

# EVALUATION OF COMMON BEAN CULTIVARS FROM THE UNITED STATES FOR THEIR REACTION TO SOYBEAN RUST UNDER FIELD CONDITIONS IN BRAZIL AND SOUTH AFRICA

M. A. Pastor-Corrales<sup>1</sup>, A. Sartorato<sup>2</sup>, M. M. Liebenberg<sup>3</sup>, M. J. del Peloso<sup>2</sup>, P. A. Arraes Pereira<sup>2,4</sup>, J. Nunes Junior<sup>5</sup>, H. Dinis Campos<sup>6</sup>

<sup>1</sup>Vegetable Laboratory, USDA-ARS, Beltsville, MD, 20705-2350, USA, <sup>2</sup>EMBRAPA Arroz e Feijão, C.P.179, CEP 75375-000, San Antonio de Goiás, GO, Brazil, <sup>3</sup>ARC-Grain Crops Institute, Private Bag X1251, Potchefstroom, 2520, South Africa, <sup>4</sup>Embrapa/Labex, USDA, ARS, OIP, Beltsville, MD 20705-5141, USA, <sup>5</sup>Centro Tecnológico de Pesquisa Agropecuária Ltda., C. Postal 533, CEP 74001-970, Goiânia, GO, Brazil, <sup>6</sup>Universidade Federal de Rio Verde, Rio Verde, GO, Brazil. Corresponding author: pastorm@ba.ars.usda.gov

**Introduction.** The host range of the soybean rust pathogen (*Phakopsora pachyrhizi*) is broad with at least 95 leguminous species, including dry and snap beans (*Phaseolus vulgaris*). This pathogen was initially reported in the Americas infecting mostly soybean (*Glycine max*) but also kudzu (*Pueraria spp.*). However, recently *P. pachyrhizi* has been reported infecting dry beans in South Africa, the U.S., Argentina, and Brazil. However, little is known about the capacity of *P. pachyrhizi* to infect and cause damage to most common bean cultivars under field conditions.

There is speculation about the possible negative effect that soybean rust may have on common bean, especially where dry bean and soybean are planted in adjacent fields, as it occurs in the U.S., Canada, Brazil, Argentina, South Africa and other countries. We report here the reaction of common bean cultivars belonging to important commercial classes in the U.S. and Canada, to a natural infection of the soybean rust pathogen under field conditions of Brazil and South Africa.

**Material and Methods.** Twenty seven dry bean cultivars from nine commercial market classes were evaluated in three locations in the state of Goiás, Brazil: 1. Senador Canedo (four evaluations), 2. Goiania (three evaluations), and 3. Rio Verde (three evaluations). Bean cultivars were planted adjacent to fields with soybeans naturally infected with *P. pachyrhizi*. In all three locations soybean varieties were included as checks. Leaves from top, middle and lower parts of the common bean plants were collected and evaluated for soybean rust severity using a 0-100 % scale. In South Africa, bean cultivars were planted in Cedara, KwaZulu-Natal province (two evaluations) in unreplicated single rows, with an inter-row spacing of 75cm. The side rows and every second row contained a mixture of highly susceptible early and late soybean cultivars. To ensure a constant supply of inoculum, one half of these rows were planted one month before and the rest at the same time as the trial entries. Disease severity was rated on five plants per row, 82 and 89 days after planting using a 1-9 scale where 1 corresponded to no visible soybean rust symptoms and 9 to very severe symptoms that resulted in severe premature defoliation.

**Results and Discussion.** In Brazil, all common bean cultivars in all three locations had very mild soybean rust symptoms compared to the soybean check cultivars (Table 1). Conversely, the soybean plants had very severe soybean rust symptoms in Senador Canedo (100%) and Goiania (78%), and mild (20%) in Rio Verde. In South Africa, all common bean cultivars had various degrees of soybean rust symptoms, but these were rather mild compared to the symptoms on the soybean cultivars. In a study conducted in South Africa, (Liebenberg et al 2007), it was found that soybean rust symptoms on common bean decreased significantly within 20 m from the inoculum source. Thus, it appears that the more severe soybean rust symptoms observed in common beans in South Africa (than in Brazil) was due to the close proximity of the common beans to heavily infected soybeans. We have included in the table data the common bean cultivars, PI 181996, CNC, Aurora, and Pinto 114 for comparison. These cultivars (highlighted in Table 1) were the resistant to six different isolates of the soybean rust pathogen from Africa,

Asia and South America under greenhouse conditions. Interestingly, they were also among the most resistant common bean cultivars under field conditions in Brazil and South Africa.

