

ENERGY-SAVING TECHNOLOGY AND MACHINERY FOR GROWING MELONS

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ABSTRACT

The article presents the results of research on the development of energy-resource-saving technology and a combined machine for its implementation, on the cultivation of melons.

Key words: gourds, technology, soil, subsurface processing, technological operation, combined machine, furrow, sowing.

Introduction

Today, about 3.5 million people worldwide die each year. hectares, including 2.7 million in Asian countries. melons are grown per hectare, which is 77% of the total cultivated area [1]. In the cultivation of melons, it is important to use advanced technologies and modern techniques of tillage while maintaining soil fertility for high yields. It is known that currently the preparation of fields for planting melons consists of agro-technical measures, such as fertilization, plowing, leveling, chiseling, harrowing, mulching and digging ditches. It is recommended to sow the seeds of melons only after the implementation of these technological processes. Repeated tillage from the field to the soil leads to an increase in labor, energy and fuel consumption, structural failure and over-compaction. It also increases the type and number of agricultural machinery, prolongs the preparation of the soil for planting, which leads to a decrease in productivity in horticulture [2 - 18].

The aim of the study is to substantiate the optimal design of a combined machine for preparing soil for sowing melons and gourds.

Literature Review

The problems of high-quality soil preparation for sowing melons and gourds are considered in many scientific works [2-18]. F. Mamatov, BS Mirzaev [2-11] studied the issues of basic processing, thorough interaction of working bodies with the soil. Research on the creation of machines for melon growing, the substantiation of the designs and parameters of their working bodies were carried out by VG Abezin [16], A. Em, V. Zhukov [17], VI Malyukov [18], and others. VG Abezin [16] substantiated and developed working bodies for pre-sowing soil cultivation and sowing melon seeds. Research by A. Em and V. Zhukov [17] is mainly aimed at developing machines for inter-row processing of melons. These studies did not consider the development of machines for sowing melons after winter crops. The above disadvantages can be eliminated by developing a machine for preparing the soil for sowing melons after winter crops in one pass of the unit.

Materials and Methods

Performance indicators of the combined machine determination according to Tst 63.04: 2001 "Tests of agricultural machinery. Machines and implements for surface tillage. Program and test methods" and Tst 63.02: 2001 "Testing of agricultural machinery. Machines and implements for deep tillage. Test program and methods".

Results

Based on the analysis of the literature and the results of research, a technology has been developed aimed at preparing the land for planting melons and minimal tillage of the soil during planting. In developing this technology, the following were taken into account: fertilization, basic tillage of the soil and its preparation for planting melons, as well as the coincidence of sowing dates; the need to prepare the soil for planting melons as soon as possible; availability of powerful tractors for aggregation of combined machine; the ability to conduct all processes simultaneously with the help of working bodies.

Based on the research, a prototype of a combined machine for growing melons (conditional brand PKTV-3,6) was prepared at JSC BMKB-Agromash and tested in the fields of farms of

Kamashi district of Kashkadarya region. In tests, the machine was aggregated with a TS-130 tractor.

The proposed technology is implemented as follows (Figure 1): the spacing of adjacent planting areas is softened, then the surface area of the planting area, i.e. winter wheat stalks and weeds, is divided into two and cut and laid on the sides accordingly, then the planting area soil deep loosened and at the same time an irrigation ditch is formed and local fertilizer is applied. The corridor where the seeds are planted, i.e. the soil on both sides of the irrigation ditch, is ground, leveled and compacted, and then the seeds are planted.

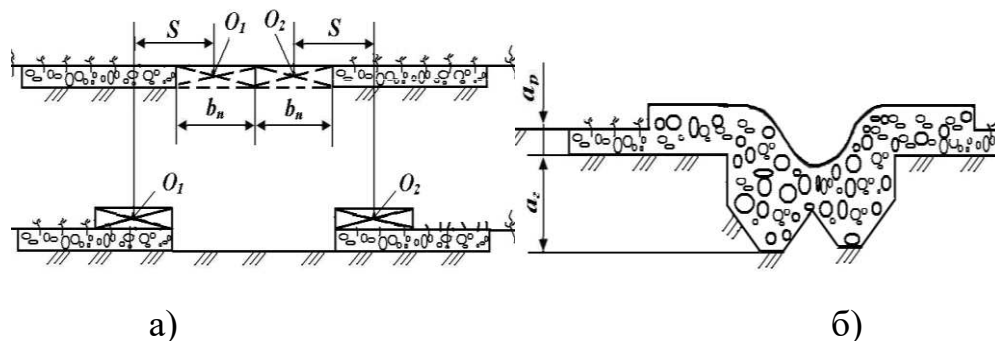


Figure 1. The scheme of the new technological process of preparing the fields for planting melons: a – the cross-sectional profile of the field after the planting area has been softened between the surfaces and the stalks have been turned to the right and left; б – cross-section profile of the field after sowing seeds with deep loosening of row spacing and opening of irrigation ditches

This technology is implemented in one pass by a combined machine that cultivates the soil and prepares it for planting, fertilizing and planting melons.

