

Welcome to the webinar!

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- Find a handout of the slides at <http://www.extension.org/pages/71933>
- To type in a question, use the question box on your control panel. We will read the questions aloud after the c. 45 minute presentation.
- The webinar is being recorded and you can find it in our archive in the coming week at <http://www.extension.org/pages/25242>



Systems Organic Management Suppresses Cabbage worm Outbreaks: Evidence from 4 Long-term Organic Farms

Jake Asplund, Doug O'Brien

January 13, 2015





Jake Asplund



Doug O'Brien

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Outline:

1. Biology and management of the 3 cabbage worms
2. Introduction to Long-term organic farm systems
and analysis
3. Cabbage worm control: Evidence from four farms
4. Cabbage worm control: Components of four
successful farm systems
5. Conclusion: 'Important' system components
across all four farms



PROJECT FARMERS



Winter Green Farm



Doug O'Brien
Phil Foster Ranches
IPM



Phil Foster,
Phil Foster Ranches



Jeff Falen
Elanor O'Brien
Persephone Farm



Helen Atthowe
BioDesign Farm



Carl Rosato
Woodleaf Farm

PROJECT STAFF

Oregon State University:

Helen Atthowe, Aaron Heinrich, and Alex Stone, Horticulture
Bryan Tilt, Anthropology

Washington State University:

Jake Asplund, Bill Snyder, and Chris Philips, Entomology

Doug O'Brien, Doug O'Brien Agricultural Consulting



Pieris rapae (Imported Cabbageworm)



Egg (4-5 days at 22°C)



Larvae (12-16 days at 22°C)



Pupa (8-10 days at 22°C)



Adult (Male)



Adult (Female)

Richards, O. W. 1940. "The Biology of the Small White Butterfly (*Pieris Rapae*), with Special Reference to the Factors Controlling Its Abundance." *Journal of Animal Ecology* 9 (2): 243–88. doi:10.2307/1459.

Plutella xylostella (Diamondback Moth)



Egg (6 days)



Larvae (9-32 days)



Pupa (5-15 days)



Adult

Trichoplusia ni (Cabbage Looper)



Egg (2-5 days)



Larvae(17-21 days)



Pupa (4-10 days)



Adult

Chemical Controls

Common name (trade name and formulation)	Mode of action ¹	Selectivity ² (affected groups)	Predatory mites ³	General predators ⁴	Parasites ⁴	Honey bees ⁵	Duration of impact to natural enemies ⁶
acephate (Orthene S)	1B	broad (insects)	H	H	M/H	I	moderate
acetamiprid (Assail WP)	4A	moderate (sucking insects, larvae)	— ⁷	— ⁸	—	III	moderate
<i>Bacillus thuringiensis</i> ssp. <i>aizawai</i>	11.B1	narrow (caterpillars)	L	L	L	IV	short
<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>	11.B2	narrow (caterpillars)	L	L	L	IV	short
bifenthrin (Brigade EC)	3	broad (insects)	H	H	H	I-III ⁹	long
carbaryl (Sevin bait)	1A	narrow (cutworms, armyworms)	L	L	L	IV	short
carbaryl (Sevin F, S)	1A	broad (insects)	M/H	H	H	I ¹⁰	long
carbaryl (Sevin XLR Plus)	1A	broad (insects)	L	H	L	I ¹¹	long
chlorantraniliprole (Coragen)	28	narrow (primarily caterpillars)	—	—	—	IV	—
chlorpyrifos (Lorsban Advanced)	1B	broad (insects)	M	H	H	I ¹²	moderate
cryolite (Kryocide W)	9A	narrow (foliage chewing insects)	L	L	L	IV	short

H = high M = moderate L = low — = no information

1 Rotate chemicals with a different mode-of-action Group number, and do not use products with the same mode-of-action Group number more than twice per season to help prevent development of resistance. For example, the organophosphates have a Group number of 1B; chemicals with a 1B Group number should be alternated with chemicals that have a Group number other than 1B. Mode of action Group numbers are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at <http://www.irac-online.org/>.

