Laboratory Evaluation of Chemical, Biorational and Microbial Insecticides Against *Thrips parvispinus*

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Life Cycle

Hutasoit et al., 2017, Indonesia Journal of Entomology, 14:107-116

Adult

Egg

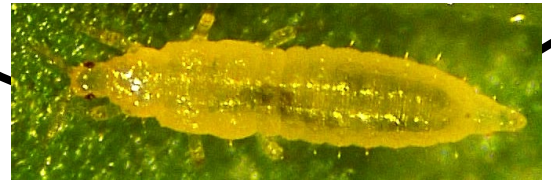
4.79 days

1st instar larva (L1)

1.36 days

2nd instar larva (L2)

3.54 days



Prepupa

1.08 days

Pupa

1.96 days

27°C (80 °F)

12.73 days

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Chemical Insecticides

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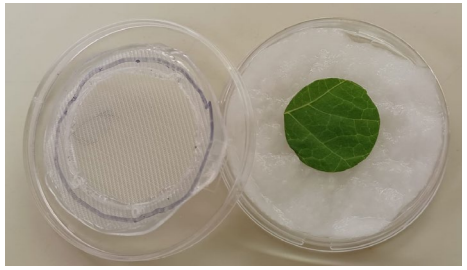
Tested Chemical Insecticides

#	Product Name	Active Ingredient	Group	Rate	Site	EPA Registration #
1	Timectin 0.15 EC	Abamectin	6	8 fl oz/100 gal	S, G, N	84229-1
2	Acephate 97 UP	Acephate	1B	8 oz/ 100 gal	G, N, L	70506-8
3	Talstar Nursery Flowable	Bifenthrin	3A	21.7 fl oz/ 100 gal	G, N, L	279-3206
4	Sevin SL	Carbaryl	1A	1 qt/ 100 gal	G, N, L	432-1227
5	Conserve SC	Spinosad	5	0.1 fl oz/ 1 gal	G, N, L	62719-291
6	Hachi-Hachi	Tolfenpyrad	21A	27 fl oz/ 100 gal	G, N, S, L	71711-31-67690
7	Mainspring GNL	Cyantraniliprole	28	8 fl oz/ 100 gal	G, N, I, L	10015-43
8	Azasol	Azadirachtin	Unknown	6 oz/ 50 gal	G, N, I, L	81899-4-74578
9	Xxpire	Sufloxaflor-Spinetoram	4C-5	2.75 oz/ 100 gal	G, N	62719-676
10	Altus	Flupyradifurone	4D	14 fl oz/ 100 gal	G, N, L	432-1575
11	Rycar	Pyrifluquinazon	9B	3.2 fl oz/100 gal	G	71711-37-67690
12	Kontos	Spirotetramat	23	3.4 fl oz/ 100 gal	G, N, I	432-1471
13	Sarisa	Cyclaniliprole	28	27 fl oz/ 100 gal	G, N, S	71512-32-59807
14	Pradia	Cyclaniliprole-Flonicamid	28-29	17.5 fl oz/ 100 gal	G, N, S	71512-33-59807
15	Fulcrum	Pyriproxyfen	7C	12 fl oz/ 1 gal	G, N, L, S*	59807-14
16	Tristar	Acetamiprid	4A	25.3 fl oz/ 100 gal	G, N, S, L	8033-106-1001
17	Aria	Flonicamid	29	2.9 oz/ 100 gal	G, N, L	279-3287
18	Pedestal	Novaluron	15	8 fl oz/ 50 gal	G, N, S	53883-419-59807
19	Piston	Chlorfenapyr	13	10 fl oz/ 100 gal	G	91234-19
20	Overture	Pyridalyl	Unclassified	8 oz/ 100 gal	G	59639-125
21	Merit 75 WSP	Imidacloprid	4A	1.6 oz/300 gal	N, L, I	432-1318

S: shadehouse, G: greenhouse, N: nursery, L: landscape, I: interior, * Not for Gardenia and Schefflera

