

REACTION TO WHITE MOLD OF EARLY MATURITY CARIOCA SEEDED COMMON BEAN ELITE LINES IN MULTI-ENVIRONMENT TRIALS

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INTRODUCTION

White mold, caused by the fungus *Sclerotinia sclerotiorum* (Lib.) de Bary, is one of the most destructive diseases for the common bean (*Phaseolus vulgaris* L.) crop, especially in rainy and irrigated growing seasons in Central Brazil. The development and use of resistant cultivars has been an aim of common bean breeding programs and of the productive sector because this strategy represents a viable alternative easily adopted by growers and is an important tool for integrated management of the disease (Schwartz & Singh, 2013). Promising efforts have evaluated both physiological resistance and resistance associated with disease avoidance mechanisms in the field. New superior genotypes developed by breeding programs should preferentially have both these resistance mechanisms, which are complementary (Miklas et al., 2013). The main goal of this study was to evaluate the reaction to white mold of early maturity (< 85 days) carioca seeded common bean elite lines and control cultivars in field nurseries in Brazil and in a controlled environment assay to select resistance sources to the disease.

MATERIAL AND METHODS

The elite lines and control cultivars tested include genotypes evaluated in the VCU trials (Value for Cultivation and Use trials) of the 2016/2017 cycle conducted by the Embrapa Common Bean Breeding Program in a national network of final field trials. The controlled environment assay was carried out at Embrapa Arroz e Feijão, using the modified straw test reported by Ferreira et al. (2018). The white mold field nurseries were carried out in Oratorios–MG (lat 20°24'S, long 42°24'W, alt 400 m) and Goianira–GO (lat 16°26'S, long 49°24'W, alt 734 m). In Oratorios–MG, three replicates were used and each plot was composed of two 3.0-m long rows, with 0.5 m between rows and 15 seed m⁻¹, in the fall/winter growing season of 2018. In Goianira–GO, the trial was set up with three replicates and each plot was composed of three 4.0-m long rows, with 0.5 m between rows and 12 seed m⁻¹, in the winter growing season of 2017. For the disease severity evaluation, a visual scale was used with scores from 1 (immune plant or plots without disease symptoms) to 9 (dead plant or plots with 80%-100% of plants exhibiting generalized necrosis). Statistical analyses were carried out using mixed models via REML/BLUP.

RESULTS AND DISCUSSION

Considering the modified straw test, the lines CNFC 16832, CNFC 16729, CNFC 16820, CNFC 16846 and CNFC 16871 shown the best performance for physiological resistance to white mold, with mean genotypic values (eBLUP mean) for disease severity less than that presented by the control cultivar BRS Notavel (4.27). In the field nursery carried out in Goianira–GO, among the nine genotypes with eBLUP mean lower than 4.0 are the lines CNFC 16729 and CNFC 16871,

which also shown physiological resistance by the straw test. In Oratorios–GO, the lines with best performance were CNFC 15502 and CNFC 16242, with eBLUP mean of 3.33 and 3.81, respectively (Table 1). The lines CNFC 16820 and CNFC 15875 are examples of potential resistance sources selected based on their general performance both in the field and in the controlled environment evaluations.

Table 1. Genotypic values (eBLUP) related to white mold severity of early maturity (< 85 days) carioca seeded common bean elite lines and control cultivars evaluated in field nurseries in Brazil (Goianira–GO and Oratorios–MG) and in a controlled environment assay.

Genotype	Modified straw test		Goianira–GO		Oratorios–MG	
	eBLUP _(μ+gi) ^a	eBLUP _(gi) ^b	eBLUP _(μ+gi)	eBLUP _(gi)	eBLUP _(μ+gi)	eBLUP _(gi)
CNFC 16832	3.49	-2.0931	7.70	3.2423	4.54	-0.5566
CNFC 16729	3.55	-2.0321	3.80	-0.6586	5.27	0.1708
CNFC 16820	3.58	-2.0040	4.07	-0.3800	4.91	-0.1929
CNFC 16846	3.64	-1.9424	6.16	1.7098	5.03	-0.0716
CNFC 16871	3.95	-1.6292	3.80	-0.6586	6.72	1.6256
BRS Notavel	4.27	-1.3146	4.21	-0.2406	4.30	-0.7990
CNFC 15875	4.33	-1.2536	3.52	-0.9372	4.54	-0.5566
CNFC 16188	4.45	-1.1353	4.07	-0.3800	5.51	0.4133
CNFC 15873	4.70	-0.8852	7.42	2.9637	4.91	-0.1929
BRS FC104	4.81	-0.7765	4.21	-0.2406	4.06	-1.0415
CNFC 15856	4.88	-0.7006	5.05	0.5953	4.78	-0.3141
TAA Gol	5.19	-0.3891	4.07	-0.3800	5.75	0.6558
BRS Cometa	5.70	0.1203	5.33	0.8739	4.91	-0.1929
CNFC 16831	6.33	0.7481	4.63	0.1773	4.91	-0.1929
IPR Andorinha	7.05	1.4655	3.80	-0.6586	6.24	1.1407
CNFC 16242	7.21	1.6321	3.52	-0.9372	3.81	-1.2840
CNFC 15502	7.31	1.7272	3.24	-1.2159	3.33	-1.7689
IPR Colibri	7.49	1.9118	4.63	0.1773	6.48	1.3832
CNFC 16066	7.49	1.9118	3.66	-0.7979	5.27	0.1708
IAC Imperador	7.50	1.9139	4.07	-0.3800	6.24	1.1407
CNFC 15723	7.85	2.2727	3.24	-1.2159	4.78	-0.3141
CNFC 15708	8.03	2.4520	3.80	-0.6586	5.88	0.7770
Mean	5.58		4.45		5.10	
CV _{gi} %	36.06		29.95		20.00	
CV _{ei} %	32.01		22.98		21.21	
CV _r	1.13		1.30		0.94	

^aeBLUP mean of the genotype *i*; ^bgenotypic value (eBLUP) of the genotype *i*.

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