Combined machine frame 1, hanging device 2, disk blade 3, left and right rolling lister type housing mounted on the axis of symmetry of the unit 4, softeners 5, deep softeners with tilting bevel handle 7, fertilizer feeding apparatus 8, softening-leveling roller 9, sowing machine It consists of 10 and a base wheel 6s. The spool 9 and the sowing apparatus 10 are hinged to the frame (Fig. 2).

The combined machine is mainly used in the preparation of fields freed from winter wheat for planting melons (Fig. 3). The technological operation of the combined machine is carried out

as follows: series-mounted softeners soften the field on the side of the planting area, ie the field between adjacent rows to a depth of 12-15 cm and cut the root of weeds, rolling hulls equipped with sliding plates in the form of listers 4 Cut to a depth of -10 cm and roll over the loosened field to the right and left, respectively, then the planting area is loosened deep with sloping handle softeners and fertilizers are applied to a specific place along the line where the seeds are planted at the same time. Using a softener-leveling roller 9, the row spacing soil is softened and compacted and prepared for sowing, and the seeds are sown with a sowing machine.

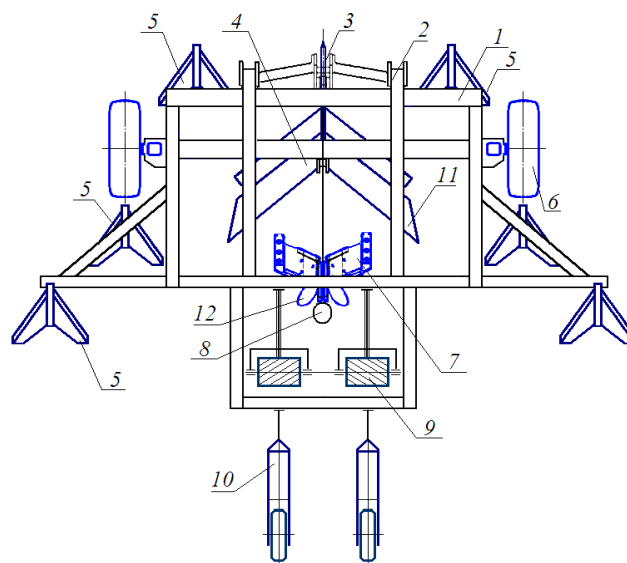


Figure 2. Constructive scheme of the combined machine:

1 - frame; 2 - hanging device; 3 - disc blade; 4 - double housing with a guide plate in the form of a lister; 5 - straight cutter; 6 - base wheel; 7 - sinker; 8 - fertilizer; 9 - reel; 10 - sowing device; 11 - reference plate; 12 - thinner

It was found that the quality of soil preparation and planting processes for planting melons with a combined machine depends on the mutual location of the working bodies and their parameters [8, 9].

In the tests, the working depth of the seedbed was set at 30 cm, while in practice its average value was 30.6 cm. The average fraction of fractions smaller than 50 mm was 76.2%, the unevenness of the treated field surface was 7.8 cm, the width of the top of the irrigation ditch was 58.4 cm, and the depth of the irrigation ditch was 21.8 cm. This allows you to sow the

seeds of melons in two rows at the top of the ditch, with 60, 70 or 90 cm between the main rows.



Figure 3. A view of the working process of a combined machine in a field emptied of wheat

It is clear from these data that the performance of the combined unit meets the requirements of agrotechnics. The developed combined machine reliably performed the specified technological processes.

Combining tillage with and without tillage, as well as deep loosening of the soil with tape, the formation of irrigation ditches and sowing of melon seeds leads to a sharp reduction in energy consumption and prevents water and wind erosion. Applying fertilizer to a specific location on two tiers increases the efficiency and productivity of the use of mineral fertilizers.

CONCLUSIONS

The use of a combined machine that implements energy-saving technology for growing melons ensures quality preparation of the soil for planting and planting melons in a short time, prevents soil erosion and over-compaction, reduces labor and capital costs, increases the yield of melons.

REFERENCES

- [1]. Литвинов С.С., Быковский Ю.А. Бахчеводство: стратегия и перспективы развития // Картофель и овощи. – Москва, 2013. -№4. – С.2-6.
- [2]. Mirzaev, B., Mamatov, F., &Tursunov, O. (2019). A justification of broach-plow's parameters of the ridge-stepped ploughing. <https://doi.org/10.1051/e3sconf/20199705035>.

