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ELECTROPHORETIC INVESTIGATION OF THE SEED PROTEINS OF THE COTTON PLANT *Gossypium hirsutum*

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The proteins of the buffer-soluble fraction of the seeds of cotton plants of the species Gossypium hirsutum, *wild and ruderal varieties, have been investigated by electrophoresis in polyacrylamide gel and have been subdivided into two classes. Characteristic components have been detected in the protein spectra of these samples. In diploid species of the cotton plant, in addition to characteristic protein components, individual components are also observed.*

The investigation of cottonseed proteins by electrophoretic methods has permitted the detection of polymorphism in individual groups of proteins in the water-soluble [1-3], salt-soluble [4], buffer-soluble [5], and acid-soluble [6] fractions, together with a number of enzymes and their isoforms [7, 8]. However, the question of development of accelerated methods of selection based on biochemical characteristics and their use for the solution of problems of the genetics, selection, and seed production of the cotton plant still remains open.

The present work was devoted to a comparative electrophoretic investigation of the buffer-soluble seed proteins of cotton plants of the species *G. hirsutum*, wild and ruderal varieties, and also of some diploid species and their hybrids.

Figure 1 shows a sketch of an electrophoretogram of the buffer-soluble proteins of the species studied. The densitometry of the electrophoretogram gels on an Ultraskan instrument enabled the amounts of the proteins to be estimated from the intensities of the coloration of the components on a five-point scale. As can be seen from Fig. 1 and Table 1, races belonging to *G. hirsutum* L., *ssp. richmondi, jucatense, morilli, mexicanum, paniculatum, latifolium*, and *palmeri* were similar to one another in their overall protein spectra, which gives grounds for considering them as varieties of a single species. A characteristic feature is the presence of an electrophoretic component with R_f 0.1 for all the species studied. Components with R_f 0.37, 0.48, and 0.43, 0.51 divide these wild and ruderal races into two subclasses. Samples *3-5, 8-14, 9, 20*, and *24-26* contained the component with R_f 0.43 and 0.51. These results agree well with those that we obtained previously [6, 7].

In the diploid species a characteristic component was a protein with R_f 0.08, while distinguishing components had R_f 0.34 and 0.40 for *G. herbaceum*, 0.37 for *G. arboreum*, and 0.60 and 0.65 for *G. raimondi*. Samples *20* and *21* of hybrid material contained all the main protein components of the parental forms. The spectra of the hybrids included some minor components characteristic for one or the other parent. A. A. Sozinov [9] has shown features of the inheritance of parental proteins in hybrids, noting that, as a rule, the proteins of hybrids consist of components identical partly with maternal and partly with paternal forms. The appearance in hybrids of new components absent from the parental forms is considered as a result of interallele complementation [10].

Thus, the use of the electrophoretic method of analyzing cottonseed proteins makes possible the biochemical identification of cotton species from specific protein components.

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TABLE 1. Relative Electrophoretic Mobilities (R_f) and Intensities (+) of the Protein Components of Buffer-soluble Fractions

Samples investigated and catalog Nos.	Relative electrophoretic mobility (R_f)														
	0.08	0.10	0.17	0.20	0.24	0.30	0.34	0.37	0.40	0.43	0.48	0.51	0.55	0.60	0.65
G. hirsutum															
1. *ssp. richmondi* 454540		+++++	++++	++++	+++	+++				++++		++++			
2. *ssp. richmondi* 454550		+++	+++	++	+++	++				+++		++++			
3. *ssp. jucatanence* 397501		+++++	+++	++	+++	++++		+++			++++				
4. *ssp. jucatanense* 397503		+++++	+++	++	+++	+++		++++			++				
5. *ssp. punctatum* 397498		+++++	+++		+++	+++		++		++	++	++			
6. *ssp. morilli* 454532		+++++	+++	++++		+++				++++		++++			
7. *ssp. morilli* 458905		++++	++++	++++		+++				++		++++			
8. *ssp. méxicanum* 397506		+++++	+++	++++	+++	+++++		++++			++++				
9. *ssp. mexicanum* 397505		+++++	++	+	++	+++		++++			+++++				
10. *ssp. paniculatum*		+++++	++++	++++	+++	+++++		+++++			+++++				
11. *ssp. punctatum* 397496		+++++	++++	++++	+++	+++++		+++++		++++	+++++	++++			
G. arboreum															
12. *ssp. neglectum*	+				++++	++		++++							
13. *ssp. perine*	++				++++	+++++		+++++							
14. *ssp. nancing*	+				++	++		++++							
G. herbaceum															
15. *ssp. africanum*	+				+	+	++		++						
16. *ssp. frutense*	+						++		++						
17. *ssp. pseudoarboreum*	+						++		++						
18. *ssp. pseudoherbaceum*	+						++		++						
19. *G. thurberi*+	+		+++	+++++	+++++	+++++		++++			++++				
20. *G. thurberi*+ *G. raimondi* (2n–52)			++++	+++				+++++							
21. *G. thurberi*+ *G. raimondi* (2n–26)	+							+++++			++++			+++	
22. *G. raimondi*	++		+++++			+++++		+++++			++++			++++	++
23. *G. tricuspidatum ssp. purpuraceae*			+++++	++++		+++++		+++++			++++				
24. *G. hirsutum ssp. palmeri*		+++++	++++	+++	+++	+++		+++++			++++				
25. *G. hirsutum ssp. latifolium*		+++++	++++	++++	+++	++++		+++			++++				
26. *G. saudanense*		+++	++++	++++	++++	++++		++++			+++++				

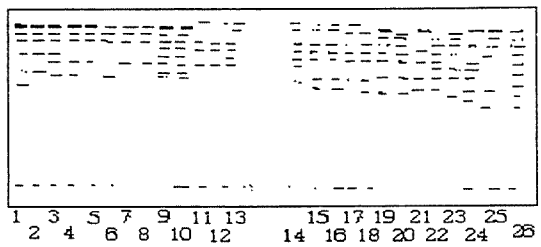

Fig. 1. Sketch of an electrophoretogram of the proteins of the buffer-soluble fractions from the seeds of wild and ruderal varieties of the cotton plant *G. hirsutum* L., and of diploid species:

G. hirsutum
1-2) *ssp. richmondi*
3-4) *ssp. jucatanense*
5, 11) *ssp. punctatum*
6-7) *ssp. morilli*
8-9) *ssp. mexicanum*
10) *ssp. paniculatum*

G. arboreum
12) *ssp. perine*
13) *ssp. neglectum*
14) *ssp. nanking*
15) *ssp. africanum*
G. herbaceum
16) *ssp. frutense*
17) *ssp. pseudoarbarum*
18) *ssp. pseudoherbaceum*

19) *G. thurberi*
20) *G. thurberi+G.raimondi 2n-52*
21) *G. thurberi+G.raimondi 2n-26*
22) *G. raimondi*
23) *G. tricupidatum ssp. purpuraceae*
24) *G. hirsutum ssp. palmeri*
25) *G. hirsutum ssp. latifolium*
26) *G. saudanense*

EXPERIMENTAL

Samples of individual seeds free from husk were ground and defatted, first with hexane and then with acetone. The water-soluble fraction was eliminated and the buffer-soluble proteins were isolated by a method that we have described previously [6, 7]. Electrophoretic separation was conducted by Davis's method [11]. The fixation, staining, and densitometry of the gels were performed as we have described previously [12].

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