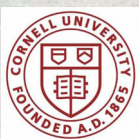


The Lorsban “ban” – Cabbage maggot control without it

2020 Empire State Producers EXPO
January 15, 2020



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Acknowledgments

- **Faruque Zaman** – Assoc.
Entomologist, CCE Suffolk Co.
- **Dan Gilrein** – Entomologist, CCE
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- **Tony Shelton** – Professor, Cornell
Entomology
- **Ben Werling** – Vegetable
Production Educator, Michigan
State University Extension



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Cabbage maggot (*Delia radicum*)

- Found in northern temperate regions worldwide
- Feeds only on plants in Family *Brassicaceae* (mustards)
- Close relative includes seedcorn maggot – a generalist and sporadic pest of cabbage



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Cabbage maggot (*Delia radicum*)

Life Cycle

- Overwinters as pupa
- Complete one generation in 25-30 days in summer
- 3-4 generations per year

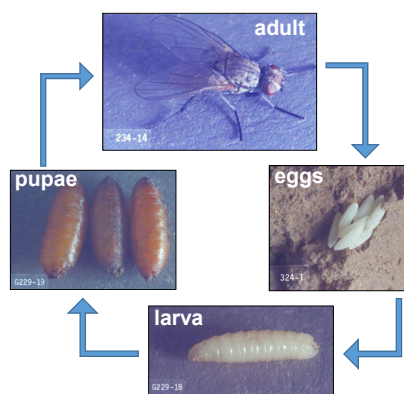
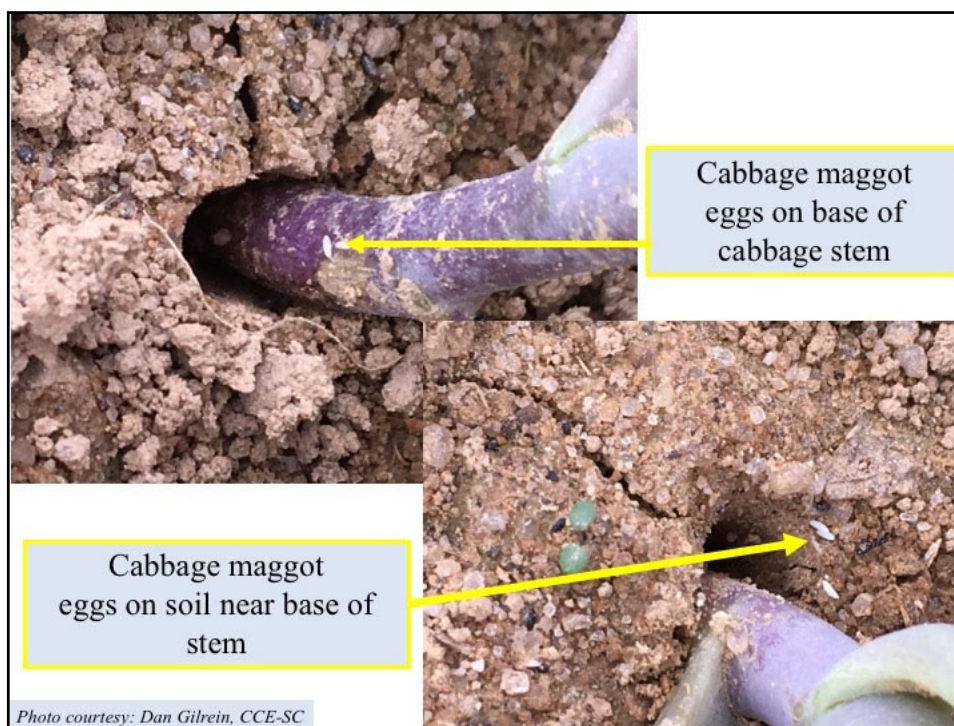


Photo credits: Ken Gray

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How best to manage cabbage maggot?



How best to manage cabbage maggot?

