Delaware Field and Vegetable Crop Insect Pest Management Trials
2022

David Owens
Entomology Extension Specialist
Carvel Research and Education Center
16483 County Seat Highway
Georgetown, DE 19947
(302) 856-2585 ext 574; E-mail owensd@udel.edu; (302) 698-7125 (cell)

Morgan Malone
Entomology Research Associate
Carvel REC
E-mail carvelent@gmail.com

Dylan Wilkerson
Term Researcher
Carvel REC
E-mail wilkers@udel.edu

Cody Stubbs
UD ENWC Master's Student
Carvel REC
E-mail bookman@udel.edu

Technical Support: Samantha Cotten, Calista Turman, Diana Flores, Pixie Rolleston, Bethany Knutson, Danielle Watkins, Morgan Marzec, Dick Monaco

UNIVERSITY OF DELAWARE

The purpose of this book is to disseminate insect, mite, and mollusk efficacy and field survey results for information only. These data are not meant to be used for marketing purposes. Inclusion or exclusion of a product from a trial is not meant as an endorsement of one or discrimination against another. Please note that not all products evaluated might be labeled for use on the crop in which they were tested on. If you have questions or concerns, feel free to contact David Owens anytime.

Acknowledgements

This research could not have been possible without the support from numerous individuals, farmers, and organizations, many of whom are listed below:

Carvel REC faculty and staff, especially:
Dr. Mark Isaacs (Director)
Dr. Gordon Johnson
Dr. Emmalea Ernest
James Adkins
Brian Hearn (Farm Manager)
Ward Harris
Gunnar Isaacs
Justin Jameson
Kyler LeCates
Chad Messick
George Petitgout
Warren Wiley
Buddy Willey

UMD Lower Eastern Shore Research and Education faculty and staff, especially:
David Armentrout (Farm Manager)

University of Maryland Eastern Shore
Dr. Simon Zebelo

Sussex County Council

Master Gardeners
George Dellinger
Ana Dittel
Dan Johnson (friend of George)
Brent Marsh

Competitive Grants:
DDA Specialty Crop Block Grant Program
Delaware Soybean Board
Northeast IPM Center
Northeast SARE
USDA NIFA CPPM program EIP 2021-70006-35651
USDA AFRI Sustainable Agricultural Systems

Industry Support:
Adama
BASF
Bayer
Brotherton Seed
Corteva
Dyna-Gro Seed
FMC
Gowan
IR-4
ISK Life Science
Nichino America
Pioneer
Syngenta
UPL
Vallent
Vestaron

University Collaborators:
Dr. Galen Dively, University of Maryland
Dr. Russel Groves, University of Wisconsin
Dr. Kelly Hamby, University of Maryland
Catherine Herms, Ohio State University
Dr. William Lamp, University of Maryland
Dr. Brian Nault, Cornell University
Dr. Alan Taylor, Cornell University
Dr. Sally Taylor, Virginia Tech Tidewater AREC

Dr. Simon Zebelo, University of Maryland Eastern Shore

Farmers and Consultants:

Mark Atkins
Jay Baxter
Hail Bennett
Will Betts
Donnie Brittingham
Henry Bergfelder
Gary Calloway
Keith and Will Carlisle
Wayne Crawley
Mark Collins
Gary Conaway
Bruce Daisy
Adam Dickerson
Wade Dunning
Tommy Eliason
Robbie Emmerson
Kevin Evans
Fifer Farms
Travis Hastings
Roland Hill
Hudson Consulting
Steve Isaacson
James Adkins
Mark Johnson
Glen Jones
Cory LeCates
Geno Lowe
Mark Wilson
Randy McCloskey
Bryan Melvin
Craig Murray
Nassau Valley Vineyards
Jim Palermo
Papen Farms
Maegan Perdue
Guy and Dale Phillips
Wayne Pierson
Lee Richardson
Salted Vines Vineyards
Richard L Sapp
Charlie Smith
Jamie Stafford
Greer Stayton
Phillip Sylvester
Trapwoods Consulting
Vincent Farms
Fred West
West Farms
Joanne Whalen
R.C. and Brent Willin
Richard Woolyhan
Chris and Mel Wyatt

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Vegetables

Peas 2022 Seedcorn Maggot 1

Location: Carvel REC, field 5
Variety: 'Wando'
Planting Date: 16 March
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 9 rows x 17'
Row Spacing: 7"
Seeding Rate: 875 seed per plot
Treatment Method: Seed treated by Dr. Alan Taylor at Cornell University
Sample Size: 2 rows x 6 row ft
Dest. Sample Size: 6 row ft
Dest. Sample Date: 3 May
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: 4 tons/acre poultry manure incorporated before planting. Austrian winter pea cover crop incorporated before planting. 'Old Roy' dogfood spread over plots at a rate of 256 grams / row. Reps III and IV were affected by severe crusting and ponding. TRT 3, 5 looked the most promising.

TRT	Material	Rate
1	UTC	---
2	Cruiser	
3	Entrust 80WP	0.25 mg ai/seed
4	Entrust 80WP	0.50 mg ai/seed
5	Entrust 240 SC	0.25 mg ai/seed
6	Lumiderm 625FS	0.15 mg ai/seed
7	Lumiderm 625FS	0.25 mg ai/seed
8	Lumivia 625FS	0.15 mg ai/seed

TRT	Stand			Runt		Dead	
	19 April	27 April	24 May	19 April	27 April	19 April	27 April
1	12.0 ± 7.0	7.0 ± 4.0	5.8 ± 3.0	3.0 ± 1.7	3.3 ± 1.9	0.3 ± 0.3	2.5 ± 1.5
2	15.3 ± 7.9	7.5 ± 3.7	4.3 ± 1.7	0.5 ± 0.3	3.8 ± 1.1	1.0 ± 0.6	6.3 ± 3.6
3	28.3 ± 3.8	28.5 ± 4.4	13.8 ± 1.9	3.3 ± 0.5	7.8 ± 1.0	1.5 ± 0.9	3.3 ± 1.4
4	12.8 ± 7.1	11.5 ± 6.1	6.8 ± 5.1	1.5 ± 0.6	4.0 ± 0.9	0.3 ± 0.3	2.0 ± 0.6
5	22.3 ± 7.7	20.8 ± 6.2	9.5 ± 2.9	2.8 ± 2.1	5.8 ± 1.1	0.5 ± 0.3	3.3 ± 1.5
6	15.8 ± 6.9	12.3 ± 5.7	6.0 ± 1.9	1.5 ± 0.6	6.0 ± 2.5	2.3 ± 1.3	5.0 ± 2.8
7	17.3±12.7	15.8±11.5	5.8 ± 3.4	2.0 ± 1.2	4.5 ± 2.7	0	1.8 ± 1.2
8	6.5 ± 3.3	5.5 ± 2.9	4.0 ± 2.3	1.3 ± 0.9	3.0 ± 1.8	0	2.8 ± 1.4
Anova	*P = 0.615 F = 0.77; df = 7, 24*	*P = 0.168 F = 1.66; df = 7, 24*	*P = 0.353 F = 1.18; df = 7, 24*	*P = 0.694 F = 0.67; df = 7, 24*	*P = 0.561 F = 0.85; df = 7, 24*	*P = 0.151 F = 1.72; df = 7, 24*	*P = 0.736 F = 0.62; df = 7, 24*

Peas 2022 Seedcorn Maggot 1B

Location: Carvel REC, field 5
Variety: ‘Jumpstart’
Planting Date: 16 March, March 29, April 5
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 9 rows x 17’
Row Spacing: 7”
Seeding Rate: 250 # per acre
Sample Size: 2 rows x 6 row ft
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: 4 tons/acre poultry manure incorporated before planting date 1. Austrian winter pea cover crop incorporated before planting.

Treatments: base fungicide (UTC), base fungicide + cruiser 0.5 mg (IST = insecticide seed treatment)

	TRT	**Total Stand 19-April**	**Runts 19-April**	**Dead 19-April**	**Total Stand 27-April**	**Runts 27-April**	**Dead 27 April**	**Stand 24 May**	**Runts 24 May**
Planting Date 1	UTC	51.8 ± 15.2	14.5 ± 1.7	0.3 ± 0.3	40.8 ± 13.1	5.5 ± 2.7	11.5 ± 2.8	9.8 ± 7.8	
	IST	83.0 ± 15.1	17.0 ± 5.8	3.0 ± 1.6	41.3 ± 14.9	10.5 ± 3.6	10.3 ± 4.3	22.0 ± 7.0	
	t-Test	*P = 0.098 t = 1.46; df = 6.0*	*P = 0.353 t = 0.41; df = 3.5*	*P = 0.090 t = 1.72; df = 3.1*	*P = 0.490 t = 0.03; df = 5.9*	*P = 0.302 t = 0.55; df = 5.6*	*P = 0.409 t = 0.24; df = 5.1*	*P = 0.144 t = 1.17; df = 5.9*	
Planting Date 2	UTC				14.0 ± 9.2	3.8 ± 2.8	0.5 ± 0.5	8.8 ± 4.2	
	IST				8.0 ± 4.0	3.3 ± 1.4	1.5 ± 1.2	3.8 ± 1.3	
	t-Test				*P = 0.290; t = 0.60; df = 4.1*	*P = 0.440 t = 0.16; df = 4.5*	*P = 0.241 t = 0.77; df = 4.0*	*P = 0.163 t = 1.14; df = 3.6*	
Planting Date 3	UTC							23.0 ± 7.0	6.0 ± 3.0
	IST							30.5 ± 19.5	7.0 ± 3.0
	t-test							*P = 0.384 t = 0.36; df = 1.3*	*P = 0.418 t = 0.23; df = 2.0*

Radish 2022 Seedcorn Maggot

Location: Carvel REC, Field 5
Variety: 'Champion'
Planting Date: 25 March
Experimental Design: Randomized complete block design with 5 treatments and 5 replicates
Plot size: 6 rows x 15'
Row Spacing: 15"
Seeding Rate: Earthway seeder with radish plate
Treatment Method: Seed treatment

Sample Size: 10 row ft
Harvest Date: 11 May
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: 4 tons/acre poultry manure incorporated before planting. Austrian winter pea cover crop incorporated before planting. 'Old Roy' dogfood spread over plots at a rate of 256 grams / row.

TRT	Rate
1. UTC	---
2. Syn547407	0.018 mg
3. Syn547407	0.036 mg
4. Syn547407	0.072

Stand Counts

TRT	Stand/ft			% Runts		% Dead		
	11 April	20 April	27 April	20 April	27 April	11 April	20 April	27 April
1	18.5 ± 2.1 a	11.3 ± 1.2	5.5 ± 1.8 b	8.8 ± 1.9	13.7 ± 3.3 a	0	13.4 ± 3.2 a	48.8 ± 11.6 a
2	12.3 ± 0.9 b	12.5 ± 1.0	11.2 ± 1.8 ab	7.9 ± 2.1	11.2 ± 3.2 b	0	1.8 ± 0.7 b	7.5 ± 4.1 b
3	13.6 ± 0.6 ab	13.7 ± 0.6	13.1 ± 1.0 a	6.1 ± 1.1	8.2 ± 1.2 b	0.1 ± 0.1	1.7 ± 0.3 b	1.6 ± 0.3 b
4	11.3 ± 0.8 b	12.0 ± 0.4	12.6 ± 1.0 a	7.9 ± 0.8	9.6 ± 1.8 b	0	0.8 ± 0.3 b	1.8 ± 0.5 b
ANOVA	*P = 0.004* *F = 6.53; df = 3, 16*	*P = 0.288* *F = 1.37; df = 3, 16*	*P=0.006* *F=6.05; df =3,16*	*P = 0.667* *F = 0.53; df = 3, 16*	*P = 0.477* *F = 0.87; df = 3, 16*	*P = 0.418* *F = 1.00; df = 3, 16*	*P <0.001* *F=12.02; df = 3, 16*	*P<0.001* *F=13.74 df =3,16*

Destructive Sample

6 row-ft; Reps I-III on 29 April; Rep IV on 1 May. Rep V was not destructively sampled.

TRT	% Clean*	% Injured/Infested*	% Damaged
1	8.8 ± 6.3	18.9 ± 3.9	72.3 ± 7.5
2	24.3 ± 2.1	25.8 ± 3.8	49.9 ± 3.4
3	26.5 ± 5.1	29.0 ± 3.4	44.5 ± 5.1
4	21.7 ± 6.3	23.0 ± 2.3	55.3 ± 7.9
ANOVA	*P = 0.050 F = 3.49; df =3,12*	*P = 0.249 F = 1.57; df = 3, 12*	*P = 0.043 F = 3.71; df = 3, 12*

*Data square root +0.01 transformed. Presented are non-transformed means.

Harvest Samples

TRT	# Mrkt Sz Clean	% Mrkt Sz Clean	Mrkt Sz Weight (g)	# Small Clean	% Small Clean	Small Clean Weight (g)	# Mrkt Sz Damaged	% Mrkt Sz Damaged	Mrkt Sz Damaged Weight (g)	# Small Damaged	% Small Damaged	Small Damaged Weight (g)	# Market Sized, with and without damage
1	0.2 ± 0.2 b	3.3 ± 3.3	1.9 ± 1.9 b	1.4 ± 0.7	3.7 ± 1.6	1.7 ± 1.0	16.6 ± 6.6 b	50.1 ± 2.9 b	227.8 ± 62.9 b	13.4 ± 4.1	42.8 ± 4.4 a	17.0 ± 5.6	16.8 ± 6.5 b
2	6.2 ± 2.5 ab	5.1 ± 1.7	76.0 ± 34.2 ab	5.0 ± 1.4	4.8 ± 1.1	6.3 ± 1.8	71.8 ± 9.6 a	69.6 ± 3.1 a	1110.6 ± 220.7 a	20.9 ± 4.2	20.5 ± 3.3 b	41.7 ± 10.4	78.0 ± 11.9 a
3	8.0 ± 2.2 a	6.6 ± 1.8	139.6 ± 50.7 ab	5.6 ± 1.0	4.7 ± 0.8	11.0 ± 3.7	82.2 ± 4.1 a	68.8 ± 3.0 a	1516.7 ± 106.2 a	24.0 ± 4.1	19.9 ± 3.2 b	50.3 ± 14.1	90.2 ± 4.6 a
4	12.0 ± 2.0 a	10.7 ± 1.8	180.6 ± 38.4 a	6.0 ± 1.9	5.4 ± 1.8	10.5 ± 1.0	83.8 ± 5.2 a	74.8 ± 3.6 a	1584.2 ± 111.9 a	10.2 ± 1.3	9.2 ± 1.1 b	15.2 ± 2.2	95.8 ± 4.9 a
ANOVA	*P=0.004 F=6.52 df=3, 16*	*P = 0.165 F = 1.93; df = 3, 16*	*P = 0.016 F = 4.67; df = 3, 16*	*P = 0.1 F = 2.46; df = 3, 16*	*P=0.863 F = 0.25; df = 3, 16*	*P=0.91 F=2.57 df=3,16*	*P <0.001 F = 22.5; df = 3, 16*	*P <0.001 F=11.68; df = 3, 16*	*P <0.001 F=20.37; df =3, 16*	*P = 0.056 F = 3.11; df = 3, 16*	*P <0.001; F =19.37; df = 3, 16*	*P = 0.036 F = 3.63; df = 3, 16*	*P<0.001 F=23.15 df =3,16*

Snap and Dry Bean 2022 Seedcorn Maggot 1

Location: Carvel REC, field 5
Variety: 'Coyote' 'Lariot Pinto'
Planting Date: 16 March
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 2 rows x 20'
Row Spacing: 30"
Seeding Rate: 160 seed/row
Treatment Method: Seed treatment by The Seedcare Institute, Dennison, MN
Sample Size: 2 row
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: 4 tons/acre poultry manure incorporated before planting. Austrian winter pea cover crop incorporated before planting. 'Old Roy' dogfood spread over plots at a rate of 256 grams / row.

All seed treated with FarMore F300 (Mefenoxam + Sedaxane + Fludioxonil)

Lariot Pinto Kidney Bean

TRT	Material	Rate	Stand 19 April	Emerged plants 27 April**	Runts 27 April	Dead
1	UTC	---	0.5 ± 0.5	0 b	0	0
2	Cruiser	50 g a.i./100 kg seed	10.0 ± 8.4	20.0 ± 16.5 ab	5.8 ± 4.8	7.5 ± 5.7
3	Entrust	0.05 mg a.i./seed	10.5 ± 5.8	23.0 ± 13.0 ab	7.3 ± 4.1	6.8 ± 3.9
4	Fortenza	0.2 g a.i. /100 kg seed	1.0 ± 1.0	6.8 ± 3.6 ab	2.5 ± 1.2	1.3 ± 1.3
5	Lumivia	0.2 g a.i./ 100 kg seed	1.8 ± 1.1	0.5 ± 0.5 ab	0	0.5 ± 0.5
6	Plinazolin	5 g a.i./ 100 kg seed	6.3 ± 3.4	16.5 ± 8.4 ab	4.5 ± 2.6	6.8 ± 3.6
7	Plinazolin	10 g a.i./00 kg seed	4.8 ± 2.6	14.5 ± 4.5 a	5.8 ± 1.4	2.8 ± 1.6
ANOVA			*P = 0.470 F = 0.97; df = 6, 21*	*P = 0.033 F = 2.89; df = 6, 21*	*P = 0.354 F = 1.18; df = 6, 21*	*P = 0.372 F = 1.14; df = 6, 21*

**Emerged plants includes runts and dead plants, data $\log_{10} + 0.01$ transformed for analysis

Coyote Snap Bean

TRT	Material	Rate	Stand 27 April	Runts 27 April	Dead 27 April
1	UTC	---	0	0	0
2	Cruiser	50 g a.i./100 kg seed	0	0	0
3	Entrust	0.05 mg a.i./seed	4.5 ± 3.9	2.3 ± 1.9	0.3 ± 0.3
4	Fortenza	0.2 g a.i. /100 kg seed	1.5 ± 1.5	0.8 ± 0.8	0
5	Lumivia	0.2 g a.i./ 100 kg seed	0	0	0
6	Plinazolin	5 g a.i./ 100 kg seed	1.5 ± 1.5	0.8 ± 0.8	0
7	Plinazolin	10 g a.i./00 kg seed	4.3 ± 1.3	2.0 ± 0.7	0.3 ± 0.3
ANOVA			*P = 0.311 F = 1.27; df = 6, 21*	*P = 0.349 F = 1.19; df = 6, 21*	*P = 0.558 F = 0.83; df = 6, 21*

Stand includes runts

Snap Bean 2022 Seedcorn Maggot 2

Location: Carvel REC, field 5
Variety: 'Coyote'
Planting Date: 3 May
Experimental Design: Randomized complete block design with 7 treatments and 4 replicates
Plot size: 2 rows x 20'
Row Spacing: 30"
Seeding Rate: 160 seed/plot
Treatment Method: Seed treated by Dr. Alan Taylor at Cornell University
Sample Size: 1 row
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: soil disked April 26

TRT	Stand			Runt			Dead	
	17 May	**23 May**	**2 June**	**17 May**	**23 May**	**2 June**	**17 May**	**23 May**
1	120.0 ± 15.7	114.0 ± 16.4	136.3 ± 13.0	18.3 ± 0.9	11.5 ± 0.6	3.5 ± 1.0	3.0 ± 0.6	1.5 ± 1.2
2	114.8 ± 18.5	114.0 ± 16.0	103.5 ± 15.2	18.8 ± 4.8	8.5 ± 1.8	3.3 ± 1.1	2.3 ± 1.1	0.5 ± 0.5
3	126.5 ± 4.5	128.0 ± 6.7	117.3 ± 4.5	15.0 ± 1.5	7.8 ± 1.3	2.5 ± 0.6	2.5 ± 0.3	0
4	119.5 ± 15.8	109.5 ± 16.0	107.3 ± 16.2	13.3 ± 4.1	5.8 ± 2.3	4.5 ± 2.5	3.0 ± 1.6	0
5	131.8 ± 12.7	131.5 ± 12.7	116.8 ± 10.1	16.5 ± 3.6	8.3 ± 2.5	3.5 ± 1.4	0.8 ± 0.5	0
6	140.5 ± 3.1	139.8 ± 4.5	121.0 ± 2.3	11.3 ± 1.1	8.3 ± 1.3	2.0 ± 1.1	1.8 ± 0.3	0
7	131.0 ± 4.5	132.8 ± 3.8	121.0 ± 3.2	11.3 ± 0.8	7.8 ± 1.8	3.0 ± 1.1	3.5 ± 1.2	0
ANOVA	*P=0.781 F=0.53; df=6, 21*	*P=0.500 F=0.92; df=6, 21*	*P=0.458 F=0.989; df =6, 21*	*P = 0.357 F = 1.18; df = 6, 21*	*P=0.476 F=0.959; df=6, 21*	*P=0.911 F=0.33; df=6, 21*	*P=0.441 F=1.02; df=6, 21*	*P=0.280 F=1.35; df=6, 21*

Sweet Corn 2022 Seedcorn Maggot 1

Location: Carvel REC, field 5
Variety: 'Remedy'
Planting Date: 16 March
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 2 rows x 20'
Row Spacing: 30"
Seeding Rate: 42 seed/row
Treatment Method: Seed treatment by The Seedcare Institute, Dennison, MN

Dest. Sample Size: 6 row ft
Dest. Sample Date: 3 May
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: 4 tons/acre poultry manure incorporated before planting. Austrian winter pea cover crop incorporated before planting. 'Old Roy' dogfood spread over plots at a rate of 256 grams / row.

TRT	Material	Active Ingredient	Rate
1	UTC		---
2	Cruiser 5 FS	thiamethoxam	0.5 mg a.i./seed
3	Poncho	clothianidin	0.5 mg a.i./seed
4	Entrust	Spinosad	0.2 mg a.i./seed
5	Fortenza 5 FS	cyantraniliprole	0.5 mg a.i./seed
6	Lumivia	chlorantraniliprole	0.5 mg a.i./seed
7	Plinazolin	isocycloseram	25 g a.i./100 kg seed
8	Plinazolin	isocycloseram	50 g a.i./100 kg seed

All treatments had a base fungicide Vibrance Cinco and Vayantis applied at a rate of 30.5 and 2.5 g a.i. per 100 kg seed.

