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# Improvement of Saw Ginning

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**ABSTRACT***:* The article presents the results of study of influence of seed grid and ginning productivity on residual fibering of ginned seeds. Correlations between them were obtained. Improved ginning technology ensuring decreased fiber losses with underginned seeds was offered.

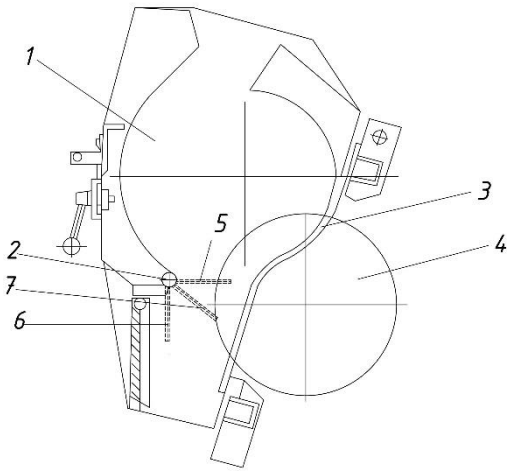
**KEYWORDS**: gummy roller, seeds damage, residual fibering, seed grid, regeneration of underginned seeds.

## I.INTRODUCTION

Main efficiency indicator of saw ginning machine operation is quality of the produced fiber. Analysis of operation of the present saw ginning machines showed that they did not answer the increased requirements of the textile industry.DP-130 ginning machines manufactured today, produce formation of gummy roller of high density which leads to higher dynamic load on the produced fiber and raw cotton seeds [1]. This brings about increased seeds damage, grow of fiber failure, decrease of productivity, high electrical power flow for rotation of the gummy roller. Furthermore, spinnable fibers with underginned seeds coming out from the working chamber with the increased lowness are lost.

Application of different modifications of seed grid and clearance with saw cylinder for fiber loss enhancement with the ginned seeds showed no desired result [2, 3].It was found out that it was impossible to eliminate residual fibering of ginned seeds due to the specific peculiarities of the construction of the saw ginning machine and ginning technology itself [4]. Scientific researches that aim to improve the technology of ginning and construction of ginning machine are carried out with this regard.

These days, the density of the gummy roller on ginning machines 4DP-130 and 5DP-130 is partially controlled by the seed grid, change of its location relatively to the gummy roller and saw cylinder. Operation experience of the saw ginning machines showed that only two positions of the seed grin were used in practice – compact (horizontal) and standard (at right angle to the surface of saw disc) (Figure 1).




1-working chamber; 2-seed grid; 3-bar grid; 4-saw cylinder; 5,6,7-position of the seed grid (compact, standard, opened)
Fig.1 Location diagram of the seed grid in the working chamber of the saw ginning machine

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The easiest way to decrease the gummy roller density is to carry out ginning in opened position of the seed grid (refer to Fig.1). However, during this, not complete ginning occurs which requires seed regeneration with the residual fibering after ginning. For the sake of effective regeneration of the underginned seeds, structural content and influence of ginning machine productivity and position of the seed grid should be studied.

## II.SUBJECTS OF THE STUDY

They are ginning machine 5DP-130 and residual fibering of the seeds during ginning.

## III.OBJECT OF THE STUDY

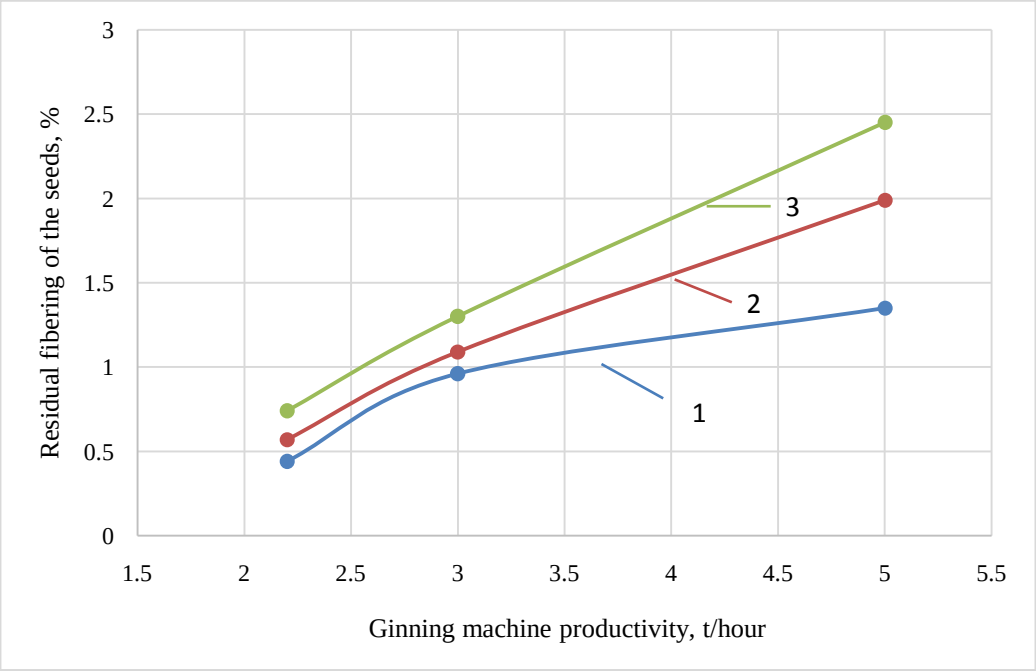
It wasto establish correlation between ginning machine productivity, position of the seed grid and residual fibering of ginned seeds, basing on results of which the offer for improvement of raw cotton ginning technology was prepared.

