

# SELECTION OF SEGREGATING POPULATIONS WITH DELAYED DARKENING IN CARIOCA TYPE COMMON BEANS

**F.C. Silva<sup>2</sup>, H.S. Pereira<sup>1\*</sup>, L.C. Melo<sup>1</sup>, P.G.S. Melo<sup>2</sup>,  
A. Wendland<sup>1</sup>, B.H. Ferreira<sup>2</sup> and B.A.R. Paiva<sup>2</sup>**

<sup>1</sup>Embrapa Arroz e Feijão; and <sup>2</sup>Universidade Federal de Goiás, Brasil

\*Corresponding author: helton@cnpaf.embrapa.br

Carioca common beans type is cropped throughout Brazil, representing 70% of the total cultivated area (Del Peloso and Melo, 2005). During storage chemical changes take place, modifying tegument color, leading to depreciation of quality and market value. Darkened tegument is associated to old beans, with extended cooking time, rejected by consumers. Study reports had pointed out the possibility of selecting breeding lines with delayed darkening (Junk-Knievel et al., 2008; Silva et al., 2008). Elite genotypes with delayed darkening trait are already available, such as BRS MG Madrepérola, BRS Requite and CNFC 10467. However there are no reports comparing the delayed darkening level of each of those genotypes neither the way these genotypes combine with others without desired trait.

Crosses were performed in a partial diallel scheme with: three genotypes having tegument delaying characteristics (Group I: BRS Requite, BRS MG Madrepérola and CNFC 10467) and ten cultivars/elite lines, with usual tegument darkening (Group II: BRS Estilo, Pérola, BRS Cometa, BRS Pontal, BRS MG Majestoso, IAC Alvorada, IPR Saracura, IPR Siriri, CNFC 10429 and CNFC 10408). The segregating populations were evaluated in 2010 in Santo Antônio de Goiás in a randomized block design with three replicates in four line four meter long plots. Seeds of thirty individual plants were collected in each replicate in each treatment. Collected beans were stored in transparent polyethylene bags and kept at room temperature for further evaluation of tegument darkening. Tests were performed 106 days after harvest, assigning grades in a scale ranging from 1 (light beans) to 5 (beans very dark). Data were submitted to the analysis of variance, with further partial diallel analysis according to procedures described by Kempthorne, to estimate the effect of the general combination capability (GCC) and specific combination capability (SCC).

Significant differences were observed ( $p < 0.01$ ) among GCC ( $g_1$ ) in the two groups of genitors analyzed, showing the existence of variability in the general combination capability of the genitors of the two groups (Table 1). GCCs of all genotypes were significantly different from zero (standard error of group 1=0.05 and standard error of group 2=0.11). In group I, BRS MG Madrepérola was the genitor with the best GCC, for delayed darkening (-0.51). Other genotypes in this group were BRS Requite (0.22) and CNFC 10467 (0.23). In group II there was also variability for darkening, and the genitors that contributed the most for lesser darkening were CNFC 10429 (-0.31); IAC Alvorada (-0.28); BRS Estilo (-0.24); IPR Siri (-0.18); and IPR Saracura (-0.14). Genotypes CNFC 10408 (0.49) and BRS Cometa (0.25) showed the worst estimates to form new populations with darkening time delaying. It was not observed significance in SCC.

Populations with the best averages for increased darkening delay were originated from crosses between: BRS MG Madrepérola (group I) and IAC Alvorada (2.5); and BRS Estilo (2.6) and CNFC 10429 (2.7) (Table 2); these populations are promising genotypes for obtaining breeding lines.

**Table 1.** Summary of partial diallel analysis for delayed darkening in populations of common beans carioca type. Santo Antônio de Goiás-GO, 2011.

Source of variability	GL	SS	MS	Probability
Treatments	42	41.83	0.99	0.00000
Genitors	12	22.13	1.84	0.00000
Group I	2	3.02	1.51	0.00003
Group II	9	11.95	1.33	0.00000
Group I x II	1	7.15	7.15	0.00000
Parents x Crossing	1	0.30	0.30	0.13090
Crossing	29	19.40	0.70	0.00000
GCC I	2	11.78	5.89	0.00000
GCC II	9	5.80	0.64	0.00040
GCC I x GCC II	18	1.82	0.10	1.00000
Residue	84	10.92	0.13	

**Table 2.** Darkening means of genitors and populations of common bean carioca type. Santo Antônio de Goiás-GO, 2011.

Genotype	BRS MG Madrepérola	CNFC 10467	BRS Requite	Genitors means
BRS Cometa	3.2	3.7	4.1	4.7
BRS Estilo	2.6	3.6	3.5	3.4
BRS Pontal	2.9	3.8	4.0	3.3
IAC Alvorada	2.5	3.9	3.2	3.1
IPR Saracura	2.8	3.5	3.5	4.0
IPR Siriri	2.8	3.5	3.4	2.8
Pérola	3.2	3.9	3.5	3.9
BRS MG Majestoso	3.0	3.9	3.7	4.1
CNFC 10408	3.5	4.2	4.0	4.8
CNFC 10429	2.7	3.2	3.4	3.4
Genitors means	2.1	2.4	3.5	-

## REFERENCES

- DEL PELOSO, M.J.; MELO, L.C. **Potencial de rendimento da cultura do feijoeiro comum**. Santo Antônio de Goiás: Embrapa Arroz e Feijão, 2005. 131p.
- JUNK-KNIEVEL, D.C.; VANDERBERG, A; BETT, E. K. Slow darkening in pinto bean (*Phaseolus vulgaris* L.) seed coats is controlled by a single major. **Crop science**, 48:189-193, 2008.
- SILVA, G.S.; RAMALHO, M.; ABREU, A.F.; BOTELHO, F.B. Genetic control of early grain darkening of carioca. **Crop Breeding and Applied Biotechnology**, 8: 299-304, 2008.