2012 VBI Field Day
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Estimating the impact of U.S. Great Lakes virus diseases on snap bean production to identify tolerance and evaluate resistance

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Background

Coinciding with the accidental introduction of the soybean aphid *Aphis glycines* in 2000, an aphid-transmitted virus disease complex has threatened the viability of snap bean production and processing in New York and Wisconsin, the two most important production regions of the United States. Three viruses of the disease complex have been focused on as the most prevalent and the most damaging to snap bean production: *Clover yellow vein virus* (ClYVV), *Bean yellow mosaic virus* (BYMV), and *Cucumber mosaic virus* (CMV). The snap bean breeding program at Cornell NYSAES lead by Dr. Phillip Griffiths conducts research to elucidate the genetics of host plant resistance and to develop multiple-virus resistant snap beans in response to this threat.

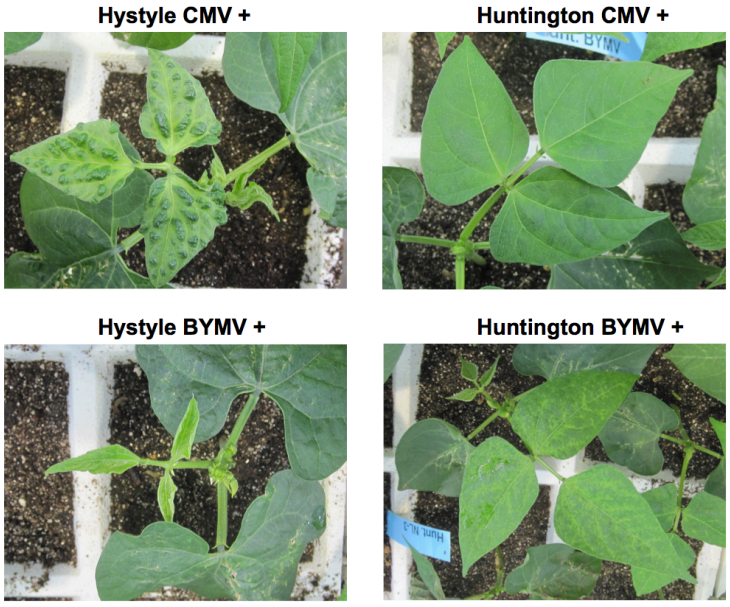
Research Objectives

The overall objective of my research is to assess the available genetic variation for virus resistance in *Phaseolus* beans, evaluate its utility, and enable marker-assisted selection to accelerate resistance gene pyramiding efforts. In addition to our efforts to identify and introgress major gene resistance, we have assembled and evaluated a panel of more than 300 snap bean cultivars for their response to ClYVV, BYMV, CMV, as well as *Alfalfa mosaic virus* (AMV), and strains of *Bean common mosaic necrosis virus* (BCMNV) at the seedling stage. Screening this germplasm collection with multiple viruses has allowed for the characterization and assignment of numerous virus resistance genotypes, and in the absence of resistance, has revealed distinct patterns of symptom expression (***Figure 1***). Numerous hypotheses have been developed about the range of interactions, including the hypothesis that seedling symptom severity is correlated with the impact of virus infection and disease on yield.

A set of experiments were designed to accomplish the following objectives:

- Determine the impact of CMV, BYMV, and ClYVV on yield in a range of cultivars.
- Evaluate the relationship between seedling symptom expression (in response to infection by CMV and BYMV) and yield loss
- Develop efficient field-based screening methodology to accurately identify snap bean germplasm with tolerance to CMV and BYMV infection
- Evaluate ClYVV resistant germplasm in the field

Figure 1. Symptom expression in response to CMV and BYMV infection at the seedling stage (V1) in two commercial standard cultivars



