2018 Hancock Agricultural Research Station Field Day

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Full-season reduced-risk Colorado Potato Beetle control programs – Large Plot Demo (Field K-9)

It is critically important to frequently rotate the chemistries of insecticides used in the control of Colorado Potato Beetle, as this insect has the ability to rapidly develop resistance after repeated exposures to insecticides with common modes of action. This trial is a demonstration of several different insecticide chemistry rotations which will ensure season-long control of Colorado Potato Beetle while reducing the risk of resistance development. Potato cv. *'Russet Burbank'* machine planted May 4, with at-plant insecticides administered at this time. Besiege and Coragen foliar applications use 0.2% v/v MSO adjuvant, all other foliar applications use 0.2% v/v NIS adjuvant. Plots are four rows by 20 ft. with 1 ft. seed spacing. Three reps.

	Trt	Target	Delivery	App date	Week	Product	Rate		Vendor	Actives	IRAC	Class
At-plant systemic programs	**1**	1st gen	Seed	May 4	1	Verimark 1.67 SC	0.62	fl oz/cwt	DuPont	Cyantraniliprole	28	Diamides
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Torac 1.29 EC	21	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
			Foliar	Jul 16	12	Torac 1.29 EC	17	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
	2	1st gen	Seed	May 4	1	AdmirePro 4.6 FS	0.35	fl oz/cwt	Bayer	Imidacloprid	4A	Neonicotinoids
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Belay 2.13 SC	3	fl oz/a	Valent	Clothianidin	4A	Neonicotinoids
			Foliar	Jul 16	12	Belay 2.13 SC	2.5	fl oz/a	Valent	Clothianidin	4A	Neonicotinoids
	3	1st gen	Seed	May 4	1	Cruiser 5 FS	0.16	fl oz/cwt	Syngenta	Thiamethoxam	4A	Neonicotinoids
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Besiege 1.25 ZC	9	fl oz/a	Syngenta	Chlorantraniliprole Lambda-cyhalothrin	28 3	Diamides Pyrethroids
			Foliar	Jul 16	12	Besiege 1.25 ZC	7.5	fl oz/a	Syngenta	Chlorantraniliprole Lambda-cyhalothrin	28 3	Diamides Pyrethroids
	4	1st gen	In-furrow	May 4	1	Platinum 75 SG	2.67	oz wt/a	Syngenta	Thiamethoxam	4A	Neonicotinoids
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Torac 1.29 EC	21	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
			Foliar	Jul 16	12	Torac 1.29 EC	17	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
	5	1st gen	In-furrow	May 4	1	Verimark 1.67 SC	13.5	fl oz/a	DuPont	Cyantraniliprole	28	Diamides
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Actara 25 WDG	3	oz wt/a	Syngenta	Thiamethoxam	4A	Neonicotinoids
			Foliar	Jul 16	12	Actara 25 WDG	2.5	oz wt/a	Syngenta	Thiamethoxam	4A	Neonicotinoids
	6	1st gen	In-furrow	May 4	1	AdmirePro 4.6 FS	8.7	fl oz/a	Bayer	Imidacloprid	4A	Neonicotinoids
			Foliar	Jun 20	8	Agri-Mek 0.7 SC	3.5	fl oz/a	Syngenta	Abamectin	6	Avermectins
		2nd gen	Foliar	Jul 6	10	Coragen 1.67 SC	7.5	fl oz/a	DuPont	Chlorantraniliprole	28	Diamides
			Foliar	Jul 16	12	Coragen 1.67 SC	5	fl oz/a	DuPont	Chlorantraniliprole	28	Diamides
Foliar programs	**7**	1st gen	Foliar	Jun 13	7	Minecto Pro 1.37 SC	10	fl oz/a	Syngenta	Cyantraniliprole Abamectin	28 6	Diamides Avermectins
			Foliar	Jun 20	8	Minecto Pro 1.37 SC	8.5	fl oz/a	Syngenta	Cyantraniliprole Abamectin	28 6	Diamides Avermectins
		2nd gen	Foliar	Jul 6	10	Assail 30 SG	4	oz wt/a	UPI	Acetamiprid	4A	Neonicotinoids
			Foliar	Jul 16	12	Assail 30 SG	3.5	oz wt/a	UPI	Acetamiprid	4A	Neonicotinoids
	8	1st gen	Foliar	Jun 13	7	Assail 30 SG	4	oz wt/a	UPI	Acetamiprid	4A	Neonicotinoids
			Foliar	Jun 20	8	Assail 30 SG	3.5	oz wt/a	UPI	Acetamiprid	4A	Neonicotinoids
		2nd gen	Foliar	Jul 6	10	Minecto Pro 1.37 SC	10	fl oz/a	Syngenta	Cyantraniliprole Abamectin	28 6	Diamides Avermectins
			Foliar	Jul 16	12	Minecto Pro 1.37 SC	8.5	fl oz/a	Syngenta	Cyantraniliprole Abamectin	28 6	Diamides Avermectins
	9	1st gen	Foliar	Jun 13	7	Blackhawk 36 WG	3.3	oz wt/a	Dow	Spinosad	5	Spinosyns
			Foliar	Jun 20	8	Blackhawk 36 WG	3	oz wt/a	Dow	Spinosad	5	Spinosyns
		2nd gen	Foliar	Jul 6	10	Besiege 1.25 ZC	9	fl oz/a	Syngenta	Chlorantraniliprole Lambda-cyhalothrin	28 3	Diamides Pyrethroids
			Foliar	Jul 16	12	Besiege 1.25 ZC	7.5	fl oz/a	Syngenta	Chlorantraniliprole Lambda-cyhalothrin	28 3	Diamides Pyrethroids
	10	1st gen	Foliar	Jun 13	7	Torac 1.29 EC	21	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
			Foliar	Jun 20	8	Torac 1.29 EC	17	fl oz/a	Nichino	Tolfenpyrad	21A	METI insecticides
		2nd gen	Foliar	Jul 6	10	Coragen 1.67 SC	7.5	fl oz/a	DuPont	Chlorantraniliprole	28	Diamides
			Foliar	Jul 16	12	Coragen 1.67 SC	5	fl oz/a	DuPont	Chlorantraniliprole	28	Diamides

