

Using B.t. to manage caterpillars on cole crops



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January 2017

What is B.t.?

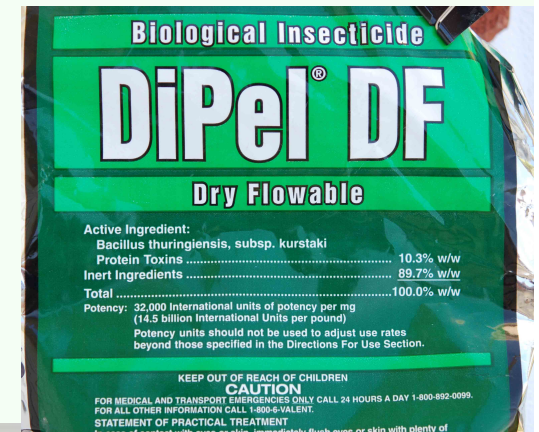
- A natural soil-borne bacterium
- Species: *Bacillus thur*ing*ien*sis**
- This bacterium produces crystal-like proteins that kill certain insects
- Found world-wide
- Produced by fermentation methods
- Discovered 1915; used since 1957

How does B.t. work?

- B.t. must be eaten by target insect
- B.t. contains toxins that are activated by insect's gut enzymes
- toxins paralyze insect's digestive tract
- feeding stops within 2 hours after eating B.t.
- death takes 1 - 5 days

B.t. products for caterpillar control

- DiPel (Valent)
- XenTari (Valent)
- Biobit (Valent)
- Javelin (Certis)
- Agree (Certis)

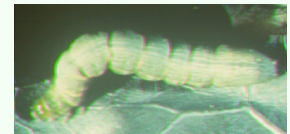
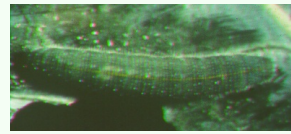


B.t. performance

- **Sometimes erratic due to:**
 - Breakdown in U.V. light
 - Reduced toxicity against older larvae
 - Incomplete spray coverage
 - Too long a spray interval
- **Best if:**
 - Target young larvae
 - Apply at 3-7 day intervals
 - Get thorough coverage
 - Lot of water (>35 gal/A)
 - Good pressure (60 psi)

B.t. = a selective insecticide

- Kills caterpillars



- Does not kill parasitoids



- Allows natural enemies to help kill pests

How are B.t. sprays most effective for cabbageworm control?

- **Rate?**
- **Frequency?**
- **Time of day?**

B.t. trial on cabbage, 2012

- **cv 'Bravo'**
- **Transplanted 18 May**
- **Scouted weekly for insects**
- **1st spray 18 days after planting**
- **Sprays for 11 weeks**
- **Harvest 20 August**

