The Lorsban “ban” – Cabbage maggot control without it

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Acknowledgments

- **Faruque Zaman** – Assoc. Entomologist, CCE Suffolk Co.
- **Dan Gilrein** – Entomologist, CCE Suffolk Co.
- **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

Cabbage maggot (*Delia radicum*)

Life Cycle

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

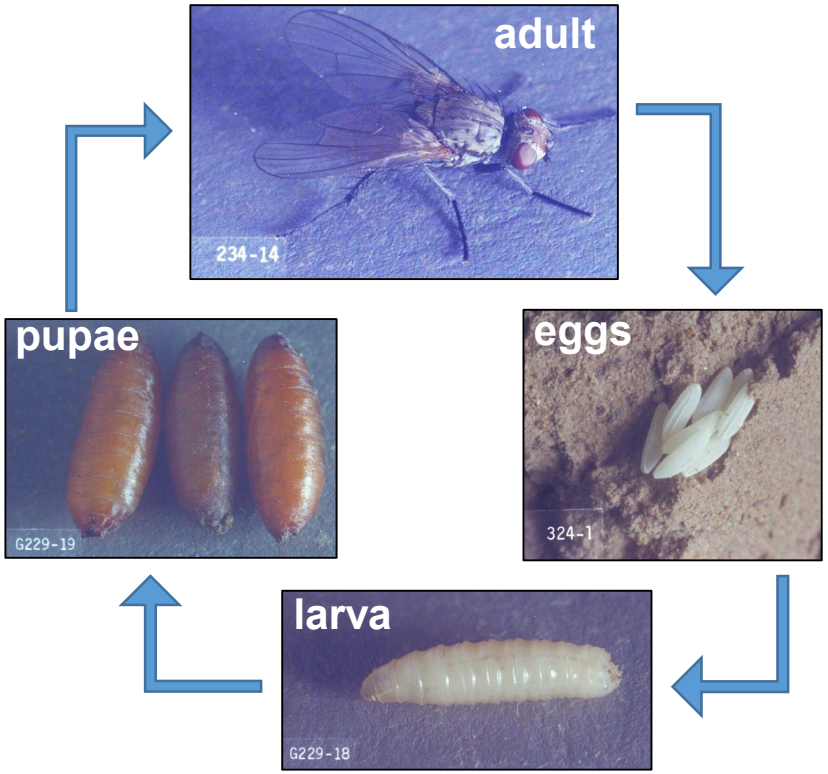


Photo credits: Ken Gray

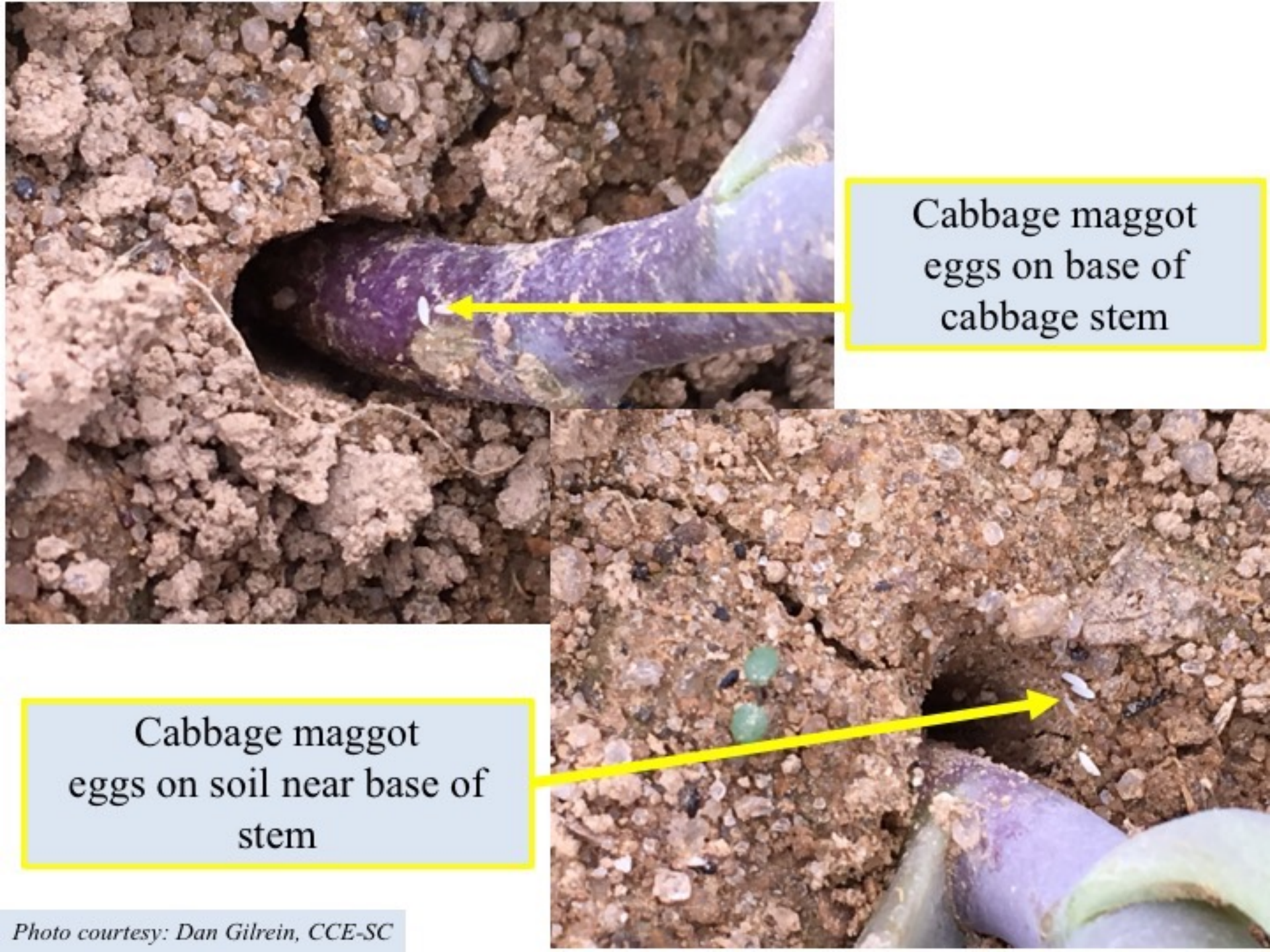
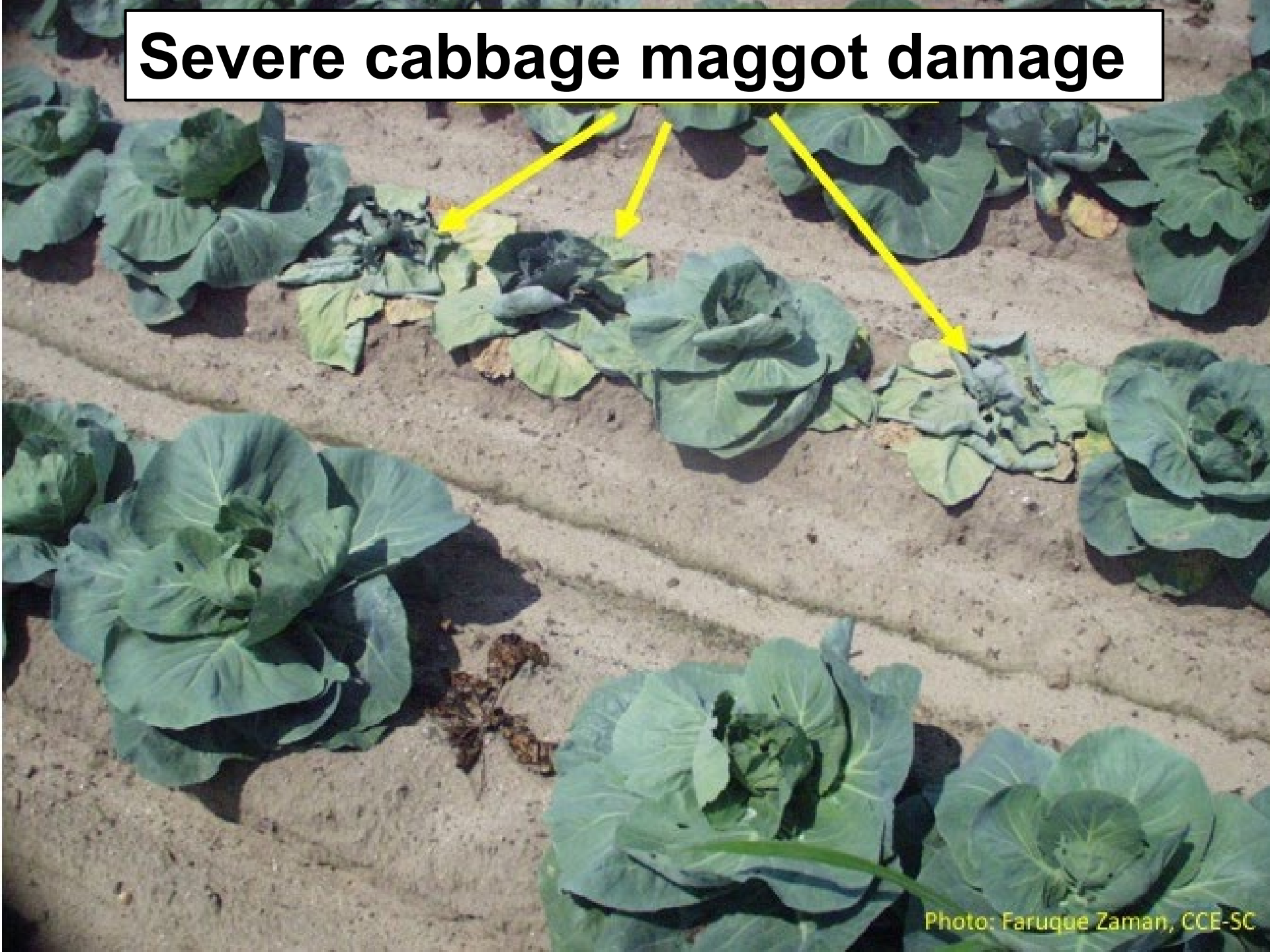


