spectrum increases, and then close to zero, and this pattern is repeated. The character shape calculated theoretical spectra coincides with the theory set forth above.

Conclusion. Diagnosis on the edge of the upper border of the spectrum in zarezonansniy field of ultrasonic range outside resonance, where the range is relatively solid, allowed to increase the ratio "signal - barrier", while in the case of switching to another brand engine can avoid the spectral analysis of these options, which to some extent is a measure of the versatility of this method.

List of references

1. *Aleksandrov EV*Applied Theory and raschetы udarnыh systems / *E. Alexandrov, VB Sokolynskyy*. - M .: Nauka, 1969. - 287 p.
2. *Brokh ET* Measuring mechanical oscillations and udarov / ET Broch. - London: Bruhl and Kъer, 1973. - 308 p.
3. *Soloviev VI* Vybratsyonnaya diagnostics of machines / VI Soloviev. - M .: Agropromizdat, 1988. - 186 p.
4. *Soloviev VI* Study and Development of diagnostic method for tractor engine parameters vybroudarnыh ympulsov, vыdelenыh in the ultrasonic frequency bands: Author. diss ... candidate. Sc. Science / *VI Soloviev*. - M .: 1975. - 22 p.
5. *Vibrate* in technology. Directory in 6 volumes. v. 5 / Ed. MD Genkin. -M .: Engineering, 1981. - 576 p.

Abstract.*Rassmotrenы klassycheskyy and its contemporary approaches for shock at the CHU diesel. Opredelenы dependence for definitions shyrynы spectrum, such durations soudarenyya details. For modeling yspolzovalsya mathematical package MathCad 15.*

Keywords: blow spectrum amplitudes, energy balance, plastycheskye deformation, ultrasound

Annotation.*Considered classic and contemporary approaches to shocks in CPG diesels. The dependences for determination of the spectral width on the duration spowodowana details. For modelling we used the mathematical package MathCad 15.*

Key words: beat spectrum, amplitudes, energy balance, plastyc deformation, ultrasound

UDC 631.31: 634

STUDY OF parameters of cylindrical brushes RESISTANCE TO EFFECTIVE SOIL AND REACTION ground base The disclosure of the root system of mother plants

A. Voytik, V. Kravchenko, A. Pushka, Ph.D.
Uman National University of Horticulture

Abstract.*In the article the technology and equipment for the disclosure of the root system of clonal rootstock mother plants. Found that rational option is to use a combined unit with passive and active vidhortachamy cylindrical brushes with vertical axes of rotation and flexible working elements. The analysis workflow a lint brush rod and identified the forces that act on it. The conditions in which the element zmitalnyy brush will remove particles from the soil or substrate roll. Using elliptic integrals Legendre defined soil base reaction rod on the pile. Based on the analysis of the resultant force of the resistance of the soil and ground base reactions found graphic resultant depending on the design and kinematic parameters brushes.*

Keywords: brush pile rod, deflection, deformation, root head, mother plants, roller, ground, base, reaction, resistance

Formulation of the problem. Today, Ukraine is beginning to recover horticultural industry. But the laying of new high gardens is not possible without quality planting material, which is the main source of seedlings on clonal rootstocks. Production of this type of rootstock there is little mechanized with significant use of manual labor, which increases the cost of materials while reducing its quality. At the same time intensification of horticulture, a significant decrease in the area of plant nutrition led to increased demand for planting material of fruit and berry crops in which domestic seedling should respond. One way to improve the situation is the mechanization of labor-intensive processes in the production of clonal rootstocks.

Analysis of recent research. It should be noted that the current production of planting material is a complex, time-consuming and least mechanized sub gardening. One of the time-consuming

operations for the production of clonal rootstocks is disclosure mother plants and jigging separation clonal rootstocks. These operations spent about 50% of total expenses during the year [1].

In Ukraine and in the world practice of gardening developed and applied the following technologies disclosure mother plants and jigging separation clonal rootstocks.

Powered way jigging separation clonal rootstocks is to use machines working body which is one or two discs knife or pollen types. Institute of Horticulture in 1995-1997. has developed a machine OP-1 for jigging separation clonal rootstocks. By car segment disc set with the drive mechanism and copying microrelief. During the passage of the machine along the line clipped the ground roll due to the high frequency of rotation disk scattered in the aisle [2]. The disadvantage of this type of

cut called bezpidpirnym is damaged jigging mother plants by deforming action of circular saws.