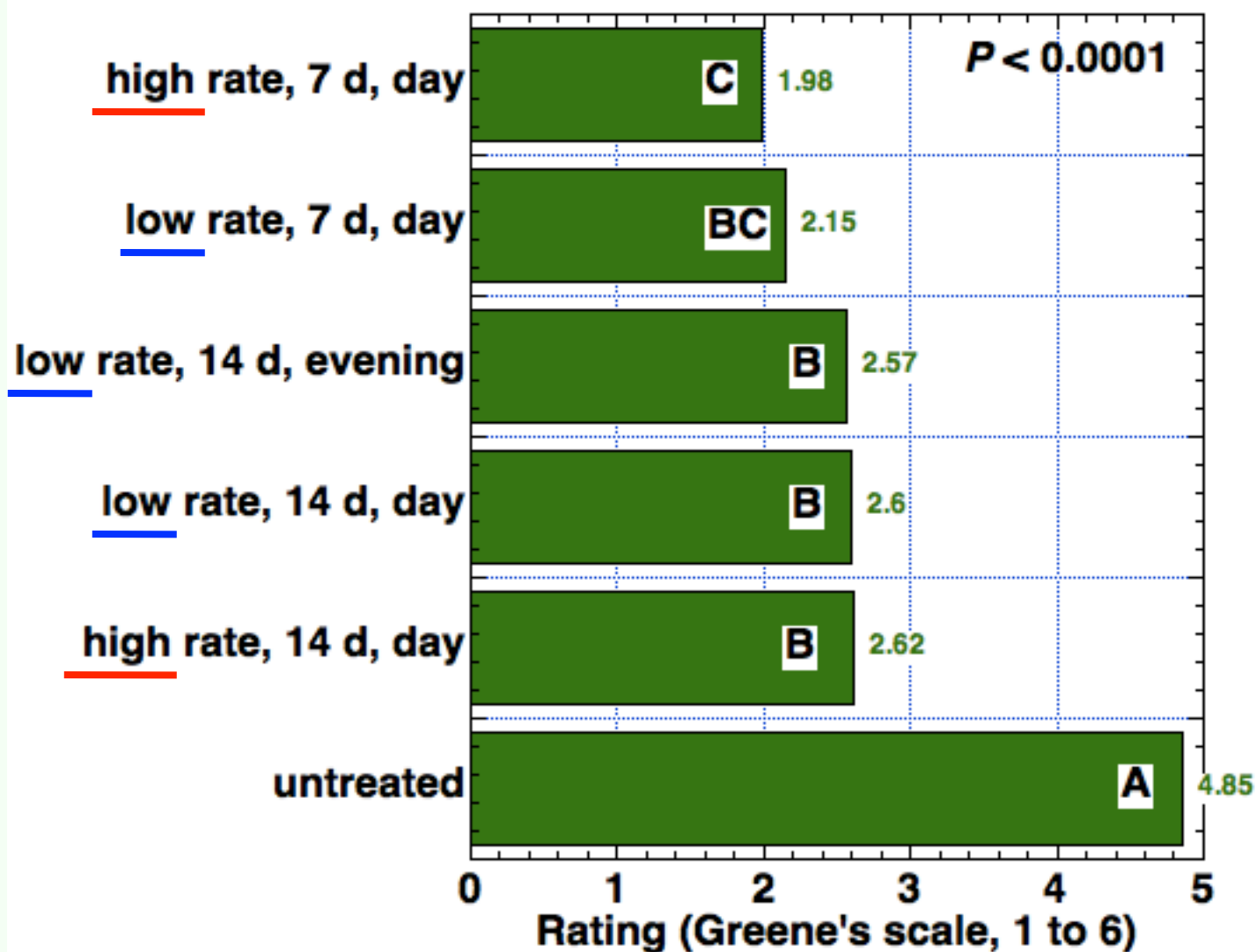
Cabbage B.t. treatments

| Treat- ment | Rate of Dipel DF | Frequency | Time |
|------------------------|-----------------------------|----------------------|----------------|
| 1 | - | - | - |
| 2 | Low (0.5 lb/A | Every 7 days | daytime |
| 3 | Low (0.5 lb/A) | Every 14 days | daytime |
| 4 | High (1.0 lb/A) | Every 7 days | daytime |
| 5 | High (1.0 lb/A) | Every 14 days | daytime |
| 6 | Low (0.5 lb/A) | Every 14 days | evening |

