

Efficacy & Cost Comparisons of Using Insecticide Seed Treatments on Cucurbits



**Celeste Welty
Extension Entomologist
Ohio State University
December 2009**

Cucumber beetles: key pests of cucumbers, pumpkins & squash



Feeding damage



Vectors of bacterial wilt disease

Trials on seed insecticides with Ohio cucurbits

<i>Crop</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
Pickling cucumber	✓	✓	✓	✓	✓
Pumpkin	✓	✓		✓	✓
Zucchini	✓				

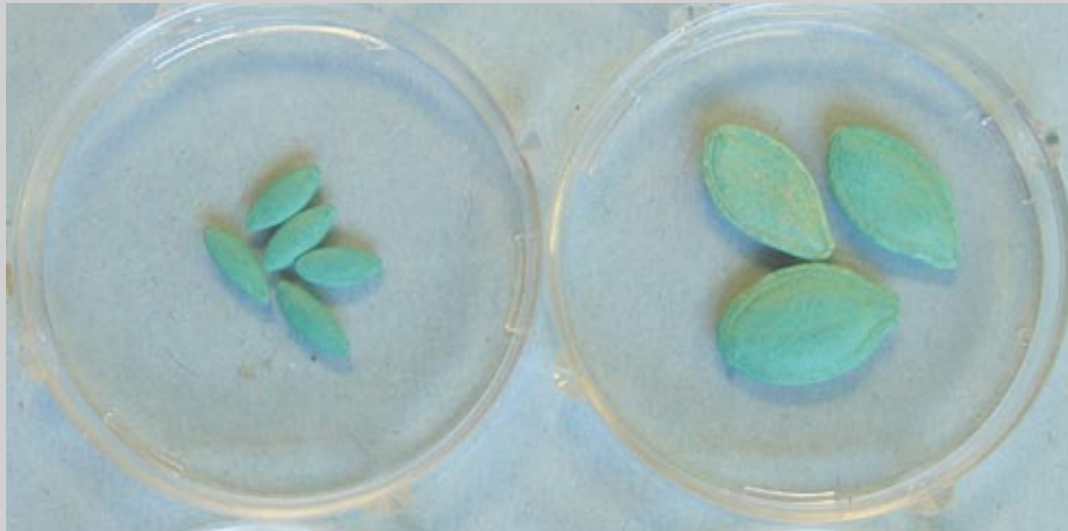
Seed insecticide rates tested in Ohio cucurbits

<i>Product & rate in mg AI/seed</i>		2005	2006	2007	2008	2009
*	thiamethoxam 0.05	✓				
	thiamethoxam 0.25	✓		✓		
	thiamethoxam 0.40	✓	✓			
	thiamethoxam 0.50			✓		
	thiamethoxam 0.75		✓	✓	✓	✓
	thiamethoxam 0.75 + A14024				✓	✓
	thiamethoxam 0.75 + A9180, 9625					✓
	fipronil 0.75		✓			
	clothianidin + β -cyfluthrin 0.565		✓			
	clothianidin + β -cyfluthrin 0.75		✓			
	clothianidin + β -cyfluthrin 1.13		✓			
	clothianidin + imidacloprid 0.75				✓	
*	clothianidin + imidacloprid 1.0			✓	✓	
	clothianidin + imidacloprid 1.3			✓		

a.i.s tested on Ohio cucurbits

<i>Common name</i>	<i>Trade name</i>
thiamethoxam	Cruiser, FarMore DI 400
fipronil	Regent
L-1497-A (clothianidin + beta-cyfluthrin)	Poncho Beta (= Poncho + Baythroid XL)
L-1778-A (clothianidin + imidacloprid)	Sepresto (= Poncho + Gaucho)

Rates given per seed



**pickling
cucumber**

pumpkin

thiamethoxam

- **Active ingredient in:**
 - **Actara (foliar sprays)**
 - **Platinum (soil treatment)**
 - **Cruiser (seed treatment, corn & beans)**
 - **FarMore DI 400 (seed treatment, veg.)**
- **Made by Syngenta**

‘FarMore Technology’

- **A registered trademark for several commercial seed treatments**
 - **Available from Rupp, Seminis, Harris-Moran, & selected seed companies**
- **Existing FarMore packages:**
 - **FarMore D 200**
 - **FarMore D 300**
 - **FarMore DI 400**

‘FarMore Technology’ packages

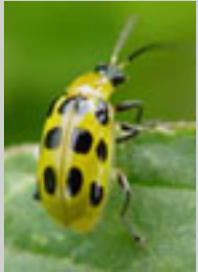
- **FarMore D 200**
 - **2 components: 2 fungicides**
- **FarMore D 300**
 - **3 components: 3 fungicides**
 - **Heading Brassica, carrot, onion, tomato, pepper, spinach**
- **FarMore DI 400**
 - **4 components: 3 fungicides + 1 insecticide**
 - **Cucurbits, lettuce**

FarMore DI 400

- **Registered for cucurbits 2009**
- **Contains:**
 - **3 fungicides: Apron, Maxim, Dynasty**
 - **1 insecticide: thiamethoxam**

Field trials

- How **seed** treatment compares with standard **in-furrow** treatment, for:
 - **Beetle feeding damage to plants**
 - **Presence of live & dead beetles**
 - **Incidence of bacterial wilt**
 - **Yield**