CMV Entries

Entry #	Cv	origin and year	Sieve	Target
1	Lynx	Seminis (PVP) 2002	4	Fresh
2	Lewis	HM (Patent) *2011-12*	4	Fresh
3	Valentino	Seminis (PVP) 2008	3-4	Dual
4	Frontier	HM (Patent) *2011-12*	4	Fresh
5	Hickok	HM (Patent) 2009	3-4	Fresh
6	Prevail	Syngenta (Patent) 2011	3-4	Fresh
7	Inspiration	Syngenta (Patent) 2011	3-4	Fresh
8	Dusky	Seminis (PVP) 2003	3-4	Fresh
9	Festina	Seminis (PVP) 2001	5	Processing
10	Boone	HM (Patent) 2008	3	Dual
11	Matador	Seminis (PVP) 1996	4	Processing
12	Bronco	Seminis (Asgrow) (PVP) 1990	4	Fresh
13	Contender	USDA (1950)	5	Dual
14	Venture	Syngenta (PVP) 1989	5	Processing
15	Blue Lake 274	Seminis (Asgrow) 1964	5	Processing
16	OSU 5402	OSU 1988	5	Processing
17	Hystyle	HM (PVP) 1985	5	Processing
18	Huntington	Syngenta (Patent) 2010	5	Processing

BYMV Entries

Entry #	Cv	origin and year	Sieve	Target
1	B28-R	Cornell Expt. Line	5	
2	Paloma	Nunhems	3-4	Fresh
3	Valentino	Seminis (PVP) 2008	3-4	Dual
4	Frontier	HM (Patent) *2011-12*	4	Fresh
5	Hickok	HM (Patent) 2009	3-4	Fresh
6	Prevail	Syngenta (Patent) 2011	3-4	Fresh
7	Inspiration	Syngenta (Patent) 2011	3-4	Fresh
8	Molly	Nunhems	3-4	Fresh
9	Festina	Seminis (PVP) 2001	5	Processing
10	Boone	HM (Patent) 2008	3	Dual
11	Matador	Seminis (PVP) 1996	4	Processing
12	Bronco	Seminis (Asgrow)(PVP) 1990	4	Fresh
13	Sonesta	PopVriend	2-3	Fresh (wax)
14	Venture	Syngenta (PVP) 1989	5	Processing
15	Blue Lake 274	Seminis (Asgrow) 1964	5	Processing
16	OSU 5402	OSU 1988	5	Processing
17	Hystyle	HM (PVP) 1985	5	Processing
18	Huntington	Syngenta (Patent) 2010	5	Processing

CIYVV Entries

Line	Cv	origin and year	Sieve	Target
1	CY-7	Cornell Expt. Line	5	Processing
2	Amanda	IVT (Wageningen)	4	Fresh
3	Laureat	Seminis (PVP) 1987	3	Processing
4	Huntington	Syngenta (Patent) 2010	5	Processing

Field Maps on next page

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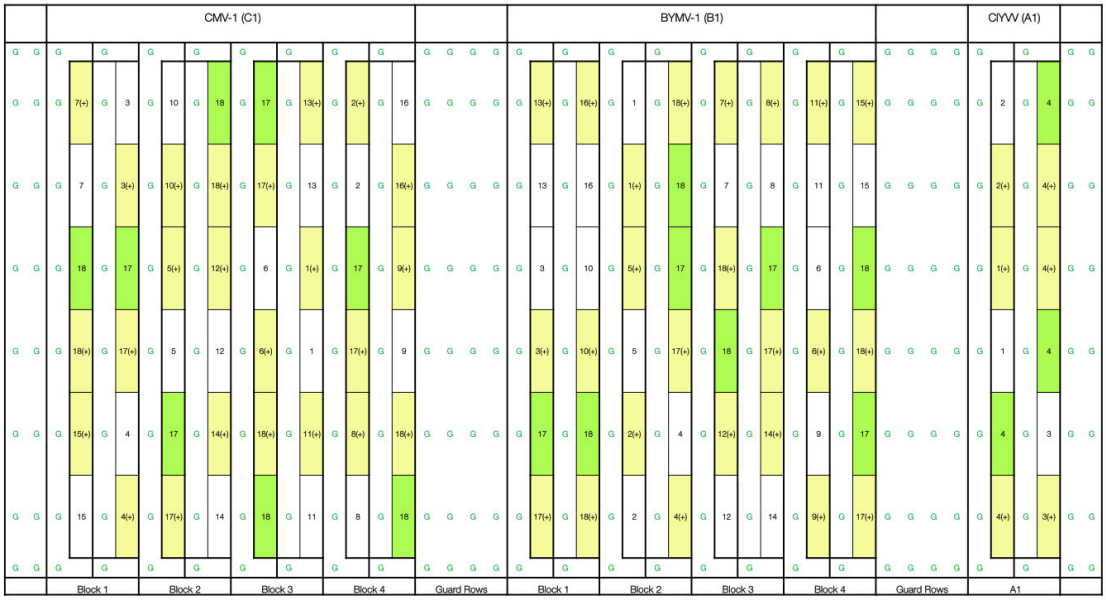
Snap Bean Virus Impact / Tolerance / Resistance Evaluation

