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TEST RESULTS OF A NEW SEEDER FOR SEEDING ONION SEEDS

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Abstract. (Purpose of research) To develop a new vegetable seeder in relation to the soil and climatic conditions of Uzbekistan and to determine the onion seed rate depending on the length of the active part of the seed coil, as well as to assess the quality of the formation of sowing ridges and irrigation furrows.

Key words: seeder, sowing apparatus, onion seeds, sowing ridges, irrigation furrows, sowing, sowing belt method, sowing rate, active part of the sowing coil, dependence.

Increasing the level of cultivation of vegetable crops is one of the important tasks facing farmers of the Republic of Uzbekistan. Onions occupy a significant share in vegetable production. Special seeders are used to sow its small seeds.. However, there is no local production of such machines, while many different pneumatic seeders are produced abroad. They provide precise sowing of seeds to a given depth in a row method. But foreign samples are complex in design, are not adapted to the soil and climatic conditions of Uzbekistan, and cannot ensure uniform placement of seeds on the ridges. The cost of the seeders themselves and service is very high. Therefore, farmers and peasants are forced to adapt other available technical means. In addition, the operations of preparing the soil and sowing seeds are carried out separately, which each time is accompanied by the arrival of units on the field, excess consumption of fuel and lubricants, time and labor costs. All this increases the cost of production.

Purpose of research – develop a vegetable seeder in relation to the soil and climatic conditions of Uzbekistan, determine the sowing rates of onion seeds depending on the length of the active part of the sowing wheel, evaluate the quality of the formation of seed ridges and irrigation furrows.

Materials and methods. The Research Institute of Agricultural Mechanization has developed a new seeder for sowing onion seeds and other small-

seeded vegetable crops (Fig. 1). In one pass, it cuts irrigation furrows with the formation of trapezoidal seed ridges and sows onion seeds or other small-seeded crops using the belt method in three rows in each belt. As the seeder moves across the field, furrow cutters cut irrigation furrows and form ridges. Levellers cut off the upper part of the ridges, giving them a trapezoidal shape. A slide with coulters seals the upper part of the ridge using a spring of a parallelogram mechanism. The coulters open the seed grooves of the required depth. Onion seeds are dosed with grooved seeding coils and fall into the seed ducts, and then into the sowing grooves. The sealing working body covers the seeds with a thin layer of soil. Markers are used to indicate the subsequent arrivals of the sowing unit.

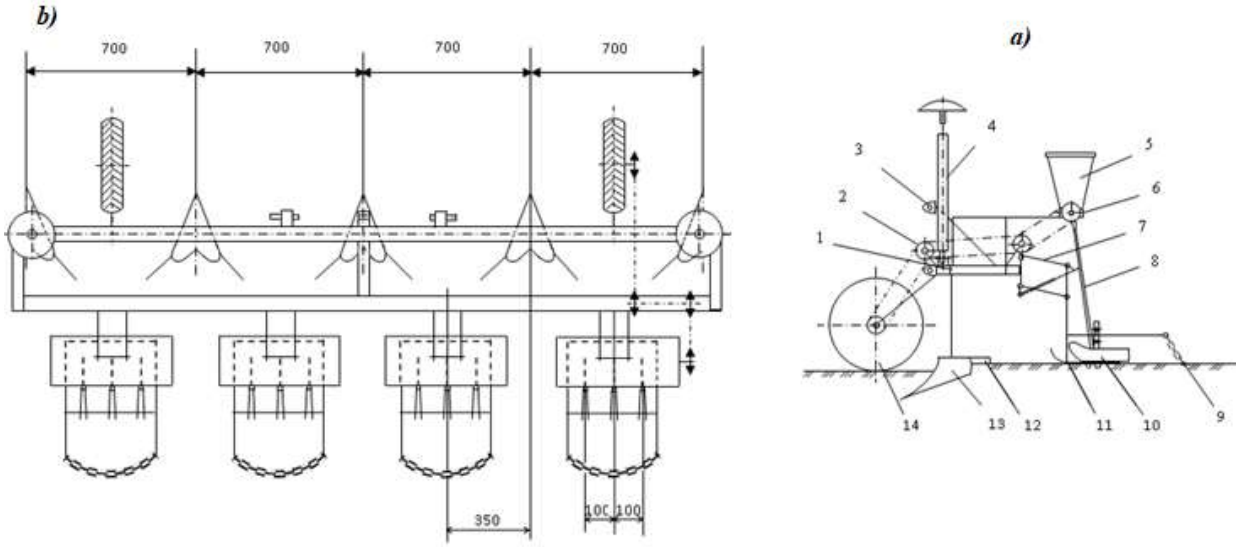

Fig.1. Design diagram of a vegetable planter:
a – side view; b – top view

1 – frame; 2 – drive; 3 – three–point hitch; 4 – marker; 5 - hopper; 6 – seeding machine; 7 – parallelogram mechanism; 8 – seed duct; 9 – sealing working body; 10 – coulter; 11 – coulter slide; 12 – leveler; 13 – furrow cutter; 14 – support and drive wheel

To determine the seeding rate of onion seeds in the laboratory, its dependence on the length of the active part of the seeding coil was studied, which was changed by moving the device relative to the body of the apparatus.

The seed ducts of the sowing machines were removed and numbered cups for collecting the sown seeds were placed under the receiving funnels of the devices. Then, setting a certain position of the seeding coil along the length, the seeding was

carried out in 10 revolutions of the support and drive wheel, which is equivalent to a distance of 12.56 m (wheel diameter 0.4 m). The sown amount of seeds was weighed with an accuracy of 0.01 g. The seeding rate is 10 times for each coil position along the length. The length of the active part of the seeding coil was 0; 5; 10; 15 and 20 mm.

