ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 05,2025

AMERICAN ACADEMIC PUBLISHER OPEN ACCESS JOURNAL

Journal: https://www.academicpublishers.org/journals/index.php/ijai

IMPROVED VINE BURYING MACHINE

J.U.Ruzikulov, A.Hakimov, D.U.Ruzikulova
Bukhara State Technical University
jasurruzikulov@mail.ru

Annotation: This article presents an analysis of targeted research work aimed at developing resource-saving technologies and technical means for burying vines, the development of an energy-saving machine design that can bury vines at the required level with minimal damage, the justification of the parameters of its working bodies that ensure their operation at the level of agrotechnical requirements in the processes of interaction with vines and soil, as well as recommendations for developing a machine that can bury vines at the required level with minimal energy and resource consumption.

Keywords: technology, resource-efficient technologies, machinery, vine plantations, vine bushes.

The development of energy-saving technologies and modern equipment for wine growing is taking a leading position in the world. "Considering that vines are grown on more than 7.545 million hectares worldwide," developing a machine that can bury vines at the required level while consuming less energy and resources is an important task. In Uzbekistan, to prevent vines from being frostbitten, they are buried with straw or soil in late autumn and re-opened in spring. However, due to the lack of production of special equipment, this work has not been mechanized and has been carried out manually to this day. This, in turn, sharply increases labor, working hours, and other costs, preventing the establishment of large-scale grape plantations. In this regard, great attention is being paid to developing machines and mechanisms that can bury vines to the required level with minimal damage.

Targeted research is being conducted around the world to develop resource-saving technologies and technical means for burying vines. In this direction, it is considered urgent to conduct targeted scientific research to develop an energy-saving machine design that can bury vines at the required level with minimal damage, and to substantiate the parameters of its working bodies that ensure their operation at the level of agrotechnical requirements in the processes of interaction with vines and soil.

The layout of vines in vineyards, the height of the vine, the diameter of the trunk, the distance of the lowest branches from the ground, the width of the rows, and the deviation of the vines relative to the row axis are all parameters that affect the planting process.

It is known that the physical and mechanical properties of the soil are one of the most important factors in justifying the design and operation of a vine-burying machine.

Experiments to study the architectonics of vines, their location in the vineyard, and the physical and mechanical properties of the soil were conducted in November 2019 in the vineyards of the «Halim Habibjon» farm in the Bukhara district of the Bukhara region. The experiments were conducted in 5-6-year-old vineyards planted with the common varieties of raisins and table grapes. The planting scheme for vines is 4x3 m, the width between rows is 4 m, and the distance between vines in a row is 3 m. In many parts of our republic, vines are planted in this scheme.

The necessary control and measuring instruments and equipment were selected to conduct the

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 05,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

experiments [1]. Measurements were taken to determine the transverse distance between vines and the deviation of vines from the row axis using a 50-55 m long rope, several stakes, and a measuring tape (Figure 1). In this case, a rope was pulled 1 m across the trunk of the vine and the distances X_1, X_2,…,X_n were measured. The difference between successive results indicates the deviation of the vines from the row axis [2]. The longitudinal distance between vines was measured from the center of their body.

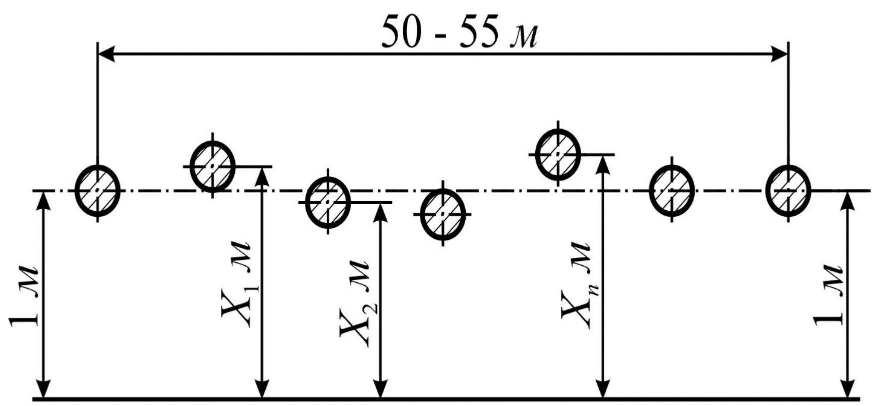


Figure 1. Scheme for determining the deviation of grapevines from the row axis

A measuring tape 1 m long (with an error of 2 mm) was used to measure the height (h_t) of the trunk of the vine bush. The distance from the soil surface to the lowest branch was measured along the body axis.

