Improved White Mold Resistance in Common Bean from Multi-site Tests and Progress in Pathogen Characterization

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As with many crops- there is no complete resistance to white mold in bean

Partial resistance has been reported but effectiveness of resistance sources has varied with testing location and method

This variation may be due to

•test environment,

•repeatability of screening methods and/or

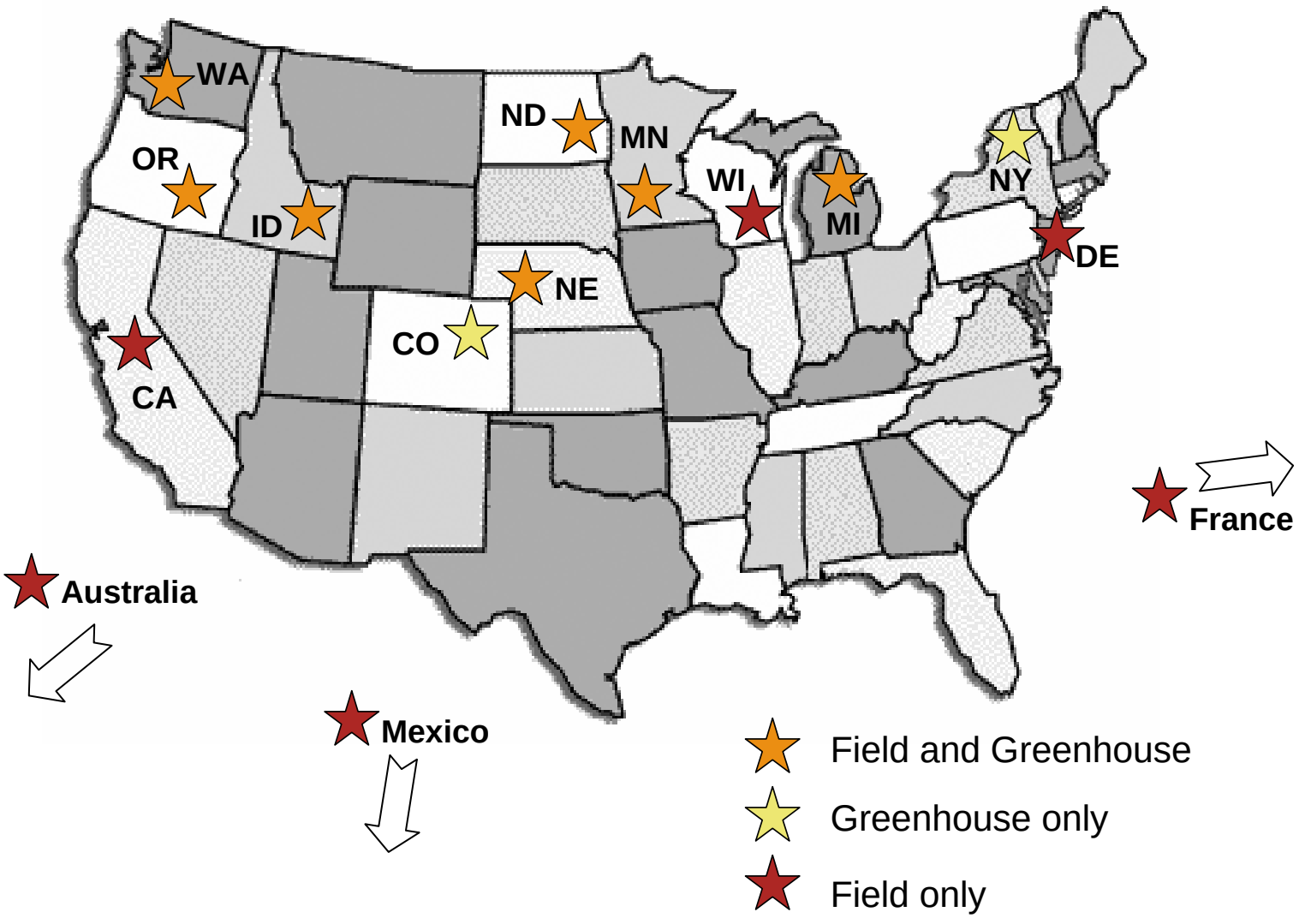
•variation in the pathogen, especially virulence or aggressiveness.

Field tests at multiple sites will verify broad partial resistance

Goal 1. Identify resistance to white mold in adapted common bean lines.

