeds of autumn cereal crops, sowing, special seeder, egat opener, parallelogram mechanism, longitudinal traction, angle of inclination of longitudinal traction from the horizon, base wheel, width of the base wheel knot.

I.INTRODUCTION

Currently, the bulk of winter cereals in the country, ie more than 70%, is planted between rows of cotton. However, due to the lack of seeders between the rows of cotton, sowing of seeds of autumn cereals is carried out by means of fertilizer spreaders, adapted cotton cultivators and other devices. In this case, the seeds are sown between rows of cotton and a flat sowing is not provided, and they are not sown to the required depth, much of which does not germinate as a result of remaining on the soil surface. Based on these assumptions, a special seed drill was developed to sow the seeds of autumn cereal crops in rows between rows of cotton. The developed seed drill consists of a frame hanging on the body of the tractor, a seed hopper mounted on it, roller counters, propeller-driven support wheels, seed drills, working bodies forming the sowing fields (hereinafter referred to as seeders), disc planters and compacting rollers. The frame of the sieve is hinged by means of parallelogram mechanisms equipped with support wheels, and disc pads and compression rollers are hinged by means of traction. When the sowing unit moves across the field, the cultivators form triangular sowing plots at the specified depth between the rows of cotton (Fig. 1). The disc plows then sow the seeds on their sides in rows at a set depth and width, while the plows compact the soil above the seeds. In order for the seeds to be sown at the same depth and at the required level, the seeders should be marked along the entire plot and form sowing plots at the same depth. Based on the above, we studied the problem of ensuring that the seed drill developed by us sinks to a certain depth and runs smoothly at this depth.

II. SIGNIFICANCE OF THE SYSTEM

The article describes the development of a special drill for sowing the seeds of autumn cereals between rows of cotton and the longitudinal.The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

Theoretical research was carried out using the basic laws of mechanics in the study of the problem
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IV. EXPERIMENTAL RESULTS

Assuming that all the forces acting on the ego during operation are given by the lower moving hinge D of the parallelogram mechanism (Fig. 2) [1, 2], we obtain the following condition for its sinking to a specified depth and stable motion at this depth

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Figure 1.Scheme of sowing the seeds of autumn cereals between rows of cotton in the developed seeder

$$(mg \pm R_Z) l_n \cos\varepsilon > R_X l_n \sin\varepsilon \qquad (1)$$

or

$$mg \pm R_Z > R_X tg\varepsilon, \qquad (2)$$

They are; m – the mass of the egat openerand the parallelogram mechanism on which it is mounted, kg;

g – free fall acceleration, м/с^2;

R_X, R_Z – the horizontal and vertical components of the impact force equal to the resistance forces acting on the egator by the ground, H;

l_n – the length of the longitudinal traction of the parallelogram mechanism, m;

ε – angle of inclination (installation) of the longitudinal traction of the parallelogram mechanism relative to the horizon, degrees.

When conditions (1) and (2) are met, the base wheel of the self-propelled parallelogram mechanism is constantly pressed against the soil surface, and as a result it is affected by the reaction forces of the soil N_X and N_Z. This means that the egat opener works by sinking to the specified depth and without changing the depth of immersion in the ground. Otherwise, that is

$$mg \pm R_Z < R_X tg\varepsilon, \qquad (3)$$

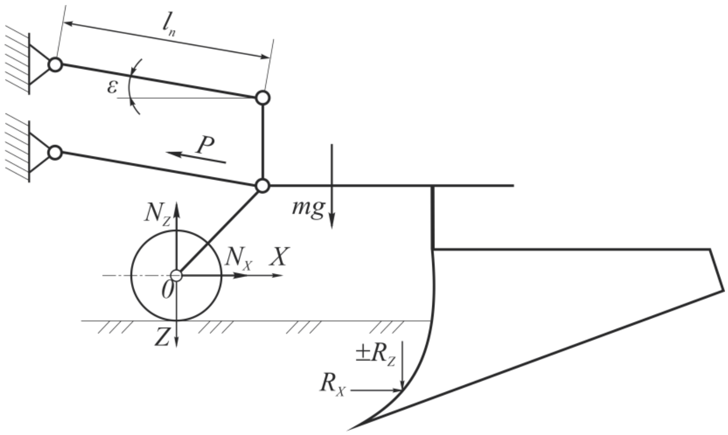

Figure 2.Schematic of the study of the operation of the engine sinking to a specified depth and a straight line at that depth

