

## Analysis of The Percentage of Impurities in Cotton

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Received: 24 Jan 2026 | Received Revised Version: 10 Feb 2026 | Accepted: 28 Feb 2026 | Published: 21 Mar 2026

Volume 08 Issue 03 2026 | Crossref DOI: 10.37547/tajet/Volume08Issue03-08

### Abstract

*The article is devoted to the study of the proportion of contamination of raw cotton, the geometric dimensions and the number of contaminations of raw cotton are analyzed. It is shown that the existing method used in practice for determining the contamination of raw cotton by the weight of the litter does not fully characterize the contamination of raw cotton as an object of cleaning. The influence of the type and quality of the collection and the variety of raw cotton on the weed fraction was determined.*

*It is shown that in the composition of raw cotton of the highest grades and machine, about the manual collection, there is a significant amount of collection of small litter.*

*It has been established that weed impurities up to 6 mm in size make up 93-97% of the total contamination of raw cotton.*

*It is recommended, based on the analysis of the results of the experiment, to improve the quality of the collection of raw cotton, control the collection, take into account the influence of fractional cotton harvesters, take into account the fractional composition of weeds when drawing up a plan for harvesting raw cotton, and also carry out a wide development of the composition of raw cotton in this area by studying the factors influencing the study of the geometric dimensions of contamination, give the appropriate conclusions.*

Keywords: Small and large litter, weed fraction, cleaning plan, raw cotton sample, cotton variety, cleaning effect.

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**Cite This Article:** Parpiev Azimjon, & Saidbekova Saidakhon. (2026). Analysis of The Percentage of Impurities in Cotton. The American Journal of Engineering and Technology, 8(03), 127–135. <https://doi.org/10.37547/tajet/Volume08Issue03-08>

### 1. Introduction

Cotton (*Gossypium hirsutum*.) is an important crop being cultivated in more than eighty countries due to its

products and socio-economic scope. 80% of world cotton production share comes from the top five countries, i.e., India, China, USA, Brazil, and Uzbekistan, respectively. The cotton crop provides raw materials for several

industries to produce edible oil, clothes, and seed cakes for livestock, organic matter, and several other products. Cotton (*Gossypium* spp.), the subject of this review, is unique among major agricultural crops in which the maternal and filial tissues in the seed, both have economic value. Cellulose-rich fibers produced by cells of the seed coat are the main natural fiber used in the textile industry, while the cotton seed embryo is rich in oil and protein making the seed valuable not only for extraction of oil for human consumption but also to produce a protein-rich meal for feedstock [1-9]. Contamination and defects in the produced fiber are one of the main factors affecting the stable operation of spinning mills and the production of quality yarn.

At ginning enterprises, the cleaning plan is determined depending on the class of cotton and its initial contamination [9-15]. The cleaning plan defines the passage of cotton through several stacks and saw drums, that is, the cleaning of cotton from small and large impurities.

The experience of cleaning cotton in piles and saw drums showed that sometimes the cleaning efficiency of cotton batches with the same initial contamination gave different results [16-20].

This situation leads to the processing of cotton contrary to the requirements of the harmonized primary processing technology, relatively high contamination, and excessive amount of fiber contamination.

The produced fiber mainly contains small impurities, which indicates the insufficient efficiency of cotton cleaning from small impurities.

The process of cleaning cotton is very complex, and in order to increase its efficiency, it is necessary to create the maximum conditions for the separation of pollution by extensive analysis of all the factors that affect the cleaning [21-28].

The reasons why a certain number of impurities remain in the produced fiber and why they can bind to the fiber to such an extent that they cannot be separated from cotton have not been studied. However, when the bag is opened, the cotton is clean and free from dirt.

Pollution occurs during harvesting, and activation of pollution, and the appearance of adhesion force with the

fiber occurs in the processes of its transportation, harvesting, and transfer to production. In the mentioned processes, the dirt contained in the cotton is crushed. During the grinding process, small impurities in cotton decrease in size and increase in quantity.

It is known that the finer the dirt, the deeper it penetrates between the fibers and the more easily it turns into active dirt with high adhesion to the fiber.

