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BASIS OF PARAMETERS shredder-spreader STRAW combine harvesters

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The optimal design parameters straw shredder-spreader combine harvester developed its design and fractional composition determined chopped straw.

Options shredder-spreader, straw, grain harvester.

Problem. Use nezernovoyi of the harvest of grain crops as organic fertilizer is an urgent problem today due to a sharp decrease in the number of organic fertilizers of animal origin. Straw and its components actively regulate processes in the soil, which aimed to improve its physical properties, which leads to increased soil fertility. On straw decomposition in the soil has a significant effect of grinding and uniform spreading over the surface of the field.

For chopping and spreading nezernovoyi of the harvest in modern combine harvesters installed devices that perform this process. The analysis process of grinding and spreading straw crops in the open field showed that existing devices do not provide the necessary size fractions of crushed stems and uniformity of spreading, and therefore intense straw decomposition in the soil after earnings. Therefore, improving the process of grinding and uniform spreading nezernovoyi of the harvest of the field is a key issue and requires further study.

Analysis of recent research. The research process stem grinding materials on scientific papers VP Horyachkina, ID Koblyakova, AV Titenko [1,2,3] and others. Analysis of the literature shows that many questions concerning the extent and quality of stem grinding materials should be investigated.

The purpose of research. To analyze the process of shredding and spreading the field nezernovoyi of the harvest for

better-size shredded material and its uniform distribution across the field.

Results. The theory of the deformation process stems of various crops transverse impact and their destruction is represented in the works of HA Rahmatulina [4]. According to it, each characterized by its own specific material impact velocity at which there is damaging stress.

The destruction of the stems of cereal crops such as elastic-viscoplastic material having a fibrous structure, the impact loading is the

scheme of brittle fracture, which is characterized by the absence of plastic deformation and a slight difference between the outside of fluidity and strength.

The speed of impact on the working body of material that is crushed, less speed distribution of the stem longitudinal elastic wave voltage.

Thus, the tensile deformation of lateral impact will be involved only a small portion of the stem that is equal to the length of the deformation path. For stalks of grain crops characterized by its own specific impact velocity at which there are tensions and destroy the material in *Vpyt> Vkr* it is destroyed instantly.

On this basis, and given the formulas proposed by JA Rahmatulinym expression for the destructive speed *Vruyn* on impact shredding blades can be written as

$$V_{руйн} = 0{,}5 k_{пит} C_0 tg^3(k_д \nu_{ст}),\ \text{m / s} \qquad (1)$$

where *kpyt* - Specific rate of destruction is to puff plastic material is (1,3 ... 1,5); *C0* - Speed of propagation of elastic (longitudinal) waves (for grain crops it is within 800 ... 950 m / s); *kd* - Coefficient of dynamic dried stems (1.2 ... 1.5); $\nu_{ст}$ - Static angle fracture (14 ... 18 deg.).

With these characteristics and considering Formula 1 can be found value destructive speed lateral impact.

Destructive speed associated with kinematic parameters crush drum ratio

$$V_{руйн} = \frac{D\omega}{2},\ \text{m / s} \qquad (2)$$

where *D* - Diameter drum crush the ends of the blades, m;

ω - Angular velocity of crush drum *s-1*.

When choosing the diameter of the drum crush into account structural conditions and placing straw chopper between the extension and the upper sieve combine harvester. Based on these conditions accepted *D*= 0.6 m, ω = 75.4 *s-1.*

Experimental shredder-spreader-top schwader crush drum consists of 2 (Fig. 1), beams with longitudinal protyrizalnymy 2 knives, case, pallet 3, reversible panel, diffuser plates with distribution and drive mechanism.

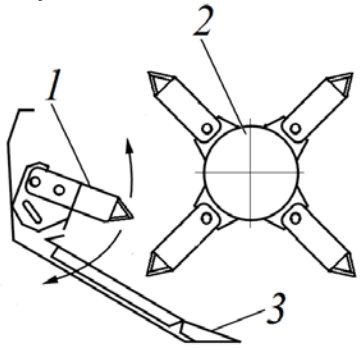

Fig. 1. The scheme Straw Chopper 1 - beam with longitudinal protyrizalnymy knives; 2 - shredding drum; 3 - pallet.

Swath makers should back cover, two sides and two rails.

Shredding drum consists of a shaft-pipe, which is pivotally mounted knives in the form of plates pryklepanymy them ribbed segments that are borrowed from the cutting machine combine harvesters. Knives are placed on the drum dvozahidniy spiral.

Longitudinal protyrizalni blades are the same as for shredding drum, but mounted on a bar rigidly, and the beam is pivotally attached to the body. Move timber from protyrizalnymy knives changing the degree of grinding nezernovoyi of the harvest.

For the experimental determination of the average size of the fine particles of straw, depending on feeding straw chopping, shredding the number of knives and the angular velocity of the drum crush technique applied multivariate experiment. To find the coefficients of the polynomial used orthogonal central composite plan-second order. The significance of the regression coefficients was examined by Student's test. Adequacy derived equations was tested by Fisher's criterion. After sifting statistically insignificant coefficients using the stepper in the decoded form of regression equation is:

$$L = 569{,}43 - 59{,}24m - 5{,}22\omega - 14{,}3\nu + 3{,}21m^2 + 0{,}041\omega^2 \qquad (3)$$

where *L* - The average length of fine particles, m; *m* - Number of shredding knives in each spiral; ω - Angular velocity of crush drum *s-1*; ν - Submission of straw, kg / s.