Cucumber beetle feeding damage: rated on scale 0 to 3



1 = light

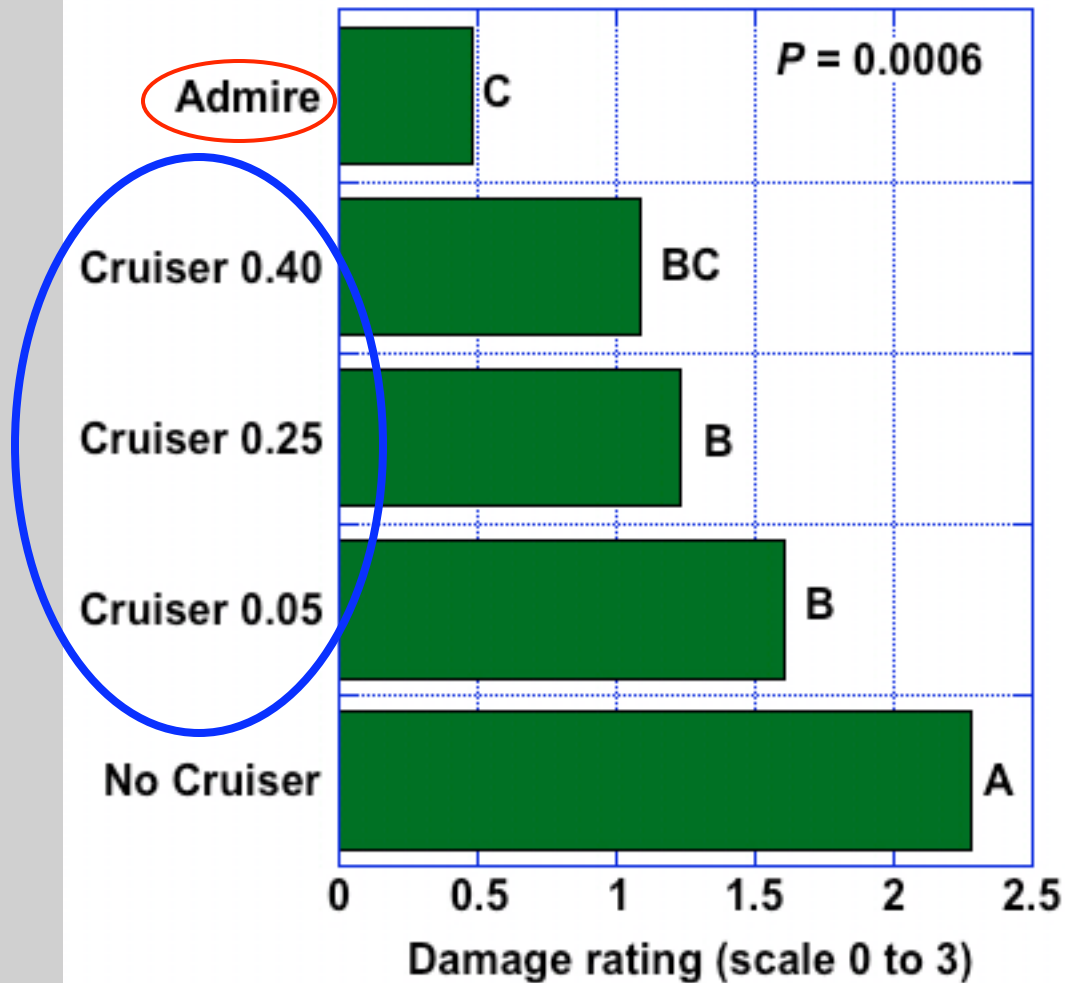


2 = moderate

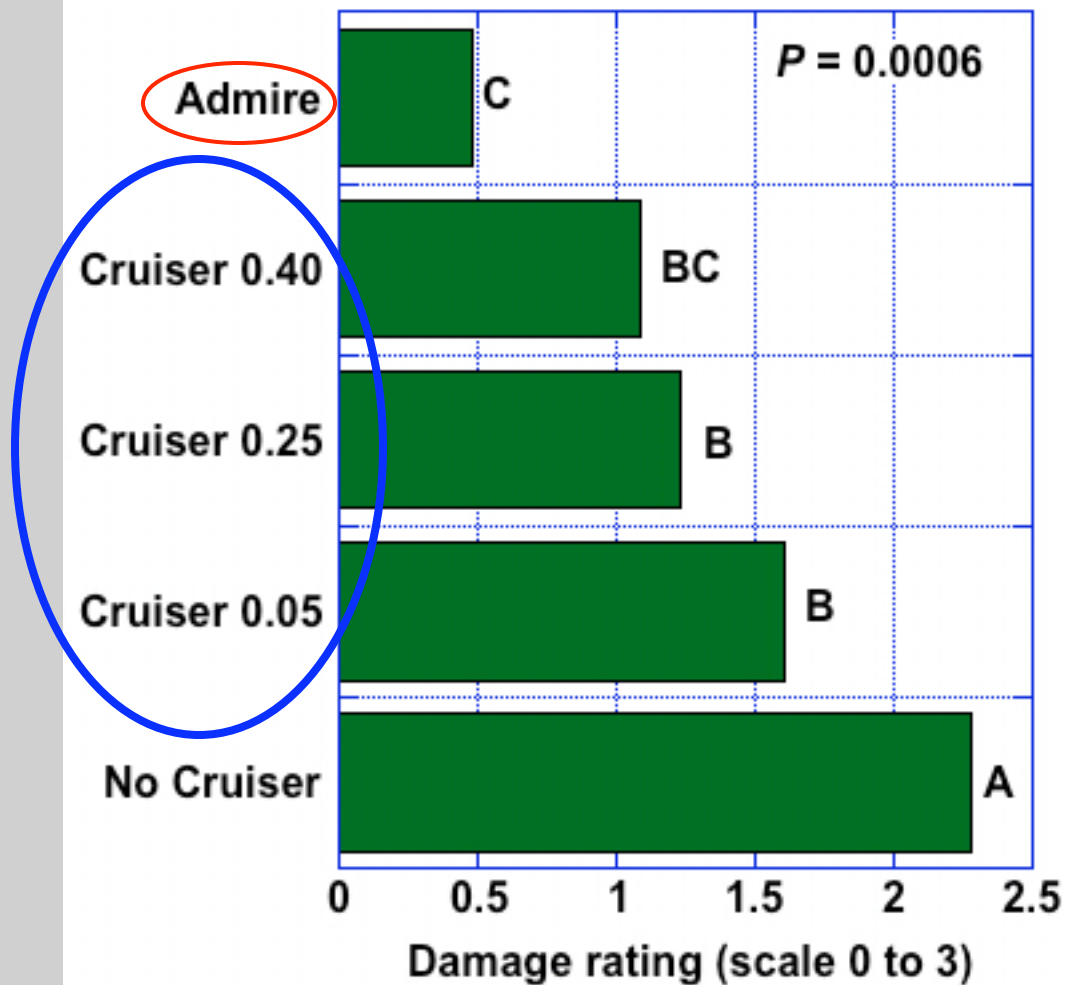


3 = heavy

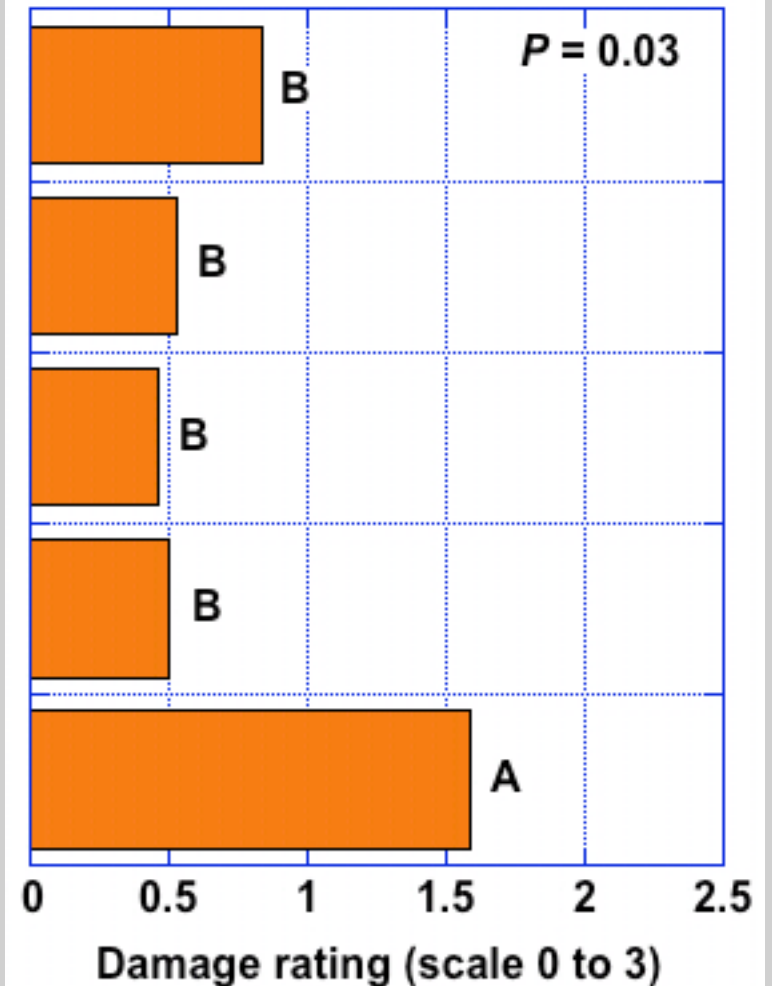
Zucchini, 2-leaf stage Columbus 6/8/2005



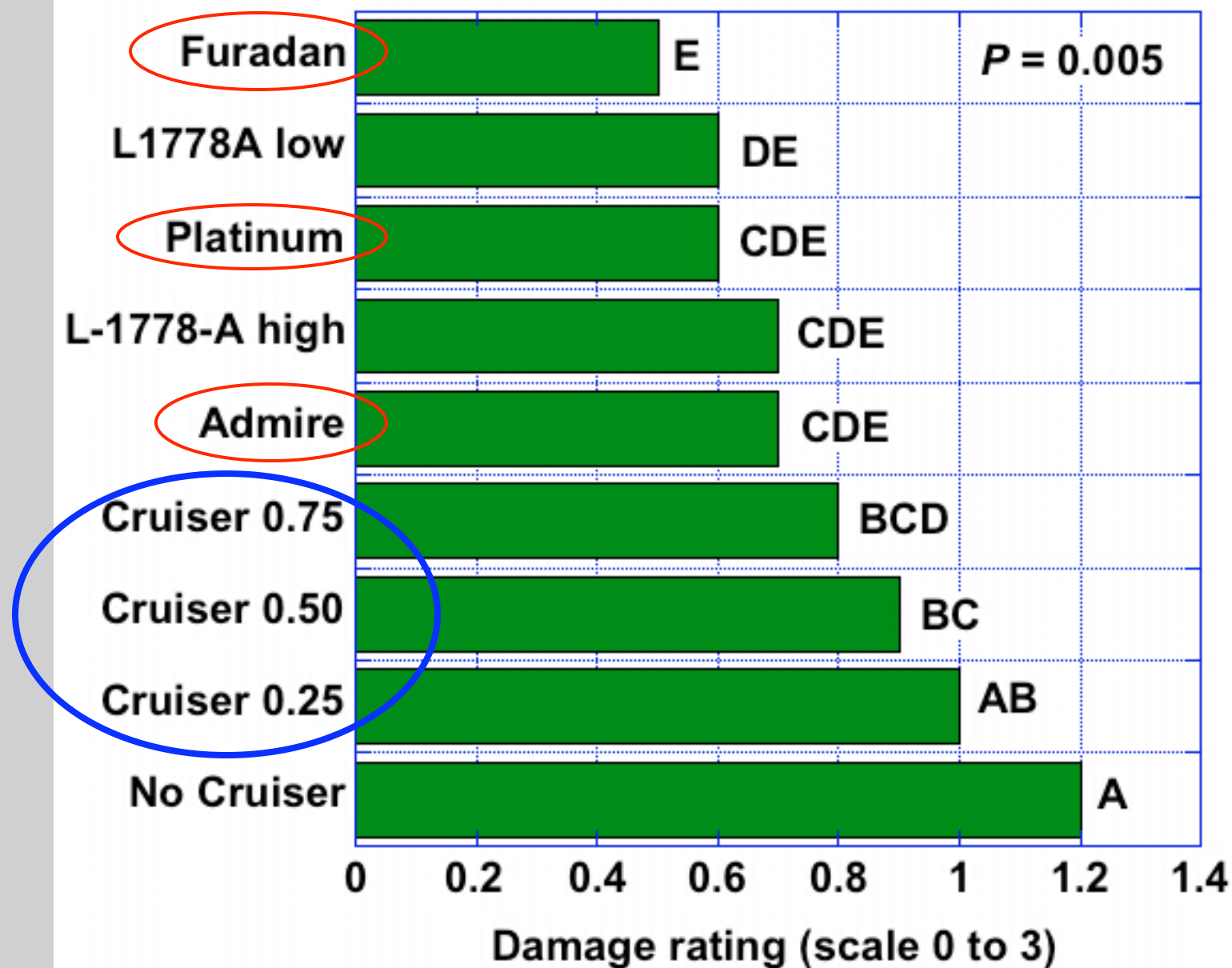
**Zucchini, 2-leaf stage
Columbus 6/8/2005**



