Hancock Agricultural Experiment Station, 2009 Field Day; Potato and Vegetable Insect Research

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I. Colorado Potato Beetle; Neonicotinoid Statewide Insensitivity 2007-09: Population Changes (Fig. 1) [1].

County	Site ID	Year	(P<0.0001) (=0.05)	Estimated slope (± SE)	LD_{50} (± 95% CL)	Resistance Ratio[2]
Adams	A	2007	(P=0.4081)	11.2% ± 1.3	0.655 (0.452 – 0.822)	0.655 / 0.031 (**15.6**)
		2008	(P=0.2231)	9.3% ± 1.1	0.476 (0.378 – 0.613)	0.476 / 0.042 (**11.3**)
		2009	(P=0.2877)	7.7% ± 2.2	0.589 (0.375 – 0.710)	0.589 / 0.028 (**21.0**)
	B	2007	(P=0.3429)	9.0% ± 0.8	0.855 (0.683 – 0.919)	0.855 / 0.031 (**21.1**)
		2008	(P=0.2416)	11.3% ± 1.1	1.23 (0.822 – 1.43)	1.23 / 0.042 (**29.3**)
		2009	(P=0.4592)	13.3% ± 2.8	1.44 (1.131 – 2.09)	1.44 / 0.028 (**51.4**)
Columbia	AAES	2007	(P=0.0052)	10.6% ± 0.9	0.049 (0.031 – 0.067)	0.049 / 0.031 (**1.2**)
		2008	(P=0.0049)	11.9% ± 1.9	0.036 (0.020 – 0.079)	0.036 / 0.042 (**0.9**)
		2009	(P=0.0103)	12.1% ± 1.3	0.031 (0.019 – 0.053)	0.031 / 0.028 (**1.1**)
Portage	C	2007	(P=0.1682)	7.0% ± 1.8	0.398 (0.253 – 0.561)	0.398 / 0.031 (**12.8**)
		2008	(P=0.4507)	6.4% ± 1.4	0.512 (0.373 – 0.673)	0.512 / 0.042 (**12.2**)
		2009	(P=0.2347)	8.9% ± 2.6	0.821 (0.691 – 0.944)	0.821 / 0.028 (**29.3**)
Waushara	HAES	2007	(P=0.0761)	7.4% ± 1.6	0.432 (0.309 – 0.562)	0.432 / 0.031 (**13.9**)
		2008	(P=0.1639)	10.9% ± 1.0	0.368 (0.232 – 0.517)	0.368 / 0.042 (**8.8**)
		2009	(P=0.0452)	9.3% ± 1.2	0.311 (0.234 – 429)	0.311 / 0.028 (**11.1**)
	D	2007	(P=0.0552)	9.6% ± 1.2	0.113 (0.040 – 0.209)	0.113 / 0.031 (**3.7**)
		2008	(P=0.0742)	11.0% ± 1.9	0.091 (0.043 – 0.162)	0.091 / 0.042 (**2.2**)
		2009	(P=0.0211)	9.3% ± 1.5	0.186 (0.106 – 0.284)	0.186 / 0.028 (**6.6**)

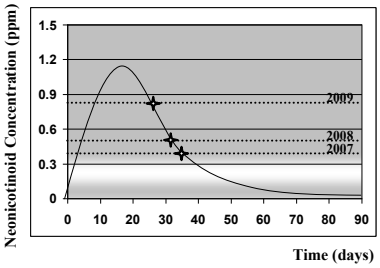

Figure 1. Hypothetical in-plant concentration of an at-plant neonicotinoid insecticide over time. Illustration depicts annual changes in adult CPB insensitivity at a single location (population C: Portage County, WI) over a 3 year period, 2007-09

[1] Special thanks to all cooperating growers and pest management practitioners for their assistance with the CPB insensitivity project (Mr. Randy Van Haren Pest Pros Inc., Plainfield, WI & Mr. Andy Merry, Antigo, WI, Mr. Anders Huseth, Department of Entomology)

[2] Resistance ratio estimates calculated against a New Jersey reference control strain of Colorado potato beetle adults obtained in 2007, 2008, and 2009 with associated (LD_{50} of 0.031, 0.042, and 0.029, respectively.