Novel dsRNAs for foliar control of 1st gen CPB (Field E-13)

Greenlight Biosciences (Medford, MA, www.greenlightbiosciences.com) has contracted our lab to perform field evaluations of novel double-stranded RNA compounds targeting Colorado Potato Beetle. RNA interference is a relatively new technology in pest management, and works by suppressing the translation of specific RNA gene transcripts into proteins, effectively shutting down any genes matching the sequences of the dsRNA strands. In practice, dsRNA compounds are applied via foliar sprays and become active in the insect when consumed with plant tissue. This technology is especially promising because dsRNAs can be constructed that are extremely specific to a target pest and so are potentially much safer to humans and the environment than existing chemical pest management solutions. Trial consists of 10 treatments in four replicates. Two-row plots are 20 ft. long and bordered by untreated guard rows. Potato cv. *'Yukon Gold'* was machine planted with 1 ft. seed spacing on April 26. Treatments were initiated on 12 Jun and reapplied five times on a four-day interval. Insect counts were performed on Jun 15, 21, 26, and Jul 3.

Trt	Product	Rate	Mean total CPB per 10 plants				% DF (Jul 3)
			Adult	Egg mass	Sm larvae	Lg larvae	
1	NF	Low	2	2	339	55	4
2	AF + MSO	Low	12	3	196	59	3
3	NF	Med	5	3	154	27	3
4	AF + MSO	Med	4	3	212	23	3
5	AF + AtPlus	Med	6	2	173	47	3
6	CF	Med	12	3	191	25	4
7	NF	High	8	2	174	28	2
8	AF + MSO	High	3	2	136	39	2
9	Blackhawk 36 WDG	3.3 oz/a	3	3	25	7	1
10	Untreated		15	2	395	499	80

Evaluation of foliar programs for aphid control in potato (AARS)

Aphids feed on plant sap and excrete a sugary honeydew that attracts ants and creates the conditions for sooty mold. In addition to directly weakening the host plant, aphids are capable of vectoring several important viral plant diseases, including mosaic viruses and Potato Virus Y. Aphids that pose the most serious problem to Wisconsin vegetable production include the green peach, melon, and potato aphids. We conduct annual trials of novel experimental compounds and established commercial products for the control of aphid populations in potato production. This trial is located at the Arlington Agricultural Research Station. The 14 treatments include one untreated control, three experimental compounds, and several commercial standards. Potato cv. *'Russet Burbank'* was machine planted on 17 May. Plots are 2 rows by 20 ft. All treatments include the spray adjuvant Dyne-Amic at 0.25% v/v. Foliar application will be initiated around mid-July.