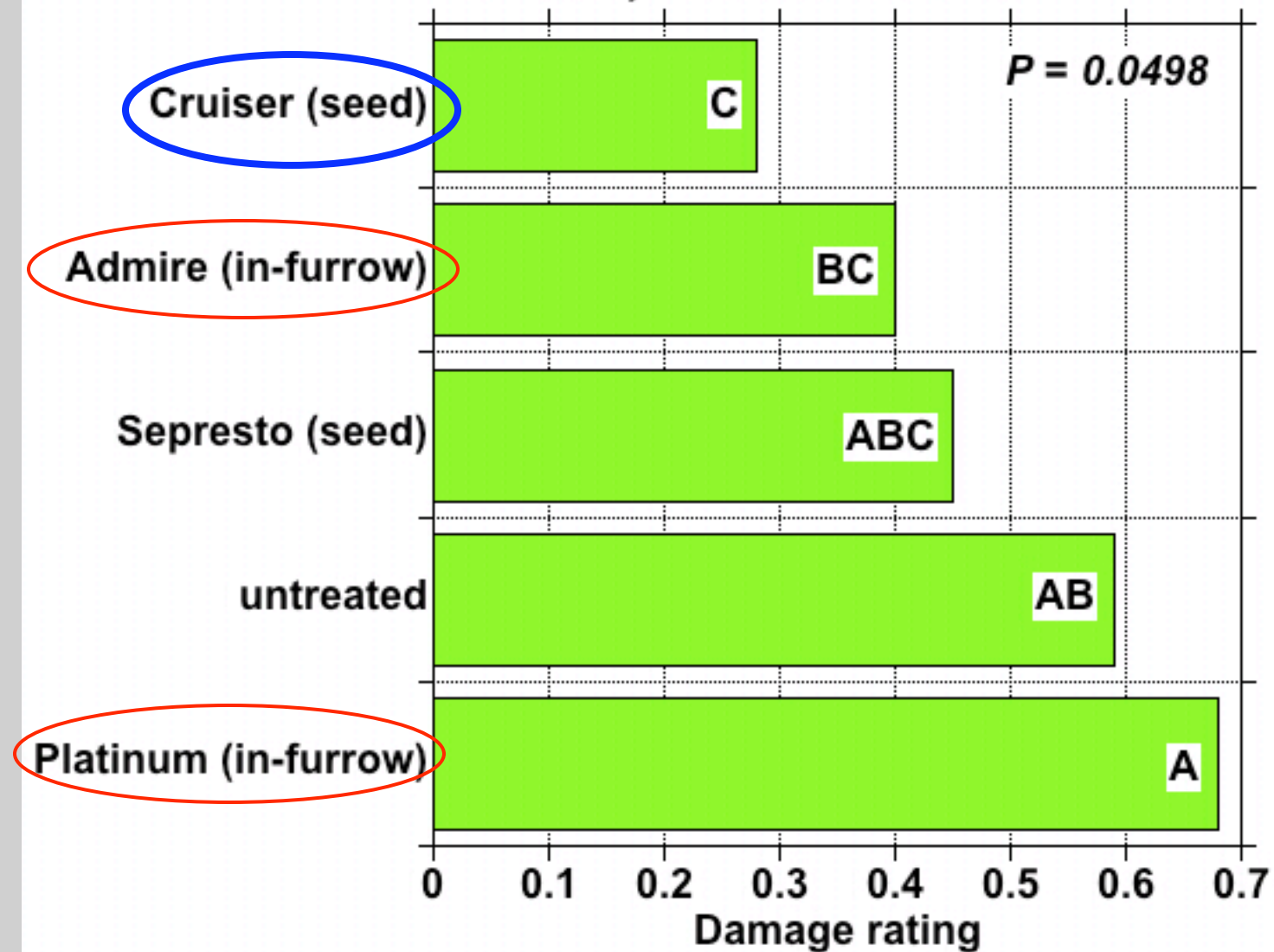
**Pumpkin, 2-leaf stage
Columbus 6/8/2005**