2 Selectivity: broad means it affects most groups of insects and mites; narrow means it affects only a few specific groups.

3 Generally, toxicities are to western predatory mite, *Galendromus occidentalis*. Where differences have been measured in toxicity of the pesticide-resistant strain versus the native strain, these are listed as pesticide-resistant strain/native strain.

4 Toxicities are averages of reported effects and should be used only as a general guide. Actual toxicity of a specific chemical depends on the species of predator or parasite, environmental conditions, and application rate.

5 Ratings are as follows: I = Do not apply to blooming plants; II = Apply only during late evening; III = Apply only during late evening, night, or early morning; and IV = Apply at any time with reasonable safety to bees. For more information, see How to Reduce Bee Poisoning From Pesticides (700 KB, PDF), Pacific Northwest Extension Publication PNW591.

6 Duration: short means hours to days; moderate means days to 2 weeks; and long means many weeks or months.

<http://www.ipm.ucdavis.edu/PMG/r108900111.html>

Bio-control of cole crop lepidopteran pests

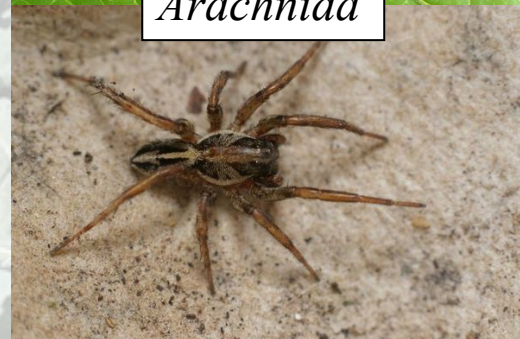
Generalist Predators



Nabidae



Arachnida



Carabidae



Coccinellidae



Bio-control of cole crop lepidopteran pests

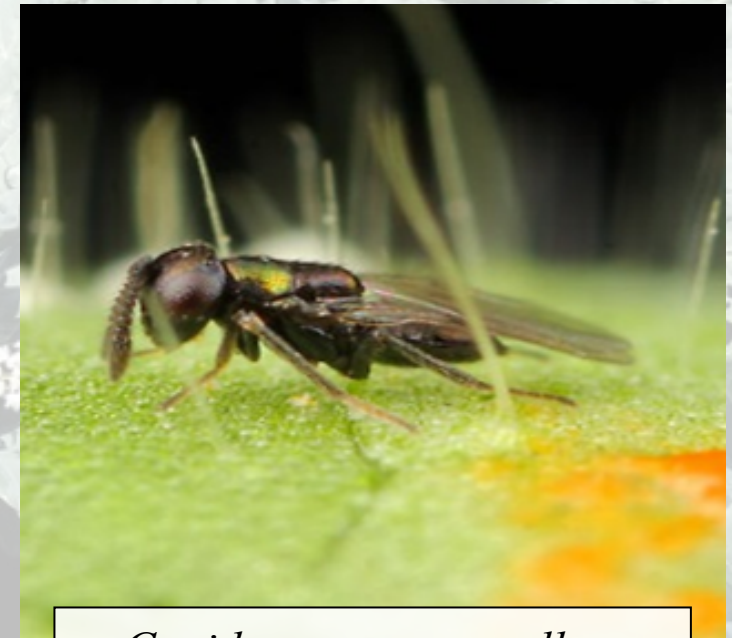
Specialist Parasitoids



Cotesia rubecula
(Parasitoid of *Pieris rapae*)



Cotesia plutellinae
(Parasitoid of *Plutella xylostella*)



Copidosoma truncatellum
(Parasitoid of *Trichoplusia ni*)

Characteristics of long term vegetable systems:

- Whole farm tools and strategies
- Time (many years)
- Integration of pest and soil management with climate, location, marketing, and philosophical uniqueness



