

**Report to the Pennsylvania Vegetable Marketing and Research
Program for work undertaken in 2010**

Breeding for White Mold Resistance in Snap Beans

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Abstract:

White mold (*Sclerotinia sclerotiorum*) is an important disease of snap beans in the northeast particularly during cool, damp seasons. Incorporation of high levels of resistance to this pathogen in commercial type snap bean lines is a major focus of the breeding program. 'Cornell 501' was released in 2001 and tested nationally in white mold nurseries in 2002-2006, 'Cornell 504' was released in 2007 and has been used in the development of new populations segregating for improved plant type. The breeding lines have ranked among the best commercial type common bean entries with other Cornell dry bean lines following evaluation in multiple field and greenhouse tests throughout the US between 2002-2009 in collaboration with W-150/W-1150 national trials and in yield performance trials with Ballerstein/Reiners at Cornell. Crosses have been made between 2005 and 2009 between commercial snap bean and breeding lines have been advanced through white mold greenhouse inoculation trials. Additional crosses were made in 2007 to resistant line A-195 and Cornell 504, are being advanced to segregating populations that will be tested in Spring 2010. Advanced lines and lines from new crosses will be tested in 2010 to develop snap beans with acceptable yield/quality with a high level of resistance to white mold. Additional crosses of resistant materials to small-sieve snap beans were made in 2007/2008 that were selected at the F₄ generation in 2008, 12 new lines including selections from crosses with highly resistant dry bean materials were selected. These 12 lines have been crossed with two commercial snap beans and are currently being increased to develop 24 F₂ populations for selection in 2010

Objectives:

- [1] To greenhouse and field evaluate and advance breeding lines for resistance to white mold, yield and quality.
- [2] To screen and cross white mold resistant field selections and advanced breeding populations in the greenhouse, and advance the generations with further screens to determine resistant types with good horticulture.

Results:

[1] Snap bean breeding lines were evaluated for white mold resistance in 2010 in both the large sieve and small sieve plant types for selection of breeding lines with high levels of resistance. These evaluations were based on populations developed from crosses with the resistant breeding lines and previously released lines. Common bean lines were also inoculated and compared to W-2150 national white mold entries, where they continue to perform as the most resistant lines. Breeding lines derived in the light red and dark red kidney backgrounds following crosses to Red Kanner were also used in development of new populations for transfer of enhanced resistance to snap beans focusing on the development of four new populations for enhancement of resistance. A total of 38 F₄ lines were selected and progeny planted for confirmation of resistance in 2009. Twelve lines were selected with high levels of resistance and crossed to snap beans ASR 1644 and ASR 1544. Of the 24 possible cross combinations, 23 segregating F₂ populations were derived and planted in fall 2009 for selection of plant type and seed quality, prior to selection of white mold resistance at the F₃ generation. The 23 newly selected lines were advanced, and the best of the twelve parents for determining F₃ population trials are currently being determined. Large sieve white seeded lines were also selected from these populations in fall 2010 and are currently being harvested for confirmation through progeny testing. Additional evaluation of resistance in greenhouse trials will help to determine the best snap bean materials for development of tolerant varieties.

[2] Snap bean breeding lines have been developed by accumulating minor genes for white mold resistance using sources that include PI 204717 and PI 169787. The accumulation of genes in these breeding lines requires extensive greenhouse screening through multiple generations in order to recover lines with high levels of physiological resistance to white mold. Crosses have been made to improve horticultural type focusing on crosses to 'Hystyle' and small sieve cultivars. Snap bean lines were evaluated for white mold resistance in two greenhouse screens in 2010 focusing on large sieve populations developed from 12 new breeding lines, and advancement of the 2009 crosses from the 12 selections. Lines exhibiting any significant level of disease symptoms were eliminated during the trials. Additional populations to improve horticultural type were included in populations developed following crosses and backcrosses to 'Hystyle' and two small-sieve bush types. Additional crosses were made to further improve the horticultural type.

Table 1: Mean rankings of Cornell WM lines when compared to W-2150 entries in greenhouse straw test trials Fall 2010

Line	# of plants rated	Mean disease rating	Rank
Cornell 607	10	2.44	1
Cornell 611	10	2.50	2
Cornell 605	10	3.00	3
VCW54	10	3.10	4
Cornell 610	9	3.11	5
Cornell 612	9	3.22	6
G122	10	3.90	7
C08709	8	4.00	8
Cornell 609	10	4.10	9
Cornell 608	10	4.40	10
A195	10	4.50	11
ND080547	10	5.60	12
NE2-09-16	10	5.80	13
P07751	10	6.20	14
NE2-06-8	10	6.40	15
NE2-09-4	10	7.20	16
NE2-09-19	10	7.30	17
P07863	10	7.30	17
Beryl	10	7.90	19
37-2	10	8.20	20
NE2-09-1	10	8.30	21
ND060514	10	8.40	22
NE1-09-20	10	8.50	23
NE2-09-6	10	8.50	23
50-2	10	8.80	25
NE2-09-14	8	8.88	26
NE2-09-10	9	8.89	27
NE2-09-12	10	8.90	28
70-1	10	9.00	29
ExRico(Bunsi)	10	9.00	29
Hystyle	10	9.00	29