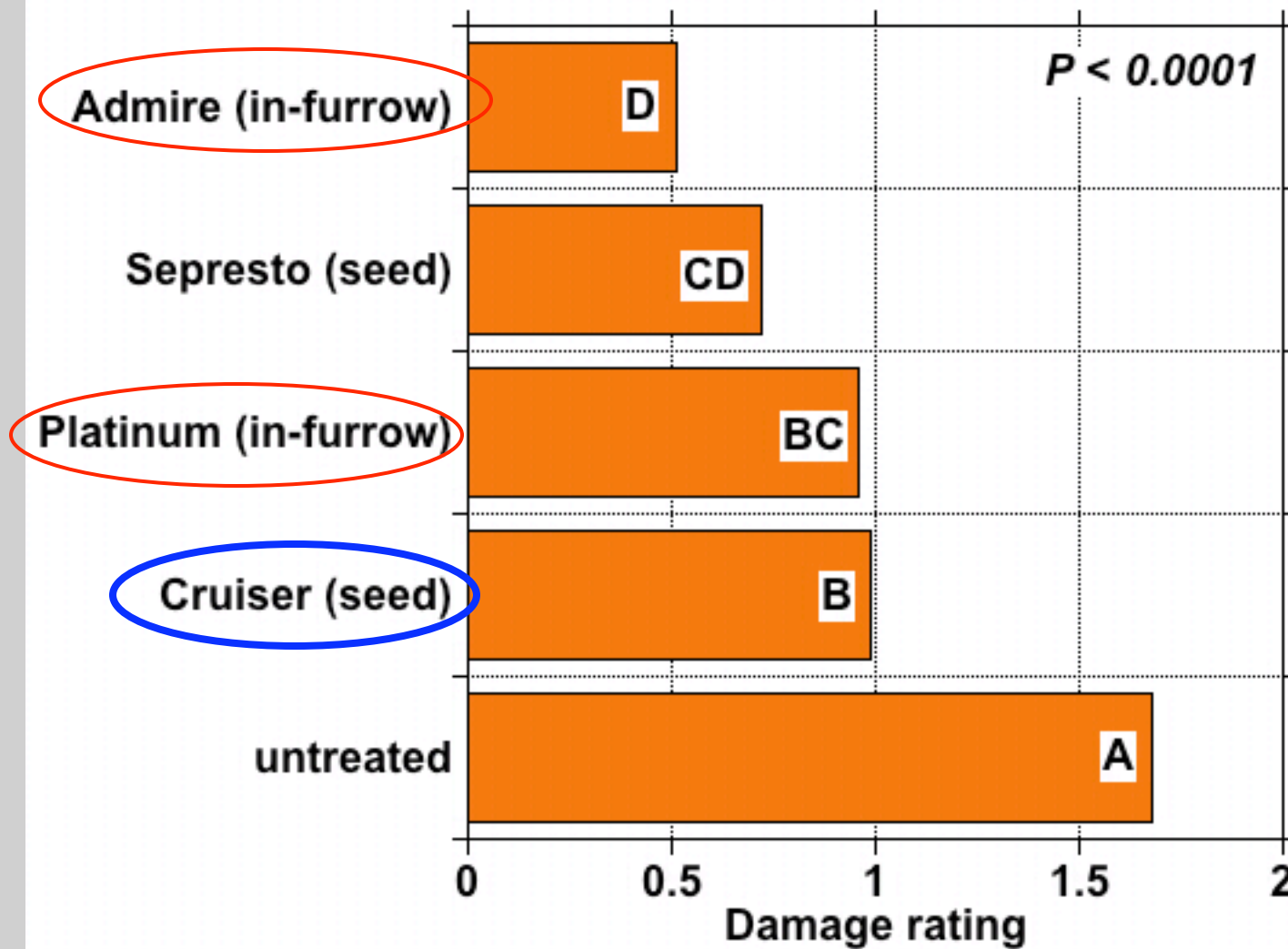
Pickles, 2-leaf stage, 2007



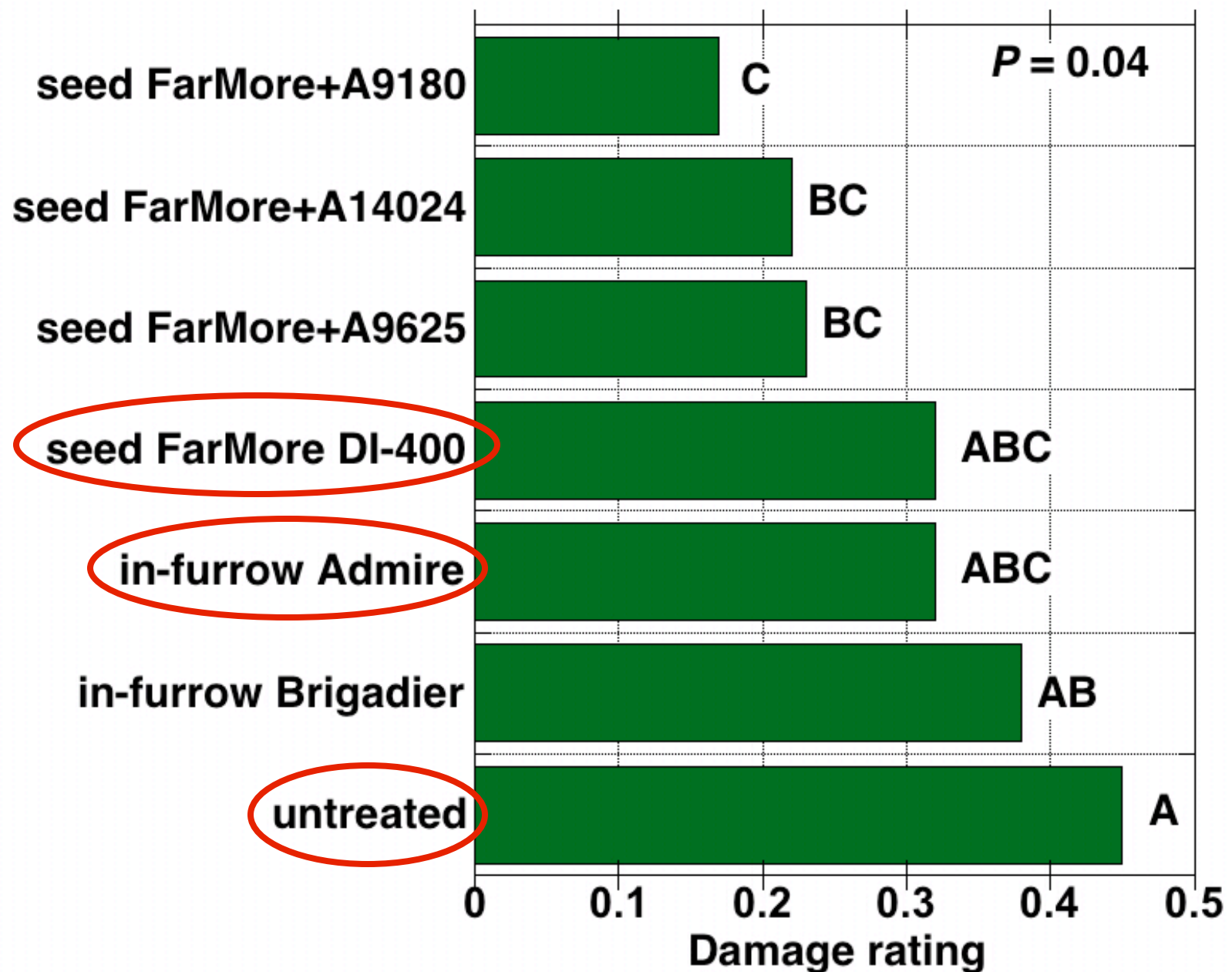
**Pickling cucumber, 4th true-leaf stage,
7/1/08, Fremont Ohio**



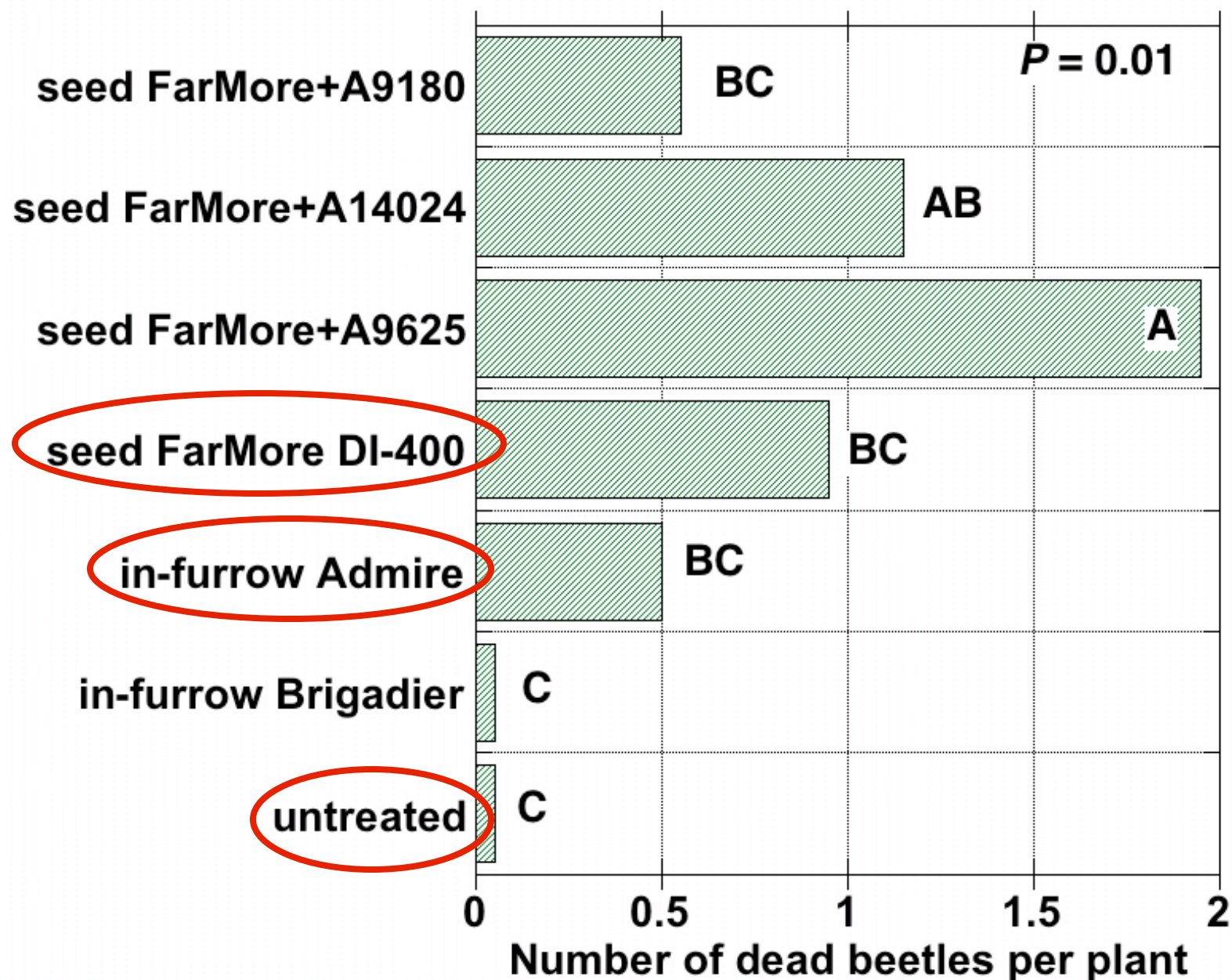
**Pumpkins, 2nd true-leaf stage,
6/16/08, Columbus Ohio**



