

## 2013 Hancock Agricultural Experiment Station Field Day; Potato and Vegetable Insect Research

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### I. Colorado Potato Beetle; Neonicotinoid Statewide Insensitivity Among 6 Populations (Fig. 1)<sup>1</sup>.

Year	Population	County	Generation	N	Slope±SEM	LD <sub>50</sub>	(95% CL)	χ <sup>2</sup>	df	RR <sup>2</sup>
2012	WI-1	Columbia	1	500	1.43±0.39)	0.05	(0.025 - 0.31)	55.33	6	- -
2012	WI-40	Marinette	1	400	1.92±0.43)	0.55	(0.29 - 1.60)	28.94	5	19.67 (17.99-21.36)
2012	WI-41	Langlade	2	400	1.17±0.27)	1.27	(0.6 - 11.4)	13.69	5	45.47 (37.37-53.56)
2012	WI-42	Oconto	1	400	1.56±0.16	0.35	(0.28 - 0.44)	7.44	5	12.33 (11.46-13.21)
2012	WI-43	Marinette	1	400	1.81±0.21	0.50	(0.4 - 0.68)	7.29	5	17.97 (17.25-18.68)
2012	WI-45	Oneida	1	400	1.88±0.37	0.37	(0.23 - 0.64)	17.47	5	14.85 (14.09-15.64)

<sup>1</sup> 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 Huseeth, Department of Entomology)

<sup>2</sup> Resistance ratio estimates calculated against a Arlington Agricultural Experiment Station reference control strain of Colorado potato beetle adults (LD<sub>50</sub> = 0.03).

### II. Full Season – Reduced-Risk, Colorado Potato Beetle Control, Large Plot Demonstration Trials (Hancock Agricultural Experiment Station, Field K1)

Treatments	Active Ingredient	Application Rates	Application Number	Plot Numbers
<i>At-plant systemic programs:</i>				
1) Platinum 75SG Besiege 1.25ZC	thiamethoxam lambda-cyhalothrin	2.67 fl oz / A 9 & 7.5 fl oz / A	1 (26 April 2013) 2 (TBD)	(101, 201, 301)
2) Belay 2.13SC Agri-Mek 0.7SC	clothianadin abamectin	12.0 fl oz / A 3.5 & 3 fl oz / A	1 (26 April 2013) 2 (TBD)	(102, 202, 302)
3) Verimark 20SC Assail 30SG Blackhawk 36WG (rescue trt)	cyazypyr (cyantraniliprole) acetamiprid spinosad	10.2 fl oz / A 4.0 & 3.0 oz / A 3.3 oz wt / A	1 (26 April 2013) 2 (TBD) 3 (28 June 2013)	(103, 203, 303)
4) Verimark 20SC Actara 25WDG Agri-Mek 0.7SC (rescue trt)	cyazypyr (cyantraniliprole) thiamethoxam abamectin	13.5 fl oz / A 3.0 & 2.5 oz / A 3.5 fl oz / A	1 (26 April 2013) 2 (TBD) 1 (28 June 2013)	(104, 204, 304)
5) AdmirePro 4.6SC Radiant SC Agri-Mek 0.7SC (rescue trt)	imidacloprid spinetoram abamectin	8.7 fl oz / A 8.0 & 6.0 fl oz / A 3.5 fl oz / A	1 (26 April 2013) 2 (TBD) 1 (28 June 2013)	(105, 205, 305)
6) Scorpion 3.24SC Athena 0.83SC Blackhawk 36WG (rescue trt)	dinotefuran bifenthrin + abamectin spinosad	13.25 oz / A 17 fl oz / A 3.3 oz wt / A	1 (26 April 2013) 2 (TBD) 1 (28 June 2013)	(106, 206, 306)
<i>Foliar insecticide programs:</i>				
7) Rimon 0.83EC Exirel 10SE	novaluron cyazypyr (cyantraniliprole)	10.0, 7.0 & 7.0 fl oz / A 5.0 & 6.75 fl oz / A	3 (14, 21 and 28 June 2013) 2 (TBD)	(107, 207, 307)
8) Coragen 1.67SC AdmirePro 4.6SC	rynaxypyr (chlorantraniliprole) imidacloprid	5.0 & 3.5 fl oz / A 1.3 & 1.0 oz / A	2 (21 and 28 June 2013) 2 (TBD)	(108, 208, 308)
9) Agri-Flex 1.55EC Besiege 1.25ZC	abamectin + thiamethoxam lambda-cyhalothrin	8.5 & 6.0 fl oz / A 9.0 & 7.5 fl oz / A	2 (21 and 28 June 2013) 2 (TBD)	(109, 209, 309)
10) Blackhawk 36WG Exirel 10 SE	spinosad cyazypyr (cyantraniliprole)	3.3 & 2.5 oz / A 5.0 & 5.0 fl oz / A	2 (21 and 28 June 2013) 2 (TBD)	(110, 210, 310)
11) Radiant SC Actara 25WD	spinetoram thiamethoxam	8.0 & 6.0 fl oz / A 3.0 & 2.5 fl oz / A	2 (21 and 28 June 2013) 2 (TBD)	(111, 211, 311)
12) Athena 0.87EC AdmirePro 4.6 SC	bifenthrin + avermectin imidacloprid	17.0 & 14.0 fl oz / A 1.3 & 1.0 fl oz / A	2 21 and 28 June 2013) 2 (TBD)	(112, 212, 312)
13) Actara 25WDG Besiege 1.25ZC	thiamethoxam lambda-cyhalothrin	3.0 & 1.5 oz / A 9.0 & 7.5 fl oz / A	2 (21 and 28 June 2013) 2 (TBD)	(113, 213, 313)
14) Belay 2.13SC Coragen 1.67SC	clothianadin rynaxypyr (chlorantraniliprole)	3.0 & 2.5 fl oz / A 5.0 & 5.0 oz / A	2 (21 and 28 June 2013) 2 (TBD)	(114, 214, 314)
15) Exirel 10SE Belay 2.13SC	cyazypyr (cyantraniliprole) clothianadin	4.3 & 5.0 fl o 3.0 & 2.5 fl oz / A	2 (TBD) 2 (TBD)	(115, 215, 315)