Stand Counts

TRT	Stand			Runts	
	April 19	**April 27**	**May 11 (only 1 row)**	**April 27**	**May 11**
1	56.25 ± 2.5 b	56.5 ± 4.3 b	31.0 ± 2.3 b	16.75 ± 0.75 a	10.0 ± 2.0 a
2	68.5 ± 1.6 a	71.5 ± 1.7 a	32.5 ± 0.5 ab	10.75 ± 1.5 ab	2.25 ± 1.4 b
3	75.25 ± 1.0 a	76.75 ± 0.6 a	37.25 ± 1.2 ab	6.0 ± 1.2 b	3.75 ± 0.5 ab
4	76.25 ± 1.5 a	76.75 ± 1.7 a	38.3 ± 1.5 ab	8.75 ± 1.1 b	3.25 ± 1.4 ab
5	72.75 ± 2.2 a	78.0 ± 1.1 a	40.0 ± 1.0 a	10.75 ± 2.6 ab	3.0 ± 1.9 b
6	73.0 ± 1.4 a	78.5 ± 1.0 a	40.5 ± 1.5 a	9.25 ± 1.9 b	1.75 ± 1.2 b
7	75.75 ± 1.6 a	78.75 ± 1.7 a	38.0 ± 1.5 ab	7.75 ± 0.9 b	3.75 ± 1.5 ab
8	73.75 ± 2.3 a	75.0 ± 1.7 a	35.7 ± 1.5 ab	9.75 ± 1.1 ab	3.75 ± 1.4 ab
ANOVA	*P <0.001 F = 13.01; df = 7, 24*	*P <0.001 F = 13.72; df = 7, 24*	*P = 0.009 F = 4.21; df = 7, 15*	*P = 0.003 F = 4.41; df = 7, 24*	*P = 0.022 F = 2.96; df = 7, 24*

Destructive Samples (6 row ft)

TRT	# healthy plants	# Injured	# Damaged	Total plants
1	0 c	1.25 ± 0.9 b	7.25 ± 0.25 a	8.5 ± 1.0
2	1.25 ± 0.9 bc	6.5 ± 0.3 a	3.5 ± 1.0 ab	11.25 ± 0.75
3	5.75 ± 0.5 a	6.25 ± 0.25 a	0.25 ± 0.25 b	12.25 ± 0.75
4	3.25 ± 0.25 abc	7.0 ± 0.7 a	1.75 ± 0.9 b	12.0 ± 1.2
5	4.25 ± 0.75 ab	6.25 ± 1.4 a	1.75 ± 0.9 b	12.25 ± 1.8
6	4.75 ± 1.4 ab	3.5 ± 0.9 ab	1.25 ± 0.5 b	9.5 ± 2.0
7	6.0 ± 0.7 a	4.5 ± 1.0 ab	2.25 ± 1.3 b	12.75 ± 1.0
8	5.0 ± 1.5 ab	4.75 ± 1.4 ab	2.5 ± 1.7 b	12.25 ± 0.5
ANOVA	*P = 0.001 F = 5.87; df = 7, 24*	*P = 0.005 F = 4.05; df = 7, 24*	*P = 0.002 F = 4.86; df = 7, 24*	*P = 0.208 F = 1.52; df = 7, 24*

Sweet Corn 2022 Seedcorn Maggot 2

Location: Carvel REC, Field 5
38°38'06.3"N; 75°27'42.3"W
Variety: 'GSS1453' 'Remedy, trt 12'
Planting Date: 3 May
Experimental Design: Randomized complete block design with 4 treatments and 4 replicates
Plot size: 6 rows x 15'
Row Spacing: 15"
Seeding Rate: 42 seed per 20' row
Treatment Method: Treated seed supplied by Syngenta
Sample Size: stand: 1 row per plot
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

TRT	Material	Active ingredient	Rate
1	Poncho	Clothianidin	0.5 mg a.i./unit
2	Cruiser 5FS	Thiamethoxam	0.25 mg a.i./unit
3	UTC		---
4	Reatis	Tetraniliprole	0.25 mg a.i./unit
5	Fortenza	Cyantraniliprole	0.25 mg a.i./unit
6	Lumiderm	Cyantraniliprole	0.25 mg a.i./unit
7	Lumivia	Chlorantraniliprole	0.25 mg a.i./unit
8	Entrust 240SC	Spinosad	0.5 mg a.i./unit
9	Entrust 240SC	Spinosad	0.25 mg a.i./unit
10	Entrust 80 WP	Spinosad	0.50 mg a.i./unit
11	Entrust 80 WP	Spinosad	0.25 mg a.i./unit
12	Plinazolin	Isocycloseram	

TRT 1-11 with base fungicide Apron XL, Dividend Extreme, Maxim 4FS, 42-S Thiram, and Vitavax 24

TRT	**Stand**		**Runts**	
	17-May	**23 May**	**May 17**	**23-May**
1	38.3 ± 0.6	37.5 ± 1.2	3.5 ± 0.6	1.8 ± 1.0
2	37.0 ± 0.7abc	29.8 ± 8.6	2.3 ± 0.2	2.5 ± 0.3
3	40.0 ± 1.2abc	29.5 ± 8.6	3.8 ± 0.5	1.5 ± 0.9
4	38.0 ± 0.4abc	37.8 ± 0.8	2.8 ± 0.5	1.8 ± 0.9
5	36.8 ± 1.0bc	29.3 ± 8.5	3.8 ± 0.5	1.3 ± 0.6
6	39.8 ± 0.5 abc	38.5 ± 0.6	3.0 ± 1.0	2.8 ± 0.6
7	39.0 ± 0.8 abc	37.5 ± 0.6	2.5 ± 0.3	2.8 ± 0.3
8	40.5 ± 0.6 ab	37.5 ± 0.6	2.8 ± 0.5	2.3 ± 0.9
9	39.0 ± 0.7 abc	36.8 ± 0.6	3.8 ± 0.8	4.3 ± 2.6
10	38.8 ± 1.3 abc	37.3 ± 1.8	3.0 ± 0.4	1.0 ± 1.0
11	36.0 ± 0.8 c	35.8 ± 0.6	3.0 ± 0.7	3.0 ± 1.1
12	41.0 ± 0.4 a	41.0 ± 0.7	2.8 ± 0.5	2.3 ± 1.1
ANOVA	*P = 0.002* *F = 3.57;* *df = 11, 36*	*P = 0.630* *F = 0.81;* *df = 11, 36*	*P = 0.695* *F = 0.74;* *df = 11, 36*	*P = 0.731* *F = 0.70;* *df = 11, 36*

Zucchini 2022 Seedcorn Maggot

Location: Carvel REC, field 5
Variety: 'Spineless Beauty'
Planting Date: 3 May
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 2 rows x 20'
Row Spacing: 30"
Seeding Rate: 30 seed/row
Treatment Method: Seed treatment by The Seedcare Institute, Dennison, MN
Sample Size: 1 row
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: 4 tons/acre poultry manure incorporated before planting. Austrian winter pea cover crop incorporated before planting. 'Old Roy' dogfood spread over plots at a rate of 256 grams / row.

TRT	Material	Rate
1	UTC	---
2	Cruiser	0.75 mg a.i./seed
3	Entrust	0.75 mg a.i./seed
4	Fortenza	0.45 mg a.i./seed
5	Lumivia	0.25 mg a.i./seed
6	Plinazolin	0.25 mg a.i./seed
7	Plinazolin	0.45 mg a.i./seed

All seed treated with FarMore F300 (Mefenoxam + Azoxystrobin + Fludioxonil)

TRT	**Stand**			**Runts**		
	17 May	**23 May**	**2 June**	**17 May**	**23 May**	**June 2**
1	29.0 ± 0.4	28.3 ± 0.9	26.3 ± 0.3	3.0 ± 0.8	1.5 ± 0.6	0
2	27.5 ± 1.8	28.0 ± 1.7	24.5 ± 0.9	3.3 ± 0.3	1.0 ± 0.4	0
3	25.0 ± 3.0	23.3 ± 3.7	24.3 ± 3.1	2.0 ± 0.4	3.0 ± 2.0	0.5 ± 0.5
4	24.5 ± 2.4	26.5 ± 1.0	22.8 ± 2.3	2.3 ± 0.8	2.0 ± 0.7	0.8 ± 0.3
5	26.5 ± 1.3	25.3 ± 1.5	25.0 ± 0.9	2.3 ± 0.8	0.5 ± 0.5	0.5 ± 0.5
6	25.3 ± 3.8	24.0 ± 3.8	23.0 ± 2.6	3.0 ± 0.4	1.8 ± 0.5	0.5 ± 0.3
7	23.8 ± 4.1	24.0 ± 4.1	22.3 ± 4.3	2.8 ± 0.5	1.3 ± 0.5	0.5 ± 0.3
ANOVA	*P = 0.827 F = 0.46; df = 6, 21*	*P = 0.765 F = 0.549; df = 6, 21*	*P = 0.910 F = 0.34; df = 6, 21*	*P = 0.563 F = 0.83; df = 6, 21*	*P = 0.615 F = 0.752; df = 6, 21*	*P = 0.601 F = 0.77; df = 6, 21*

Cabbage 2022 Lepidoptera 1

Location: Wyoming, DE
Variety: 'Cecile'
Seeding Date: 8 July
Planting Date: 9 August
Experimental Design: Randomized complete block design with 10 treatments and 4 replicates
Plot size: 10' x 1 treated row and 1 guard row
Row Spacing: 30"
Plant Spacing: 1.5'
Treatment Method: CO_2 pressured backpack sprayer with a 3' boom equipped with 3 D4-23 nozzles calibrated to deliver 34.5 GPA at 40 PSI for first application and a 2.5' boom with two drop nozzles and a center nozzle calibrated to deliver 36.9 GPA at 45 PSI for the second application.

Treatment Dates: 1 September, 14 September, 29 September
Sample Size: 5 plants for insect counts, 10 heads per plot for damage ratings
Harvest Date: 18 October
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: All treatments tank mixed with the adjuvant Dyne-Amic at 0.25% v/v

TRT	**Material**	**Rate**
1	UTC	---
2	ISM555	2.05 fl oz
3	Coragen	7.5 fl oz
4	Harvanta	13.5 fl oz
5	Spear Lep + Leprotec	32 fl oz + 16 fl oz
6	Dibrom	16 fl oz
7	Avaunt	3 oz
8	VST-7300 + Leprotec	10 oz + 16 fl oz
9	Leprotec	16 fl oz
10	Azera	32 fl oz

Season Total

TRT	ICW	CL	DBM	Total Worms*
1	0.3± 0.3	0.5± 0.5	3.8± 0.6	4.5± 1.0
2	0	0.3± 0.3	0.5± 0.5	0.8 ± 0.5
3	0.3± 0.3	0	2.0± 1.2	2.3 ± 1.0
4	0	0	4.8± 2.2	4.8 ± 2.2
5	1.0 ± 0.4	0.3± 0.3	2.3± 0.5	3.5 ± 0.5
6	0	0.3± 0.3	1.8± 0.6	2.0 ± 0.7
7	1.0 ± 0.7	0	1.0± 0.7	2.0 ± 0.9
8	0	0	2.0± 0.7	2.3 ± 0.8
9	0.3± 0.3	0.3± 0.3	1.3± 0.9	1.8 ± 1.4
10	0.5± 0.3	0.5± 0.3	2.8± 1.2	3.8 ± 1.2
ANOVA	*P = 0.150 F = 1.64; df = 9, 30*	*P = 0.732 F = 0.67; df = 9, 30*	*P = 0.179 F = 1.54; df = 9, 30*	*P = 0.262 F = 1.33; df = 9, 30*

Harvest

10 heads harvested/plot. Cabbage was graded on a 0-4 scale, where 0 = clean, 1 = frame leaf damage, 2 = slight wrapper leaf damage, 3 = significant wrapper leaf damage, 3.5 = slight head damage, 4 = significant head damage. Cabbage receiving a grade of 2 or less was considered marketable.

TRT	% Marketable	Damage Rating
1	95 ± 2.9	0.53 ± 0.14
2	100	0.05 ± 0.03
3	100	0.38 ± 0.05
4	92.5 ± 7.5	0.44 ± 0.18
5	97.5 ± 2.5	0.61 ± 0.15
6	90 ± 4.1	0.50 ± 0.22
7	92.5 ± 7.7	0.36 ± 0.16
8	97.5 ± 2.5	0.36 ± 0.09
9	95 ± 2.9	0.40 ± 0.15
10	82.5 ± 6.3	0.83 ± 0.11
ANOVA	*P = 0.135 F = 1.69; df = 9, 30*	*P = 0.061 F = 2.10; df = 9, 30*

30 August 2 D PRE

TRT	ICW	CL	DBM	Total Worms*
1	0.3 ± 0.3	1.3 ± 0.5	0.8 ± 0.5	2.3 ± 0.8
2	0	0	1.5 ± 0.5	1.5 ± 0.5
3	0.5 ± 0.5	0.3 ± 0.3	2.5 ± 1.3	3.3 ± 1.0
4	1.0 ± 1.0	0.5 ± 0.5	2.8 ± 1.0	4.3 ± 0.5
5	0	0.8 ± 0.8	0.8 ± 0.3	1.5 ± 0.9
6	0	0.5 ± 0.5	1.3 ± 0.8	1.8 ± 0.6
7	0	0.8 ± 0.5	2.3 ± 1.3	3.0 ± 0.9
8	0	0.3 ± 0.3	2.5 ± 1.2	2.8 ± 1.1
9	0.3 ± 0.3	0.5 ± 0.3	1.0 ± 0.4	1.8 ± 0.5
10	0	0.8 ± 0.8	2.8 ± 1.1	3.5 ± 1.2
ANOVA	*P = 0.629* *F = 0.79; df = 9, 30*	*P = 0.839* *F = 0.53; df = 9, 30*	*P = 0.604* *F = 0.82; df = 9, 30*	*P = 0.177* *F = 1.55; df = 9, 30*

6 September 5 DAT1

TRT	ICW	CL	DBM
1	0	0	1.3 ± 1.3
2	0	0	0
3	0	0	0.5 ± 0.5
4	0	0	1.3 ± 0.8
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0.3 ± 0.3
ANOVA			*P = 0.402* *F = 1.09; df = 9, 30*

14 September 13 DAT1, 0 D PRE

TRT	ICW	CL	DBM	Total Worms*
1	0	0.3 ± 0.3	0.3 ± 0.3	0.5 ± 0.3
2	0	0	0.3 ± 0.3	0.3 ± 0.3
3	0	0	1.0 ± 0.6	1.0 ± 0.6
4	0	0	1.8 ± 0.5	1.8 ± 0.5
5	0.8 ± 0.3	0	1.3 ± 0.3	2.0 ± 0.4
6	0	0	0.5 ± 0.3	0.5 ± 0.3
7	0.8 ± 0.8	0	0.3 ± 0.3	1.0 ± 0.7
8	0	0	0.8 ± 0.3	1.0 ± 0.4
9	0.3 ± 0.3	0	0.3 ± 0.3	0.5 ± 0.3
10	0.5 ± 0.3	0	0.8 ± 0.5	1.3 ± 0.6
ANOVA	*P = 0.258* *F = 1.34; df = 9, 30*	*P = 0.461* *F = 1.00; df = 9, 30*	*P = 0.063* *F = 2.09; df = 9, 30*	*P = 0.177* *F = 1.55; df = 9, 30*

16 September, 2 DAT2

TRT	ICW	CL	DBM	Total Worms*
1	0.3 ± 0.3	0.3 ± 0.3	0.3 ± 0.3	0.8 ± 0.5
2	0	0.3 ± 0.3	0.3 ± 0.3	0.5 ± 0.3
3	0.3 ± 0.3	0	0.3 ± 0.3	0.5 ± 0.3
4	0	0	0.5 ± 0.5	0.5 ± 0.5
5	0.3 ± 0.3	0.3 ± 0.3	0.8 ± 0.5	1.3 ± 0.5
6	0	0	1.3 ± 0.5	1.3 ± 0.5
7	0.3 ± 0.3	0	0.3 ± 0.3	0.5 ± 0.3
8	0	0	0.8 ± 0.5	0.8 ± 0.5
9	0	0.3 ± 0.3	0.3 ± 0.3	0.5 ± 0.5
10	0	0.5 ± 0.3	0.5 ± 0.5	1.0 ± 0.7
ANOVA	*P = 0.732* *F = 0.67; df = 9, 30*	*P = 0.524* *F = 0.92; df = 9, 30*	*P = 0.669* *F = 0.74; df = 9, 30*	*P = 0.177* *F = 1.55; df = 9, 30*

20 September, 6 DAT2

TRT	20 September 6 DAT2	29 Sept 14 DAT2, 0D PRE3	11 Oct 12 DAT3		
	DBM	DBM	CL	DBM	Total Worms*
1	1.0 ± 0.7	0.5 ± 0.3	0	0.5 ± 0.5	0.5 ± 0.5
2	0	0	0	0	0
3	0	0.3 ± 0.3	0	0	0
4	0.8 ± 0.5	0	0	0.5 ± 0.3	0.5 ± 0.3
5	0	0.3 ± 0.3	0	0	0
6	0	0	0.3 ± 0.3	0	0.3 ± 0.3
7	0	0.5 ± 0.5	0	0	0
8	0.3 ± 0.3	0	0	0.3 ± 0.3	0.3 ± 0.3
9	0.3 ± 0.3	0.3 ± 0.3	0	0.3 ± 0.3	0.3 ± 0.3
10	0.5 ± 0.3	0.3 ± 0.3	0	0.5 ± 0.5	0.5 ± 0.5
ANOVA	*P = 0.232* *F = 1.40; df = 9, 30*	*P = 0.732* *F = 0.67; df = 9, 30*	*P = 0.461* *F = 1.00; df = 9, 30*	*P = 0.666* *F = 0.75; df = 9, 30*	*P = 0.177* *F = 1.55; df = 9, 30*

Cabbage 2022 Lepidoptera 2

Location: Carvel REC, Field 1A
Variety: 'Cecile'
Seeding Date: 8 July
Planting Date: 10 August
Experimental Design: Randomized complete block design with 4 treatments and 4 replicates
Plot size: 10'
Row Spacing: 30"
Plant Spacing: 1.5'
Treatment Method: CO_2 pressured backpack sprayer with a 3' boom equipped with 3 D4-23 nozzles calibrated to deliver 34.5 GPA at 40 PSI for first application and a 2.5' boom with two drop nozzles and a center nozzle calibrated to deliver 36.9 GPA at 45 PSI for the second application.

Treatment Dates: 14 September, 21 September
Sample Size: 5 plants for insect counts, 10 heads per plot for damage ratings
Harvest Date: 14 October
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: All treatments tank mixed with the adjuvant Dyne-Amic at 0.25% v/v. At harvest, cabbage graded on a 0-4 scale, where 0 = clean, 1 = frame leaf damage, 2 = slight wrapper leaf damage, 3 = significant wrapper leaf damage, 3.5 = slight head damage, 4 = significant head damage. Scores of 2 or less are considered marketable.

TRT	**Material**	**Rate**
1	UTC	---
2	ISM555	2.05 fl oz
3	Proclaim	4.0 oz
4	Warrior + Lannate	1.92 fl oz + 2.25 fl oz

Season Totals (excluding the first pre-treatment count) and Harvest

TRT	**ICW**	**CL**	**DBM**	**Total**	**Avg Damage Score**	**% marketable heads**
1	34.8 ± 7.3 a	0.5 ± 0.3	12.3 ± 3.4	41.5 ± 5.0	3.8 ± 0.05 a	0 b
2	5.5 ± 1.2 b	0.3 ± 0.3	5.0 ± 1.5	3.8 ± 1.0	1.2 ± 0.4 b	92.5 ± 7.5 a
3	8.8 ± 2.6 b	0	4.5 ± 1.0	4.8 ± 1.8	1.3 ± 0.2 b	87.5 ± 6.3 a
4	10.0 ± 2.0 b	0	8.5 ± 2.0	8.0 ± 2.0	1.6 ± 0.4 b	77.5 ± 10.3 a
ANOVA	*P = 0.001 F = 11.18; df = 3, 12*	*P = 0.248 F = 1.57; df = 3, 12*	*P = 0.086 F = 2.79; df = 3, 12*	*P <0.001 F = 39.42; df = 3, 12*	*P <0.001 F = 21.05; df = 3, 12*	*P <0.001 F = 17.51; df = 4, 15*

September 14 (0 d PRE)

TRT	**ICW**	**CL**	**DBM**	**Total Worms***
1	3.8 ± 1.8	0	5.0 ± 2.8	9.5 ± 3.5
2	2.3 ± 0.5	0	4.8 ± 1.6	7.3 ± 1.4
3	4.5 ± 0.9	0	4.0 ± 0.7	9.0 ± 1.4
4	4.0 ± 1.2	0	6.5 ± 1.6	13.3 ± 4.0
ANOVA	*P = 0.807* *F = 0.33; df = 3, 12*	---	*P = 0.807* *F = 0.33; df = 3, 12*	*P = 0.513* *F = 0.80; df = 3, 12*

September 16 2 DAT1

TRT	**ICW**	**CL**	**DBM**	**Total Worms***
1	6.5 ± 2.0 a	0	1.0 ± 0.6	7.5 ± 1.6 a
2	1.3 ± 0.8 b	0	0	1.3 ± 0.8 b
3	2.3 ± 1.3 b	0	0.3 ± 0.3	2.5 ± 1.2 b
4	1.0 ± 0.4 b	0	0	1.0 ± 0.4 b
ANOVA	*P = 0.035* *F = 4.00; df = 3, 12*		*P = 0.133* *F = 2.26; df = 3, 12*	*P = 0.003* *F = 8.05; df = 3, 12*

September 20 6 DAT1, 1 d PRE2

TRT	**ICW**	**CL**	**DBM**	**Total Worms***
1	7.8 ± 2.4 a	0	0.8 ± 0.3	8.5 ± 2.4 a
2	2.0 ± 0.4 b	0	0.3 ± 0.3	2.3 ± 0.3 b
3	1.0 ± 0.4 b	0	0	1.0 ± 0.4 b
4	4.0 ± 0.9 ab	0	1.5 ± 0.9	5.5 ± 1.7 ab
ANOVA	*P = 0.016* *F = 5.16; df = 3, 12*	---	*P = 0.168* *F = 2.00; df = 3, 12*	*P = 0.015* *F = 5.32; df = 3, 12*

September 23 2 DAT2

TRT	ICW	CL	DBM	Total Worms*
1	7.0 ± 1.6 a	0	1.8 ± 1.2	9.0 ± 2.1 a
2	0 b	0	0	0 b
3	0.5 ± 0.5 b	0	0	0.5 ± 0.5 b
4	1.0 ± 0.6 b	0	0	1.0 ± 0.6 b
ANOVA	*P <0.001* *F = 13.92; df = 3, 12*	---	*P = 0.142* *F = 2.19; df = 3, 12*	*P <0.001* *F = 14.34; df = 3, 12*

September 27 6 DAT2

TRT	ICW	CL	DBM	Total Worms*
1	6.5 ± 2.1 a	0.3 ± 0.3	1.5 ± 1.2	8.3 ± 1.7 a
2	0 b	0.3 ± 0.3	0	0.3 ± 0.3 b
3	0.5 ± 0.3 b	0	0.3 ± 0.3	0.8 ± 0.3 b
4	0 b	0	0.3 ± 0.3	0.3 ± 0.3 b
ANOVA	*P = 0.002 F = 9.31; df = 3, 12*	*P = 0.589 F = 0.67; df = 3, 12*	*P = 0.355 F = 1.19; df = 3, 12*	*P <0.001 F = 21.11; df = 3, 12*

October 11

TRT	ICW	CL	DBM	Total Worms*
1	3.3 ± 0.9 a	0.3 ± 0.3	2.3 ± 1.1 a	8.3 ± 2.7 a
2	0 b	0	0 b	0 b
3	0 b	0	0 b	0 b
4	0 b	0	0.3 ± 0.3 ab	0.3 ± 0.3 b
ANOVA	*P <0.001 F = 14.49; df = 3, 12*	*P = 0.426 F = 1.00; df = 3, 12*	*P = 0.044 F = 3.68; df = 3, 12*	*P = 0.002 F = 8.95; df = 3, 12*

Green Onion 2022 Onion Thrips

Location: Carvel REC Field 1A
Variety: 'Parade'
Planting Date: 13 May
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 3 rows x 10' with a 4th guard row in internal plots.
Row Spacing: 30"
Seeding Spacing: 1"
Treatment Method: CO_2 pressured backpack sprayer with a 6' boom equipped with 4 11002 twin flat fan nozzles calibrated to deliver 20 GPA at 38 PSI. Plots were treated twice for a total delivery of 40 GPA. Treatment bottles were mixed for 40 gpa.

Sample Size: 10 onion plants from center row.
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: onions were at 4 leaf stage at the beginning of treatment.
On August 4, there appeared to be a subtle plant vigor difference between treatment 6 and the untreated check. Photos were taken of plots.
On August 4, a thrips sample was collected, all adults were identified as onion thrips.

TRT	Material	Rate
1	UTC	---
2	Radiant	10.0 fl oz
3	Harvanta	16.4 fl oz
4	ISM-555 SC400	4.1 fl oz
5	SP3014	16 fl oz
6	Spear T	3 gal
7	Sivanto Prime	14 fl oz
8	Beleaf	2.8 fl oz

Dyne-Amic was added to all treatments at a rate of 0.25% v/v

TRT	7 July 1 d PRE1			14 July 1 d PRE2			22 July 0 d PRE3			27 July 1 d PRE4			4 Aug 7 d Post 4			11 Aug 14 d Post 4		
	Adult	**Larvae**	**Total**	**Adult**	**Larvae**	**Total**	**Adult***	**Larvae**	**Total**	**Adult**	**Larvae**	**Total**	**Adult**	**Larvae**	**Total**	**Adult**	**Larvae**	**Total**
1	10.5 ± 1.6	49.0 ± 12.0	59.5 ± 11.2	30.3 ± 13.0	91.3 ± 14.3 a	121.5 ± 26.8 a	14.0 ± 4.1 ab	32.8 ± 10.3 ab	46.8 ± 13.8 ab	14.3 ± 5.7	26.0 ± 5.2 ab	40.3 ± 3.5 abc	44.3 ± 25.5	130.5 ± 93.2	174.8 ± 117.4	14.0 ± 7.9	39.8 ± 28.1	53.8 ± 36.0
2	20.5 ± 9.7	31.5 ± 13.1	52.0 ± 22.0	13.5 ± 4.0	14.3 ± 1.9 b	27.8 ± 5.0 bc	1.0 ± 0.7 c	0.8 ± 0.5 c	1.8 ± 1.1 c	1.3 ± 0.5	1.0 ± 0.6 b	2.3 ± 0.6 d	6.3 ± 4.9	2.0 ± 0.9	8.3 ± 5.4	0.8 ± 0.5	0.8 ± 0.3	1.5 ± 0.6
3	35.5 ± 3.1	51.5 ± 6.7	87.0 ± 9.7	6.3 ± 1.6	20.8 ± 4.5 b	27.0 ± 3.9 bc	4.3 ± 2.3 bc	5.0 ± 1.9 c	9.3 ± 2.9 c	6.8 ± 2.7	4.3 ± 2.5 b	11.0 ± 5.1 cd	6.0 ± 3.0	2.3 ± 1.0	8.3 ± 3.0	3.8 ± 1.9	3.0 ± 2.1	6.8 ± 2.7
4	23.5 ± 17.6	46.0 ± 13.5	69.5 ± 30.4	0.3 ± 0.3	10.5 ± 2.5 b	10.8 ± 2.8 c	3.0 ± 1.5 c	2.5 ± 1.6 c	5.5 ± 2.7 c	1.0 ± 0.7	2.0 ± 1.7 b	3.0 ± 2.4 d	6.3 ± 2.0	2.0 ± 0.8	8.3 ± 2.8	0.8 ± 0.5	0	0.8 ± 0.5
5	16.5 ± 4.6	37.8 ± 9.1	54.3 ± 12.8	29.0 ± 18.8	85.5 ± 11.1 a	114.5 ± 11.3 a	17.3 ± 6.6 a	41.0 ± 10.5 a	58.3 ± 13.2 a	16.5 ± 6.7	30.5 ± 9.6 ab	47.0 ± 4.8 ab	27.3 ± 9.3	65.8 ± 57.3	79.0 ± 24.4	3.5 ± 1.3	21.5 ± 9.0	25.0 ± 9.8
6	21.3 ± 7.7	35.0 ± 12.1	56.3 ± 19.6	27.5 ± 16.8	67.5 ± 21.3 ab	95.0 ± 24.3 ab	13.3 ± 4.8 ab	16.5 ± 5.9 abc	29.8 ± 9.9 abc	24.0 ± 10.2	43.5 ± 16.9 a	67.5 ± 19.1 a	23.5 ± 10.5	65.8 ± 57.3	89.3 ± 67.2	4.8 ± 1.0	17.0 ± 6.3	21.8 ± 6.3
7	27.0 ± 8.1	50.5 ± 10.1	77.5 ± 18.2	23.0 ± 8.7	59.5 ± 19.6 ab	82.5 ± 19.6 abc	6.8 ± 1.8 bc	15.3 ± 3.6 abc	22.0 ± 4.1 abc	10.3 ± 4.4	5.5 ± 2.3 b	15.8 ± 4.4 bcd	11.8 ± 3.7	7.5 ± 1.7	19.3 ± 3.1	4.0 ± 1.4	7.5 ± 1.9	11.5 ± 2.9
8	9.5 ± 2.1	32.8 ± 10.1	42.3 ± 10.6	22.0 ± 9.7	37.3 ± 10.7 ab	59.3 ± 18.5 abc	5.3 ± 1.6 bc	12.8 ± 1.7 bc	18.0 ± 3.2 bc	10.3 ± 4.0	8.8 ± 2.2 b	19.0 ± 4.4 bcd	22.3 ± 3.7	7.3 ± 3.6	29.5 ± 5.7	4.5 ± 1.7	6.8 ± 5.5	11.3 ± 6.9
ANOVA	$P = 0.431$ $F = 1.04; df = 7, 24$	$P = 0.771$ $F = 0.57; df = 7, 24$	$P = 0.704$ $F = 0.658; df = 7, 24$	$P = 0.455$ $F = 1.00; df = 7, 24$	$P < 0.001$ $F = 6.27; df = 7, 24$	$P < 0.001$ $F = 6.52; df = 7, 24$	$P = 0.024$ $F = 2.90; df = 7, 24$	$P < 0.001$ $F = 6.08; df = 7, 24$	$P < 0.001$ $F = 6.39; df = 7, 24$	$P = 0.075$ $F = 2.16; df = 7, 24$	$P = 0.002$ $F = 4.80; df = 7, 24$	$P < 0.001$ $F = 9.30; df = 7, 24$	$P = 0.182$ $F = 1.61; df = 7, 24$	$P = 0.253$ $F = 1.39; df = 7, 24$	$P = 0.223$ $F = 1.48; df = 7, 24$	$P = 0.125$ $F = 1.84; df = 7, 24$	$P = 0.200$ $F = 1.55; df = 7, 24$	$P = 0.180$ $F = 1.61; df = 7, 24$

*means separated using student's t.

