Main parameters of manure sealer

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Abstract

The unevenness of the soil surface is an important factor affecting the efficiency of agricultural production. It is known that fertilizers should be applied to the soil in such a way and in such a place that they are only in those layers where they will be effective. The rising formation, forming a gap along the manure strip lying on the surface field, pushing it into the gap, and leveling the gap with soil. A slitter has been developed for lifting the formation, forming a gap along the manure strip lying on the surface field, pushing it into the gap, and leveling the gap with soil. The slitter includes a rack, large and small cheeks connected to a soil bearing plate. A slitter is made with an increasing slope from the bottom to the top towards the small cheek and adjacent to the soil. It is established that when planting crops, it is necessary that fertilizers are only in those layers where they will be effective. The rise formation, forming a gap along the manure strip, pushing the latter into the gap, and leveling the gap with soil. A slitter has been developed for lifting the formation, forming a gap along the manure strip lying on the surface field, pushing it into the gap, and leveling the gap with soil. The slitter includes a rack, large and small cheeks connected to a soil bearing plate. A slitter is made with an increasing slope from the bottom to the top towards the small cheek and adjacent to the soil. It is established that when planting crops, it is necessary that fertilizers are only in those layers where they will be effective.

1 Introduction

It is known that fertilizers should be applied to the soil in such a way and in such a place that they are only in those layers where they will be effective. The rise formation, forming a gap along the manure strip, pushing the latter into the gap, and leveling the gap with soil. A slitter has been developed for lifting the formation, forming a gap along the manure strip lying on the surface field, pushing it into the gap, and leveling the gap with soil. The slitter includes a rack, large and small cheeks connected to a soil bearing plate. A slitter is made with an increasing slope from the bottom to the top towards the small cheek and adjacent to the soil. It is established that when planting crops, it is necessary that fertilizers are only in those layers where they will be effective.
by a lifting plate made with an increasing slope towards the small cheek as it rises. A window is provided in the large cheek, the parameters which are selected from the conditions for passing through it the maximum norm manure mixed with soil. The large cheek is slightly pushed forward relative to the small one, and its front face is pointed; therefore, the deformation of the soil occurs during the operation plowshare, and the soil lifting plate does not extend towards the manure tape lying on the surface field. Therefore, the justification parameters working bodies for embedding manure into the soil was carried out, taking into account the technological features of process embedding manure for melon crops and the physical and mechanical properties and soil melon-growing zone of Uzbekistan.

The designated purpose study is to substantiate the basic parameters slitter for embedding manure in the soil.

2 Materials and methods

The technological process sealing fertilizers using slits is as follows. On the frame unit for embedding manure into the soil, the slits are installed so that when the unit is moved, the belts unit (previously sown by the manure-raising unit) are located on the side large cheek. When working, the soil cut by the ploughshare moves along the soil-bearing and soil-supporting plates and is kept from shedding between the cheeks, thereby forming a space (gap) free soil. The colliders move the manure to the window big cheek during which the manure is mixed with the soil and push the resulting mixture to the bottom gap. After that, the soil, crumbling from the soil-supporting plate, falls asleep with manure. Thus, by adjusting the depth stroke working body for manure sealing, it is possible to ensure that the manure is located only in the root layer soil and is covered with soil from above.

Experiments to substantiate the main parameters slitter were carried out in the experimental farm Research Institute of Agricultural Mechanization. The optimal distance from the upper, anterior point large cheek along the movement unit to the upper anterior point its connection with the soil-bearing surface (in the future, the removal of the large cheek) is determined by the mass soil thrown aside by the manure tape lying on the surface of the field. The removal was considered optimal, in which the soil rejection was minimal, since the width its flow in front dumper, and therefore the parameters slitter, depend on the mass soil thrown towards the manure.[1,2].

Measurements were carried out as follows. The manure-making unit was stopped every 10 m. Then two metal sheets were taken, one of which (0.25 x 0.25) was placed on the surface field at a distance of 25 cm from the large cheek, and the second (0.4 x 0.25) on it so that the long side is perpendicular to the cheeks of the slitter. Then the top sheet was moved close to the big cheek. The soil found on the top sheet was collected and weighed.

