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 ºC mean temperature, 
average annual rainfall 1600 mm) in 2002.

RESULTS AND DISCUSSION

Some landraces exhibited *Skdh*\(^{100}\), *Me*\(^{100}\), *Rbcs*\(^{100}\) and *Diap-1*\(^{95}\) or *Skdh*\(^{103}\), *Me*\(^{100}\), *Rbcs*\(^{100}\) 
and *Diap-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.

<table>
<thead>
<tr>
<th>Phaseolin pattern</th>
<th>Skdh</th>
<th>Me</th>
<th>Rbc</th>
<th>Diap-I</th>
<th>Mdh-I</th>
<th>Mdh-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S B</td>
<td>103</td>
<td>100</td>
<td>102</td>
<td>100</td>
<td>98</td>
<td>102</td>
</tr>
<tr>
<td>0.82 0.18</td>
<td>0.74</td>
<td>0.26</td>
<td>0.09</td>
<td>0.81</td>
<td>0.10</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>0.06</td>
<td>0.84</td>
<td>0.10</td>
<td>0.07</td>
<td>0.93</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.76</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.98</td>
</tr>
</tbody>
</table>

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.

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

*, ** 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