

INTROGRESSING WHITE MOLD RESISTANCE FROM THE SECONDARY GENE POOL OF COMMON BEAN

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SUMMARY

Our objectives in FY 2005 were to (i) screen 51 interspecific breeding lines (IBL) for white mold (WM) resistance, (ii) screen 119 single-plant selections from the 51 IBL, and (iii) develop a new group of approximately 700 IBL from pinto Othello and UI320 by resistant *P. coccineus* accessions P1433246 and P1439534. Of 51 IBL 17 and 10 resistant and two susceptible checks were evaluated in Idaho, North Dakota, and Washington; and four IBL in the National Bean White Mold Nursery (NBWMN) in 2005. All 17 IBL and 10 resistant checks were variable for WM reaction. The greenhouse evaluation of all 170 interspecific genotypes is in progress in Colorado and Idaho. A new large-seeded dry bean breeding line A195 with high WM resistance was identified. Also, the "straw-test" was modified to facilitate a better differentiation among resistant, intermediate, and susceptible genotypes. Development of a new set of IBL from crosses between pinto bean and *P. coccineus* is continuing in the greenhouse in Idaho.



INTRODUCTION

White mold caused by *Sclerotinia sclerotiorum* Lib de Bary is a major concern to dry bean (*Phaseolus vulgaris* L.) growers throughout the U.S. Dry bean losses can average 30% in the central high plains with individual losses as high as 92%. Disease management through cultural practices, fungicides and existing cultivars is difficult. The highest levels of resistance occur in the *Phaseolus* species in the secondary gene pool. Interspecific breeding lines (IBL) such as 19365-3, 19365-5, 19365-25, 19365-31, and 92BG-7 (Miklas et al., 1998) derived from *P. coccineus* have been more effective than *P. vulgaris* sources in multi-location tests.

OBJECTIVES

Our objectives in 2005 were to:

- Screen 51 IBL, derived from *P. coccineus*, *P. costaricensis*, and *P. polyanthus*.
- Screen 119 single-plant selections from the 51 IBL.
- Continue development of a new group of approximately 700 IBL from crosses of susceptible pinto 'Othello' and 'UI320' with resistant *P. coccineus* accessions P1433246 and P1439534.



PROGRESS ACHIEVED IN 2005

Screening of IBL from the Three *Phaseolus* Species in the Secondary Gene Pool

The number of IBL screened since 2002, and the mean and range for WM scores [on a 1 to 9 modified Petzoldt and Dickson rating scale (Terán et al., 2006), where 1=symptomless, and 9=severely diseased] in the greenhouse in FY 2005 are summarized in Table 1.

The greenhouse in Idaho and field scores at Paterson (WA) and Carrington (ND) for three of 17 IBL and resistant and susceptible check is given in Table 2.

Table 1. The field and greenhouse screening of interspecific breeding lines from *P. coccineus*, *P. costaricensis* and *P. polyanthus* between 2002 and 2005.

Genotype	Initial	2005	
	2002	Selected	WM Score
With <i>P. coccineus</i>	195	17	3.5
With <i>P. costaricensis</i>	187	5	3.4
With <i>P. polyanthus</i>	164	29	4.8
ICA Pijao	1	1	7.3
TOTAL	547	52	--



P. coccineus



P. costaricensis



P. polyanthus

Table 2. Mean white mold score 27 days after inoculation in the greenhouse at Kimberly (ID) and in the field at Carrington (ND) and Paterson (WA) in 2005.

Identification	ID - GH		WA - FD		ND - FD (%)	
	Range	Mean	Range	Mean	Range	Mean
WM54	3.0-4.0	3.3	4.5-6.5	5.7	10-60	30
WM55	3.0	3.0	4.0-6.5	5.2	10-50	27
20(2-4-8)	3.0-9.0	4.3	2.0-3.0	2.7	10-30	18
ICA Bunsu	3.0-9.0	6.2	3.0-5.5	4.3	10-70	40
G122	3.0-9.0	6.2	2.0-3.0	2.5	20-90	48
ICA Pijao	3.0-9.0	8.0	3.0-6.0	5.0	35-80	52
19365-25	3.0-9.0	5.3	5.0-6.5	5.8	10-50	23
LSD (0.05)		2.3		1.9		39

EXPECTED OUTPUTS

Germplasm Release:

Seed of interspecific breeding line(s) with the lowest white mold scores in both the greenhouse and field tests across locations will be multiplied and necessary documents prepared for their joint release in FY2007.

Publications:

One manuscript on the inheritance of white mold resistance in *P. coccineus* accessions P1433246 and P1439534, and another one on introgression of white mold resistance from the secondary gene pool will be prepared for publication in refereed journals in FY2007.

DISSEMINATION OF RESULTS

Highly white mold resistant genotypes will be distributed nationally and internationally, and information shared with bean growers, researchers, and other clientele through Agricultural Experiment Station Bulletins, Field Days, Bean Schools, and other means.

Modification of the Petzoldt and Dickson White Mold Rating Scale

The details of the modified Petzoldt and Dickson (1996) rating scale are provided in another poster paper in this annual meeting. The white mold reaction of a set of known germplasm using the two rating scales is given in Table 3.

Identification of A195, a New White Mold Resistant Dry Bean Breeding Line

In our greenhouse screenings thus far, A195 has repeatedly shown high level of resistance (Table 3).

Table 3. Mean white mold score for bean using the Petzoldt & Dickson and modified rating scales in the greenhouse at Kimberly, Idaho in 2005.

Genotype	Petzoldt and Dickson scale	Modified scale
A195	4.8	2.8
B7354	6.7	6.0
G122	7.5	5.7
ICA Bunsu	7.8	6.8
19365-25	8.7	5.7
NY6020-4	6.2	3.7
Othello (susceptible)	8.6	7.6
LSD ($P \leq 0.05$)	1.2	1.8

Development of New Set of IBL from Crosses Pinto Othello and UI320 and Resistant *P. coccineus* Accessions P1433246 and P1439534.

Table 4 summarizes the number of F₁-derived F₂ or F₄ IBL that have been produced thus far.

Table 4. Development of new interspecific breeding lines from crosses of white mold susceptible pinto Othello and UI320 and resistant *P. coccineus* accessions P1433246 and P1439534 between 2002-2005.

Interspecific crosses	No. of F ₁ seed	F ₂	F ₃	F ₄
Othello / P1433246	182	182	-	58
Othello // Othello / P1433246	163	-	95	
Othello /// Othello // Othello / P1433246	191	151	101	63
UI320 / P1439534	267	267	157	26
UI320 // UI320 / P1439534	204	-	143	
UI320 /// UI320 // UI320 / P1439534	187	167	129	97

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