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SEPARATE METHOD FOR HARVESTING ALFALFA SEEDS

Mahmudov Davron
Tashkent State Technical University, Termez Branch, Associate Professors
davron1954@mail.ru

ABSTRACT

The article discusses the technology of harvesting alfalfa seed plants, the advantage of a separate harvesting method, the channels for the occurrence of seed losses behind the header, the development of the parameters of the seed trapping device for the KPS-5G mower, which consists of a container inside which an unloading auger is located, and a sieve is installed above them, which The use of this device makes it possible to collect an additional 15-60 kg of high-quality seeds from each hectare, depending on the moisture content of the seed pods.

Keywords: agriculture, food security, alfalfa seed collection.

INTRODUCTION

Harvesting of alfalfa seed plants, as you know, is one of the most complex and critical technological processes in agricultural production. The difficulty of harvesting seeds with existing machines is associated with the specific features of the cultivated crop: alfalfa testes ripen extremely unevenly, the stem mass during the harvesting period has a high moisture content (65% or more), the vegetative mass is large (up to 160 centners / ha), the stems lie heavily (lodging coefficient reaches 1.5), ripe beans are prone to shedding from minor mechanical influences, etc.

In the practice of seed growing, depending on the state of the herbage on the site, the biological characteristics of seed ripening and meteorological conditions, several methods of harvesting the testes of grasses are used: direct combining, harvesting with desiccation, two-phase combining, harvesting with threshing at a hospital and separate harvesting / 1,2,3, 4.5 /.

The separate method of harvesting alfalfa seed plants is recommended for stable weather conditions. The separate method of harvesting includes mowing the grass stand into rolls, picking and threshing after the mass has dried and the seeds have ripened. This method of cleaning is used on unevenly ripened areas; in areas where the stem is prone to lodging or has already lodged with a strongly stretched vegetative mass; on heavily weedy areas with 70-80% ripening of seed beans / 1 /.

Separate harvesting helps to prevent self-damping of seeds at the root. Unripe seeds ripen in rolls.

This method of harvesting provides high productivity to combines and good separation of seeds during cleaning due to the fact that the threshing mass is not large in volume, and the moisture content is also not high. Due to the fact that the seeds from the beans are completely wiped, there is a real possibility of obtaining clean seeds in the hopper. Dry strawy products are stored immediately. Since the fields are cleared earlier than usual, it becomes possible to obtain additional cutting for forage.

Separate harvesting of grasses testes is widely used as it reduces seed loss, shortens the time of work, and reduces labor costs during the cleaning period.

Thus, the analysis of various technologies for harvesting alfalfa seed plants under conditions of irrigated agriculture can be considered separate. The advantage of separate harvesting is that the mowed wet mass dries out and threshes well when picking up, unripe seeds ripen in rolls and become full-fledged.

But the separate method of harvesting, as it was found out, does not fully meet the agrotechnical requirement of seed farms due to the large losses of seeds for harvesting.As already noted, the bulk of the losses occurs behind the header when mowing the seed plants with simultaneous swathing.

On the mowing of seed alfalfa, mowers-conditioners of the E-303 and KPS-5G type with removed conditioning rollers are widely used. To eliminate losses, we have developed a seed catcher for the header of the KPS-5G mower, which consists of a container inside which an unloading auger is located, and a sieve is installed above them. The device installs the KPS-5G mower instead of the flattening rollers to the header exit window. The mowed mass is placed in a swath, moving through the sieve, and the seed heap, released under the mechanical action of the working bodies of the header, is separated between the bars of the sieve into a container and from there is transported by means of an auger and an elevator to the hopper, which is installed on the KPS-5G frame.

Channels for the occurrence of losses behind the KPS-5G header. Seed losses, which depend only on the design features of the header, arise as a result of the interaction of its working bodies with the stems.