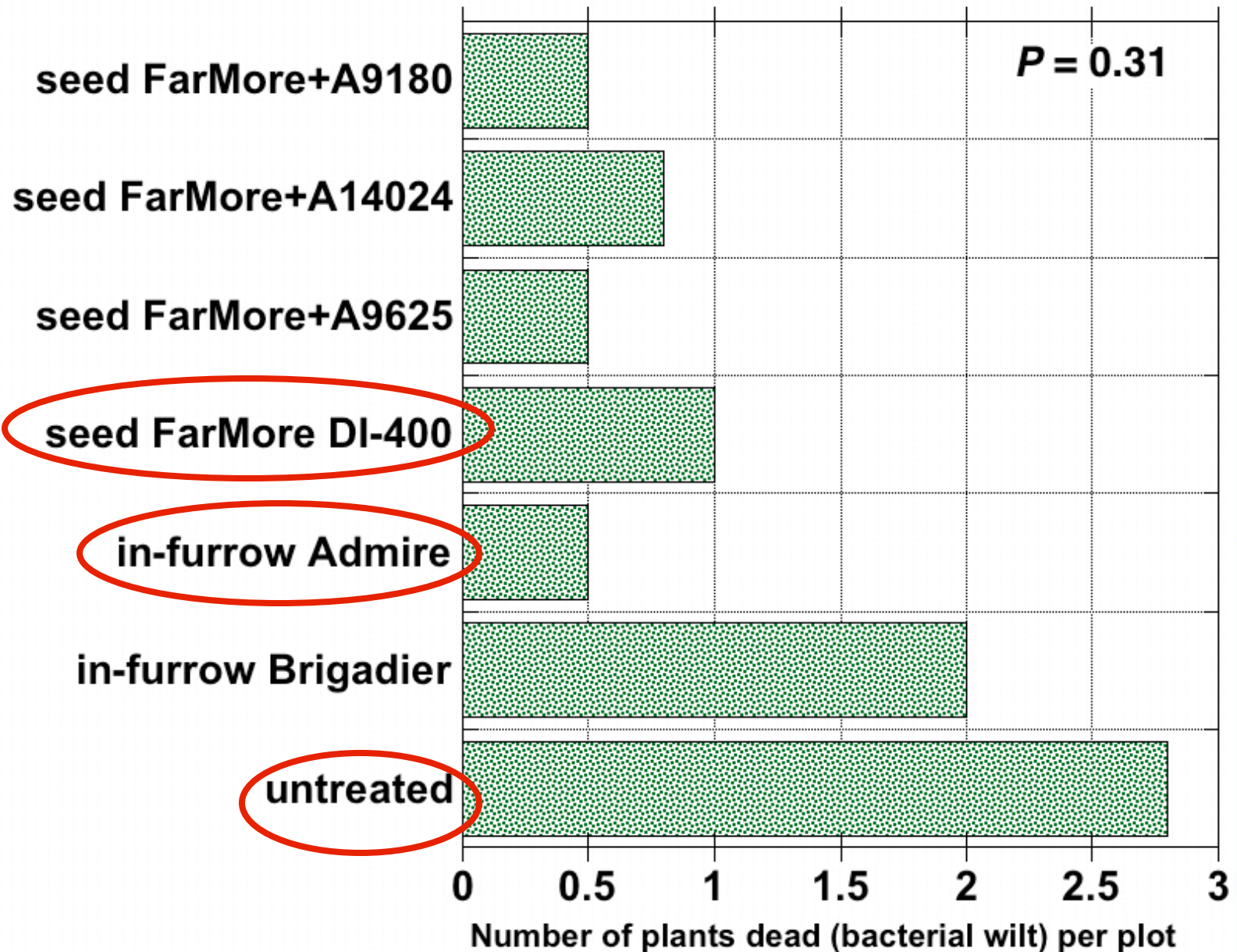
Pickles 2009, first true-leaf stage (22 June)



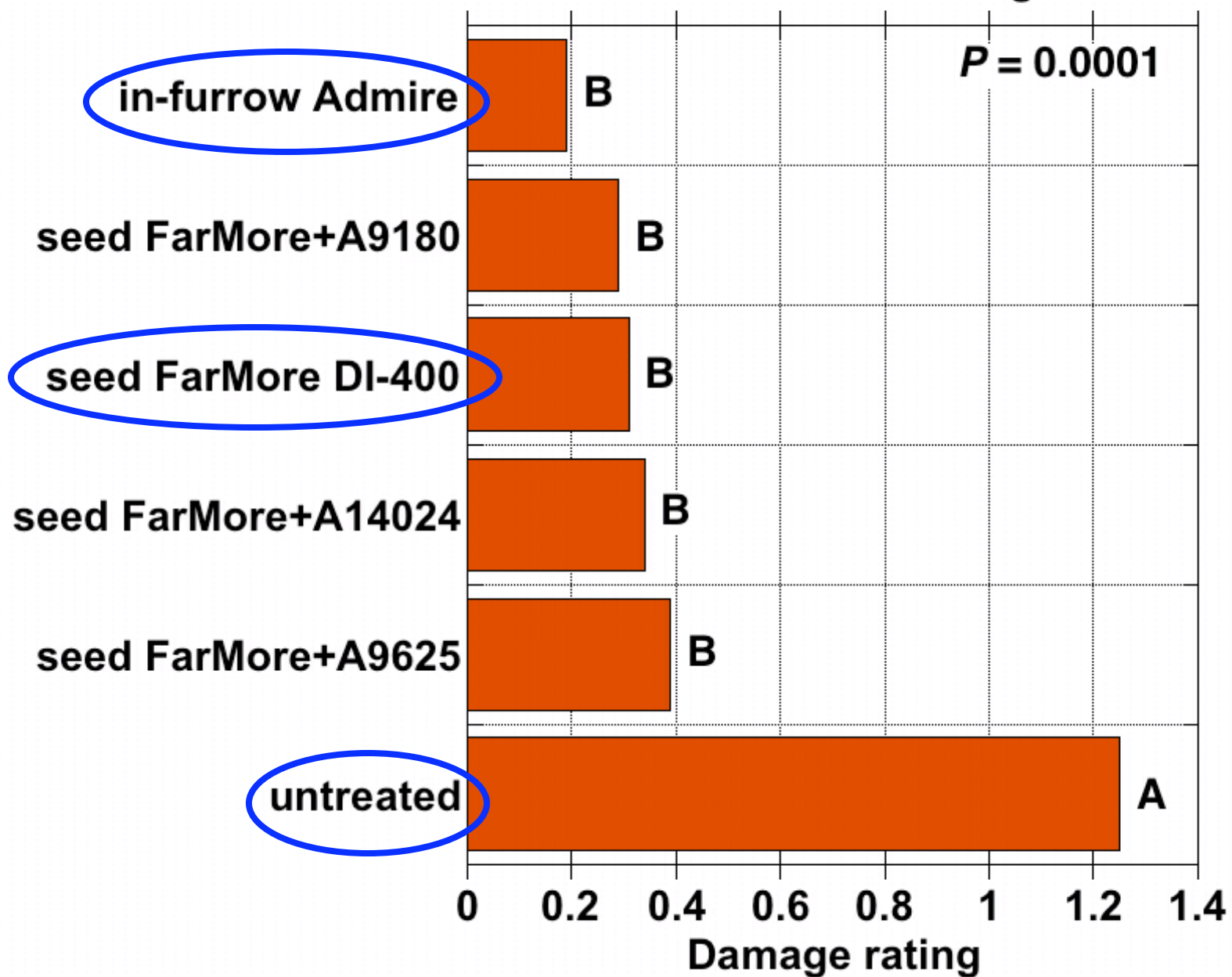
Pickles 2009, first true-leaf stage (22 June)



