

Using B.t. to manage caterpillars on cole crops



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What is B.t.?

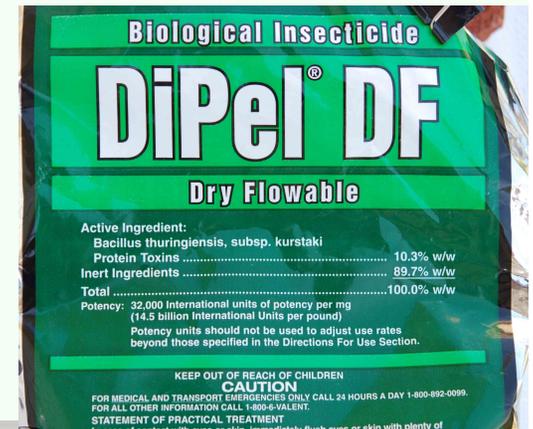
- A natural soil-borne bacterium
- Species: *Bacillus thuringiensis*
- This bacterium produces crystal-like proteins that kill certain insects
- Found world-wide
- Produced by fermentation methods
- Discovered 1915; used since 1957

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**

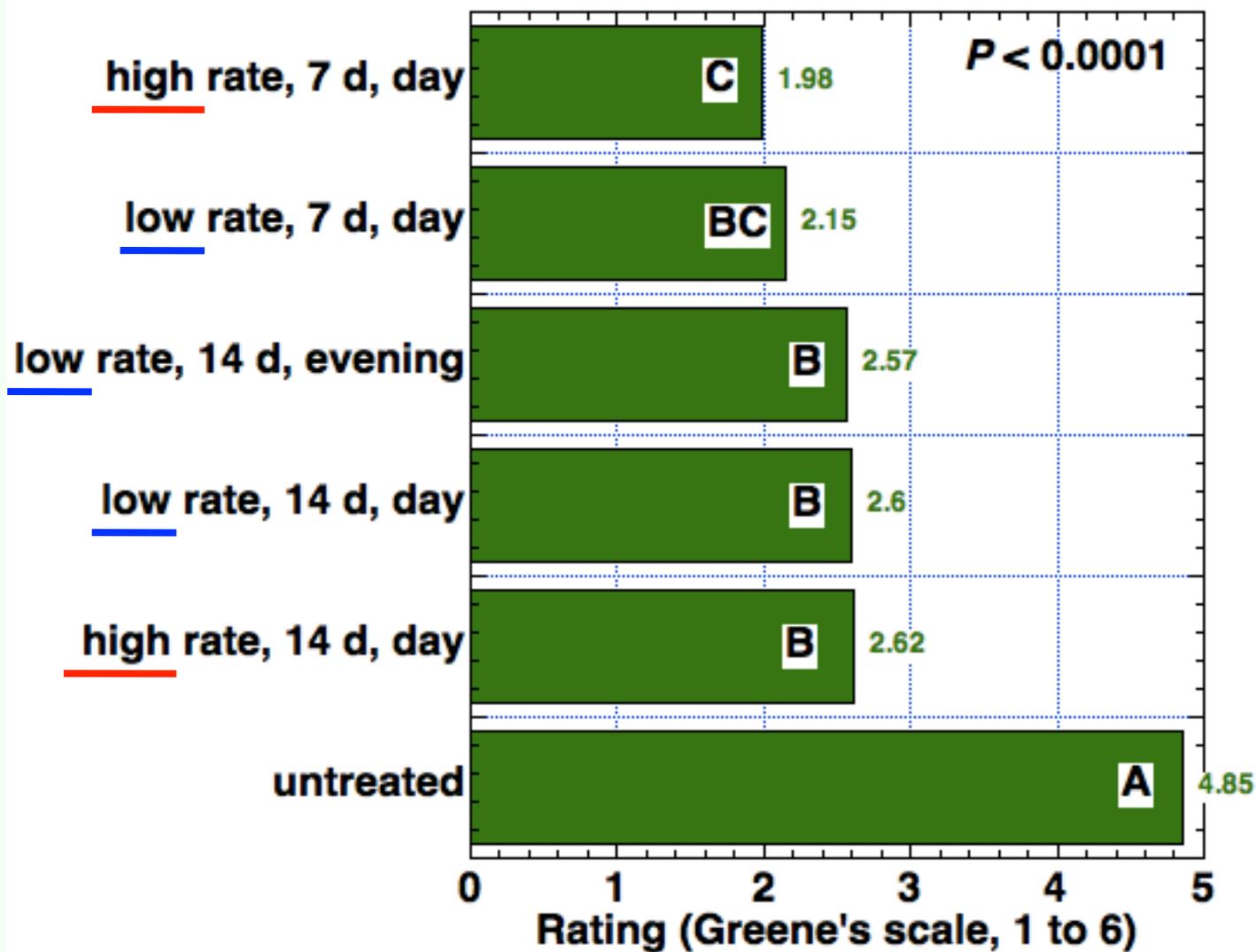
Cabbage B.t. treatments