Based on the literature data / 4 /, we will describe the effect of external conditions on the header by the functions, $X(t)$ and $V(t)$.

where: $N(t)$ - takes into account the topography of the field, acting on the suspension of the propeller and the supporting shoes of the header, causing it to vibrate;

$X(t)$ -the condition of the herbage;

$V(t)$ - speed of movement of the unit.

Estimates for this system are header, header, and thresher losses.

Loss of seeds from uncut stems occurs as a result of unsatisfactory operation of the reel and cutterbar $Z_1(t)$, luring the stems with a divider, poor copying of the field relief. These losses mainly depend on the degree of lodging of the grass stand.

The loss of seeds in the cut stems $Z_2(t)$ occurs due to insufficient adaptability of the header, as a result of significant passive zones between the cutter bar and the conveyor. In addition, when harvesting lodged grass with the cutting device, the short upper parts of the stems with seed beans are cut off and they are lost without falling into the swath.

Loss of free seeds and beans occurs $Z_3(t)$ when the seed beans are knocked out and combed out with a reel in the process of bringing the stems to the cutting device, as well as transporting the stem mass and dropping it to the ground. These losses increase with a decrease in moisture,

with an increase in the degree of ripening of seed beans, as well as with an increase in lodging and confusion of the stem mass, and, as a rule, the largest and most valuable seeds are lost.
Losses behind the pick-up $Z_4(t)$ and $Z_5(t)$ thresher indirectly depend on the characteristics $W(t)$ of the swath.

$$Z_4(t) = \mu_1 \cdot Z_n(t)$$
$$Z_5(t) = \mu_2 \cdot Z_M(t)$$

where: μ_1, μ_2 - is the proportion of losses, respectively, behind the $Z_n(t)$ pick-up and thresher $Z_M(t)$, depending only on the linear density, structure and cohesion of the roll, its distance from the ground, uneven width, etc.
Direct and indirect losses depending on the work of the header are equal:

$$Z(t) = Z_1(t) + Z_2(t) + Z_3(t) + Z_4(t) + Z_5(t) \quad (1)$$

The main part of the above channels of seed loss behind the header is the loss of free seeds and beans, which occurs due to the mechanical effect of the working bodies of the header. When the combine picks up swaths, the seeds and seed pods threshed by the header remain on the field surface.
To achieve a significant reduction in seed loss by changing the technological mode of the header, in our opinion, it is not possible. We believe that the most rational way to reduce seed losses when harvesting alfalfa is to develop the parameters of the seed catcher for the KPS-5G mower. The technological process of roll formation is as follows. The cutter bar of the mower cuts the crop mass and the reel bar fingers feed it to the auger conveyor, which directs the crop through the ejection window to the bar sieve of the seed catcher. The mass moving through the sieves is placed in the swath on the stubble, and the seed heap, allocated by the working bodies of the header, wakes up between the bars into the compartment, from where the unloading auger and the elevator transport it along the pitched pipe to the hopper.
According to the results of the research, the dimensions of the separating sieve of the seed catcher are taken: width 1.7 m, length 0.5 m, distance between the bars of the sieve 0.02 m, bar diameter 0.006 m and the angle of inclination of the sieve 12^0.
The volume of the benker ($1\,м^3$) is taken according to the design capabilities of the mower and at the same time ensures its operation without downtime on unloading seeds, taking into account the average corral characteristic of the irrigated zone.
The above analysis showed that the best results were obtained with separate harvesting of alfalfa testes using a KPS-5G mower with a seed catcher, which significantly reduces seed losses and ensures the formation of uniform thin-layer swaths. In turn, the dimensional and weight parameters of the rolls ensure their accelerated drying, ripening of seeds, as well as uniform load on the harvester's thresher / 6,7,8 /.

The use of the KPS-5G e mower with a seed catcher in comparison with the ZhSK-4A header during separate harvesting of alfalfa seed plants made it possible to reduce the loss of seeds by 1.9 times.

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