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Short Communication

Radiation induced self-incompatibility and its inheritance in cowpea [*Vigna unguiculata* (L.) Walp)]

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With a view to induce agronomically useful mutations for desirable characters like earliness, determinate growth habit and large seed size in cowpea [*Vigna unguiculata* (L.) Walp)], the seeds of an elite variety, V-130, were irradiated with 200 Gy gamma rays and morphological mutants were isolated in M_2 [1]. In addition to various desirable mutants a few plants that flowered but did not set pods were also noticed in the M_2. The pollen of such visibly sterile plants, when tested for fertility with aceto-carmine, was found to be fertile, indicating the involvement of self-incompatibility. The floral morphology of this self-incompatible mutant (SIM) was similar to that of the parent V-130 and set pods when pollinated with the pollen from another cowpea variety C-152. Hence the mutant was studied further to investigate the mode of inheritance of its non-bearing character.

The flowers of a SIM plant were pollinated without emasculation, with the pollen collected from the flowers of the cowpea variety C-152. The resultant pod was harvested on maturity and the seeds obtained were used to raise the F_1 plants. The F_1 plants were fertile and the seeds collected from the F_1 plants were used to grow the F_2 plants. The number of fertile (pod bearing) and sterile (non-bearing) plants in the F_2 generation were scored. The progenies of the fertile plants were further grown in the F_3 generation and data on true breeding and segregating progenies were recorded. With a view to confirm the pollen fertility of the SIM plants, their pollen was used to pollinate the emasculated flowers of the parent variety V-130. Seed set occurred and the seeds obtained were used to grow the F_1 and the F_2 plants. The segregation pattern in the F_2 was recorded.

The F_1 plants had normal fertility. The F_2 population derived from the cross between SIM × C-152, segregated into fertile (pod bearing) and sterile (non-bearing) plants. The two families of the F_2 generation segregated into 15 fertile : 6 sterile and 32 fertile : 11 sterile respectively (pooled 47 fertile : 17 sterile), giving a genetic ratio of 3 fertile : 1 sterile (Table 1). In the F_3 generation, 4 out of the 14 plant progenies raised from the seeds obtained from the fertile F_2 plants bred true and 10 segregated for fertility. Nine of the ten segregating progenies gave segregation ratio of 3 fertile : 1 sterile, while one did not fit into 3 : 1 ratio.

Table 1. Segregation pattern between fertile and sterile plants in the F2 and F3 generations of the cross SIM of V-130 × Variety C-152

Generation	No. of plant progenies	Number of plants		Total plants	χ^2 (3:1)	P
		Fertile	Sterile			
F_2	2	47	17	64	0.08	0.75-0.90
F_3 (True breeding)	4	119	-	119	-	-
(Segregating)	9	182	66	248	0.33	0.50-0.75
(Segregating)	1	12	11	23	*	-
Total segregating F_3 progenies	10	194	77	271	1.21	0.10-0.25

χ^2 (1:2) for 4:10 = 0.1139, P = 0.50-0.75

* Deviated from 3:1

Pod formation and seed setting in V-130, when pollinated with the pollen from the SIM plant, confirmed the viability of pollen. This also indicated that the non-bearing character in the mutant was due to self-incompatibility. The F_2 segregation of fertile and sterile plants of the cross V-130 (female) × SIM (male) showed 7 fertile and 3 sterile, giving a good fit to 3:1 ratio.

The F_2 segregation pattern between fertile (pod bearing) and sterile (non-bearing) plants indicates that self-incompatible trait of the mutant was controlled by a single recessive gene. The F_3 data confirmed this hypothesis. Although one progeny deviated from the expected 3:1 ratio, the pooled data of the total F_3 progenies fitted into 3:1 ratio.

Though induced male sterility has been reported in cowpea [2], reports on non-pod setting self-incompatible sterile mutants are scanty. However, there are radiation induced self-incompatible mutants in crops such as oilseed rape (*Brassica napus*) and their possible use in hybrid seed production has been suggested [3]. The mechanisms governing the self-incompatibility in the present cowpea mutant need to be investigated and its usefulness assessed.

References

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