The seeding rate is determined by the formula:

$$Q = \frac{10qn}{BC}$$

In this here Q is the seeding rate of the seeder, kg/ha;

10 – conversion factor;

q – sowing seeds from 1 machine per 1 revolution of the support-drive wheel, g;

n – the number of sowing machines on the drill;

B – the width of the seeding machine, m;

C - is the length of the path traveled in 1 revolution of the support and drive wheel of the seeder, m.

The quality of the formation of seed ridges and irrigation furrows was assessed during preliminary field tests. The furrows were adjusted to a row spacing of 70 cm, the depth of the irrigation furrows is 10 cm, the width of the ridges along the top is 40 cm. After carrying out all the adjustment work and trial runs, a registration check-in was carried out on the site, having previously determined the transverse profile of the field before the passage of the unit. After passing the unit in the same places, the profiles of the obtained sowing ridges and irrigation furrows were studied. To do this, a well-known technique was used, using a special rail with a scale with divisions of 5 cm and a ruler. The repeatability of removing profiles is 5-fold.

Results and discussion. The seeding rate is directly proportional to the length of the active part of the seeding coil: the longer the length of the coil, the higher the seeding rate (table). Thus, the average seeding rate for three seeding machines of the same row (ridge) with a length of the active part of 5 mm for 10 revolutions of the support-drive wheel was 1.89 g of seeds with a coefficient of variation of 4%.

The width of the gripper B = 2.8 m, the number of sowing machines on the drill n = 12 pcs, the length of the path traveled in 1 revolution of the support-drive wheel, C = 1.256 m. Therefore, the seeding rate of onion seeds per hectare by the

seeding machine with a length of the active part equal to 5 mm will be equal to 6.45 kg / ha.

Table

The dependence of the seeding rate of onion seeds on the length of the active part of the coil

Length of the active part of the coil, mm	The average seeding rate for three machines, g	Coefficient of variation of the seeding rate between devices, %	Seeding rate of the seeder, kg/ha
5	1,89	4,0	6,45
10	3,91	2,8	13,34
15	8,27	3,7	28,22
20	11,63	2,7	39,68

With a length of the active part of the seeding coil of 20 mm, the sowing of onion seeds was 11.63 g/m2, or 39.68 kg /ha, and the coefficient of variation was 2.7%.

The dependence of the seeding rate of the seeding machine on the length of the active part of the seeding coil has a weakly expressed parabolic shape (Fig. 2).

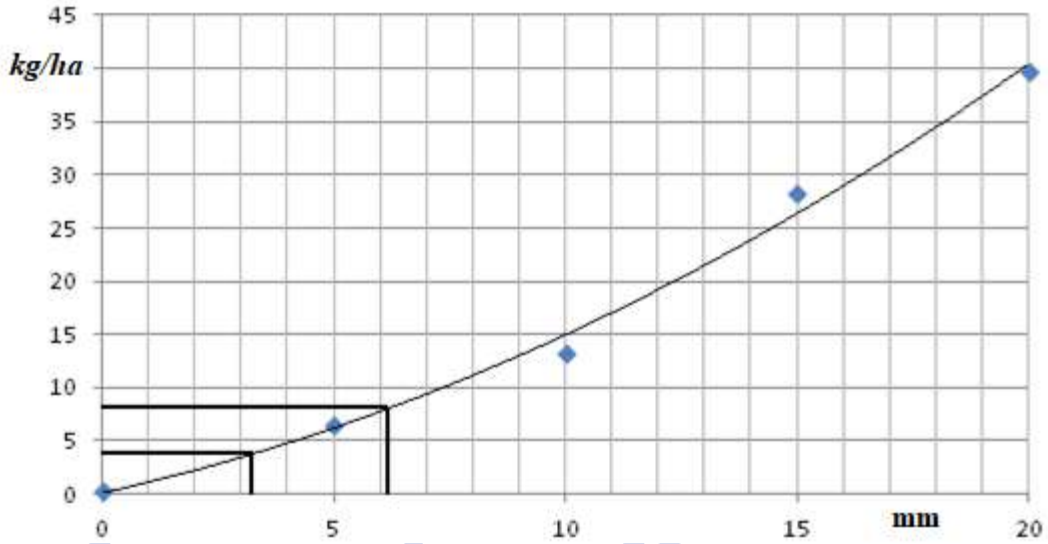

Fig. 2. Change in the seeding rate of onion seeds depending on the length of the active part of the seeding coil

According to the initial requirements, the seeding rate of small vegetable seeds with one device should be within 24-48 pcs. / sq. m. In our case, when the seeder

has a working width of 2.8 m and sows 12 rows in 1 pass, this corresponds to the norm of 3.9-7.8 kg / ha (weight 1000 pcs. onion seeds are equal to an average of 3.8 g). To sow onion seeds with the specified norms, the sowing coil must have an active length within 3.3-6.2 mm (Fig. 2).

In preliminary field experiments, the row spacing was 68.8±4.8 cm instead of the specified 70 cm (coefficient of variation V = 7.0%). The width of the ridges at the top is set to 40 cm. In fact, the average was 42.5±2.9 cm (V = 6.8%). The depth of irrigation furrows averaged 9.6±0.4 cm (V = 4.3%).

Conclusions. The developed vegetable seeder for sowing small-seeded vegetable crops with simultaneous formation of seed ridges and cutting of irrigation furrows is operable, provides set norms for sowing onion seeds, high-quality cutting of seed ridges and irrigation furrows.

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