Kale 2022 Harlequin Bug

Location: Carvel REC, Field 1A
Variety: 'Winterbor'
Planting Date: 8 July
Experimental Design: Randomized complete block design with 4 treatments and 4 replicates
Plot size: 10'
Row Spacing: 5'
Plant Spacing: 1'
Treatment Method: CO_2 pressurized backpack sprayer with a 3' boom equipped with 3 D4-45 nozzles calibrated to deliver 45 GPA at 14 PSI with Dyne-Amic
Treatment Dates: 06 Oct 2022
Sample Size: 5 plants
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes:

TRT	Material	Rate
1	UTC	---
2	Harvanta	16 fl oz
3	ISM 555	2.05 fl oz
4	Endigo ZCX	4.5 fl oz

Stink bug counts

TRT	Pre TRT			4DAT		
	Adult	**Nymph**	**Total**	**Adult**	**Nymph**	**Total**
1	14.3 ± 4.4	29.3 ± 8.4	43.5 ± 11.4	22.5 ± 10.7	37.5 ± 15.2	60.0 ± 25.8
2	6.3 ± 1.7	34.0 ± 7.0	40.3 ± 8.6	5.8 ± 2.1	9.5 ± 6.4	15.3 ± 8.4
3	10.0 ± 1.2	36.8 ± 7.5	46.8 ± 8.2	6.0 ± 3.4	7.8 ± 2.4	13.8 ± 5.5
4	14.0 ± 5.1	24.5 ± 7.1	38.5 ± 11.9	1.0 ± 0.4	11.8 ± 5.7	12.8 ± 5.3
ANOVA	*P = 0.362 F = 1.17; df = 3, 12*	*P = 0.680 F = 0.52; df = 3, 12*	*P = 0.941 F = 0.13; df = 3, 12*	*P = 0.091 F = 2.71; df = 3, 12*	*P = 0.105 F = 2.54; df = 3, 12*	*P = 0.094 F = 2.68; df = 3, 12*

Kale 2022 Lepidoptera

Location: Carvel REC, Field 1A
Variety: 'Winterbor'
Planting Date: 8 July
Experimental Design: Randomized complete block design with 6 treatments and 4 replicates
Plot size: 10'
Row Spacing: 5'
Plant Spacing: 1'
Treatment Method: CO_2 pressured backpack sprayer with a 3' boom equipped with 3 D4-45 nozzles calibrated to deliver 25 GPA at 18 PSI for first application and 36.9 GPA at 45 PSI for the second application.
Treatment Dates: 3 August, 17 August
Sample Size: 5 plants for insect counts, 20 leaves for defoliation visual percentage estimates
Harvest Date: 25 August
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: Plots treated with Admire Pro at 1.5 fl oz on Aug 17 for aphid and harlequin bug control. The majority of 'Other' Lepidopteran pests were cross striped worms. No adjuvant was included in August 17 treatments.

TRT	Material	Rate/ acre
1	UTC	---
2	ISM-555	2.05 fl oz
3	Coragen	7.5 fl oz
4	Harvanta	13.6 fl oz
5	Spear Lep + Leprotec	24 fl oz + 8 fl oz
6	Torac*	17 fl oz

*Sample 4 years old.

Season Totals and % leaf defoliation estimate 8 DAT2

TRT	ICW	CL	DBM	Total	% Leaf Defoliation August 25
1	11.8 ± 4.8	0	3.8 ± 1.1 a	19.8 ± 6.0 a	7.6 ± 0.9 a
2	0.5 ± 0.3	0	0.3 ± 0.3 b	1.0 ± 0.6 b	1.5 ± 0.2 b
3	0.5 ± 0.3	0	0.3 ± 0.3 b	6.5 ± 5.2 ab	1.8 ± 0.5 b
4	1.0 ± 0.4	0	0.3 ± 0.3 b	3.3 ± 1.3 b	1.8 ± 0.6 b
5	3.0 ± 1.4	0.8 ± 0.5	1.5 ± 0.6 ab	6.3 ± 1.5 ab	3.5 ± 0.7 b
6	4.5 ± 1.3	0	2.8 ± 1.3 ab	15.0 ± 3.3 ab	2.4 ± 0.4 b
ANOVA	*P = 0.011 F = 4.16; df = 5, 18*	*P = 0.073 F = 2.45; df = 5, 18*	*P = 0.013 F = 3.99; df = 5, 18*	*P = 0.013 F = 4.03; df = 5, 18*	*P <0.001 F = 14.80; df = 5, 18*

Total worms includes yellow striped armyworm and cross striped worm. Cross striped worm populations varied but made up the vast majority of 'other worms.'

2 August – 1 D PRE

TRT	ICW	CL	DBM	Other	Total	Aphids	Harlequin Bug
1	2.25 ± 1.3	0	1.25 ± 0.9	5.25 ± 4.9	8.75 ± 5.2	23.25 ± 13.7	1.0 ± 1.0
2	1.25 ± 0.5	0.5 ± 0.5	1.0 ± 0.7	1.75 ± 1.75	4.5 ± 2.0	13.25 ± 5.3	3.25 ± 1.5
3	0.75 ± 0.25	1.75 ± 1.0	0.75 ± 0.5	0	3.25 ± 0.9	24.5 ± 10.4	0.5 ± 0.3
4	1.75 ± 0.75	0.25 ± 0.25	0.5 ± 0.5	0.25 ± 0.25	2.75 ± 1.0	19.5 ± 15.9	6.5 ± 5.5
5	2.75 ± 2.1	0.75 ± 0.5	1.5 ± 0.3	0	5.0 ± 2.1	18.5 ± 11.8	11.5 ± 10.8
6	0.25 ± 0.25	0.75 ± 0.5	0.75 ± 0.5	0.25 ± 0.25	2.0 ± 0.9	8.25 ± 2.3	3.25 ± 1.5
ANOVA	P = 0.611 F = 0.73; df = 5, 18	P = 0.349 F = 1.20; df = 5, 18	P = 0.816 F = 0.37; df = 5, 18	P = 0.482 F = 0.94; df = 5, 18	P = 0.500 F = 0.90; df = 5, 18	P = 0.897 F = 0.316; df = 5, 18	P = 0.660 F = 0.66; df = 5, 18

5 August

TRT	ICW	CL	DBM	Other	Total	Aphids	Harlequin Bug
1	0.5 ± 0.3	0	0	0	0.5 ± 0.3	.	6.3 ± 3.4
2	0	0	0	0	0	.	3.0 ± 2.4
3	0	0	0	0	0	.	2.8 ± 1.4
4	0.3 ± 0.3	0	0	0	0.3 ± 0.3	.	6.8 ± 2.1
5	0.3 ± 0.3	0	0	0	0.3 ± 0.3	.	10.8 ± 9.4
6	0.3 ± 0.3	0	0.3 ± 0.3	0.3 ± 0.3	0.8 ± 0.5	.	6.5 ± 4.3
ANOVA	*P = 0.574 F = 0.78; df = 5, 18*				*P = 0.361 F = 1.17; df = 5, 18*		*P = 0.85 F = 0.40; df = 5, 18*

August 10

TRT	ICW	CL	DBM	Other	Total	Aphids	Harlequin Bug
1	2.0 ± 0.4	0	2.0 ± 0.4	0.8 ± 0.5	4.8 ± 0.6 ab	19.3 ± 3.1	9.0 ± 2.3
2	0	0	0	0	0 b	17.0 ± 1.1	3.0 ± 2.7
3	0.5 ± 0.3	0	0.3 ± 0.3	0	0.8 ± 0.3 ab	11.0 ± 3.1	6.0 ± 1.9
4	0	0	0	0	0 b	14.3 ± 10.6	18.5 ± 5.6
5	1.8 ± 1.8	0	0.5 ± 0.5	0	2.3 ± 1.7 ab	15.5 ± 6.2	11.8 ± 6.9
6	1.3 ± 0.8	0	2.3 ± 1.3	1.5 ± 1.2	5.0 ± 2.0 a	9.3 ± 3.7	13.8 ± 8.5
ANOVA	*P = 0.354 F = 1.19; df = 5, 18*		*P = 0.047 F = 2.83; df = 5, 18*	*P = 0.259 F = 1.44; df = 5, 18*	*P = 0.010 F = 4.26; df = 5, 18*	*P = 0.808 F = 0.45; df = 5, 18*	*P=0.393 F = 1.10; df = 5, 18*

August 17

TRT	ICW	CL	DBM	Other	Total
1	0.5 ± 0.5	0	0.8 ± 0.3	2.0 ± 1.2	3.3 ± 0.9
2	0	0	0.3 ± 0.3	0	0.3 ± 0.3
3	0	0	0	5.5 ± 5.2	5.5 ± 5.2
4	0	0	0.3 ± 0.3	1.5 ± 1.5	1.8 ± 1.8
5	0.3 ± 0.3	0	0.5 ± 0.3	0.5 ± 0.3	1.3 ± 0.8
6	1.3 ± 0.6	0	0.3 ± 0.3	0.8 ± 0.5	2.3 ± 0.8
ANOVA	*P = 0.120 F = 2.05; df = 5, 18*		*P = 0.349 F = 1.20; df = 5, 18*	*P = 0.583 F = 0.77; df = 5, 18*	*P = 0.678 F = 0.63; df = 5, 18*

August 22

TRT	ICW	CL	DBM	Other	Total
1	5.5 ± 4.9	0	0.3 ± 0.3	0.5 ± 0.3	6.3 ± 5.0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0.3 ± 0.3	0.5 ± 0.3	0	0.8 ± 0.5
6	0.3 ± 0.3	0	0	3.5 ± 3.5	3.8 ± 3.8
ANOVA	*P = 0.324 F = 1.26; df = 5, 18*	*P = 0.446 F = 1.00; df = 5, 18*	*P = 0.164 F = 1.80; df = 5, 18*	*P = 0.470 F = 0.957; df = 5, 18*	*P = 0.413 F = 1.06; df = 5, 18*

August 25

TRT	ICW	CL	DBM	Other	Total
1	1.5 ± 0.9	0	0.5 ± 0.5	1.0 ± 0.7	3.0 ± 1.3
2	0	0	0	0.3 ± 0.3	0.3 ± 0.3
3	0	0	0	0	0
4	0	0	0	0.5 ± 0.5	0.5 ± 0.5
5	0.8 ± 0.3	0.5 ± 0.3	0	0.3 ± 0.3	1.5 ± 0.5
6	0.8 ± 0.3	0	0	1.5 ± 0.6	2.3 ± 0.8
ANOVA	*P = 0.063 F = 2.57; df = 5, 18*	*P = 0.038 F = 3.00; df = 5, 18*	*P = 0.446 F = 1.00; df = 5, 18*	*P = 0.248 F = 1.47; df = 5, 18*	*P = 0.034 F = 3.12; df = 5, 18*

September 1

TRT	ICW	CL	DBM	Other	Total
1	1.8 ± 0.3	0	0.3 ± 0.3	0	2.0 ± 0.4
2	0.5 ± 0.3	0	0	0	0.5 ± 0.3
3	0	0	0	0.3 ± 0.3	0.3 ±0.3
4	0.8 ± 0.5	0	0	0	0.8 ± 0.5
5	0	0	0	0.3 ± 0.3	0.3 ± 0.3
6	0.8 ± 0.8	0	0	0.3 ± 0.3	1.0 ± 0.7
ANOVA	*P = 0.056 F = 2.68; df = 5, 18*		*P = 0.446 F = 1.00; df = 5, 18*	*P = 0.701 F = 0.60; df = 5, 18*	*P = 0.081 F = 2.37; df = 5, 18*

Lima Bean 2022 Stink Bug

Location: Carvel REC
Variety: 'Cypress' and 'UCBF'
Planting Date:
Experimental Design: Randomized complete block design with 2 varieties, 2 treatments and 5 replicates
Plot size:
Row Spacing: 30"
Plant Spacing:
Treatment Method: Cages placed around 2 rows of plants, treated with stink bugs or no
Treatment Dates:
Sample Size:
Harvest Date:
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes:

Stink bug interior pod damage variety test
25 random pods were selected from each variety outside of cages (6 reps)

Variety	Num pods with warts	Total num of warts	Num warts per damaged pod
Cypress	4.8 ± 0.9	6.7 ± 2.0	1.3 ± 0.1
UCBF	4.2 ± 0.8	6.3 ± 1.3	1.5 ± 0.2

Variety	Stink Bug (y/n)	dropped pods / plant	flat pods / plant	dry pods / plant	full pods / plant	Num of good seeds / plant	Num of shrivel seeds / plant	Num of stung seeds / plant	Good seed weight (g) / plant	Shrivel seed weight (g) / plant	Stung seed weight (g) / plant
Cypress	No	2.0 ± 0.3	3.9 ± 0.6	0.9 ± 0.3 A	18.2 ± 1.7	49.3 ± 5.3	1.2 ± 0.4	0.7 ± 0.3	34.8 ± 1.9	0.1 ± 0.07	0.4 ± 0.2
Cypress	Yes	2.5 ± 0.4	5.2 ± 1.3	0.6 ± 0.2 AB	19.0 ± 2.8	50.6 ± 7.8	1.3 ± 0.5	1.5 ± 0.5	36.6 ± 5.0	0.1 ± 0.03	0.7 ± 0.2
UCBF	No	1.7 ± 0.2	7.0 ± 2.4	0.1 ± 0.06 B	18.0 ± 1.2	49.5 ± 3.9	1.5 ± 0.3	0.4 ± 0.1	34.2 ± 3.0	0.1 ± 0.06	0.3 ± 0.1
UCBF	Yes	2.0 ± 0.3	10.1 ± 2.4	0.07 ± 0.03 B	15.6 ± 1.8	42.3 ± 5.8	1.2 ± 0.6	1.6 ± 0.6	30.8 ± 2.3	0.03 ± 0.05	0.8 ± 0.3
Anova		*P = 0.3886; F = 1.0726; df = 3, 16*	*P = 0.1326; F = 2.1605; df = 3, 16*	*P = 0.0039; F = 6.6709; df = 3, 16*	*P = 0.6477; F = 0.5621; df = 3, 16*	*P = 0.6703; F = 0.5266; df = 3, 16*	*P = 0.9653; F = 0.0886; df = 3, 16*	*P = 0.1344; F = 2.1464; df = 3, 16*	*P = 0.6589; F = 0.5445; df = 3, 16*	*P = 0.4383; F = 0.9537; df = 3, 16*	*P = 0.2623; F = 1.4622; df = 3, 16*

Sweet Corn 2022 Corn Earworm 1

Location: Carvel REC, Field 1
Variety: 'American Dream'
Planting Date: 11 May
Experimental Design: Randomized complete block design with 12 treatments and 4 replicates
Plot size: 20'
Row Spacing: 30"
Plant population: 24,000
Treatment Method: Directed ear spray; CO_2-pressurized backpack sprayer with single-row boom equipped with 2 D2 tips and #25 cores delivering 40 GPA at 38 PSI.

Treatment Interval: 4 days
Sample Size: 25 ears
Harvest Date: 21 July
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: All foliar treatments received Induce at 0.25% v/v. Treatments were initiated 2 days after first silk was observed.

Dates Trap Checked	June 30- 4 July	July 4-7	July 7-11	July 11-14	July 14-18
# moths/ night	2.5	3.66	3.75	2.0	7.0

TRT	Material	Rate/ acre	Application
1	UTC	---	---
2	Besiege Baythroid XL	10.0 fl oz 2.8 fl oz	A, C B, D
3	Elevest Baythroid XL	9.6 fl oz 2.8 fl oz	A, C B, D
4	Baythroid XL	2.8 fl oz	A-D
5	Brigade	6.4 fl oz	A-D
6	Hero	4.0 fl oz	A-D
7	Hero	7.0 fl oz	A-D
8	Hero	10.3 fl oz	A-D
9	Radiant + Baythroid XL	3.0 fl oz + 2.8 fl oz	A-D
10	Intrepid Edge + Baythroid XL	4.0 fl oz + 2.8 fl oz	A-D
11	Vantacor Baythroid XL	2.5 fl oz 2.8 fl oz	A-D
12	Blackhawk + Baythroid XL	2.2 oz + 2.8 fl oz	A-D

A: 3 July, B: 7 July, C: 11 July, D: 15 July

TRT	Worms per 25 ears			
	Small CEW	Med CEW	Large CEW	Total*
1	1.8 ± 0.8	4.3 ± 1.6 a	2.0 ± 1.1	13.3 ± 1.9 a
2	0.5 ± 0.5	0.8 ± 0.5 ab	0.3 ± 0.3	1.8 ± 0.9 b
3	0	0.3 ± 0.3 b	0.3 ± 0.3	1.5 ± 0.5 b
4	1.0 ± 0.6	0.5 ± 0.3 ab	1.3 ± 0.8	4.0 ± 0.6 b
5	0.8 ± 0.5	1.3 ± 0.5 ab	0.5 ± 0.3	3.3 ± 1.1 b
6	1.5 ± 0.9	2.0 ± 0.8 ab	1.0 ± 0.7	6.3 ± 1.4 ab
7	0.8 ± 0.5	0.5 ± 0.3 ab	0.8 ± 0.5	2.3 ± 0.6 b
8	0.3 ± 0.3	0.3 ± 0.3 b	0.5 ± 0.3	1.8 ± 0.9 b
9	0	0 b	0.5 ± 0.3	1.3 ± 0.5 b
10	0.4 ± 0.2	1.4 ± 1.4 ab	1.2 ± 1.0	4.0 ± 3.0 b
11	0.5 ± 0.	1.0 ± 0 ab	1.8 ± 0.3	6.3 ± 1.7 ab
12	0	0.3 ± 0.3 b	0.5 ± 0.3	1.5 ± 0.6 b
ANOVA	*P = 0.153 F = 1.56; df = 11, 37*	*P = 0.028 F = 2.31; df = 11, 37*	*P = 0.543 F = 0.91; df = 11, 37*	*P <0.001 F = 5.18; df = 11, 37*

TRT	% Clean ears	% Clean + tip ears	# sap beetle damaged kernels	# stink bug damaged kernels
1	36.4 ± 2.9 b	93.9 ± 2.6	74.5 ± 32.5 a	21.0 ± 9.6
2	91.8 ± 4.5 a	100	8.3 ± 4.6 b	3.8 ± 2.8
3	94.0 ± 2.0 a	100	2.0 ± 2.0 b	0.3 ± 0.3
4	80.9 ± 4.7 a	97.0 ± 1.9	12.0 ± 11.0 b	1.3 ± 0.8
5	86.0 ± 4.2 a	99.0 ± 1.0	2.3 ± 1.3 b	0
6	71.6 ± 4.1 a	96.9 ± 3.1	13.5 ± 4.0 b	1.5 ± 0.9
7	88.0 ± 5.2 a	100	1.5 ± 1.2 b	5.3 ± 3.0
8	91.0 ± 3.0 a	100	1.0 ± 1.0 b	0.3 ± 0.3
9	94.9 ± 2.4 a	98.1 ± 1.9	6.5 ± 1.6 b	6.8 ± 3.6
10	80.2 ± 13.8 a	97.5 ± 2.5	4.4 ± 2.8 b	10.2 ± 5.4
11	76.5 ± 5.2 a	100	21.3 ± 4.6 b	12.3 ± 3.9
12	93.0 ± 1.9 a	99.0 ± 1.0	8.5 ± 5.0 b	9.0 ± 7.1
ANOVA	*P <0.001 F = 6.75; df = 11, 37*	P = 0.318 F = 1.20; df = 11, 37	*P = 0.001 F = 3.97; df = 11, 37*	*P = 0.047 F = 2.09; df = 11, 37*

Sweet Corn 2022 Corn Earworm 2

Location: Carvel REC, Field 11A
Variety: 'American Dream'
Planting Date: June 17
Experimental Design: Randomized complete block design with 6 treatments and 4 replicates
Plot size: 20'
Row Spacing: 30"
Plant population: 24,000
Treatment Method: Directed ear spray; CO_2-pressurized backpack sprayer with single-row boom equipped with 2 D2 tips and #25 cores delivering 40 GPA at 38 PSI.
Treatment Interval: 3 days
Sample Size: 25 ears
Harvest Date: 22-August
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: All foliar treatments received Induce at 0.25% v/v. Treatments were initiated 2 days after first silk was observed.

Dates Trap Checked	Aug 1-4	Aug 4-8	Aug 8-11	Aug 11-15	Aug 15-18
# moths/ night	26	24.25	25.66	20.5	26.33

TRT	Material	Rate/ acre	Application
1	UTC	---	---
2	Baythroid XL	2.8 fl oz	A-F
3	Warrior II	1.92 fl oz	A-F
4	Brigade	6.4 fl oz	A-F
5	Hero	7.0 fl oz	A-F
6	Hero	10.3 fl oz	A-F

August 3, 6, 9, 12, 15, 18

TRT	Worms per 25 ears			
	Small CEW	**Med CEW**	**Large CEW**	**Total***
1	2.0 ± 1.1	7.3 ± 1.1 a	8.3 ± 0.8 a	24.5 ± 0.6 a
2	1.0 ± 0.7	2.0 ± 0.8 b	1.8 ± 0.5 b	9.0 ± 2.0 bc
3	3.3 ± 0.6	3.5 ± 0.5 b	1.8 ± 0.8 b	14.5 ± 0.5 b
4	1.0 ± 0.4	3.3 ± 0.8 b	2.3 ± 1.0 b	10.0 ± 2.3 bc
5	1.3 ± 0.3	1.5 ± 0.6 b	2.5 ± 1.0 b	8.3 ± 1.3 bc
6	0.8 ± 0.5	1.0 ± 0.6 b	1.3 ± 0.5 b	4.3 ± 0.5 c
ANOVA	$P = 0.112$ $F = 2.11; df = 5, 18$	$P < 0.001$ $F = 8.88; df = 5, 18$	$P < 0.001$ $F = 11.12; df = 5, 18$	$P < 0.001$ $F = 15.23; df = 12, 39$

TRT	**% Clean ears**	**% Clean + tip ears**	**# sap beetle damaged kernels**	**# stink bug damaged kernels**
1	6.0 ± 1.2 c	42.0 ± 8.7 b	14.3 ± 7.0	12.3 ± 10.3
2	61.7 ± 8.3 ab	90.2 ± 1.7 a	7.3 ± 1.8	6.5 ± 5.5
3	45.0 ± 3.8 b	89.0 ± 3.0 a	8.8 ± 3.7	4.0 ± 2.3
4	54.5 ± 8.8 b	92.2 ± 1.5 a	24.0 ± 10.1	0.3 ± 0.3
5	67.0 ± 8.8 ab	84.0 ± 3.7 a	7.5 ± 2.7	5.8 ± 2.1
6	83.0 ± 1.9 a	96.0 ± 1.6 a	13.5 ± 9.7	1.3 ± 0.9
ANOVA	*P <0.001 F = 23.04; df = 5, 18*	*P <0.001 F = 22.89; df = 5, 18*	*P = 0.501 F = 0.90; df = 5, 18*	*P = 0.596 F = 0.75; df = 5, 18*

Sweet Corn 2022 Corn Earworm 3

Location: Carvel REC, Field 11A
Variety: ‘American Dream’
Planting Date: 5 July
Experimental Design: Randomized complete block design with 13 treatments and 4 replicates
Plot size: 20’
Row Spacing: 30”
Plant population: 24,000
Treatment Method: Directed ear spray; CO_2-pressurized backpack sprayer with single-row boom equipped with 2 D2 tips and #25 cores delivering 40 GPA at 38 PSI.