At the Crimean Experimental Station developed a separator jigging mother plants with two circular blades that rotate in opposite directions. Disks have a mutual overlap in the area of which is cut. Because of the relatively low rotational speed of the drive ground roll shall not be imposed and cut occurs at a depth of 10-15 cm. This section is retaining. The disadvantage of this method is that the discs causes vertical deformation and pulling vylamuyuchy jigging from the soil [3].

Recently, there have been changes in the structure of planting material. The main producers were small farms with an area of mother plantations up to 5 hectares and application of machine jigging separation was inappropriate because of mechanical injury to mother plants (5-10%), especially in the early years nursery use. Because the farms jigging separation performed manually. This process is divided into two stages: Disclosure mother plants and the actual separation jigging.

Means disclosure queen are divided into two types - pneumatic and mechanical. The main disadvantages of these machines are: air - reducing efficiency with increasing soil moisture and causing its erosion; Mechanical - need to use manual labor for the final opening of the queen cells, resulting in increased labor costs.

The purpose of research. Due to the low level of mechanization in the Nursery, which is 12-15%, have high production costs and low quality of [4]. The use of manual labor to perform many processes on growing planting material negative impact on the quality of work and agronomic terms of their conduct. To improve the situation at the Institute of Horticulture developed and implemented in the production of special machines for the mechanization of the process of opening the fallopian root system of plants.

Rozhortalnyk RVM-1 is a frame with nachipky mechanism, which consistently set vidhortachi as spherical disks and brush active working bodies of the vertical axis of rotation, which is enshrined elastic pile. Test results showed that this machine can remove about 90% of the ground roll, thus damaging to 3% of plants. But the use of the machine requires still more manual labor for purification heads root mother plants. Therefore, it is necessary to improve Brush working bodies in order to increase the degree of soil removal.

Results. Rod pile, which has a rectangular cross section, during his work on moving soil particles can be seen as dihedral wedge that forms the front face of the working and lower-edged rod rod. Soil that is sweeping rod pile, will be seen as a continuous bulk environment that roll in soil nahortayetsya three passes pidhortacha disk, with good rozpushuyuchys and sealed only under its own weight.

One of the basic requirements relating to the disclosure of the operation of the root system is to ensure zmitannya soil or substrate roll with no spaces. Multiplicity impact lint brush on a layer affects the process zmitannya particles from the surface of the coating roll. With increasing multiplicity impact is more thorough zmitannya soil. Fig. 1 shows the process zmitannya soil two flexible elements revolve in one plane zmitannya.

Considering brush having individual elements, must fulfill the following conditions: a path passing element in contact with the base hruntvoho roll S = AD (Fig. 1) must be greater than the distance at which move the car for the period of time between contacts adjacent elements of dirt foundation.

In the first section AV element comes in contact with soil base and bent under the normal reaction N. This site is determined by the angle of the front of the meeting of the working pile rod facets of surface soil bases φ1, which determines the maximum warp pile:

$$\varphi_1 = \arccos(1 - \frac{\Delta l}{R_{щ}}) , \qquad (1)$$

where: Δl - value of the deflection rod pile, m; Rsch - brush radius, m.

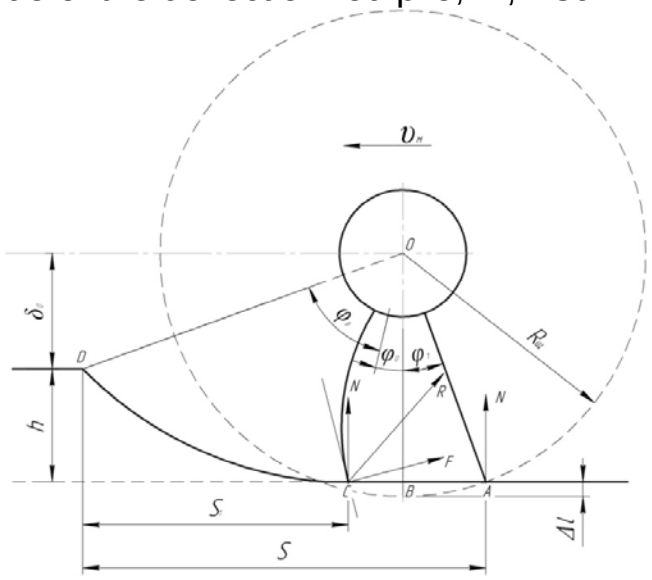

Fig. 1. Scheme of the brush.