Direct spray on *Thrips parvispinus*

1. Bean leaf discs 24mm diameter



2. Five L1, L2 or adults
3. Treatment application → Potter Tower
4. Mortality at 24h and 48h post treatment
5. Feeding damage at 48h → Image J

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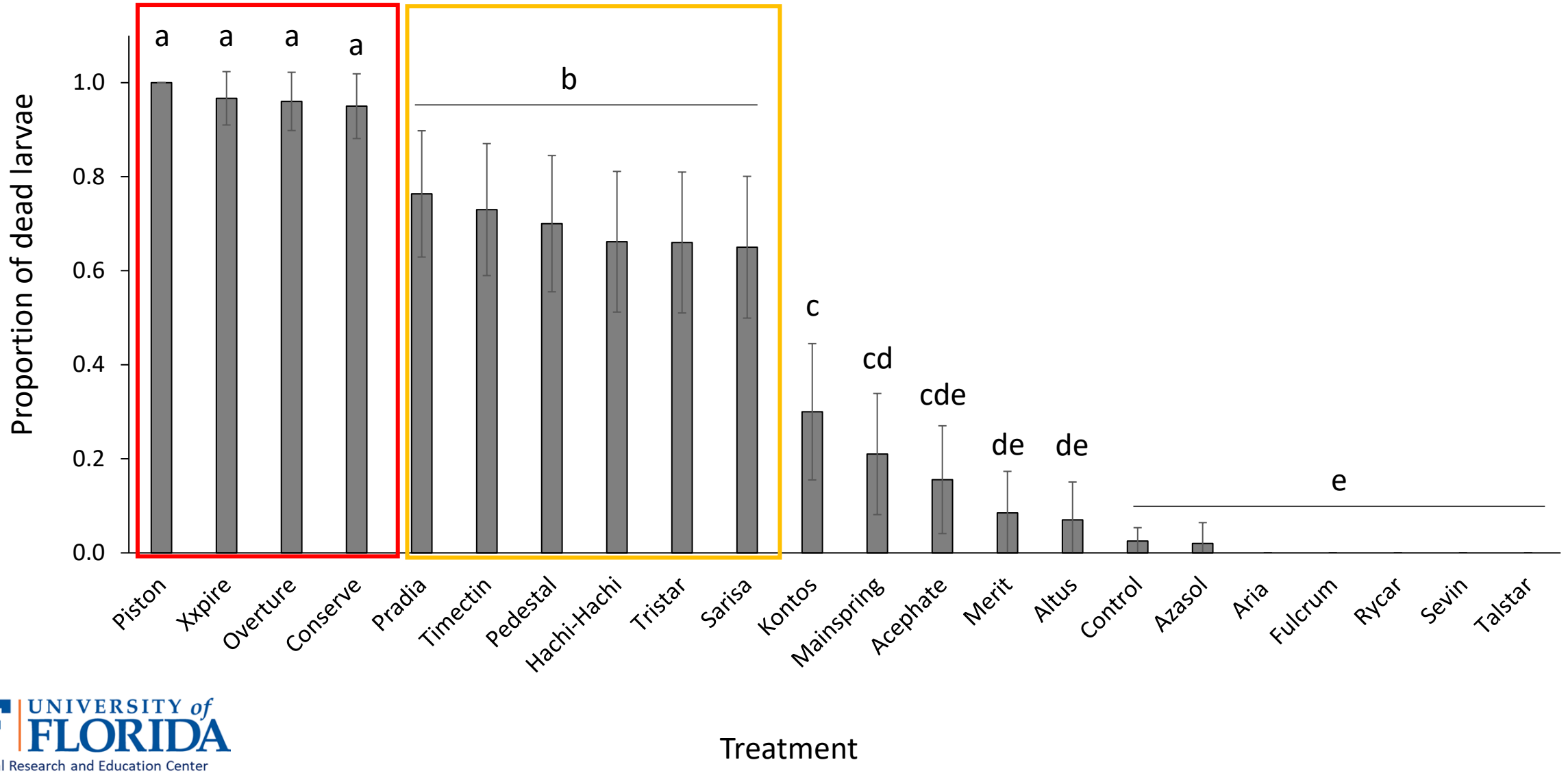
First-instar Larval Mortality (Direct)