- [3]. Mirzaev, B., Mamatov, F., Avazov, I., & Mardonov, S. (2019). Technologies and technical means for anti-erosion differentiated soil treatment system. E3S Web of Conferences, <https://doi.org/10.1051/e3sconf/20199705036>.
- [4]. Mamatov F., Mirzayev B., Shoumarova M., Berdimuratov P., Khodzhaev D. Comb former parameters for a cotton seeder // International Journal of Engineering and Advanced Technology (IJEAT). – Volume-9 Issue1, October 2009. DOI: 10.35940/ijeat.A2932.109119. P.4824-4826.
- [5]. Mirzayev B., Mamatov F., Ergashev I., Ravshanov H., Mirzaxodjaev Sh., Kurbanov Sh., Kodirov U., Ergashev G. Effect of fragmentation and pacing at spot ploughing on dry soils // E3S Web of Conferences, <https://doi.org/10.1051/e3sconf/201913501065>.
- [6]. Mirzaev B., Mamatov F., Ergashev I., Islomov Yo., Toshtemirov B., Tursunov O. Restoring degraded rangelands in Uzbekistan // Procedia Environmental Science, Engineering and Management. – 2019. – № 6. – pp. 395-404.
- [7]. Mirzayev B., Mamatov F., Ergashev I., Ravshanov H., Mirzaxodjaev Sh., Kurbanov Sh., Kodirov U., Ergashev G. Effect of fragmentation and pacing at spot ploughing on dry soils // E3S Web of Conferences. <https://doi.org/10.1051/e3sconf/201913501065>.
- [8]. Mirzayev B., Mamatov F., Chuyanov D., Ravshanov X., Shodmonov G., Tavashov R., Fayzullayev X. Combined machine for preparing soil for cropping of melons and gourds // XII International Scientific Conference on Agricultural Machinery Industry. doi.org/10.1088/1755-1315/403/1/012158.
- [9]. Mirzayev B., Mamatov F., Aldoshin N., Amonov M. Anti-erosion two-stage tillage by ripper // Proceeding of 7th International Conference on Trends in Agricultural Engineering. 2019 / 17th - 20th September 2019 Prague, Czech Republic. P.391-396.
- [10]. Aldoshin N. Didmanidze O., Mirzayev B., Mamatov F. Harvesting of mixed crops by axial rotary combines // Proceeding of 7th International Conference on Trends in Agricultural Engineering 2019. 17th - 20th September 2019 Prague, Czech Republic. – pp.20-26.
- [11] Mamatov F., Mirzaev B., Batirov Z., Toshtemirov S., Tursunov O., Bobojonov L. Justification of machine parameters for ridge forming with simultaneous application of fertilizers // CONMECHYDRO – 2020. IOP Conf. Series: Materials Science and Engineering 883 (2020) 012165. doi:10.1088/1757-899X/883/1/012165.
- [12] Mamatov F., Mirzaev B., Berdimuratov P., Turkmenov Kh., Muratov L., Eshchanova G. The stability stroke of cotton seeder moulder // CONMECHYDRO – 2020. IOP Conf. Series: Materials Science and Engineering 883 (2020) 012145. doi:10.1088/1757-899X/883/1/012145.

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- [13] Mamatov F., Ergashev I., Ochilov S. & Pardaev X. Traction Resistance of Soil Submersibility Type "Paraplau"// Journal of Advanced Research in Dynamical and Control Systems (JARDCS). – Volume-12, 07-Spesial Issue, 2020. DOI: 10.5373/JARDCS/V12SP7/20202336. P. 2154-2161.
- [14] Aldoshin N., Mamatov F., Ismailov I., Ergashov G. DEVELOPMENT OF COMBINED TILLAGE TOOL FOR MELON CULTIVATION// 17th International Scientific Conference ENGINEERING FOR RURAL DEVELOPMENT Proceeding, Volume-19. 20th - 22th May 2020 Jelgava. – pp.767 -773. DOI: 10.22616/ERDev2020.19.TF175.
- [15]. Ravshanov K., Fayzullaev K., Ismoilov I., Irgashev D., Mamatov S., Mardonov Sh. The machine for the preparation of the soil in sowing of plow crops under film// CONMECHYDRO – 2020. IOP Conf. Series: Materials Science and Engineering 883(2020) 012138. IOP Publishing. doi:10.1088/1757-899X/883/1/012138.
- [16]. Abezin V.G. Mehanizacija vozdeleyvaniya bahchevyh kul'tur na osnove resursosberegajushhih pochvozashhitnyh tehnologij: Dis. ... d-ra tehn. nauk., Volgograd, 2004, – 478 c.
- [17]. Em A.D., Zhukov V.N., Kodirov A.Je.. Rekomendacii po primeneniju mehanizirovannoj tehnologii i kompleksa mashin dlja vozdeleyvaniya bahchevyh kul'tur. –Toshkent, 1989. – S.1-13.
- [18]. Maljukov V.I. Mehanizacija bahchevodstva. – Volgograd, Nizh.-Volzh. Kn. izd-vo, 1982. – S. 6-14.