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Inheritance of the fuzzless-lintless character in cotton (*Gossypium hirsutum*)

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Summary. A fuzzless-lintless mutant was identified in MCU.5 (*Gossypium hirsutum*) cotton in 1984. The inheritance of this character is reported in this paper. The fuzzless-lintless mutant was crossed with fuzzy-linted parents viz. MCU.5, MCU.7, Express Sindh (W), Piedmont Cleveland and Sindis Wild and the segregation pattern was studied in F_2 and BC_1F_1 generations. The segregation ratios for fuzzy-linted and fuzzless-lintless were 15 : 1 in the first cross, 63 : 1 in the second, third and fourth crosses and 255 : 1 in the fifth cross. These ratios indicated that this character is controlled by 2–4 gene pairs, and the fuzzless-lintless character is a recessive to fuzzy-linted character. The chi-square test was significant only in the BC_1F_1 generation with MCU.7 and Express Sindh (W). The test revealed that the observed values deviated significantly from the expected ratio of 7 : 1, suggesting that this character is also influenced by modifier gene complex.

Key words: Lintless – Fuzzless – Segregation – Modifier – Gene complex

Introduction

The presence of lint is the chief characteristic of cultivated cotton. The most important economic part of the cotton plant is lint. Lintless mutants were first reported in diploid Asiatic cotton (*Gossypium arboreum*) by Kottur (1927) and Afzal and Hutchinson (1933); the inheritance was also studied by Afzal and Hutchinson (1933), Hutchinson (1935) and Hutchinson and Gadkari (1937). The first report of lintlessness in tetraploid cotton *Gossypium hirsutum* was made by Griffee and Ligon (1929). Recently, Peter et al. (1984) reported a fuzzless-lintless mutant in cotton cv MCU.5 (*G. hirsutum*) i.e., lack of both small hairs and the longer (lint) fibers. The inheritance pattern of this fuzzless-lintless mutant has been studied and is reported in this paper.

Materials and methods

The fuzzless-lintless mutant of the variety MCU.5 (*G. hirsutum*) was crossed with selected linted types to study the inheritance of "lintlessness". The following parents belonging to *G. hirsutum* were utilized:

Parents	Origin	Distinct characters
MCU.5	Tamil Nadu India	Extra-long staple variety
MCU.7	Tamil Nadu India	Early maturing medium staple variety
Express Sindh (W)	Pakistan	Short staple type
Piedmont Cleveland	USA	Long staple type
Sindis wild	Pakistan	Medium staple type
Fuzzless-lintless mutant of MCU.5	Tamil Nadu India	Fuzzless-lintless

The parents MCU.5, MCU.7, Express Sindh (W), Piedmont Cleveland and Sindis Wild were used as female parents and the fuzzless-lintless mutant was used as common pollen parent; crosses were made during the 1983 summer season. In the 1983–84 winter season, backcrosses were made using the fuzzless-lintless mutant as the common ovule parent and the F1's as pollen parents. The crosses made during the first season (1983 summer season) were raised as F1's during the second season (1983–84 winter season) and self-fertilised to raise F2's during the next season. During the third season the F2's and BC_1F_1's were raised (summer season 1984) and the

Table 1. Segregation ratio for fuzzy-linted and fuzzless-lintless characters

Crosses	Generation	Observed value		Expected ratio	χ^2 value	p value
		fuzzy linted	fuzzless-lintless			
MCU.5 × Fuzzless-lintless type	F2	443	27	15:1	0.15	0.70 to 0.60
Fuzzless × F1 lintless type	BC_1F_1	165	68	3:1	2.30	0.20 to 0.10
MCU.7 × Fuzzless-lintless type	F2	459	12	63:1	2.91	0.10 to 0.05
Fuzzless-lintless F1 type	BC_1F_1	183	49	7:1	15.76*	70.001
Express Sindh (W) × Fuzzles linthless type	F2	452	11	63:1	2.04	0.20 to 0.10
Fuzzless × F1 lintless type	BC_1F_1	211	15	7:1	7.15*	0.01 to 0.005
Piedmont Cleveland × Fuzzles linthless type	F2	456	12	63:1	3.07	0.10 to 0.05
Fuzzless × F1 lintless type	BC_1F_1	197	29	7:1	0.02	0.90 to 0.80
Sindis Wild × Fuzzless-lintless type	F2	460	4	225:1	2.00	0.20 to 0.10
Fuzzless × F1 lintless type	BC_1F_1	202	21	15:1	3.73	0.10 to 0.05

* Significant at 1% level

segregation pattern for fuzzy-linted characters was worked out to determine their inheritance. The chi-square test was made to prove the significance.

Results and discussion

The number of plants that segregated for fuzzy-linted and fuzzless-lintless appearance in the F2 and BC_1F_1 generations are shown in Table 1.

The chi-square test was not significant in the F2 and BC_1F_1 generations for MCU.5 × fuzzless-lintless, Piedmont Cleveland × fuzzless-lintless and Sindis Wild × fuzzless-lintless crosses, showing that the observed value did not deviate from the expected ratios of 15 : 1 and 3 : 1, 63 : 1 and 7 : 1 or 255 : 1 and 15 :1, respectively. The fuzzless-lintless trait is apparently recessive to the fuzzy-linted character and is governed by 2–4 pairs of genes. The chi-square test proved significant deviation from the expected ratio of 7 : 1 for the BC_1F_1 generation of MCU.7 × fuzzless-lintless and Express Sindh (W) × fuzzless-lintless. This would indicate the influence of modifier genes.

Hutchinson (1935), Silow (1939), Gadkari (1950) and Christidis and Harrison (1955) reported a similar influence of modifying genes for linted versus lintless appearance in tetraploid cotton as evident from disturbed segregation values.

Kadambavanasundaram and Velusamy (1968) made the same conclusion when analyzing diploid cotton, *G. arboreum,* in which they found modifying genes influencing lint quantity.

Griffee and Ligon (1929) reported that lintlessness was a dominant character in cotton. An incomplete dominance inheritance for the presence of fibres was reported by Abzalov (1972). Musaev and Abzalov (1972) reported both dominant and recessive conditions for fuzzlessness in cotton. In the present study, the segregation pattern in all the crosses suggested that the fuzzless-lintless character is recessive to the fuzzy-linted character.

In the present study, the fuzzless condition was found to be associated with the lintless condition in all five crosses studied. Low (1968) reported evidence of linkage between naked seed with lintlessness in *G. hirsutum* cotton.

The inheritance of the fuzzless-lintless character appears in the present study to be governed by a duplicate type of gene action as supported by the observed F2 fit with a 15 : 1 in the first cross, 63 : 1 in the second, third and fourth crosses and 255 : 1 in the fifth cross, respectively. Duplicate gene action for the inheritance of this character was reported by Harland (1939).

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