Experiment set 1 – NYSAES Research North Field 39

Planted: 6/28/12; Airbrush Inoculated: 7/09/12 & 07/13/12



Augmented Split Plot Experiment Design:

Whole plot = genotype, Sub-plot = infection status

Replicated check genotypes

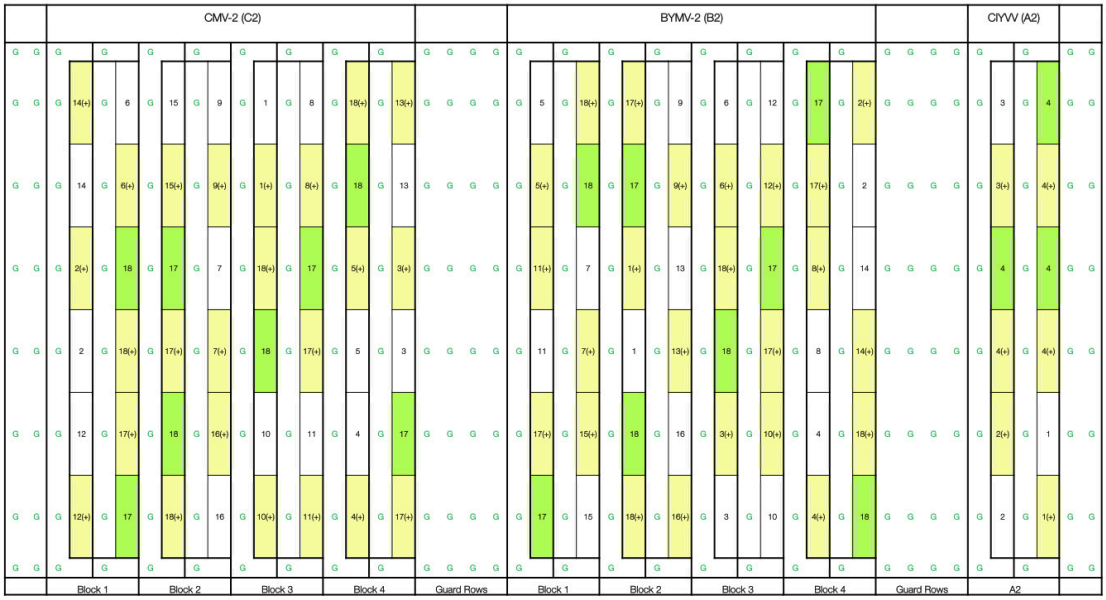
Augmented genotypes

Inoculated subplots

Snap Bean Virus Impact / Tolerance / Resistance Evaluation

Experiment set 2 – NYSAES Research North Field 28

Planted: 07/24/12; Airbrush Inoculated: 08/03/12 & 08/16/12; ClYVV: 08/15/12



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