Photo courtesy: Dan Gilrein, CCE-SC


Mild damage
Severe damage
Photo: Faruque Zaman, CCE-SC


Severe cabbage maggot damage
Photo: Faruque Zaman, CCE-SC

How best to manage cabbage maggot?

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Plant Resistance

- None used

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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

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Photo: Ben Werling

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New York's Food and Life Sciences Bulletin

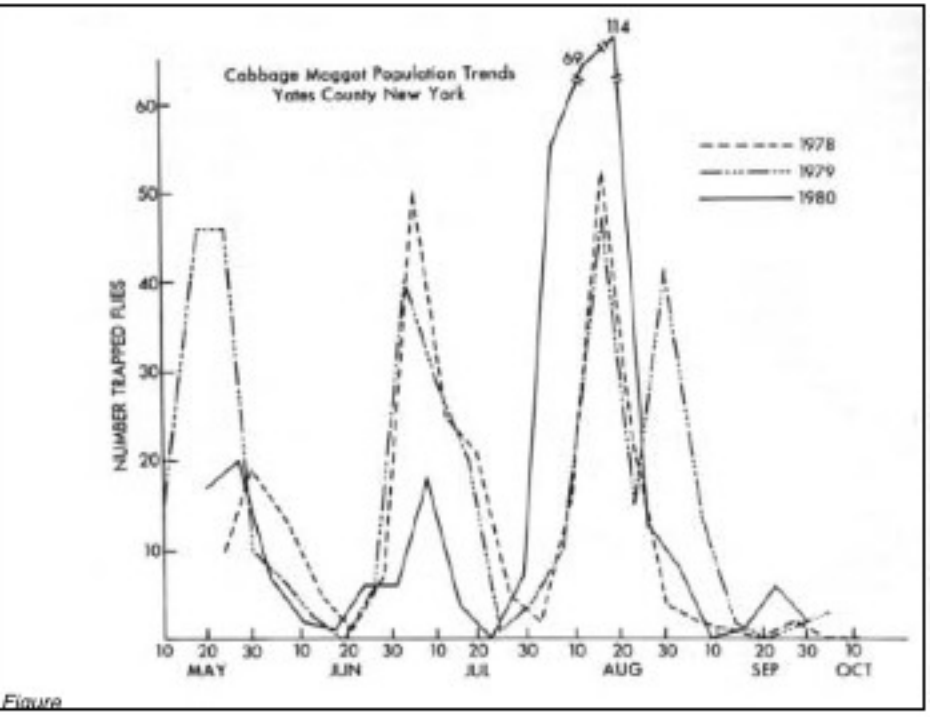
New York State Agricultural Experiment Station, Geneva, a Division of the New York State College of Agriculture and Life Sciences, a Statutory College of the State University, at Cornell University, Ithaca