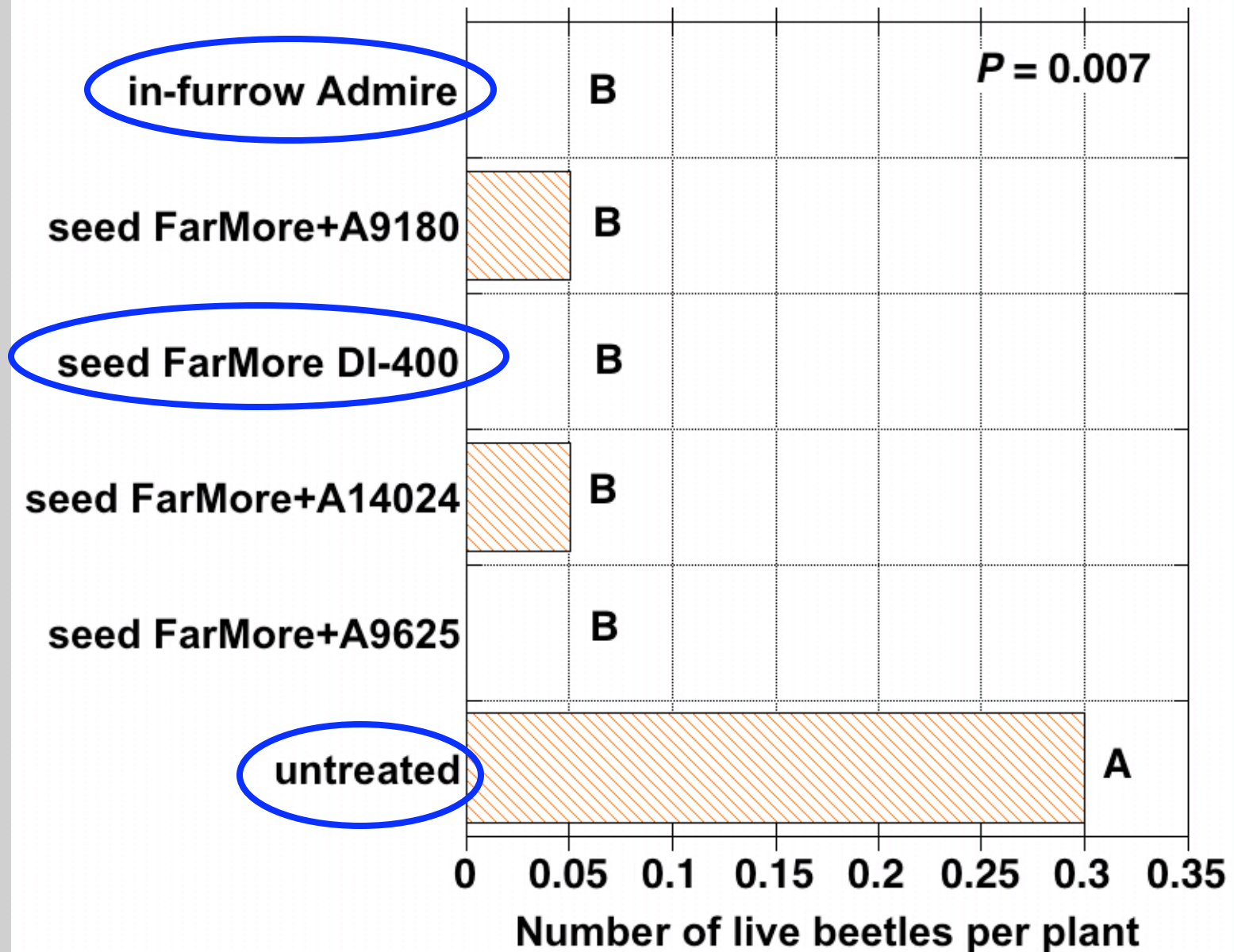
Bacterial Wilt in Pickle Plots 7/24/2009 (3 days before harvest)



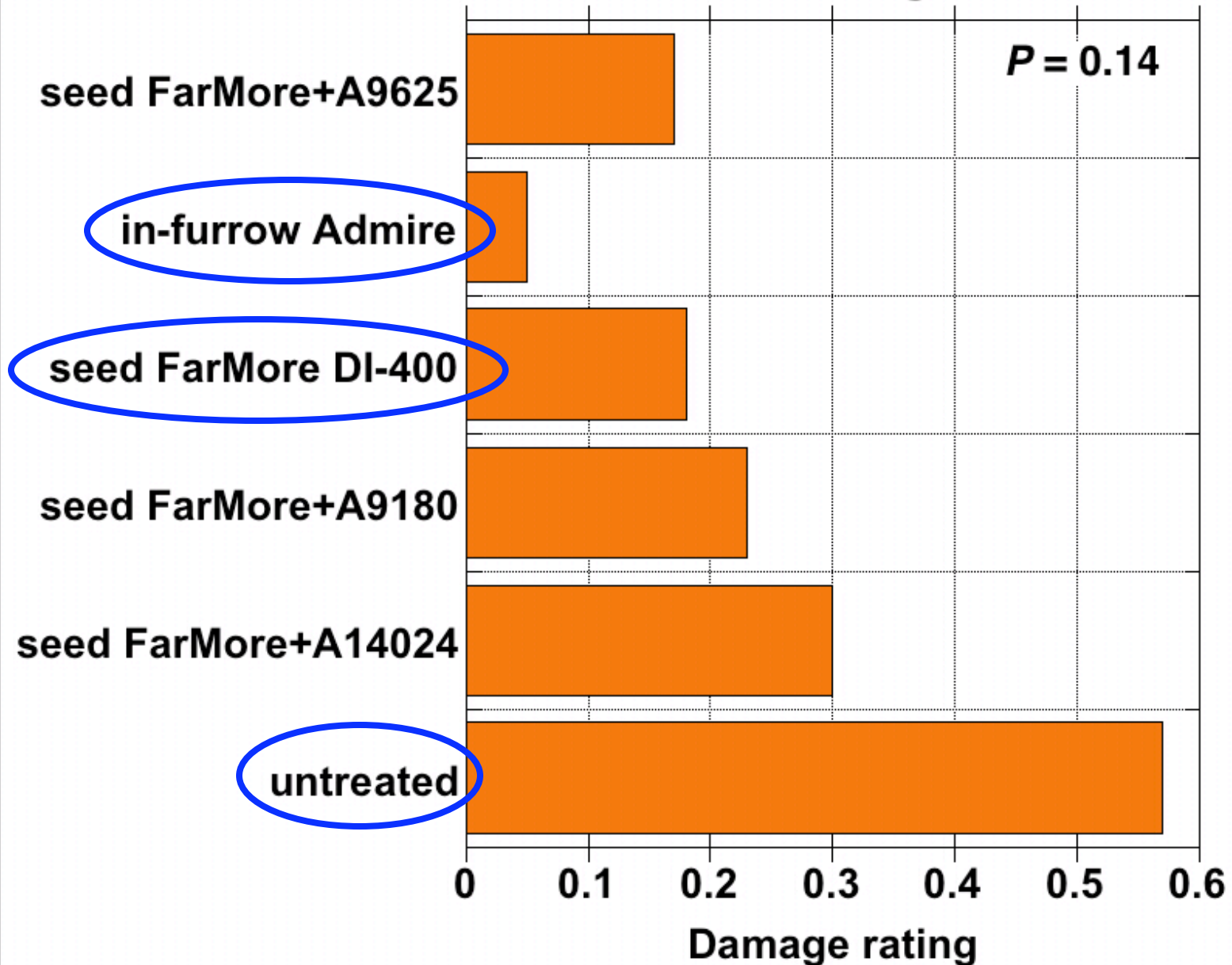
**Pumpkins 2009, Columbus Ohio
second true-leaf stage**



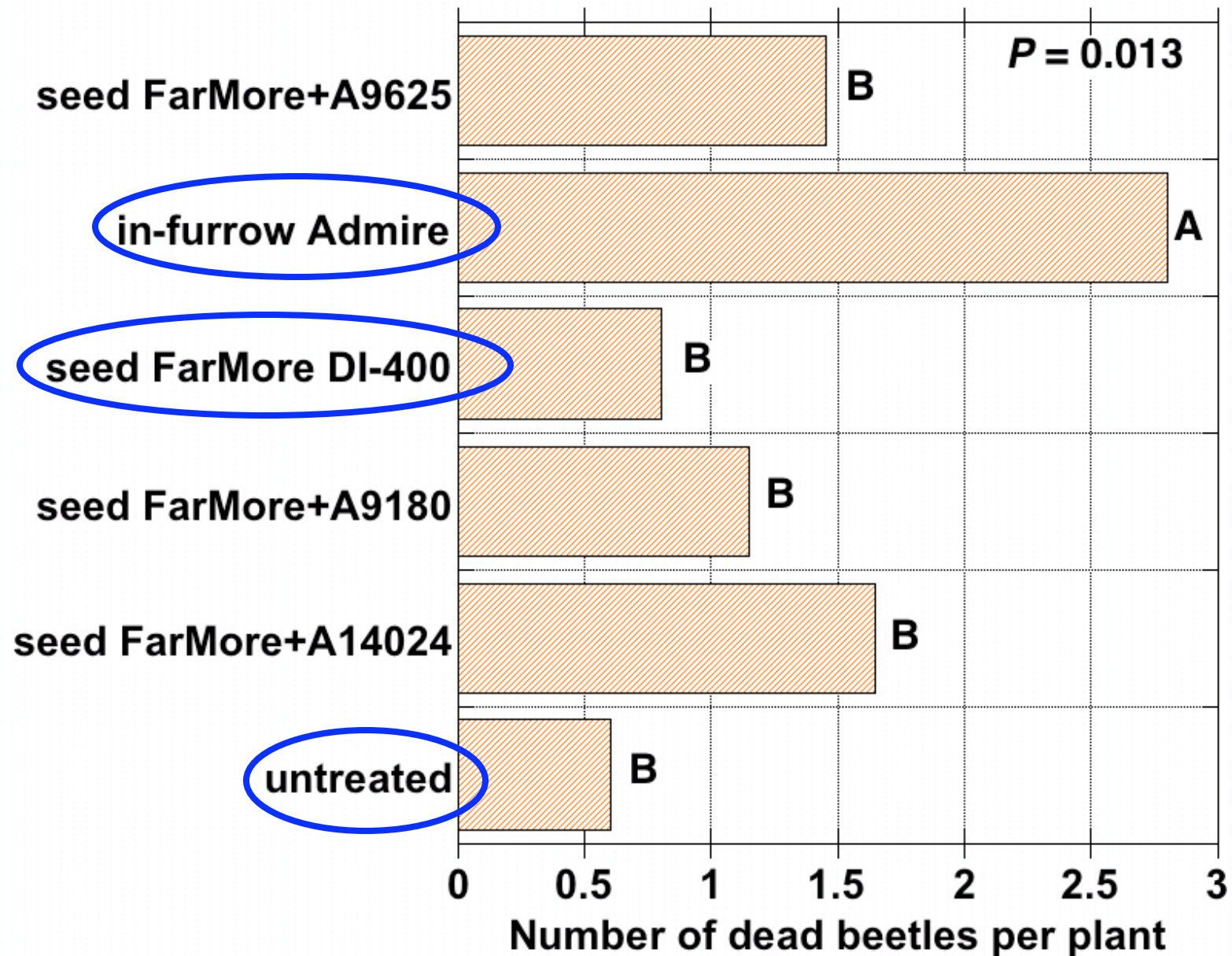
Pumpkins 2009, Columbus Ohio first true-leaf stage (20 June)



