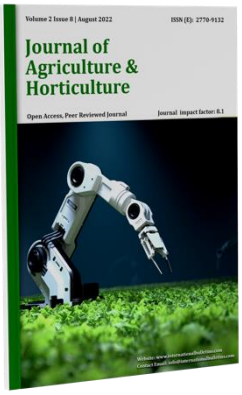

RESULTS OF FIELD TESTS OF A COTTON PICKING MACHINE EQUIPPED WITH AN UPDATED AIR TRANSPORT SYSTEM

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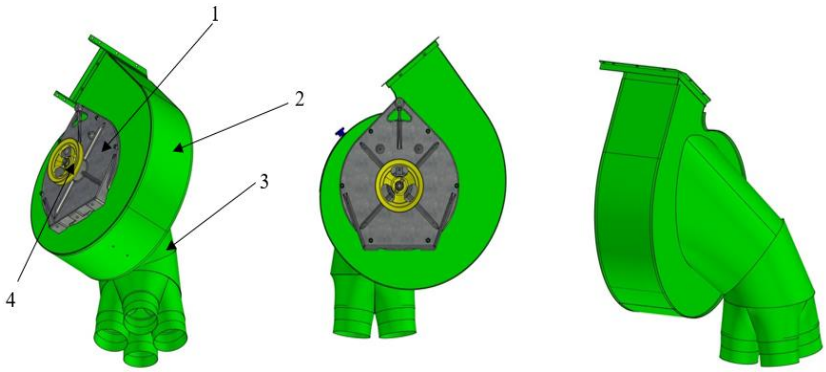
Annotation. The article focuses on the research on the development of an updated design of an air transport system for semi-trailer type cotton picking machines. Plates from the process of field testing of a cotton picker equipped with this system are presented. The results of the test were analyzed for compliance with the requirements for the machine test and conclusions were made

Introduction. In cotton picking machines, the air transport system ensures that the cotton crop harvested through the picking apparatus is transported reliably from the receiving chamber to the bunker. Detailed information about the construction of air transport systems as well as the principles of operation [1-4] is widely covered in the literature. In our previous work, we have given analyzes of the energy and quality indicators of this system [5,6]. Based on the results of our studies, we developed an updated variant of the centrifugal fan for air transport system, and this construction is protected by a patent on a utility model by the Intellectual property agency of the Republic of Uzbekistan [7]. The Patent-based design of an upgraded centrifugal fan for the system was carried out through modern computer programs. Figure 1 below shows a 3D image of an upgraded centrifugal fan of an air transport system.



1-the bed , 2-spiral body of the fan,
3-air collector, 4-drive pulley

Figure 1. 3D layout of the fan assembly

The energetically efficient air transport system installed on the ventilator in this updated structure compared to its predecessors was determined in theoretical calculations [8,9]. And on the quality of the picked cotton, experimental studies were carried out in experimental laboratory of the Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan. According to the results of these studies, the degree of mechanical damage to the seeds in the picked cotton was 0.6, 0.8, 1.0 and 1.2% in the number of revolutions of the impeller of the fan 1000, 1200, 1400 and 1600 rpm [10.11]. This is close to the requirements of the state standard for cotton picking, which is

listed in [12,13] (under the standard requirements, pollen damage should not exceed 1%).

Materials and methods. Like all agricultural techniques, it is impossible to conclude about the effectiveness of the updated construction without conducting field tests on cotton picking machines. In this regard, a yanigated air transport system fan was prepared in Tashkent Agricultural Machinery Plant brought to its own Certification and Testing Center for Agricultural Machinery and Technology for installation in experimental cotton picking machine.

The following Figure 2 presents photographs from the process of preparing the updated air transport system-equipped 2-row semi-trailer MX-1.8 cotton picking machine for field tests.

а) б) в)

Figure 2. The process of installing an updated fan for air transport system on a cotton picking machine

A semi-trailer with an updated air transport system MX-1.8 cotton picking machine with 2 rows of vertical spindles is designed for picking medium-fiber cotton varieties from open sleepers of row planting in fields with a row spacing of 60 cm.

