2017 Hancock Agricultural Experiment Station Field Day

Potato and Vegetable Insect Research

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I. Full Season Reduced-Risk Colorado Potato Beetle Control, Large Plot Demonstration Trials (Field K-1)

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 April 25, with at-plant insecticides administered at this time.

	Trt	Target	Product	Form.	Delivery	Rate	Date	Actives	Group	Group Name
At-plant systemic treatments	1	1st gen	Platinum	75 SG	At-plant	2.67 oz/a	25 Apr	Thiamethoxam	4A	Neonicotinoids
			Blackhawk	36 WG	Foliar Rescue	3 oz wt/a	5 Jul	Spinosad	5	Spinosyns
		2nd gen	Minecto Pro	1.37 SC	Foliar	10 fl oz/a	11 Jul	Cyantraniliprole	28	Diamides
								Abamectin	6	Avermectins
			Minecto Pro	1.37 SC	Foliar	8.5 fl oz/a	TBD	Cyantraniliprole	28	Diamides
								Abamectin	6	Avermectins
	2	1st gen	Belay	2.13 SC	At-plant	10 fl oz/a	25 Apr	Clothianidin	4A	Neonicotinoids
			Agri-Mek	0.7 SC	Foliar Rescue	3.5 fl oz/a	5 Jul	Abamectin	6	Avermectins
		2nd gen	Harvanta	50 SL	Foliar	16 fl oz/a	11 Jul	Cyclaniliprole	28	Diamides
			Harvanta	50 SL	Foliar	13 fl oz/a	TBD	Cyclaniliprole	28	Diamides
	3	1st gen	Belay	2.13 SC	At-plant	12 fl oz/a	25 Apr	Clothianidin	4A	Neonicotinoids
			Agri-Mek	0.7 SC	Foliar Rescue	3.5 fl oz/a	5 Jul	Abamectin	6	Avermectins
		2nd gen	Exirel	100 SE	Foliar	13.5 fl oz/a	11 Jul	Cyantraniliprole	28	Diamides
			Exirel	100 SE	Foliar	10 fl oz/a	TBD	Cyantraniliprole	28	Diamides
	4	1st gen	Verimark	20 SC	At-plant	10.5 fl oz/a	25 Apr	Cyantraniliprole	28	Diamides
			Blackhawk	36 WG	Foliar Rescue	3 oz wt/a	21 Jun	Spinosad	5	Spinosyns
		2nd gen	Venom	70 SG	Foliar	1.5 oz wt/a	11 Jul	Dinotefuran	4A	Neonicotinoids
			Venom	70 SG	Foliar	1.25 oz wt/a	TBD	Dinotefuran	4A	Neonicotinoids
	5	1st gen	Verimark	20 SC	At-plant	13.5 fl oz/a	25 Apr	Cyantraniliprole	28	Diamides
			Blackhawk	36 WG	Foliar Rescue	3 oz wt/a	21 Jun	Spinosad	5	Spinosyns
		2nd gen	Scorpion	3.24 SL	Foliar	2.75 fl oz/a	11 Jul	Dinotefuran	4A	Neonicotinoids
			Scorpion	3.24 SL	Foliar	2.5 fl oz/a	TBD	Dinotefuran	4A	Neonicotinoids
	6	1st gen	AdmirePro	4.6 SC	At-plant	8.7 fl oz/a	25 Apr	Imidacloprid	4A	Neonicotinoids
			Agri-Mek	0.7 SC	Foliar Rescue	3.5 fl oz/a	21 Jun	Abamectin	6	Avermectins
		2nd gen	Besiege	1.25 ZC	Foliar	9 fl oz/a	11 Jul	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
			Besiege	1.25 ZC	Foliar	7.5 fl oz/a	TBD	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
Foliar treatments	7	1st gen	Rimon	0.83 EC	Foliar	12 fl oz/a	14 Jun	Novaluron	15	Benzoylureas
			Rimon	0.83 EC	Foliar	10 fl oz/a	21 Jun	Novaluron	15	Benzoylureas
		2nd gen	Assail	30 SG	Foliar	4 oz wt/a	11 Jul	Acetamiprid	4A	Neonicotinoids
			Assail	30 SG	Foliar	3.5 oz wt/a	TBD	Acetamiprid	4A	Neonicotinoids
	8	1st gen	Harvanta	50 SL	Foliar	16 fl oz/a	14 Jun	Cyclaniliprole	28	Diamides
			Harvanta	50 SL	Foliar	14 fl oz/a	21 Jun	Cyclaniliprole	28	Diamides
		2nd gen	AdmirePro	4.6 SC	Foliar	1.3 fl oz/a	11 Jul	Imidacloprid	4A	Neonicotinoids
			AdmirePro	4.6 SC	Foliar	1.1 fl oz/a	TBD	Imidacloprid	4A	Neonicotinoids
	9	1st gen	Besiege	1.25 ZC	Foliar	9 fl oz/a	14 Jun	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
			Besiege	1.25 ZC	Foliar	7.5 fl oz/a	21 Jun	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
		2nd gen	Actara	25 WDG	Foliar	3 oz wt/a	11 Jul	Thiamethoxam	4A	Neonicotinoids
			Actara	25 WDG	Foliar	2.5 oz wt/a	TBD	Thiamethoxam	4A	Neonicotinoids
	10	1st gen	Agri-Mek	0.7 SC	Foliar	3.5 fl oz/a	14 Jun	Abamectin	6	Avermectins
			Agri-Mek	0.7 SC	Foliar	3 fl oz/a	21 Jun	Abamectin	6	Avermectins
		2nd gen	Besiege	1.25 ZC	Foliar	9 fl oz/a	11 Jul	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
			Besiege	1.25 ZC	Foliar	7.5 fl oz/a	TBD	Chlorantraniliprole	28	Diamides
								Lambda-cyhalothrin	3	Pyrethroids
	11	1st gen	Blackhawk	36 WG	Foliar	3.3 oz wt/a	14 Jun	Spinosad	5	Spinosyns
			Blackhawk	36 WG	Foliar	3 oz wt/a	21 Jun	Spinosad	5	Spinosyns
		2nd gen	Belay	2.13 SC	Foliar	3 fl oz/a	11 Jul	Clothianidin	4A	Neonicotinoids
			Belay	2.13 SC	Foliar	2.5 fl oz/a	TBD	Clothianidin	4A	Neonicotinoids
	12	1st gen	Coragen	1.67 SC	Foliar	7.5 fl oz/a	14 Jun	Chlorantraniliprole	28	Diamides
			Coragen	1.67 SC	Foliar	5 fl oz/a	21 Jun	Chlorantraniliprole	28	Diamides
		2nd gen	Scorpion	3.24 SL	Foliar	2.75 fl oz/a	11 Jul	Dinotefuran	4A	Neonicotinoids
			Scorpion	3.24 SL	Foliar	2.5 fl oz/a	TBD	Dinotefuran	4A	Neonicotinoids

