RATIONALE SCHEMES FOR MAKING MACHINE bulk substrate trunks ZONE perennial crops

IV Timoshok, Ph.D.
VA Sokolov Engineer
Institute of Horticulture NAAS
RV Shatrov, Ph.D.
National University of Life and Nature Ukraine

In order to ensure the required quality and reliability performance of technological operations making loose substrate trunks strips of perennial plants proved structural and technological schemes machinery for its application.

Trunks strip, hold the soil, mulch substrate, machine operating parameters.

Formulation of the problem. One of the prerequisites for obtaining high yields of the application of intensive technologies of production of fruit production is maintaining the soil in good condition and provide plants with essential nutrients. The most common system is the retention of the soil between rows sodding and black pair of trunks band width 1,0-1,6 m. The last in the first 2 years recommended support by mechanical instruments and subsequently make herbicides 2-3 times per season. [1]

However, along with the positive aspects of this technology, as it contains significant shortcomings. Unprotected surface soil quickly loses moisture in dry season. After rain the surface crust is formed, which prevents air and enrich the soil causing its desiccation. Significantly reduced replenishment of soil nutrients and so on. To compensate pereliche-

these negative developments technology provides installation of drip irrigation with simultaneous feeding of plants. This requires substantial additional capital investment, operating and depreciation costs and also can cause soil salinization. [6] Moreover, herbicides falling on the trunks of plants, leaves branches hanging, and the soil may inhibit growth and development, and nakopychyvshys in fruits, damage the health of consumers [5].

An alternative and most effective way to hold the soil in orchards and berry fields are hiding trunks bands layer of mulch, which reduces evaporation, protects plant roots from freezing, improve their nutrition,

improves soil structure, prevents the formation of surface crust, reduces daily fluctuations in temperature, inhibits germination weeds, enhances microbiological processes and others. [2, 4, 7].

Mulch materials can be sawdust, shavings, trust flax, shredded twigs, grass, straw or blend used mushroom substrate and litter that accumulates in the holding of animals, and so on.

Analysis of recent research. In young meadow garden rows to solid organic fertilizer is recommended to bring manure spreader purpose 1PTU-4, 5-DOC, DOC-6, 6-Rod and others. [3]. Unfortunately, they can not apply fertilizer or mulch in trunks bands locally, which greatly reduces the effectiveness of the technological operation, and after her performance meadow aisle generally unnecessary.

Known spreader mineral and organic fertilizers Spanish company Industrias David S.L.U. with the prefix for making organic gardens in the stripes trunks [9]. However, due to the nature of structural parameters of his job, he can not provide the required number of organic bringing the entire surface of the strip. In addition, most households do not have the money to purchase expensive imported equipment.

In view of the above, the most appropriate and economically justified to solve this problem by developing and introducing into production car that would easily mounted on the widespread litter solid organic fertilizer type DOC-6. This would minimize the costs associated with the implementation of operations and would make them more versatile to use.

The purpose of research - Ensure the required quality and reliability performance of technological operations making loose substrate trunks strips of perennial plants justification by technological and structural schemes cars.

Studies were conducted using the methods of abstraction and formalization. It analyzes the possibility of using one of the three most suitable working bodies: blade rotor auger or conveyor belt (Fig. 1).

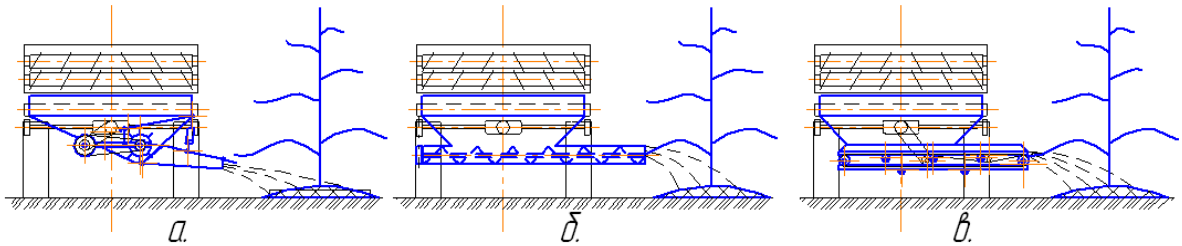

Fig. 1. Possible working bodies of machines for making the substrate: a - rotor, - a screw in - ribbon.

Calculations were performed approximately, excluding air resistance. Key source data, row spacing (l) - 4 - 5, the average width of

the substrate (b) - 1,5 m, the rate of introduction (W) - 150 - 600 m3 / ha, the maximum speed of the unit at the maximum application rate (Vmax .ah.) - 0.7 m / s.

Results. Considering the possibility of using the rotor unit to simplify circuit transmission torque will be taken into account only version of its location in the vertical plane (Fig. 1a). Determine that the initial speed in the horizontal direction (V0) must provide conditional shares of the substrate, assuming that the distance of the flight (S) should be about 3.0 at the height separation (h) 0,4 meters (hereinafter spatial distribution parameters working body were selected based on its structural potential execution).

$$\begin{cases} S = V_0 t \\ h = \dfrac{gt^2}{2} \end{cases} \text{ or } \begin{cases} V_0 = \dfrac{S}{t} \\ t = \sqrt{\dfrac{2h}{g}} \end{cases} \text{ or } V_0 = \frac{S}{\sqrt{2\,h/g}} = \frac{3}{\sqrt{2\,\dfrac{0,4}{9,81}}} = 10,5 \text{ m / s. (1)}$$