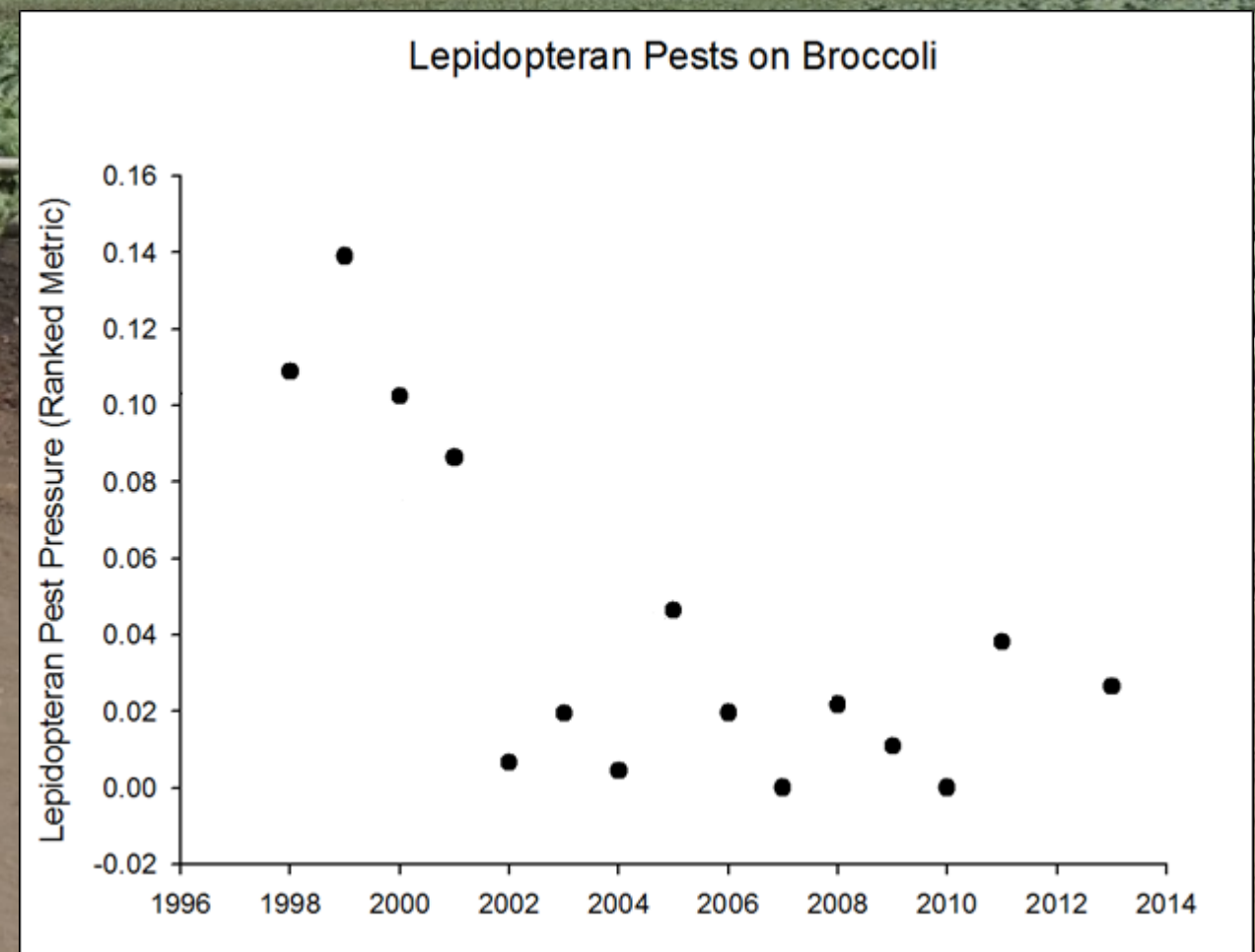
Analysis: Identify some systems' strategies and tools that work and don't work

- **First**: develop a **Farm System Description**: Compare farmer's perceptions about trends with available data from farm records and on-farm data sets.
- **Second**: develop a **Farm System Analysis**: identify whole farm system management strategies and tools that are working and not working on individual farms and across the 4-5 long-term organic farms in our study.
- **Third**: Summarize innovative soil and pest management tools and strategies in a whole farm context.