Predicting Cabbage Maggot Flights in New York Using Common Wild Plants

L.H. PEDERSEN and C.J. ECKENRODE

Photo K. Lawless, vaplantatlas.org

At least 4 generations on Long Island

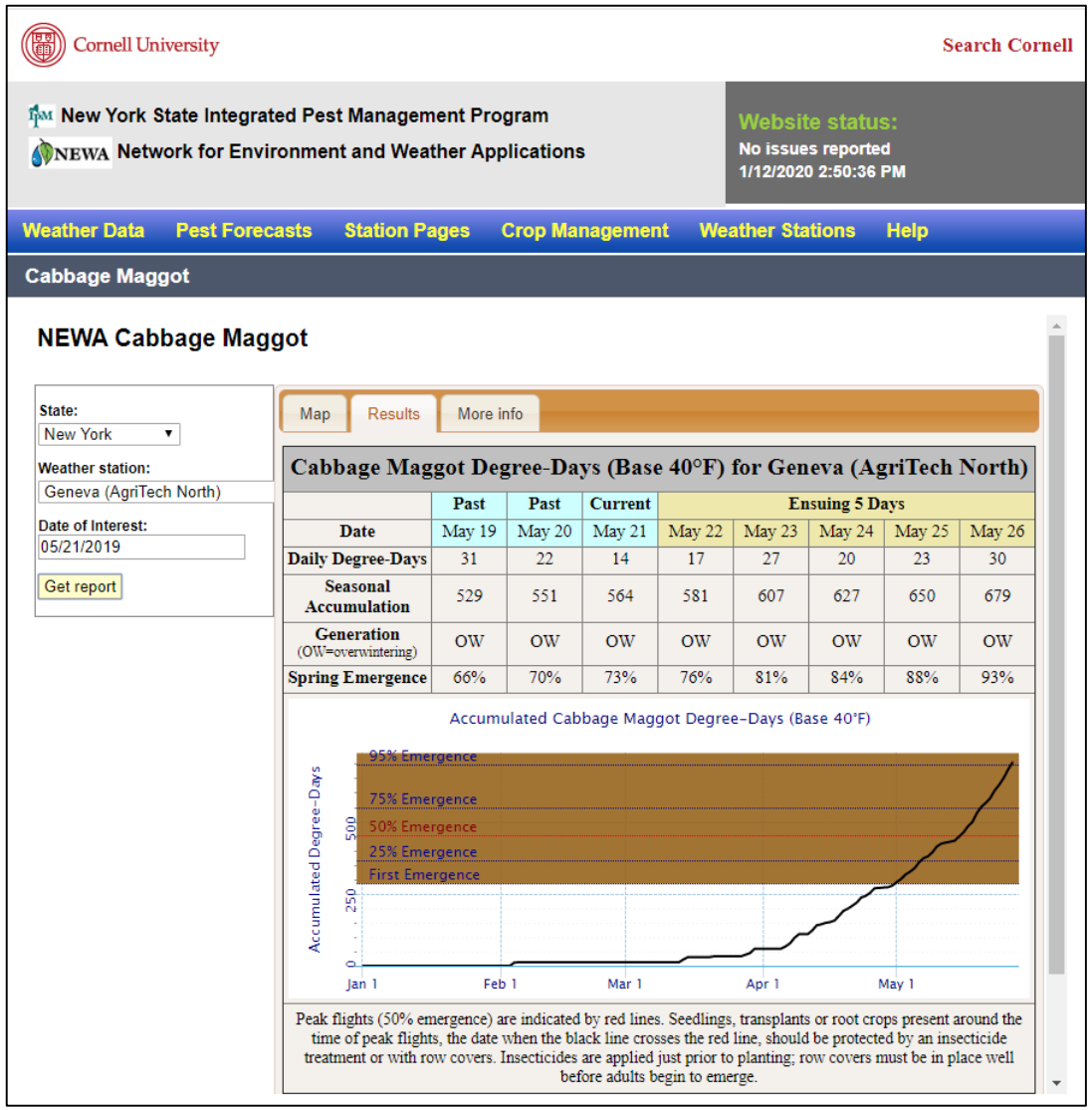


Figure

Peak emergence correlated with peak bloom

PLANT	YEAR	MAY 1 2 3 4	JUN 1 2 3 4	JUL 1 2 3 4	AUG 1 2 3 4	SEP 1 2 3 4	OCT 1 2 3 4
Yellow Rocket	78						
	79		peak spring emergence				
	80						
Day Lily	78						
	79			2nd peak emergence			
	80						
Canada Thistle	78						
Early Goldenrod	79					3rd peak emergence	
	80						
New England Aster	78						
	79					4th peak emergence	
	80						

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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Sterile Insect Technique

- Sterile male release

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- Nematodes

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Chemical Control

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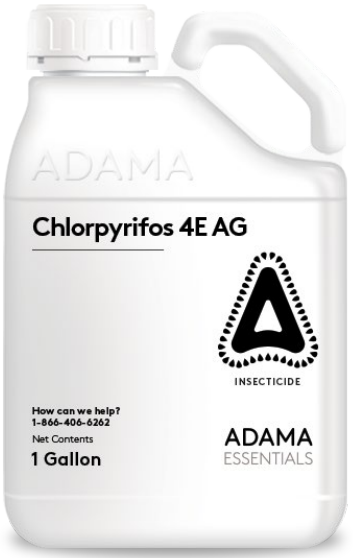
Chlorpyrifos

Lorsban® Advanced

INSECTICICIDE



Lorsban* 75WG

Lorsban™ 15G

Insecticide

Lorsban™ 4E

Insecticide

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EPA Environmental Protection Agency

- **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. <u>Are there effective alternatives</u>?**

…?

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EPA Environmental Protection Agency

- 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)

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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	• Direct-seeded: at-plant band (4”) • Transplants: direct spray at base of transplants after setting
Diazinon AG500	2-3 qts/acre 4-8 fl oz/ 50 gal	• Direct-seeded: broadcast at planting • Transplants: water transplant treatment
Capture LFR	3.4-6.8 fl oz/acre	• Direct-seeded only: apply in 5-7” band in furrow

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

Product	Rates	Application Method
Verimark	10 – 13.5 fl oz/acre	• In-furrow spray • Transplant tray drench • *Transplant water treatment* • Surface band • Soil shank injection
Coragen SC*	3.5-7.5 fl oz/acre	• 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**	• **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**	• **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

Chemical Control

- Insecticides

Cultural Control

- Row covers

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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 INSECT CONTROL)

- **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

Faruque Zaman, CCE Suffolk Co.

