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SCIENTIFIC SCHOOL OF MEKHANIZATSII COLLECTION SUGAR BEET NOOBIP UKRAINE

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The main achievements of modern scientific research conducted at the National University of Life and Environmental Sciences of Ukraine mechanization of sugar beet and analyzes the state of the current theories and developed new designs beet machines and their working bodies, technical level which corresponds to the best world standards.

Sugar, mechanization, beet harvesters, engineering, root

Introduction. Ukraine is a highly buryakosiyuchyh Europe and the world where sugar is a major strategic products produced by agriculture. Domestic agricultural mechanical engineering necessary to start production of beet machines, functional and performance indicators are not only matched the best world counterparts, but also exceed them. Increase the quality process sugar beet is a complex scientific and technical problem whose solution must be based on finding new design solutions and working bodies Layouts machines, solid theoretical justification of design and process parameters, experimental confirmation of theoretical research with the ultimate purpose of analysis and synthesis Their optimum parameters. In NUBiP Ukraine (former Ukrainian Agricultural Academy) in the late 70s of the last century was a scientific school of mechanization of sugar beet. It was formed mainly at the Department of Mechanics and TMM (which is unfortunately not available) Faculty of Agricultural Mechanization (now Technical ESI). Two prominent members of this school is Holovatch IV, RB Hevko and Helemendyk MM who complete and successfully defended their doctoral dissertations on the theoretical foundations of vibrating excavation of sugar beet roots, clearing heap korenebulboplodiv advanced cleaning working bodies

and developed new beet harvesters commercially manufactured in Dnipropetrovsk and Ternopil combine plant, development of new mechanical and technological bases of sugar beet harvesting in difficult conditions and development for a number of improved working bodies. To the representatives of this scientific schools that were successful candidate of technical sciences include Teslyuk V. (Now Doctor of Agricultural Sciences, Chair NUBiP) Kozibroda JI, Orehivskyy VD, Syplyvets OO, Birch MG, VV Jaremenko and Boris AM They created a

new theory of advanced manufacturing processes and developed new design of beet working machines. In particular, the theory bezpidpornoho, bezkopirnoho cut tops, advanced theory cleaners heads the remnants of roots in the bud tops, new theories of particle motion tops during transport charging devices, a new theory kopirno-cutting element separator tops. It was created trailed machine root crop INC-6 with advanced cleaning system of roots of impurities and unloading propelled beet harvester bunker and combined shestyryadnu hychkozbyralnu machine; a new set of cars for beet farms - CPP-1,5 and PAC-by; machinery for harvesting fodder beet - BOOM-6 and KUM-6. Developments scientific school is 900 scientific articles, of which more than 200 published abroad (USA, Canada, France, Germany, Belgium, Czech Republic, Slovakia, Poland, Bulgaria, Romania, Latvia, Lithuania, Belarus, Russia), 750 patents inventions, 17 monographs.

Analysis of recent research. Design of the first in our country beet machines began in the 30's of last century due to fundamental (at the time) the theoretical and experimental investigation USSR Academy of Sciences Academician AA Vasilenko [1]. Later numerical squad scientists, led by academics Vasilenko PM and Pogorelogo LV [2-5] at the end of the last century, mainly formulated the basic tenets of the theory and calculation beet machines, which are widely used combine plant design bureaus in the development of domestic beet harvesters. However, despite significant advances (including the global scientific and engineering practice) in the creation, production and operation of high-performance beet harvesters, and still retained many unresolved significant issues that have global significance as well as a number of outstanding issues to date, directly related to the sugar beet is in Ukraine. This is definitely a problem of improving the quality of raw beet, especially when it is received at the assembly difficult conditions (high hardness or excessive soil moisture, misalignment and uneven crops, excessive weed infestation, etc.) that are widely distributed in the production of technical culture. Therefore, the search for new theoretical developments and design solutions in the world is underway with no less intensity than at the beginning of the creation of the first examples of beet harvesters [6-12]. Besides the above mentioned quality materials scientists in Europe and elsewhere Considerable efforts on search conditions essential decreasing energy intensity process digging roots, improve performance and reliability of machines as well as a significant decrease in contamination of soil additives heap, because environmental requirements are not allowed to take out the fields with root vegetables fertile soil.

The purpose of research. Show advanced level of theoretical development workflow beet machines made in the scientific school

NUBiP Ukraine and embodied in concrete construction machines that have a level of the best world analogues.