<sup>1</sup> Foliar insecticides applied with a 24' boom operating at 30 psi delivering 19.9 gpa through 12 flat-fan nozzles (8002VS-XR) spaced 18" apart. Applications of foliar insecticides timed to control 1<sup>st</sup> and 2<sup>nd</sup> generation Colorado potato beetle.



**III. Foliar Insecticide Evaluations for the Control of Colorado Potato Beetle, (Hancock Agricultural Experiment Station, Hancock, WI Fields C32- 33)<sup>1</sup>.**

Treatments	Active Ingredient	Application Rate	Plot Numbers	Treatments	Active Ingredient	Application Rate	Plot Numbers
1) UTC			(101, 201, 301, 401)	21) Actara	thiamethoxam	3.0 oz / A	(121, 221, 321, 421)
2) Benevia 100D + MSO	cyazypyr methylated seed oil	5.0 fl oz / A 0.5% V:V	(102, 202, 302, 402)	22) Endigo	lambda-cyhalothrin +thiamethoxam	4.0 fl oz / A	(122, 222, 322, 422)
3) Exirel 10SE + MSO	cyazypyr methylated seed oil	5.0 fl oz / A 0.5% V:V	(103, 203, 303, 403)	23) Endigo	lambda-cyhalothrin +thiamethoxam	4.0 fl oz / A	(123, 223, 323, 423)
4) Exirel 10SE	cyazypyr	5.0 fl oz / A	(104, 204, 304, 404)	24) Besiege	lambda-cyhalothrin	9.0 fl oz / A	(124, 224, 324, 424)
5) Exirel 10SE	cyazypyr	6.75 fl oz / A	(105, 205, 305, 405)	25) Agri-Flex	abamectin + thiamethoxam	6.0 fl oz / A	(125, 225, 325, 425)
6) Coragen	rynaxypyr	4.5 fl oz / A	(106, 206, 306, 406)	26) Athena	abamectin+bifenthrin	13.0 fl oz / A	(126, 226, 326, 426)
7) Coragen	rynaxypyr	5.0 fl oz / A	(107, 207, 307, 407)	27) Athena	abamectin+bifenthrin	17.0 fl oz / A	(127, 227, 327, 427)
8) Exp 1	experimental	X g ai/ha	(108, 208, 308, 408)	28) Gladiator	abamectin+bifenthrin	12.0 fl oz / A	(128, 228, 328, 428)
9) Exp 1	experimental	X g ai/ha	(109, 209, 309, 409)	29) Gladiator	abamectin+bifenthrin	18.0 fl oz / A	(129, 229, 329, 429)
10) Exp 1	experimental	X g ai/ha	(110, 210, 310, 410)	30) Brigadier	bifenthrin+imidacloprid	6.14 fl oz / A	(130, 230, 330, 430)
11) AdmirePro	imidacloprid	1.3 fl oz / A	(111, 211, 311, 411)	31) UTC			(131, 231, 331, 431)
12) Provado	imidacloprid	3.8 fl oz / A	(112, 212, 312, 412)	32) Rimon	novaluron	9, 8, 7 fl oz / A	(132, 232, 332, 432)
13) Leverage 360	imidacloprid +beta-cyfluthrin	2.8 fl oz / A	(113, 213, 313, 413)	33) Rimon	novaluron	4X - 6.0 oz / A	(133, 233, 333, 433)
14) Belay	clothianadin	3.0 fl oz / A	(114, 214, 314, 414)				
15) IKI 3106	experimental	2.74 fl oz / A	(115, 215, 315, 415)				
16) IKI 3106	experimental	5.5 fl oz / A	(116, 216, 316, 416)				
17) UTC			(117, 217, 317, 417)				
18) Blackhawk	spinosad	2.5 oz / A	(118, 218, 318, 418)				
19) Blackhawk	spinosad	3.3 oz / A	(119, 219, 319, 419)				
20) Warrior II	lambda-cyhalothrin	1.92 fl oz / A	(120, 220, 320, 420)				