## IV.EXPERIMENTAL PROCEDURE

Experiments were carried out under factory conditions on ginning machine 5DP-130 using cotton of selection sort C-6524, II industrial sort with humidity of 8.4%, impurity on the ginning machine tray of 1.7%, at ginning machine productivity of 2.2, 3 and 5 t/hour in three positions of the seed grid (compact, standard, opened). Provided the stable work of the ginning machine, quantity and residual fibering of the seeds going out from the ginning machine were defined. Experiments were repeated three times each.

## V.RESULTS AND THEIR ANALYSIS

Experiments results and their processing are presented on Figures 2-5.




Position of the seed grid: 1-compact; 2- standard; 3-opeded.
Fig.2. Dependence of the residual fibering of the seeds on the ginning machine productivity

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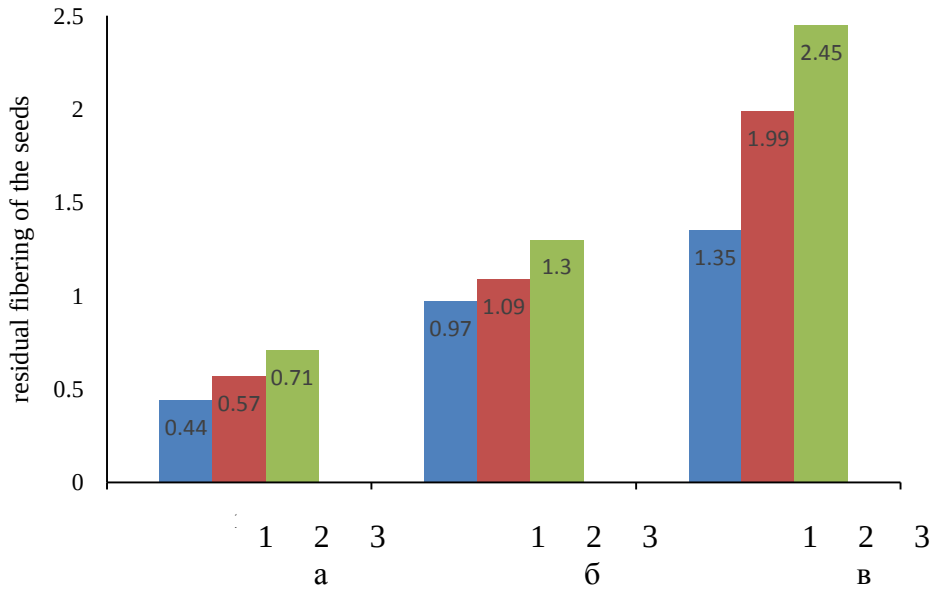
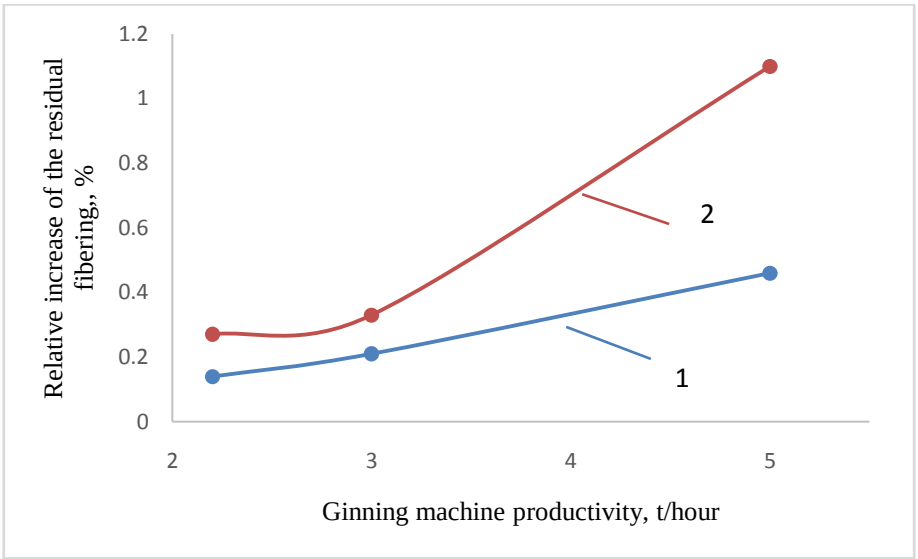



Position of the seed grid: 1-compact; 2-standard; 3-opeded.
а) 2.2 t/hour; б) 3 t/hour в) 5 t/hour

Fig.3. Bar graph of the influence of the seed grid on the residual fibering of the seeds at different ginning machine productivity




Position of the seed grid: 1-relatively standard position;
2-relatively opened position.

