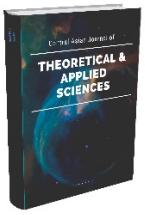

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Substantiation of Deep Softener Parameters that Cut the Vine Roots and Apply Fertilizer in a Wide-Band Manner

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Abstract: *The article presents the results of theoretical research conducted on the basis of the coverage width of the working body and the height of its column, which cut the vine roots and apply mineral fertilizers.*

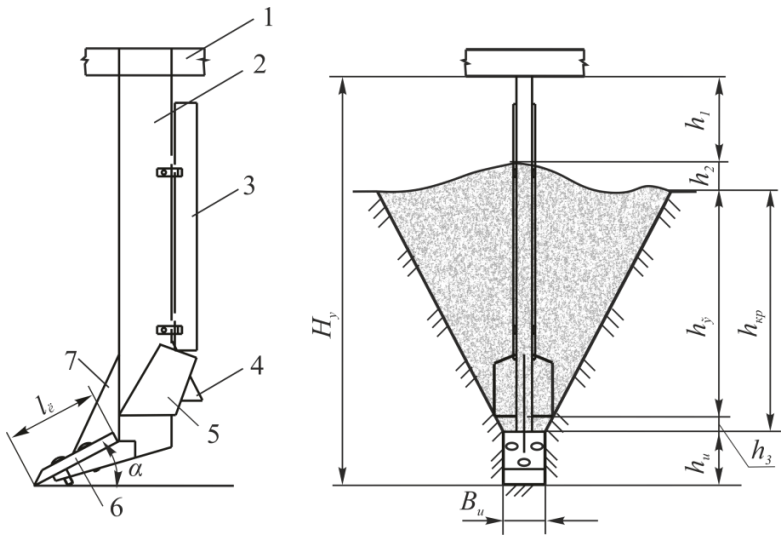
Keywords: *catch width, conical drill, loosened layer, depth of mineral fertilizer application, deep softener that cuts the vine root and makes mineral fertilizer.*

Introduction

One of the main factors in increasing the productivity of vineyards is the application of mineral fertilizers at the same time as pruning the roots during the period of soil loosening. According to a number of researchers in Russia, Moldova and Uzbekistan, the yield of vineyards will increase by 36.5% compared to existing technology. It was found that the regeneration process was intensive in the vessels cut at a distance of 50 cm from the stem. At the same time, depending on the navigation of the vine, at a distance of 125 cm from the stem, the length of new roots increased from 48.5% to 50.8% compared to the cut root, and a set of roots is formed.

Materials and methods

It is recommended to apply mineral fertilizers in a wide strip to the depth of 30-35 cm. For this purpose, a deep softener that cuts the vine roots is equipped with a conical sprinkler protected by a barrier. In the process, a deep softener cuts the vine roots and loosens the soil, while a fertilizer spreader spreads fertilizer in a wide belt under this softened layer. It is known that the soil is loosened by the working body to a depth of h_{kr} called critical (see picture). Below this depth, without loosening the soil, a compacted ridge is formed, and the movement of the conical seed drill at the back of the working body in this ridge increases its resistance to gravity.



1-rama; 2-column; Fertilizer 3; 4 conical seed drill; 5 barriers; 6-scan; 7 knives

Figure 1. Scheme for substantiation of the parameters of the deep softener, which cuts the current roots and applies the fertilizer in a wide band method

Results and discussion

It is advisable to ensure that the barrier of the conical drill moves in the softened layer. To do this, the following condition must be met.

$$h_o = h_{кр} - \frac{a_к - B_i}{2} tg\psi_ë \quad , \qquad (1)$$

where h_o is the depth of fertilizer application according to agro-technical requirements, m; B_i is the width of the iskan, m; $a_к$ is the major axis of the conical hair base, m; $\psi_ë$ - lateral fracture angle of the soil under the influence of the working body, grad. The depth of critical softening of the soil for the working body can be determined according to the following formula [1].

$$h_{кр} = \frac{B_u\left[0{,}1\frac{T}{[\tau_ч]}(1+3tg\gamma)-n\right]}{m+ctg\alpha} \quad , \qquad (2)$$

where T -the specific resistance to soil compaction, Pa;

$[\tau_ч]$ - boundary stress on soil displacement, Pa;

γ - ground resistance forces equal to the impact horizon

relative slope angle, grad .;

n, m - a measurement that depends on the physical and mechanical properties of the soil

coefficients without unity;

α - the angle of entry of the working body into the soil.

Determine the width of the sieve by considering that the depth of the fertilizer spreader in the soil is equal to the depth of fertilizer application and by solving (1) and (2) together.

$$B_u \geq \frac{(m+ctg\alpha)(2h_{\breve{y}}+a_{\kappa}tg\psi)}{\left[0{,}1\frac{T}{[\tau_{ч}]}(1+3tg\gamma)-n\right]+(m+ctg\alpha)tg\psi}. \qquad (3)$$

based on sources [1-3], $T/\tau_{пр}$=100, n=2,5, m=4,2, $a_к$=18 см, α=35° and $\gamma = \frac{\pi}{2} - \frac{1}{2}(\alpha + \varphi_1 + \varphi_2)$ (where φ_1, φ_2- the internal and external friction angles of the soil, respectively) assuming that the width of the scaffold according to expression (3) should be at least 71 mm.

The height of the deep softener column can be determined using the scheme in the figure, taking into account the condition that it is not clogged with weeds and soil [2].

$$H_y = h_1 + h_2 + h_{\breve{y}} + h_3 + h_u, \qquad (4)$$

where h_1 is the distance from the bottom of the frame to the soil surface,

$$h_1 = 0{,}15 - 0{,}20 \text{ м;} \qquad (5)$$

h_3 - the distance from the barrier to the compacted wall or screed,

$$h_3 = \frac{a_{\kappa} - B_u}{2} tg\psi_{\ddot{e}}, \qquad (6)$$

h_i -the height of the scan, m;

$$h_u = l_u \sin\alpha, \qquad (7)$$

In this l_u – the length of the scan

h_2 – maximum height of the piled soil layer, m;

The value of h_2 is equal to a quarter of the processing depth [4], i.e.

$$h_2 = \frac{h_{\breve{y}} + h_3 + h_u}{4}. \qquad (8)$$

Substituting the value of expressions (5) - (8) into expression (4), we assume the total height of the deep softener column in the interval $H_y = 0{,}6 - 0{,}7$ m.

Conclusion

Our research has shown that the width of the deep softener, which cuts the vine roots and spreads the fertilizer in a wide band, should not be less than 7.1 cm, and the total height of the column should be in the range of 60-70 cm.

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