<sup>1</sup> Foliar insecticides applied with a 6' boom operating at 30 psi delivering 19.9 gpa through 3 flat-fan nozzles (8002VS-XR) spaced 18" apart. Two applications of each foliar insecticide applied 21 June and 28 June, 2013.

**IV. At-Plant, Systemic Insecticide Evaluations for the Control of Colorado Potato Beetle, (Hancock Agricultural Experiment Station, Hancock, WI Field C31)<sup>1</sup>.**

Treatments	Active Ingredient	Application Rate	Plot Numbers
1) UTC			(101, 201, 301, 401)
2) Verimark	cyazypyr (cyantraniliprole)	0.47 fl oz / cwt	(102, 202, 302, 402)
3) Verimark	cyazypyr (cyantraniliprole)	0.62 fl oz / cwt	(103, 203, 303, 403)
4) AdmirePro	imidacloprid	0.35 fl oz / cwt	(104, 204, 304, 404)
5) Cruiser	thiamethoxam	0.16 fl oz / cwt	(105, 205, 305, 405)
6) Belay	clothianadin	0.6 fl oz / cwt	(106, 206, 306, 406)
7) Platinum	thiamethoxam	2.67 fl oz wt/A	(107, 207, 307, 407)
8) Verimark	cyazypyr (cyantraniliprole)	10.3 fl oz / A	(108, 208, 308, 408)
9) Verimark	cyazypyr (cyantraniliprole)	13.5 fl oz / A	(109, 209, 309, 409)
10) AdmirePro	imidacloprid	8.7 fl oz / A	(110, 210, 310, 410)
11) Belay	clothianadin	12 fl oz / A	(111, 211, 311, 411)
12) UTC			(112, 212, 312, 412)

<sup>1</sup> 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<sub>2</sub> pressurized, backpack sprayer delivering 9.9 gpa at 30.0 psi with a single hollow-cone nozzle (TXVS-6). Seed treatment applications were applied 25 April and in-furrow applications applied 26 April, 2013.

**V. Insecticide / Fungicide Interaction Evaluations, (Hancock Agricultural Experiment Station, Hancock, WI C32 Field)<sup>1</sup>.**

Treatments	Application Rate	Plot Numbers
1) UTC		(101, 201, 301, 401)
2) Agri-Mek	14 oz / A	(102, 202, 302, 402)
3) Agri-Mek	3.5 oz / A	(103, 203, 303, 403)
4) Agri-Mek + Induce	14 & 0.25 oz / A	(104, 204, 304, 404)
5) Agri-Mek + Induce	14 & 0.5 oz / A	(105, 205, 305, 405)
6) Agri-Mek + Bravo Weather Silk	14 & 1.0 oz / A	(106, 206, 306, 406)
7) Agri-Mek + Bravo Weather Silk	14 & 16 oz / A	(107, 207, 307, 407)
8) Agri-Mek + Bravo Weather Silk	3.5 & 16 oz / A	(108, 208, 308, 408)
9) Agri-Mek + Induce + Bravo Weather Silk	14 oz / A & 0.25v/v	(109, 209, 309, 409)
10) Agri-Mek+ Induce + Bravo Weather Silk	14 oz / A & 0.5v/v & 16 oz/A	(110, 210, 310, 410)
11) Agri-Mek+ Induce + Bravo Weather Silk	14 oz / A & 1.0v/v & 16 oz/A	(111, 211, 311, 411)
12) Agri-Mek+ Induce + Bravo 720	14 oz / A & 0.25v/v & 16 oz/A	(112, 212, 312, 412)
13) Agri-Mek + Induce + Bravo 720	14 oz / A & 1.0 v/v & 16 oz/A	(113, 213, 313, 413)
14) Agri-Mek Mek + Induce + Bravo Weather Silk	14 oz / A & 0.25v/v & 16 oz/A	(114, 214, 314, 414)
15) Agri-Mek Mek + Induce + Bravo Weather Silk	14 oz / A & 1.0v/v & 16 oz/A	(115, 215, 315, 415)