Plant Resistance

- None used



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Plant Resistance

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Cultural Control

- Crop rotation
- Avoid planting into high OM
- Row covers

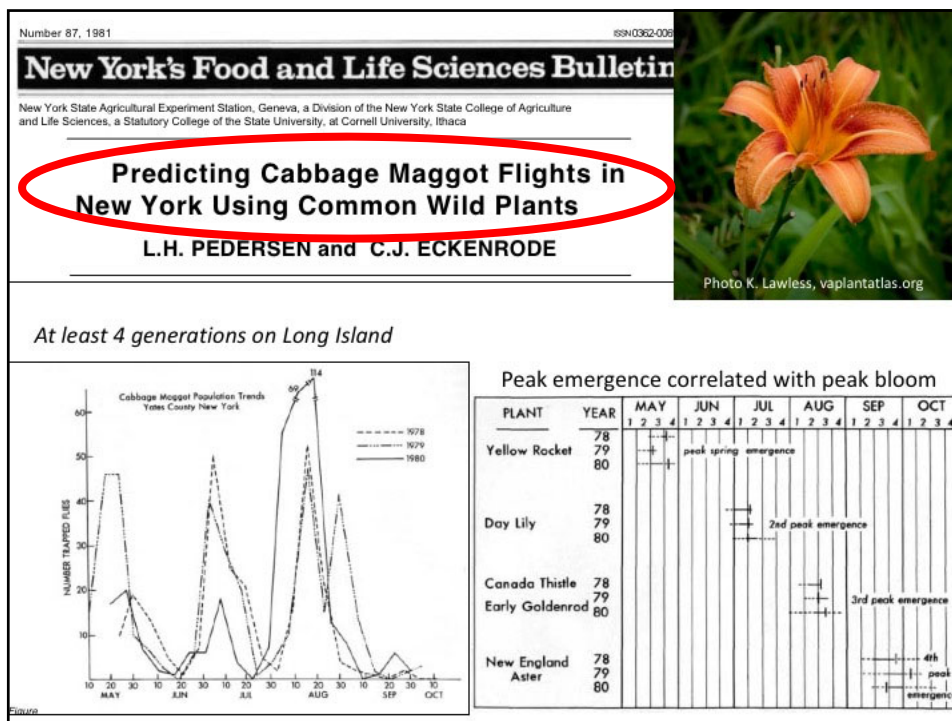
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Row covers will protect plants from ALL insects, not just cabbage maggot

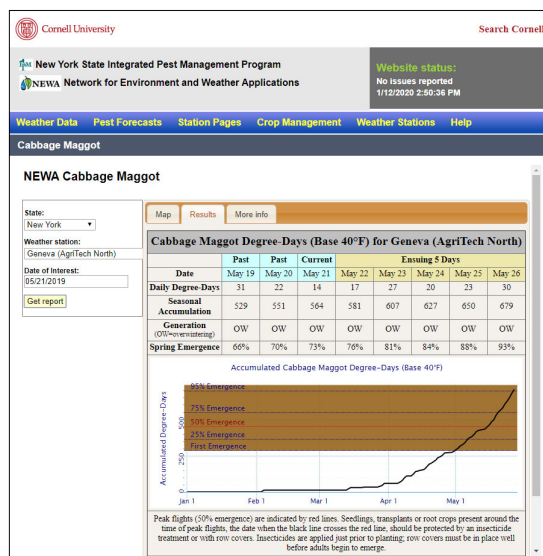


Row covers will protect plants from ALL insects, not just cabbage maggot





NEWA cabbage maggot degree-day model for predicting fly activity



<http://www.newa.cornell.edu/>

- Degree-day model will generate information to help determine when to remove row cover

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How best to manage cabbage maggot?

Plant Resistance

- None used

Cultural Control

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- Avoid planting into high OM
- Row covers

Sterile Insect Technique

- Sterile male release

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How best to manage cabbage maggot?

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- None used

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Sterile Insect Technique

- Sterile male release

Biological Control

- Nematodes

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How best to manage cabbage maggot?

Plant Resistance

➤ None used

Chemical Control

➤ Insecticides

Cultural Control

➤ Crop rotation
➤ Avoid planting
into high OM
➤ Row covers

Biological Control

➤ Nematodes

Sterile Insect Technique

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How best to manage cabbage maggot?

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Biological Control

➤ Nematodes

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➤ Sterile male release

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Chlorpyrifos



- EPA has threatened to pull all food uses for chlorpyrifos, including cabbage.
- NY chose NOT to ban chlorpyrifos, but its use will be restricted in the near future. Are there effective alternatives?



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- EPA has threatened to pull all food uses for chlorpyrifos, including cabbage.