II. 2009 Full Season – Reduced-Risk, Colorado Potato Beetle Control, Large Plot Demonstration Trials (Hancock Agricultural Experiment Station, Field K25)

	Treatments	Active Ingredient	Application Rates	Application Number	Plot Numbers
	At-plant systemic programs (with neonicotinoids):				
1)	Cruiser® FS	thiamethoxam	0.27 fl oz / cwt	1 (at-plant)	(101, 201, 301)
	Agri-Mek® 0.14EC	abamectin	12.0 fl oz / cwt	1 (1st generation)	
	Volium Xpress™	chlorantraniliprole	7.0 & 7.0 fl oz / A	2 (2nd generation)	
2)	AdmirePro®	imidacloprid	8.7 fl oz / A	1 (at-plant)	(102, 202, 302)
	BlackHawk®	spinosad	3.3 oz. / A 2	1 (1st generation)	
	Alverde™	metaflumizone	4.5 & 4.5 fl oz / A	2 (2nd generation)	
3)	Platinum® 2SC	thiamethoxam	8.0 fl oz / A	1 (at-plant)	(103, 203, 303)
	Coragen® 1.67SC	rynaxypyr	3.5 & 3.5 fl oz. / A	2 (2nd generation)	
4)	Belay® 2.13SC	clothianadin	9.6 fl oz / A	1 (at-plant)	(104, 204, 304)
	Coragen® 1.67SC	rynaxapyr	5.0 & 3.5 fl oz / A	2 (2nd generation)	
	Foliar programs (with and without neonicotinoids):				
5)	Endigo® ZC	thiamethoxam + lambda-cyhalothrin	4.5 fl oz / A	1 (1st generation)	(105, 205, 305)
	Alverde™ SC	metaflumizone	4.5 & 4.5fl oz / A	2 (2nd generation)	
6)	Radiant® 2SC	spinetoram	8.0 fl oz / A	1 (1st generation)	(106, 206, 306)
	Alverde™ SC	metaflumizone	4.5 & 4.5 fl oz / A	2 (2nd generation)	
7)	Rimon® 0.83EC	novaluron	12.0 fl oz / A	1 (1st generation)	(107, 207, 307)
	Coragen® 1.67SC	rynaxypyr	5.0 & 3.5 fl oz. / A	2 (2nd generation)	
8)	Actara® 40WDG	thiamethoxam	3.0 oz / A	1 (1st generation)	(108, 208, 308)
	Voliam Xpress™	chlorantraniliprole	7.0 & 5.0 fl oz / A	2 (2nd generation)	
9)	Coragen® 1.67SC	rynaxypyr	5.0 fl oz / A	1 (1st generation)	(109, 209, 309)
	Assail® 30SG	acetamiprid	4.0 & 4.0 oz / A	2 (2nd generation)	
10)	BlackHawk®	spinosad	3.3 oz / A	1 (1st generation)	(110, 210, 310)
	Coragen® 1.67SC	rynaxypyr	3.5 & 3.5 fl oz / A	2 (2nd generation)	
11)	Brigadier®	imidacloprid + bifenthrin	6.14 fl oz / A	1 (1st generation)	(111, 211, 311)
	Coragen® 1.67SC	rynaxypyr	3.5 & 3.5 fl oz / A	2 (2nd generation)	
12)	Radiant® SC	spinetoram	8.0 fl oz / A	1 (1st generation)	(112, 212, 312)
	Coragen® 1.67SC	rynaxypyr	3.5 & 3.5 fl oz / A	2 (2nd generation)	
13)	Novodor® FC	*Bacillus thuringiensis* ssp. *tenebrionis*	2.75 & 2.0 L / A	2 (1st generation)	(113, 213, 313)
	Entrust® WP	spinosad	2.0 & 2.0 fl oz / A	2 (2nd generation)	
14)	Agri-Mek® 0.15EC	abamectin	12.0 fl oz / A	1 (1st generation)	(114, 214, 314)
	Voliam Flexi™	chlorantraniliprole + thiamethoxam	7.0 & 5.0 fl oz / A	2 (2nd generation)	
15)	Actara® WDG	thiomethoxam	3.0 oz / A	1 (1st generation)	(115, 215, 315)
	Agri-Mek® 0.15EC	abamectin	14.0 & 10.0 fl oz / A	2 (2nd generation)	