Treatment Interval: 3 days
Sample Size: 25 ears
Harvest Date: 6-7 September
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: All foliar treatments received Induce at 0.25% v/v. Treatments were initiated 2 days after first silk was observed.

Dates Trap Checked	Aug 15-18	Aug 18-22	Aug 22-25	Aug 25-29	Aug 29-Sept 1	Sept 1-5
# moths/ night	26.33	18.25	19.33	---	6.66	7.75

TRT	Material	Rate/ acre	Application
1	UTC	---	---
2	Vantacor	1.2 fl oz	A-E
3	Vantacor	1.7 fl oz	A-E
4	Elevest Baythroid XL	6.7 fl oz 2.8 fl oz	A, C, E B, D, F
5	Elevest Baythroid XL	9.6 fl oz 2.8 fl oz	A, C, E B, D, F
6	Brigade	6.4 fl oz	A-E
7	Mustang Maxx	4.0 fl oz	A-E
8	Hero	9.0 fl oz	A-E
9	Besiege Baythroid XL	10.0 fl oz 2.8 fl oz	
10	Intrepid Edge + Warrior II	12 fl oz + 1.92 fl oz	A-E
11	Intrepid Edge + Warrior II	6 fl oz + 1.92 fl oz	A-E
12	Warrior II	1.92 fl oz	A-E
13	Baythroid XL	2.8 fl oz	A-E

A: 8/19 B: 8/22 C: 8/25 D: 8/28 E: 8/31 F: 9/3

TRT	Worms per 25 ears			
	Small CEW	Med CEW	Large CEW	Total*
1	1.3 ± 0.3	1.0 ± 0.4 ab	4.3 ± 2.0	27.5 ± 0.9 a
2	0.8 ± 0.5	1.5 ± 0.6 ab	2.0 ± 0.9	14.8 ± 0.9 bc
3	0.5 ± 0.5	0.3 ± 0.3 ab	1.0 ± 0.4	14.0 ± 1.1 bc
4	0.3 ± 0.3	0.3 ± 0.3 ab	0.3 ± 0.3	4.5 ± 1.6 d
5	0	0 b	0.3 ± 0.3	8.5 ± 0.5 cd
6	1.0 ± 0.6	0.8 ± 0.5 ab	2.3 ± 1.3	19.5 ± 2.2 ab
7	2.0 ± 0.7	2.8 ± 1.3 a	2.8 ± 1.8	21.8 ± 3.3 ab
8	1.5 ± 1.0	1.5 ± 0.9 ab	2.0 ± 1.0	18.8 ± 1.2 b
9	0	0.3 ± 0.3 ab	0.3 ± 0.3	8.3 ± 2.8 cd
10	0	0.3 ± 0.3 ab	0.3 ± 0.3	4.5 ± 2.1 d
11	0.5 ± 0.3	0.5 ± 0.3 ab	1.3 ± 0.8	15.0 ± 1.9 bc
12	1.0 ± 0.6	0.5 ± 0.3 ab	1.8 ± 0.5	18.3 ± 0.3 b
13	0.5 ± 0.3	0.3 ± 0.3 ab	1.0 ± 0.7	15.5 ± 1.0 bc
ANOVA	*P = 0.093* *F = 1.75; df = 12, 39*	*P = 0.036* *F = 2.14; df = 12, 39*	*P = 0.177* *F = 2.52; df = 11, 35*	*P < 0.001* *F = 15.23; df = 12, 39*

*includes dead worms, 'missing' worms that damaged corn but apparently did not complete their development, or worms that completed their development and left.

TRT	% Clean ears	% Clean + tip ears	# sap beetle damaged kernels	# stink bug damaged kernels
1	1.0 ± 1.0 f	13.2 ± 7.7 c	24.8 ± 11.2 ab	0
2	34.0 ± 6.8 cde	63.0 ± 11.1 ab	39.0 ± 17.9 ab	0
3	46.0 ± 4.2 bcd	77.0 ± 6.0 ab	84.5 ± 22.0 a	52.3 ± 22.9
4	83.0 ± 6.6 a	91.0 ± 6.4 a	9.0 ± 4.8 b	3.0 ± 3.0
5	62.2 ± 4.4 abc	82.3 ± 4.7 ab	11.0 ± 4.3 b	2.8 ± 2.8
6	22.0 ± 7.8 def	47.0 ± 9.1 bc	9.8 ± 6.2 b	0
7	13.0 ± 6.0 ef	67.0 ± 14.5 ab	17.5 ± 15.9 b	1.3 ± 1.3
8	23.0 ± 5.3 def	45.0 ± 3.4 bc	22.5 ± 6.3 ab	0
9	49.0 ± 10.1 bcd	79.0 ± 11.0 ab	33.5 ± 21.7 ab	0.3 ± 0.3
10	70.0 ± 8.1 ab	89.0 ± 3.4 a	16.8 ± 14.8	0
11	41.0 ± 7.9 bcde	81.0 ± 3.4 ab	10.8 ± 5.6 b	0
12	26.3 ± 1.0 def	43.4 ± 3.3 bc	8.5 ± 5.0 b	0
13	33.0 ± 6.6 cde	68.0 ± 11.9 ab	14.5 ± 9.0 b	0
ANOVA	*P <0.001* *F = 13.34; df = 12, 39*	*P <0.001* *F = 7.39; df = 12, 39*	*P = 0.011* *F = 2.63; df = 12, 39*	*P <0.001* *F = 5.02; df = 12, 39*

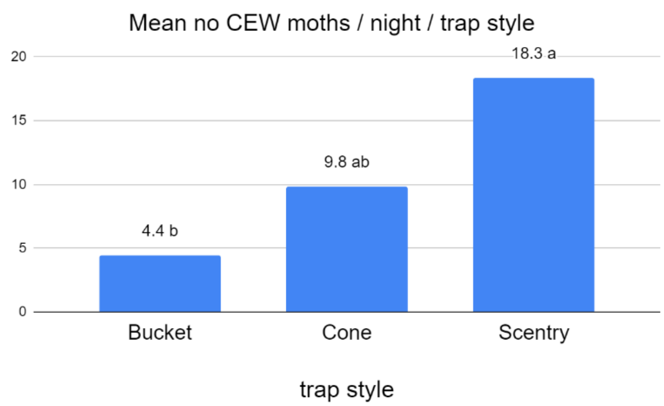
Sweet Corn 2022 CEW Traps and Lures

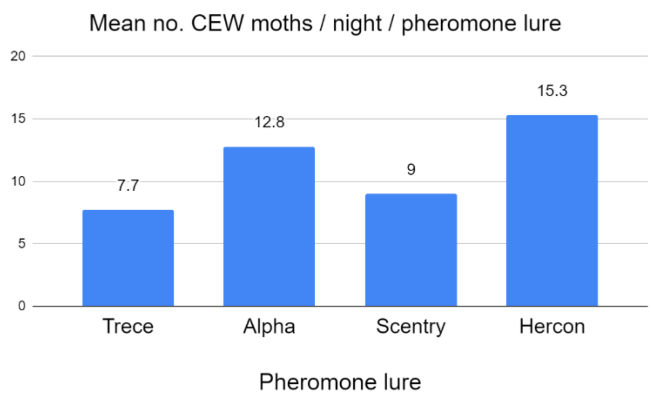
Location: Bridgeville, DE (Sharps Mill Rd)
Variety: silking sweet corn
Deploy date: August 23
Experimental Design: Traps arranged in row by trap type 230 feet apart along the field. Each trap was placed 1 row in. Pheromone lure was rotated after each date.
Data Analysis: ANOVA; Tukey-Kramer HSD means separation (pseudo replication ignored)

Trap types: Universal Moth Bucket Trap, Wire Cone, Scentry Nylon Mesh
Pheromone lure: Alpha, Hercon, Scentry, Trece

Trap Style	Mean CEW moths / night / trap style
Bucket	4.4 ± 0.9 b
Cone	9.8 ± 4.0 ab
Scentry	18.3 ± 4.3 a
ANOVA	P = 0.0315; F = 3.6473; df = 2, 65

Pheromone lure	Mean num CEW moths / night / pheromone lure
Trece	7.7 ± 4.7
Alpha	12.8 ± 5.7
Scentry	9.0 ± 3.2
Hercon	15.3 ± 4.7
ANOVA	*P = 0.5904* *F = 0.6427; df = 3; 64*





Raw Data

Trap	Lure	24-Aug (1 nights)	25-Aug (1 nights)	29-Aug (4 nights)	02-Sept (4 nights)	09-Sept (7 nights)	15-Sept (6 nights)
Bucket	**Alpha**	.	14	12	5	19	6
Bucket	**Hercon**	.	13	14	8	5	23
Bucket	**Scentry**	.	7	26	7	15	17
Bucket	**Trece**	.	6	43	13	20	0
Cone	**Alpha**	94	14	35	0	5	5
Cone	**Hercon**	16	12	150	25	3	1
Cone	**Scentry**	3	0	44	35	11	2
Cone	**Trece**	10	7	2	0	9	9
Scentry	**Alpha**	42	6	99	7	18	0
Scentry	**Hercon**	59	31	236	29	64	0
Scentry	**Scentry**	52	13	121	42	17	4
Scentry	**Trece**	52	2	119	8	8	0

Sweet Corn 2022 Melon Aphids

Location: Concord, DE
Experimental Design: Randomized complete block design with 5 treatments, 4 reps
Plot size: 3 rows x 25’
Row Spacing: 30”
Treatment Method: CO_2-pressurized backpack sprayer with a 6’ boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.
Treatment Date: 12 August
Sample Size: 7 mid canopy leaves
Data Analysis: ANOVA, Tukey-Kramer HSD means separation in SAS JMP

Notes: species was melon aphid. Leaves were collected and photographed for aphid counting on the computer.

TRT	Material	Rate
1	UTC	---
2	Assail	2.9 oz
3	Assail	5.3 oz
4	Lanate	24 fl oz
5	Sivanto	7.5 fl oz

Average aphid count per leaf

Trt	PRE	3DAT	5DAT
1	1265 ± 348	128 ± 18	90 ± 81
2	1725 ± 645	81 ± 26	38 ± 22
3	1747 ± 599	70 ± 46	1 ± 1
4	1750 ± 479	210 ± 40	16 ± 15
5	917 ± 164	134 ± 52	11 ± 11
Anova	*P = 0.6581, F = 0.6155; df = 15, 19*	*P = 0.1361, F = 2.0673, df = 15, 19*	*P = 0.4555, F = 0.9777, df = 12, 16*

Sweet Corn 2022 Sentinel Plot CEW Bt Susceptibility

Location: Carvel REC
Variety: See Table
Planting Date: 05 July
Experimental Design: Randomized complete block design with 5 varieties, 4 replicates. Two large alleys separated Sh2 from Se/Sh 2 corm
Plot size: 4 rows x 20'
Row Spacing: 30"
Seeding Rate: 24,000 seeds/a
Harvest date: 12 September
Sample size: 25 ears/ plot from rows 2 and 3
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Variety	Type	Protein	% Clean Ears	% Clean + Tip	% Damage	Sap Beetle damaged kernels	Area Damaged (cm^2)
Obsession	Sh2	---	2 ± 2.0 c	24 ± 8.2 b	77 ± 8.7 a	18.9 ± 3.6 a	7.1 ± 1.3 a
Obsession II	Sh2	Cry1A.105 + Cry2Ab2	25 ± 6.6 b	15.1 ± 7.6 b	44 ± 8.5 ab	15 ± 3.3 a	4.7 ± 1.4 ab
Providence	SE, Sh2	---	10 ± 3.5 bc	32 ± 11.7 b	68 ± 11.7 a	18.4 ± 3.0 a	10.6 ± 2.0 a
BC0805 Attribute	SE, Sh2	Cry1Ab	22 ± 7.0 bc	46 ± 15.2 b	54 ± 15.2 a	15.7 ± 4.5 a	9.1 ± 1.3 a
Remedy Attribute II	SE, Sh2	Cry1Ab + Vip3A	99 ± 1.0 a	99 ± 1.0 a	1 ± 1 b	9.5 ± 2.5 a	0.15 ± 0.15 b
ANOVA			*P < 0.001; F = 68.42; df = 4, 15*	*P=0.001; F =8.71; df = 4, 15*	*P=0.001; F =8.49; df = 4, 15*	*P= 0.352; F= 1.20; df = 4, 15*	*P= 0.001; F= 9.22; df = 4, 15*

Variety	No. worms (instar) / ear							
	2nd	3rd	5th	5th	6th	Exits	Missing	Dead	Total
Obsession	0.08	0.05	0.07	0.06	0.14	0.34	0.46	0.01	1.21
Obsession II	0.06	0.05	0.05	0.03	0.02	0.03	0.53	0.04	0.81
Providence	0.01	0.06	0.05	0.07	0.1	0.55	0.37	0.04	1.25
BC0805 Attribute	0.06	0.02	0.05	0.09	0.13	0.16	0.43	0.01	0.95
Remedy Attribute II	0	0	0	0	0.01	0	0	0	0.01

Sweet Potato 2022 Wireworm

Location: Carvel REC, Field 18
Variety: Covington
Planting Date: June 09
Experimental Design: Randomized complete block design with 11 treatments and 5 replicates
Plot size: 25' x 1 row; 5 ft buffer between plots
Row Spacing: 72"
Plant Spacing: 12"
Treatment Method: P = at planting (June 09) treated with a single nozzle boom equipped with an 8002 even flat fan nozzle calibrated to deliver 15.98 GPA at 50 PSI.

Lay-by = 2.5 weeks after planting when beginning to vine, June 28 with a single nozzle boom. Material incorporated and plots handled manually via garden hoe.

F = foliar, July18 and 26, 3 nozzle boom calibrated to deliver 23 GPA at 20 PSI

Sample Size: 30 tubers of approximately US Grade 1 size
Harvest Date: Sept 26-27; cured in greenhouse for 2 weeks and evaluated for damage
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

TRT	Material	Rate
1	UTC	---
2	Brigade (P)	19.2 fl oz/A
3	Movento (F)	5.0 fl oz/A
4	Brigade (P) Movento (F)	19.2 fl oz/A 5.0 fl oz/A
5	Admire (P) Brigade (lay-by)	0.74 fl oz/1000 row-ft 9.6 fl oz
6	Platinum (P) Brigade (lay-by)	0.37 fl oz/1000 row-ft 9.6 fl oz
7	Brigade (P) Brigade (lay-by)	19.2 fl oz/A 9.6 fl oz
8	Verimark (P) Brigade (lay-by)	1.86 fl oz/1000 row-ft 9.6 fl oz
9	Platinum (P) Movento (F)	0.37 fl oz/1000 row-ft 5.0 fl oz
10	Brigade (lay-by)	9.6 fl oz
11	Platinum (P)	0.37 fl oz/1000 row-ft

Trt	**Num potatoes with damage**	**Percent damage**	**Num wireworm holes total**	**Avg num holes per potato**	**Avg num holes per damaged potato**
1	14 ± 1.97	46.7 ± 6.6	40.2 ± 16.04	1.3 ± 0.53	2.5 ± 0.66
2	14 ± 1.22	46.7 ± 4.1	52 ± 7.84	1.7 ± 0.26	3.7 ± 0.44
3	16.8 ± 2.52	56 ± 8.4	75 ± 20.21	2.5 ± 0.67	4.1 ± 0.75
4	13 ± 2.81	43.3 ± 9.4	55 ± 24.91	1.8 ± 0.83	3.6 ± 0.86
5	11.4 ± 1.44	38 ± 4.8	47.6 ± 9.23	1.6 ± 0.31	4.1 ± 0.42
6	9.4 ± 0.51	31.3 ± 1.7	57.4 ± 17.81	1.9 ± 0.59	6.1 ± 1.95
7	14.6 ± 2.11	48.7 ± 7	61 ± 8.86	2 ± 0.3	4.2 ± 0.42
8	11.2 ± 2.56	37.3 ± 8.5	44 ± 9.18	1.5 ± 0.31	4.8 ± 1.53
9	14.2 ± 1.46	47.3 ± 4.9	55.6 ± 8.95	1.9 ± 0.3	3.9 ± 0.56
10	11 ± 1.52	36.7 ± 5.1	28.6 ± 8.17	1 ± 0.27	2.5 ± 0.67
11	13 ± 2.1	43.3 ± 7	48.2 ± 7.34	1.6 ± 0.24	3.8 ± 0.33
ANOVA	*P = 0.3582; F = 1.1365; df = 10, 44*	*P = 0.3582; F = 1.1365; df = 10, 44*	*P = 0.6745; F = 0.7497; df = 10, 44*	*P = 0.6745; F = 0.7497; df = 10, 44*	*P = 0.3542; F = 1.1424; df = 10, 44*

Watermelon 2022 Aphid

Location: Carvel REC, Field 37
Variety: 'Fascination'; 'Wingman' pollinizer
Planting Date: May 27
Experimental Design: Randomized complete block design with 5 treatments and 4 replicates
Plot size: 1 rows x 24'
Row Spacing: 7'
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: foliar treatments applied with CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.
Treatment Date: 3 August
Sample Size: 10 leaves
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

TRT	Material	Rate
1	UTC	---
2	NA Experimental	8 fl oz
3	Assail	5.3 fl oz
4	Exirel	13.5 fl oz
5	Torac	17 fl oz

Total aphid count per 10 leaves; treated on 8/03

Trt	0D PRE	2DAT	8DAT
1	270.25 ± 86.2	596.0 ± 594.6	2.25 ± 1.3
2	402.5 ± 225.1	28.5 ± 20.2	0
3	322.5 ± 197.0	2.75 ± 1.9	0.5 ± 0.5
4	300.25 ± 185.7	5.25 □± 2.7	0
5	202.5 ± 107.8	4.25 ± 2.7	0
Anova	*P = 0.9415; F = 0.1871; df = 4,15*	*P = 0.4522; F = 0.9709; df = 4, 15*	*P = 0.0961; F = 2.4000; df = 4, 15*

Watermelon 2022 Cucumber Beetles 1

Location: Carvel REC, Field 37
Variety: 'Fascination'; 'Wingman' pollinizer
Planting Date: May 27
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 3 rows x 24'
Row Spacing: **7'**
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: foliar treatments applied with CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.

Chemigation was applied to all three rows simultaneously from a CO_2-pressureized 3 gallon tank. 3 gallons of water were applied first to prime the drip tape, followed by 3 gallons of product solution, and flushed with 3 gallons of water. Valves were installed at the back of each plot to isolate plots from the remainder of the field during application.

Sample Size: 7 plants
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: No discernible phytotoxicity was observed from any treatments at any post treatment sample date.

TRT	Material	Rate	Application Method
1	UTC	---	---
2	Admire Pro	10.5 fl oz	Chemigation
3	Platinum	3.67 oz	Chemigation
4	Verimark	10.0 fl oz	Chemigation
5	ISM-555 SC100	4.1 fl oz	Foliar
6	ISM-555 SC100	6.16 fl oz	Foliar
7	ISM-555 SC100	8.24 fl oz	Foliar
8	Besiege	10.0 fl oz	Foliar

TRT	June 22 0 D PRE			June 27 5 DAT						July 6 14 DAT			
	Live StCB	**Live SpCB**	**Total**	**Live StCB**	**Dead StCB**	**Live SpCB**	**Dead SpCB**	**Total Live**	**Total Dead**	**Live StCB**	**Dead StCB**	**Live SpCB**	**Total Live**
1	1.5 ± 0.3	1.5 ± 0.6	3.0 ± 0.9	3.5 ± 1.3 ab	0	3.0 ± 0.9 a	0	6.5 ± 2.2 a	0	0.25 ± 0.25	0	1.0 ± 0.6	1.25 ± 0.75
2	0.75 ± 0.5	0	0.75 ± 0.5	2.25 ± 0.6 ab	1.0 ± 0.7	2.0 ± 0.9 ab	0.25 ± 0.25	4.25 ± 0.75 ab	1.25 ± 0.75	0	0	0.8 ± 0.4	0.8 ± 0.4
3	2.0 ± 0.9	0.25 ± 0.25	2.25 ± 0.75	1.5 ± 0.9 ab	1.0 ± 0.0	1.5 ± 0.6 ab	0.75 ± 0.5	3.0 ± 0.9 ab	1.75 ± 0.5	0.5 ± 0.5	0	0.5 ± 0.5	1.0 ± 1.0
4	1.0 ± 0.7	0.5 ± 0.3	1.5 ± 0.9	4.5 ± 0.5 a	0	1.5 ± 0.6 ab	0	6.0 ± 0.4 a	0	0	0	0	0
5	0.25 ± 0.25	0.75 ± 0.25	1.0 ± 0.4	0.5 ± 0.5 b	0.75 ± 0.25	0.0 b	0	0.5 ± 0.5 b	0.75 ± 0.25	0	0	0.75 ± 0.5	0.75 ± 0.5
6	1.0 ± 0.7	0.75 ± 0.75	1.75 ± 1.0	2.0 ± 1.1 ab	2.5 ± 1.7	0.25 ± 0.25 ab	0.5 ± 0.3	2.25 ± 0.9 ab	3.0 ± 1.9	0	0	0.25 ± 0.25	0.25 ± 0.25
7	0.5 ± 0.3	0.25 ± 0.25	0.75 ± 0.25	1.75 ± 0.75 ab	2.25 ± 1.0	0.5 ± 0.5 ab	1.0 ± 0.7	2.25 ± 0.75 ab	3.25 ± 1.5	0	0.3 ± 0.3	1.0 ± 0.6	1.0 ± 0.6
8	2.25 ± 1.0	0	2.25 ± 1.0	4.0 ± 0.7 ab	0	0.5 ± 0.5 ab	0	4.5 ± 0.6 ab	0	0.75 ± 0.5	0	0.25 ± 0.25	1.0 ± 0.4
ANOVA	*P = 0.346 F = 1.19; df = 7, 24*	*P = 0.183 F = 1.60; df = 7, 24*	*P = 0.386 F = 1.12; df = 7, 24*	*P = 0.034 F = 2.67; df = 7, 24*	*P = 0.136 F = 1.79; df = 7, 24*	*P = 0.030 F = 2.75; df = 7, 24*	*P = 0.240 F = 1.43; df = 7, 24*	*P = 0.006 F = 3.85; df = 7, 24*	*P = 0.087 F = 2.07; df = 7, 24*	*P = 0.314 F = 1.25; df = 7, 24*	*P = 0.197 F = 1.55; df = 7, 24*	*P = 0.582 F = 0.817 ; df = 7, 24*	*P = 0.762 F = 0.584 ; df = 7, 24*

Watermelon 2022 Cucumber Beetles 2

Location: Parsonsburg, MD
Variety: Sweet Gem Seedless Sugar Baby
Planting Date: May 1
Experimental Design: Randomized complete block design with 8 treatments and 4 replicates
Plot size: 3 rows x 24'
Row Spacing: **7'**
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: foliar treatments applied with CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.
Treatment Date: 17 June
Sample Size: 5 plants
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

TRT	**Material**	**Rate**
1	Hero	10.0 fl oz
2	Brigade	6.4 fl oz
3	Actara	5.5 oz
4	Minecto Pro	10 fl oz
5	Harvanta	13.6 fl oz
6	Assail	2.5 oz
7	Assail + Cidetrak D	2.5 oz
8	Assail	5.3 oz

June 17 0D PRE

TRT	**Live StCB**	**Live SpCB**	**Total Live**
1	5.0 ± 1.8	0.8 ± 0.3	5.8 ± 2.0
2	3.0 ± 0.8	2.5 ± 0.9	5.5 ± 0.6
3	2.3 ± 1.3	1.0 ± 0.4	3.3 ± 1.7
4	5.0 ± 2.0	2.0 ± 0.9	7.0 ± 2.4
5	5.3 ± 1.7	1.0 ± 0.4	6.3 ± 1.4
6	4.5 ± 1.0	0.8 ± 0.5	5.3 ± 1.4
7	6.0 ± 0.9	3.3 ± 0.9	9.3 ± 1.7
8	5.5 ± 1.9	1.5 ± 0.6	7.0 ± 2.3
ANOVA	$P = 0.653$ $F = 0.72; df = 7, 24$	$P = 0.097$ $F = 2.00; df = 7, 24$	$P = 0.487$ $F = 0.95; df = 7, 24$