Pumpkins 2009, Clark County, Ohio first true-leaf stage



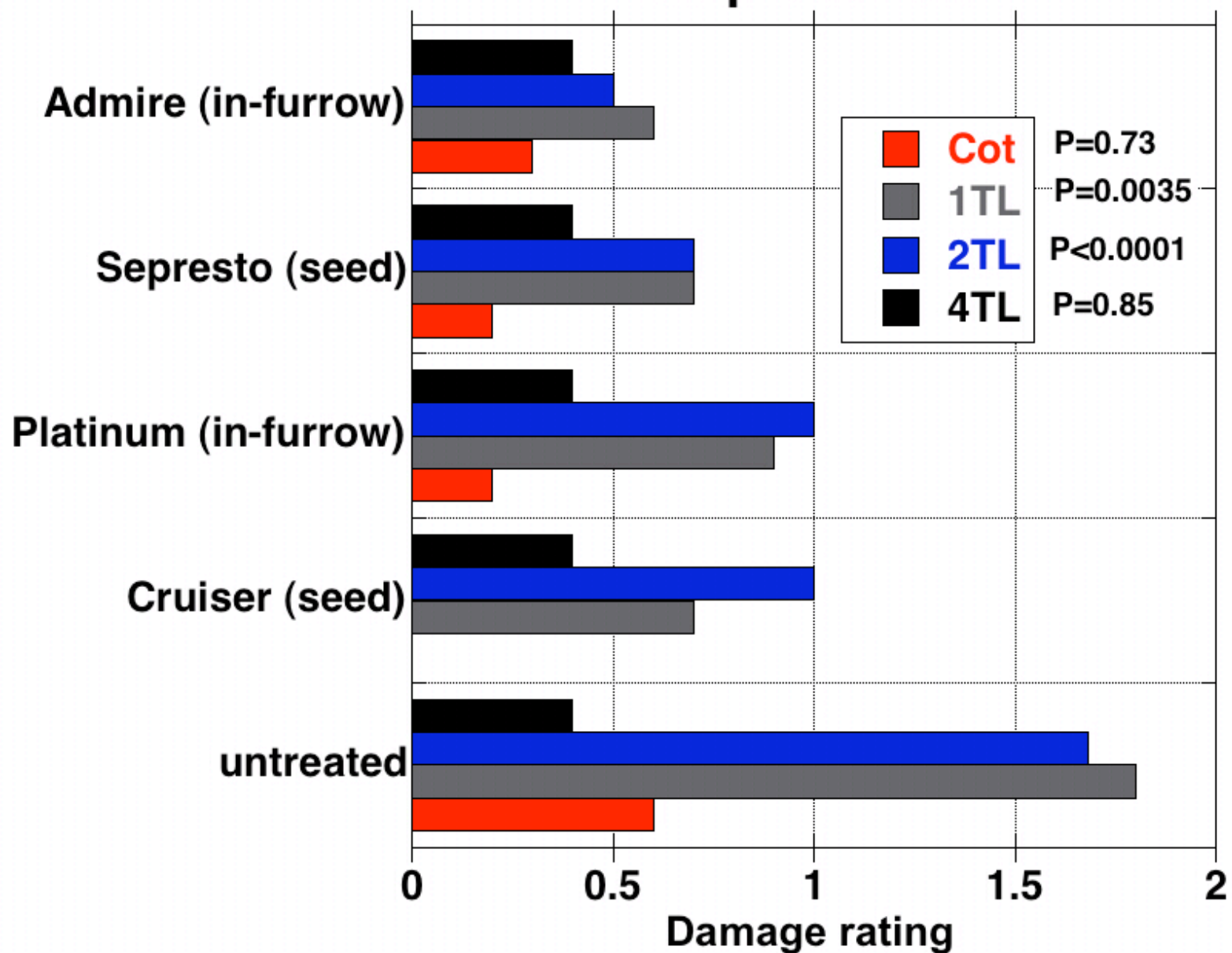
Pumpkins 2009, Clark County, Ohio fourth true-leaf stage (19 June)



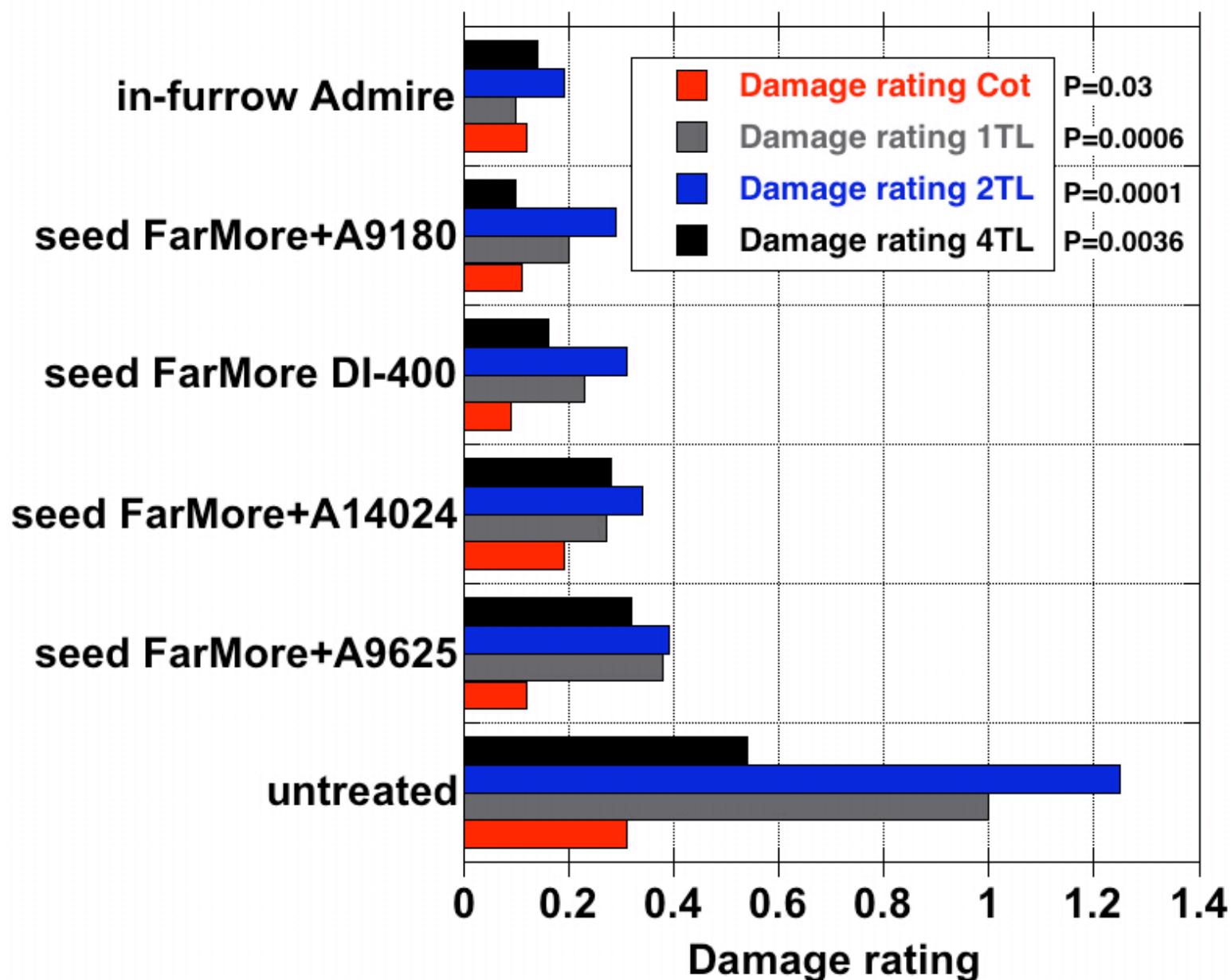
How long does beetle control by insecticide seed treatment last?

