

GENETIC PARAMETERS IN YIELD RECURRENT SELECTION FAMILIES IN CARIOCA TYPE BEANS

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Increases in common bean commercial type carioca yield potential have been gradual, besides the wide variability in the majority of its traits, especially grain yield. Therefore, when breeding programs work to improve one or more traits controlled by various genes, it is impossible to succeed in one selection cycle only. The only alternative is recurrent selection – a dynamic and cyclic system designed to gradually increase the desired allele frequency for a specific quantitative characteristic through repeated selection, evaluation and recombination cycles. The use of recurrent selection in autogamous plants enables the intercrossing of selected genotypes to form new genotype combinations. The objectives of this work were: to estimate genetic parameters; to evaluate families from recurrent selection breeding programs, comprising carioca type beans from Embrapa Rice and Beans Research Center, and to select superior families for the obtainment of lines to intercross to form new selecting populations.

In 2008 three carioca grain type recurrent selection trials with 78 C₁S_{0.3} families and three controls were conducted: one in Santo Antonio de Goiás at the winter cropping season and two at the wet season in Ponta Grossa-PR and Sete Lagoas – MG. The experimental design was a 9x9 triple square lattice with two four meter rows (Santo Antônio de Goiás-GO and Ponta Grossa-PR) and two meters rows (Sete Lagoas-MG) spaced 0.5m and 15 seeds per meter. Disease responses (common bacterial blight and rust) were evaluated only in Ponta Grossa-PR; ranking from 1 (absence of symptoms) to 9 (maximum severity). At physiological maturity plant architecture and lodging were also evaluated, ranked from 1 (ideal phenotype) to 9 (totally undesirable). Visual assessment data were not included in the statistical analysis, but were considered as complementary information for yield. Yield was computed using the mass of each plot adjusted to 13% moisture. Data were subjected to the analysis of variance and the genetic parameters estimate was obtained using the Genes Program (CRUZ, 2001).

The genotypes evaluated showed genetic heterogeneity for grain yield in all trials and in the joint analysis, indicating the existence of genetic variability in all families tested. After the individual analyses of variance were performed, values of the experimental coefficient of variation, genetic coefficient of variation, ‘b’ coefficient and broad sense heritability estimated. The individual experiments heritability varied from 50% to 70% and 66.7% was the estimative in the joint analysis (Table 1), considered satisfactory for bean yield, a quantitative trait controlled by many genes of low effect and highly influenced by the environment. This result corroborates the existence of enough genetic variability to obtain selection gains aiming the obtainment of cultivars superior to those now in use in those populations within the recurrent selection breeding program at Embrapa Rice and Beans Research Center. Although population variability were significant, the bellow 1 “b” estimate in all individual analyses and joint analysis (Table 1) indicated unfavorable selecting conditions, suggesting the inclusion of other selection sites to increase precision and selection consistence.

Line SRC-207102999 yielded most in the average, with (2,345 kg ha⁻¹), higher than all controls (BRS Pontal, BRS Estilo and BRS 9435 Cometa). 38 lines (48.7%) yielded higher than BRS Estilo (1,913 kg ha⁻¹), the control line that yielded the most. Regarding disease reaction, that line showed tolerance to rust and intermediary reaction to common bacterial blight. Regarding plant architecture it showed an intermediary behavior and no lodging.

Based on those results we could conclude that there is a wide variability within the base population of the recurrent selection breeding program for common beans carioca type grain yield at the Embrapa Rice and Beans Research Center. The large population and high intensive selection used within the recurrent selection programs indicate the possibility to select superior genotypes with a great number of alleles favorable to bean yield.

Table 1. Joint analysis of variance and genetic parameters estimate for bean yield of the recurrent selection program trials for carioca type grains at Santo Antônio de Goiás-GO in the winter cropping season; Ponta Grossa-PR and Sete Lagoas-MG at the wet cropping season, 2008.

F.V.	G.L.	S.Q.	Q.M.	F
Families (F)	80	22846250	285578	3.00**
Environment(A)	2	204986561	102493280	1077**
F x A	160	35952073	224700	2.36**
Average Effective Error	408	38802082	95103	
Genotype Variance			21164	
Phenotype Variance			31731	
Heritability (%)			66.70	
Mean (kg.ha ⁻¹)			1926	
Experimental CV (CVe)			16.01	
Genetic CV (CVg)			7.55	
“b” - CVg/CVe			0.47	

** Significant at 1 % probability by F test.

ACKNOWLEDGEMENTS

This work was supported by Embrapa Rice and Beans Research Center and CNPq.

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