June 21 4 DAT

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Total Live	Total Dead
1	0.3 ± 0.3 b	0.3 ± 0.3	0.8 ± 0.5	1.0 ± 0.7	3.8 ± 1.3	1.3 ± 0.9 c
2	1.0 ± 0.4 b	1.0 ± 0.4 b	0.3 ± 0.3	0.8 ± 0.3 b	2.8 ± 1.1	1.8 ± 0.6 c
3	2.3 ± 1.3 ab	2.3 ± 1.3 ab	0.8 ± 0.3	1.0 ± 0.4 b	2.3 ± 0.5	3.3 ± 1.7 bc
4	0.8 ± 0.5 b	0.8 ± 0.5 b	1.5 ± 0.9	0 b	6.5 ± 1.3	0.8 ± 0.5 c
5	0.5 ± 0.3 b	0.5 ± 0.3 b	1.5 ± 0.3	0.8 ± 0.8 b	2.5 ± 0.9	1.3 ± 0.9 c
6	6.3 ± 1.1 a	6.3 ± 1.1 a	2.3 ± 1.4	1.8 ± 0.9 b	4.0 ± 2.1	8.0 ± 1.5 ab
7	3.3 ± 0.8 ab	3.3 ± 0.8 ab	2.3 ± 1.1	1.8 ± 1.2 b	4.0 ± 1.4	5.0 ± 1.8 abc
8	4.5 ± 1.9 ab	4.5 ± 1.9 ab	0.8 ± 0.3	6.0 ± 0.4 a	1.5 ± 0.5	10.5 ± 1.6 a
ANOVA	*P = 0.002 F = 4.91; df = 7, 24*	*P = 0.002 F = 4.91; df = 7, 24*	*P = 0.472 F = 0.98; df = 7, 24*	*P <0.001 F = 7.69; df = 7, 24*	*P = 0.200 F = 1.55; df = 7, 24*	*P <0.001 F = 7.92; df = 7, 24*

June 27 10 DAT

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Total Live	Total Dead
1	1.3 ± 0.8	0.8 ± 0.8	0.5 ± 0.3	0	1.8 ± 0.5	0.8 ± 0.8
2	3.5 ± 0.9	0.3 ± 0.3	0.5 ± 0.3	0	4.0 ± 0.8	0.3 ± 0.3
3	3.8 ± 1.4	2.0 ± 1.4	1.5 ± 0.6	1.0 ± 0.6	5.3 ± 1.9	3.0 ± 1.9
4	3.5 ± 1.0	0.3 ± 0.3	0.8 ± 0.8	0	4.3 ± 1.1	0.3 ± 0.3
5	2.5 ± 1.0	0.3 ± 0.3	1.3 ± 0.9	0.8 ± 0.8	3.8 ± 0.9	1.0 ± 0.7
6	2.5 ± 1.3	2.0 ± 0.9	1.0 ± 0.4	0.8 ± 0.5	3.5 ± 1.6	2.8 ± 1.0
7	3.5 ± 1.6	2.3 ± 1.1	3.3 ± 1.1	3.5 ± 1.8	6.8 ± 2.1	5.8 ± 2.8
8	2.3 ± 0.9	1.0 ± 0.4	2.0 ± 1.2	0.3 ± 0.3	4.3 ± 2.0	1.3 ± 0.5
ANOVA	*P = 0.755 F = 0.59; df = 7, 24*	*P = 0.339 F = 1.20; df = 7, 24*	*P = 0.256 F = 1.39; df = 7, 24*	*P = 0.054 F = 2.37; df = 7, 24*	*P = 0.508 F = 0.92; df = 7, 24*	*P = 0.092 F = 2.04; df = 7, 24*

July 5, no dead beetles were observed

TRT	Live StCB	Live SpCB	Total Live
1	1.5 ± 0.6 a	0	1.5 ± 0.6
2	0 b	0	0
3	0 b	0	0
4	0.3 ± 0.3 ab	0	0.3 ± 0.3
5	0.3 ± 0.3 ab	0.3 ± 0.3	0.5 ± 0.5
6	0.3 ± 0.3 ab	0.3 ± 0.3	0.5 ± 0.3
7	0 b	0	0
8	1.0 ± 0.4 ab	0.3 ± 0.3	1.3 ± 0.5
ANOVA	*P = 0.755 F = 0.59; df = 7, 24*	*P = 0.661 F = 0.71; df = 7, 24*	*P = 0.038 F = 2.61; df = 7, 24*

Watermelon 2022 Cucumber Beetles 3

Location: LESREC
Variety: 'Fascination'; 'Wingman' pollinizer
Planting Date: May 25
Experimental Design: Randomized complete block design with 5 treatments and 3 replicates
Plot size: 3 rows x 30'
Row Spacing: **7'**
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: foliar treatments applied with CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, nozzles calibrated to deliver GPA at PSI.

Chemigation was applied to all three rows simultaneously from a CO_2-pressureized 3 gallon tank. 3 gallons of water were applied first to prime the drip tape, followed by 3 gallons of product solution, and flushed with 3 gallons of water. Valves were installed at the back of each plot to isolate plots from the remainder of the field during application.

Sample Size: 7 plants
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Overwintering Generation, June 24; Dyne-Amic at 0.25% v/v for foliar treatments

TRT	Material	Rate	Application Method
1	UTC	---	---
2	Admire Pro	10.5 fl oz	Chemigation
3	Platinum	3.67 oz	Chemigation
4	Brigade	6.4 fl oz	Foliar
5	Azera	48.0 fl oz	Foliar

First Generation (3 applications; Aug 2, Aug 9, Aug 19). 2nd Application used Induce 0.25% v/v.

TRT	Material	Rate
1	UTC	---
2	ISM-555 SC100	4.11 fl oz
3	ISM-555 SC100	6.16 fl oz
4	ISM-555 SC100	8.21 fl oz
5	Besiege	10.0 fl oz

Post Foliar Treatment First Generation Adult Treatment Totals

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Live Total	Dead Total	Number of flowers	Damaged flowers
1	3.7 ± 1.5	2.3 ± 1.2	0.3 ± 0.3	0	4.0 ± 1.2	2.3 ± 1.2	107.0 ± 9.1	24.3 ± 3.7
2	4.7 ± 0.7	1.0	0	0.7 ± 0.3	4.7 ± 0.7	1.7 ± 0.3	104.0 ± 16.5	16.0 ± 2.0
3	5.3 ± 1.9	2.3 ± 1.4	0	0.7 ± 0.3	5.3 ± 1.9	3.0 ± 1.7	76.3 ± 29.6	13.7 ± 8.7
4	8.0 ± 2.0	2.7 ± 2.2	0.3 ± 0.3	0.7 ± 0.7	8.3 ± 1.9	3.3 ± 2.8	123.7 ± 29.7	19.3 ± 2.9
5	5.0 ± 1.2	1.3 ± 0.9	0.3 ± 0.3	0.3 ± 0.3	5.3 ± 1.5	1.2 ± 0.7	119.7 ± 36.0	31.3 ± 14.0
ANOVA	*P = 0.387 F = 1.15; df = 4, 10*	*P = 0.880 F = 0.29; df = 4, 10*	*P = 0.737 F = 0.50; df = 4, 10*	*P = 0.690 F = 0.57; df = 4, 10*	*P = 0.341 F = 1.28; df = 4, 10*	*P = 0.921 F = 0.22; df = 4, 10*	*P = 0.732 F = 0.51; df = 4, 10*	*P = 0.532 F = 0.84; df = 4, 10*

August 2 (2 d PRE)

TRT	Live StCB	Live SpCB	Live Total
1	6.3 ± 1.3	0.3 ± 0.3	6.7 ± 1.2
2	2.7 ± 0.3	0	2.7 ± 0.3
3	2.3 ± 1.9	0.3 ± 0.3	2.7 ± 1.7
4	3.7 ± 1.2	0	3.7 ± 1.2
5	7.0 ± 3.1	0.3 ± 0.3	7.3 ± 3.2
ANOVA	*P = 0.290 F = 1.42; df = 4, 10*	*P = 0.737 F = 0.50; df = 4, 10*	*P = 0.254 F = 1.58; df = 4, 10*

August 9

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Live Total	% Damaged flowers	Damaged flowers
1	1.7 ± 0.9	0	0	0	1.7 ± 0.9	6.5 ± 3.3	1.7 ± 0.9
2	0.3 ± 0.3	0	0	0	0.3 ± 0.3	8.3 ± 4.8	0.7 ± 0.3
3	0	0	0	0	0	3.6 ± 2.2	0.7 ± 0.3
4	0.7 ± 0.7	0	0	0	0.7 ± 0.7	5.6 ± 5.6	1.3 ± 1.3
5	0.7 ± 0.7	0	0	0	0.7 ± 0.7	6.8 ± 3.9	2.0 ± 1.2
ANOVA	*P = 0.411 F = 1.09; df = 4, 10*				*P = 0.411 F = 1.09; df = 4, 10*	*P = 0.943 F = 0.18; df = 4, 10*	*P = 0.782 F = 0.43; df = 4, 10*

August 12

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Live Total	Number of flowers	% Damaged flowers	Damaged flowers
1	1.7 ± 0.9	0	0	0	1.7 ± 0.9	6.3 ± 1.2	9.5 ± 9.5	0.7 ± 0.7
2	0.7 ± 0.3	0	0	0	0.7 ± 0.3	14.0 ± 7.1	1.2 ± 1.2	0.3 ± 0.3
3	0.3 ± 0.3	0	0	0	0.3 ± 0.3	6.7 ± 2.0	9.5 ± 9.5	0.7 ± 0.7
4	0.3 ± 0.3	0	0	0	0.3 ± 0.3	7.0 ± 3.2	18.4 ± 11.1	2.0 ± 1.5
5	0.3 ± 0.3	0	0	0	0.3 ± 0.3	15.7 ± 9.6	20.6 ± 17.1	6.3 ± 5.8
ANOVA	*P = 0.314 F = 1.36; df = 4, 10*				*P = 0.314 F = 1.36; df = 4, 10*	*P = 0.641 F = 0.65; df = 4, 10*	*P = 0.733 F = 0.51; df = 4, 10*	*P = 0.531 F = 0.84; df = 4, 10*

August 15

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Live Total	Number of flowers	% Damaged flowers	Damaged flowers (total flowers)
1	0	0	0.3 ± 0.3	0	0.3 ± 0.3	9.3 ± 3.7	2.8 ± 2.8	0.3 ± 0.3
2	0	0	0	0	0	4.3 ± 1.8	0	0
3	0	0.7 ± 0.7	0	0	0	10.0 ± 6.0	1.5 ± 1.5	0.3 ± 0.3
4	0.3 ± 0.3	0.3 ± 0.3	0	0	0.3 ± 0.3	4.3 ± 1.5	0	0
5	0.7 ± 0.7	0	0	0	0.7 ± 0.7	3.7 ± 1.8	11.1 ± 11.1	0.3 ± 0.3
ANOVA	*P = 0.552 F = 0.80; df = 4, 10*	*P = 0.552 F = 0.80; df = 4, 10*	*P = 0.452 F = 1.00; df = 4, 10*		*P = 0.682 F = 0.58; df = 4, 10*	*P = 0.548 F = 0.81; df = 4, 10*	*P = 0.549 F = 0.81 df = 4, 10*	*P = 0.737 F = 0.50; df = 4, 10*

August 19

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Number of flowers	% Damaged flowers	Damaged flowers (total flowers)
1	0	0	0	0	9.3 ± 6.5	1.5 ± 1.5	0.3 ± 0.3
2	0	0.3 ± 0.3	0	0	4.0 ± 0.6	0	0
3	0	0.7 ± 0.7	0	0	6.7 ± 4.3	0	0
4	0	0	0	0	4.7 ± 2.0	0	0
5	0.7 ± 0.7	0	0	0	5.7 ± 2.2	0	0
ANOVA	*P = 0.452 F = 1.00; df = 4, 10*	*P = 0.552 F = 0.80; df = 4, 10*			*P = 0.861 F = 0.317; df = 4, 10*	*P = 0.452 F = 1.00; df = 4, 10*	*P = 0.452 F = 1.00; df = 4, 10*

August 22

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Live Total	Dead Total	Number of flowers	% Damaged flowers	Damaged flowers (total flowers)
1	1.7 ± 1.7	0	0.7 ± 0.3 a	0	2.3 ± 1.9	0	42.0 ± 22.0	64.7 ± 9.9 a	23.0 ± 8.2
2	3.3 ± 1.5	1.0 ± 1.0	0 b	0	3.3 ± 1.5	1.0 ± 1.0	24.3 ± 9.9	33.5 ± 1.0 ab	8.0 ± 3.1
3	1.0 ± 0.6	0	0 b	0.3 ± 0.3	1.0 ± 0.6	0.3 ± 0.3	28.0 ± 14.6	25.7 ± 4.1 b	6.0 ± 2.1
4	1.7 ± 0.9	2.7 ± 1.5	0 b	0.3 ± 0.3	1.7 ± 0.9	3.0 ± 1.7	27.7 ± 2.0	22.9 ± 2.5 b	6.3 ± 0.9
5	1.7 ± 0.9	0	0 b	0	1.7 ± 0.9	0	23.7 ± 16.3	20.5 ± 10.7 b	6.0 ± 4.2
ANOVA	*P = 0.699 F = 0.56; df = 4, 10*	*P = 0.145 F = 2.18; df = 4, 10*	*P = 0.034 F = 4.00; df = 4, 10*		*P = 0.722 F = 0.52; df = 4, 10*	*P = 0.182 F = 1.93; df = 4, 10*	*P = 0.897 F = 0.26; df = 4, 10*	*P = 0.006 F = 6.93; df = 4, 10*	*P = 0.088 F = 2.76; df = 4, 10*

August 25

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Dead Total	Number of flowers	% Damaged flowers	Damaged flowers (total flowers)
1	1.0 ± 0.6	0.3 ± 0.3	0	0	0.3 ± 0.3	30.3 ± 15.8	39.4 ± 7.2 a	10.3 ± 3.9
2	1.3 ± 0.3	0.3 ± 0.3	0	0.7 ± 0.3	1.0 ± 0.6	19.7 ± 3.8	9.8 ± 1.3 b	2.0 ± 0.6
3	1.0 ± 0.6	0.3 ± 0.3	0	0.7 ± 0.3	1.0 ± 1.0	21.3 ± 10.3	21.0 ± 6.9 ab	3.3 ± 0.7
4	0.7 ± 0.3	1.7 ± 0.7	0	0.3 ± 0.3	2.0 ± 0.6	26.3 ± 3.0	22.9 ± 5.8 ab	6.0 ± 1.5
5	1.3 ± 0.9	0.7 ± 0.3	0	0	0.7 ± 0.3	18.0 ± 5.2	9.9 ± 1.2 b	1.7 ± 0.3
ANOVA	*P = 0.913 F = 0.23; df = 4, 10*	*P = 0.192 F = 1.88; df = 4, 10*		*P = 0.534 F = 0.83; df = 4, 10*	*P = 0.438 F = 1.03; df = 4, 10*	*P = 0.860 F = 0.32; df = 4, 10*	*P = 0.014 F = 5.36; df = 4, 10*	*P = 0.050 F = 3.47; df = 4, 10*

August 26

TRT	Live StCB	Dead StCB	Live SpCB	Dead SpCB	Number of flowers	% Damaged flowers	Damaged flowers (total flowers)
1	0.3 ± 0.3	0 b	0	0	14.3 ± 7.9	38.6 ± 14.2	3.7 ± 0.9
2	0	0 b	0	0	11.7 ± 3.0	22.5 ± 8.0	2.7 ± 1.2
3	0.7 ± 0.3	0 b	0	0	14.3 ± 7.0	10.2 ± 5.8	1.7 ± 0.9
4	1.0 ± 0.6	0.7 ± 0.3 a	0	0	19.0 ± 5.5	16.2 ± 5.7	3.7 ± 2.2
5	1.7 ± 0.7	0 b	0	0	11.0 ± 3.1	22.9 ± 5.4	2.7 ± 1.2
ANOVA	*P = 0.162 F = 2.06; df = 4, 10*	*P = 0.034 F = 4.00; df = 4, 10*			*P = 0.864 F = 0.31; df = 4, 10*	*P = 0.261 F = 1.55; df = 4, 10*	*P = 0.818 F = 0.38; df = 4, 10*

Watermelon 2022 Two Spotted Spider Mite Efficacy

Location: Carvel REC, Field 37
Variety: 'Fascination'; 'Wingman' pollinizer
Planting Date: May 27
Experimental Design: Randomized complete block design with 6 treatments and 4 replicates
Plot size: 2 rows x 24'
Row Spacing: **7'**
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.
Sample Size: 10 crown or basal leaves
Data Analysis: ANOVA; Tukey-Kramer HSD means separation; All data LOG10(x+0.1) transformed for analysis. Presented are non-transformed means.

TRT	Material	Rate
1	UTC	---
2	Minecto Pro	7.75 fl oz
3	Portal	2 pts
4	Banter	14 fl oz
5	Magister	30 fl oz
6	Oberon + Brigade	7.75 fl oz 6.4 fl oz

Average Spider Mite count per leaf and Cumulative Mite Days post treatment

Trt	July 18 0D PRE	July 25 7DAT	August 3 16DAT	Cumulative Mite Days
1	16.7 ± 8.6	12.2 ± 8.1 AB	3.5 ± 1.6	250.5 ± 154.1 a
2	19.1 ± 10.5	0 C	0.025 ± 0.025	0.1 ± 0.1 b
3	32.1 ± 11.5	1.8 ± 1.2 BC	0.5 ± 0.3	37.4 ± 24.2 a
4	7.75 ± 3.4	3.3 □± 1.8 AB	0.5 ± 0.3	65.8 ± 35.0 a
5	41.4 ± 16.2	34.6 ± 17.7 A	11.6 ± 6.4	717.6 ± 369.1 a
6	35.95 ± 15.1	8.0 ± 3.5 AB	2.8 ± 2.1	167.2 ± 67.4 a
Anova	*P = 0.6291; F = 0.7021; df = 5, 18*	*P = 0.0004; F = 8.1680; df = 5, 18*	*P = 0.0799; F = 2.3801; df = 5, 18*	*P <0.001* F = 17.44; df = 5, 18*

Watermelon 2022 Two Spotted Spider Mite Threshold

Location: Carvel REC, Field 37
Variety: 'Fascination'; 'Wingman' pollinizer
Planting Date: May 27
Experimental Design: Randomized complete block design with 3 treatments and 5 replicates
Plot size: 2 rows x 24'
Row Spacing: 7'
Plant Spacing: 40", 3:1 seedless: pollinizer; pollinizers planted between seedless
Treatment Method: CO_2-pressurized backpack sprayer with a 6' boom equipped with 4, D4-45 nozzles calibrated to deliver 40.2 GPA at 50 PSI.
Harvest Date: Aug 3, Aug 16, and Sept 8, all vine ripe melons regardless of other damage or defect provided the structural integrity was sound enough to get a weight and a brix reading.
Sample Size: 10 crown or basal leaves
Data Analysis: ANOVA; Tukey-Kramer HSD means separation; All data LOG10(x+0.1) transformed for analysis. Presented are non-transformed means.
Notes: Plants were infested with spider mites in the greenhouse prior to transplant. Treatment 1 was treated with Agri-Mek shortly after transplant.

TRT	Target Goal
1.	0 mites
2.	2-3 mites per leaf
3.	20+ mites per leaf

Mite counts

TRT	July 8	July 18	July 25	August 3	Cumulative Mite Days
1.	0.4 ± 0.3 b	5.4 ± 3.8 b	11.8 ± 4.9	1.2 ± 0.3	147.5 ± 73.2 b
2.	3.8 ± 1.2 b	23.2 ± 4.4 ab	22.2 ± 11.6	1.6 ± 0.7	404.6 ± 108.6 ab
3.	21.1 ± 6.0 a	50.4 ± 15.9 a	32.3 ± 18.6	2.9 ± 1.2	826.1 ± 186.6 a
ANOVA	*P = 0.003 F = 9.81; df = 2, 12*	*P = 0.022 F = 5.35; df = 2, 12*	*P = 0.551 F = 0.626; df = 2, 12*	*P = 0.346 F = 1.16; df = 2, 12*	*P = 0.011 F = 6.78; df = 2, 12*

Harvest Data

TRT	Aug 3		Aug 16		Sept 8		Harvest Total Weight
	Av Wght (kg)	**Brix**	**Av Wght (kg)**	**Brix**	**Av Wght**	**Brix**	
1.	7.8 ± 0.1	10.8 ± 0.1	8.8 ± 0.5	11.5 ± 0.3	8.2 ± 0.2	11.7 ± 1.0	420.9 ± 58.7
2.	7.9 ± 0.2	12.2 ± 1.1	8.8 ± 0.2	12.8 ± 1.4	9.1 ± 0.6	11.0 ± 0.1	427.8 ± 38.5
3.	7.7 ± 0.2	11.0 ± 0.2	8.2 ± 0.3	11.2 ± 0.2	8.8 ± 0.3	10.9 ± 0.1	405.3 ± 49.5
ANOVA	$P = 0.6323$; $F = 0.4780$; $df = 2, 11$	$P = 0.2776$; $F = 1.4286$; $df = 2, 12$	$P = 0.4557$; $F = 0.8396$; $df = 2, 12$	$P = 0.3996$; $F = 0.9911$; $df = 2, 12$	$P = 0.342$ $F = 1.17$; $df = 2, 12$	$P = 0.555$ $F = 0.620$; $df = 2, 12$	$P = 0.948$ $F = 0.05$; $df = 2, 12$

Field Crops

Alfalfa 2022 Alfalfa Weevil 1

Location: Hebron, MD
Experimental Design: Randomized complete block design with 10 treatments and 4 replicates
Plot size: 9' x 25'
Treatment Method: CO_2-pressurized backpack sprayer with a 9' boom equipped with 6, 11003 nozzles calibrated to deliver 18.7 GPA at 26 PSI
Sample Size: 15 stems/plot
Treatment Date: 30 March
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: Farmer noted inadequate pyrethroid efficacy 2 years prior. Roundup WeatherMax was included in all treatments at 30 fl oz/acre. The organosilicone adjuvant Kinetic was included in all treatments at 0.5% v/v

TRT	Material	Rate
1	UTC	---
2	Warrior II	1.92 fl oz
3	Dimethoate	16.0 fl oz
4	Mustang Maxx + Dimethoate	4.0 fl oz 8.0 fl oz
5	Besiege	10.0 fl oz
6	Steward	5.0 fl oz
7	Mustang Maxx	4.0 fl oz
8	Steward	8.0 fl oz
9	Entrust	4.0 fl oz
10	Malathion	20.0 fl oz

Alfalfa Weevil

TRT	30 March 0 D PRE	5 April 6 DAT	13 April 14 DAT	20 April 21 DAT
UTC	31.25 ± 6.25	38.0 ± 4.7 a	25.0 ± 5.0 ab	17.25 ± 6.0
Warrior II	45.0 ± 3.65	12.5 ± 2.4 bcd	5.25 ± 1.25 c	10.5 ± 2.2
Dimethoate	35.25 ± 3.20	11.5 ± 1.0 bcd	4.75 ± 0.5 c	11.3 ± 2.5
Mustang Maxx + Dimethoate	38.75 ± 3.9	9.5 ± 1.7 cd	5.25 ± 0.6 c	5.5 ± 1.2
Besiege	34.25 ± 5.5	11.25 ± 2.25 bcd	11.25 ± 4.0 bc	10.0 ± 5.3
Steward	45.75 ± 3.75	9.75 ± 2.25 cd	5.0 ± 1.1 c	5.75 ± 1.9
Mustang Maxx	37.75 ± 3.82	16.5 ± 3.4 bc	11.25 ± 4.0 abc	8.25 ± 1.25
Steward	30.0 ± 2.0	5.0 ± 1.1 d	5.0 ± 1.1 c	4.75 ± 1.3
Entrust	41.75 ± 7.0	21.3 ± 1.3 b	31.0 ± 5.2 a	14.25 ± 7.2
Malathion	47.25 ± 6.3	13.25 ± 0.9 bcd	15.75 ± 5.3 abc	10.0 ± 4.6
ANOVA	*P = 0.153* *F = 1.63; df = 9, 30*	*P <0.001* *F = 14.99; df = 9, 30*	*P <0.001* *F = 7.00; df = 9,30*	*P = 0.461; df = 9, 30*

Aphids

TRT	30 March 0 D PRE	5 April 6 DAT	13 April 14 DAT	20 April 21 DAT
UTC	1.25 ± 0.6	0.25 ± 0.25	0	1.0 ± 1.0
Warrior II	1.75 ± 0.9	0.75 ± 0.48	0	0
Dimethoate	3.0 ± 1.8	0	0	0.25 ± 0.25
Mustang Maxx Dimethoate	1.0 ± 0.4	1.0 ± 1.0	0	0.25 ± 0.25
Besiege	2.0 ± 0.8	0.5 ± 0.5	0.25 ± 0.25	0.25 ± 0.25
Steward	1.75 ± 0.5	0.3 ± 0.3	0	1.25 ± 0.5
Mustang Maxx	2.5 ± 0.9	0	1.25 ± 0.75	0.75 ± 0.75
Steward	0.75 ± 0.25	0	1.25 ± 0.95	0.75 ± 0.5
Entrust	1.25 ± 0.5	1.0 ± 1.0	1.25 ± 0.75	0.5 ± 0.3
Malathion	1.0 ± 0.4	0	0	0.25 ± 0.25
ANOVA	*P = 0.629* *F = 0.79; df = 9, 30*	*P = 0.658* *F = 0.75; df = 9, 30*	*P = 0.138* *F = 1.68; df = 9, 30*	*P = 0.724* *F = 0.68; df = 9, 30*

Alfalfa 2022 Alfalfa Weevil 2

Location: Houston, DE
Variety: WL372HQRR
Planting Year: 2016
Experimental Design: Randomized complete block design with 7 treatments and 4 replicates
Plot size: 9' x 25'
Treatment Method: CO_2-pressurized backpack sprayer with a 9' boom equipped with 6, 11003 nozzles calibrated to deliver 18.7 GPA at 26 PSI
Treatment Date: 8 April
Sample Size: 15 stems/plot
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: The organosilicone adjuvant Kinetic was included in all treatments at 0.5% v/v

TRT	Material	Rate
1	UTC	---
2	ISM-555 SC400*	2.05 fl oz
3	Endigo ZCX*	4.5 fl oz
4	Warrior II	1.92 fl oz
5	Sivanto Prime	10.5 fl oz
6	Steward	4.0 fl oz
7	Mustang + Malathion	4 fl oz 20 fl oz

*Products not labeled in 2022, plots were destroyed.