Objective 1. Use multiple field locations and laboratory greenhouse screening tests to determine white mold reaction of putative sources of resistance and/or avoidance in field, laboratory and greenhouse screening tests

White mold monitor nursery collaborators



Mean rankings of bean lines (1=most resistant) for white mold reaction over all greenhouse/lab and field tests in 2003.

Entry	Mean Ranking	T Grouping	Seed Class
Beryl	9.063	A	GN
CO75944	7.875	B A	PTO
AN 69	7.594	B A	PTO
USWA 6	7.533	B A	SR
N02 302	7.469	B A	NAVY
AN 1	7.063	B A C	GN
AN 37	6.719	B A C	PTO
Ex Rico	6.625	B A C	NAVY
IO1892-115M	5.781	B C	BLK
Cornell 501	**5.500**	**B E C**	**SNAP**
G122	**4.688**	**E C**	**CRAN**
Cornell 601	**4.219**	**E**	**RK**
Dwarf Bees	**3.167**	**E**	***P. coccineus***

LSD = 2.52 Alpha = 0.05

Mean rankings of bean lines (1=most resistant) for white mold reaction over all greenhouse/lab and field tests in 2004.

Entry	Mean Ranking	T Grouping	Seed Class
Beryl	10.292	A	GN
CO75944	9.000	B A	PTO
AN 1	8.042	B A C	GN
AN 69	7.542	B D A C	PTO
USWA 6	7.417	B D C	SR
IO1892-115M	7.167	B D C	BLK
N02 302	6.583	B D E C	NAVY
Ex Rico	6.208	F D E	NAVY
AN 37	5.083	F D E	PTO
Cornell 501	**4.917**	**F D E**	**SNAP**
G122	**4.167**	**F E**	**CRAN**
Cornell 601	**4.083**	**F E**	**RK**
Dwarf Bees	**3.600**	**F**	***P. coccineus***

LSD = 2.7514 Alpha = 0.05

Cornell 501 released with partial white mold resistance

Field test rankings* of 12 bean lines for white mold reaction at 7 locations in 2005.

Entries	WA	NE	MI	OR	CA	MN	France
G122	1	7	1	1	11	1	2
Ex Rico	3	1	7	2	4	7	3
IO1892-115M	4	11	11	10	2	8	5
Beryl	12	10	12	12	12	12	12
PS02-006C-30	11	12	9	8	-	4	11
AN 37	7	8	9	4	10	8	10
B05001	10	6	4	3	9	11	8
WM 55	6	9	7	9	8	1	1
Cornell 501	4	5	1	4	4	6	9
Cornell 601	7	4	4	4	7	8	7
Cornell 604	9	3	4	7	1	1	4
Cornell 605	2	1	1	11	2	5	6
* (1)=most resistant, (12)=most susceptible							

Mean rankings of bean lines (1=most resistant) for white mold severity in 7 field sites in 2005.

Entries	Mean Ranking	t Grouping	Seed Class
Beryl	11.714	A	G. Northern
PS02-006C-30	9.167	B A	Pinto
AN 37	8.000	B C	Pinto
B05001	7.286	B C D	Black
IO1892-115M	7.286	B C D	Black
WM 55	5.857	E C D	Black
Cornell 601	5.857	E C D	Lt. Red Kidney
Cornell 501	4.714	E D	Snap
Cornell 604	4.143	E D	Black
Cornell 606	4.000	E	Black
Ex Rico	3.857	E	Navy
G122	3.429	E	Cranberry
LSD=3.239, Alpha=0.05			

Mean rankings of bean lines (1=most resistant) for white mold severity in 3 of 9 greenhouse tests for 2005.

Entries	Mean Ranking	t Grouping	Seed Class
PS02-006C-30	24.333	A	Pinto
Beryl	23.667	B A	G. Northern
WM 55	21.667	B A C	Black
WM 35	19.333	B D A C	Black
WM 32	17.000	E B D A C	Brown
Ex Rico	17.000	E B D A C	Navy
IO 1892-115M	16.000	E B D A C F	Black
WM 54	15.667	E B D A C F	Black
ND021841	15.333	E B D A C F	Black
AN 37	14.000	E B D A G C F	Pinto
G 122	13.667	E B D A G C F	Cranberry
PS02-OND-3	13.667	E B D A G C F	Pinto
MO 162	13.667	E B D A G C F	Yellow
ND021363	13.000	E B D G C F	Navy
Cornell 501	13.000	E B D G C F	Snap
Cornell 606	12.667	E D G C F	Black
B05002	11.667	E D G C F	Black
Cornell 601	11.667	E D G C F	Lt. Red Kidney
Dwarf Bees	11.333	E D G C F	*P. coccineus*
B05001	10.667	E D G F	Black
VA-19	9.667	E D G F	Lt. Red Kidney
Cornell 603	7.000	E G F	Dk. Red Kidney
Cornell 602	6.667	E G F	Wht. Kidney
B05003	6.000	G F	Black
Cornell 605	4.333	G	Lt. Red Kidney
Cornell 604	3.667	G	Black
LSD=10.899, Alpha= 0.05			

