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Genetic Male Sterility in Common Bean, Phaseolus vulgaris L.

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A complete male sterile was found in Phaseolus vulgaris L. in the F_2 of the cross WI 74-2047 x 'Swedish Brown'. The fit of successive progeny generations and the F_2 of the reciprocal cross of the parent lines to a 13:2:1 ratio of non:sterile:male sterile:seed lethals (Table 1) demonstrated that the sterility was genic and controlled by two unliked loci. The two genes involved are a dominant male sterile gene and a dominant inhibitor of sterility. The symbols Ms_1 and $In\text{-}Ms_1$, respectively, have been selected for these genes. The sterile genotype is Ms_1ms_1 $in\text{-}ms_1$ $in\text{-}ms_1$, and lethality is conditioned by the genotype Ms_1Ms_1 $in\text{-}ms_1$ $in\text{-}ms_1$. Backcrosses of the parent lines to male sterile plants demonstrated that the genotypes of WI 74-2047 and 'Swedish Brown' were Ms_1Ms_1 $In\text{-}ms_1$ $In\text{-}ms_1$ and ms_1ms_1 $in\text{-}ms_1$ $in\text{-}ms_1$, respectively, since only the backcross progeny of 'Swedish Brown' included male sterile plants.

Female fertility was unimpaired in male sterile individuals. Manual crosses are easily made onto open blossoms of the male sterile plants. Over 96% of 140 crosses attempted resulted in seed set.

This was an improvement over the 80% success rate using conventional emasculation and pollination techniques. Outcrossing under field conditions was observed in 1978 and 1979, with 0 to 37 and 0 to 50 seeds per sterile plant were collected in these two years. The seed collected in 1978 produced plants possessing dominant traits not seen in the maternal male sterile plants, demonstrating that seeds were a result of outcrossing.

Male steriles may be used in population improvement and cultivar development of snap or dry bean types. The sterility can be easily transferred into existing lines.

Table 1. Segregation for male sterility in the F_2 of 'Swedish Brown' x WI 74-2047, and in 15 F_3 populations resulting from selfed seed of outcrosses onto the original male sterile plants.

Populations	No. of plants non-sterile	No. of plants male sterile	Expected ratio		df	x^2	P
F_2 populations	74	8	13:2		1	2.52	<.100
15 F_3 populations	375	57	13:2	Total	15	2.28	<.995
				Pooled	1	.01	<.990

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Modeling Genetic Shifts Within Mixed Bean (Phaseolus vulgaris) Populations

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Abstract

Possible loss of genetic variability within germplasm accessions poses a serious problem for plant breeders. Selection within a mixed population can occur during storage or regeneration of seed stocks. Six factors including number of components, percentage composition, relative survival after storage, relative productivity, population size, and random vs. fixed sampling were studied in an 8-component bean seed population. The population was subjected to 3 cycles of artificial aging followed by regrowing in the field. Relative survival for the 8 components ranged from 0.42 to 1.0 at 50% viability; relative productivity ranged from 0.62 to 1.0. A computer program, which incorporated all 6 factors, was developed to study individually or collectively the effects of the various factors. Population size and sampling method appear to be the more critical factors under present germplasm maintenance procedures.