Alfalfa Weevil

TRT	4 April 4 days PRE	13 April 5 DAT	20 April 12 DAT	28 April 20 DAT
UTC	34.25 ± 8.7	37.5 ± 4.1 a	24.25 ± 1.8 a	17.25 ± 2.0 a
ISM-555 SC400*	37.25 ± 3.4	9.75 ± 1.7 b	3.0 ± 1.8 c	1.75 ± 1.0 c
Endigo ZCX*	33.75 ± 7.6	11.75 ± 3.75 b	8.5 ± 2.6 bc	5.5 ± 1.6 c
Warrior II	36.5 ± 4.2	9.5 ± 2.0 b	12.25 ± 2.9 b	7.75 ± 1.7 bc
Sivanto Prime	41.25 ± 7.3	20.5 ± 5.4 b	24.0 ± 1.2 a	13.75 ± 1.8 ab
Steward	32.0 ± 4.2	6.75 ± 1.25 b	6.25 ± 1.9 bc	2.75 ± 1.0 c
Mustang Malathion	40.3 ± 2.5	9.75 ± 3.3 b	9.5 ± 0.9 bc	8.25 ± 1.0 bc
ANOVA	*P = 0.907* *F = 0.34; df = 6, 21*	*P <0.001* *F = 10.24; df = 6, 21*	*P<0.001* *F = 18.00; df = 6, 21*	*P<0.001* *F = 14.00; df = 6, 21*

Aphids

TRT	4 April 4 days PRE	13 April 5 DAT	20 April 12 DAT	28 April 20 DAT
UTC	0.5 ± 0.5	1.25 ± 1.25	1.0 ± 0.7	3.0 ± 1.3
ISM-555 SC400*	0.25 ± 0.25	1.75 ± 0.6	0.75 ± 0.5	2.0 ± 1.4
Endigo ZCX*	0	0	0.25 ± 0.25	2.25 ± 0.5
Warrior II	0	0	0.75 ± 0.5	3.5 ± 1.2
Sivanto Prime	0.5 ± 0.3	0	0.25 ± 0.25	2.5 ± 1.5
Steward	0.25 ± 0.25	0.5 ± 0.5	1.5 ± 0.9	5.0 ± 2.3
Mustang Malathion	1.0 ± 0.7	0	0.25 ± 0.25	1.5 ± 0.6
ANOVA	$P = 0.519$ $F = 0.89; df = 6, 21$	$P = 0.183$ $F = 1.65; df = 6, 21$	$P = 0.564$ $F = 0.82; df = 6, 21$	$P = 0.653$ $F = 0.70; df = 6, 21$

Common Experiment 2 2022

Location: Carvel REC Field 21
Variety: NK1103-3111A
Seeding Rate: 32,000/A
Planting Date: 6 May
Plot size: 16 rows x 50’

Slug Sampling Method: 4 1-ft^2 white shingle traps per plot. Two were placed between rows 6 and 7 and 2 between rows 10 and 11, 16.5 feet from the edge of the plot. Slug injury was not scored on the plants as slug feeding was extremely light.

Stand Injury Assessment: Insect injury was scored from 3, 10 row-ft sections from each plot at V4-5 and V6-7. Damage on each plant was rated on a scale from 0-4 (0=no damage, 1= 1-25%, 2= 25-50%, 3=50-75%, 4=75% or more).

Sentinel Prey Assay for Predatory Insects: Waxworms (Josh’s Frogs and Concord Pet Supply) were pinned through their last abdominal segment to white modeling clay. Six waxworms were placed in the plots in the mid-afternoon, three between rows 6 and 7 and three between rows 10 and 11. A mouse guard was placed around sentinel waxworms. Modeling clay was buried in the soil such that the waxworms appeared to be on the surface of the ground. Sentinel prey was deployed at V4, V6, and R2. Prey was assessed for signs of predation at 8:30 AM and 8:30 PM on day 2 and at 8:30 AM on day 3.

Treatments:
1. No Cover Crop
2. Planting brown: terminate rye 2-4 weeks before planting corn (7-Apr)
3. Planting green: terminate rye 3-7 days after planting corn (9-May)
4. Planting green-brown: terminate rye 3-7 days before planting corn (29-Apr)

Results

Waxworm predation was not affected by cover crop treatment. Slight injury differences were noted at V4 and V6 with greater damage scores in the Planting green-brown and planting green treatments. Overall injury was very low. Marsh slug activity was not impacted by cover crop treatment.

All Marsh Slug per plot (4 shingles)

Trt	18-May	24-May	2-Jun	19-Sep	26-Sep	Season total
1 NCC	1.8 ± 2.1	3.2 ± 1.1	2.6 ± 1.8	0.8 ± 0.8	0.2 ± 0.5	8.8 ± 1.1
2 PB	3 ± 3.2	4.2 ± 2.8	4.8 ± 3.6	0.8 ± 0.8	1 ± 1.2	13.8 ± 8.0
3 PG	3 ± 1.9	2.6 ± 1.7	1.6 ± 2.1	0.2 ± 0.5	0.4 ± 0.9	7.8 ± 3.7
4 PG-B	3.8 ± 2.8	3.8 ± 1.9	2 ± 2.3	0.4 ± 0.9	1 ± 1	11 ± 6.2
ANOVA	*P = 0.665; F = 0.54; df = 3, 16*	*P = 0.602; F = 0.64; df = 3, 16*	*P = 0.234; F = 1.58; df = 3, 16*	*P = 0.538; F = 0.75; df = 3, 16*	*P = 0.431; F = 0.97; df = 3, 16*	*P = 0.327; F = 1.25; df = 3, 16*

Juvenile Marsh Slug per plot (4 shingles)

Trt	18-May	24-May	2-Jun	19-Sep	26-Sep
1	1.4 ± 2.1	2 ± 1	NA	0	0
2	2.4 ± 3.4	1.8 ± 2.4	NA	0	0
3	2 ± 1.6	1.4 ± 1.1	NA	0	0
4	2.2 ± 1.8	2 ± 1	NA	0	0
ANOVA	*P = 0.912; F = 0.18; df = 3, 16*	*P = 0.910; F = 0.18; df = 3, 16*			

Adult Marsh Slug per plot (4 shingles)

Trt	18-May	24-May	2-Jun	19-Sep	26-Sep
1	0.4 ± 0.5	1.2 ± 0.5	NA	0.8 ± 0.8	0.2 ± 0.5
2	0.6 ± 0.5	2.4 ± 0.9	NA	0.8 ± 0.8	1 ± 1.2
3	1 ± 1	1.2 ± 1.3	NA	0.2 ± 0.4	0.4 ± 0.9
4	1.6 ± 1.9	1.8 ± 1.8	NA	0.4 ± 0.9	1 ± 1
ANOVA	*P = 0.403; F = 1.04; df = 3, 16*	*P = 0.3709; F = 1.19; df = 3, 16*		*P = 0.538; F = 0.75; df = 3, 16*	*P = 0.431; F = 0.97; df = 3, 16*

Stand Injury 03-June (V4)

Trt	Stand	All Damage	Stink Bug
1	18.4 ± 1.1	0.3 ± 0.3	0.02 ± 0.03
2	18 ± 1.6	0.4 ± 0.3	0.01 ± 0.02
3	18.3 ± 1.3	0.5 ± 0.2	0.05 ± 0.09
4	17.5 ± 2.3	0.6 ± 0.2	0.09 ± 0.06
ANOVA	*P = 0.4593; F = 0.8755; df = 3, 56*	*P = 0.0348; F = 3.0767; df = 3, 56*	*P = 0.0410; F = 2.9379; df = 3, 56*

Note: Stand = total number of plants. Damage = mean score. All treatments had a small amount (0.01 or less) of bcw and wireworm damage. TRT 2 and 3 had small amount of runt/ stunted. No grasshopper or taw damage.

Stand Injury 15-June (V6)

Trt	Stand	All Damage	Stink Bug	GH
1	17.8 ± 2.0	0.2 ± 0.1	0.02 ± 0.04	0
2	18.5 ± 1.5	0.2 ± 0.1	0.05 ± 0.06	0.02 ± 0.03
3	17.5 ± 1.5	0.4 ± 0.2	0.3 ± 0.2	0.1 ± 0.1
4	18.1 ± 1.5	0.4 ± 0.2	0.3 ± 0.3	0.05 ± 0.1
ANOVA	*P = 0.3068; F = 1.2350; df = 3, 50*	*P = 0.0003; F = 7.4221; df = 3, 50*	*P = 0.0008; F = 6.5990; df = 3, 50*	*P = 0.0003; F = 7.5869; df = 3, 50*

Note: Stand = total number of plants. Damage = mean score. Treatment 1 had small (0.003) taw damage. No bcw, runt, or wireworm damage.

Waxworm Predation

June 02 waxworm predation

Trt	Alive	Dead	Missing	Predated	Total Predation	Ants	Carabid
17 hours							
1	3.8 ± 0.5	0	0.6 ± 0.9	1.6 ± 0.5	2.2 ± 0.5	0.2 ± 0.2	1.4 ± 0.5
2	3.8 ± 0.7	0.4 ± 0.2	0.6 ± 0.9	1 ± 0.5	1.6 ± 0.8	0.4 ± 0.2	0.2 ± 0.2
3	3 ± 0.4	0.2 ± 0.2	1.6 ± 0.9	1.2 ± 0.4	2.8 ± 0.6	1	1 ± 0.5
4	3.6 ± 0.5	0.2 ± 0.2	1.4 ± 1.3	0.8 ± 0.2	2.2 ± 0.6	0.8 ± 0.3	0.4 ± 0.4
Anova	*P = 0.7125; F = 0.4624; df = 3, 16*	*P = 0.5318; F = 0.7619; df = 3, 16*	*P = 0.3033; F = 1.3175; df = 3, 16*	*P 0.6058; F = 0.6306; df = 3,16*	*P = 0.6197; F = 0.6076; df = 3, 16*	*P = 0.4235; F = 0.9877; df = 3, 16*	*P = 0.2294; F = 1.5965; df = 3, 16*
30 hours							
1	0.2 ± 0.2	1.8 ± 0.4	2 ± 0.7	1.4 ± 0.4	3.4 ± 0.6	0	1.8 ± 0.4
2	0.8 ± 0.4	2.6 ± 0.4	0.4 ± 0.5	1.6 ± 0.7	2 ± 0.6	0.2 ± 0.2	1 ± 0.5
3	0.6 ± 0.2	0.2 ± 0.2	1 ± 0.7	2.4 ± 0.2	3.4 ± 0.4	0	1.6 ± 0.4
4	0.8 ± 0.4	2.6 ± 0.7	0.6 ± 0.5	0.8 ± 0.2	1.4 ± 0.2	0.2 ± 0.2	0.4 ± 0.2
Anova	*P = 0.4906; F = 0.8421; df = 3, 16*	*P = 0.0076; F = 5.6889; df = 3, 16*	*P = 0.0049; F = 6.3333; df = 3, 16*	*P = 0.1034; F = 2.4259; df = 3, 16*	*P = 0.0231; F = 4.1769; df = 3, 16*	*P = 0.5847; F = 0.667; df = 3, 16*	*P = 0.1035; F = 2.4242; df = 3, 16*
40 hours							
1	0.2 ± 0.2	0.2 ± 0.2	1.2 ± 1.3	2 ± 0.7	3.2 ± 0.6	0.6 ± 0.6	1.2 ± 0.4
2	0.4 ± 0.2	0.6 ± 0.4	1.4 ± 2.1	2.8 ± 0.7	4.2 ± 0.6	0.6 ± 0.4	1.6 ± 0.5
3	0.4 ± 0.2	0.2 ± 0.2	1.8 ± 0.8	0.8 ± 0.4	2.6 ± 0.4	0.4 ± 0.4	0.4 ± 0.4
4	0.8 ± 0.4	0.2 ± 0.2	1.6 ± 0.5	1.8 ± 0.5	3.4 ± 0.5	0.4 ± 0.4	0.6 ± 0.2
Anova	*P = 0.4895; F = 0.8444; df = 3, 16*	*P = 0.6419; F = 0.5714; df = 3, 16*	*P= 0.9013; F = 0.1905; df = 3, 16*	*P = 0.1693; F = 1.9061; df = 3, 16*	*P = 0.2314; F = 1.5879; df = 3, 16*	*P = 0.9784; F = 0.0635; df = 3, 16*	*P = 0.1612; F = 1.9570; df = 3, 16*

June 14 waxworm predation

Trt	Alive	Dead	Missing	Predated	Total Predation	Ants	Carabid
17 hours							
1	2.6 ± 0.6	0	1.6 ± 0.5	1.8 ± 0.7	3.4 ± 0.6	0.8 ± 0.4	0.2 ± 0.2
2	1.2 ± 0.4	0	1.4 ± 0.6	3.4 ± 0.7	4.8 ± 0.4	2.2 ± 0.9	0
3	2.8 ± 0.4	0.2 ± 0.2	1.4 ± 0.5	1.6 ± 0.5	3 ± 0.6	0.6 ± 0.2	0.2 ± 0.2
4	2.2 ± 0.6	0.4 ± 0.2	2 ± 0.7	1.4 ± 0.4	3.4 ± 0.7	1 ± 0.3	0
Anova	*P = 0.2036; F = 1.7175; df = 3, 16*	*P = 0.2611; F = 1.4667; df = 3, 16*	*P = 0.8728; F = 0.2319, df = 3,16*	*P = 0.1102; F = 2.3568; df = 3, 16*	*P = 0.2055; F = 1.7078; df = 3, 16*	*P = 0.1565; F = 1.9872; df = 3, 16*	*P = 0.5847; F = 0.667; df = 3, 16*
30 hours							
1	1.2 ± 0.5	0.6 ± 0.4	0.6 ± 0.4	1.8 ± 0.4	2.4 ± 0.5	0.8 ± 0.4	0.2 ± 0.2
2	0.4 ± 0.2	0	1.2 ± 0.4	2.6 ± 0.9	3.8 ± 0.7	1.2 ± 0.7	0
3	1.8 ± 0.5	0.2 ± 0.2	1.4 ± 0.2	1.4 ± 0.2	2.8 ± 0.2	0.4 ± 0.2	0.6 ± 0.4
4	1.2 ± 0.6	0	1.2 ± 0.5	1.8 ± 0.4	3 ± 0.7	0.6 ± 0.4	0.2 ± 0.2
Anova	*P = 0.2526; F = 1.5; df = 3, 16*	*P = 0.2286; F = 1.6; df = 3, 16*	*P = 0.5119; F = 0.8; df = 3, 16*	*P = 0.4895; F = 0.8444; df + 3, 16*	*P = 0.4037; F = 1.0348 ; df = 3, 16*	*P = 0.6755; F = 0.5185; df = 3, 16*	*P = 0.3953; F = 1.0556, df = 3, 16*
40 hours							
1	1 ± 0.3	0.6 ± 0.4	2.8 ± 0.7	1.6 ± 0.5	4.4 ± 0.6	0.6 ± 0.2	0.2 ± 0.2
2	0.4 ± 0.2	0.8 ± 0.3	4 ± 0.4	0.8 ± 0.5	4.8 ± 0.5	0.8 ± 0.5	0
3	1.2 ± 0.4	0.4 ± 0.2	3.8 ± 0.7	0.6 ± 0.4	4.4 ± 0.4	0.2 ± 0.2	0
4	0.8 ± 0.5	0.6 ± 0.4	3.8 ± 0.7	0.8 ± 0.4	4.6 ± 0.6	0.2 ± 0.2	0
Anova	*P = 0.4798; F = 0.8642; df = 3, 16*	*P = 0.8913; F = 0.205; df = 3, 16*	*P = 0.5265; F = 0.7719; df = 3, 16*	*P = 0.4254; F = 0.9833; df = 3, 16*	*P = 0.9403; F = 0.1310; df = 3, 16*	*P = 0.4411; F = 0.9474; df = 3, 16*	*P 0.4182; F = 1.0; df = 3, 16*

July 27 waxworm predation

Trt	Alive	Dead	Missing	Predated	Total Predation	Ants	Carabid
17 hours							
1	1.4 ± 0.4	0.4 ± 0.4	3.4 ± 0.6	0.8 ± 0.2	4.5 ± 0.5	0.6 ± 0.2	0.4 ± 0.2
2	1.8 ± 0.5	0	3.6 ± 0.6	0.6 ± 0.6	4.5 ± 0.5	1.4 ± 1	1 ± 0.3
3	2.2 ± 0.6	0	3.2 ± 0.8	0.6 ± 0.4	3.6 ± 0.6	0.4 ± 0.2	1 ± 0.8
4	1 ± 0.3	0	4.2 ± 0.7	0.8 ± 0.4	3 ± 0.3	0.6 ± 0.4	0
Anova	*P = 0.3183; F = 1.2698; df = 3, 16*	*P=0.4182; F = 1.0; df = 3, 16*	*P = 0.7447; F = 0.4148; df = 3, 16*	*P = 0.9719; F = 0.0762; df = 3, 16*	*P = 0.3774; F = 1.1014; df = 3, 16*	*P = 0.6036; F = 0.6344; df = 3, 16*	*P = 0.3204; F = 1.2632; df = 3, 16*
30 hours							
1	0.8 ± 0.2	0.2 ± 0.2	4.6 ± 0.5	0.4 ± 0.4	3 ± 0.3	0.4 ± 0.4	0
2	1 ± 0.3	0	3.8 ± 0.6	1.2 ± 0.7	3 ± 0.3	1 ± 0.8	0.2 ± 0.2
3	1.2 ± 0.5	0	4.2 ± 0.4	0.6 ± 0.4	4.5 ± 0.5	0.2 ± 0.2	0.4 ± 0.4
4	0.6 ± 0.2	0	5.2 ± 0.4	0.2 ± 0.2	5.2 ± 0.2	0	0.2 ± 0.2
Anova	*P = 0.6206; F = 0.6061; df = 3, 16*	*P=0.4182; F = 1.0; df = 3, 16*	*P = 0.2239; F = 1.6212; df = 3, 16*	*P = 0.4968; F = 0.8296; df = 3, 16*	*P = 0.6832; F = 0.5067; df = 3, 16*	*P = 0.4474; F = 0.9333' df = 3, 16*	*P = 0.7245; F = 0.4444; df = 3, 16*
40 hours							
1	0.4 ± 0.2	0	5.2 ± 0.6	0.4 ± 0.4	5.2 ± 0.2	0.6 ± 0.4	0
2	0.4 ± 0.2	0.2 ± 0.2	5.2 ± 0.6	0	5.6 ± 0.6	0	0
3	0.4 ± 0.2	0	5.4 ± 0.2	0.2 ± 0.2	5.2 ± 0.2	0.2 ± 0.2	0
4	0.2 ± 0.2	0	5.8 ± 0.2	0	5.2 ± 0.2	0	0
Anova	*P = 0.9072; F = 0.1818; df = 3, 16*	*P=0.4182; F = 1.0; df = 3, 16*	*P = 0.7478; F = 0.4103; df = 3, 16*	*P = 0.5472; F = 0.7333; df = 3, 16*	*P = 0.6832; F = 0.5067; df = 3, 16*	*P = 0.2286; F = 1.6; df = 3, 16*	

Cover Crop 2021-2022 Slugs

Location: Georgetown – following lima bean. Field without history of slug damage but adjacent farm with history of slug populations.

Harbeson – following soybean. Field with history of slug damage.

Lewes – following corn. Field with history of slug damage

Planting Date: Georgetown: 29 September, incorporated 30 September
Harbeson: 1 October, incorporated 2 October
Lewes: 8 October

Experimental Design: Randomized complete block design with 5 treatments and 4 replicates. Split plot design at Harbeson and Lewes in spring with two main plot treatments and 5 subplot treatments, all with 4 replicates.

Plot size: 60’ x 100’

Subplot size: 60’ x 50’

Seeding Rate: Rye and Barley: 120 pounds/acre; Crimson Clover 20 pounds/ acre; Radish 10 pounds/ acre

Sample Size: 2 shingles per plot in Fall and late winter, 4 shingles per plot in spring

Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: Shingles deployed 27-28 October. Tillage radish winter-killed at all sites.

Georgetown

Trt	**Nov 18**	**Dec 2**	**Feb 10**	**April 1**	**April 6**	**April 15**	**April 22**
Barley	0.5 ± 0.3	0.5 ± 0.3	2.8 ± 0.9	0.3 ± 0.3	0.3 ± 0.3	0	0.3 ± 0.3
Crimson	0.3 ± 0.3	0	0	0.3 ± 0.3	0	0	0
Radish	0.5 ± 0.5	0	0	0	0	0	0
Rye	0.3 ± 0.3	0.5 ± 0.3	0.3 ± 0.3	0.3 ± 0.3	0.3 ± 0.3	0	0
UTC	0	0.3 ± 0.3	0.8 ± 0.8	0	0	0	0.5 ± 0.3
ANOVA	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*

Lewes

Trt	Dec 2	Feb 10	March 18	April 1	April 15	May 4	May 13	May 25	June 1
Barley	1.3 ± 0.5	2.8 ± 0.9	0.8 ± 0.5	2.5 ± 0.5	1.3 ± 0.8	1.7 ± 0.6	3.3 ± 0.9	3.3 ± 0.9	2.1 ± 1.2
Crimson	0.8 ± 0.5	2.3 ± 1.0	0.8 ± 0.3	2.5 ± 1.0	1.3 ± 0.8	1.1 ± 0.5	3.3 ± 1.3	3.5 ± 1.1	3.8 ± 1.1
Radish	0.5 ± 0.5	2.0 ± 0.8	1.3 ± 0.8	2.0 ± 1.2	1.8 ± 0.9	0.6 ± 0.3	4.5 ± 1.5	3.8 ± 0.8	2.8 ± 1.1
Rye	1.5 ± 0.3	2.0 ± 0.7	1.8 ± 0.5	4.8 ± 1.0	2.3 ± 0.3	1.9 ± 0.5	5.5 ± 1.6	4.4 ± 1.2	2.9 ± 1.2
UTC	0.5 ± 0.5	1.5 ± 0.3	2.0 ± 0.7	2.5 ± 1.0	2.3 ± 0.5	0.8 ± 0.3	2.0 ± 0.7	4.6 ± 1.9	2.3 ± 0.5
ANOVA	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*		*NS*	*NS*

4 shingles per plot beginning March 18

Harbeson

Trt	Nov 18	Dec 2	April 6	April 18	April 21	May 20	June 1
Barley	2.0 ± 1.7	1.0 ± 1.0	0.5 ± 0.3	1.0 ± 0.7	0.5 ± 0.3 ab	1.6 ± 0.7	1.6 ± 0.7
Crimson	0.8 ± 0.5	0.5 ± 0.3	0	1.8 ± 0.5	0.4 ± 0.2 ab	1.0 ± 0.5	0.5 ± 0.3
Radish	0.3 ± 0.3	0.3 ± 0.3	0.3 ± 0.3	2.3 ± 1.3	0.3 ± 0.2 b	2.8 ± 1.3	1.3 ± 1.3
Rye	1.5 ± 0.6	1.8 ± 0.9	0	1.5 ± 0.5	1.4 ± 0.4 ab	2.9 ± 0.8	2.0 ± 0.7
UTC	0.8 ± 0.5	0.3 ± 0.3	0.5 ± 0.3	2.5 ± 1.0	1.8 ± 0.6 a	1.1 ± 0.5	0.5 ± 0.3
ANOVA	*NS*				*$P = 0.014$ $F = 3.60$; $df = 4, 36$*		

Early vs Late Termination

Lewes

Timing	**May 4**	**May 13**	**May 25**	**June 1**
Early	2.2 ± 0.4	3.3 ± 0.8	4.0 ± 0.6	3.2 ± 0.7
Late	1.5 ± 0.3	4.1 ± 0.8	3.9 ± 0.9	2.4 ± 0.6
T-test	*NS*	*NS*	*NS*	*NS*

Harbeson

Timing	**April 21**	**May 20**	**June 1**
Early	1.1 ± 0.3	1.0 ± 0.2	0.8 ± 0.3
Late	0.7 ± 0.2	2.8 ± 0.6	1.6 ± 0.6
T-test	*NS*	*P = 0.012* *t = 2.74; df = 23.6*	*NS*

Crimson clover on May 20: P = 0.021; t = 3.46; df = 3. Untreated check on May 20 P = 0.042; t = 2.33; df = 3.7.