Goal 2. Assess variation in *S. sclerotiorum* bean isolates
Initial comparisons between 9 greenhouse/laboratory isolates

Objective 1. Determine mycelial compatibility groups (MCGs)

Mycelial Compatibility Groupings (MCGs) for the 9 greenhouse/lab isolates and reference isolate 1980.

	Blank (Check)	NE (152)	ND (274)	NY (443)	OR (455)	WA (456)	CO (467)	WI (478)	MI (482)	ID (483)	NE (1980)
Blank	NG	*	*	*	*	*	*	*	*	*	*
NE		O	X	X	**O**	X	X	X	X	X	**O**
ND			O	X	X	X	X	X	X	X	X
NY				O	X	X	X	**O**	X	X	X
OR					O	X	X	X	X	X	**O**
WA						O	X	X	X	X	X
CO							O	X	X	X	X
WI								O	X	X	X
MI									O	X	X
ID										O	X
NE											O

O=Compatible; *Clonal*, X=Incompatible; *Unique*, NG=No Growth, (*)=Isolates did not meet

Mycelial Compatibility Groupings (MCGs)

Group 1	New York=Wisconsin
Group 2	Nebraska (152)=Oregon=Nebraska (1980)
Group 3	North Dakota
Group 4	Washington
Group 5	Colorado
Group 6	Michigan
Group 7	Idaho

Mycelial compatability test reactions

Compatible (isolates=clonal)

Incompatible (isolates=unique)

Goal 2. Assess variation in *S. sclerotiorum* bean isolates
Initial comparisons between 9 greenhouse/laboratory isolates