III. 2009 Novaluron (Rimon® 0.83EC) Application Refinement: Control of Colorado Potato Beetle, (AAES, Arlington, WI).

	Treatments	Application Rates	Application Number	Plot Numbers	Mean Proportion of Viable Egg Masses 15 June	25 June	1 July	8 July	Mean
1)	Rimon® 0.83EC	12 fl oz. / A	2 (14 days apart)	(101, 201, 301, 401)	0.85	0.9	0.3	0.75	**0.7**
2)	Rimon® 0.83EC + Alverde™ 240SC	6 fl oz. / A 2.4 fl oz / A	2 (14 days apart) 2 (14 days apart)	(102, 202, 302, 402)	1.00	0.9	0.55	0.95	**0.85**
3)	Alverde™ 240SC	4.75 fl oz. / A	2 (14 days apart)	(103, 203, 303, 403)	1.00	0.95	0.4	0.85	**0.8**
4)	Rimon® 0.83EC	8 fl oz. / A	3 (10 days apart)	(104, 204, 304, 404)	1.00	0.8	0.45	0.4	**0.66**
5)	Rimon 0.83EC	6 fl oz. / A	4 (7 days apart)	(105, 205, 305, 405)	1.00	0.3	0.6	0.3	**0.55**
6)	UTC			(106, 206, 306, 406)	1.00	0.7	0.95	0.85	**0.88**

IV. 2009 Foliar Insecticide Evaluations for the Control of Colorado Potato Beetle, (HAES, Hancock, WI Fields C31-33)[1].

Treatments	Active Ingredient	Application Rate	Plot Numbers
1) Brigadier	imidacloprid +bifenthrin	4.8 fl oz / A	(101, 201, 301, 401)
2) Brigadier	imidacloprid +bifenthrin	6.14 fl oz / A	(102, 202, 302, 402)
3) HGW 86 OD	experimental	3.37 fl oz / A	(103, 203, 303, 403)
4) HGW 86 OD		6.74 fl oz / A	(104, 204, 304, 404)
5) HGW 86 OD		10.1 fl oz / A	(105, 205, 305, 405)
6) HGW 86 OD		20.5 fl oz / A	(106, 206, 306, 406)
7) HGW 86 OD + MSO		3.37 fl oz / A	(107, 207, 307, 407)
8) Coragen 1.67 SC	rynaxypyr	3.45 fl oz /A	(108, 208, 308, 408)
9) Coragen 1.67 SC	rynaxypyr	5.06 fl oz /A	(109, 209, 309, 409)
10) Coragen 1.67SC + MSO		7.0 fl oz /A	(110, 210, 310, 410)
11) Provado	imidicloprid	3.8 fl oz /A	(111, 211, 311, 411)
12) GWN-1970	experimental	21.3 oz / A	(112, 212, 312, 412)
13) GWN-1970 + GWN 9810		21.3 + 8.0 oz / A	(113, 213, 313, 413)
14) Assail	acetamiprid	4.0 oz / A	(114, 214, 314, 414)
15) UTC			(115, 215, 315, 415)
16) Actara	thiamethoxam	1.5 oz / A	(116, 216, 316, 416)
17) Actara	thiomethoxam	3.0 oz / A	(117, 217, 317, 417)
18) Belay 2.13 SC	clothianadin	1.9 fl oz / A	(118, 218, 318, 418)
19) Belay 2.13 SC	clothianadin	2.8 fl oz / A	(119, 219, 319, 419)
20)Warrior II	lambda-cyhalothrin	1.92 fl oz / A	(120, 220, 320, 420)
21) Leverage	imidacloprid + Baythroid	3.0 fl oz / A	(121, 221, 321, 421)
22) Leverage	imidacloprid +Baythroid	3.8 fl oz / A	(122, 222, 322, 422)
23)XXXX	experimental	8.0 g a.i. / A	(123, 223, 323, 423)
24)XXXX	experimental	16 g a.i. / A	(124, 224, 324, 424)
25)XXXX	experimental	24 g a.i. / A	(125, 225, 325, 425)
26) Asana	esfenvalerate + PBO	9.6 fl oz / A	(126, 226, 326, 426)
27)Rimon	novaluron	9.0 fl oz / A	(127, 227, 327, 427)
28)Rimon	novaluron	12.0 fl oz / A	(128, 228, 328, 428)
29) Vydate	oxamyl	4 pt / A	(129, 229, 329, 429)
30) UTC			(130, 230, 330, 430)