Notes: the first juvenile gray garden slugs were observed in Lewes on March 18. At the Lewes site, slug populations gradually decreased throughout the early spring, but increased during the month of May to a peak on May 25. The Harbeson site similarly peaked on May 20.

Field Corn 2022 Stink Bug

Location: Carvel REC, Field 9D
Variety: 'H4490RC2P'
Planting Date: 10 May
Experimental Design: Randomized complete block design with 5 treatments and 4 replicates
Plot size: 5 rows x 40'
Row Spacing: 30"
Treatment Method: CO_2-pressurized backpack sprayer with a 6' boom equipped with 6, 11003 nozzles calibrated to deliver 15.9 GPA at 18 PSI

Sample Size: 30 plants
Data Analysis: ANOVA; Tukey-Kramer HSD means separation

Notes: Field side-dressed with 29-0-0-6 at 40 GPA on 13 June. Rep 1 and Rep II were on the north edge of the field adjacent to a grassy field, Rep III and IV were on the south edge of the field adjacent to a tax ditch.

TRT	Material	Rate / Acre
1	UTC	---
2	Warrior II	1.92 fl oz
3	Warrior + Dimethoate	1.0 fl oz + 8 fl oz
4	Endigo ZCX	4.5 fl oz
5	Brigade	6.4 fl oz

TRT	**July 14 0 d PRE**			**July 18 4 DAT**			**July 21 7 DAT**		
	GSB	**BSB**	**Total**	**GSB**	**BSB**	**Total**	**GSB**	**BSB**	**Total**
1	2.0 ± 1.1	7.3 ± 1.0	9.3 ± 0.9	1.3 ± 0.9	3.0 ± 1.0	4.3 ± 1.7	6.5 ± 5.5	4.0 ± 1.5	10.5 ± 6.1
2	2.3 ± 0.9	7.5 ± 1.7	9.8 ± 1.9	0	1.8 ± 0.6	1.8 ± 0.6	1.5 ± 1.5	4.3 ± 2.4	5.8 ± 2.8
3	4.3 ± 2.2	4.5 ± 0.5	8.8 ± 1.9	0	1.8 ± 0.6	1.8 ± 0.6	1.0 ± 0.6	5.3 ± 1.6	6.3 ± 1.9
4	5.0 ± 2.1	6.0 ± 1.9	11.0 ± 2.7	0	1.0 ± 0.6	1.0 ± 0.6	0	2.8 ± 1.7	2.8 ± 1.7
5	2.5 ± 1.9	7.5 ± 1.0	10.0 ± 2.9	0	0.8 ± 0.8	0.8 ± 0.7	0.5 ± 0.3	2.0 ± 0.9	2.5 ± 0.9
ANOVA	*P = 0.657 F = 0.62; df = 4, 15*	*P = 0.455 F = 0.96; df = 4, 15*	*P = 0.958 F = 0.16; df = 4, 15*	*P = 0.193 F = 1.74; df = 4, 15*	*P = 0.272 F = 1.43; df = 4, 15*	*P = 0.121 F = 2.18; df = 4, 15*	*P = 0.416 F = 1.05; df = 4, 15*	*P = 0.682 F = 0.58; df = 4, 15*	*P = 0.436 F = 1.00; df = 4, 15*

Field Corn 2022 Two Spotted Spider Mites

Location: Bridgeville, DE
Experimental Design: Randomized complete block design with 7 treatments and 5 replicates
Plot size: 4 rows x 25’
Row Spacing: 30”
Treatment Method: CO_2-pressurized backpack sprayer with a 9’ boom equipped with 6, 11003 nozzles calibrated to deliver 15.9 GPA at 18 PSI
Sample Size: 10 leaves, mid-whorl to 5 leaves below tassel (approximately the leaf below the ear leaf
Harvest Date: 9 September, 10 row ft
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: Please note that the leaf position sampled changed during the experiment as the plants continued to grow.
Farmer ran frequent pivot irrigation over the field including the plots in an attempt to slow mite reproduction until tassel push fungicide spray window.

TRT	Material	Rate
1	UTC	---
2	Brigade	6.4 fl oz
3	Hero	10.3 fl oz
4	Dimethoate	16 fl oz
5	Portal	32 fl oz
6	Oberon4	4.0 fl oz*
7	Zeal SC	3.0 fl oz**

*rate range is 2.85 to 8.0 fl oz in field corn
**rate range is 2.0 to 6.0 fl oz in field corn

Mites per leaf:

TRT	**13-June** **0 d PRE**	**17-June** **4 DAT**	**24-June** **11 DAT**	**6-July** **23 DAT**
1	39.5 ± 4.4	40.1 ± 19.2	282.0 ± 71.3 ab	94.3 ± 24.0
2	20.3 ± 6.5	34.0 ± 10.9	208.5 ± 50.2 abc	45.1 ± 6.9
3	20.4 ± 6.9	40.0 ± 18.7	199.8 ± 42.8 abc	22.0 ± 8.2
4	33.0 ± 13.5	26.8 ± 8.7	420.6 ± 83.9 a	110.3 ± 54.7
5	32.7 ± 7.8	33.2 ± 11.6	141.4 ± 37.1 bc	94.3 ± 29.3
6	17.3 ± 4.7	10.8 ± 2.8	96.9 ± 13.3 bc	95.6 ± 25.7
7	17.9 ± 4.4	15.1 ± 4.4	31.9 ± 9.7 c	116.4 ± 36.1
ANOVA	$P = 0.242$ $F = 1.42; df = 6, 28$	$P = 0.518$ $F = 0.89; df = 6, 28$	$P < 0.001$ $F = 6.29; df = 6, 28$	$P = 0.277$ $F = 1.33; df = 6, 28$

Harvest Samples

TRT	9 Sept moisture %	30 Sept weight (pounds)
1	27.32 ± 0.15	6.63 ± 0.20
2	26.25 ± 0.98	6.50 ± 0.47
3	29.92 ± 1.95	6.99 ± 0.17
4	27.66 ± 0.72	6.30 ± 0.18
5	26.59 ± 0.77	6.34 ± 0.26
6	28.33 ± 0.53	6.76 ± 0.31
7	27.59 ± 0.63	6.76 ± 0.29
ANOVA	$P = 0.191$ $F = 1.57; df = 6, 29$	$P = 0.614$ $F = 0.75; df = 6, 29$

Sorghum 2022 Aphid

Location: Carvel REC, Field 2A
Planting Date: June 22, 2022
Experimental Design: Randomized complete block design with 20 varieties, 2 treatments (UTC and Sivanto), and 8 replicates (reps 1,3,5,7 were treated with Sivanto and reps 2,4,6,8 were untreated).
Plot size: 9 rows x 15’
Row Spacing: 7.5”
Plant Spacing: 9 rows x 7.5”
Fertility: 100# of 27-0-0-6S prior to planting; spring application of 250# potash
Treatment method: Besiege was applied on Aug 25 at 10 fl oz. Sivanto applied on Sept 9 at 5 fl oz on Reps 1, 3, 5, and 7.
Sample Size: 10 mid canopy leaves
Data Analysis: Split Plot Analysis, Tukey HSD means separation; SAS JMP
Notes: Harvested Dec 02, 2022

TRT	Material	Maturity Group	Panicle Type	Company’s SCA Tolerance Rating (DeKalb lower is better)
1	ISU 278			
2	DKS 36-07	Medium-Early	Semi-Open	1
3	DKS 45-60	Medium	Semi-Open	8
4	ISU 472			
5	ISU 494			
6	DKS 51-01	Medium-Full	Semi-Open	6
7	NS			
8	DKS 38-16	Medium-Early	Semi-Open	6
9	85P 75	Full		NR
10	M59 GB 94	Medium-Early	Semi-Open	2, 3 for anthracnose
11	86G 32	106 day		NR
12	M60 GB31	Medium-Early	Semi-Open	1, 3 for anthracnose
13	DKS 44-07	Medium	Semi-Compact	1
14	DKS 40-76	Medium	Semi-Open	2
15	DKS 5407	Medium-Full	Semi-Compact	1
16	DKS 5007	Medium-Full	Semi-Compact	2
17	IST 375			
18	ISU 281			
19	DKS 33-07	Medium Early	Semi-Open	2
20	Pioneer 84G 62	Full (118-122)		NR

Harvest Data: Sivanto Main Effect: Not Significant (*P = 0.079; F = 3.14; df = 1, 117*).

Sivanto	119.2 ± 2.0 bu
Untreated	114.0 ± 2.4 bu

Interaction between treatment and variety: Not Significant (*P = 0.761; F = 0.75; df = 19, 117*)

Variety: *P <0.001; F = 2.73; df = 19, 117*

TRT	Variety	Yield (Bu/A)	With Sivanto Treatment	Without Sivanto Treatment
19	DKS 33-07	87.5 ± 11.0 b	98.0 ± 12.7	77.0 ± 18.0
7	NS	100.7 ± 6.4 ab	97.9 ± 6.3	103.5 ± 12.2
1	ISU 278	105.2 ± 10.8 ab	114.1 ± 10.5	90.4 ± 23.1
14	DKS 40-76	107.6 ± 4.8 ab	113.1 ± 5.1	102.1 ± 7.9
3	DKS 45-60	112.1 ± 3.8 ab	106.8 ± 3.0	117.5 ± 6.3
11	86G 32	114.6 ± 5.7 ab	114.9 ± 7.4	114.3 ± 9.8
16	DKS 5007	115.5 ± 4.5 ab	122.4 ± 3.4	108.7 ± 3.8
15	IKS 5407	116.1 ± 5.5 ab	114.9 ± 6.5	117.3 ± 9.9
4	ISU 472	116.6 ± 5.1 ab	115.1 ± 2.2	118.1 ± 10.7
8	DKS 38-16	117.4 ± 5.2 ab	127.5 ± 5.1	107.3 ± 5.7
2	DKS 36-07	118.2 ± 6.7 ab	128.3 ± 8.3	112.1 ± 9.0
6	DKS 5101	118.3 ± 8.7 ab	113.7 ± 13.9	122.8 ± 12.1
5	ISU 494	119.7 ± 5.7 ab	119.2 ± 7.2	120.3 ± 9.9
10	M59 GB 94	120.1 ± 12.3 ab	127.0 ± 18.2	113.3 ± 18.6
13	DKS 44-07	122.2 ± 4.5 a	122.4 ± 6.2	122.0 ± 7.5
17	IST 375	123.5 ± 6.67 a	127.7 ± 8.6	119.2 ± 11.0
12	M60 GB31	124.3 ± 7.7 a	118.6 ± 6.6	130.5 ± 14.5
20	Pioneer 84G 62	129.9 ± 6.5 a	126.6 ± 6.3	133.3 ± 12.1
18	ISU 281	131.5 ± 5.9 a	138.1 ± 6.0	124.8 ± 10.0
9	85P 75-N 28P	131.9 ± 6.9 a	138.1 ± 6.4	125.8 ± 12.5

Aphid counts (10 mid canopy leaves). Note: Trt 20 significant difference between UTC and Sivanto on 9/15 (P = 0.025; F = 8.85; df = 1, 6)

TRT		**9/02 UTC**	**9/02 Sivanto**	**9/15 UTC**	**9/15 Sivanto**	**9/22 UTC**	**9/22 Sivanto**
1	ISU 278	0.75 ± 0.75	0	1.3 ± 0.8 B	0	0	0
2	DKS 36-07	2 ± 2	0	0 B	0	0	0
3	DKS 45-60	0	0.3 ± 0.3	9.8 ± 8.8 B	0	1.3 ± 1.3	0
4	ISU 472	0	0	3.8 ± 2.3 B	0	0	0
5	ISU 494	1.3 ± 1.3	0	5 ± 5 B	13.5 ± 13.2	0	0
6	DKS 5101	1 ± 1	2 ± 2	0.8 ± 0.8 B	0	0	0
7	NS	2 ± 2	8 ± 8	0 B	0	0	0
8	DKS 38-16	0	0	8.5 ± 6.7 B	0	1.5 ± 1.5	0
9	85P 75-N 28P	0	1 ± 0.7	1.8 ± 1 B	1.75 ± 1.75	0	0
10	M59 GB 94	0.25 ± 0.25	0.75 ± 0.75	7.3 ± 6.9 B	0.75 ± 0.75	1.5 ± 1.5	0
11	86G 32	0.25 ± 0.25	4 ± 3.7	2.8 ± 1.7 B	0.75 ± 0.75	15.3 ± 15.3	3.5 ± 3.5
12	M60 GB31	0	0	1 ± 0.7 B	0	0.8 ± 0.8	0
13	DKS 44-07	0	0	0.8 ± 0.5 B	3.5 ± 3.5	0.5 ± 0.5	0
14	DKS 40-76	0	0	0.5 ± 0.5 B	0.25 ± 0.25	0	0
15	IKS 5407	0	1 ± 1	0.8 ± 0.8 B	0.5 ± 0.5	0	1.3 ± 1.3
16	DKS 5007	0	0	12.8 ± 12.4 B	0	0	0
17	IST 375	2 ± 2	0	26 ± 22.4 B	0	4.8 ± 4.8	0
18	ISU 281	7.5 ± 5.0	0	3.5 ± 2.2 B	0	0	0
19	DKS 33-07	1.25 ± 1.25	0	0.3 ± 0.3 B	0	0	0
20	Pioneer 84G 62	8 ± 5.3	2.5 ± 1.7	115 ± 38.6 A	0.25 ± 0.25	0	0
	ANOVA	*P = 0.209; F = 1.32; df = 19, 47*	*P = 0.414; F = 1.07; df = 19, 41*	*P < 0.001; F = 5.51; df = 19, 60*	*P = 0.499; F = 0.98; df = 19, 60*	*P = 0.560; F = 0.92; df = 19' 60*	*P = 0.510; F = 0.97; df = 19, 60*

Soybean 2022 Corn Earworm

Location: Omar, DE
Variety: P48A94PR
Planting Date: June 29, 2022
Experimental Design: Randomized complete block design with 10 treatments and 4 replicates
Plot size: 50’ x 18’
Row Spacing: 15”
Treatment Method: CO_2-pressurized backpack sprayer with a 9’ boom equipped with 6 11002 nozzles calibrated to deliver 13.8 GPA at 20 PSI.
Sample Size: 25 sweeps
Data Analysis: ANOVA; Tukey-Kramer HSD means separation
Notes: Orthene’s label calls for higher rates

TRT	**Material**	**Rate**
1	UTC	---
2	Besiege	6.5 fl oz
3	Warrior II	1.92 fl oz
4	Warrior II + Orthene	.92 fl oz + 4 oz
5	Blackhawk	2 oz
6	Denim	10 fl oz
7	Intrepid	8 fl oz
8	Vantacor	2 fl oz
9	Intrepid Edge	5.2 fl oz
10	Baythroid	2.8 fl oz

23 August 0 D PRE

TRT	**Small CEW**	**Medium CEW**	**Large CEW**	**Total**	**GCW**	**SL**
1	4.3 ± 1.3	0.3 ± 0.3	0	4.5 ± 1.3	5.3 ± 3.6	0.3 ± 0.3
2	1.8 ± 1.2	0.5 ± 0.5	0	2.3 ± 1.0	2.0 ± 1.7	0
3	3.0 ± 1.7	0	0	3.0 ± 1.7	5.3 ± 4.3	0
4	2.0 ± 1.7	0.8 ± 0.8	0.5 ± 0.3	3.3 ± 1.8	2.3 ± 0.9	0
5	4.3 ± 1.3	1.0 ± 0.7	0.3 ± 0.3	5.5 ± 2.2	2.0 ± 0.7	0
6	3.0 ± 1.1	0.5 ± 0.3	0	3.5 ± 1.0	5.3 ± 2.7	0.3 ± 0.3
7	2.8 ± 0.9	0	0	2.8 ± 0.9	3.3 ± 2.3	0
8	3.0 ± 0.7	0.8 ± 0.5	0.5 ± 0.3	4.3 ± 0.5	1.3 ± 0.3	0
9	3.5 ± 1.6	0.5 ± 0.3	0	4.0 ± 1.5	5.5 ± 3.2	0.3 ± 0.3
10	2.0 ± 1.0	0.3 ± 0.3	0	2.3 ± 0.9	3.0 ± 1.6	0
ANOVA	*P = 0.877 F = 0.479; df = 9, 30*	*P = 0.794 F = 0.591; df = 9, 30*	*P = 0.079 F = 1.97; df = 9, 30*	*P = 0.793 F = 0.59; df = 9, 30*	*P = 0.897 F = 0.45; df = 9, 30*	*P = 0.638 F = 0.78; df = 9, 30*

26 August 3 DAT

TRT	Small CEW	Medium CEW	Large CEW	Total	GCW	SL
1	8.0 ± 0.9 a	6.5 ± 1.6 a	1.8 ± 0.8	16.3 ± 2.9	10.5 ± 9.2	4.0 ± 3.4
2	0.5 ± 0.5 bc	0.3 ± 0.3 b	0	0.8 ± 0.5	0	0.3 ± 0.3
3	1.5 ± 0.3 bc	0.5 ± 0.5 b	0	2.0 ± 0.4	1.8 ± 1.8	1.0 ± 0.7
4	2.0 ± 0.7 bc	0.3 ± 0.3 b	0	2.3 ± 0.9	0	0
5	1.5 ± 0.6 bc	0 b	0	1.5 ± 0.6	0	0
6	0.3 ± 0.3 c	0 b	0	0.3 ± 0.3	0	0
7	3.3 ± 1.1 b	1.0 ± 1.0 b	0	4.3 ± 1.2	0	0
8	1.0 ± 0.4 bc	0 b	0	1.0 ± 0.4	0	0.5 ± 0.5
9	1.0 ± 0.4 bc	0.3 ± 0.3 b	0	1.3 ± 0.5	0	0
10	0.5 ± 0.3 bc	0 b	0.3 ± 0.3	0.8 ± 0.5	0	1.5 ±0.9
ANOVA	*P <0.001 F = 13.95; df = 9, 30*	*P <0.001 F = 10.39; df = 9, 30*	*P = 0.001 F = 4.84; df = 9, 30*	*P <0.001 F = 18.50; df = 9, 30*	*P = 0.308 F = 1.24; df = 9, 30*	*P = 0.313 F = 1.23; df = 9, 30*

30 August 7 DAT

TRT	Small CEW	Medium CEW	Large CEW	Total	GCW	SL
1	11.0 ± 1.4 a	8.5 ± 1.2 a	8.0 ± 2.8 a	27.5 ± 4.3 a	7.5 ± 3.4 a	1.3 ± 0.6
2	0 c	0 b	0 b	0 b	0 b	0.8 ± 0.3
3	2.0 ± 0.8 bc	0.8 ± 0.8 b	1.0 ± 1.0 b	3.8 ± 2.5 b	1.3 ± 1.3 b	0
4	2.5 ± 0.9 bc	1.3 ± 0.9 b	0 b	3.8 ± 1.5 b	0 b	0.5 ± 0.3
5	1.3 ± 0.3 c	0.8 ± 0.3 b	0.8 ± 0.8 b	2.8 ± 1.1 b	0 b	0
6	1.8 ± 0.9 bc	0.3 ± 0.3 b	0 b	2.0 ± 0.9 b	0 b	0
7	4.8 ± 0.5 b	1.8 ± 0.3 b	0 b	6.5 ± 0.5 b	0.3 ± 0.3 b	0.5 ± 0.3
8	0.8 ± 0.5 c	0.3 ± 0.3 b	0 b	1.0 ± 0.4 b	0.5 ± 0.5 b	0.3 ± 0.3
9	0.8 ± 0.3 c	0.3 ± 0.3 b	0 b	1.0 ± 0.4 b	0 b	0
10	2.8 ± 0.6 bc	0.5 ± 0.3 b	0.8 ± 0.5 b	4.0 ± 1.1 b	0 b	0
ANOVA	*P <0.001 F = 19.84; df = 9, 30*	*P <0.001 F = 19.75; df = 9, 30*	*P <0.001 F = 6.26; df = 9, 30*	*P <0.001 F = 21.35; df = 9, 30*	*P = 0.002 F = 4.00 df = 9, 30*	*P = 0.022 F = 2.64; df = 9, 30*

8 Sept 16 DAT

TRT	Small CEW	Medium CEW	Large CEW	Total	GCW	SL
1	1.3 ± 0.5	1.3 ± 0.5 a	0.3 ± 0.3	2.8 ± 0.6 a	0.3 ± 0.3	2.8 ± 1.3
2	0	0 b	0	0 b	0	0.5 ± 0.3
3	1.3 ± 0.3	0 b	0	1.3 ± 0.3 ab	0	1.0 ± 0.3
4	1.0 ± 0.7	0.3 ± 0.3 ab	0.5 ± 0.5	1.8 ± 1.0 ab	0	2.3 ± 1.0
5	0	0.3 ± 0.3 ab	0	0.3 ± 0.3 b	0	1.0 ± 0.7
6	0.8 ± 0.3	0 b	0	0.8 ± 0.3 ab	0	0
7	0.5 ± 0.3	0.3 ± 0.3 ab	0	0.8 ± 0.5 ab	0	1.3 ± 0.6
8	0	0 b	0	0 b	0	0.8 ± 0.5
9	0.8 ± 0.5	0 b	0	0.8 ± 0.5 ab	0	0.3 ± 0.3
10	0.8 ± 0.5	0.3 ± 0.3 ab	0	1.0 ± 0.7 ab	0	1.0 ± 0.4
ANOVA	$P = 0.129$ $F = 1.72$; $df = 9, 30$	$P = 0.011$ $F = 3.03$; $df = 9, 30$	$P = 0.529$ $F = 0.91$; $df = 9, 30$	$P < 0.001$ $F = 18.50$; $df = 9, 30$	$P = 0.461$ $F = 1.00$; $df = 9, 30$	$P = 0.145$ $F = 1.64$; $df = 9, 30$

Soybean 2022 Prophylactic Insecticide Application

Locations, Plant Dates, Variety: Houston,
Harrington, May 4, Northrup King 46
Whaleyville, June 25-July 2, Dyna-gro S41EN72,S43EN61

Treatment Dates: Harrington: July 14
Houston: June 20
Whaleyville: July 29-August 3

Harvest Date: Houston, November 9
Harrington, November 4

Three producers treated paired fields or paired strips with and without an insecticide (Warrior II, 1.92 fl oz) when treating the field with a post emergence herbicide application during vegetative to early R2 timing. At the Harrington location, there were 2 paired strips per treatment. At the Houston location, there were 3 paired strips per treatment. At the Whaleyville location, there were 8 paired fields per treatment.

The Houston field went over stink bug threshold between July 19 and July 27, first in the untreated section and then both. Treatment with lambda cyhalothrin the month earlier did not prevent stink bug populations from building at R4. The whole field was treated for stink bugs between July 30 with bifenthrin.

The Harrington location was treated at R2, and stink bug populations were slow to build and only went over threshold in the Untreated check plot on September 1 at R6 approximately 40 days after application. It is likely that had more samples been taken past September 1 the numbers would have equalized.

The Whaleyville location went over corn earworm threshold approximately 4 weeks after application, and the entire field was treated on September 2.

Neither soybean looper nor spider mites were detected in any significant number and thus are excluded from the table below.

Presented below are means from 4, 10-sweep samples from each treatment strip in the field. Means that are highlighted are those in which there was a significant treatment difference (T-test, P <0.05). Means highlighted in red represent dates when an economically significant pest population was detected.