- Control evaluated at several stages
 - In field trials
 - In lab bioassays
- Control usually good through 2nd leaf stage
- Control usually poor by 4th leaf stage
- Control most important at cotyledon stage, when plants most susceptible to bacterial wilt

Duration of control Pumpkins 2008



Duration of control Pumpkins 2009, Columbus, OH



Cost of FarMore DI 400

- **Environmental: rate a.i./acre**
- **Economic: \$/acre**

Rate of in-furrow treatment

Product	Rate for cucumbers in 30'' rows		Rate for pumpkins in 7.5' rows	
	Per 1000'	Per acre	Per 1000'	Per acre
Furadan 4F	2.4 fl oz	41.8 fl oz	2.4 fl oz	13.9 fl oz
Admire Pro (4.6F)	0.4 fl oz	7 fl oz	1.2 fl oz	7 fl oz
Platinum 2SC	0.6 fl oz	11 fl oz	1.9 fl oz	11 fl oz

Compare a.i./acre thiamethoxam

Product	Rate	Rate of a.i. for pickles (58,000 seeds/A)	Rate of a.i. for pumpkins (3,000 seeds/ A)
In-furrow Platinum 2SC	11 fl oz/A	0.172 lb a.i./A	0.172 lb a.i./A
Seed trtmt FarMore DI 400	0.75 mg a.i./seed	0.096 lb a.i./A	0.005 lb a.i./A
Difference		1.8 x	34 x

Cost of FarMore DI 400

- Pumpkins & squash
 - + \$2.30/1000 seeds
- Cucumbers
 - + \$0.50/1000 seeds



Phat Jack



Solid Gold



Wolf



Big Autumn

PUMPKINS Large

		Days	Diameter Height	Weight	Skin	Vine	Spacing Category	Features
28049	Phantom	105		25	Dark Orange	Vine	2	A Howden type hybrid from Samois.
28072	Phat Jack	125		50 + lbs.	Orange	Vine	1 or 2	A very large Jack O Lantern pumpkin from Sag-ers. Tall with a thick handle.
28085	Solid Gold	100		25	Deep Orange	Vine	2	A new Huggs hybrid in that has performed very well in trials. Has excellent color, handles and yields.
28036	Sorcerer	105	12 x 14"	15 - 25	Deep Orange	Semi Full Vine	2	An AAS Winner from Harris Moran. Deep orange, firmly rooted handle, heavily ribbed, round shape.
28550	Wolf	120		15 - 25	Deep Orange	Large Vine	1	Produces 15 - 25 lb. round to oblate shaped fruit that has a deep orange color with moderate ribs and very thick, long and firmly attached handles. The flesh thickness is excellent which helps to prevent against flat-sided fruit and makes them deceptively heavy for their size. Wolf will produce a range of sizes and shapes but all will have its trademark handle.

PUMPKINS Large

	Price per package 500 seed						
	Price per 1,000 seeds in these package sizes	1M	2M	25M	100M	250M*	Seeds /lb.
28017 Appalachian	21.50 22.95 32.05 31.20 30.30 29.40	1900					
28049 Phantom	23.40 36.00 34.90 33.95 33.00 32.00	1100					
28036 Sorcerer	31.25 47.90 46.50 45.35 44.05 42.75	2700					
28008 30 Karat Gold	25.00 40.00 38.00 37.00 36.00 35.00	2900					
28073 Gold Challenger	26.25 42.00 40.00 39.00 38.00 37.00	1800					
	Price per package 1 lb. 4 ea.						
	Price per pound in these package sizes	1#	5#	25#	100#*	Seeds /lb.	
28027 A & C Hybrid #515	6.75 20.65 58.00 94.00 54.00 52.00	3000					
28004 Connecticut Field	7.55 20.75 19.75 18.75 17.75	2500					
28051 Gold Gem	6.80 22.40 64.00 42.00 60.00 58.00	3000					
28030 Gold Medal	10.45 34.65 98.50 94.50 94.50 92.50	3000					
28071 Gold Medalion	10.45 34.75 98.50 94.50 94.50 92.50	3000					
28022 Gold Rush	6.15 20.45 58.00 54.00 54.00 52.00	3000					
28024 Gold Strike	6.45 21.55 61.00 59.00 57.00 55.00	3000					
28006 Howden	4.40 7.60 21.00 20.00 19.00 18.00	3000					
28000 Jumpin' Jack	5.40 18.00 51.00 49.00 47.00 45.00	2700					
28022 Mammoth Gold	3.85 8.85 18.50 17.50 16.50 15.50	3000					

*Multiple packages may be used to fill orders for these quantities.

PUMPKINS Large

	Price per package 1 lb. 4 ea.						
	Price per pound in these package sizes	1#	5#	25#	100#*	Seeds /lb.	
28137 Dr Zek's	4.55 15.40 47.00 45.00 43.00 41.00	3000					
28085 Solid Gold	10.45 34.75 98.50 94.50 94.50 92.50	2900					
28030 Wolf	10.40 34.50 98.00 96.00 94.00 92.00	2900					
	Price per package 4 ea.						
	Price per pound in these package sizes	1#	5#	25#	100#*	Seeds /lb.	
28008 30 Karat Gold	42.90 40.90 39.30 38.30 37.30	2900					
28082 Connecticut Giant	42.90 41.45 40.30 39.15 38.00						
28073 Gold Challenger	44.90 42.90 41.90 40.90 39.90	2900					
28050 Gold Medal	12.95 107.65 105.65 103.65 101.65	3000					
28071 Gold Medalion	12.85 107.45 105.45 103.45 101.45	3000					
28023 Gold Rush	21.80 96.30 64.20 62.30 59.20	3000					
28010 Phat Jack	27.15 82.90 80.00 79.00 78.00	2900					
28085 Solid Gold	17.95 102.60 105.60 103.60 101.60	2900					

*Multiple packages may be used to fill orders for these quantities.



Cost of FarMore DI 400

- **Pumpkins & squash**
 - **\$2.30/1000 seeds**
 - **If buy 3000 'Betternut' seeds from Rupp**
 - **\$23.90/1000 seeds with FarMore**
 - **\$21.00/1000 seeds without FarMore**

Cost of FarMore DI 400

- **Pumpkins & squash**
 - **\$2.30/1000 seeds**
 - **If buy 25 lbs of 'Gold Rush' from Rupp**
 - **\$62.20/lb with FarMore**
 - **\$54.00/lb without FarMore**

Options for Pumpkins

if 3000 seeds/lb, 1 lb seed/A;

Admire Pro: 7 fl oz/A, ~\$8.20/fl oz

Item	With FarMore DI 400 (& no Admire)	With Admire (& no FarMore DI 400)
Seed cost/A	\$62	\$54
Admire cost/A	\$0	\$58
Total cost/A	\$62	\$102

Options for Pickles

if 58,000 seeds/A;
15,000 seeds/lb; 4 lb seed/A

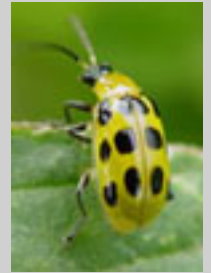
Item	With FarMore DI 400 (& no Admire)	With Admire (& no FarMore DI 400)
Seed cost/A	\$244	\$214
Admire cost/A	\$0	\$58
Total cost/A	\$244	\$272



Conclusions

- **Efficacy of seed treatment**
 - **As good as in-furrow treatment**
 - **Control is good during the critical cotyledon to 2-leaf stage**
 - **Control is not consistently lasting past the 2-leaf stage**

Conclusions



- **Advantages of seed treatment**
 - **Convenience; easier application**
 - **Lower rate of a.i. per acre (2-34 x)**
 - **Lower cost**

Acknowledgements

- **Funding:** IR-4 Project, Bayer, Syngenta, Ohio Vegetable & Small Fruit Research & Development Program, Vlastic Foods
- **Products:** Seminis, Harris-Moran, Harris Seeds, Syngenta, Bayer, BASF, FMC
- **Field operations:** Matt Hofelich, Glenn Mills, Mark Schmittgen, Clarence Renk, Joe Davlin
- **Technical assistance:** Gretchen Sutton
- **Collaborators:** Alan Taylor, Jim Jasinski, Joanne Whalen, Tom Kuhar, Brian Nault, Jerry Brust, Mark Bennett, Michele Giovannini, Jack Norton