**Fig.4.**Relative increase of the residual fibering of the seeds at opened position of the seed grid

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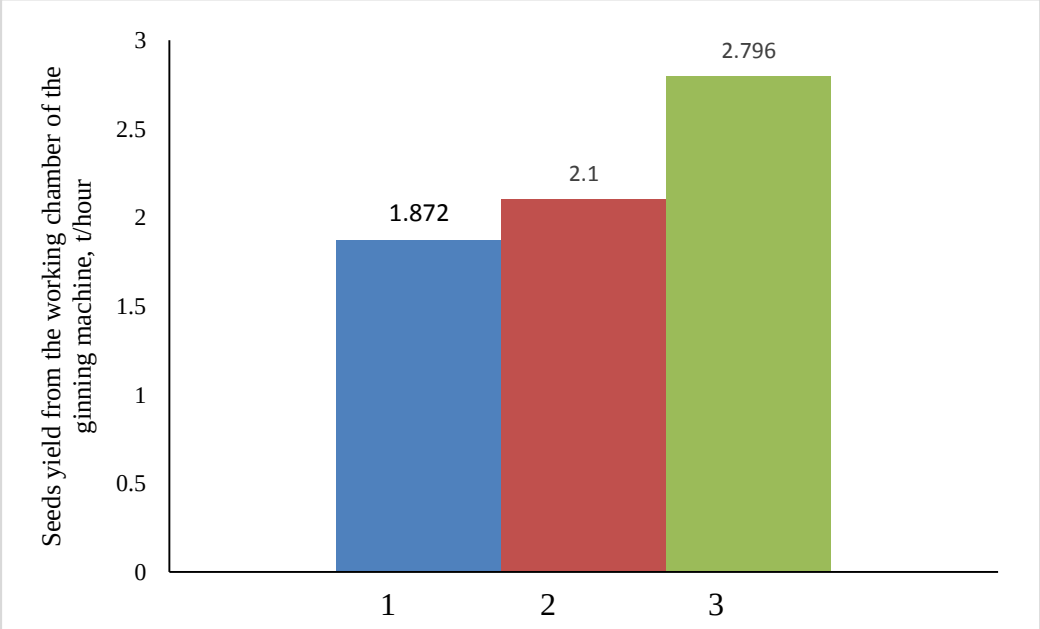


Position of the seed grid: 1-compact; 2-standard; 3-opeded.
Fig.5.Influence of the position of the seed grid on the seeds yield from the working chamber

The results has shown that along with the opening of the seed grid and increase of ginning machine productivity, residual fibering of the seeds also increased. At low productivity (2.2 t/h), residual fibering of the seeds in compact position of the seed grid made 0.44%, in opened position – 0.71%, regardless of the seed grid position, particular amount of the fiber remained on the surface of grinned seeds. When ginning machine productivity increased from 2.2 t/h to 5 t/h, residual fibering of the seeds increased from 0.57% to 1.99% in standard position of the seed grid and from 0.71% to 2.45% - in opened position.

As can be seen on Fig.2, as the seed grid opens, the curve strengthens that is characteristic of dominating role of ginning machine productivity and decrease of the influence of other factors on residual fibering of the seeds.

Equation of regression describing dependence of residual fibering of the seeds on the ginning machine productivity in different positions of the seed grid was drawn:
In compact position of the seed grid:
$Y=-0.217x^2+2.209x-2.82$ (1)
In standard position of the seed grid:
$Y=-0.071x^2+1.018x-1.32$ (2)
In opened position of the seed grid:
$Y=-0.059x^2+1.047x-1.31$ (3)

Figures 1-3 show that at ginning machine productivity up to 3 t/h, residual fibering of the seeds increases slightly and then intensively. It should be noted that in compact position of the seed grid residual fibering of the seeds is high which leads to considerable loss of the fiber.

Equation of the regression of the curves shown on Fig.4 characterizing influence of the ginning machine productivity on the increase of the residual fibering of the seeds in opened position of the seed grid was drawn.