To determine the influence of even factors in optimization criterion (weighted average length of fine particles) response surface based on two factors - the angular velocity of crush drum and feed straw with constant shredding blades (Fig. 2).

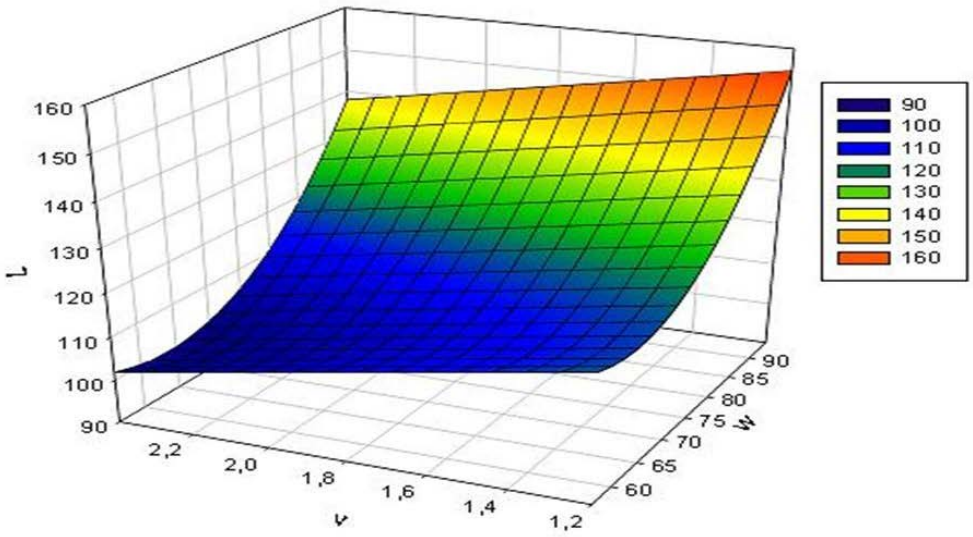

Fig. 2. Surface Review $L = f(w,v)$ at zero *m = 10.*

Comparative testing several different shredding devices showed that the performance of experimental shredding shredder-spreader, rotary haymaker satisfactory. Length fractions of crushed stems from 0 to 120 mm in experimental shredder-spreader GLC-9-1 was 94.8% (Fig. 3) at an acceptable value of not less than 85%.

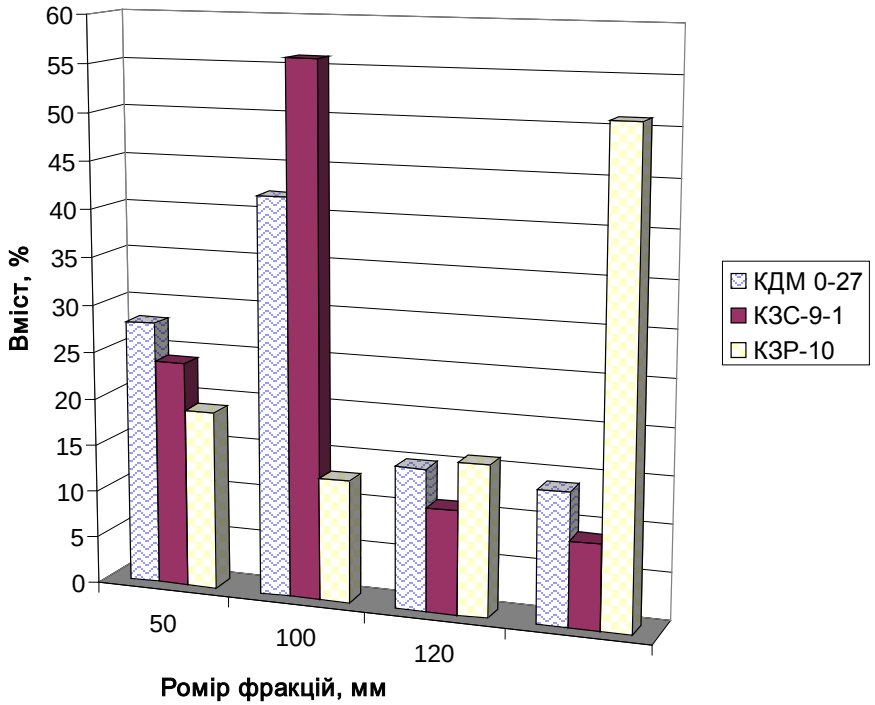

Fig. 3. Fractional composition of chopped straw crushing various devices.

Conclusion. The study was based basic design parameters (*D*=0.6 m,*m = 10* for each of dvozahidnyh spiral when placing and cutting blades at a distance protyrizalnyh 50 mm across the width of the thresher, v_{with}= 3.4 m / s and ω= 75.4 *C)* Cutter-spreader, rotary haymaker. It was also found that the speed of rotation of the drum crush 2400 rev / min provided by grinding 94.8% straw, fractional composition which ranges from 0 to 120 mm and is made even spreading across the width Reaper combine harvester.

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Ustanovlenы optymalnыe konstruktyvnыe Options grinder-Spreaders solomы zernouborochnoho combine ego is designed constructions and opredelen fraktsyonnыy composition yzmelchennoy solomы.

Options, Grinder, Spreaders, straw, zernouborochnыy processor.

The optimal design parameters, straw chopper harvester was developed to design and define the fractional composition of chopped straw.

Parameters, Chopper spreader, straw combine harvester.