In the works of L. Guseva [5, 6] found that hair brushes sweep performs its functions at a time when its end tangent to the surface, make it an angle π / 2, or close to it. In other cases, hair slides along the surface and zmitannya not occur or is very inefficient.

Pile, located in the central angle φ1, significantly deformed, and the angle of his meetings with the surface than π / 2, that intensive soil zmitannya happens. Within the working angle φr end of the pile takes about a normal position relative to the base, and zmitannya is rapidly and

completely [7, 8]. Accordingly, the contact rod pile of soil will be some section S, but perform useful work in zmitannyu of soil at the site will only S1, which begins after the brush back at an angle φ0, which determines the discharge element. Consider the forces acting on the rod pile during operation. In the section AB is the growth of normal reaction N basics of soil and increase the deflection rod pile. After passing through point B decreases and the normal reaction is to discharge rod until the angle between the working face of the rod and the soil will not make a point of 90 ° C. from now perform useful work is to remove the soil from the roll bars and the pile begins to act soil resistance force F. The process of removing soil continues to point D in this period rod pile are two forces - the normal reaction N basics of soil and soil resistance force F. this force can be reduced to their resultant force of resistance R. soil consisting of

$$F = \frac{\pi \upsilon_a}{z}\left(\frac{2\sin\alpha}{\omega}\left(\eta\upsilon + \left([\tau]-c\right)a\right) + \frac{a\upsilon h k_{вiд}^2 \mu}{\arccos\left(1-\frac{h}{R_{ц}}\right)}\right). \quad (2)$$

Analyzing the equation (2) to the following conclusions. With increasing ω 20 ... 25 rad / s decreased supply of soil S, and therefore the force F also decreases from 0.48 to 0.24 N at z = 70 pc. Further increase in ω although it reduces supply, but significantly increases the absolute speed υ rod end of the pile, which increases the resistance of the ground rejection and require more efforts to overcome the viscosity of the soil. Therefore, there is a minimum of functions within ω = = 17 ... 25 rad / sec when F takes values from 0.24 to 0.26 N.

Silas normal reaction of soil foundations can be defined as follows:

$$N = \frac{3\Delta l EI}{fl^3}, \quad (3)$$

where: Δl - The value of deflection of pile, m; l - initial length rod brush pile, m; E - modulus of elasticity (E for polypropylene = 3.2 · 109 Pa), Pa; I - moment of inertia rod pile, M4; f - coefficient of friction on a dirt pile bars basis (f = 0,6).

$$\Delta l = l\left(1-\left(\left(\frac{2}{\beta}\int_{\psi_0}^{\frac{\pi}{2}}\sqrt{1-k^2(\sin(\psi))^2}\,d\psi - 1\right)\sin(\xi_0) + \frac{2}{\beta}k\cos(\psi_0)\cos(\xi_0)\right)\right), \quad (4)$$

where: β - the power factor of similarity; k, ψ - the module and amplitude elliptic integrals; ζ0 - the angle between the direction of the force and the axis deformed rod.

The design developed machine RVM-1 used brush radius of 200 mm with 140 mm rods pile. The length of the rods pile determined

subject to the angle between the working face of the rod and the soil surface at 90 °.