Thus, the diameter of the rotor 0,4 m frequency of rotation should be:

$$n = \frac{V_0}{2\pi R} = \frac{10,5}{2\pi 0,2} = 8,4 \text{ p-1 = 504 min-1 (2)}$$

Analyze the condition of the substrate particles getting into the working area of the rotor. In the process of centrifugal force, trying to throw the substrate beyond the rotor should not exceed the force of gravity, under which fall in its share of the work area:

$$\frac{mV^2}{R} \le mg, \text{ or } V \le \sqrt{Rg} = \sqrt{0,2 \times 9,81} = 1,4 \text{ m / s (3)}$$

Thus, the calculated linear speed of the rotor, which can be considered roughly equal to the initial speed of the conventional substrate particles (10.5 m / s), more than 7 times higher than the specified maximum allowable. To eliminate this phenomenon should provide additional feeding device, such as a screw, which would be submitted to the substrate along the rotor blade axis of rotation, which can significantly complicate the design of what we should avoid. So working rotary body in this case use impractical.

In the case of the screw body (Fig. 1b) The minimum flight range substrate particles may be 1.0 m. Using the formula (1), we find the initial velocity of the particles at the time of their separation from the screw placed at a height0,5 m above ground: V0 = 3,1 m / s.

Taking into account the existing recommendations for maximum performance at minimum revs screw shaft outer diameter (D) and pitch propeller (Shv) should be 0.4 m [8].

Suppose that the share of conventional substrate moves along the straight jacket of the screw, then the speed of rotation (n) should be:

$$n = \frac{V_0}{S_{св}} = \frac{3{,}1}{0{,}4} = 7{,}75,$$ P-1 = 465 min-1 (4)

This figure exceeds the recommended speed of rotation of the screw (80-200 min-1) is more than 2 times, which casts doubt on its use. [8] Additionally determine which height (hsh) share rise substrate if the interaction with the outer edge of the screw it will take the same initial velocity (VIII), directed vertically upwards:

$$h_ø = \frac{V_ø^{\,2}}{2g} = \frac{(\pi Dn)^2}{2g} = \frac{9{,}73^2}{2 \times 9{,}81} = 4{,}8$$ m (5)

Given that auger for loading substrate should be open top defined by the frequency of its rotation will lead to the spreading of matter in all directions, not moving in the desired direction. Thus, the use auger as well as the working body can not meet the requirements for the machine.

Consider the possibility of conveyor belt (Fig. 1, B). Once again using the formula (1), define the required initial speed of conventional substrate particles in the horizontal direction for her flight at 1.5 meters when placing the working surface of the conveyor belt at a height 0.5 m: V0 = 4,7 m / s. The calculated speed of the tape somewhat higher than the recommended maximum limit (4.5 m / s) for grain conveyors [8], but not exceeding the significant and definite figure could be acceptable.

When calculating the width of the conveyor belt (btr.) Will proceed from the fact that its performance (Qmax.tr.) should not be lower than the calculated maximum performance unit (Qmax.ah.), that:

$$Q_{\max.mp.} \geq Q_{\max.аг.}$$ or $$V_{mp.} h_{\max.mp.} b_{mp.} \geq \frac{W_{\max.} l_{\max.} V_{\max.аг.}}{10000}$$ Where: (6)

$$b_{mp.} \geq \frac{W_{\max.} l_{\max.} V_{\max.аг.}}{10000 V_{mp.} h_{\max.mp.}} = \frac{600 \times 5{,}0 \times 0{,}7}{10000 \times 4{,}7 \times 0{,}1} = 0{,}45$$ m (7)

where: Wmax. - The maximum rate to substrate 1 ha, lmax. - The maximum width of the aisle, Vmax.ah. - The maximum speed of the unit, Vtr. - Speed conveyor belt, hmax.tr. - The height of the substrate layer at the time of his ascension to the tape.

Zrushuvalnoho determine the frequency of rotation of the drum to provide the necessary speed of the conveyor belt.

$$V = \omega R = 2\pi n R$$ whence $$n = \frac{V_{mp.}}{2\pi R} = \frac{4{,}7}{\pi 0{,}15} = 9{,}98$$ s-1 ≈ 600 min-1. (8)

Obviously Ensure that the working body of the subject specified structural parameters and operating mode of the machine by using the conventional chain arrangements.

Conclusions

Based on these evaluation criteria, namely the reliability and quality of technological operations and minimize costs, it is advisable to make a car mounted version. At the same time as the base machine should use common in the production of solid organic fertilizer spreader type DOC-6.

His body of work is advisable to perform as a conveyor belt with a belt width of 0,5 m and the rotation speed of the drive drum 600 min-1, with a diameter latter shall be 0.15 m.

Move efficiently from the longitudinal conveyor shaft base machine that is directly driven by the tractor's GDP and as a mechanism for changing the torque of the simple and reliable chain of transmission.

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With a view Provision neobhodymoho quality and reliability of Performing technological operations vnesenyya sыpucheho substrate in prystvolnыe bar only mnoholetnyh nasazhdenyy obosnovano konstruktyvnuyu and tehnolohycheskuyu scheme Machines for vnesenyya ego.

Prystvolnыe bar only, Content soil, mulchevalnyy substrate, machine Rabochie parameters.

On purpose of ensuring necessary quality and reliability of technological operation performance of loose substratum fertilizing into under trunk strips of long-term plantings the constructional and technological

schemes of machine for loose substratum fertilizing into under trunk strips of long-term plantings is substantiated.

Under trunk strips, maintenance of soil mulching substratum, machine, working parameters.