<sup>1</sup> Foliar insecticides applied with a 6' boom operating at 30 psi delivering 19.9 gpa through 3 flat-fan nozzles (8002VS-XR) spaced 18" apart. Two applications of each foliar insecticide applied 21 June and 28 June, 2013.

**VI. 2013, Additional Vegetable Insect Research.**

**I. European corn borer (*Ostrinia nubilalis*) and corn earworm (*Helicoverpa zea*) control in succulent snap bean:**

Improved application techniques for the control of European corn borer in succulent snap bean. Investigating the influence of soil-applied, water-soluble anthranilic diamides for the control of ECB in snap beans. Tank mix applications with herbicide and fungicides. Experiments performed in cooperation with Del Monte Foods, Plover, WI.

**II. Current season management of Potato Virus Y (PVY) in seed potato production:**

Limiting the current season spread of PVY using novel foliar crop protectant technologies to meet certification requirements of the Wisconsin Certified Seed Potato Program. Experiments performed in cooperation with Langlade County Cooperative Extension, Antigo, WI.

More information can be found at.....<http://labs.russell.wisc.edu/vegeto/>



Appendix 1. Topical bioassay estimates for selected *L. decemlineata* populations in Wisconsin (2007-12).

Year	Population	County	Generation	N	Slope±SEM	LD <sub>50</sub>	(95% CL)	χ <sup>2</sup>	df	RR	
2007	WI-1	Columbia <sup>b</sup>	1	75	6.93±1.69	0.03	(0.03 - 0.036)	3.8482	3	-	-
2008	WI-10	Adams	1	76	2.5 ±1.99	0.92	(-)	20.3459	3	24.73	(11.35 - 53.89)
2008	WI-10	Adams	2	76	4.35±1.1	0.33	(0.21 - 0.41)	5.0929	3	8.78	(2.15 - 35.78)
2008	WI-11	Waushara	1	75	1.25±0.43	0.26	(0.15 - 0.69)	5.1914	3	7.06	(3.85 - 12.95)
2008	WI-11	Waushara	2	75	1.43±0.58	0.01	(0.00002 - 0.031)	5	3	0.34	(0.08 - 1.52)
2008	WI-11	Portage	2	75	0.53±0.49	2.20	(-)	1.717	3	59.26	(1.24-2842.83)
2008	WI-12	Portage	1	64	0.5±0.6	0.01	(-)	4.0534	3	0.25	(0-36.04)
2008	WI-13	Adams	1	75	1.88±0.5	0.43	(0.26 - 0.64)	0.7348	3	11.60	(7.52-17.91)
2008	WI-14	Waushara	1	75	2.67±0.6	0.32	(0.21 - 0.42)	1.8682	3	8.52	(5.86-12.38)
2008	WI-14	Waushara	2	73	2.98±0.67	0.41	(0.29 - 0.52)	4.1882	3	10.90	(7.88-15.08)
2008	WI-15	Oconto	2	59	3.69±1.64	0.03	(-)	10.9638	3	0.88	(0.52-1.49)
2008	WI-16	Portage	1	73	1.98±0.66	0.48	(0.20 - 0.69)	4.395	3	12.93	(8.08-20.67)