Resistance to chlorpyrifos in cabbage maggot populations occurs in New York



...?

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Insecticides labeled for cabbage maggot in Brassica Leafy Vegetables (Crop Group 5)

- Lorsban (chlorpyrifos) (1B)
- Diazinon AG500 (diazinon) (1B)
- Capture LFR (bifenthrin) (3A)
- Verimark (cyantranilprole) (28)
- Coragen SC (chlorantraniliprole) (28)
- Entrust SC (spinosad) (5)
- Radiant SC (spinetoram) (5)



Helena
DIAZINON® AG500
INSECTICIDE



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- Coragen SC (chlorantraniliprole) (28)
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 - **Suppression only**

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Insecticides available for cabbage maggot control in New York (IRAC 1B & 3A)

Product	Rates	Application Method
Lorsban Advanced	1.6-2.75 fl oz/ 1000 ft	<ul style="list-style-type: none"> • <u>Direct-seeded</u>: at-plant band (4") • <u>Transplants</u>: direct spray at base of transplants after setting
Diazinon AG500	2-3 qts/acre 4-8 fl oz/ 50 gal	<ul style="list-style-type: none"> • <u>Direct-seeded</u>: broadcast at planting • <u>Transplants</u>: water transplant treatment
Capture LFR	3.4-6.8 fl oz/acre	<ul style="list-style-type: none"> • <u>Direct-seeded only</u>: apply in 5-7" band in furrow

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Insecticides available for cabbage maggot control in New York (IRAC 28)

Product	Rates	Application Method
Verimark	10 – 13.5 fl oz/acre	<ul style="list-style-type: none"> • In-furrow spray • Transplant tray drench • <i>Transplant water treatment</i> • Surface band • Soil shank injection
Coragen SC*	3.5-7.5 fl oz/acre	<ul style="list-style-type: none"> • Transplant water treatment only

*suppression only

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Insecticides available for cabbage maggot “suppression” in New York (IRAC 5)

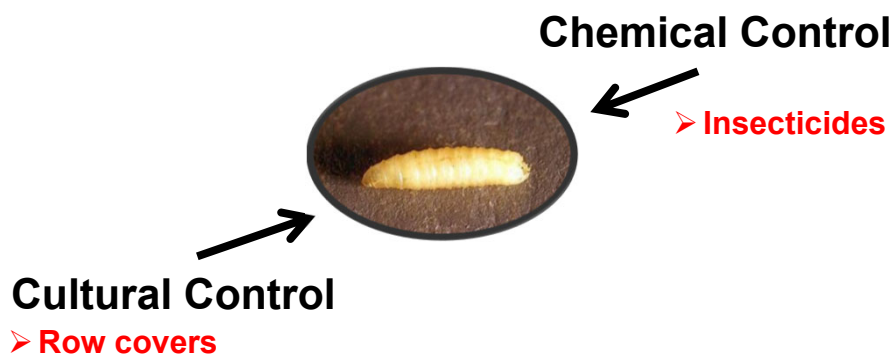
Product	Rates	Application Method
Entrust SC*	5-10 fl oz/acre	<ul style="list-style-type: none"> • Directed spray at base of young direct-seeded plants (4") • Directed spray at base of transplants immediately after setting
Radiant*	5-10 fl oz/acre	<ul style="list-style-type: none"> • Same as above

- Use high gallonage of spray (e.g., 100 gallons per acre)
- **Need at least 2 applications spaced 2-3 weeks apart**
- Do not apply more than 29 fl oz of Entrust SC or 34 fl oz of Radiant SC per acre per crop for all methods of application
- Maximum Number of Applications: Do not make more than six applications per year

*suppression only

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Evaluating alternatives to Lorsban for cabbage maggot management



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Insecticide treatments evaluated for cabbage maggot control in cabbage

Riverhead, NY 2017-2019

Treatment	Rates	Application Method
Entrust SC*	8 fl oz/acre	Tray drench** + post directed
Radiant SC*	10 fl oz/acre	Tray drench** + post directed
Verimark	13.5 fl oz/acre	Tray drench + post directed
Lorsban	1.8 fl oz/ 1,000 ft	At planting 4" band furrow

