

Genetic divergence for iron content and yield in common bean (*Phaseolus vulgaris* L.)

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Introduction

The common bean (*Phaseolus vulgaris* L.) is one of the main components of the low income Brazilian population basic diet. Its seeds are a remarkable protein source and are also a high carbohydrate and a considerable iron supplier. As iron-deprived anemia in humans is associated with the decrease in common bean and meat consumption, this organic disturbance is commonly found in developing country populations, where vegetables are normally used as the main protein source in the diets. A high genetic diversity was observed in *Phaseolus vulgaris* represented by native and improved cultivars, which can have variable grain iron contents. Genetic divergence studies among individuals or populations in vegetable species indicate those potentially capable of contributing with a greater heterotic effect in the progeny and with a high probability of producing superior genotypes in segregant generations (Falconer, 1981). The divergence analysis was used to identify those individual (parents) potentially capable of generating segregant populations with greater variability both for iron content and for grain yield and, therefore, to increase the chances of selection for the required recombinants.

Materials and Methods

Twenty-five common bean genotypes, 11 commercial cultivars and 14 elite lines, were assessed for grain yield and iron content. The chemical composition of the grains was analyzed using the nitro-perchloric digestion methodology followed by atomic absorption spectrophotometry according to Malavolta et al. (1989). The statistical methods Nearest Neighbour analysis, Tocher and two-dimension graphic dispersion were applied for the genetic divergence study among the 25 cultivars using the GENES computer program (Cruz, 1997).

Results and Discussion

The Tocher clustering revealed six groups: a) Group I included the cultivars Iapar 31, Iapar 57, Pérola, Pyatã, Akytã, LP 9019, LP 9382, LP 9082, LP 9315, LP 9338, LP 9381 and LP 9429; b) Group II included the cultivars FT Bonito, Iapar 72, LP 9122, LP (SPI) 9317 and PF 9029984; c) Group III, Iapar 14, Rudá and LP 9123; d) Group IV, Aruã and LP 9329; e) Group V, Iapar 65 and LP 932; and, f) Group VI, only LP 9333. Group I contained the most genetically similar cultivars, showing intra-group genetic divergence values varying from 0.36 to 1.51. This suggests that combinations between genotypes belonging to this group would produce lower variability comparatively to the other within group combinations. Regarding inter-group distances, greater divergences were observed between group I and groups IV, V and VI. The hierarchical Nearest Neighbour analysis showed a similar result to the Tocher method in terms of number of groups formed and number of cultivars within each group. Vilarinhos et al. (1995) and Gonçalves-Vidigal et al. (1997) using these two methods for genetic divergence analysis also obtained similar results between these two methodologies. The Rudá and LP 9333 cultivars were the most dissimilar, while Iapar 57 and Pérola and, Iapar 31 and LP 9382 were the most similar (Figure 1). The method two-dimensional graphic dispersion shows that the most distant cultivars were LP 9333 and Rudá, while Iapar 31 and LP 9382 were the closest.

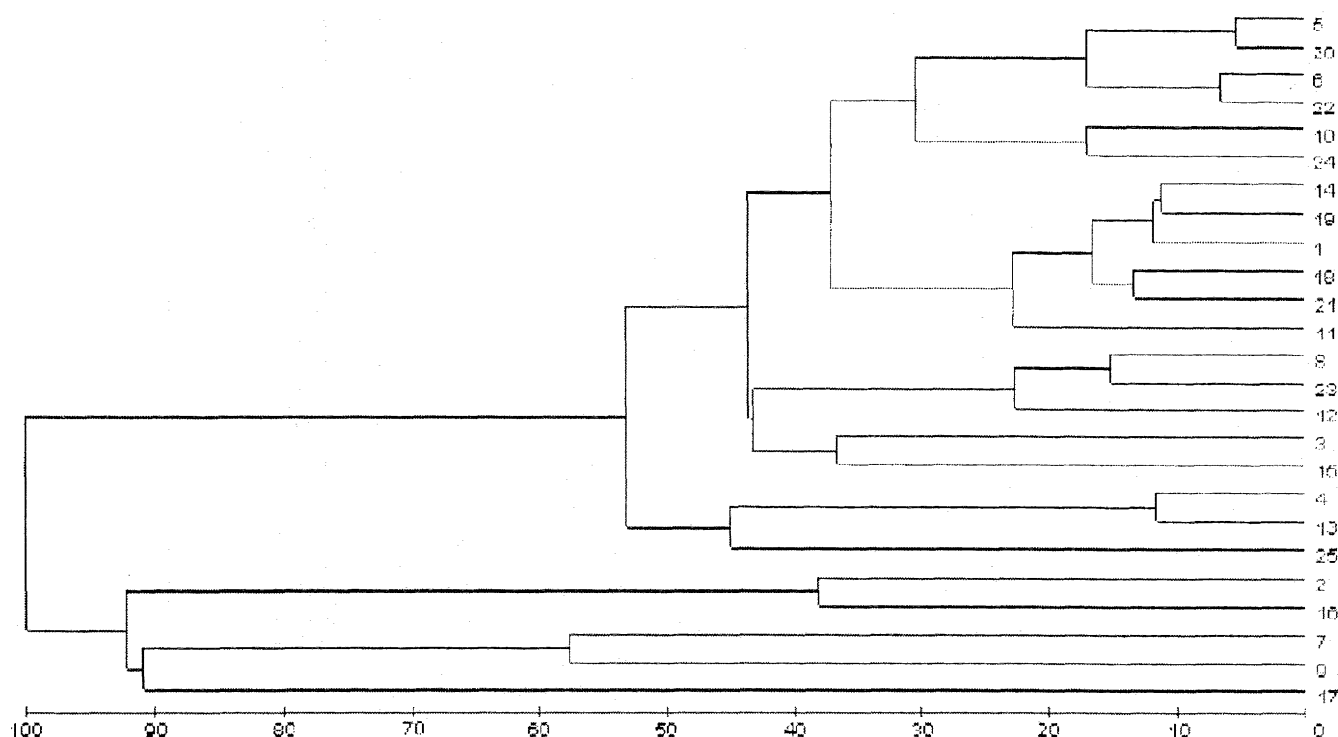


Figure 1. Dendrogram of the 25 common bean cultivars based on their genetic dissimilarity obtained by the Nearest Neighbour Analysis: 1, Akytã; 2, Aruã; 3, FT Bonito; 4, Iapar 14; 5, Iapar 31; 6, Iapar 57; 7, Iapar 65; 8, Iapar 72; 9, LP 932; 10, LP 9019; 11, LP 9082; 12, LP 9122; 13, LP 9123; 14, LP 9315; 15, LP (SPI) 9317; 16, LP 9329; 17, LP 9333; 18, LP 9338; 19, LP 9381; 20, LP 9382; 21, LP 9429; 22, Pérola; 23, PF 9029984; 24, Pyatã, and 25, Rudá.

Conclusions

1. The Rudá and LP 9333 are the most dissimilar cultivars and can be used to generate superior segregant populations for higher grain yield and iron content.
2. Grouping the cultivars in six clusters containing distinct cultivars shows the existence of genetic variability for grain yield and iron content in the cultivars.

References

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