The binding force between fibers and dirt, the friction force arising from the roughness of their surfaces, and the molecular force arising in the presence of free moisture, i.e. [29]

$$R_{bf} = R_{ff} + R_{mf} + R_a \quad (1)$$

where  $R_{ff}$  - is the friction force  $R_{mf}$  is the molecular force;  $R_a$  - is the adhesion of fibers and dirt.

The dirt can be separated from the cotton  $R_{bf}$  by hitting it with great force or repeatedly hitting it with a force that reduces its value  $R_{bf}$ .

Because free moisture evaporates  $R_{mf} = 0$  when cotton is dried

will, then the bond strength  $R_{bf} = R_{ff} + R_a$  will be equal to, that is, the value will decrease. If cotton is cleaned while it is still cotton,  $R_a$  its value will decrease.

When examining the surface of impurities under a microscope, it was noticed that they have very jagged edges. Strength is due to the adhesion of these edges to the fiber.  $R_a$  the surface of the fiber is not smooth, and as the quality decreases, the dirt adhesion strength increases.

Table 1 shows the tensile strength, the strength of attachment to the seed, and the strength of attachment to the dirt of 3 varieties of the Tashkent-1 selection [30].

It can be seen that the strength of attachment of some impurities to the fiber is 2-3 times higher than the strength of their attachment to the seed. Analysis of impurities released from gins in various gins shows that they contain a certain number of fibers.

Table 1

Fiber tensile strength, seed adhesion strength, and mud adhesion strength

Fiber tensile strength, seed attachment force $N \cdot 10^{-2}$			The adhesion strength of dirt to fiber, $N \cdot 10^{-2}$					
In Khalaza	The seed is on the side	In the micropyle	Pollution intensity, $10^{-3} kg$					
			0,10	0,15	0,20	0,25	0,30	0,35
$\frac{2,95}{0,89}$	$\frac{3,44}{1,67}$	$\frac{3,92}{1,97}$	2,9	3,6	4,1	4,9	5,5	6,0

Note. In the figure - the tensile strength of the fiber, and in the denominator - is the strength of the attachment of the fiber to the seed.

The force must act to separate  $R_f > R_{bf}$  the dirt from the fiber. that is  $R_f > R_{ff} + R_a - \Delta R_a$  evaporation of free moisture  $R_{mf} = 0$  can  $R_{ff}$  and  $R_a$  be reduced for cotton drying?  $R_a$  value, we can reduce the number of fibers stuck in the dirt by increasing the cotton level  $\Delta R_a$ . In that will  $R_f > R_{ff} + R_a - \Delta R_a$  it should be noted that the fact that the force acting on the fiber is  $R_f$ -force  $R_{ff}^{min} + R_a - \Delta R_a$  greater than the sum of the forces is not enough to separate the impurity,  $R_f$  the direction of the force relative to other forces, the nature and form of the addition of the impurity to the fiber are important.

If there is dirt on the surface, it can be attached to the fiber only by a fraction,  $R_f > R_{ff}^{min}$ , and the cost of its separation  $R_f$  will not be high. The impact force can be in the form of impact, concussion, or resistance of a particular surface  $R_{ff}^{min}$

If the dirt is between the fibers and  $R_{ff}$  and  $R_a$  under the action of forces, then hitting and shaking may not be effective.

It can be seen that the isolation of impurities in cotton is a unique problem and requires a deeper study. Cotton contamination is determined by the following formula [31]

$$S = \frac{M_1 - M_2}{M_2} * 100 = \frac{M_p}{M_2} * 100\% \tag{2}$$

in this  $M_1$  and  $M_2$  - the mass of dirty cotton and cleaned cotton, respectively;  $M_p$  - the mass of pollution.

As can be seen from Formula 2, the mass of dirt is used as the basis for determining the soiling of cotton. The percentage of small and large impurities and the number of sizes is not taken into account.

Although the overall soiling of cotton varies, the percentage, size, and amount of small and large impurities in it can be different. This will affect the cleaning efficiency.

Another important issue is the mechanism of fiber contamination.

It is known that impurities in cotton - cotton leaves, straws, and the surface of the box - are smooth, and it is more difficult to combine with fiber. The broken edges of the dirt are jagged and fibers can get stuck between them.

