DEVELOPMENT OF DRY BEAN CULTIVARS ADAPTED TO MECHANICAL HARVEST

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Common bean is one of the main crops of the irrigated farming system in the "Cerrado" region. During the dry season using central pivot irrigation. up to 3000 kg/ha of dry bean can be obtained. Disease and pest problems still contribute to increase the bean production cost. Another main constraint for the expansion of dry bean crop in this region, is the lack of a bean cultivar with a suitable plant type for mechanical harvest.

Since 1986 the Bean Breeding Program of the National Bean Research Center in Brazil, have as its objective to combine traits such as erect plant type; lodging resistance; uniformity of maturity, high insersion of the first pod in relation to the soil, and high productivity. Some of the parents which had one or more of these traits used in this breeding program are:

Genotype	Source	Traits	Seed color
TC 1558-1	CIAT	Erect plant type High pod insersion Lodging resistant	Beige
LA 720164	CNPAF	Erect plant type High pod insersion High yielding	Black
PR 710315	CNPAF	Erect plant type	Red
LA 721492	CNPAF	Erect plant type High yielding	Black
LA 721477	CNPAF	Erect plant type High yielding	Black
TY 3326-1	CIAT	Erect plant type High pod insersion	Beige
LA 822119	CNPAF	Lodging resistance Erect plant type	Beige
ICA Pijao	ICA	Erect plant type	Black
WBR 22-55	VW/CNPAF	Erect plant type High yielding	Black
AN 710950	CNPAF	Erect plant type	Black
DOR 352	CIAT	Erect plant type	Black
Milionario 1732	CIAT	Erect plant type	Black
TC 1172-1	CIAT	Erect plant type High pod insersion	Pink

The breeding method used to combine these traits was F_2 derived families as follows:

F_2 Generation

750 plants/cross - 100 plants selected based on plant type, seed color, and anthracnose resistance.

F_2 derived F_3 families

100 families are planted in single rows and from 10 to 10 families one parent is used as control. Superior families are selected based on yield, and plant type compared to the control.

F_2 derived F_4 families

Conducted as the previous generation with three rows/family.

F_2 derived F_5 families

Disease reaction to Anthracnose, common blight and rust are evaluated and yield test based on replicated trials are made

The first test of direct harvest was done using a New Holland direct combined with a special kit for dry bean harvest. Five promissing bean lines with a control, EMGOPA 201-Ouro, a widly grown cultivar in Brazil, were tested.

The results showed that the losses on the plataform were larger than the losses in the machine (Table 1). There were larger total grain losses in the control cultivar than among the promissing lines. The same test was repeated in a farm field with the bean line PR 710315 with total loss of 9.1% and yield of 2597 kg/ha.

These results indicated that dry bean lines can be improved for machine harvest, which will remove the main constraint for the expansion of the dry bean production area under irrigated farm system, in Central Brazil.

Table 1. Results obtained on the direct combined harvest on five dry bean lines and the control EMGOPA 201-Ouro in the farmer field Paracatu, Brazil.

	TC 1558-1	LA 720164	PR 710315	DOR 352	LM 30636	EMGOPA 201-Ouro
	1	1	1	1	1	1
Machine speed (km/h)	3,51	3,51	3,35	3,51	3,20	3,51
Grain moisture (%)	17,50	15,50	14,50	19,00	20,50	16,00
Broken grains (%)	9,80	16,40	12,70	12,20	8,50	11,40
Trash (%)	0,20	0,00	0,70	0,40	2,90	3,30
Machine loss (%)	0,23	0,16	0,54	0,40	1,62	0,44
Plataform loss (%)	9,31	3,93	9,63	11,70	7,12	33,98
Total loss (M+Pl)(%)	9,54	4,09	10,17	12,10	8,74	34,43
Grain yield (t/ha)	2,28	2,86	2,48	2,01	1,73	2,48