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

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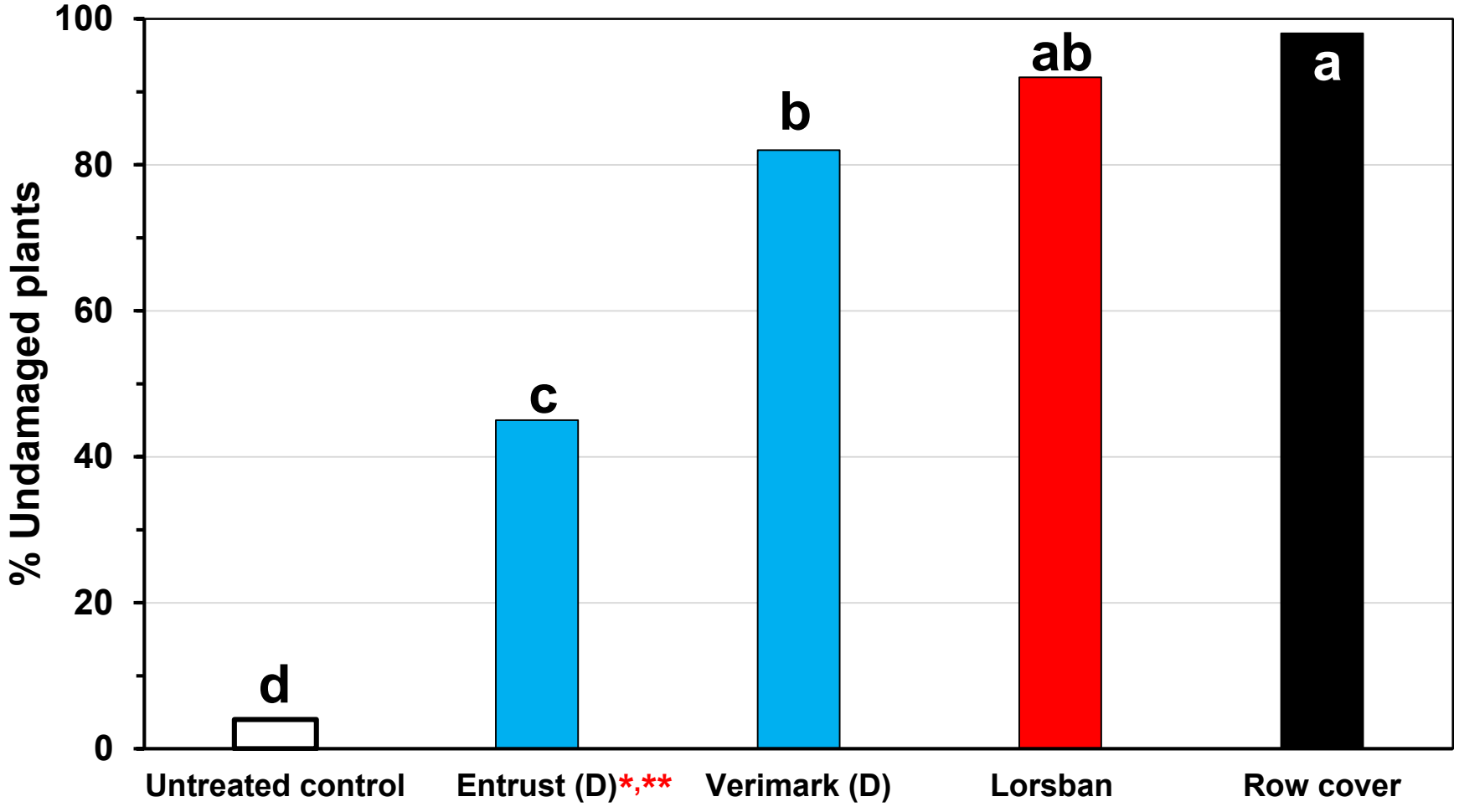
Row covers will protect plants from ALL insects, not just cabbage maggot

Assessing cabbage maggot damage

Faruque Zaman, CCE Suffolk Co.

