

MULTIPLE PATERNITY IN COMMON BEANS (Phaseolus vulgaris L.)

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Evidence for multiple paternity within fruits was reported in Phaseolus vulgaris cultivars (Waines and Ibarra-Perez, 1990). This phenomenon can occur in animal-pollinated plant species with multiple-seeded fruits and is clearly impossible for species with single-seeded fruits, as is the case for most wind-pollinated species (Ellstrand and Marshall, 1986). The extreme zygomorphism of the flower in Phaseolus species would suggest that floral morphology evolved in close association with pollinating insects, thereby allowing the opportunity for multiple paternity in this species. Hypocotyl color was used as a marker to measure the outcrossing rate and the possibility of multiple paternity in two common bean cultivars which differ in their rate of outcrossing. FM 53 had a higher rate of outcrossing than PI 164778 (Wells et al. 1988). These cultivars (which had green hypocotyls) were used as female parents. The male parents, a bulk of nine black-seeded cultivars, had purple hypocotyls. The experimental design and the field layout is mentioned in an accompanying report.

Both bean cultivars produced outcrossed pods with FM 53 producing significantly more than PI 164778. However, the cultivars were statistically similar in the percent of outcrossed pods (Table 1). Not all seeds within each pod were hybrids. Selfed as well as hybrid seeds were observed within each outcrossed pod. This indicates that more than one male parent was involved in pollination and fertilization of these pods, resulting in multiple-sired fruits. Multiple paternity was found to occur for 90.1% of the outcrossed fruits scored from both bean cultivars studied. All of the outcrossed pods were multiple-sired in cultivar PI 164778 while only 86.3% were in FM 53 (Table 1). Moreover, it was found that in both cultivars a higher number of hybrid seeds resulted from the stylar end rather than the peduncular end of the multiple-sired pods (Table 2). However, we do not know whether one or more than one of the nine potential male parents contributed to these multiple-sired bean legumes. What we know is that at least two sources of pollen contributed to produce the multiple-sired outcrossed pods. Some pollen came from the white-seeded female plants since selfs were detected within the multiple-sired bean legumes.

Table 1. Outcrossed and multiple-sired pods in two bean cultivars grown at South Coast Field Station Irvine, CA.

Cultivar	number of pods scored	outcrossed pods		multiple-sired pods	
		number	%	number	%
FM 53	905	124	13.7	107	86.3
PI 164778	448	47	10.5	47	100.0
Total	1353	171	12.6	154	90.1
LSD 0.05	34	9	6.1	8	12.5

Table 2. Hybrid seed position within the outcrossed pods in two bean cultivars grown at South Coast Field Station Irvine, CA.

Cultivar	number of hybrid seeds within the pod [@]							Total
	1	2	3	4	5	6	7	
FM 53	41	48	49	57	64	56	29	344
PI 164778	9	14	16	24	18	9	2	92
Total	50	62	65	81	82	65	31	436
LSD 0.05	5	4	5	5	5	5	4	4

[@] From stylar end to peduncular end.

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