Theor Appl Genet (1995) 90:63–64

B. B. Singh · D. P. Singh

Inheritance of spontaneous male sterility in peas

Received: 2 March 1994 / Accepted: 10 March 1994

Abstract A plant with a mutant phenotype was observed in a 'Longittee' cultivar. The plant was late in maturity, had white-translucent anthers, and was male sterile. The inheritance of this mutant was studied in a cross involving the mutant and the mother parent and their F_1, F_2, F_3 and BC_1F_1 generations. The results suggested that the sterile character was genetic and due to a recessive gene.

Key words Peas · Pisum sativum · Male sterility · Inheritance

Introduction

Mutations are the building blocks of genetic variation. In every crop plant spontaneous mutations occur regularly; however, most of these are not noticed because of the minor changes involved. By contrast, mutations with major morphological alterations can be easily selected.

The pea plant is prone to give rise to spontaneous mutations and Singh and Joshi (1970) have reported mutations affected morphological characters. We have observed an abnormal plant in the 'Longittee' cultivar of peas and this paper reports the inheritance pattern of this spontaneous mutant.

Communicated by J. Mackey

B. B. Singh (✉) · D. P. Singh[1]
Department of Genetics and Plant Breeding, N. D. University of Agriculture and Technology, Narendrangar, Faizabad-224 229, India

Present address:
[1] Department of Genetics and Plant Breeding, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar, Nainital-263145, India

Materials and methods

The present investigation was conducted at the research farm of the Genetics and Plant Breeding Department of the N. D. University of Agriculture and Technology, Faizabad. The soil at this farm is sodic with a high pH (> 8.5); the dominant salts are sodium carbonate and bicarbonates. In general the plants grown in such soil suffer from stress. Forty plants of the cultivar 'Longittee' were planted in a hybridization block in the rabi (dry) season of 1990–1991. One plant with abnormal appearance was spotted in this cultivar. This plant was similar to 'Longittee' in all characteristics except that it was late and more vigorous. The flowers had white translucent anthers, which were devoid of pollen grains. We crossed this plant with the mother parent to study the inheritance of the mutant phenotype.

Results and discussion

The cross of the mutant plant and the mother cultivar 'Longittee' was successful suggesting that the plant with the mutant phenotype was male sterile. In the F_1 generation five plants were grown which were fertile and with a normal phenotype.

The segregation pattern was studied in the F_2, F_3 and BC_1F_1 generations of this cross (Table 1). In the F_2 generation 540 plants were grown and flowers were opened to observe the anther phenotype. Of the 540 plants, 396 had normal anthers and 144 had white translucent anthers. The F_2 segregation indicated that male sterility was a genetic character and showed a segregation pattern with a 3 (normal): 1 (mutant) ratio. The F_1 plants were backcrossed with fertile 'Longittee' plants. Forty-three BC_1F_1 plants were all fertile and normal. From 130 fertile individual F_2 plants, progenies were grown in the F_3 generation. Of these 42 were non-segregating fertile and 88 were segregating, which indicated a 2 (normal) : 1 (mutant) segregation pattern. Within F_3 progenies segregation was in a ratio of 3 (fertile) : 1 (sterile). These findings suggest that the mutant plant carries a genetic male sterility governed by a single recessive gene. A similar genetic explanation has

Table 1 Inheritance of a spontaneous male sterile in peas

Generation	Observed segregating			Expected ratio	χ^2	*P*
	Fertile	Segregation	Sterile			
F_1	5	–	–			
F_2	396	–	144	3:1	0.800	0.50–0.30
BC_1F_1	43	–	–			
F_3	42	88	0	1:2	0.063	0.90–0.80

been given for the male sterility found in pigeonpea (*Cajonus cajon* (L.) Millsp. Reddy et al. 1977, 1978). The nuclear male sterility involved is being maintained through sib-mating of heterozygous male fertile and male sterile pea plants for further use.

The male sterility system will be useful in making a large number of crosses without emasculation for the improvement of pea populations.

References

Reddy BVS Green JM, Bisen SS (1978) Genetic male sterility in pigeonpea. Crop Sci 18:362–364

Reddy BVS, Reddy LJ, Murthi Anisetty N (1977) Reproductive variants in *Cajanus cajan* (L.) Millsp. Trop Grain Leg Bull 7:11

Singh HB, Joshi BS (1970) Peas. In: Kachroo P. (ed) Pulse crops of India. Indian Council of Agricultural Research Krishi Bhawan, New Delhi, India, pp 256–305