Treatments	Active Ingredient	Application Rate	Plot Numbers
31) Agri-Mek	abamectin	8.0 fl oz / A	(131, 231, 331, 431)
32) Agri-Mek	abamectin	12.0 fl oz / A	(132, 232, 332, 432)
33) SpinTor	spinosad	4.5 fl oz / A	(133, 233, 333, 433)
34) SpinTor	spinosad	6.0 fl oz / A	(134, 234, 334, 434)
35) Radiant	spinetoram	6.0 fl oz / A	(135, 235, 335, 435)
36) Radiant	spinetoram	8.0 fl oz / A	(136, 236, 336, 436)
37) Thiodan	endosulfan	1.33 qt / A	(137, 237, 337, 437)
38) Imidan	phosmet	1.33 lb / A	(138, 238, 338, 438)
39) Voliam Flexi	CTPR + thiamethoxam	4.0 oz / A	(139, 239, 339, 439)
40) Voliam Xpress	CTPR + lambda-cyhalothrin	7.0 fl oz / A	(140, 240, 340, 440)
41) Agri-Flex	abamectin + thiamethoxam	4.5 fl oz / A	(141, 241, 341, 441)
42) Endigo	thiomethoxam + (Warrior II)	4.0 fl oz / A	(142, 242, 342, 442)
43) Endigo	thiomethoxam + (Warrior II)	4.5 fl oz / A	(143, 243, 343, 443)
44) Agri-Mek SC	abamectin	1.75 fl oz / A	(144, 244, 344, 444)
45) UTC			(145, 245, 345, 445)
46) Mustang Max	zeta-cypermethrin	4.7 fl oz / A	(146, 246, 346, 446)
47) Venom	dinotefuran	1.0 oz / A	(147, 247, 347, 447)
48) Venom	dinotefuran	1.5 oz / A	(148, 248, 348, 448)
49) Novodor	*B.t. tenebrionis*	2.75 L / A	(149, 249, 349, 449)
50) Novodor	*B.t. tenebrionis*	2.0 L / A	(150, 250, 350, 450)
51) Temprid	imidacloprid+cyfluthrin	2.4 fl oz / A	(151, 251, 351, 451)
52) Temprid	imidacloprid+cyfluthrin	2.8 fl oz / A	(152, 252, 352, 452)
53) BlackHawk	spinosad	2.25 oz / A	(153, 253, 353, 453)
54) BlackHawk	spinosad	3.2 oz / A	(154, 254, 354, 454)
55) Alverde	metaflumizone	4.5 fl oz / A	(155, 255, 355, 455)
56) Alverde	metaflumizone	6.0 fl oz / A	(156, 256, 356, 456)
57) Temprano	abamectin	8.0 fl oz / A	(157, 256, 356, 456)
58) Temprano	abamectin	12.0 fl oz / A	(158, 258, 358, 458)
59) UTC			(159, 259, 359, 459)

[1] Foliar insecticides applied with a 6' boom operating at 30 psi delivering 24.9 gpa through 3 flat-fan nozzles (8002VS-XR) spaced 18" apart. Two applications of each foliar insecticide applied 16 and 23 June, 2008.

V. 2009 At-Plant, Systemic Insecticide Evaluations for the Control of Colorado Potato Beetle, (Hancock Agricultural Experiment Station, Hancock, WI Field E 23)[1].