II. Evaluation of Registered and Experimental Foliar Insecticides for the Control of Colorado Potato Beetle 1st Generation (Field E-22)

This trial is conducted annually to evaluate the efficacy of standard rates of registered and experimental foliar insecticides applied to early instar larvae of the first generation of Colorado potato beetle *(Leptinotarsa decemlineata)*, and potato leafhopper adults *(Empoasca fabae)*. Treatments were applied on either two or three dates, as indicated on the right side of the table.

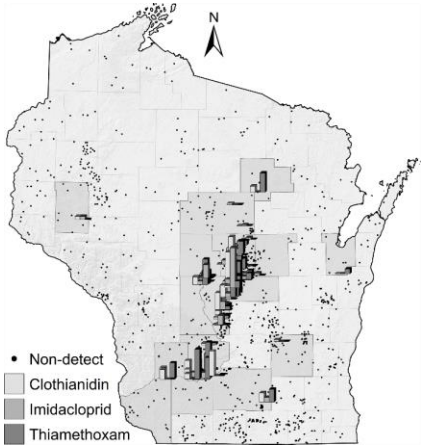
Trt	Product	Form.	Rate	Adj.[a]	Trt Date		
					7-Jun	14-Jun	21-Jun
1	Minecto Pro	163.5 SC	6 fl oz/a	A90	-	X	X
2	Minecto Pro	163.5 SC	8 fl oz/a	A90	-	X	X
3	Minecto Pro	163.5 SC	10 fl oz/a	A90	-	X	X
4	Blackhawk	36 WG	3.3 oz wt/a	A90	-	X	X
5	Besiege	150 ZC	9 fl oz/a	A90	-	X	X
6	Exirel	100 SE	10 fl oz/a	A90	-	X	X
7	Agri-Mek	84 SC	3 fl oz/a	A90	-	X	X
8	EXP 1		A (low)	-	X	X	X
9	EXP 1		B	-	X	X	X
10	EXP 1		C	-	X	X	X
11	EXP 1		D (high)	-	X	X	X
12	- CONTROL 1 -				-	-	-
13	Coragen	1.67 SC	7.5 fl oz/a	MSO	-	X	X
14	Rimon	0.83 EC	10 fl oz/a	A90	X		
	Rimon	0.83 EC	7 fl oz/a	A90	-	X	X
15	AdmirePro	4.6 SC	1.3 fl oz/a	A90	-	X	X
16	EXP 2		A	LI-700	X	X	X
17	- Adjuvant only -			LI-700	X	X	X
18	EXP 2		A	LI-700	X	X	X
19	EXP 2		A	LI-700	X	X	X
	+ Boric Acid	100 WSG	0.25 % w/w		X	X	X
20	EXP 2		A	LI-700	X	X	X
	+ Boric Acid	100 WSG	0.5 % w/w		X	X	X
21	Boric Acid	100 WSG	0.25 % w/w	LI-700	X	X	X
22	Boric Acid	100 WSG	0.5 % w/w	LI-700	X	X	X
23	- cancelled -				-	-	-
24	Trident	14.32 LC	3 qt/a		X	X	X
25	Trident	14.32 LC	6 qt/a		X	X	X
26	- CONTROL 2 -				-	-	-
27	Athena	0.87 EC	17 fl oz/a	A90	-	X	X
28	Harvanta	50 SL	16.4 fl oz/a	A90	-	X	X
29	Grandevo	70 WG	3 lb/a	NFP	X	X	X
30	Venerate XC	94.46 SL	8 qt/a	NFP	X	X	X