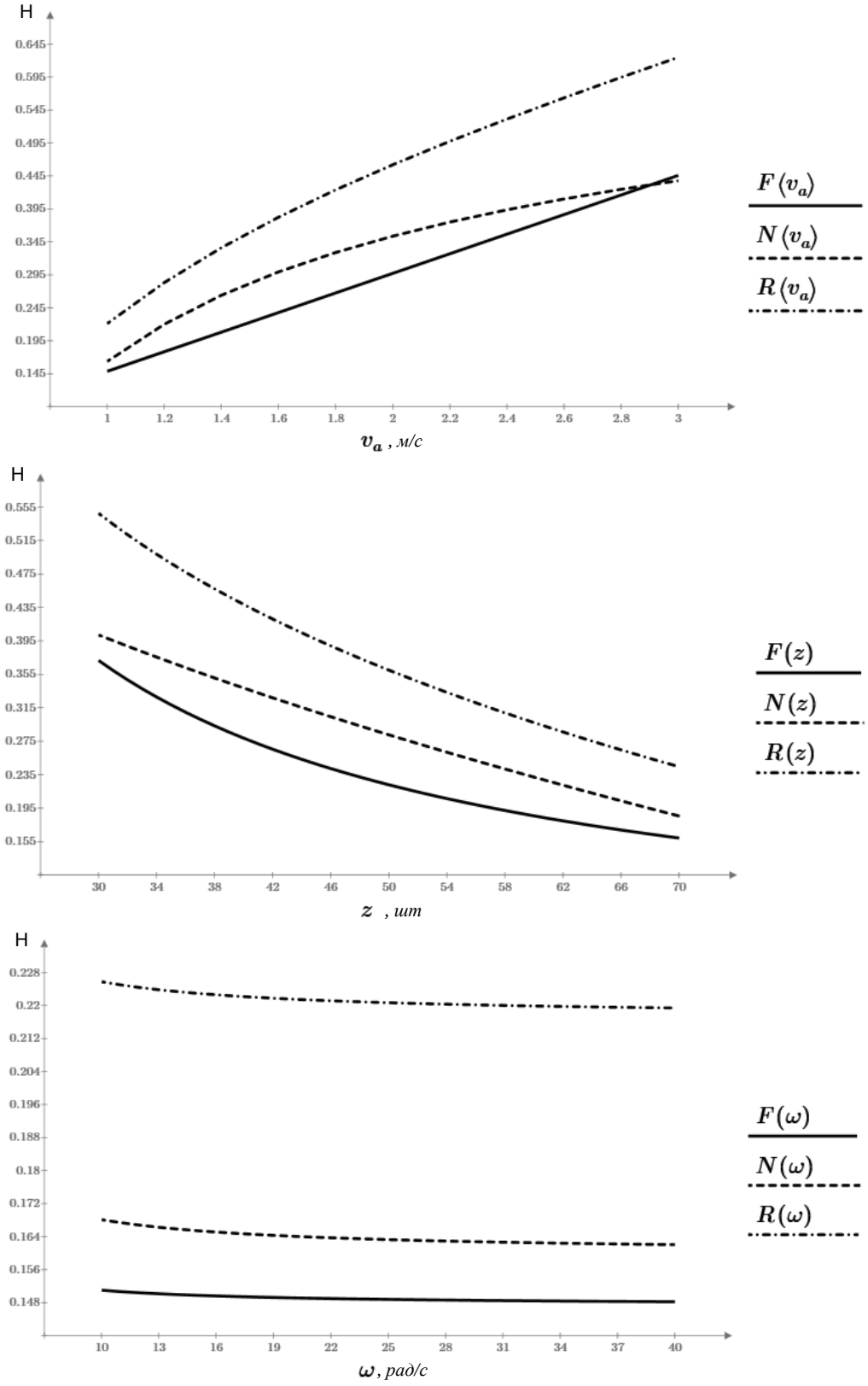

Fig. 2. Dependence of the resistance of the soil, soil base reactions and their parameters resulting from brush.

To determine the permissible length rods pile method was used elliptic integrals Legendre first kind [10, 11] and found that pile polypropylene rods can withstand the load of providing 0,24-0,6 N Subject angle with a maximum length of 140 mm. Using graphical analysis it was determined the influence of basic kinematic and structural parameters of the brush on the resistance of soil reactions F and ground base N, as well as their resultant R (Fig. 2).

Conclusion. Established that the increase in the number of bars lint reduces the resistance by reducing the supply of soil on one rod. The optimal number of bars in a pile several brushes within 50-70 units. Similarly, the value of impact forces and increasing the angular velocity of the brush. But it must be remembered that a considerable increase it will damage the plant rod pile, so rational values of angular velocity from 25 to 35 rad / s. the forward speed of the growth results in an increase of the resistance, with initially sharply increases the resistance of the soil and the soil base reaction increases in direct proportion. Therefore, the forward speed of the unit should not exceed 2 m / sec.