The diameter of the trunk of the vine was determined by the length of the circumference using an elastic measuring tape with a scale of 1 mm at a height of 20 cm above the soil surface.

The cross-sectional diameter of the planted vines was determined by hand from the highest point of the planted vines using an elastic measuring tape graduated in 1 mm increments, based on their circumference..

Measurements of the above-ground architecture of vines and their location in vineyards were carried out in 25 replicates. Field experiment data were processed using mathematical statistics.

The following was determined: $M_{o‘r}$ is the arithmetic mean and $\pm\sigma$ is the standard deviation [3].

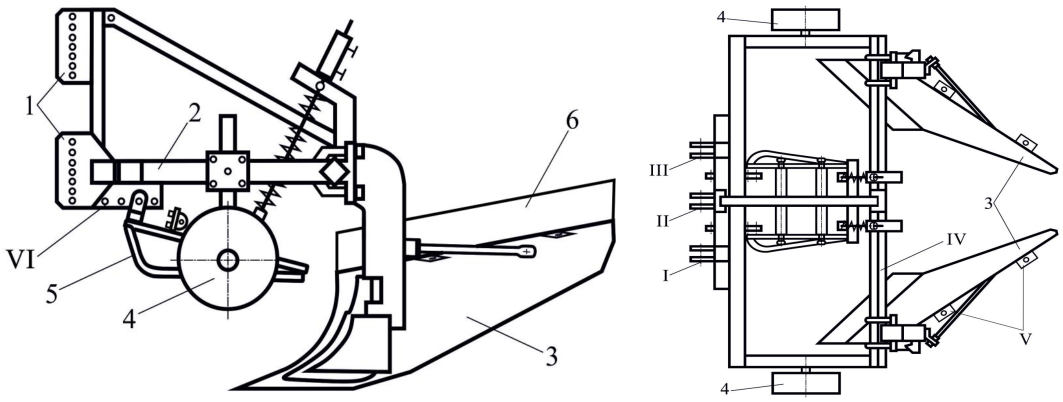
A special laboratory-field device design scheme was developed taking into account the operating conditions of the device. Figure 2 depicts the structural diagram of the laboratory-field device.

The device consists of a frame, suspension mechanism, support wheels, ball bearings, and right and left bodies. The device is designed to be able to change the vertical distance from the support plane to the lower attachment point of the suspension device, the transverse distance between its bodies, the longitudinal distance between the body and the ball bearing, the height of the body's working surface, and other parameters within a wide range.

The vertical distance from the support plane of the device to the lower attachment point of the suspension device is changed by moving the fingers into the upper or lower holes of the brackets I, II and III on the frame.

The transverse distance between the bodies is adjusted by moving them to the right or left along the transverse beam IV.

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 05,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai



a) b)

Figure 2. Structural diagram of the laboratory-field device
1 – hanging device; 2 – frame; 3 – bodies; 4 – support wheels; 5 – bushing; 6 – plank; I, II and III – suspension brackets;
IV – cross beam, V – ear (place of fastening of planks);
VI – ball bearing mounting brackets
a) side view; b) top view

The longitudinal distance between the bodies and the main bearing is changed by moving the main bearing forward or backward along the brackets VI.
The height of the cabinet work surface is changed by attaching slats of different heights to the ears V.
Based on the results of the research, the following conclusions were presented:
1. Currently, in our republic, planting vines is carried out manually. As a result, labor costs are increasing and burial times are lengthening.
2. Machines that can be aggregated with chainsaw tractors and bury vines have been created. However, they have not found a place in agricultural production due to their high fuel, labor and time consumption, their structural complexity, and their inability to completely bury vines. In addition, these machines are morally obsolete and cannot be aggregated with the high-power tractors currently available in our republic.
3. The above shortcomings can be overcome by developing and using a vine-burying machine that can be aggregated with modern wheeled tractors.
4. Based on the above, it is urgent to conduct targeted research aimed at validating the parameters and operating modes of the working bodies of a vine-burying machine.
5. To ensure high-quality burying of vines at the required level with low energy consumption, the coverage width of the burying bodies must be at least 45 cm..
6. To ensure proper embedding of vines with soil, the external transverse distance between the bodies of the machine that bury them should be between 2.16-2.46 m..
7. In order to fully form the soil mound required for burying vines, the angle of installation of the machine's burying bodies relative to the direction of movement of the share blades should be at least 55°, and the angle of entry into the soil should be between 20°-26°.

