The study of the working body of the sowing complex in flowvision

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Abstract. The studies performed clearly show the distribution of soil pressure on the working surface of the opener and allow a comparative assessment based on the experimental data obtained.

In the course of research, the angle of sharpening α of the stand of the proposed opener [1] ranged from 30° to 50°, and the angle of inclination β of the stand of the opener varied from 0° to 10°. Search experiments revealed that when the grinding angle of the coulter stand developed by us is less than 30°, its weight increases significantly. Based on this, further studies of openers with smaller sharpening angles were not performed due to increased material intensity. With an increase in the speed of the seeder, exceeding the established agrotechnical requirements (more than 2.4 m / s), the density and height of the seeded soil layer decreases to values that do not meet agrotechnical requirements. In this regard, the studies performed in the program were modeled in accordance with the agrotechnical requirements.

The visualization of the movement of the coulters (Fig. 1, 2) allows you to display the movement of soil particles along the working surface of the coulters, which clearly shows a decrease in soil pressure on the proposed coulter compared to the standard, and, therefore, traction resistance.

Fig. 1. Soil pressure on coulters: a - proposed; b – serial

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Fig. 2. Soil particles flow around the coulters: a - proposed; b – serial.

By performing the wedge-shaped coulters stand, the soil does not wrinkle before the coulters and much less sticks to its working surface, since the front cutting face cuts the soil and shifts it to the sides with minimal friction losses of the soil on the coulters surface. The stand of the standard coulters is subjected to excessive pressure (resistance) of the soil when moving, this is manifested in the crushing and unloading of the soil in front of the coulters during his work, which leads to increased traction resistance.

Further studies conducted in the laboratory confirmed the dependencies obtained during modeling in the program FlowVision. The lowest coulters has a lower coulters with an angle of sharpening of the coulters rack $\alpha = 30$ degrees. and the angle of the coulters rack $\beta = 10$ degrees. [2, 3]. According to the data obtained, reducing the angle of sharpening α of the coulters rack and increasing the angle of inclination β of the coulters stand decreases the pulling resistance of the opener. Thus, as the angle of sharpening α of the coulters stand is reduced by every 10 degrees, the traction resistance decreases by approximately 10%, as well as the angle of inclination β of the coulters stand is increased by every 5 degrees.

Next, we examined the soil soil grading after the passage of the serial and proposed lap openers (Fig. 3). According to agrotechnical requirements, the soil grading after the passage of the coulters of the seeder should not exceed 5%. The FlowVision program modeled the soil surface after the coulters pass.

Fig. 3. Soil surface after the pass of coulters: a - proposed; b – serial.

Analyzing the obtained images, we can say that the execution of the wedge coulters stand allows one to reduce the soil soil grading after the coulters pass and to better grab the seeds with soil after sowing, without taking it beyond the furrow. While the standard coulters crushes the soil in front of him, removing the wet layer from the furrow, which negatively affects the height of the seed layer and the provision of moisture to the seeds, as the seeds are covered with dry soil due to the self-drying of the dry soil from the furrow walls.

Analysis of the response surfaces (Fig. 4) also shows that the proposed opener with the angle of sharpening of the opener rack $\alpha = 30$ degrees. and the inclination angle of the coulters

rack $\beta = 10$ degrees allows to achieve the required agrotechnical parameters of soil codging after the coulter pass.

Fig. 4. Graphic representation of the surface response of soil crests after the passage of the proposed coulter from its design parameters: α - the angle of sharpening of the coulter rack, degrees; β is the angle of inclination of the coulter rack, degrees; v - speed of the unit, km/h.

The obtained data were confirmed by laboratory and production studies [4, 5, 6].

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