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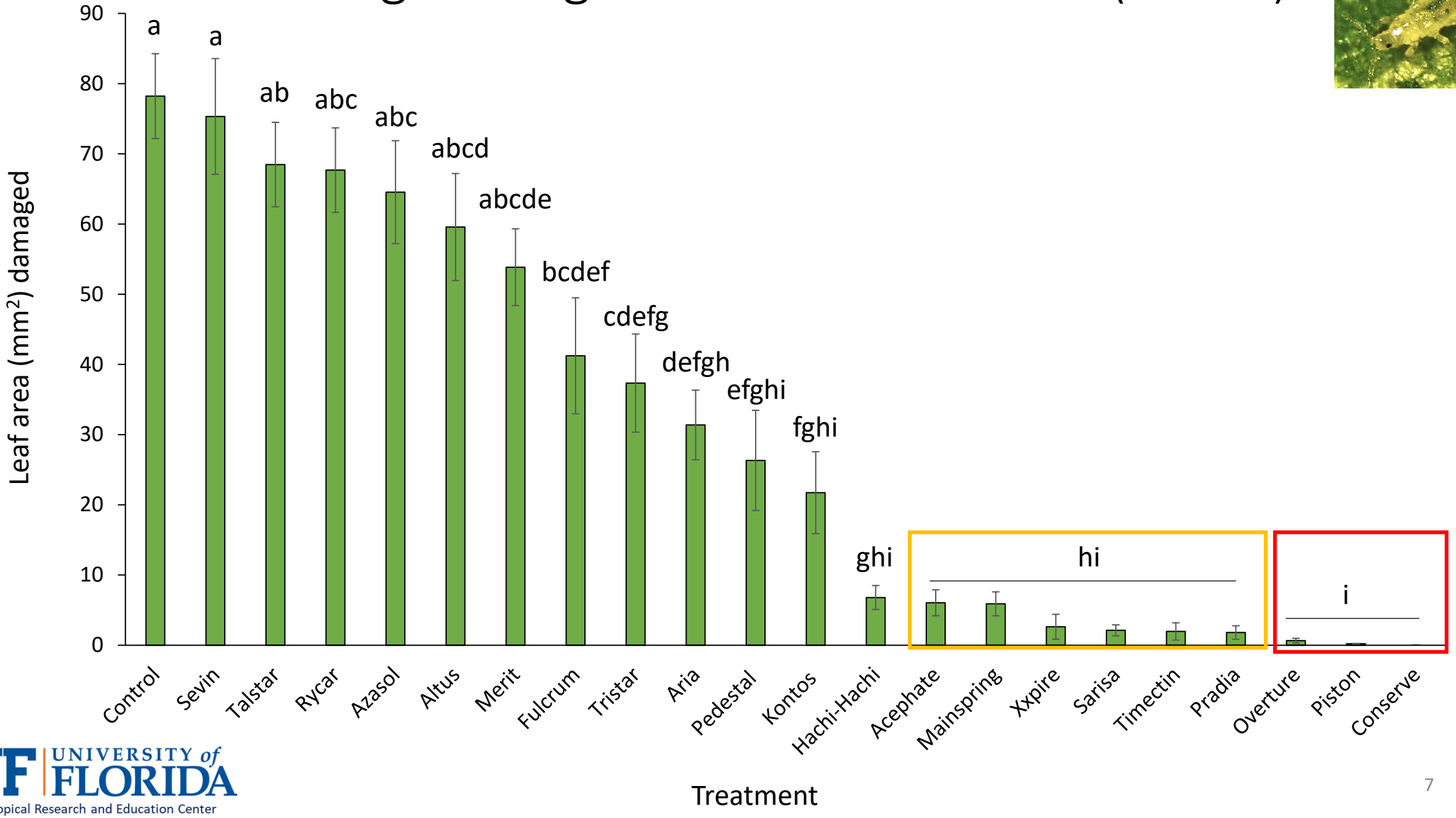
Feeding Damage - First-instar Larvae (Direct)