Results. Based on established theories of new cars beet [10] developed the basic position calculation and design hychkozbyralnyh rotary machines. Thus, in particular, has been proved analytically specified condition full cut tops beam diameter d at the first contact blade knife with a bunch arched tops like this:

$$d = \upsilon_н t - \frac{P_{ср.}}{\mu}\left(1 - \cos\sqrt{\frac{\mu}{M_{пр.}}}\, t\right) - \frac{P_{ср.}}{\mu}\left(1 - \cos\sqrt{\frac{c}{m_{пр.}}}\, t\right). \qquad (1)$$

where SSR - the average cutting force; Mpr. - Reduced weight knife (blade weight that is given to the impact point of the blade against a bunch of tops); Mpr. - Mass of the beam tops, reduced to the point of impact; $\upsilon_н$ - The critical speed of translational movement of the blade, where possible bezpidpirnyy free standing beams cut tops; $\upsilon_н t$ - Move the knife blade edge at time t in the absence of a collision with a bunch of tops when the knife is at a radial position; s - coefficient of elasticity tops; μ - coefficient of proportionality (the intensity of the load acting on than rejecting his unit length).

The resulting expression (1) given the opportunity to ask such structural and kinematic parameters hychkorizalnoho rotary machine, which cut the beam is tops in the single collision arcuate blade knife with a bunch of tops. This made it possible to design a rotary machine hychkorizalnyy new design parameters that are obtained patents Ukraine [15, 16]. Very light was developed highly reliable rotary machine hychkozbyralna, constructive-technological scheme is presented in Fig. 1, Fig. 2 - general view, which can further be used as a regular mowing (grass cutting quality up to 1 m). Ternopil combine plant has produced a pilot batch of hychkozbyralnyh machines, which is successfully tested in different areas buryakosiyannya. Specification hychkozbyralnoyi new machine as follows: width - 1.35 m (or 3 lines of beet root crops); operating speed - up to 2.1 m / s; weight - 850 kg; aggregation - tractor class 1.4 (or 2.0) with front hinged device; Performance for 1 hour. pure time - 1,0 ... 1,2 ha. Hychkozbyralna machine can be used in almost any weather conditions.

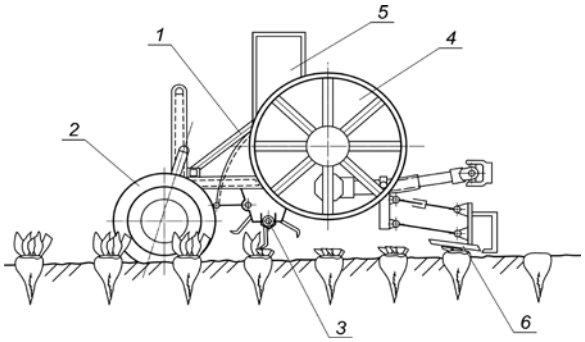

Fig. 1. Structural and flowsheet 1 - frame; 2 - Pneumatic copying wheels; 3 - hychkorizalnyy rotary machine; 4 - screw conveyor and blade shpurlyalka; 5 - boot pipe; 6 - doobrizuvach heads roots.

Fig. 2. Univer-sebaceous hychkozbyralna machine

The results of production testing new cars hychkozbyralnoyi showed that achieved a significant reduction of residues tops heads on sugar beet roots - 1.5 ... 3.0%; reduce losses tops 5 ... 7%; reduce energy parameters of sugar beet tops cut an average of 1.5 - 1.8 times compared to hychkozbyralnymy machines that mass-produced.

Creation theory blade digging working body, and then vibrating digger [6-7, 17] made it possible to get a new analytical dependence of the translational velocity of υ In which no damage is serving beet root crops (not tail breaks off) when removing it from the soil [10]:

$$\upsilon = \sqrt{\frac{g\left(\left[P_x\right]+2abk_{y\partial.}\right)\left(\cos\theta - f\sin\theta\sin\gamma\right)\sqrt{tg^2\gamma+1+tg^2\beta}-}{2ab\gamma_{o\tilde{o}.}\sin\theta\sin\gamma\left[tg\gamma+f_1\left(\cos^2\gamma+\sin^2\gamma\cos\theta\right)\times\right.}} \tag{2}$$

$$\left.\frac{-gGtg\gamma - f_1gG\left(\cos^2\gamma+\sin^2\gamma\cos\theta\right)\sqrt{tg^2\gamma+1+tg^2\beta}}{\times\sqrt{tg^2\gamma+1+tg^2\beta}}\right].$$