Phil Foster Ranches San Juan Bautista and Hollister, California

- Mixed vegetables and tree fruit.
- 2 farms. Hedgerows, in-field insectaries, rapid rotations, intensive crop scouting
- 1/3 Wholesale, 2/3 retail
- Threshold levels: zero worms inside broccoli heads, tolerate some worm feeding on outside cabbage leaves



FOSTER 4/23/01 SJ/FREITAS

- ① Broccoli & cauli next to covercrop in SE Freitas. Light slug, a little heavier in cauli. Frequent cultivation will probably kill them.
- ② Cuka ¹ Sowbugs & slugs seriously affecting stand. Very wet.
- ③ Onion 1,2 Downy mildew very active.
- ④ Broccoli/cauli Light worm damage, none live found. Aphid increased slightly.
- ⑤ Napa/bok #1,2 Lower flea beetle. Possibly start Mei Qing next wk. Increase in root maggot, esp Napa 1. Continuing light aphid.
- ⑥ Spinach 5-7 Downy mildew slight increase, but still light. Light Cbeetle.
- ⑦ Strawberry Mite numbers maybe a little lower.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	
1		Aphids			I. Cabbage Worm			Diamondback Moth	Thrips					Flea Beetle			Lygus				Aphids			I. Cabbage Worm			Diamondback Moth	Thrips				
2		Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbag	Broccoli	Celery	Cabbage		Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbage	Broccoli	Celery	Cabbage	Broccoli	Celery	
3	Date	SJaBR	SJaCL	SJaCB	SJiBR	SJiCL	SJiCB	SJdBR	SJdCL	SJdCB	SJthripBR	SJthripCL	SJthripCB	SJfbBR	SJfbCL	SJfbCB	SJlygBR	SJlygCL	SJlygCB	SJpred	SAaBR	SAaCL	SAaCB	SAiBR	SAiCL	SAiCB	SAdBR	SAdCL	SAdCB	SAthripBR	SAthripCL	SAthripCB
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237	3/8/2001																				2		1	0		0	0		0	0		
238	3/12/2001																				1		0	0		0	0		0	0		
239	3/21/2001																				1		1	0		0	0		0	0		
240	3/26/2001		0									0			0			0			2		2	0		0	0		0	0		
241	3/29/2001	0	0		0	0		0	0			0			0			0			3		2	0		0	0		0	0		
242	4/5/2001																				2		2	0		0	0		0	0		
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3	Date	SJaBR	SJaCL	SJaCB	SJiBR	SJiCL	SJiCB	SJdBR	SJdCL	SJdCB	SJthripBR	SJthripCL	SJthripCB	SJfbBR	SJfbCL	SJfbCB	SJlygBR	SJlygCL	SJlygCB	SJpred	SAaBR	SAaCL	SAaCB	SAiBR	SAiCL	SAiCB	SAdBR	SAdCL	SAdCB	SAthripBR	SAthripCL
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248	4/30/2001																				1		1	0		0	0		0	0	
249	5/4/2001	0	0		0	0		0	0												0		0	0		0	0		0	0	
250	5/8/2001	0	0		0	0		0	0		0	0		0	0		0	0			0		0	1		0	0		0	0	
251	5/11/2001	1			0			0			0	0		0	0		0	0			0		0	1		1	0		0	0	
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253	6/15/2001	0	0		2	0		0	0		0	0		0	0		0	1					0		0			0			
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Biodesign Farm