2008	WI-17	Portage	1	150	1.98±0.6	0.03	(0.0036 - 0.045)	13.6198	8	0.75	(0.39-1.42)
2008	WI-18	Waushara	1	75	2.55±0.55	0.53	(0.38 - 0.72)	5.0992	3	14.13	(9.95-20.07)
2008	WI-19	Portage	1	149	1.66±0.29	0.30	(0.21 - 0.41)	5.6677	8	8.09	(5.57-11.77)
2008	WI-19	Portage	2	146	7.35±1.57	0.24	(0.21 - 0.27)	0.5287	3	6.42	(5.14-8.03)
2008	WI-2	Langlade	1	75	1.95±1.3	0.13	(-)	10.6312	3	3.49	(0.89-13.62)
2008	WI-20	Portage	2	40	2.85±0.97	0.03	(0.0092 - 0.038)	3.4337	3	0.70	(0.42-1.16)
2008	WI-21	Adams	1	150	1.66±0.5	0.15	(0.039 - 0.32)	28.2281	8	4.07	(2.11-7.85)
2008	WI-22	Langlade	2	105	1.09±1.01	0.01	(-)	47.9491	5	0.40	(0.02-8.68)
2008	WI-23	Portage	2	48	1.81±0.71	0.08	(0.046 - 0.24)	4.7577	3	2.14	(1.25-3.67)
2007	WI-27	Langlade	2	48	2.96±1.29	0.02	(0.00033 - 0.024)	0.5336	2	0.42	(0.21-0.85)
2008	WI-3	Waushara	1	75	1.01±0.59	0.02	(-)	6.5453	3	0.67	(0.11-4.17)
2008	WI-4	Waushara	1	76	1.44±0.63	1.48	(0.8 - 1241)	3.515	3	39.94	(13.74-116.05)
2008	WI-4	Waushara	2	74	1.43±1.05	0.08	(-)	10.9939	3	2.22	(0.52-9.43)
2008	WI-5	Adams	2	146	0.87±0.6	0.79	(-)	6.4028	3	21.32	(7.25-62.75)
2008	WI-6	Adams	1	75	0.83±0.52	0.14	(-)	3.3113	3	3.67	(0.34-39)
2008	WI-7	Adams	1	75	2.46±0.8	0.24	(0.049 - 0.37)	4.0762	3	6.44	(3.26-12.73)
2008	WI-8	Waushara	1	78	1.26±0.89	0.81	(-)	6.3736	3	21.91	(9.76-49.19)
2008	WI-9	Adams	1	74	2.41±0.6	0.43	(0.23 - 0.59)	0.1641	3	11.45	(7.28-17.98)
2009	WI-1	Columbia	1	75	3.29±1.36	0.01	(0.01 - 0.02)	3.68	3	-	-
2009	WI-11	Waushara	1	75	0.72±0.93	0.02	(-)	8.80	3	0.65	(0.02-17.73)
2009	WI-24	Adams	1	75	2.46±0.81	0.08	(-)	8.09	3	2.24	(1.29-3.9)
2009	WI-24	Adams	2	48	1.27±0.65	0.09	(0 - 0.19)	6.24	3	2.54	(0.96-6.69)
2009	WI-25	Adams	2	76	3.12±0.96	0.07	(0.03 - 0.10)	1.12	3	1.91	(1.19 - 3.05)
2009	WI-26	Adams	1	75	1.72±0.59	0.03	(0.01 - 0.05)	1.23	3	0.88	(0.54-1.46)
2009	WI-27	Langlade	1	75	3.14±0.66	0.12	(0.09 - 0.15)	0.37	3	3.10	(2.28-4.22)
2009	WI-28	Marquette	1	75	5.17±0.99	0.06	(0.05 - 0.07)	0.86	3	1.57	(1.21-2.02)
2009	WI-29	Adams	1	75	4.21±1.51	0.80	(-)	9.68	3	21.63	(14.66-31.92)
2009	WI-30	Adams	2	76	2.1±0.63	0.06	(0.02 - 0.08)	3.20	3	1.55	(0.92-2.61)
2009	WI-31	Adams	1	75	1.01±0.53	0.15	(-)	2.37	3	4.00	(1.93-8.29)
2009	WI-32	Langlade	2	73	3.61±1.26	0.09	(-)	8.57	3	2.54	(1.66-3.89)
2009	WI-33	Adams	1	75	1.83±0.6	0.15	(0.10- 0.48)	0.85	3	3.93	(2.22-6.96)
2009	WI-38	Langlade	1	75	3.84±1.14	0.06	(0.02- 0.34)	6.72	3	1.49	(1.04-2.14)