Relatively standard position:
$Y=0.013x^2+0.021x+0.03$ (4)
Relatively compact position:
$Y=0.111x^2-0.503x+0.84$ (5)

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Fig.5 provides information about influence of the position of the seed grid on the outflow of the seeds from the working chamber. It is visible that in opened position of the seed grid the outflow increases from 1.872 t/h to 2.796 t/h that is in 49%. Naturally, this leads to decrease of the density of the gummy roller, increase of productivity and quality of the fiber. Here, the main problem is the regeneration of the underginned seeds. Analysis of the underginned seeds has shown that the increase of the residual fibering of the seeds occur mainly due to the individual pappus of raw cotton which had not been touched by the saw teeth.

Basing on the research carried out, in order to decrease losses of the fiber from the underginned seeds, the improved technological process of the ginning was offered, refer to Fig.2.

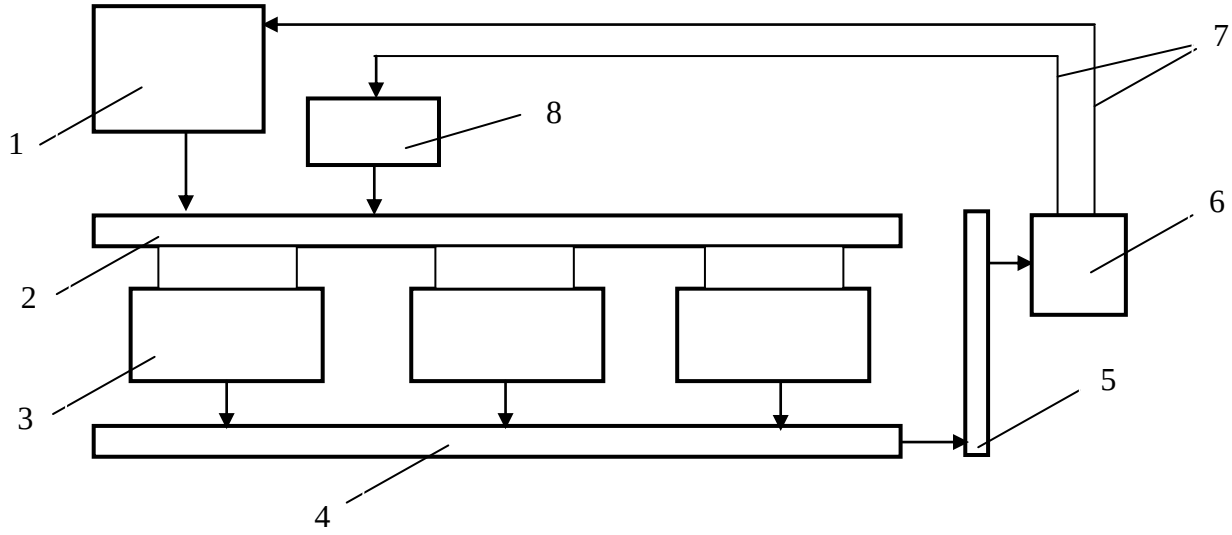


Fig.6. Diagram of the improved ginning procedure
1-separatofCC-15A; 2- distribution screw; 3- ginning machine 5DP-130; 4-collective seed line; 5- elevator; 6-underginned seeds regeneratorPHC; 7- tube for seeds pneumatic conveyor system; 8-condesor.

In this diagram, raw cotton from separator 1 and distribution screw 2 enters ginning section 3 where the ginning of raw cotton takes place, position of the seed grid is opened. Ginned seeds with the help of collective seed line 4 and elevator 5 enter regenerator 6 that have saw roll with bar grid and movable brush, where the extraction of raw cotton pappus and underginned seeds takes place, which, in their turn, go through tubes 7 into the separator 1 or condenser 8, for repeated ginning. In order to implement this process, additional installation of regenerator PHC is required as well as of separate condenser for transportation of seed to distributive screw. In present diagram, two types of transportation of underginned seeds from regenerator to the distributive screw are provided for. Both options are applicable in practice. Regenerator PHC catches separate pappus of raw cotton to the fullest extent.

## VI. CONCLUSION

The research carried out made it possible to find out that in different positions of the seed grid and even at the lowest ginning machine productivity, not complete ginning and loss of seeds with fibers took place. Residual fibering of the ginned seeds is more likely influenced by the ginning machine productivity rather than position of the seed grid. In order to reduce the fiber loss, regeneration of underginned seeds with repeated ginning is required.

The dependence of the residual fibering of seeds on ginning machine productivity and position of the deed grin obtained indicate limitation of ginning machine productivity so that to reduce the losses or application of two-stages ginning including regeneration of underginned seeds.

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The core of the offered process is in ginning of the cotton in opened position of the seed grid, regeneration of the underginned seed with their further mixing with raw cotton and further ginning.

Today, experimental research is carried out in order to draw up the offered ginning technology so that to set up common factors of changes in density of the gummy roller, of fiber quality in different positions of the seed grid and of ginning productivity.

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