Before conducting the research, the main characteristics of manure were determined according to GOST 28718-2016. "Machines for applying solid organic fertilizers. Programs and test methods".

Figure 1. The scheme experimental slot machine: 1 - stand; 2 - big cheek; 3 - a ploughshare; 4 - a soil-lifting plate; 5 - a small cheek; 6 - a fieldboard.

Experiments were carried out with semi-ripened manure at a rate application 20 t/ha. Before the experiments, the average bulk density, humidity, and sphericity manure particles were determined, which are equal to 686 kg/m^3, 51.5% and 33.68%, respectively.
3 Results and discussion

The width grip slitter, and, consequently, the width slit should be such that all the manure mixed with the soil collided with the collider can fit in it. In addition, it is necessary that the manure after the passage through the crevice was covered with a ten-centimeter layer of soil. The recommended depth of manure in the bedding is 25-30 cm, so the thickness of its layer can be 15-20 cm.

In order for there to be no manure left on the surface field, after sealing it, it is necessary to cut off such a layer of soil, within which the depth of this layer should be at least 30 cm. Therefore, the cross-sectional area slit to be cut should be equal to or greater than the sum of the cross-sectional areas of the manure layer to be sealed with the soil and a ten-centimeter mound above it, i.e. (Fig. 2)

\[ B_s(h_s - h_{uk}) \geq \frac{B_l h_s}{2} + B_z h \]

(1)

\[ B_s \geq \left( \frac{B_l h_s + B_z h}{h_s - h_{uk}} \right) \]

(2)

Figure 2. Technological scheme of manure embedding in the soil

Experimental studies have established that when manure is embedded in the soil, the coefficient of mixture is 1.0-1.05. It can be seen from formula 1 that the width slit mainly depends on the thickness and width of the manure and the cut soil layer, the permissible thickness of the manure layer introduced into the soil, as well as the coefficient of fluffiness of the manure-soil mixture. Research results (Fig. 3) show that an increase in the removal large cheek L from 230 to 710 mm leads to a sharp decrease in the mass thrown aside by the manure soil. A further increase in this removal is impractical, since it leads to a decrease in the strength of the large cheek and an increase in the angle of its entry into the soil as. At L = 710 mm, the angle of entry is 65°. A further increase in the angle of entry leads to an increase in the size of the cheek with plant residues.
The dependence of mass soil thrown towards the manure roll on the removal of large cheek.

The depth manure sealing is mainly influenced by the width and depth of the slit cut by the slitter. The depth of the gap is dictated by the optimal depth of manure sealing, and the width of the gap should be such that all the manure dumped by the collider is located in it and there is a ten-centimeter layer of soil without manure above it. The maximum depth of manure embedding is 25-30 cm, so the thickness of this layer can be 15-20 cm.

The research results shown in Fig. 4 show that with a decrease in the width gap from 250 to 150 mm, the thickness of the manure layer with the soil pushed into the gap increased by 1.8 times. With a further decrease in the width gap, the sealing of fertilizers to the desired depth does not occur, because the volume collided mass exceeds the size of the gap.

Based on the obtained research results, it can be argued that the width of the slit, and therefore the width of the slit, should be 200 mm.

The length and height of the slit window should be such that fertilizers pushed into the slot pass through the window without delay. The results of studies of the dependence of the width of the drawing prism in front of the collider on the length and height of the window show (Fig. 5 and 6) that when the length and height of the window is less, respectively, 450 and 150 mm, a mixture of manure and soil accumulates, as a result, the technological process of fertilizing is disrupted.

Figure 3.

Figure 4.
Figure 5. Dependence drawing prism width on length, \( b_p = f(l_0) \).

With the length and height of the window, respectively, 450 and 250 mm, the width of the drawing prism in front of the collider decreases sharply, and with further increase it stabilizes, i.e., the size of the window ceases to affect the process of pushing fertilizers into the slot. Therefore, the optimal size of the window can be taken as a length of 550 mm and a height of 250 mm.

4 Conclusions

The slitter provides sealing of 20 t/ha manure with a layer thickness of 15-20 cm, with the following values of its parameters: removal large cheek 710 mm, width 200 mm, respectively, length and height of the window, respectively, 550 and 250 mm.

References