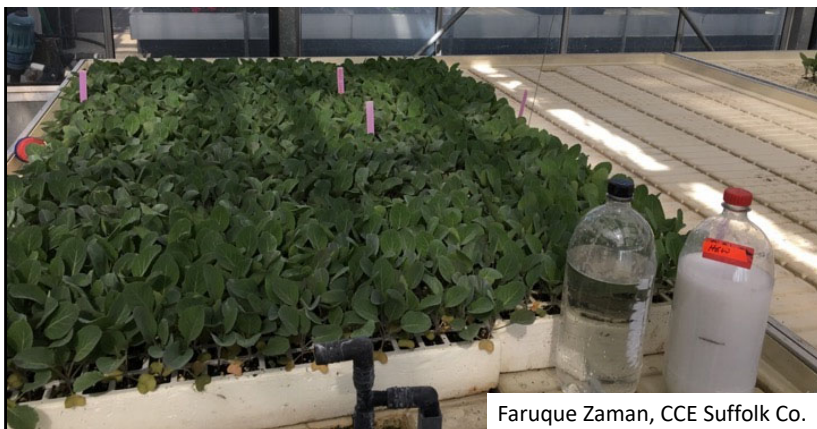
* suppression only

** not labeled use

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Transplant tray drench (e.g., **VERIMARK**)

- **Rate:** high rate of Verimark is 13.5 fl oz/ acre
- **Number of plants/ acre:** 16,786
- **Amount of Verimark per plant:** 0.0008 fl oz or 0.024 ml
- **Number of plants/ tray:** 200
- **Number of trays per acre:** 84
- **Amount of Verimark/ tray:** 4.7 ml in 250 ml of water
- **NOTE:** do not water trays for at least 24 hours before treatment



Row covers evaluated for cabbage maggot control in cabbage

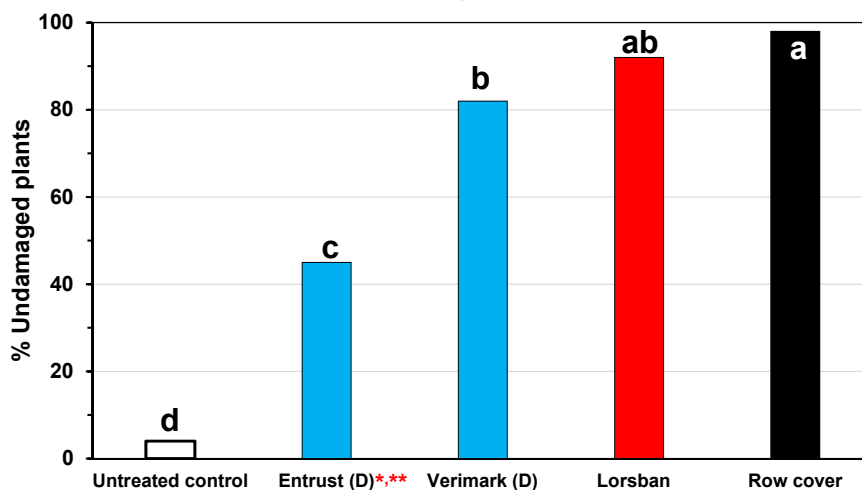
Riverhead, NY 2017-2019

Treatment	Rates	Application Method
Row cover netting	-	At planting
Black plastic mulch	-	-
Row cover + plastic	-	At planting



Management of cabbage maggot in cabbage

Riverhead, NY 2017



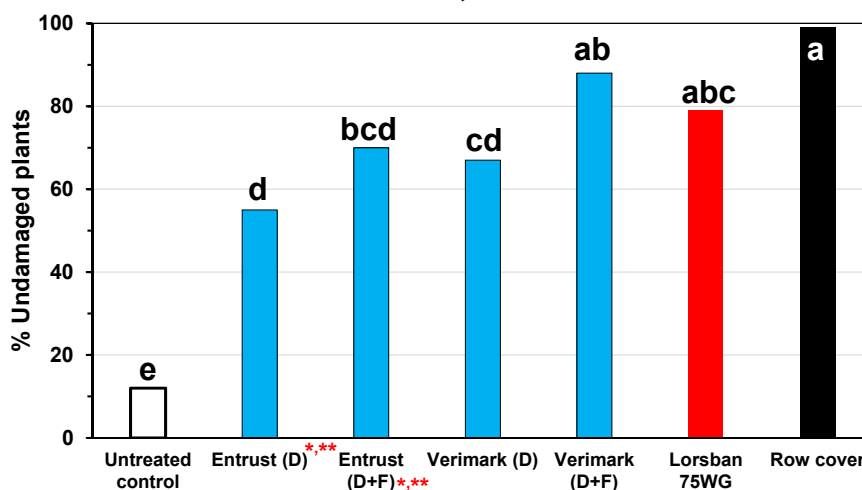
* suppression only
** not labeled use

Treatment

Modified from Faruque Zaman, CCE Suffolk Co.