Several studies [32-33] have suggested that cleaning is easier if the surface area of the dirt is large as an indicator of cotton contamination. If the dirty surface is in contact with the fiber, the above points will be correct. In it, the total comparison surface of impurities can be determined by the following formula

$$S = \frac{S_1 n_1 + S_2 n_2 + S_3 n_3 + \dots + S_n n_n}{n_1 + n_2 + n_3 + \dots + n_n} \tag{3}$$

where  $S_1 n_1 + S_2 n_2 + \dots + S_n n_n$  is the surface area and the number of impurities of a certain size.

Some researchers [33-35] suggested that the bond between dirt and fiber is formed as a result of the penetration of the fiber along the perimeter of the dirt, between the irregularities formed as a result of destruction. In it, the perimeter of impurities in contact with the fiber is determined as follows:

$$P = \frac{P_1 n_1 + P_2 n_2 + P_3 n_3 + \dots + P_n n_n}{n_1 + n_2 + n_3 + \dots + n_n} \tag{4}$$

As can be seen from formulas (3) and (4), in both cases it is necessary to take into account the number of impurities. As a result of mud grinding, the total perimeter proportionally increases, and the relative surface area does not change.

The analysis showed that it is necessary to carry out large-scale experiments to determine the proportions, sizes, and amounts of small and large impurities in

cotton, as well as the mechanisms of interaction of impurities with fibers.

This article presents the results of an experiment to determine the percentage, geometric dimensions, and amount of cotton impurities.

## 2. Methods

For the experiment, “Porloq” type mud 1/2 from “An-Bayaut” cotton gin 14.9%, machine collection, “An-Bayaut” type mud 1/2 15.3% from “An-Bayaut” cotton gin, manual collection, “C65-24” from cotton gin Chinoz Plant 1/2 grade dirt 5.9%, hand-picked, S65-24 from “Buka” cotton gin 5/3 grade dirt 31.8%, hand-picked raw cotton. Than 300 g samples were taken . Large and small impurities were separated according to the standard procedure for determining impurities. The impurities contained in the cotton separated from the samples were passed through sieves with openings 2, 4, 6, 8, and 10 mm in diameter, and the proportions of the content of impurities were determined. Sizes 0-2; 2.1-4; 4.1-6; 6.1-8; 8:1-10; and 1 g of impurities larger than 10 mm. Samples were taken and the number of impurities in them was determined.

## 3. Results and discussion

The results of the experiment are presented in Tables 2 and 4.

A comparison of machine-picked and hand-picked cotton showed that machine-picked cotton had a higher content of fine impurities. It can be seen that the percentage of small impurities in machine-picked cotton at the “An-Bayaut” cotton ginning plant was 74.77% and in hand-picked cotton - 35.09% (see Table 2). The share of small impurities up to 6 mm in machine-picked cotton is 57.07% and in hand-picked cotton - 28.67%.

Machine-harvested cotton has a high amount and number of small impurities, which indicates that they have high adhesion to the fibers and are more difficult to separate from cotton. The number of cotton impurities, and the percentage of fine and coarse impurities can be affected. Of course, this also affects the quality of the defoliation. For example, the percentage of small impurities in hand-picked cotton “An-Bayaut” 1/2, produced at the “An-Bayaut” cotton ginning plant, was 35.09%, and in cotton grade “C65-24” 1/2, produced at the “Chinoz” cotton ginning plant, - 77, 81%. cotton gin plant.

**Table 2**  
**Cotton Dirt Fraction**

№	Cotton indicators	Composition and percentage of impurities									
		Dimensions, mm						Total, g/%			Lost mass g/%
		0-2 g /%	2,1-4 g /%	4,1-6 g /%	6,1-8 g /%	8,1-10 g /%	Greater than 10 mm, g /%	Small	Big	General	
1	“Porloq” Impurity is 14.9 %; harvested by machine.	12,7	27,8	9,8	7,1	8,5	17,7	68,2	17,7	85,9	2,3
		14,78	32,36	11,41	8,27	9,9	20,61	79,39	20,61	100	2,68
2	“An-Bayaut” Impurity is 15,3; harvested by hand	11,5	10,5	3,8	2,6	3,4	56,8	32,5	56,8	89,3	0,7
		12,88	11,76	4,26	2,91	3,81	63,61	36,39	63,61	100	0,78
3	“C65-24” Impurity is 5,9 %; harvested by hand	38	9,7	5,3	3,2	5,2	5,81	27,6	5,81	33,41	0,4
		11,37	29,03	15,86	9,58	15,56	17,39	82,61	17,39	100	1,2
4	“C65-24” Impurity is 31,8 %;	16,1	15,8	9,2	5,2	6,4	133	54,2	133	187,2	1,5
		8,6	8,44	4,91	2,78	3,42	71,05	28,95	71,05	100	0,8

	harvested by hand									
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Explanation. In the photo in grams, in the denominator as a percentage