List of references

1. *Normatyvы* Growing costs of planting material plodovыh and berry crops and Technological cards for pytomnykovodstvu / Gos. agribusines. com. SSR: - Otv. by Vol. VT Gontar. - K .: 1989. - 94 p.
2. *catalog* machines and equipment for mechanization of works in plodopytomnykah; VDNH USSR. - M., 1989. - 101 p.
3. *Directory* Mechanization of Horticulture / MO Babiy, LE Babeshko, MO DEMYDKO etc. ; Ed. MO DEMYDKO. - 2nd edition, revised. and add. - K .: Harvest, 1992. - 261 p.
4. *Fryshev SG* Comparative evaluation of technologies disclosure and jigging separation clonal rootstocks / SG Fryshev, I. Privalov, Voytik AV // Scientific Bulletin of National Agrarian University. - 2005. - №80. - C. 62-66.
5. *Gusev L.* Fundamentals of theory and calculating machines podmetanyya horodskyh roads: Author. diss ... Doctor. Sc. Science / LM Gusev. - M., 1961. - 48 p.
6. *Gusev L.* Calculation and konstruyrovanye podmetalno-harvesters machines / *L. Gusev*. - M.-L .: Mashhyz, 1963. - 204 p.
7. *Mikhailov AV* Mnohofunktsyonalnыe schetochnыe torfyanыe mashiny / *A. Mikhailov* // Notes SPbHHY. - Vol. 157 - SPb., 2004. - P. 42-45.
8. *Murashov MV* Theory and calculation frezeruyuschyh workers organs of machines to development depends torfyanoy: Diss ... doctor. Sc. Science / MV Murashov. - Kalynyn, 1964. - 196 p.
9. *Popov EP*Nonlinear static tasks thin rods / EP Popov. - L. M .: Hostehyzdat. 1948. - 170 p.
10. *Popov EP* Theory and raschët and elastic bending rods / EP Popov. - M .: Nauka, 1986. - 264 p.
11. *Voytik A.* Research forms the working body brush to disclose the mother plants root system / AV Voytik, MG Gnatyuk // Bulletin of the Ukrainian branch of the International Academy of Agricultural Education. - Melitopol: Oldie-Plus, 2015. - P. 190-197.

Abstract.*In Article rassmotrenы technology and tehnycheskye sredstva for Disclosure kornevoy system matochnыh plants klonovыh podvoev. Established something ratsyonalnым javljaetsja Option Using Device kombynyrovannoho with passyvnыmy razokuchyvatelyamy and aktyvnыmy tsylyndrycheskymy schetkamy with vertykalnыmy axes of rotation and bending of the working elements. Proanalyzyrovan Rabochy process one rod pile schetky and opredelenы sylы, kotoryya deystvuyut on him. Found terms, in Kotor smetayuschyy element schetky soil particles will be DELETE FROM substrate Or roll. C. Using Elliptic yntehralov Legendre opredeleno reaction rod on grounds of soil pile. On the grounds of the power analysis ravnodeystvuyuschey Resistance forces and soil reactions pochvennoy Fundamentals, naydenы graphic dependence ravnodeystvuyuschey from konstruktyvnыh and kinematically schetky parameters.*

Keywords: schetka, rod pile prohyb, deformation, kornevaya head, matochnoe plants, roll, soils, base reaction, Resistance

Annotation.*The paper considers technologies and technical means for the disclosure of the root system of the mother plant clonal rootstocks. Found that the rational option is the use of the combined device with passive disks and active cylindrical brushes with vertical axes of rotation and flexible working elements. Analyzed the workflow of one rod lint brush and determined forces that are not. Found the condition under which the element sweeping brush will remove the particles of soil or substrate from the roll. Using elliptic integrals, Legendre determined the reaction of the subgrade on the rod of the pile. On the basis of the power analysis of the resultant resistance force of soil reaction and soil bases, found graphic dependences of the resultant of the constructive and kinematic parameters of the brush.*

Key words: brush, rod pile, deflection, deformation, root head, mother plants, swath, soil, foundation, reaction resistance

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