Biodesign Farm, Stevensville, Montana

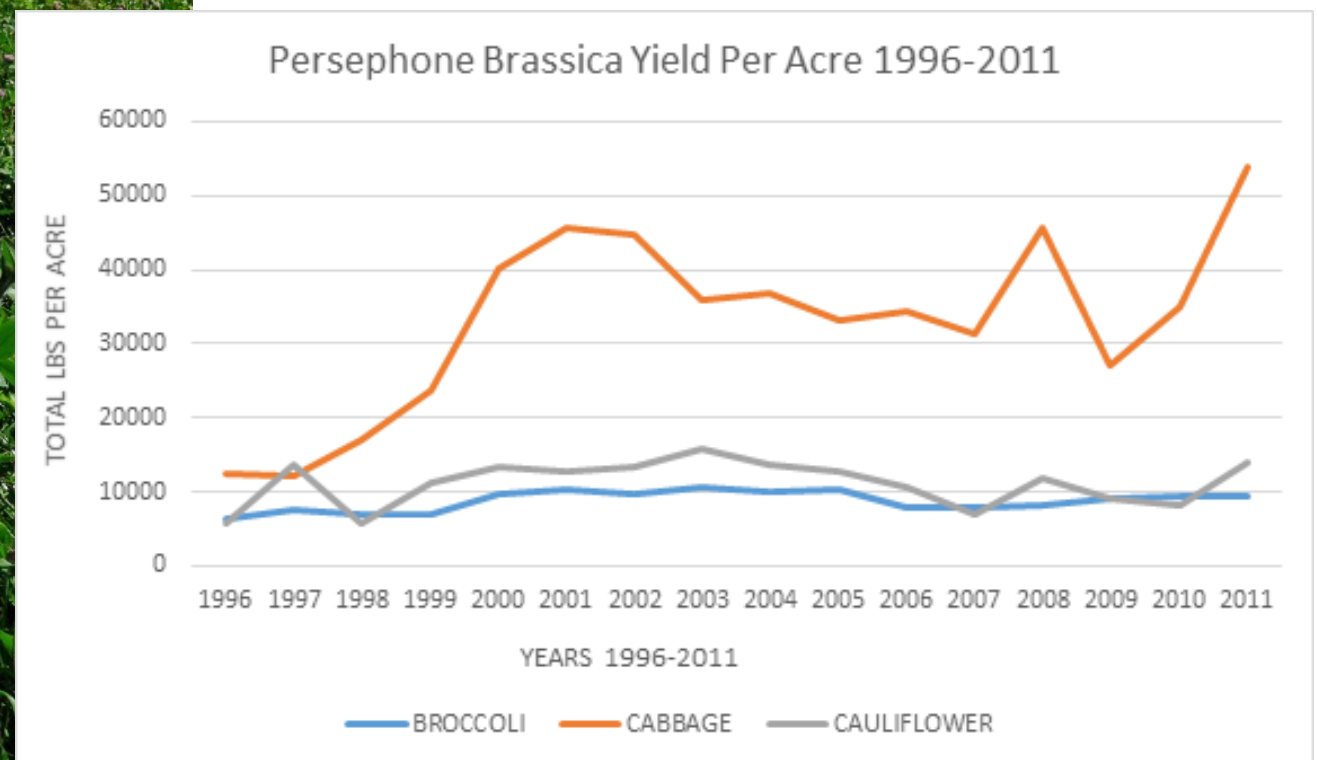
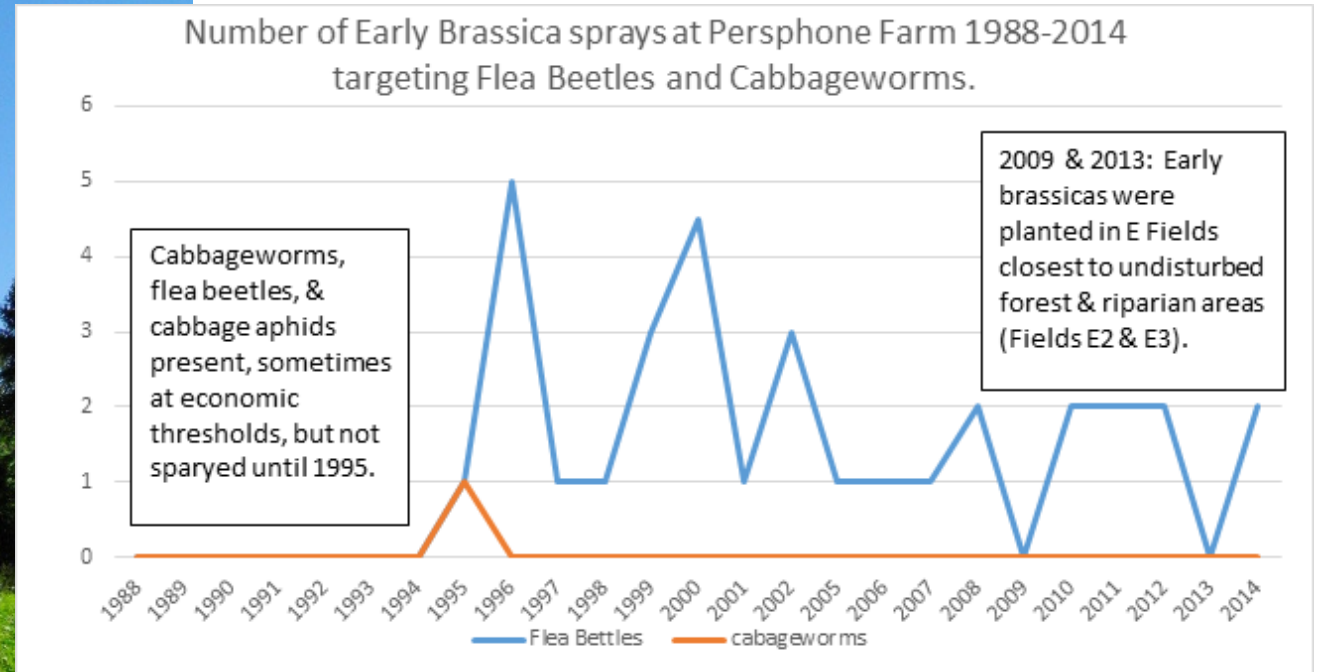
- Mixed vegetables.
- Living mulches between crop rows
- 75% Retail, 25% Wholesale
- Threshold levels: zero worms inside broccoli heads, tolerate some worm feeding on outside cabbage leaves