**Table 3**  
**Size distribution of impurities**

№	Cotton indicators	Dimensions of impurities, mm						Total n /%
		0-2 n /%	2,1-4 n /%	4,1-6 n /%	6,1-8 n /%	8,1-10 n /%	Greater than 10 n /%	
1	“Porlok” Impurity is 14.9 %; harvested by machine	136398	71057	5449	4942	5984	106	223936
		60,9	31,73	2,43	2,21	2,67	0,05	100
2	“An-Bayaut” Impurity is 15,3; harvested by hand	119830	27405	2394	1664	3196	227	154716
		77,45	17,71	1,55	1,08	2,07	0,15	100
3	“C65-24” Impurity is 5,9 %; harvested by hand	38076	25249	3678	1261	3370	58	71692
		53,11	35,22	5,13	1,76	4,7	0,08	100
4	“C65-24” Impurity is 31,8 %; harvested by hand	169050	48727	6146	1966	5018	532	231439
		73,1	21,05	2,66	0,85	2,17	0,23	100

Explanation. In the figure in units, in the denominator, in percent

When analyzing the mass of impurities, it was found that in options with a percentage of large impurities of 62.73% and 70.19%, their amount is 0.15% and 0.23%, respectively, concerning the total amount of impurities. This situation indicates that more attention should be paid to cleaning cotton from small impurities.

An experimental-scale analysis of the influence of the cotton variety on the mud fraction showed that the number of small impurities is greater in type I cotton (77.81%), and less (27.64%) in type V cotton. The amount of contamination up to 6 mm in type I cotton was 53.78% and in type V cotton - 27.52%.

Analysis of the number of impurities in cotton varieties showed the following.

300 cottons with 14.9% dirt content Mr. \_ and the number of impurities is 223,936, and with manual skinning 154,716, that is, 1.45 times more than with machine skinning.

300 g C65-24 grade 1/2, dirty cotton 5.9%. 71692 impurities, 31% soiled cotton 5/3 grade, 231439 impurities, i.e., in V-type cotton, contamination is 2.86 times greater, contamination is 3.23 times greater. Compared with cotton of the brand "Porlok" 1/2, prepared at the “An-Bayaut” cotton-cleaning enterprise, with contamination of 14.9%, the contamination of grade B was 1.67 times higher, and the number of impurities was 1.03 times higher (Table 4).

**Table 4**  
**Shares by the number of impurities**

№	Cotton grade and initial dirt, %	Mass fraction of impurities, %		The number of impurities	Mass fraction of impurities with a size of 0-4 mm, %	The number of impurities with a size of 0-6 mm	Percentage of impurities 0-6 mm in size by quantity, %
		Small	Big				
1	“Porloq” Impurity is 14.9 %; harvested by machine	74.77	20.14	223936	57.08	212904	95.1
2	“An-Bayaut” Impurity is 15,3 %; harvested by hand	35.09	62.73	154716	28.17	149629	96.7
3	“C65-24” Impurity is 5,9 %; harvested by hand	77.81	16.62	71692	53.78	67003	93.5
4	“C65-24” Impurity is 31,8 %; harvested by hand	27.64	70.19	231439	21.52	223923	96.8

Explanation. When calculating the percentage of small and large impurities, large and small grains are not taken into account.

In the experimental variants, no regularity was found in the percentage of small and large impurities in cotton, the percentage of small impurities varied from 27.64 to 77.81% and it was found that it did not depend on the total contamination of cotton.

The analysis of the size of small impurities showed that the number of impurities up to 6 mm in size ranged from 93.5 to 96.8% of the total impurities in all variants.