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

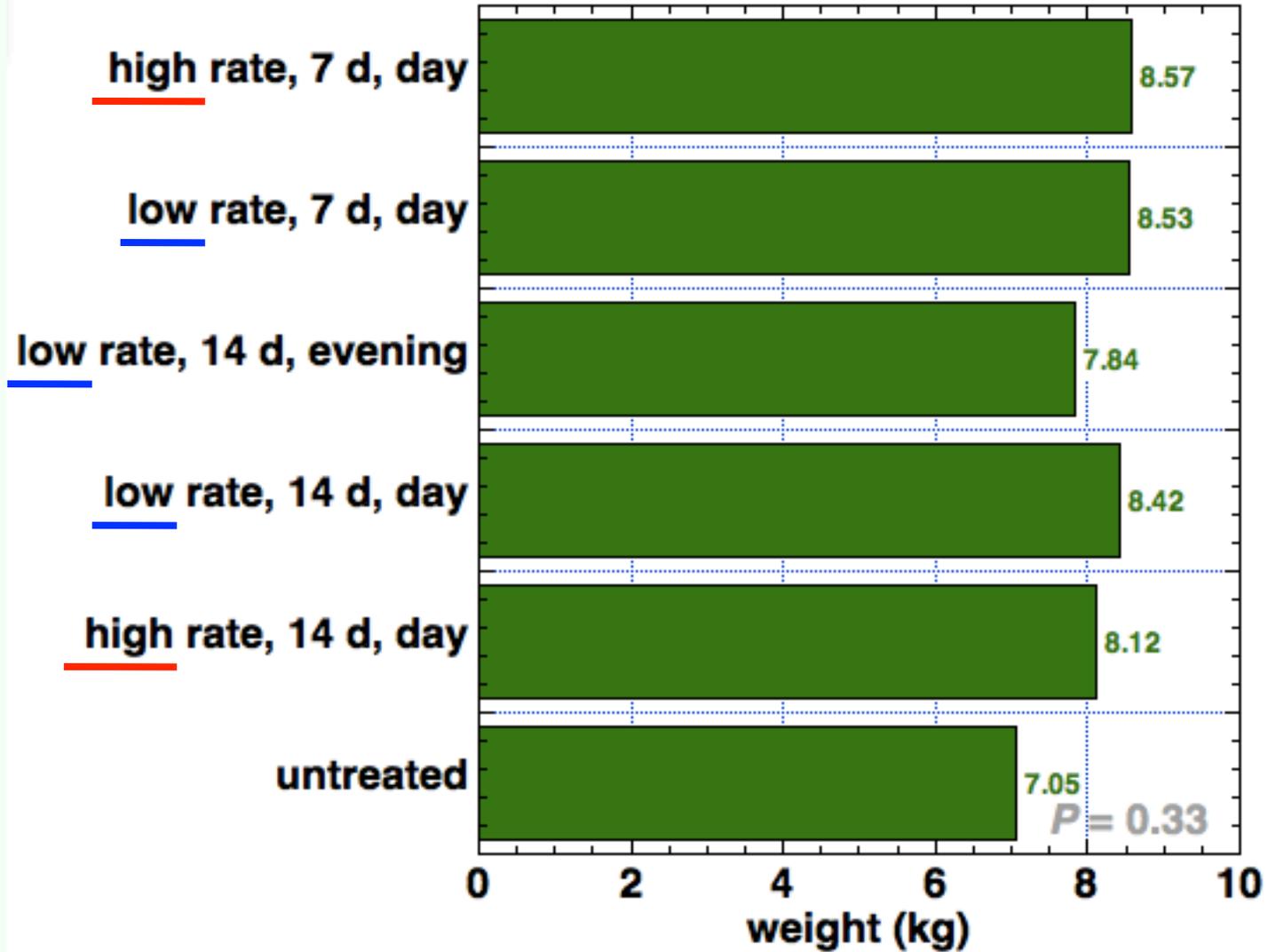
Results

- **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



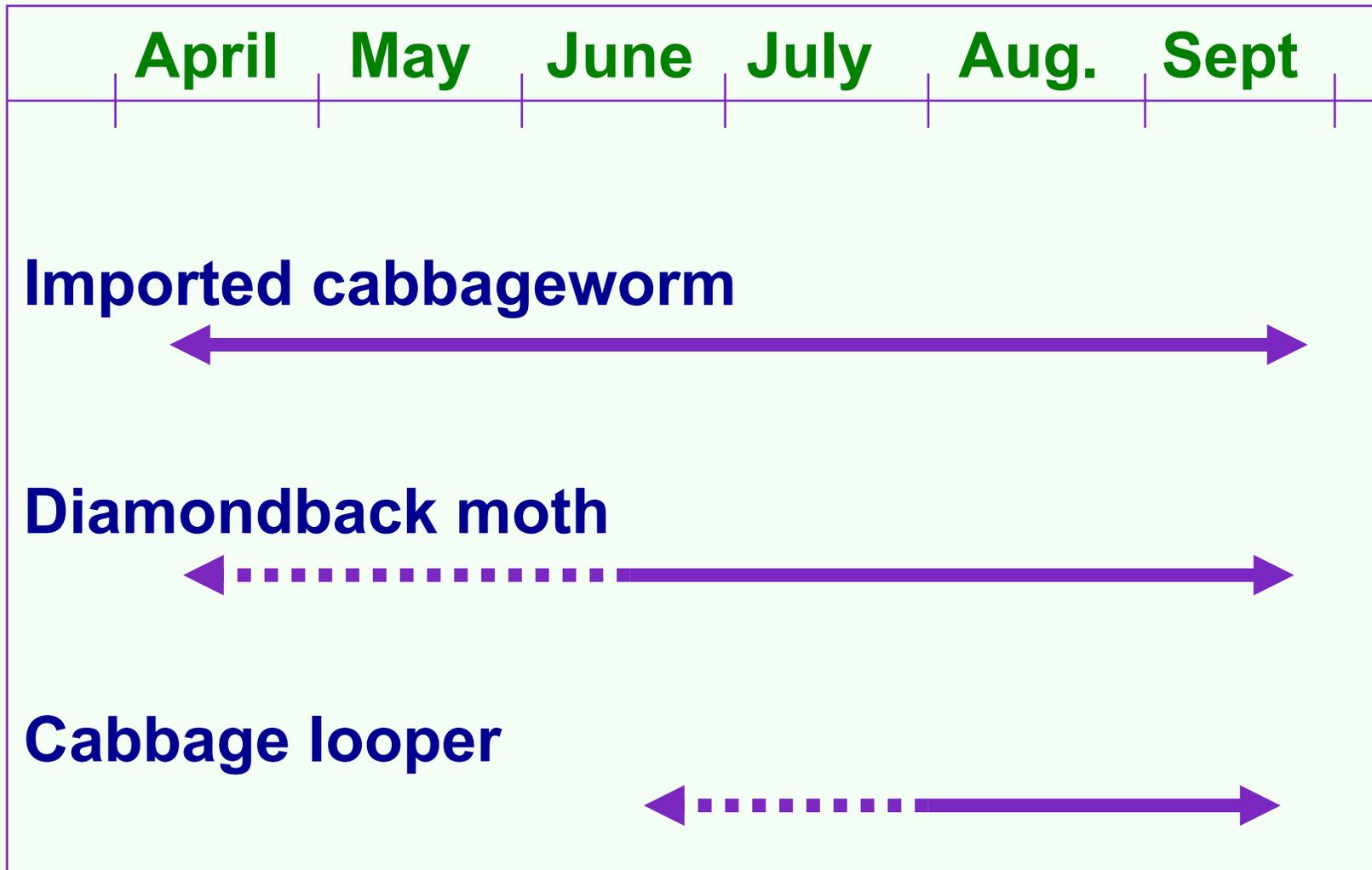
Cabbage B.t. trial: Weight (kg) of 3 heads at harvest