Treatments	Active Ingredient	Application Rate	Plot Numbers
1) UTC			(101, 201, 301, 401)
2) Tops MZ (CTL)	thiophanate/ mancozeb		(102, 202, 302, 402)
3) Maxim (CTL)	fludioxonil		(103, 203, 303, 403)
4) Cruiser	thiomethoxam (seed)	0.16 fl oz / cwt	(104, 204, 304, 404)
5) CruiserMaxx	thiomethoxam (seed)	0.27 fl oz / cwt	(105, 205, 305, 405)
6) AdmirePro	imidacloprid (seed)	0.27 fl oz / cwt	(106, 206, 306, 406)
7) AdmirePro	imidacloprid (seed)	0.35 fl oz / cwt	(107, 207, 307, 407)
8) Cyazypyr	cyazypyr (seed)	0.115 fl oz / cwt	(108, 208, 308, 408)
9) Cyazypyr	cyazypyr (seed)	0.23 fl oz / cwt	(109, 209, 309, 409)
10) Cyazypyr	cyazypyr (seed)	0.29 fl oz / cwt	(110, 210, 310, 410)
11) Cyazypyr	cyazypyr (seed)	0.345 fl oz / cwt	(111, 211, 311, 411)
12) Belay SC	clothianadin (seed)	0.4 fl oz / cwt	(112, 212, 312, 412)
13) Belay SC	clothianadin (seed)	0.5 fl oz / cwt	(113, 213, 313, 413)
14) Belay SC	clothianadin (seed)	0.6 fl oz / cwt	(114, 214, 314, 414)
15) V-10263	experimental (seed)	0.34 fl oz / cwt	(115, 215, 315, 415)
16) V-10263	experimental (seed)	0.42 fl oz / cwt	(116, 216, 316, 416)
17) V-10263	experimental (seed)	0.54 fl oz / cwt	(117, 217, 317, 417)
18) V-10264	experimental (seed)	1.3 fl oz / cwt	(118, 218, 318, 418)
19) V-10264	experimental (seed)	1.625 fl oz / cwt	(119, 219, 319, 419)
20) V-10264	experimental (seed)	1.95 fl oz / cwt	(120, 220, 320, 420)
21) Experimental	experimental	0.05 lb / A	(121, 221, 321, 421)
22) Experimental	experimental	0.1 lb / A	(122, 222, 322, 422)
23) Experimental	experimental	0.15 lb / A	(123, 223, 323, 423)

Treatments	Active Ingredient	Application Rate	Plot Numbers
24) Tops MZ Gaucho	Tops MZ + imidacloprid	12.0 oz. / cwt	(124, 224, 324, 424)
25) Tops MZ Gaucho	Tops MZ + imidacloprid	16.0 oz. / cwt	(125, 225, 325, 425)
26) UTC			(126, 226, 326, 426)
27) Cyazypyr	cyazypyr	0.088 lb a.i. / A	(127, 227, 327, 427)
28) Cyazypyr	cyazypyr	0.134 lb a.i. / A	(128, 228, 328, 428)
29) Cyazypyr	cyazypyr	0.176 lb a.i. / A	(129, 229, 329, 429)
30) Cyazypyr	cyazypyr	0.264 lb a.i. / A	(130, 230, 330, 430)
31) AdmirePro	imidacloprid	7.0 fl oz / A	(131, 231, 331, 431)
32) AdmirePro	imidacloprid	8.7 fl oz / A	(132, 232, 332, 432)
33) Platinum	thiamethoxam	6.5 fl oz / A	(133, 233, 333, 433)
34) Platinum	thimethoxam	8.0 fl oz / A	(134, 234, 334, 434)
35) Belay (in-furrow)	clothianadan	10.8 fl oz / A	(135, 235, 335, 435)
36) Belay (in-furrow)	clothianadan	12.0 fl oz / A	(136, 236, 336, 436)

[1] Seed treatments were applied using an overhead spray system at the Hancock Agricultural Research Station on cut, suberized seed pieces of Russet Burbank 24 h prior to planting. In-furrow insecticide applications were applied in a 4" band over cut, suberized seed pieces placed in an open furrow using a CO_2 pressurized, backpack sprayer delivering 5 gpa at 24.9 psi with a single hollow-cone nozzle (TXVS-6). Seed treatment applications were applied 23 April and in-furrow applications applied 24 April, 2008.