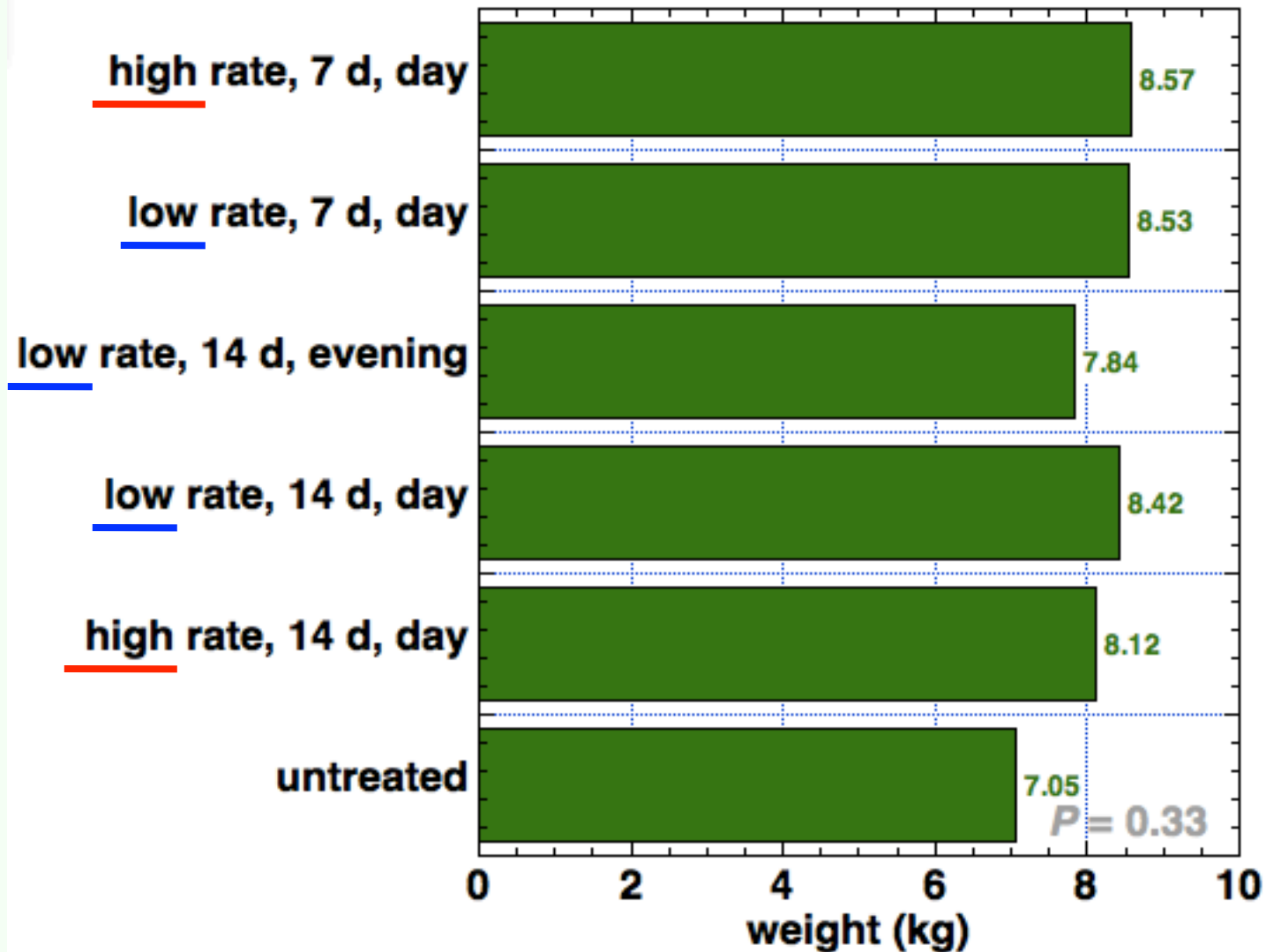
Results

- **Caterpillar density, weekly**
- **Harvest**
 - Yield: weight of heads
 - Quality: insect damage rating by Greene's scale