#### 4. Conclusions

1. When picking cotton by hand, the quality of the picking must be strictly controlled for contamination of the cotton.
2. When choosing cotton pickers and working bodies, it is advisable to pay serious attention to the mechanical effect they have on cotton and cotton leaves, resulting in small impurities.
3. It is shown that the percentage of small impurities in machine-picked cotton is several times higher than in hand-picked cotton. This should be taken into account when drawing up a cleaning plan.
4. The influence of the cotton variety on the composition of the fraction of impurities is traced, and in the variants

of the experiment, it is shown that the percentage of small impurities is much lower in B-type cotton compared to I-type. This can be explained by the fact that V-type cotton is harvested after the leaves have fallen.

5. Determination of the contamination of cotton by weight showed that it cannot fully characterize the contamination of cotton as an object of cleaning. The definition of impurity by the mass fraction of impurity cannot represent the number of its geometric dimensions. One of the main factors affecting the efficiency of harvesting is the number, size, and coordinates of their location on the cotton. Naturally, the smaller the size of the dirt, the more it penetrates between the fibers and the stronger the bond with the fibers. In the experimental variants, the number of large impurities was 62.73% and 70.19%, and their amount was 0.15% and 0.23%, respectively, compared with the total amount of impurities in cotton. This provision must be taken into account when choosing a method for cleaning cotton from small and large impurities.

6. Analyzes showed that the number of impurities with a size of 6 mm ranges from 93.3% to 96.8% of the total amount of impurities in cotton.

7. As a result of the experiments carried out, preliminary data have been obtained, which requires extensive

scientific research in this direction, the study of other factors affecting the size and amount of pollution, and obtaining appropriate conclusions.