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 05,2025

AMERICAN ACADEMIC PUBLISHER OPEN ACCESS JOURNAL

Journal: https://www.academicpublishers.org/journals/index.php/ijai

Refernces:

1. UzDSt 3193:2017. "Testing agricultural machinery. Method of energy assessment of machines". - Tashkent, 2017. - 21 p.
2. Development of new and improvement of existing technical means for soil cultivation, application of fertilizers, protection of gardens from diseases and pests: Research report KA-3-008/ SamSKHI Musurmonov A.T. // Samarkand: 2015. – 135 p.
3. STO AIST 4.4-2010 Testing of agricultural machinery. Machines and tools for soil cultivation in orchards, vineyards, hop and berry fields. Methods of evaluation of functional indicators (instead of STO AIST 4.4-2004, OST 10 4.4-99) – M.: 2011. – 81 p.
4. Imomov Sh., Jurayev A., Ruziqulov J., Kurbonboyev S., Ruziqulova D., Xusinov S., Madadkhonov T. (2022). THEORETICAL STUDIES ON THE DESIGN OF TRENCHER WORK EQUIPMENT. Eurasian Journal of Academic Research, 2(12), 989–996. https://www.inacademy.uz/index.php/ejar/article/-view/6504
5. Sh.J.Imomov, J.U.Ruzikulov, S.S.Kurbanbayev, H.S.Safarov, K.S.Sobirov, and Z.Sh.Isakov “Technological process of provisional dig a ditch”, Proc. SPIE 12296, International Conference on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022), 122960O (6 July 2022); https://doi.org/10.1117/12.2642980
6. Energy-saving device for temporary ditch digging I.S.Hasanov1, J.U. Ruzikulov, F.A.Ergashov1, M.J.Toshmurodova and M.R.Sotlikova1 Published under licence by IOP Publishing Ltd IOP Conference Series: Earth and Environmental Science, Volume 868, International Conference on Agricultural Engineering and Green Infrastructure Solutions (AEGIS 2021) 12th-14th May 2021, Tashkent, UzbekistanCitation I S Hasanov et al 2021 IOP Conf. Ser.: Earth Environ. Sci. 868 012091DOI 10.1088/1755-1315/868/1/012091
7. Ruziqulov Jasur Uktam ugli, Isakov Zafarjon Shuxrat ugli, Qurbonboyev Sindorbek Sarvarbek ugli, Ruziqulova Dilnoza Uktamovna, Xusinov Sarvarbek Nodirbek ugli. (2022). Increasing the working productivity of the case 1150 l bulldozer by improving the working equipment. Neo Science Peer Reviewed Journal, 4, 87–90. https://www.neojournals.com/index.php/nsprj/article/view/83 .
8. Imomov Shavkat Jakhonovich, Murodov Tohir Faxriddin ugli, Isakov Zafarjon Shuxrat ugli, Ochilov Nuriddinjon zokirovich, Iskandarov Johongir Ochil ugli, & Ruziqulova Dilnoza Uktamovna. (2022). Local fertilizer machine with auger. Neo Science Peer Reviewed Journal, 4, 91–93. Retrieved from https://www.neojournals.com/index.php/nsprj/article/view/84
9. Ruziqulov J., Kurbonboyev S., Xusinov S., Ruziqulova D. (2023). Improvement of the scraper work equipment and improving its efficiency. Eurasian Journal of Academic Research, 3(1 Part 4), 12–16. извлечено от https://in-academy.uz/index.php/ejar/article/view/8935
10. P.G.Hikmatov, J.U.Ruzikulov, O.S.Sayidov, Ruziqulova Dilnoza Uktamovna, Improved machine for spreading and compacting road construction materials., International Bulletin of Applied Science and Technology: Vol. 3 No. 6 (2023): International Bulletin of Applied Science and Technology https://researchcitations.com/index.php/ibast/article/-view/2020
11. P.G.Hikmatov, J.U.Ruzikulov, O.S.Sayidov, Ruzikulova Dilnoza Uktamovna,Selection of an auger device for a machine for spreading and compacting improved road construction

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 05,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

materials, International Bulletin of Applied Science and Technology: Vol. 3 No. 6 (2023): International Bulletin of Applied Science and Technology https://researchcitations.com/index.php/ibast/article/-view/2009

12. J.U.Ruzikulov, D.U.Ruzikulova, U.F.Khusenov. Energy-saving device for temporary ditch production france international scientific-online conference: "Scientific approach to the modern education system" PART 18, 5th October https://interonconf.org/index.-php/fra/article/view/7258/6260