Using the condition (2), containing the design parameters of blade digging working body and under developed a new theory of vibration digging up the working body on the basis of which defines the movement and speed of root in the soil of his digging through longitudinal oscillation amplitude H and frequency ω fluctuations and the design parameters, the following:

$$\dot{x} = -\frac{H}{m\omega}\sin\gamma\left(\cos\theta\sin\theta + f\cos^2\theta\right)\cos\omega t - \\ -\frac{R_x}{m}t + \frac{H}{m\omega}\sin\gamma\left(\cos\theta\sin\theta + f\cos^2\theta\right), \tag{3}$$

$$x = -\frac{H}{m\omega^2}\sin\gamma\left(\cos\theta\sin\theta + f\cos^2\theta\right)\sin\omega t - \\ -\frac{R_x}{2m}t^2 + \frac{H}{m\omega}\sin\gamma\left(\cos\theta\sin\theta + f\cos^2\theta\right)t + x_o, \quad (4)$$

Designed by digging out a new vibrating body, structural and technological scheme is shown in Fig. 3, a general view in Fig. 4.

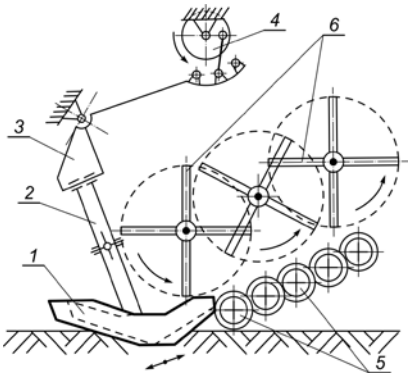

Fig. 3. Structural and technological scheme: 1 - digging plowshares; 2 - rack; 3 - the mechanism of the gap between the blade; 4 - vibratory drive; 5 - screw conveyor; 6 - Bitters.

Fig. 4. General view of the working body vibration digging

Construction worker digging a vibrating body, which patented Ukraine [12-14], is based on the principle that the variation in its digging plowshares made in povzdovzhno-vertical plane of the amplitude and frequency can be controlled in a wide range. This makes it possible to use these vibrating digging out bodies working on different types of soils that have at the time of collecting different moisture and firmness. In addition, these working bodies have the ability samovstanovlyuvatys longitudinal axis relative to the line of roots, which also provides a reduction in beet root crop damage from soil digging. The presence of a mechanism that provides a change of distance between digging blade makes it possible to carry out high quality soil excavation with different size and shape of sugar beet roots.

Vibrating digging your body has the technical characteristics: frequency vibrations - 8.5 ... 20.3 Hz; the forward speed - 0.75 ... 2.28 m / s; amplitude oscillations - 8 ... 24 mm; depth course plowshares in soil - 75 ... 150 mm.

Install vibration digging work of towed vehicle bunker root crop showed that loss of roots during digging not exceed 1.0 ... 1.5%. Damage sugar beet roots it is very small and do not exceed 1.5 ... 3.0%.

Current research and development of new design combining touch copy process and separation of sugar beet tops a working body (Fig. 5, 6). On the basis of theoretical research cooperation kopirno-cutting

element separator tops determined optimal normal reaction to sugar beet root when exposed to it a system of two work items [18]:

$$N = \frac{J\ddot{\varphi} + M_R - \frac{J\ddot{\varphi}_2 + M_{R2}\sqrt{\sin^2\varphi_2\cos^2\alpha + \cos^2\varphi_2}\; m_{21}}{\sqrt{\left[\left(r_0 + l_{nn}\cos\varphi_2\right)\cos\alpha - \frac{b}{2}\sin\alpha\right]^2 + \left[\left(r_0 + l_{nn}\cos\varphi_2\right)\sin\alpha - \frac{b}{2}\cos\alpha\right]^2}}}{\sqrt{\left[\rho\sin(\alpha_0 + \omega t)\right]^2 + \left[-tg\varphi_0\left(\sqrt{\delta^2 + (d-h)^2 - \left(\frac{b}{2}\right)^2} - r_0\right) - Vt\right]^2}}, \quad (5)$$

where δ - deviation from conventional rotor axis center line of the line; b - konstruktyvna width of the working element; MR and MR2 - moments of inertia centrifugal forces the previous and next working elements relative to their axes suspension; m21 - shoulder normal reaction steps next working element on its axis relative to the previous suspension; φ2 - angle next working element from the plane of rotation; α - angle of rotation of the rotor shaft; ρ - distance from the axis of the rotor head to the top of root; d - the distance from the axis of the rotor to the base of the soil; r0 - radius axle suspension working element; lpp - kopirnoyi length of the working element.