Management of cabbage maggot in cabbage

Riverhead, NY 2017



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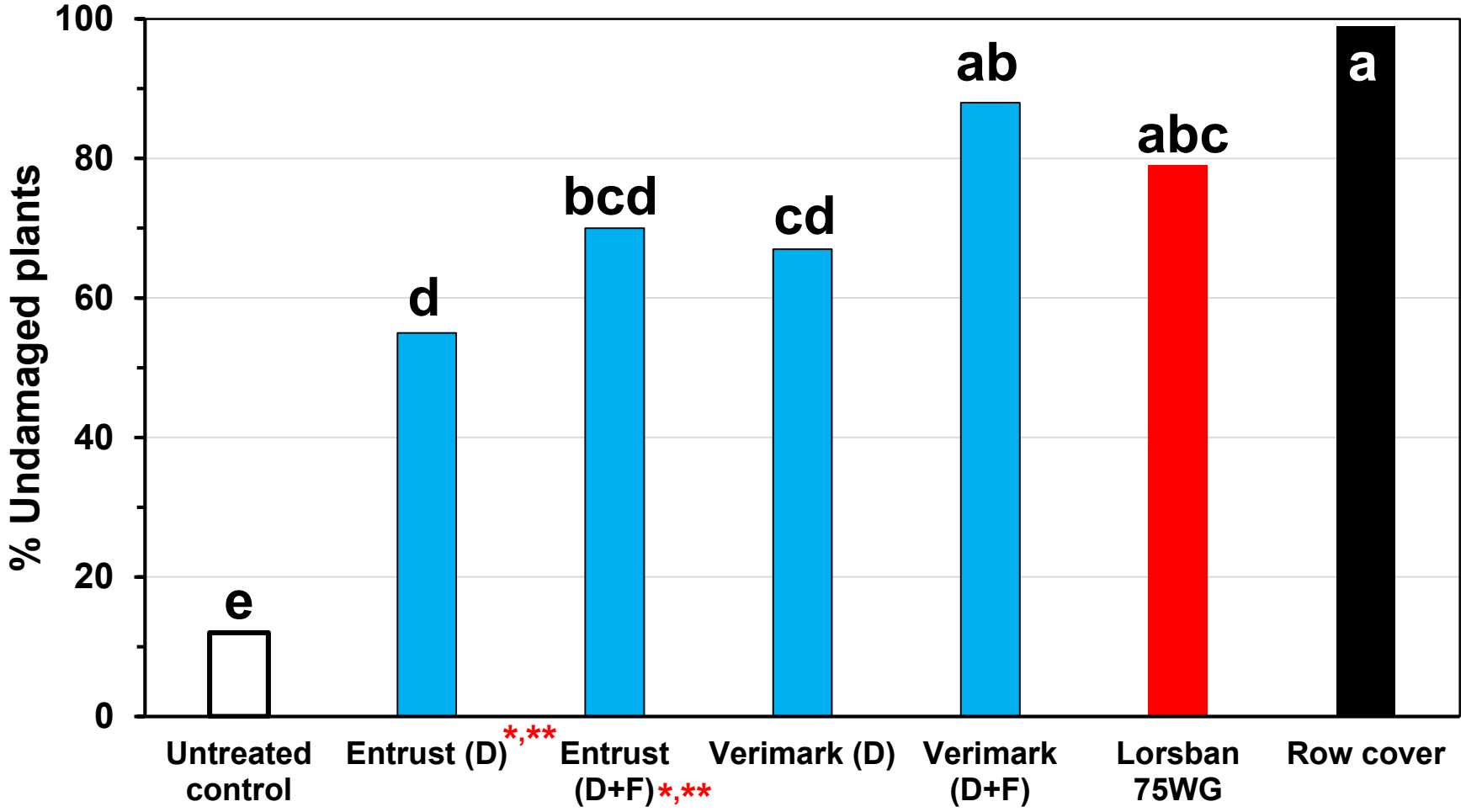
Modified from Faruque Zaman, CCE Suffolk Co.