Trt	Product	Rate	
1	Control		
2	EXP 1	Low	
3	EXP 1	Med	
4	EXP 1	High	
5	Movento 240 SC	3.99	fl oz/a
6	Movento 240 SC	3.99	fl oz/a
7	Actara 25 WG	3	oz wt/a
8	Fulfill 50 SC	2.74	oz wt/a
9	EXP 2	Single	
10	EXP 3	Single	
11	Exirel 100 OD	20	fl oz/a
12	Sivanto 200 SL	10.5	fl oz/a
13	Transform 240 SC	1.5	fl oz/a
	FulFill 50 WG	2.8	oz wt/a
14	BeLeaf 50 SG	2.8	oz wt/a

Systemic seed and at-plant insecticide evaluation (Field E-12)

Systemic at-plant insecticides continue to play an important role in commercial pest management strategies in potato production. This trial evaluates the efficacy of seed treatments versus in-furrow applications of registered commercial and novel experimental compounds for the control of Colorado Potato Beetle, leafhoppers, and aphids. Trial was hand planted with potato cv. *'Russet Burbank'* at 1 ft. spacing on May 3, with in-furrow applications applied prior to row closure. Plots are four rows by 40 ft. long. Plots arranged in four replicates. All non-control seed was also treated with the fungicide Maxim 4 FS at a rate of 0.08 fl oz/cwt. Insect counts were taken on June 13, 15, 22, 28, and July 9.

Trt	Product	App	Rate	Mean total CPB per 10 plants				% DF	Leafhopper		Aphid
				Adult	Egg m.	Sm larv.	Lg larv.		Adult	Nymph	
1	Control	-	-	11.0	10.0	236.5	450.5	60.3	23.3	12.0	1.0
2	Belay 2.13 SC	In-furrow	12 fl oz/a	17.8	9.8	24.3	19.0	7.5	5.3	0.5	0.3
3	Belay 2.13 SC	Seed	0.5 fl oz/cwt	15.0	15.3	45.8	14.5	7.3	5.3	1.5	0.3
4	Verimark 1.67 SC	Seed	0.7 fl oz/cwt	14.3	19.8	171.8	207.5	30.5	20.8	18.0	0.5
5	Verimark 1.67 SC	In-furrow	13 fl oz/a	17.3	16.3	67.3	31.8	7.5	28.0	20.8	0.5
6	EXP 1	In-furrow	Low	8.3	8.5	9.3	8.0	6.5	25.5	11.8	3.3
7	EXP 1	In-furrow	Med	6.5	6.3	0.0	0.0	4.8	9.8	2.3	0.5
8	EXP 1	In-furrow	High	4.8	3.5	2.8	4.3	5.3	25.3	2.5	0.5
9	EXP 1	Seed	Low	10.0	6.5	15.8	20.8	6.5	17.3	6.5	1.0
10	EXP 1	Seed	Med	7.0	9.3	4.3	4.0	5.0	11.8	3.3	0.3
11	EXP 1	Seed	High	6.5	2.0	0.0	0.3	5.3	7.8	0.3	0.5
12	EXP 2	In-furrow	Low	7.8	8.8	0.0	0.0	5.3	12.8	0.3	1.3
13	EXP 2	In-furrow	High	6.0	1.5	2.8	0.0	4.8	8.8	1.0	0.3
14	EXP 2	Seed	Low	6.8	3.8	8.0	0.0	4.8	13.5	4.0	0.5
15	EXP 2	Seed	High	7.5	2.3	0.0	0.3	5.0	13.0	0.5	0.5

Characterizing the phylogenetic variation of aster yellows phytoplasma subclades and virulence effectors in carrot (ongoing)

Aster yellows-group phytoplasma diseases are associated with infections by members of the *Candidatus* Phytoplasma *asteris* group, resulting in infections of herbaceous plants, including important commercial vegetables and grain crops. The phytoplasma is principally transmitted by the Aster leafhopper, *Macrosteles quadrilineatus*, although several known species of leafhoppers can acquire and transmit the phytoplasma. Following insect inoculation, the phytoplasma moves into the host plant phloem, where it can replicate and persist. These parasites produce an arsenal of virulence proteins that interact with host (plant) cells and interfere with developmental processes. Affected plants look dramatically different from their uninfected counterparts, and become very attractive to insect vectors. Inoculative leafhoppers are reported to overwinter in the southern United States and later migrate to northern latitudes in the spring, driving infection rates as they migrate. Samples of leafhoppers were collected in 2016 and 2017 from select locations in both the southern (AR, KS, OK, TX) and the northern United States (WI) in order to characterize the phylogenetic variation in populations of both leafhoppers and phytoplasma. Isolated phytoplasma was examined for geographic variation, including classification of phytoplasma strains, infection rates, and classification of virulence factors leading to increased infection rates. Phytoplasma virulence proteins SAP11 and SAP54 are responsible for the formation of overt disease symptoms and both virulence proteins increase the attractiveness of the plants to insect vectors. Geographically distinct populations of Aster leafhopper revealed both 16SrI-A and 16SrI-B clades of Aster phytoplasma in northern and southern leafhoppers. While similar clades were detected in geographically distinct locations, the proportion of clades and other genetic markers were dissimilarly distributed between southern and northern leafhopper populations in the United States.