**Total Pounds of Organic Insecticides
(*bacillus thuringiensis* Kurstaki)
Sprayed on Brassicas at Biodesign
Farm 1994-2009**



Persephone Farm. Willamette Valley , Oregon near foothills.

- Summer and winter cover crops
 - In-field weeds
- Native forest and riparian borders
 - Insectary plantings
- Variable cabbageworm thresholds
 - 100% retail (brassicas)



‘No sprays for cabbage worms,
crop yields unchanged’

Winter green farm. Foothills of Coast range, Oregon.

- 20 Acres mixed vegetable CSA rotated with pasture (cattle) and cover crops.
- Surrounded by undisturbed native forest.
- Thresholds: variable. 100% Retail sales (Brassicas).

Evidence for Cabbageworm control:

- Bt sprayed regularly (1980's)
- 2 Bt sprays 1990-2013



Successful Systems for Cabbageworms

- Descriptive, not prescriptive and unique to each farm
- Identify similarities and differences between your farm and these farms
- Choose tools and strategies that make sense on your farm



Phil Foster Ranches: Tools and Strategies for Cabbageworm management

Tool or Strategy	Important	Less Important	Neutral	Negative	Tried and abandoned
Monitoring 3x per week	x				
Flexible thresholds for Bt sprays	x				
Bt sprays	x				
Hedgerows		x			
Infield insectaries*		x			
Crop placement and timing		x			
Cover crops		x			
Crop variety		x			
Crop rotation			x		
Reduced tillage			x		
Non-BT pesticides (Entrust, Grandevo, Pyganic, etc.)			x		
Native habitat (very little close to this farm)			x		
Reduced tillage			x		
Beetle banks/insect habitat on field margins (mostly weeds)			x		
Harvested crops allowed to flower and seed within fields				x	
Infield insectaries*				x	
Release of purchased predator insects					x
Published thresholds for Bt sprays					x