2010	WI-1	Columbia	2	135	4.38±0.75	0.04	(0.03 - 0.05)	3.34	7	-	-
2010	WI-11	Waushara	1	135	1.33±0.34	0.97	(0.40 - 3.30)	17.51	7	25.98	(12.59-53.59)
2010	WI-11	Waushara	2	145	3.85±0.65	0.43	(0.34 - 0.51)	2.12	3	11.64	(8.92-15.2)
2010	WI-24	Adams	2	135	0.77±0.38	0.15	(-)	3.04	3	3.92	(1.48-10.41)
2010	WI-31	Adams	2	135	0.51±0.17	0.24	(0.06 - 0.76)	6.80	7	6.48	(2.32-18.06)
2010	WI-32	Langlade	2	179	1.55±0.44	0.18	(0.02 - 0.41)	12.21	4	4.92	(2.66-9.09)
2010	WI-33	Adams	2	135	1.25±0.22	0.08	(0.05 - 0.12)	11.77	7	2.17	(1.32-3.56)
2010	WI-34	Adams	2	150	0.58±0.17	2.94	(1.21 - 28.80)	3.22	8	79.16	(23.87-262.57)
2010	WI-35	Adams	2	148	2.07±0.42	1.14	(0.89 - 1.66)	2.45	3	30.76	(18.09-52.29)
2010	WI-36	Langlade	2	148	1.15±0.33	0.24	(0.14 - 0.99)	4.81	3	6.45	(3.08 - 13.52)
2010	WI-37	Langlade	2	107	1.46±1.00	0.10	(-)	7.49	2	2.67	(1.21-5.88)
2010	WI-6	Adams	1	196	1.64±0.22	0.22	(0.17 - 0.31)	7.10	5	0.22	(0.16-0.3)
2010	WI-6	Adams	2	150	2.58±0.44	0.77	(0.63 - 0.95)	0.29	3	0.77	(0.63-0.94)
2011	WI-1	Columbia	1	600	3.13±0.33)	0.03	(0.028 - 0.034)	14.11	6	-	-
2011	WI-11	Waushara	1	525	1.47±0.11)	0.48	(0.40 - 0.59)	6.20	5	17.23	(16.8-17.66)
2011	WI-13	Adams	1	425	1.63±0.14)	0.72	(0.59 - 0.87)	5.63	4	25.53	(24.55-26.5)
2011	WI-16	Portage	1	327	2.75±0.51)	0.38	(0.24 - 0.88)	10.94	3	13.45	(12.55-14.35)
2011	WI-31	Adams	1	500	2.03±0.26)	0.73	(0.51 - 1.047)	14.15	4	25.53	(23.86-27.98)
2011	WI-33	Adams	1	524	1.81±0.25)	0.39	(0.27 - 0.58)	15.78	5	13.45	(12.55-14.35)
2011	WI-34	Adams	1	524	1.90±0.26)	0.62	(0.41 - 0.94)	17.47	5	22.22	(21.01-23.43)
2011	WI-36	Oconto	1	120	0.44±0.82)	1.54	(-)	40.07	4	54.96	(46.44-63.47)
2011	WI-37	Langlade	1	120	1.26±0.38)	0.13	(0.08 - 0.43)	6.91	4	4.71	(4.31-5.11)
2011	WI-38	Langlade	1	120	1.86±0.62)	1.11	(-)	8.85	4	39.71	(24.55-55.75)
2011	WI-39	Langlade	1	119	1.32±0.41)	1.00	(0.44 - 18.94)	3.57	4	35.69	(-640.9-712.32)
2011	WI-44	Portage	1	525	1.49±0.28)	0.72	(0.39 - 1.47)	25.94	5	26.26	(24.54-27.98)
2012	WI-1	Columbia	1	500	1.43±0.39)	0.05	(0.025 - 0.31)	55.33	6	-	-
2012	WI-40	Marinette	1	400	1.92±0.43)	0.55	(0.29 - 1.60)	28.94	5	19.67	(17.99-21.36)
2012	WI-41	Langlade	2	400	1.17±0.27)	1.27	(0.6 - 11.4)	13.69	5	45.47	(37.37-53.56)
2012	WI-42	Oconto	1	400	1.56±0.16)	0.35	(0.28 - 0.44)	7.44	5	12.33	(11.46-13.21)
2012	WI-43	Marinette	1	400	1.81±0.21)	0.50	(0.4 - 0.68)	7.29	5	17.97	(17.25-18.68)
2012	WI-45	Oneida	1	400	1.88±0.37)	0.37	(0.23 - 0.64)	17.47	5	14.85	(14.09-15.64)

Model fits that did not converge to generate confidence intervals for LD50 estimates are represented by (-)

<sup>a</sup>R-ratio: Resistance Ratio comparing LD<sub>50</sub> of populations to response of WI-Susceptible population annually.

<sup>b</sup>Reference field population – University of Wisconsin Arlington Agricultural Research Station, Arlington, Wisconsin