### References

1. Chaudhary, I. J., & Rathore, D. (2022). Effects of ambient and elevated ozone on morpho physiology of cotton (*Gossypium hirsutum* L.) and its correlation with yield traits. *Environmental Technology & Innovation*, 25, 102146. <https://doi.org/10.1016/j.eti.2021.102146>
2. Cai, Z., Haque, A. N. M. A., Dhandapani, R., & Naebe, M. (2023). Impact of variability of cotton gin trash on the properties of powders prepared from distinct mechanical approaches. *Powder Technology*, 413, 118045. <https://doi.org/10.1016/j.powtec.2022.118045>
3. Tian, J., Zhang, X., Zhang, W., Li, J., Yang, Y., Dong, H., Jiu, X., Yu, Y., Zhao, Z., Xu, S., & Zuo, W. (2018). Fiber damage of machine-harvested cotton before ginning and after lint cleaning. *Journal of Integrative Agriculture*, 17(5), 1120-1127. [https://doi.org/10.1016/S2095-3119\(17\)61730-1](https://doi.org/10.1016/S2095-3119(17)61730-1)
4. Safoev, A., & Atajanov, A. (2022). Theoretical study of a pair of "Groom-Saw" to reduce the wear of the grooves in cotton transportation. *Transportation Research Procedia*, 63, 2984-2991. <https://doi.org/10.1016/j.trpro.2022.06.349>
5. Salman M, Zia ZU, Rana IA. (2019). Genetic effects conferring heat tolerance in upland cotton (*Gossypium hirsutum* L.). *Journal of Cotton Research*. 2(9):18. <https://doi.org/10.1186/s42397-019-0025-2>
6. Arafat, Y., & Uddin, A. J. (2022). Recycled fibers from pre- and post-consumer textile waste as blend constituents in manufacturing 100% cotton yarns in ring spinning: A sustainable and eco-friendly approach. *Heliyon*, 8(11), e11275. <https://doi.org/10.1016/j.heliyon.2022.e11275>
7. Madumarov, I., Ruzmetov, R., Tychiev, T., & Ismoilov, A. (2022). Experimental results of an improved supplier in the production process and transportation. *Transportation Research Procedia*, 63, 2998-3004. <https://doi.org/10.1016/j.trpro.2022.06.351>
8. Ramprasad, S., Venkata Ramana, M., & Manzur Husayn, M. (2023). Investigation on cotton dust-reinforced epoxy composites. *Materials Today: Proceedings*. <https://doi.org/10.1016/j.matpr.2023.02.230>
9. Hardin, R. G., Barnes, E. M., Delhom, C. D., Wanjura, J. D., & Ward, J. K. (2022). Internet of things: Cotton harvesting and processing. *Computers and Electronics in Agriculture*, 202, 107294. <https://doi.org/10.1016/j.compag.2022.107294>
10. Li, Y., Ji, H., Fan, J., & Su, H. (2023). Microstructure changes and reaction process of cotton at low-temperature oxidation stage. *Fuel Processing Technology*, 242, 107660. <https://doi.org/10.1016/j.fuproc.2023.107660>
11. Bawa, A., Samanta, S., Himanshu, S. K., Singh, J., Kim, J., Zhang, T., Chang, A., Jung, J., DeLaune, P., Bordovsky, J., Barnes, E., & Ale, S. (2023). A support vector machine and image processing based approach for counting open cotton bolls and estimating lint yield from UAV imagery. *Smart Agricultural Technology*, 3, 100140. <https://doi.org/10.1016/j.atech.2022.100140>
12. Mathangadeera, R. V., Hequet, E. F., Kelli, B., Dever, J. K., & Kelli, K. M. (2020). Importance of cotton fiber elongation in fiber processing. *Sanoat ekinlari va mahsulotlari*, 147, 112217. <https://doi.org/10.1016/j.indcrop.2020.112217>
13. Sun, S., Li, C., Paterson, A. H., Chee, P. W., & Robertson, J. S. (2019). Image processing algorithms for infield single cotton boll counting and yield prediction. *Computers and Electronics in Agriculture*, 166, 104976. <https://doi.org/10.1016/j.compag.2019.104976>
14. Feng, L., Chi, B., & Dong, H. (2022). Cotton cultivation technology with Chinese characteristics has driven the 70-year development of cotton production in China. *Journal of Integrative Agriculture*, 21(3), 597-609. [https://doi.org/10.1016/S2095-3119\(20\)63457-8](https://doi.org/10.1016/S2095-3119(20)63457-8)
15. Welsh, J., Taschetto, A., & Quinn, J. (2022). Climate and agricultural risk: Assessing the impacts of major climate drivers on Australian cotton production. *European Journal of Agronomy*, 140, 126604. <https://doi.org/10.1016/j.eja.2022.126604>
16. Tian, J., Zhang, X., Zhang, W., Li, J., Yang, Y., Dong, H., Jiu, X., Yu, Y., Zhao, Z., Xu, S., & Zuo, W. (2018). Fiber damage of machine-harvested cotton before ginning and after lint cleaning. *Journal of Integrative Agriculture*, 17(5), 1120-