The cotton picking machine is aggregated to its front-end TTZ-LS 100HC cotton tractor, with a four-wheel structure with two rear wheels pointing.

The TTZ-LS 100HC tractor is equipped with a four-cylinder diesel engine F5AE9484G*A001 with a turbocharger and intermediate air-cooled engine from the Fiat Powertrain Technologies Industrial (Italy) modification (rated power in the number of 2300 min-1 revolutions of the crankshaft according to the manufacturer is 65 kW (88 h.p)).

Additional equipment is fitted to the axle bodies to provide a 2,400 mm footprint of the tractor's driving wheels.

The main parts of the machine: MX-8.8 cotton picking machine dial apparatus 4-row blocks, bunker, improved air transport system fan.

Agrotechnical indicators of MX-1.8 cotton picking machine with updated air transport system for picking medium-fiber cotton varieties UzDst 3225:2017 "testing of agricultural techniques. Cotton picking machine. Test method". Indicators Ts 25272604-027: 2017 " MX-1.8 cotton picker. Technical specifications". The material presented here is based on its results on machine testing at Certification and Testing Center for Agricultural Machinery and Technology [14].

In the fields of the farm "Khur ulka Fayz" in the Chinoz District of the Tashkent region, the harvesting of the medium-Fiber C-6524 variety of cotton was carried out.

The agrotechnical indicators of the tested technique were determined during one-time picking. At the same time, in one plant with an average height of 85 cm and an average width

of 39 cm, the number of branches on average is 11 pieces, and the number of cocoons is 10 pieces.

The anorm in the field was defoliated using magnesium chlorite. When tested on a single plant, the number of dry leaves was 3 pieces, not more than 4 pieces, while green leaves were allowed no more than 3 pieces.

Before the harvest, the moisture content of seeds in A norms reached 6.5% nitashkil. The permissible value is at most 11%.

Thus, the agrotechnical conditions for testing a cotton picker meet the requirements of Ts 25272604-027:2017.

The following are brief technical descriptions of the updated air transport system installed on the cotton picking machine.

Table 1. Brief technical description

Specification name	Value of indicators		
	Ts 25272604-027: 2017	According to the results of the test	
		Machine in production	Testing machine
Fan type		do not avoid the center	do not avoid the center
Number of fans, in pieces		2	2
- diameter of the impeller, mm		500	500
Fan frequency, rpm, corresponding to the number of revolutions of the engine crankshaft			
- 2500 rpm		1500	1290
- 2200 rpm		1410	1183
- 2000 rpm		1260	1068
Air suction speed in the outermost intake chamber, m/s		5,0	7,1
Side entrance window surface, m^2		0,102604	0,19586
Working speed, km/h:			
Elbow val nominal in 2200 rpm rotations - on the first dial - on the second dial	 4,23 5,13	 3,8 5,14	 3,8 5,14

The location of the lowest chest was 22 cm above the top of the paws (at least 8 cm in diameter).

The opening rate of cotton in accounting plots was 86% (Ts 25272604-027:2017 at least 80% according to organization requirements) to 90% at the time of harvest was 38.07 q/h).

Upon completion of the preparation of cotton picking machine for field testing, field tests were carried out in conjunction with Certification and Testing Center for Agricultural Machinery and Technology personnel. Figure 3 below shows photographs from the testing process.

a b c d

Figure 3. Field testing processes of cotton picker equipped with updated air transport system

a-right vision, b-left vision, c-front vision, d-back vision

Table 2 below shows the results of the field tests of the MX-1.8 cotton picking machine, equipped with the updated air transport system.