Objective 2. Determine aggressiveness of *S. sclerotiorum* bean isolates

Test initial 9 Greenhouse isolates in Detached leaf test and Straw test

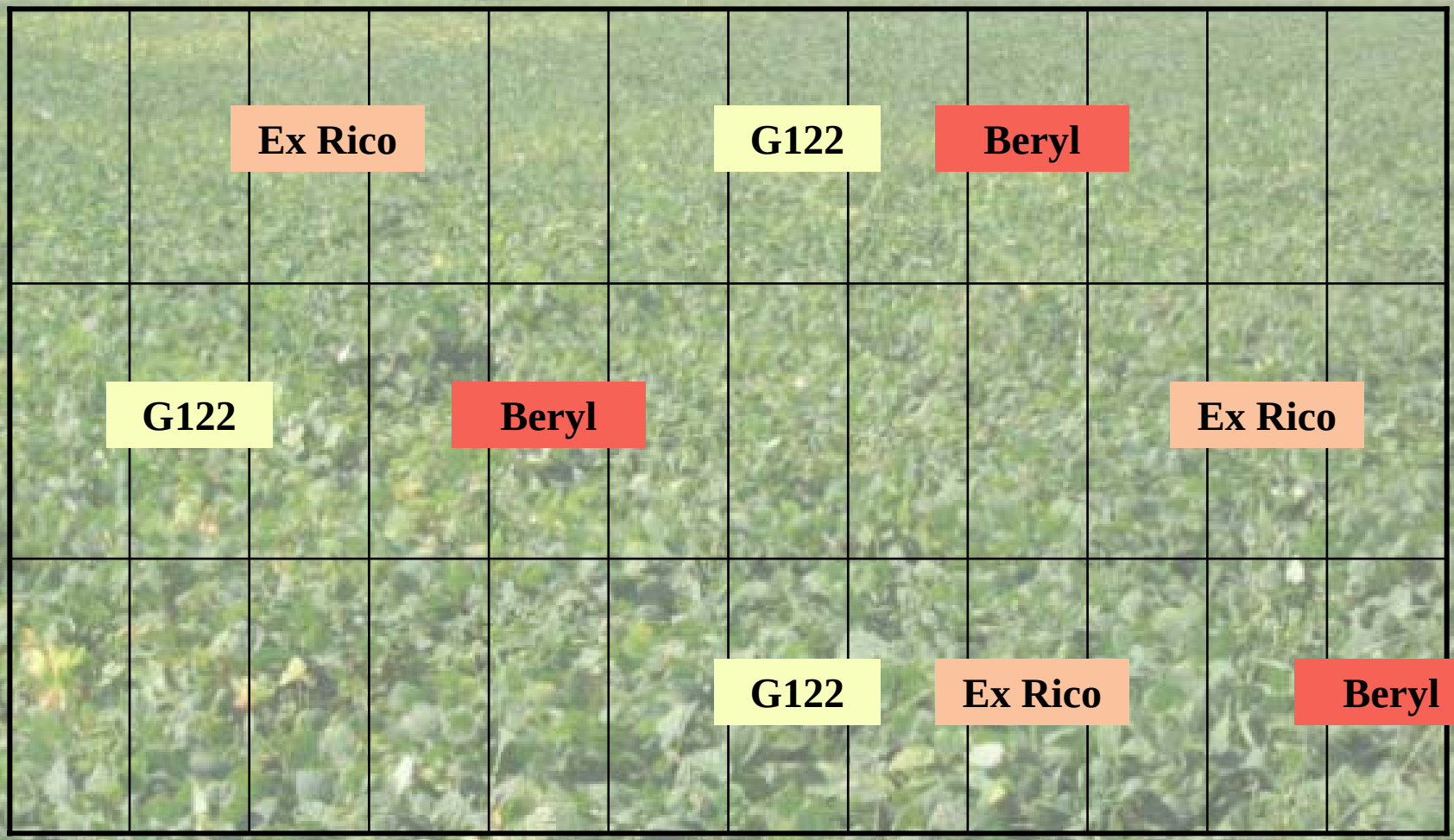
Bean leaves inoculated with an isolate of *S. sclerotiorum* for the Detached leaf test

Bean plant inoculated with an isolate of *S. sclerotiorum* for the straw test.

Comparison of the straw test and the detached leaf test for separating *Sclerotinia sclerotiorum* isolate aggressiveness.

Detached Leaf Test Results** Alpha=0.05, LSD=3.19			Straw Test Results** Alpha=0.05, LSD=0.5804		
Isolate Location*	Lesion Area (cm^2)	t Grouping	Isolate Location*	Rating***	t Grouping
Nebraska (field)	17.324	A	France	2.8250	A
Colorado	**16.840**	**A**	**Michigan**	**2.7500**	**B A**
France	16.546	A	Nebraska (field)	2.4083	B A C
New York	**16.396**	**A**	**Wisconsin**	**2.2833**	**B A C**
Michigan	**16.198**	**A**	**North Dakota**	**2.1833**	**B C**
Nebraska (field)	15.921	A	**New York**	**2.1500**	**C**
Wisconsin	**15.867**	**A**	**Washington**	**2.0750**	**C**
Washington	**15.836**	**A**	**Oregon**	**2.0583**	**D C**
North Dakota	**15.373**	**A B**	Nebraska (field)	2.0583	D C
Oregon	**15.303**	**A B**	**Nebraska (152)**	**2.0333**	**D C**
Idaho	**14.878**	**A B**	**Idaho**	**1.9833**	**D C**
Nebraska (152)	**14.204**	**A B**	**Colorado**	**1.9667**	**D C**
South Africa	12.192	B	South Africa	1.4917	D
* Isolates in bold are the 9 GH screening isolates.					
**The host in both screening tests was the partially resistant line G122.					
***Pathogen aggressiveness rating; (1)=less aggressive, (9)=most aggressive					

White mold nursery



Beryl - Susceptible **Ex Rico** - Moderately resistant **G122** - Resistant

Goal 2. Assess variation in *S. sclerotiorum* bean isolates
Initial comparisons between 9 greenhouse/laboratory isolates

Objective 3. Genotype *S. sclerotiorum* bean isolates

Microsatellite markers identified 8 polymorphic loci among the 9 greenhouse/laboratory *S. sclerotiorum* isolates

- shared 5 out of 11 polymorphic loci in common with Washington State potato field study
- shared 1 out of 8 polymorphic loci in common with Australian canola field study