Agronomic Potential Value of Great Northern Recombinant Lines and Breeding Implications in Common Bean

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INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) was introduced into the Iberian Peninsula (Spain and Portugal), mainly from Central America around 1506 and from the southern Andes after 1532, through sailors and traders, which brought the nicely colored, easily transportable seeds with them as a curiosity. The principal cultivated bean types in this area are cultivars of Andean origin and belonging to the white kidney, Canellini, marrow, "Favada", large cranberry, cranberry, red pinto and "Canela" market classes, and cultivars of Mesoamerican origin and corresponding to the great northern and pinto market classes. The level of genetic variation has not eroded since the introduction of common bean from the American centers of domestication to the Iberian Peninsula. Instead, obvious signs of introgression between the two gene pools were observed, mainly among white-seeded genotypes (Santalla et al., 2002). A preliminary study of the productivity potential and breeding value of great northern recombinant genotypes is presented in this work.

MATERIAL AND METHODS

Fifteen landraces belonging to the large great northern market class (>40 g/100 seeds), that have been collected in areas from the Iberian Peninsula where traditional farming methods have encouraged the presence of old varieties, were included in this study. This genetic material is maintained in the germplasm collection at the MBG-CSIC (Ron et al., 1997). Allozyme and phaseolin analysis were carried out per each landrace. Seventy-five plants were sown for landraces, which had trellis support because all of them have a climbing growth habit. Morphological and agronomical data were recorded per plant. One hundred and fifteen inbred lines were derived from single plants within landraces. The inbred lines were planted in one-row plot, each 3.8 m long, in a randomized complete-block design with 2 replications. Distance between rows was 0.80 m and plants were spaced 0.25 m apart in the row. The field experiments were carried out in northwest Spain (42° 24' N, 8° 38' W, 40 masl, 14 °C mean temperature, average annual rainfall 1600 mm) in 2002.

RESULTS AND DISCUSSION

Some landraces exhibited $Skdh^{100}$, Me^{100}, $Rbcs^{100}$ and $Diap\text{-}1^{95}$ or $Skdh^{103}$, Me^{100}, $Rbcs^{100}$ and $Diap\text{-}1^{100}$ allozyme profiles and they were considered as putative hybrids (Table 1). These Iberian recombinants had morphological traits that did not correspond with the characterization of Singh et al. (1991). Thus, there is a considerable overlap in seed size between the Mesoamerican and Andean groups.

Table 1. Average of the distribution of allozyme variants and phaseolin pattern in great northern landraces from the Iberian Peninsula.

Phaseolin pattern		*Skdh*		*Me*			*Rbc*			*Diap-1*		*Mdh-1*		*Mdh-2*	
S	B	103	100	102	100	98	102	100	98	100	95	103	100	102	100
0.82	0.18	0.74	0.26	0.09	0.81	0.10	0.06	0.84	0.10	0.07	0.93	0.23	0.76	0.02	0.98

Significant variation was observed among great northern landraces for flowering aspects such as days to first flowering and first dry pod, seed size and yield (Table 2).

Table 2. Analysis of variance of agronomic traits of great northern landraces from the Iberian Peninsula.

Source of variation	D.f.	Mean squares					
		First flowering	First dry pod	Seeds per pod	Pods per plant	Seed yield	100-seed weight
		days				g/plant	g
Block	1	437	1.92	2.86 *	3149.8 **	17873.2 **	132.7
Landrace	14	538.97 **	488.34 **	19.65 **	723.3 **	3414.7 **	2085.2 **
Genotype (L)	99	15.78 **	29.83 **	0.99 **	195.9	1133.8	77.4 **
Error	109	8.71	13.98	0.46	204.4	1209.3	39.1

*, ** null hypothesis rejected at the 0.05 and 0.01 levels respectively.

In addition, a wide variation was found among genotypes within landraces for important agronomic traits. Thus, some genotypes had values of seed yield of approximately 100 g/plant and a seed size of 90 g/100 seeds. This new genetic material could serve as bridging germplasm to transfer genetic diversity between the Andean and Mesoamerican gene pools that could not be achieved by direct crosses. Productivity potential of these recombinant genotypes is confirmed.

LITERATURE CITED

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