**References:** Liebenberg et al 2007. Asian soybean rust on common bean and other legumes. Annu. Rep. Bean Improv. Coop. 50:125-126.

Reaction of common bean cultivars to natural infection of the soybean rust pathogen ( <i>Phakopsora pachyrhizi</i> ) under field conditions in Brazil and South Africa									
Bean Cultivar (Market class)	Brazil <sup>1</sup>				Average Disease Incidence	South Africa <sup>2</sup>			
	Aver. Dis. Severity (0-100%)			Disease Rating (1-9)		82 days		89 days	
	Senador Canedo	Goiania	Rio Verde			Lower	Upper	Lower	Upper
Buster (Pinto)	0.69	4.37	0.0	1.72	(A)	-	-	-	
California Early (LRK)	0.71	3.49	0.10	1.43	(R, A)	-	-	-	
Montcalm (DRK)	0.29	1.65	0.20	0.71	(A, R)	-	-	-	
Beryl (GN)	0.43	1.28	0.27	0.66	0.0	0.0	(R)	-	
Norstar (Navy)	0.64	1.28	0.00	0.64	3.5	0.0	DF	3	
Matterhorn (GN)	0.55	0.85	0.17	0.52	3.0	0.0	DF	3.5	
Midnight (Black)	1.00	0.07	0.00	0.36	3.5	0.0	DF	2	
Red Hawk (DRK)	0.19	0.77	0.10	0.35	(A)	-	-	-	
Bill Z (Pinto)	0.57	0.22	0.13	0.31	(R)	0.0	-	-	
Montrose (Pinto)	0.76	0.09	0.07	0.31	0.6	0.0	DF	0?	
Chinook 2000 (LRK)	0.38	0.40	0.03	0.27	(A)	-	-	-	
Jaguar (Black)	0.17	0.40	0.17	0.25	2.2	0.0	DF	3.75	
SVM Taylor (Cranberry)	0.08	0.60	0.07	0.25	(A)	-	-	-	
Brooks (Small Red)	0.18	0.36	0.13	0.22	3.0	0	(R)	-	
Pink Panther (LRK)	0.15	0.30	0.17	0.21	(A,R)	-	-	-	
Eclipse (Black)	0.01	0.21	0.17	0.13	4.2	2.0	DF	4	
Otebo (White)	0.24	0.06	0.07	0.12	(R)	0.0	(R)	-	
T-39 (Black)	0.09	0.07	0.17	0.11	4.0	0.0	5.0	2.4	
Sedona (Pink)	0.10	0.07	0.13	0.10	0.0	0.0	DF	3.5	
Merlot (Small Red)	0.19	0.08	0.00	0.09	0.0	0.0	(R)	-	
Seahawk (Navy)	0.06	0.04	0.13	0.08	3.0	0.0	DF	4	
UI 239 (Small Red)	0.12	0.04	0.03	0.06	(A;R)	-	-	-	
Vista (Navy)	0.04	0.02	0.10	0.05	(R)	-	-	-	
CNC	0.09	0.06	0.07	0.07	4.8	0	DF	2	
Arthur (Navy)	0.00	NG <sup>3</sup>	0.07	0.04	3.5	0.0	DF	4	
Othello (Pinto)	0.04	0.05	0.00	0.03	(R)	-	-	-	
Maverick (Pinto)	0.06	0.00	0.00	0.02	3.0	0.0	(R)	-	
Condor (Black)	0.00	0.02	0.03	0.02	3.2	0.0	DF	2	
Pinto 114	0.01	0.06	0.07	0.05	(R)	-	-	-	
Aurora	0.01	0.00	0.10	0.04	(R)	-	-	-	
PI 181996	0.00	0.00	0.03	0.01	nd	nd	5.0*	0.0*	
Soybean variety (Check)	100.00	78.30	20.10		1 <sup>st</sup> : 7 2 <sup>nd</sup> : 5	1 <sup>st</sup> : 5 2 <sup>nd</sup> : 3	1 <sup>st</sup> : 9 2 <sup>nd</sup> : 9	1 <sup>st</sup> : 9 2 <sup>nd</sup> : 4	

Soybean rust evaluation. In Brazil, leaves were evaluated using a 0-100 % scale. In South Africa, soybean rust was rated on five plants per row using a 1-9 scale, where 1 corresponded to no visible symptoms and 9 to very severe symptoms that resulted in severe premature defoliation. (A, R) = dead or defoliated due to angular leaf spot (A) or common bean rust (R). 1<sup>st</sup> = first soybean planting, one month before common beans; 2<sup>nd</sup> = second soybean planting, together with common beans; nd = no data; \* = 2005 data; <sup>3</sup> = Did not germinate.