Cabbage B.t. trial: Insect damage at harvest, mean of 10 heads per plot



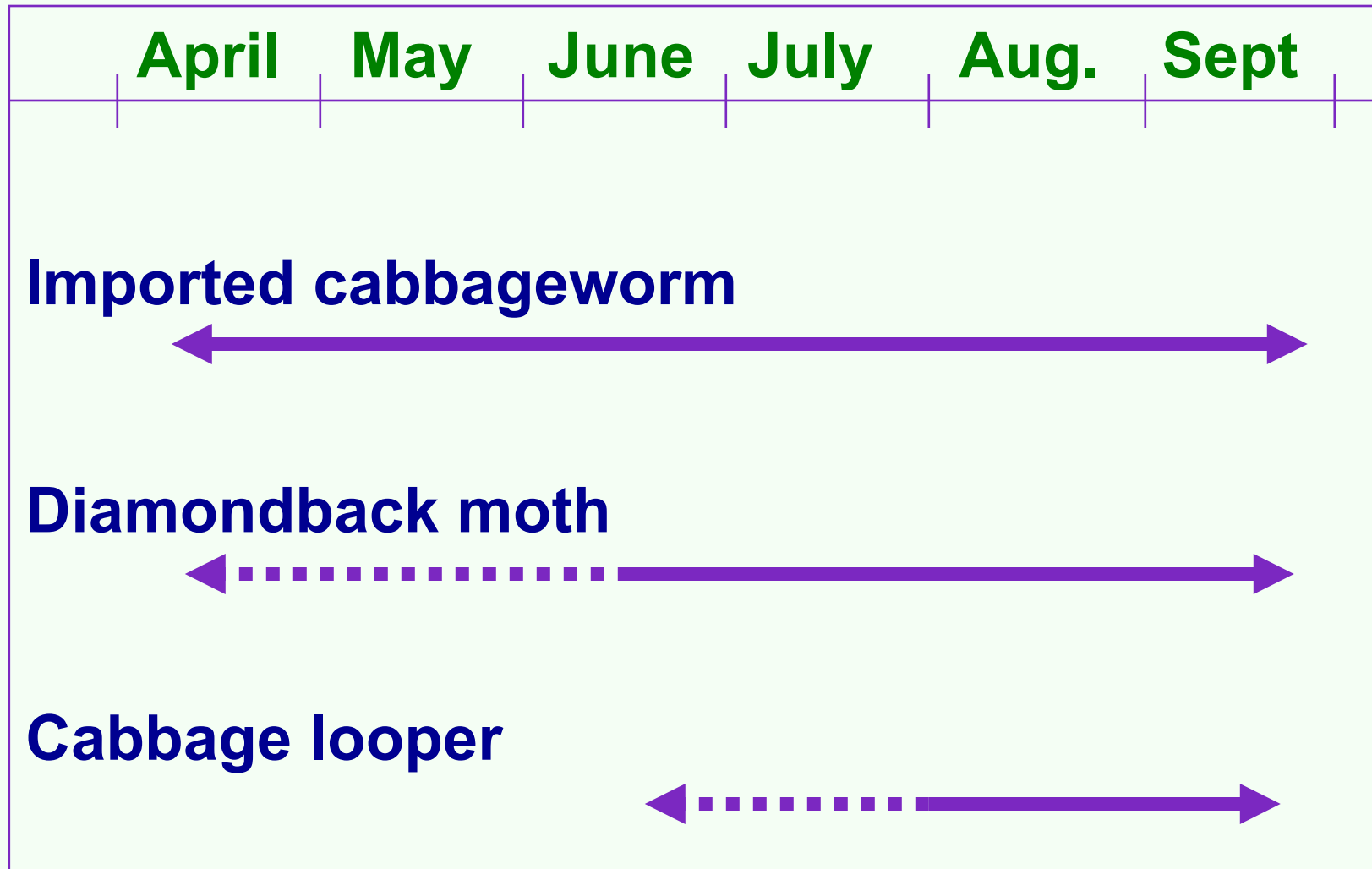
Cabbage B.t. trial: Weight (kg) of 3 heads at harvest