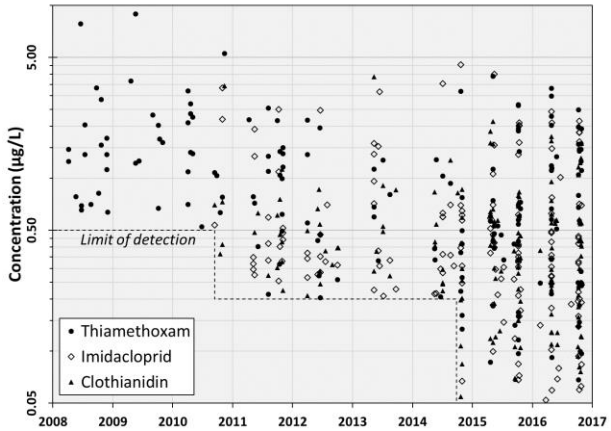
a. Adjuvant abbreviations: A90=Activator 90; NFP=NuFilm P. Activator 90 and LI-700 added at 0.1% v/v. MSO and NuFilm P added at 0.25% v/v.

Potato cv. 'Yukon Gold' machine planted April 17. Treatments were applied with a CO_2 pressurized backpack sprayer with a 6 ft boom operating at 30 psi delivering 20 gpa through 4 flat-fan nozzles (Tee Jet XR8002) spaced 18" apart while travelling at 3.5 ft / sec.

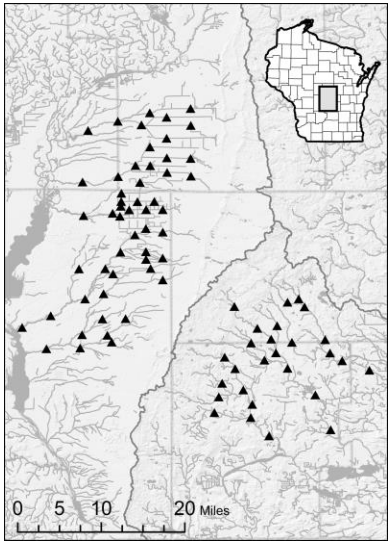
III. Groundwater quality evaluations

Systemic neonicotinoid insecticides are commonly used in vegetable production in central Wisconsin and across the United States, but high usage volumes of this class of water-soluble insecticides has raised questions about their accumulation in groundwater resources. Since 2008, the Wisconsin Department of Agriculture, Trade and Consumer Protection has been testing for neonicotinoid insecticides as part of their standard battery of water quality tests in groundwater monitoring wells and private potable well samples.





We have been investigating these data as part of our lab's water quality focus. As seen in the figure at left, the bulk of reported neonicotinoid detections are found in the Central Sands and lower Wisconsin River valley, both regions containing sandy, fast-draining soils, shallow aquifers, and frequent applications of neonicotinoid compounds. In the figure at right, individual detections are shown over time.



IV. Surface water quality evaluations

Groundwater monitoring efforts, both in our lab and at the Department of Ag (see Section III), show that neonicotinoid groundwater contaminants are found throughout central Wisconsin. Many of the surface water streams in central Wisconsin are in fact groundwater-fed, raising concerns that both agricultural runoff and groundwater inflow may lead to neonicotinoid insecticides appearing in streams and rivers in the area, which poses a risk for aquatic invertebrates that form the basis of the food chains in these environments, many of which are cherished trout-fishing streams.

To better understand the extent of contamination in groundwater-fed streams within central Wisconsin's vegetable producing regions we aim to describe the spatial distribution of contaminants and track changes in such contaminants within and between years. We also aim to describe factors that contribute to these characteristics, such as differences in agricultural intensity in the surrounding watersheds. We are monitoring five streams in the Central Sands, a region of relatively intensive agriculture, as well as several river systems in the relatively less agriculturally intense Fox River watershed to the southeast of the Central Sands. Broadening our understanding of the transport and environmental fate neonicotinoids, in addition to updating the current profile of affected aquatic invertebrates will allow us to better weigh the risks and environmental impacts associated with the heavy usage of these agro-chemicals.