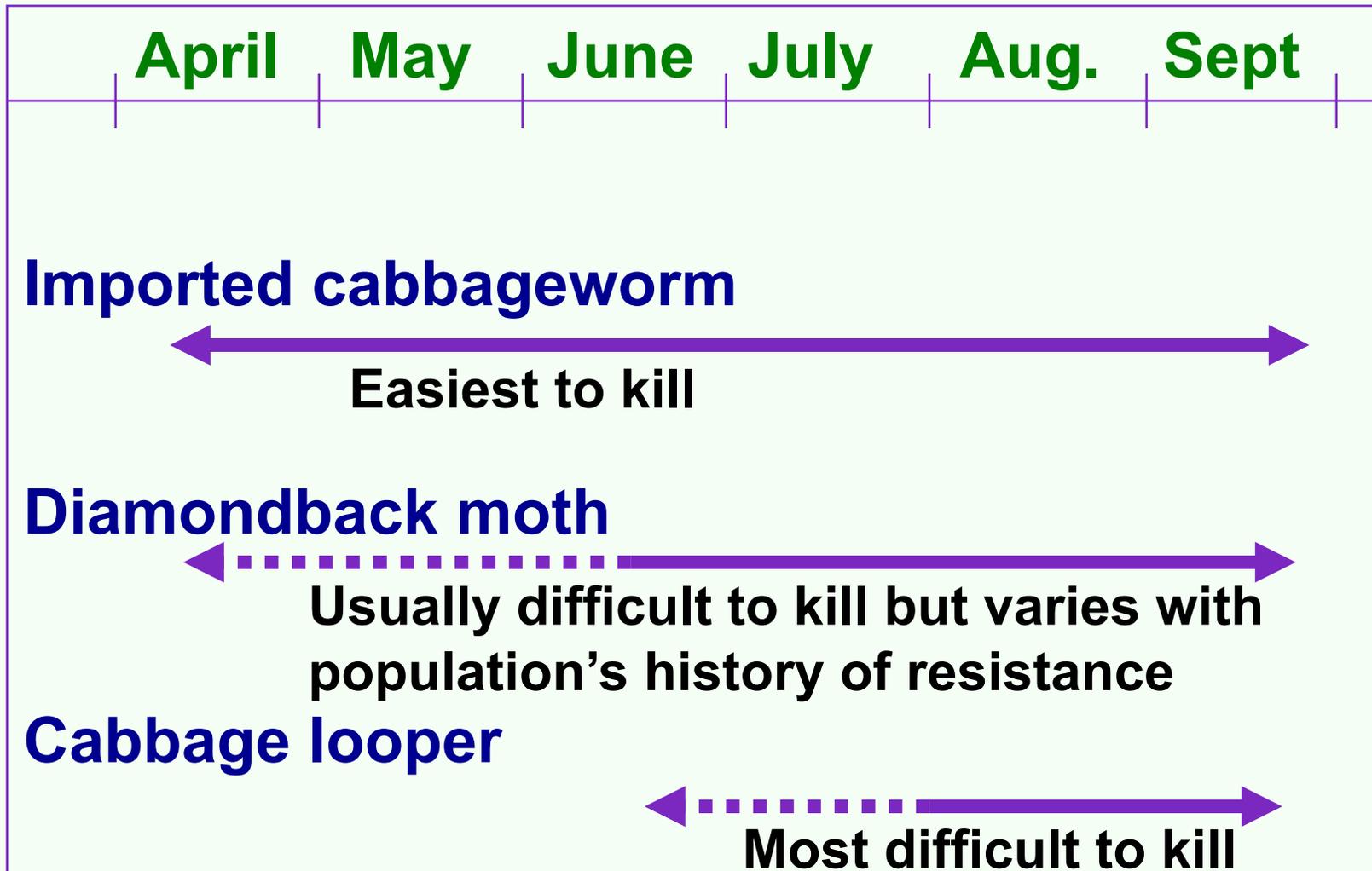
B.t. trial conclusions

- **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.)