YIELD STABILITY OF C_1 FAMILIES FROM RECURRENT SELECTION OF COMMON BLACK BEANS

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Selection of an adequate breeding method to improve yield of common beans is very important, since this is a quantitative trait of low heritability. Recurrent selection, successfully used in allogamous plant species to provide accumulation of desirable alleles of quantitative traits, such as yield, consists of a series of evaluation cycles followed by recombination of the selected families, leading to new genotypic combinations. Advanced selection cycles increases frequency of favorable alleles within the population with consequent increased chances to produce one or more pure lines with improved number of favorable alleles. It also provides the breeder increased opportunities to explore genetic variability by the new lines obtained after each selection cycle. Yield stability and adaptability of common bean families from the first selection cycle (C_1) of recurrent selection were evaluated at Embrapa Rice and Beans Research Center, using black bean genotypes, with the objective to select superior families, to obtain lines and intercrossing, and provide the new selection population.

Eight recurrent selection trials were conducted using three controls (BRS Campeiro, BRS Supremo and BRS Esplendor) plus 46 families from the cycle $C_1S_{0:3}$ carried out in 2008 and five from the $C_1S_{0:4}$ cycle conducted in 2009. In 2008, one trial was carried out in Santo Antônio de Goiás - GO, during the winter season, and two during the wet season in Ponta Grossa - PR, and Sete Lagoas - MG. In 2009, one trial was conducted during the winter in Santo Antônio de Goiás - GO, three during the dry season (Ponta Grossa- PR, Lavras- MG, Santo Antônio de Goiás- GO), and one in the wet season in Frei Paulo- SE. Experimental design was a triple square lattice 7x7 and data were submitted to individual and joint analysis of variance using the Genes program (CRUZ, 2001), a genetics and statistics computer applicative. Analysis of yield stability and adaptability was carried out using the methodology proposed by Lin & Binns (1988), estimating general family stability (P_i) and also decomposing P_i into groups related to favorable and unfavorable environment conditions classified according to ambient indexes defined by the difference between mean value obtained in each location and the overall mean.

Significant differences were detected among families (at 0.01 level of probability) in all trials and joint analysis, also presenting significant interactions between families and environments. According to results obtained for stability and adaptability analyses performed for the 20 most productive families (Table 1), family SRP-207103873 presented the smallest P_i over the average of all ambient conditions as well as in favorable environments indicating ample adaptability to different cropping conditions but specially to ambients provided with high level of technology and low risk of weather stress conditions. The best adapted family to unfavorable environment conditions was SRP-207104534 that may be recommended for regions subjected to biotic and abiotic stresses.

Recurrent selection programs used in common black type beans presents promising potential to develop high yield cultivars with ample adaptation to all regions as well as to those with or without risk of occurrence of biotic and abiotic stresses.

Table 1. Overall response to favorable and unfavorable environments, and average yield of selected families obtained in the Black Beans Recurrent Selection Program in different regions and crop seasons*.

Families	P_i Overall	P_i Favorable	P_i Unfavorable	Yield (Kg/ha)
SRP-207103873	158921	84553	282868	2323
SRP-207104593	178850	199675	144141	2251
SRP-207104055	311206	368700	61141	2072
SRP-207103883	326742	107591	691992	2237
SRP-207104586	337118	378634	100856	2054
SRP-207104534	349932	501849	96736	2018
SRP-207103881	365105	222504	602773	2029
SRP-207103913	367325	187319	667334	2115
SRP-207104099	382660	450184	270121	2105
SRP-207104522	403740	365441	467572	2011
SRP-207104488	404272	244390	670742	2067
SRP-207103879	419964	230362	735967	2067
SRP-207103876	421113	201484	787161	2136
SRP-207104594	456627	554870	292887	1929
SRP-207104342	458300	565372	279847	1987
SRP-207104206	495425	436272	594012	1861
SRP-207104098	497747	550165	410383	2097
SRP-207103898	531535	473122	628889	1883
SRP-207104458	542947	593163	459254	1774
SRP-207104521	588873	394974	912038	1915

* Santo Antônio de Goiás-GO, winter season (2008) and dry season (2009); Ponta Grossa-PR and Sete Lagoas-MG, wet season (2008); Lavras-MG and Ponta Grossa-PR, wet season (2009); Santo Antônio de Goiás-GO, winter season (2009)

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