Biodesign

Biodesign Farm: Tools and strategies for Cabbageworm management					
Tool or strategy	Important	Less Important	Neutral	Negative	Tried and abandoned
Monitoring	x				
Spring-blooming weeds tolerated since 1995	x				
Permanent living mulch between crop rows	x				
Reduced tillage	x				
Native habitat	x				
Harvested crops allowed to flower and seed within fields	x				
Hedgerows		x			
Crop placement and timing		x			
Crop variety		x			
crop rotation		x			
Beetle banks/insect habitat on field margins.		x			
Infield insectaries (>1% of crop field area)		x			
Bt sprays					x
Flexible thresholds for Bt sprays					x
Vacuum					never tried
Non-BT pesticides (eg. Entrust, Grandevo, Pyganic, etc.)					never tried, except Pyganic-rotenone for research to kill predators/parasites & test the system.
Organic mulches: straw in some brassica fields in 2013					never tried
Release of purchased predator insects					never tried
Published thresholds for Bt sprays					x

Persephone


















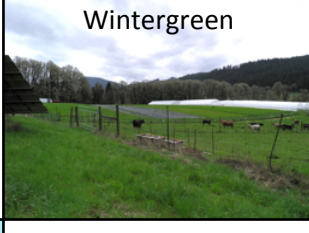


Persephone: Tools and Strategies for Cabbageworm management

Tool or Strategy	Important	Less Important	Neutral	Negative	Tried and abandoned
Spring-blooming weeds tolerated since 1995	x				
Crop placement and timing	x				
4 year pasture:vegetable crop rotation	x				
Reduced tillage	x				
Native habitat	x				
Beetle banks/insect habitat on field margins.	x				
Harvested crops allowed to flower and seed within fields	x				
Infield insectaries (>1% of crop field area)	?	x?			
Organic mulches: straw in some brassica fields in 2013		x			
Monitoring		x			
Hedgerows		x			
Cover crops		x			
Crop variety		x			
Published thresholds for Bt sprays			x		
Bt sprays					x
Flexible thresholds for Bt sprays					x
Non-BT pesticides (Pyganic)					Abandoned for worms, STILL sprayed for flea beetles

Wintergreen Farm: Tools and Strategies for Cabbageworm management

Tool or Strategy	Important	Less Important	Neutral	Tried and abandoned
Maintaining undisturbed native plant habitat	x			
Defacto grassy beetle banks on vegetable field margins	x			
Harvested crops allowed to flower and seed within fields	x			
5-6 year pasture:vegetable rotation	x			
Reduced tillage	x			
Winter annual weeds are tolerated as spring habitat	x			
Cover crops (emphasis on flowering: phacelia, buckwheat)		x		
Bt sprays		x		
Cilantro and other carrot family crops allowed to flower and seed to attract beneficial insects		x		
Hedgerows				x
Release of purchased predator insects				x

Tools and Strategies, (thought to be important), for Cabbageworm management: 4 farms

Tool or Strategy	Persephone	Biodesign	Wintergreen	Foster
Weeds allowed to bloom	 Persephone	 Biodesign	 Wintergreen	
Reduced tillage	 Persephone	 Biodesign	 Wintergreen	
Native habitat	 Persephone	 Biodesign	 Wintergreen	
Harvested crops allowed to flower and seed within fields	 Persephone	 Biodesign	 Wintergreen	
Pasture:vegetable crop rotation	 Persephone		 Wintergreen	
Beetle banks/insect habitat on field margins	 Persephone		 Wintergreen	
Monitoring		 Biodesign		 Phil Foster

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- Find the recording, slides and a handout from this webinar at <http://www.extension.org/pages/71933>
- Have an organic farming question? Use the eXtension Ask an Expert service at <https://ask.extension.org/groups/1668/ask>
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- Thank you for coming!