Table 2. Performance quality indicators of the cotton picking machine being tested in disposable skin

Specification name	Value of indicators			
	Ts 25272604-027:2017			
1	2	4		
Test date		9.10.2023 г.		
Test place		Chinoz district, Tashkent region Hur Ulka Fayz		
Working slit width, mm		34-30	32-28	30-26
Driving speed, km/h	4,23-5,13	3,3		
Calculation of the cotton harvest area, Q	No information	38,07		
Cotton processing hopper, total: q/ha		29,3	30,19	32,54
% on account	It should not be less than 90% of the total crop	76,96	79,30	85,47
Cotton Cotton Stems: Q/ha	No information	7,15	6,67	4,4
%	– // –	18,78	17,52	11,56
Cotton Production: Q/ha	– // –	1,62	1,21	1,13

%	No more than 8.0 parts of the total crop	4,26	3,18	2,97
Moisture content of the resulting cotton seeds, %	No more than 12-13	8,5	8,7	8,8
The degree of contamination of the picked cotton, %	No more than 10	7,4	7,8	8,7
Degree of damage to the seeds, %	No more than 1.0	0,2	0,6	0,8

Results and discussion. The experiment was carried out in three stages:

Experience 1. In the cotton picking machine being tested, the working groove width of the front drums is adjusted to 34 mm, and the back to 30 mm. Based on the results of the experiments carried out, it was found that cotton picking at a working speed of 3.3 km/h with cotton picking machine tested on a disposable skin was achieved by 76.96% (at least 90% of the ripe crop according to Ts 25272604-027:2017). At the same time, 18.78% of cotton remained in the norm. Cotton picking machine poured 4.26% of the total crop into the ground, the permissible figure according to Ts 25272604-027:2017 does not exceed 4%. The pollution rate of cotton harvested in cotton picking machine tested was 7.4 % (at most 10% under UzDst 615:2008), while the moisture content of the harvested cotton raw materials was 8.5% (at most 12-13% under UzDst 615:2008) did not exceed demand. The mechanical damage rate of cotton seeds was 0.2%.

Experience 2. In the cotton picking machine being tested, the working groove width of the front drums is set at 32 mm, and the back at 28 mm. In this tested cotton picking machine, the completeness of cotton picking at a working speed of 3.3 km/h was achieved by 79.30 % (at least 90% of the ripe crop according to Ts 25272604-027:2017). At the same time, the remaining cotton raw materials in bush are 17.52%. Cotton picking machine poured 3.18% of the total crop into the ground, the maximum allowed by Ts 25272604-027:2017 does not exceed 4%. The pollution levels and humidity of the harvested cotton were within acceptable limits, at 7.8 and 8.7%, respectively. The mechanical damage rate of cotton seeds was 0.6%.

Experience 3. In the cotton picking machine being tested, the working groove width of the front drums is set at 30 mm, and the back at 26 mm. In this tested cotton picking machine, the completeness of cotton picking at a working speed of 3.3 km/h was 85.47% (at least 90% of the ripe crop according to Ts 25272604-027:2017). At the same time, the remaining cotton raw materials in bush are 11.56%. Cotton picking machine poured 2.97% of the total crop into the ground, the maximum allowed under Ts 25272604-027:2017 does not exceed 4%. The weeds and moisture content of the harvested cotton were within acceptable limits, at 8.7 and 8.8%, respectively. The mechanical damage rate of cotton seeds was 0.8%.

Conclusion.

1. Thus, for MX-1.8 cotton picking machine with updated air transport system for picking medium-fiber cotton varieties, the best indicators for picking completeness and damage to the seed were observed at a working slit width of 30-26 mm. In this case, the working wheel frequency is 0.89% of the mechanical damage rate of the seeds in the 1880 min-1 position.

2. The preparation of the updated air transport system for cotton picking machine was carried out on the basis of the project documentation of the Design and Technology Center for

Agricultural Engineering and the updated construction of the system was carried out by Institute of Mechanics and Seismic Stability of Structures employees in a laboratory test at the experimental stand.

3. At the same time, the metal impeller of the fan (weight 18.93 kg) was replaced by a wheel made of composite material (weight 7.21 kg). The working wheel (rotor) made of composite material causes less mechanical damage to the cotton seed and weighs 2.63 times less than the metal.

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