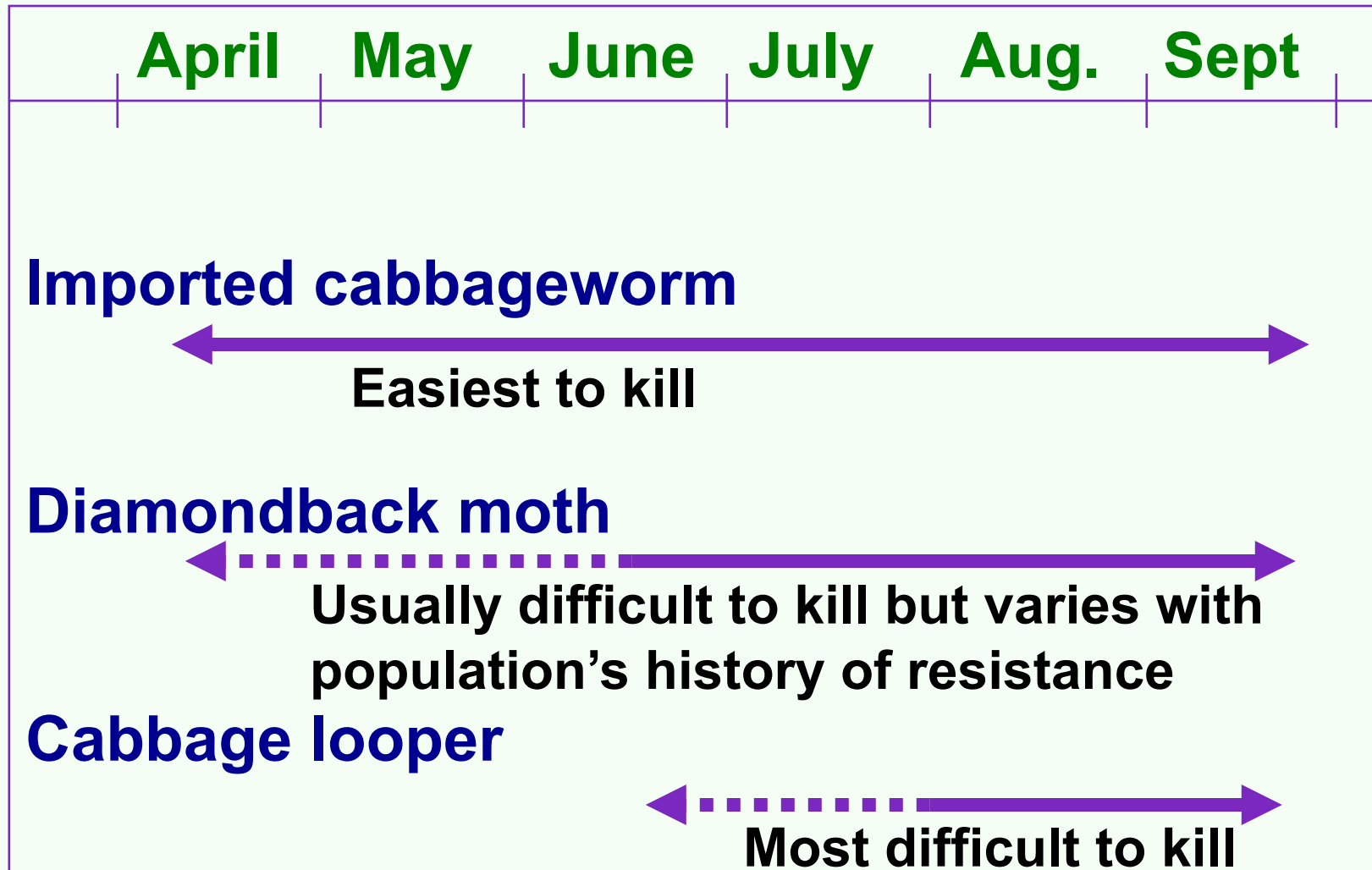
B.t. trial conclusions

- **Frequency more important than rate**
 - Every 7 days better than every 14 days
 - Low rate as effective as high rate
- **Daytime spray as effective as evening spray**

Cabbage caterpillar calendar



Cabbage caterpillar calendar & response to insecticides



Insecticides for caterpillar management on cole crops

| <i>Insecticide</i> | <i>Imported cabbage-worm</i> | <i>Diamond-back moth</i> | <i>Cabbage looper</i> | <i>Natural enemies</i> |
|---------------------------|-------------------------------------|---------------------------------|------------------------------|-------------------------------|
| Conventional | Excellent control | Fair control | Good control | Poor survival |
| B.t. | Good control | Good control | Fair control | Excellent survival |

Thus B.t. works best when diamondback moth or imported cabbageworm is dominant pest

Cabbage Insecticide Efficacy

| Product | Caterpillar species | | |
|-------------------|---------------------|--------------|----------------|
| | Imported cab'wm | Diamond back | Cabbage looper |
| Avaunt | good | excel. | excel. |
| B.t. (DiPel) | good | good | fair |
| Confirm, Intrepid | good | fair | good/excel |
| Proclaim | good | excel. | fair/good |
| SpinTor | good | excel. | good |
| pyrethroids | good | good | good |

Insecticide Calendar

- **Early & mid-season (April to July)**
 - if imported cabbageworm &/or diamondback dominant
 - use only B.t.
- **Mid- to late season (August)**
 - if cabbage looper dominant pest
 - use Confirm, SpinTor, or Proclaim
- **Late season (Sept.-October)**
 - if cabbage looper dominant pest
 - use pyrethroids (Baythroid, etc.)