Date	Defoliators		Green Cloverworm		Grasshopper		Bean Leaf Beetle		Corn Earworm		Stink Bugs	
	T	UTC	T	UTC	T	UTC	T	UTC	T	UTC	T	UTC
Whaleyville												
Aug 4	0.9	0.7	0.1	0.1	0.3	0.4	0.3	0.3	0	0	0.1	0
Aug 19	2.7	2.9	2.0	1.6	0.4	0.7	0	0.2	0	0.1	0	0
Aug 26	10.4	11.9	7.0	7.9	0.5	0.1	0.1	0.3	2.7	2.7	0.3	0.2
Sept 2	4.4	5	1.5	3.0	0.3	0.3	0	0.2	2.3	1.9	0.1	0.0
Sept 23	0.25	1.5	0	0	0	0.4	0	0	0	0.1	0.4	0.0
Houston												
June 24	1.4	0	0.1	0	0.2	0	0.8	0	0	0	0.8	0
July 1	0.2	0.4	0	0	0	0.4	0	0	0	0	2.0	1.2
July 8	1.0	1.7	0.2	0	0.4	1.0	0	0	0	0	2.0	2.1
July 14	0.9	1.7	0.4	0.8	0	0.1	0.1	0.2	0	0	1.8	0.7
July 19	1.8	0.9	1.3	0.8	0	0	0	0	0	0	1	2.4
July 27	1.9	0.8	2.3	1.4	0.1	0.2	0.2	0.2	0	0	3.6	2.5
Aug 2	0.2	0.1	0	0	0	0.1	0.2	0	0	0.2	0.1	0.2
Aug 24	0.3	0.1	0.1	0	0.1	0	0	0	0	0	0	0
Sept 1	1.1	1.2	0.1	0.3	0.7	0.4	0.2	0	0.2	0	0.6	0.2
Harrington												
July 19	0.3	1.5	0.2	0.3	0	0.7	0	0	0	0	0.5	0.8
July 27	1.1	0.3	0.7	0.1	0.3	0.3	0.2	0	0	0	0.6	0.8
Aug 2	3.7	3.7	2.2	2.2	0.7	0.7	0.7	0.5	0	0	0.7	0.8
Aug 16	2.0	4.0	0.8	3.0	0.5	0.5	0	0	0	0	0.7	0.2
Aug 24	11.2	9.7	10.8	9.2	0.2	0.3	0	0	0	0	0.7	0.5
Sept 1	11.2	15.8	8.8	9.2	0.2	0.8	0.5	0.3	0	0.3	1.8	4.5

Harvest Data

Location	UTC Yield	T Yield
Houston	72.5 ± 0.5	71.1 ± 1.5
T-test	*P = 0.229; t = 0.88, df = 2.4*	
Harrington	41.4 ± 5.1	43.8 ± 0.4
T-test	*P = 0.365; t = -0.45; df = 1.02*	
Whaleyville	49.9 ± 1.1	50.1 ± 1.0
T-test	*P = 0.456; t = -0.11; df = 13.8*	

Bioassays

Corn Earworm Pyrethroid Susceptibility Bioassay 2022

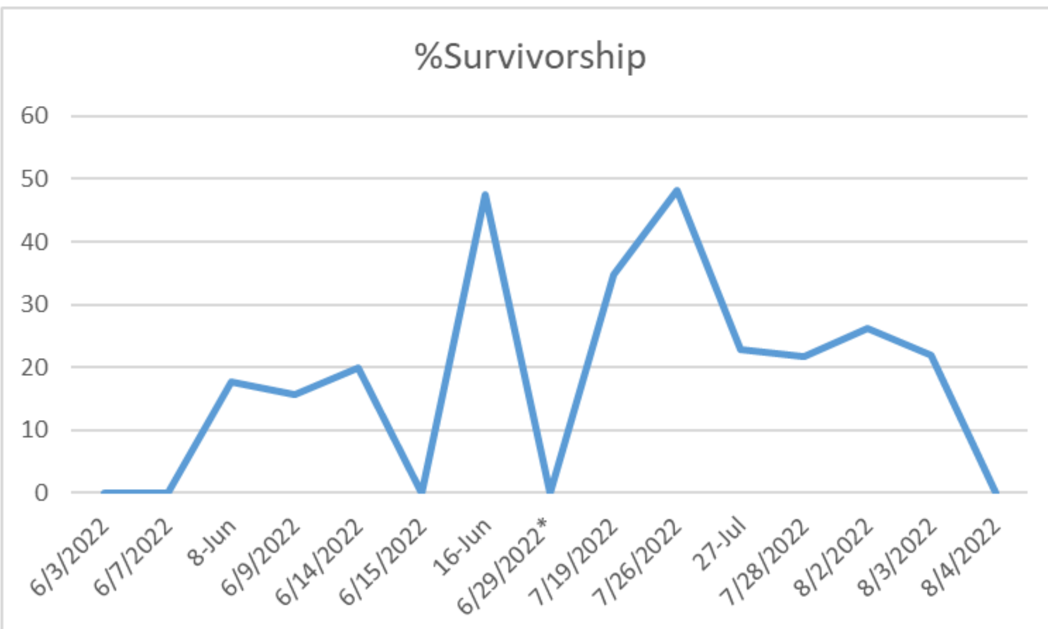
Purpose: Determine CEW susceptibility to cypermethrin as a proxy for pyrethroid susceptibility

Method: Adult Vial Test

Procedure: Male CEW moths collected daily from Hartstack pheromone traps baited with Zealure pheromone strips. Moths placed in glass scintillation vials treated with 5 µg technical grade cypermethrin dissolved in acetone. Vials were replaced after 1 month post-preparation. Control vials were treated with acetone only. Moths kept in vials 24 hours before evaluation. Moths were placed in vials for 24 hours. Vials were loosely capped, and kept tilted at a 45° angle.

Evaluation Criteria: After 24 hours, moths were removed from vials. Moths that flew at least 3 feet were counted as alive, and moths that could not fly or were dead were counted as dead.

Data Analysis: Treated moth mortality was corrected for mortality in the untreated vials using Abbott's formula Corrected morality = (Treated mortality - Control mortality)/ 1 - Control mortality.



Uncorrected June survivorship averaged 10.9%, July 20.2%, August 17.9%.

Total tested moths:

June Untreated Control: 121 Cypermethrin: 119
July Untreated Control: 36 Cypermethrin: 372
Aug Untreated Control: 36 Cypermethrin: 84

Moths that would have been used in untreated vials in July and August were used for other lab studies with very low pyrethroid doses which resulted in very low mortality but not serve as a true 'check.'

Corn Earworm Pyrethroid Active Ingredient Vial Testing

One major drawback to the cypermethrin test is that the active ingredient is used as a proxy for all pyrethroids, but itself is uncommonly used in agriculture (labeled in some states on cotton, cole crops, lettuce, onions, and pecans). Furthermore, cypermethrin is in one of two subclasses of pyrethroids; monitoring cypermethrin resistance might not accurately reflect local resistance to members of the other subclass (Hopkins and Pietrantonio 2010). This is important because recent UD spray trials in sweet corn (2019, 2020) and sorghum (2019), and the 2018 Virginia Tech spray trials in soybean (S. Taylor and S. Malone, unpublished data) and 2020 Virginia Tech spray trials in sweet corn (T. Kuhar and H. Doughty, unpublished data) suggest that pyrethroid efficacy differs among active ingredients when applied alone. For example, in Delaware, beta-cyfluthrin performs numerically better than lambda-cyhalothrin. However, in T. Kuhar and H. Doughty's 2020 spray trials, a pyrethroid mixture of zeta-cypermethrin + bifenthrin performed the best, whereas beta-cyfluthrin was equivalent to lambda-cyhalothrin (T. Kuhar, unpublished data).

The cost of these materials is very similar. However, if one or two active ingredients consistently perform better than others, even if by only a couple of percentage points of ear protection, this could have important economic ramifications for sweet corn producers by allowing them to maximize input efficiencies. However, given some of the in-season variability (see UD spray trial results between mid and late season sweet corn insect control) and apparent geographic variation (discrepancy between UD and VT Eastern Shore and VT Whitethorn; T. Kuhar and H. Doughty, unpublished data), a monitoring program that could predict in-season which pyrethroids a local population is more susceptible to would be valuable.

In this experiment, lab-reared moth susceptibility to three active ingredients was examined and compared to field-collected moths.

Objectives

1. Determine if the currently used cypermethrin diagnostic concentration is adequate for other pyrethroids
2. Determine if moth susceptibility among pyrethroids differs in vial tests

Methods

<u>Cypermethrin standard vials</u>

Male CEW moths collected from Maryland-modified Hartstack pheromone traps baited with Zealure pheromone strips. Moths placed in glass scintillation vials treated with 5 µg technical grade cypermethrin dissolved in acetone. Vials were replaced after 1 month post-preparation. Control vials were treated with acetone only. Moths kept in vials 24 hours before evaluation. Moths were placed in vials for 24 hours. Vials were loosely capped, and kept tilted at a 45° angle.

Active Ingredient Dose Response Curves

Corn earworm pupae were obtained from Benzon Research Inc (Carlisle, PA) and reared in an incubator. Upon eclosion, moths were allowed to feed on a 50% honey/water solution for 1-5 days prior to testing in vials. Doses and number of moths tested are listed in Table 1. After 24 hours, moths were removed from vials. Moths that could actively fly 1 meter or more were scored as 'alive' while moths that were either dead or moribund (unable to fly) were treated as 'dead.' Probit analysis was conducted in SAS and from the results, doses were selected LD≥90 for testing wild-type moths. A cypermethrin series was also run to compare the assay with the standard amount in the currently used vial test. Each pyrethroid active ingredient was also tested on wild-type moths at 5 ug to directly compare to the standard cypermethrin vial test.

Table 1. Number of lab-reared CEW moths tested for each dose of each active ingredient to generate a dose-response curve.

Dose ug/vial	n bifenthrin	n cyfluthrin	n lambda-cyhalothrin	n cypermethrin
0.05	25	50	96	
0.15	101	50	75	50
0.3			25	
0.5	150	74	70	50
0.7		25		
1.0		25		
1.5	100	82	50	100
3.0		25		
3.5	97	103	70	100
5.0	138	100	130	100
10.0	103	100	100	99
20.0	100	86	104	

Results

All wild type moths demonstrated resistance to pyrethroids. Bifenthrin appears to be the most potent of the active ingredients tested, with 48% mortality when exposed to the lab-type LD90 dose and 100% mortality when exposed to 5 ug of bifenthrin. Cyfluthrin and lambda-cyhalothrin gave conflicting results, with lower dose cyfluthrin less effective but higher dose slightly more effective (Table 2). More vial testing needs to be done in 2023 with more moths, with the following suggested doses and chemicals:

Cypermethrin 2.8 and 5 ug (standard)
Lambda-cyhalothrin: 3.4 ug and 5 ug
Cyfluthrin: 1.7 ug and 5 ug
Bifenthrin: 2.5 and 5 ug

Table 2. LD90 doses and mortality of wild-type moths exposed to designated doses and to 5 ug of active ingredient. This is compared to the amount of active ingredient applied to a given acre at the formulated product's highest label rate.

Active Ingredient	LD90 lab-reared	Wild Moths % Mortality (dose)	Wild Moths Mortality exposed to 5 ug	Amount a.i. (g) per acre per highest label rate
Bifenthrin (Brigade)	2.48 (1.19 – 16.66) ug	48% (2.5 ug)	100% (n = 25)	45.3
Cyfluthrin (Baythroid XL)	1.44 (1.03 – 2.36) ug	32% (1.7 ug)	92% (n = 25)	9.9
Lambda-cyhalothrin (Warrior II)	3.47 (1.42-26.65)	*48% (1.7 ug)	88% (n = 25)	14.1
Zeta cypermethrin (Mustang)				11.3
Zeta-cypermethrin + bifenthrin (Hero)				11.3 + 33.8
Cypermethrin	2.77 (1.11 – 48.29) ug			

Miscellaneous

Insect Pheromone Trapping

True Armyworm

Location	Nightly Trap Capture by week of Month								
	March 16-18	**March 23-25**	**March 30**	**April 7**	**April 12-14**	**April 20-21**	**May 4**	**May 12-13**	**May 19**
Harrington DE	1.17	5.25	10.4	7.25	22.67	27.43	5.07	NA	1.8
Laurel DE	NA	0.86	5.5	1	8.83	1.57	NA	0.11	NA
Middletown DE	0.5	0.86	0.43	0.5	9	6.43	11.38	8.63	2.71
Seaford DE	1	0.57	1.33	0	3.5	2.43	0.14	0.56	0.33
Smyrna DE	0.5	6.0	6.57	7.13	82.29	26.14	10.15	16.25	25.43
Sudlersville MD	0.14	0.43	0.14	0.29	1.43	2.57	7.86	0.57	3.29
Willards MD	0.17	0.43	NA	0.13	4.2	2.5	0.36	NA	NA

Black Cutworm

Location	Nightly Trap Capture by week of Month								
	March 16-17	**March 23-25**	**March 30**	**April 7**	**April 12-14**	**April 20-21**	**May 4**	**May 12-13**	**May 19**
Harrington DE	0	2.5	3.2	8.13	12.33	11.86	2.14	NA	2.87
Laurel DE	0	1.57	1.33	3.13	14.33	2.86	NA	NA	NA
Middletown DE	0	0.14	2.14	3.13	2.57	3.0	3.69	8.63	5.14
Seaford DE	0	1.43	2.0	4.5	7.17	0.86	0.64	2.38	1.83
Smyrna DE	0	1.0	2.43	2.5	1.29	1.0	3.31	1.22	6
Sudlersville MD	0	0	0.29	0.43	0.43	1.57	0	0	0
Willards MD	0	0.14	NA	1.88	4.2	2.13	0.57	NA	NA

Corn Earworm pheromone and black light traps as well as stink bug and European corn borer black light trap captures can be found at the UD insect trapping page: https://www.udel.edu/academics/colleges/canr/cooperative-extension/sustainable-production/pest-management/insect-trapping/#:~:text=The%20University%20of%20Delaware's%20Extension,are%20posted%20on%20this%20website.

Notable Degree Day Dates

SCM degree days for peak overwintering flight (base 39, target 360 and 1080DD): 359 on March 19

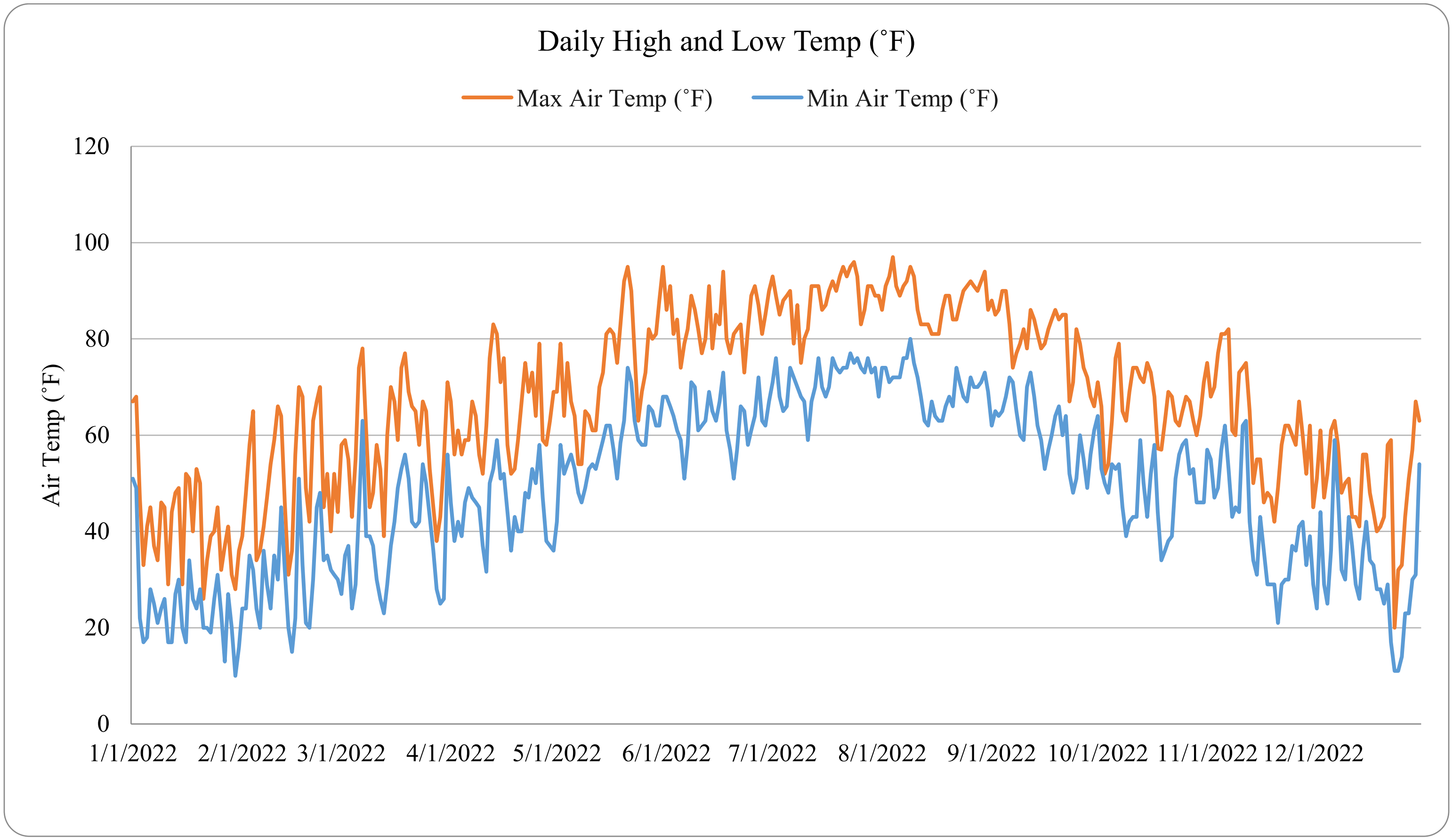
SCM degree days for peak first generation flight: 1073 on May 8

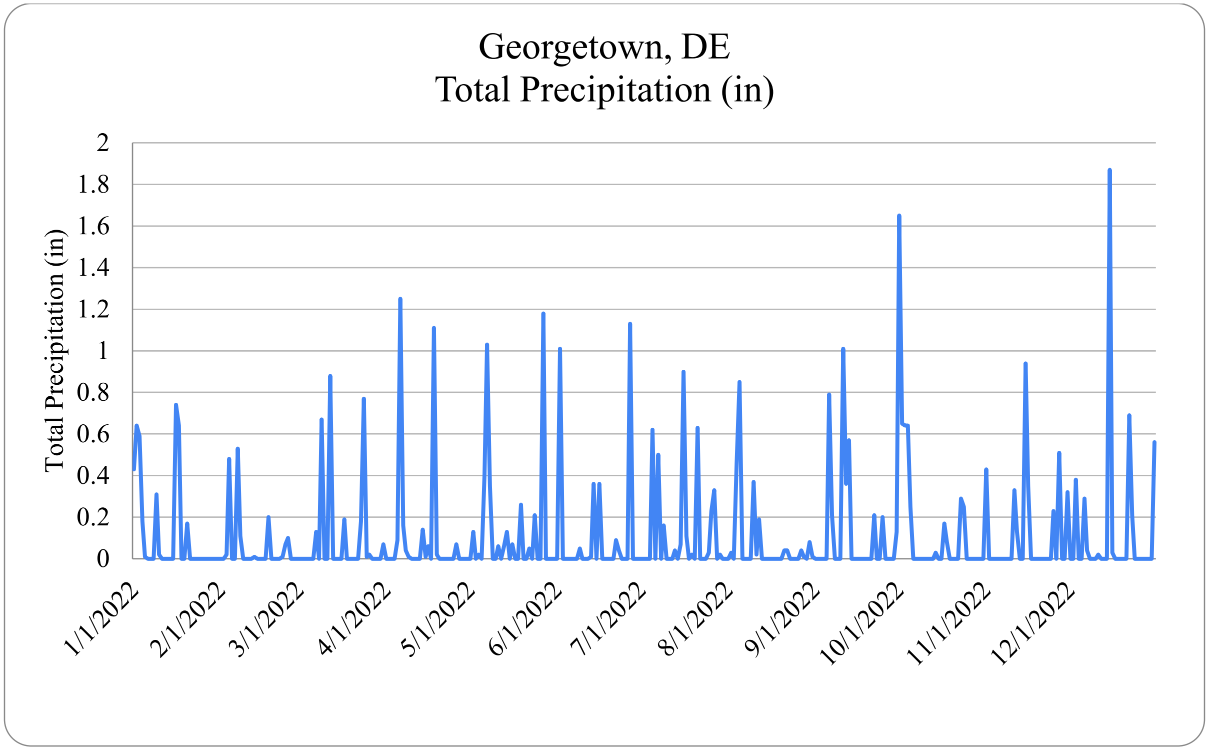
SCM degree days for Middletown DE (base 39, target 360 and 1080DD): April 1 and May 17

Black Cutworm (300 degree days from first significant flight): April 3 significant flight in Seaford, DE; Georgetown target degree days May 16

Alfalfa Weevil (base 48F, target 200 degree days): Georgetown: 3 April; Greenwood DE 5 April

Georgetown Weather





Georgetown, DE
Total Precipitation (in)
Total Precipitation (in)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/1/2022
2/1/2022
3/1/2022
4/1/2022
5/1/2022
6/1/2022
7/1/2022
8/1/2022
9/1/2022
10/1/2022
11/1/2022
12/1/2022

Soybean Pest Lost Survey

Delaware in the year 2022

Pest	Acres Infested	% Acres Infested	Acres above ET	% Acres above ET	Acres Treated	% Acres Treated	# of apps/acres treated	Cost of 1 Insecticide	% loss per acre infested	# of apps per total soy acres	cost/acre	Overall % reduction	bushel lost per pest	Loss + Cost	Loss + Cost/acre	% Total Loss + Cost
Armyworm complex	3,800	2.4%	2,500	1.6%	3,950	2.5%	1	$10.00	0.01	0.025	$0.25	0.00%	17	$39,758	$0.25	0.5%
Banded Cucumber Beetle	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Bean Leaf Beetle	112,970	71.5%	6,636	4.2%	8,532	5.4%	1	$10.00	0.60	0.054	$0.54	0.43%	31,162	$544,960	$3.45	6.2%
Blister Beetle	63,200	40.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Corn Earworm	65,096	41.2%	30,020	19.0%	28,440	18.0%	1.05	$15.00	2.50	0.189	$2.84	1.03%	74,818	$1,551,495	$9.82	17.7%
Cutworms	3,160	2.0%	0	0.0%	0	0.0%	0	$0.00	0.05	0.000	$0.00	0.00%	73	$1,071	$0.01	0.0%
Dectes Stem Borer	94,800	60.0%	7,900	5.0%	790	0.5%	1	$12.00	1.60	0.005	$0.06	0.96%	69,733	$1,038,046	$6.57	11.8%
Garden Webworms	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Grape Colaspis	7,900	5.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Grasshopper	152,786	96.7%	6,794	4.3%	2,212	1.4%	1	$10.00	0.10	0.014	$0.14	0.10%	7,024	$125,727	$0.80	1.4%
Green Cloverworm	144,728	91.6%	6,636	4.2%	26,702	16.9%	1	$10.00	0.10	0.169	$1.69	0.09%	6,654	$365,162	$2.31	4.2%
Japanese Beetle	126,400	80.0%	2,212	1.4%	790	0.5%	0	$9.00	0.10	0.000	$0.00	0.08%	5,811	$85,714	$0.54	1.0%
Kudzu Bug	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Lesser Cornstalk Borer	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Mexican Bean Beetle	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Potato Leafhopper	71,100	45.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Saltmarsh Caterpillar	23,700	15.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Seedcorn Maggot	31,600	20.0%	0	0.0%	790	0.5%	1	$52.00	1.00	0.005	$0.26	0.20%	14,528	$255,365	$1.62	2.9%
Slugs	72,680	46.0%	48,190	30.5%	8,690	5.5%	1	$35.00	3.75	0.055	$1.93	1.73%	125,302	$2,152,354	$13.62	24.5%
Soybean Aphid	15,800	10.0%	158	0.1%	158	0.1%	1	$10.00	0.01	0.001	$0.01	0.00%	73	$2,651	$0.02	0.0%
Soybean Gall Midge	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Soybean Looper	63,200	40.0%	9,480	6.0%	3,792	2.4%	1	$15.25	0.20	0.024	$0.37	0.08%	5,811	$143,542	$0.91	1.6%
Spider Mites	90,060	57.0%	18,960	12.0%	11,850	7.5%	1	$10.50	0.10	0.075	$0.79	0.06%	4,140	$185,496	$1.17	2.1%
Spotted Cucumber Beetle	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Stink Bugs (see box below)	150,732	95.4%	11,850	7.5%	26,860	17.0%	1	$11.00	1.80	0.170	$1.87	1.72%	124,735	$2,135,307	$13.51	24.3%
Thistle Caterpillar	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Threecornered Alfalfa Hoppe	15,800	10.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Thrips	158,000	100.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Velvetbean Caterpillar	0	0.0%	0	0.0%	0	0.0%	0	$0.00	0.00	0.000	$0.00	0.00%	0	$0	$0.00	0.0%
Other	41	0.0%	0	0.0%	5	0.0%	1	$40.00	0.00	0.000	$0.00	0.00%	0	$204	$0.00	0.0%
Automatic (no insects)	0	0.0%	0	0.0%	82,160	52.0%	1	$1.75	0.00	0.520	$0.91	0.00%	0	$143,780	$0.91	1.6%
Other includes pillbugs									**TOTAL**	**1.306**	**$11.64**	**6.47%**	**469,882**	**$8,770,631**	**$55.51**	**100.0%**

SUMMARY DATA

Data Input

State	DE
Year	2022
Total Acres	158,000
Yield/acre	43
Price/Bushel	$14.75
% Acres Scouted	60
Scouting Fee/scouted acre	$9.50
% Acres Insect Seed Trt.	25
Seed Trt Cost/treated ac	$6.50

Yield & Management Results

Total Bushels Harvested	6,794,000
Total Bushels Lost to Insects	469,882
Percent Yield Loss	6.47%
Yield w/o Insects	45.97
Ave. # Spray Applications	1.306
Seed Treated Acres	39,500
Scouted Acres	94,800

Economic Results

	Total	Per Acre
Foliar Insecticides Cos	$1,839,877	$11.64
Seed Treatment Costs	$256,750	$1.63
Scouting costs	$900,600	$5.70
Total Costs	$2,997,227	$18.97
Yield Lost to insects	$6,930,754	$43.87
Total Losses + Costs	$9,927,981	$62.84

Stink Bug Composition

Species	% of SB
Brown	36
Brown Marmorated	15
Green	48
Redbanded	0
Redshouldered	1
Southern Green	0
Total (make it 100%)	100