when the egator does not sink to the specified depth and the support wheel is not pressed into the ground, i.e. it rises above its surface. As a result, it is not affected by the reaction forces of the soil N_X and N_Z, i.e. $N_X = 0$ and $N_Z = 0$.Moreover, in this case, any change in the soil resistance forces, i.e. R_X and R_Z forces, will lead to a change in the depth of immersion of the cultivator into the soil and hence the formation of a planting field with an uneven depth.

From the analysis of expressions (2) and (3) it follows that the travel of the egator at a uniform depth depends mainly on the angle of inclination e of the longitudinal traction of the parallelogram mechanism connecting it with the drill frame. The smaller this angle, the less the effect of the RX force on the walking depth of the bent switch. When e = 0, ie when the longitudinal traction of the parallelogram mechanism is operating in a horizontal position during operation, the RX force has no effect on the walking depth of the opener, and in this case the effect of changes in soil properties, operating speed and other factors on the walking depth of the opener is minimal. When e = 0, the condition of immersion of the egator to the specified depth and stable motion at this depth has the following appearance

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$$mg \pm R_Z > 0. \quad (4)$$

When this condition is met, the change in the depth of immersion of the cultivator in the soil and hence the depth of the cultivator formed by it occurs mainly due to the change in R_Z force. Assuming that the R_Z force changes during the work according to the law of harmonics [3], the change in the depth of sinking of the base wheel under the influence of the R_Z force h (t) and its amplitude A can be expressed as follows

$$h(t) = \pm \frac{1}{m} \sum_{n=1}^{n_1} \frac{\Delta R_Z^n \cos(n\omega t - \delta_n)}{\sqrt{\left[\frac{C_m B_m}{m} - (n\omega)^2\right]^2 + \left[\frac{b_m B_m}{m}\right]^2 (n\omega)^2}}; \quad (5)$$

$$A = \pm \frac{1}{m} \frac{\Delta R_Z^n}{\sqrt{\left[\frac{C_m B_m}{m} - (n\omega)^2\right]^2 + \left[\frac{b_m B_m}{m}\right]^2 (n\omega)^2}}, \quad (6)$$

They are ΔR_Z^n – $R_Z$the amplitude of the power variable component, H;
n=1, 2, ..., n_1 – number of harmonics;
n_1 – the last considered harmonica;
ω–$R_Z$the rotational frequency of the power variable component, c^{-1};
t –time, c;
C_m – the coefficient of virginity of the soil reduced to one unit width of the base wheel, H/м^2;
B_m – width of base wheel knot, m;
b_m - coefficient of resistance of the ground to one unit width of the base wheel, H·c/м^2;

$$\delta = arctg \frac{b_m B_m (n\omega)}{C_m B_m - m(n\omega)^2}.$$

Discussion.The following condition must be met so that the walking depth of the egator is uniform at the required level.

$$A \le \Delta h, \quad (7)$$

whereΔh –to one side or the other of the depth of the planting area allowable deviation, cm. According to expressions (5) and (6), condition (7) is mainly satisfied by the correct choice of the width of the self-supporting wheel knot.

m=50 кг, ΔR_Z^n =75 H, C_m=1,7·10^3 H/м^2, b_m=51,2·10^3 H·c/м^2, n=1, ω=2 c^{-1}

and Δh=±0,01 м accepted, and the calculations carried out on expressions (6) and (7) showed that the width of the base wheel must be at least 12 cm in order for the change in the depth of the egat openerwalk to be at the required level (± 1 cm).

V. CONCLUSION AND FUTURE WORK

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In order for the seed drill to sink to the specified depth and run steadily at the required depth, the longitudinal pulls of its parallelogram mechanism must be horizontal or close to it and the width of its base wheel knot must be 12 cm.

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