Management of cabbage maggot in cabbage

Riverhead, NY 2018



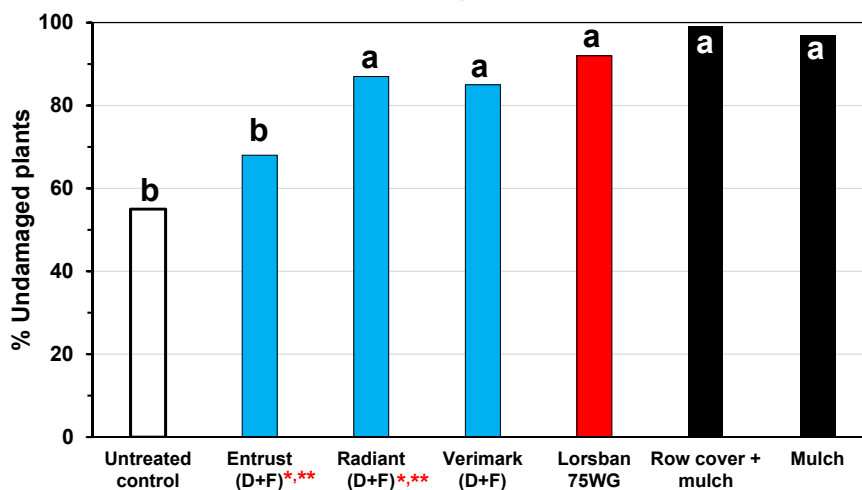
* suppression only
** not labeled use

Treatment

Modified from Faruque Zaman, CCE Suffolk Co.

Management of cabbage maggot in cabbage

Riverhead, NY 2019



* suppression only
** not labeled use

Treatment

Modified from Faruque Zaman, CCE Suffolk Co.

Estimated Costs for Cabbage Maggot Control in Fresh Market Cabbage

Assumption: 36" row spacing and 12" in-row plant spacing

Product	Low Rate	High Rate	Total Cost
Lorsban Ad.	1.6 fl oz/ 1,000 ft	2.75 fl oz/ 1,000 ft	
	\$8.33	\$14.29	\$8-14/acre

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Product	Low Rate	High Rate	Total Cost
Lorsban Ad.	1.6 fl oz/ 1,000 ft \$8.33	2.75 fl oz/ 1,000 ft \$14.29	\$8-14/acre
Radiant SC	5 fl oz/acre \$31.30	10 fl oz/acre \$62.6	\$63-126/acre*

*Includes cost of 2 applications spaced 2 wk apart

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Radiant SC	5 fl oz/acre \$31.30	10 fl oz/acre \$62.6	\$63-126/acre*
Entrust SC	5 fl oz/acre \$70.90	10 fl oz/acre \$141.90	\$142-284/acre*

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Entrust SC	5 fl oz/acre \$70.90	10 fl oz/acre \$141.90	\$142-284/acre*
Verimark	10 fl oz/acre \$74.40	13.5 fl oz/acre \$100.40	\$149-200/acre*

*Includes cost of 2 applications spaced 2 wk apart

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Summary

- Lorsban - excellent control (80-90%);
NO control of other pests
- Verimark - tray drench good control (65-80%);
drench + foliar 2 wks later was better (82-87%);
controls worms and flea beetles! EXPENSIVE
- Radiant & Entrust – tray drench fair control (45-50%); drench + foliar 2 wks later better (70%);
controls of worms! EXPENSIVE
- Row cover - was highly effective (nearly 100% protection); **controls worms and flea beetles**
EXPENSIVE & NOT PRACTICAL

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Future Research

- **Evaluate Verimark, Radiant and Entrust applied as a tray drench followed by directed spray effective at lower than labeled rates**
- **Other options?**
- **Need a field site in 2020 with high cabbage maggot pressure to conduct trials (see me)**

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