THE INFLUENCE OF TECHNOLOGICAL PROPERTIES OF FIBERS ON THE ENZYMATIC HYDROLYSIS OF FIBERS

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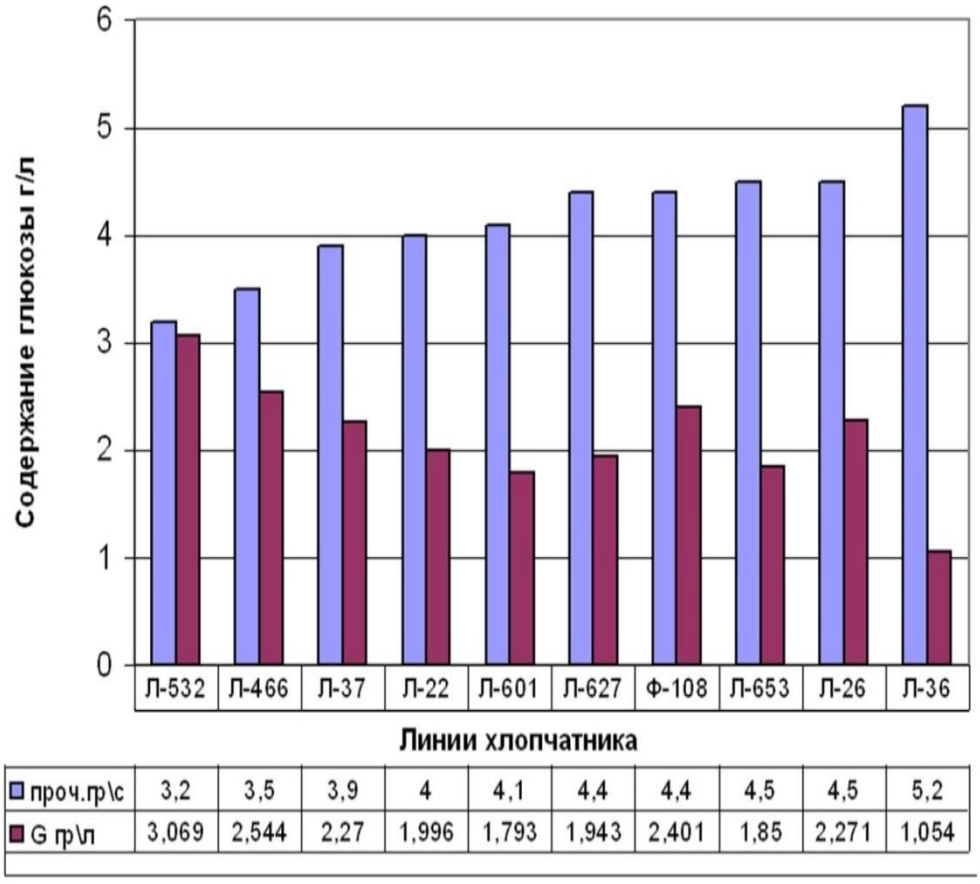
Biocatalysis is attracting increasing attention in order to obtain low molecular weight substances - reagents for directed synthesis [1]. It is known that the type of plant material and the method of separating cellulose from it determine the physicochemical properties of the substrate, therefore, determine the reactivity to enzymatic hydrolysis [2-4]. That is why the dependence of the fermentolysis of cellulose substrates on the characteristics of cellulose (degree of grinding, crystallinity, polymerization, the presence of non-cellulosic impurities, etc.) is the subject of many studies [3, 5,].

It is known that fiber strength depends not only on cotton varieties, but also on the accumulation and formation of cellulose in it. The higher the strength, the greater their orderliness and crystallinity. Less durable fibers resulting from diseases, unripe fibers, fallen cotton bolls contain more amorphous sections of cellulose. In these cotton line samples, the degree of crystallinity and polymerization is also lower. Studies have shown that ripened cotton fibers with high ordering and high strength undergo enzymatic hydrolysis to a lesser extent. As can be seen from the data in Fig. 2, the lower the fiber strength, the higher the hydrolyzability of cellulose fibers. So, for example, cotton fibers with a strength of 5.2 g.s. (L-36), hydrolyzed at a lower rate than cotton fibers having a strength of 3.2 g. (L-532). Due to their enzymatic hydrolysis in the reaction medium, the content of glucose and BC is 1,054 and 4.9 g / l, against 3.069 and 9.2 g / l, respectively (Fig.). A comparative analysis of the data obtained revealed a direct correlation between the strength and hydrolyzability of fibers with different strength parameters. Although, in some cases, a mismatch is observed, for

example, if the mechanical strength of the fibers is relatively high, then they undergo high-speed enzymatic hydrolysis.



проч.гр\с	3,2	3,5	3,9	4	4,1	4,4	4,4	4,5	4,5	5,2
G гр\л	3,069	2,544	2,27	1,996	1,793	1,943	2,401	1,85	2,271	1,054

Fig. The correlation between the strength and biohydrolyzability of cotton fibers

Obtaining data made it possible to establish that there is a direct correlation between their hydrolyzability and mechanical strength. Next, some mechanical and physical properties of the fibers of different genetic cotton lines and their enzymatic hydrolysis were studied. From the data in table 1. it can be seen that the lines L-627 and F-108 have the same fiber strength (4.4 g.s.), but hydrolyzability (glucose yield) are different. The fiber of the F-108 line has a linear density of 6020 tex and a relative breaking load of 26.5 g.s. Tex, the accumulation of the hydrolysis product - glucose is equal to 2,401 g / l. Whereas for L-627 with a higher linear density of 7640 tex and a relative breaking load of 33.8 g.s. tex, biodegradation is less pronounced and the glucose yield at the end of the process is only 1.94 g / L. In lines L - 653 and L - 26, a similar pattern can be observed according to the results of hydrolysis.

Table the relationship between the mechanical and physical properties and the enzymatic hydrolysis of the fibers of various cotton lines.

№ №	Lines	Strength gs	Tex linear density	Relative breaking load tex	Glucose yield g / l	Aircraft concentration g / l
1	Л-532	3,2	6080	19,5	3,069	11,2
2	Л-466	3,5	7200	25,2	2,544	8,80
3	Л-37	3,9	6390	24,9	2,270	7,73
4	Л-22	4,0	6920	27,7	1,996	7,23
5	Л-601	4,1	6330	26,0	1,793	7,19
6	Л-627	4,4	7640	33,8	1,941	6,32
7	Ф-108	4,4	6020	26,5	2,401	5,57
8	Л-653	4,5	5600	25,2	1,850	5,70
9	Л-26	4,5	5440	24,5	2,271	6,01
10	Л-36	5,2	4380	22,8	1,054	4,90

Based on the data obtained, it can be concluded that the technological properties of the fibers can significantly affect the process of fiber destruction. It should be noted that, while the strength of the fiber is of great importance and plays a major role in the process of enzymatic hydrolysis.

The following characteristic features of hydrolysis are grouped, which determine the strength of cellulose fibers by the accumulation of the hydrolysis product — glucose in the reaction mixture. So, a) persistent - (L - 36, L - 501, L - 525, L - 602) b) medium persistent - (L - 12, L - 12-1, L - 654), c) unstable - (L - 468, L - 469, L-532).

Analysis of the amount of total reducing sugars showed identical results both in the degree of hydrolysis and in the assessment of fiber strength in the test samples.

References

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