Management of cabbage maggot in cabbage

Riverhead, NY 2018



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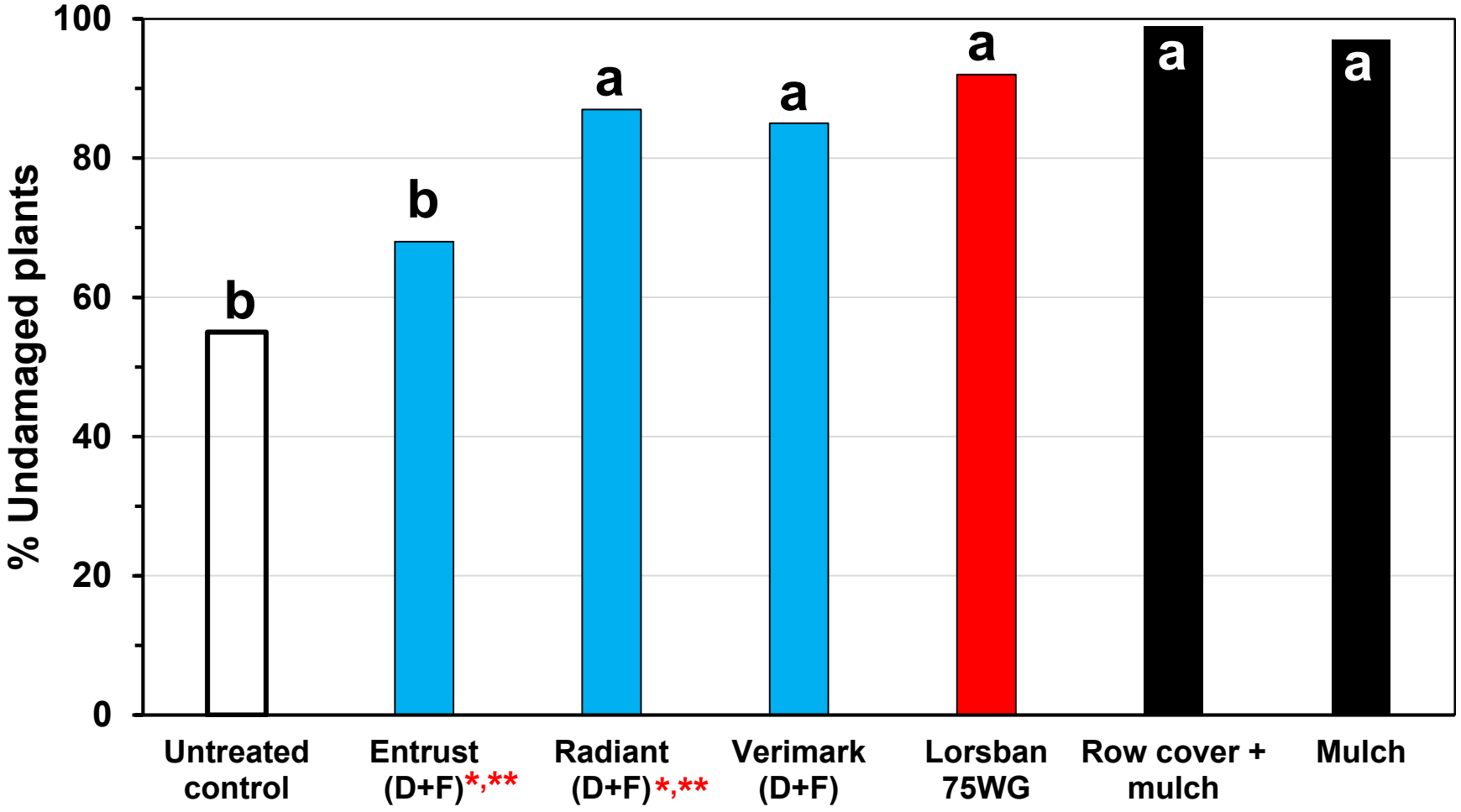
Management of cabbage maggot in cabbage

Riverhead, NY 2019



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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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Radiant SC	5 fl oz/acre	10 fl oz/acre	
	$31.30	$62.6	$63-126/acre*

*Includes cost of 2 applications spaced 2 wk apart

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Entrust SC	5 fl oz/acre	10 fl oz/acre	
	$70.90	$141.90	$142-284/acre*

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	$70.90	$141.90	$142-284/acre*
Verimark	10 fl oz/acre	13.5 fl oz/acre	
	$74.40	$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

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)