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RESULTS OF ECONOMIC TRIALS OF A FILM LAYING MACHINE EQUIPPED WITH A LEVELER-COMPACTOR FOR POTATO RIDGES

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Abstract
This article presents the design of a film-laying machine equipped with a leveler-compactor for potato ridges, along with the results of its field trials. The proposed machine demonstrated its ability to simultaneously perform the processes of leveling and compacting the ridge, creating furrows, and laying film in a uniform manner. Experimental tests confirmed that the machine's agrotechnical and operational indicators fully comply with established standards, substantiating the recommendation of this design for use in potato cultivation technology.

Keywords: Potato cultivation, ridge formation, film laying, leveler-compactor, agrotechnical indicators, farm trials, design parameters.

Introduction

The application of modern technologies in potato cultivation, particularly the practice of covering planted ridges with film, significantly enhances the effectiveness of agrotechnical measures. Under the film, soil moisture is better retained, temperature conditions are stabilized, weed growth is reduced, and seedlings emerge earlier. However, the existing film-laying devices available to dehkan farms are not sufficiently advanced in terms of technical and energy efficiency.

Therefore, the development of a new film-laying machine equipped with a leveler-compactor, which can be aggregated with tractors of classes 0.9-1.4, is an urgent matter. The aim of the research is to develop a design solution for the new machine and conduct it is experimental and field trials.

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Research materials and experimental results

The proposed potato ridge film-laying machine equipped with a leveler-compactor (Fig. 1) is designed for aggregation with a potato planter or tractors of classes 0.9-1.4. It consists of a frame 2 fitted with a mounting device 1, a roller 3 for leveling and compacting the top of the ridge, a flat disk 4 for creating a groove for the film, a film holder 5, a film presser 7, a spherical disk for covering, and a film hook 8. The potato planting unit performs the task of laying film when planting potatoes on dehkan farm lands. During this process, it levels and compacts the surface of the potato-planted ridges with a roller. A furrow is opened on the side of the ridge using a disc, and a film holder keeps the film in place along the opened groove. The held film is then buried on the side to a specified depth using a covering device. Figure 2 shows the unit aggregated with a tractor, and Figure 3 illustrates the process of film laying [1,2,3].

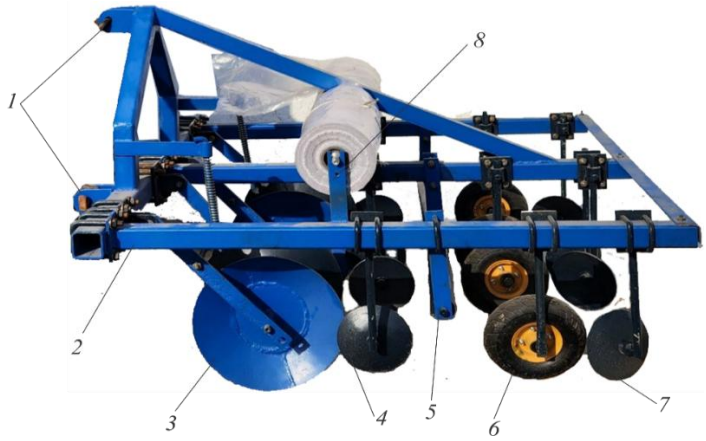

Figure 1. Machine for laying plastic film on potato-planted ridges.

Figure 2. A machine for laying plastic film over potato ridges, aggregated with a tractor.

Figure 3. Machine for laying plastic film on potato-planted ridges.

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The recommended parameters for the working body of the developed leveler-compactor are presented in Table 1 below.

Table 1 Recommended parameters of the working component of the developed leveler-compactor

т/р	Name of indicators	Designation	Value
1.	Vertical load force applied to the leveling-compacting roller, kN	Qt	0,95
2.	Total width of the leveling and compacting roller, mm	Bu	650
3.	Width of the conical section of the leveling and compacting roller, mm	Bk	170
4.	Width of the cylindrical part of the leveling and compacting roller, mm	Bs	300
5.	Large diameter of the conical section of the compacting roller, mm	Dk	500
6.	Diameter of the cylindrical part of the compacting roller, cm	Ds	230
7.	Compressive force of the spring, kN	Qp	1,0
8.	Angle of inclination of the conical part of the compacting roller, o	α	35

Table 2 presents the technical specifications of the film-laying machine equipped with a developed compacting roller featuring the recommended parameters.

Table 2

т/р	Designation of Indicators	Unit of measurement	Indicator value
1.	Type	-	Hanging
2.	Tractor class (model) for aggregation	-	0,9-1,4
3.	Speed of movement	km/h	6 – 8
4.	Productivity	km/h	0,86-1,12
5.	Number of groove opener discs	piece	4
6.	Film holder number	piece	4
7.	Number of film burial discs	piece	4
8.	Number of sealing rollers	piece	2
9.	Performance	пог·км/h	5,86
10.	Dimensions: - length - width - height	 mm	 2160 1500 1200
11.	Total machine weight	kg	660

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The results obtained demonstrate that the agrotechnical and operational indicators of the film-laying machine fully meet the agronomic requirements. Therefore, it is recommended for widespread implementation in production.

As evident from the table above, the quality and energy performance indicators of the developed machine fully comply with the requirements set for it.

Analysis of the conducted test results showed that:

The film-laying machine for potato-planted ridges can fully perform the technological process specified by agrotechnical requirements;

It was determined that the soil density of the plowed ridge, sowing depth, width of the ridge top, and height were on average 1.15 g/cm3, 6.96 cm, 27.8 cm, and 17.7 cm, respectively.

The film-laying machine developed during the trials reliably performed the specified technological process. No significant deficiencies were encountered during the course of the field tests.

Conclusion

The experimental film-laying machine, equipped with a leveler-compactor with optimized parameters, fully and reliably performed the specified technological process. No significant deficiencies were observed, and its agrotechnical performance indicators met the existing requirements. In the future, it is advisable to continue research aimed at further improving the design of this machine, optimizing its technological and geometric parameters, and enhancing its performance indicators. Additionally, it is recommended to develop an experimental-industrial prototype of the machine and subject it to extensive practical trials.

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