1127. [https://doi.org/10.1016/S2095-3119\(17\)61730-1](https://doi.org/10.1016/S2095-3119(17)61730-1)
17. Cai, Z., Haque, A. N. M. A., Dhandapani, R., & Naebe, M. (2023). Impact of variability of cotton gin trash on the properties of powders prepared from distinct mechanical approaches. *Powder Technology*, 413, 118045. <https://doi.org/10.1016/j.powtec.2022.118045>
18. Jacobs, J., Mullenix, M., Koebernick, J., Dillard, S., Justice, S., Tigue, D., Rodning, S., & Muntifer, R. (2022). Cotton gin byproduct: Effects on feed intake, quality, and safety for use in diets of gestating beef cows. *Applied Animal Science*, 38(5), 402-408. <https://doi.org/10.15232/aas.2022-02288>
19. Haque, A. N. M. A., Remadevi, R., & Naebe, M. (2021). A review on cotton gin trash: Sustainable commodity for material fabrication. *Journal of Cleaner Production*, 281, 125300. <https://doi.org/10.1016/j.jclepro.2020.125300>
20. Ismail, S. A., Chen, G., Baillie, C., & Symes, T. (2011). Energy uses for cotton ginning in Australia. *Biosystems Engineering*, 109(2), 140-147. <https://doi.org/10.1016/j.biosystemseng.2011.02.010>
21. Mullenix, M., Stewart, R., Jacobs, J., & Davis, D. (2022). Invited Review: Using whole cottonseed and cotton harvest residue in southeastern US beef cattle diets: Quality, intake, and changes in feed characteristics. *Applied Animal Science*, 38(5), 447-455. <https://doi.org/10.15232/aas.2022-0230>
22. Egan, J., Wang, S., Shen, J., Baars, O., Moxley, G., & Salmon, S. (2023). Enzymatic textile fiber separation for sustainable waste processing. *Resources, Environment and Sustainability*, 13, 100118. <https://doi.org/10.1016/j.resenv.2023.100118>
23. Shi, Y., Jiang, J., Ye, H., Sheng, Y., Zhou, Y., Foong, S. Y., Sonne, C., Chong, W. W. F., Lam, S. S., Xie, Y., Li, J., & Ge, S. (2023). Transforming municipal cotton waste into a multilayer fibre biocomposite with high strength. *Environmental Research*, 218, 114967. <https://doi.org/10.1016/j.envres.2022.114967>
24. Yang, Z., Evans, M. N., Buser, M. D., Hapeman, C. J., Torrents, A., & Whitelock, D. P. (2023). Improving modeling of low-altitude particulate matter emission and dispersion: A cotton gin case study. *Journal of Environmental Sciences*, 133, 8-22. <https://doi.org/10.1016/j.jes.2022.03.048>
25. Neupane, J., Maja, J. M., Miller, G., Marshall, M., Cutulle, M., Greene, J., Luo, J., & Barnes, E. (2023). The Next Generation of Cotton Defoliation Sprayer. *AgriEngineering*, 5(1), 441-459. <https://doi.org/10.3390/agriengineering5010029>
26. Hardin, R. G., Barnes, E. M., Delhom, C. D., Wanjura, J. D., & Ward, J. K. (2022). Internet of things: Cotton harvesting and processing. *Computers and Electronics in Agriculture*, 202, 107294. <https://doi.org/10.1016/j.compag.2022.107294>
27. Morais, J., James, J., Hinds, Z., Smith, W., Kelly, B., & Hequet, E. (2020). A method to improve cotton fiber length measurement for laboratory analysis. *MethodsX*, 7, 100859. <https://doi.org/10.1016/j.mex.2020.100859>
28. Negm, M., & Sanad, S. (2020). Cotton fibres, picking, ginning, spinning and weaving. *Handbook of Natural Fibres (Second Edition)*, 3-48. <https://doi.org/10.1016/B978-0-12-818782-1.00001-8>
29. Parpiev, A., Mardonov, B., Akhmatov, M., Akhmatov, N. (2023). Law of cotton mass movement in drying drum sections. *AIP Conference Proceedings*, 2700, статья № 020063. <https://doi.org/10.1063/5.0138707>
30. Parpiev, A., Shorahmedova, M., Saidbekova, S. (2023). Research on the geometric dimensions of fine pollutants in cotton. *E3S Web of Conferences*, 371, статья № 01023. <https://doi.org/10.1051/e3sconf/202337101023>
31. Parpiev, A., Shorahmedova, M., Saidbekova, S. (2023). Analysis of the proportions of pollutions in cotton by weight and number. *E3S Web of Conferences*, 371, №01025. <https://doi.org/10.1051/e3sconf/202337101025>
32. Kayumov, A.M., Parpiev, A., Mardonov, B. (2022). Simulation of heat exchange processes in the moving raw cotton pipeline. *AIP Conference Proceedings*, 2650, статья № 030010, <https://doi.org/10.1063/5.0105467>
33. Kayumov, A.M., Parpiev, A., Juraev, T. (2022). Features of drying cotton raw. *AIP Conference Proceedings*, 2650, №030008. <https://doi.org/10.1063/5.0105464>
34. Sabirova, Z.A., Tashpulatov, S.S., Parpiev, A.P. (2018). Mathematical substantiation of the rational package (BAG) of fully-formed FUR articles with content of polymer composition. *Journal of Engineering and Applied*, 13 (23), pp. 10145-

10147

<https://doi.org/10.3923/jeasci.2018.10145.10147>

35. Sabirova, Z.A., Tashpulatov, S.S., Parpiev, A.P. (2018). Evaluation of form-resistance of fully-formatted semi-finished furniture sewing products with content of polymer composition. Journal of Engineering and Applied, 13 (23), pp. 10141-10144

<https://doi.org/10.3923/jeasci.2018.10141.10144>