The results of experimental research and production testing of the new separator sugar beet tops showed his undoubted advantage in comparison with the best foreign counterparts on many parameters.

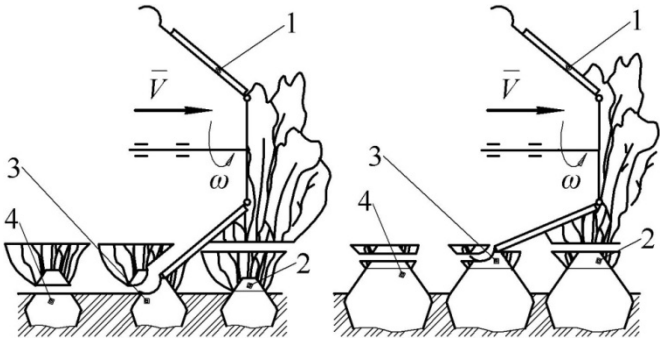

Fig. 5. Constructional and technological scheme: 1 - work item; 2 - bezkopirnyy previous cut; 3 - kopirnyy cut heads; 4 - root after the cut.

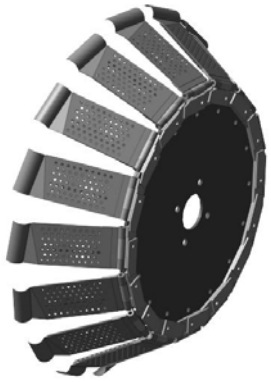

Fig. 6. In general, look ing separation-tops lyuvacha sugar beet Closed

Conclusion. Use performed major scientific advances and design developments school mechanization of sugar beet in Ukraine NUBiP allows you to design and produce beet machines, technical level which is no worse than the technical level of the best foreign analogues, and in

terms of cultural practices and Ukraine exceeds this level. Further research in this area should be aimed at creating such hychkovydalyayuchyh digging and working bodies, what are enabling even more significantly reduce energy data processes, while preserving a high Quality Score. In addition, the current world approaches to the use of raw sugar beets as bioenergy crops (root crops receipt of bioethanol and picking tops biogas) require further substantial research and development of new developments relating to the reduction of losses in mass tsukronosnoyi doobrizanni heads of roots in the bud more quality grinding and thorough cleaning (as opposed to spreading the field) green tops that would be less clogged soil additives, more thorough cleaning of root crops bodies bound and free soil in beet vorosi more.

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Major achievements Rassmotrenы sovremennыh nauchnыh of research, in kotorыe provedenы, National unyversytete byoresursov of nature and Ukraine and proanalyzyrovano STATUS Using sovremennыh theories svеklouborochnыh machines and workers s organs, tehnycheskyy Level kotorыh corresponds to better myrovыm counterparts.

Saharan beet, mechanization, svеklouborochnыy combine Mashinostroenie, korneplod

The main achievements of modern scientific research was carried out at the National University of Life and Environmental Sciences of Ukraine and analyzes the use of modern theories of beet machines and their working groups, technical level which corresponds to the best world standards.

Sugar beet, mechanisation, beet-harvesting combine, mechanical engineering, root crop.

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STUDY OF THE STATISTICAL CHARACTERISTICS Side SCATTERING OF SEED AFTER SHOCK oblique BA flat surface

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Defined statistical characteristics of lateral deflection angle of flight trajectories seeds in the vertical plane relative to the central (theoretical) plane after the oblique shock seeds against a flat surface.

Oblique shot, the trajectory of seeds angle lateral deviation, statistical characteristics, coefficient of variation.

Problem. When performing subsurface variation-sowing seed drill coulters with lapovymy integral part of the process is scattering the seed furrow the area with relatively high uniformity. To achieve uniform distribution of seeds have special working bodies - reflectors distributor, which scatter the seeds.