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Feeding Damage - First-instar Larvae (Direct)

Control

Sevin

Conserve

Overture

Piston

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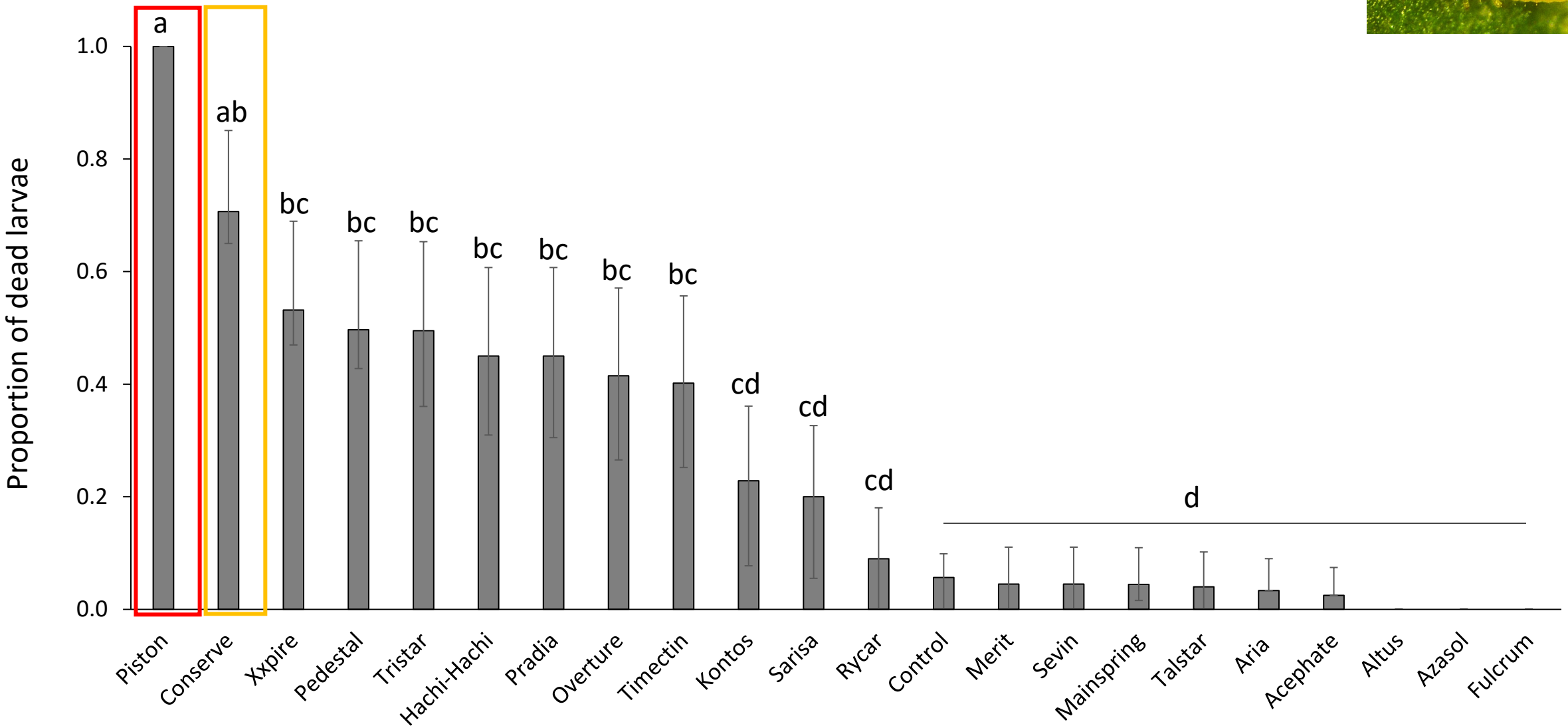
Second-instar Larval Mortality (Direct)



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Feeding Damage - Second-instar Larvae (Direct)

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Feeding Damage - Second-instar Larvae (Direct)

Control

Merit

Rycar

Timectin

Mainspring

Piston

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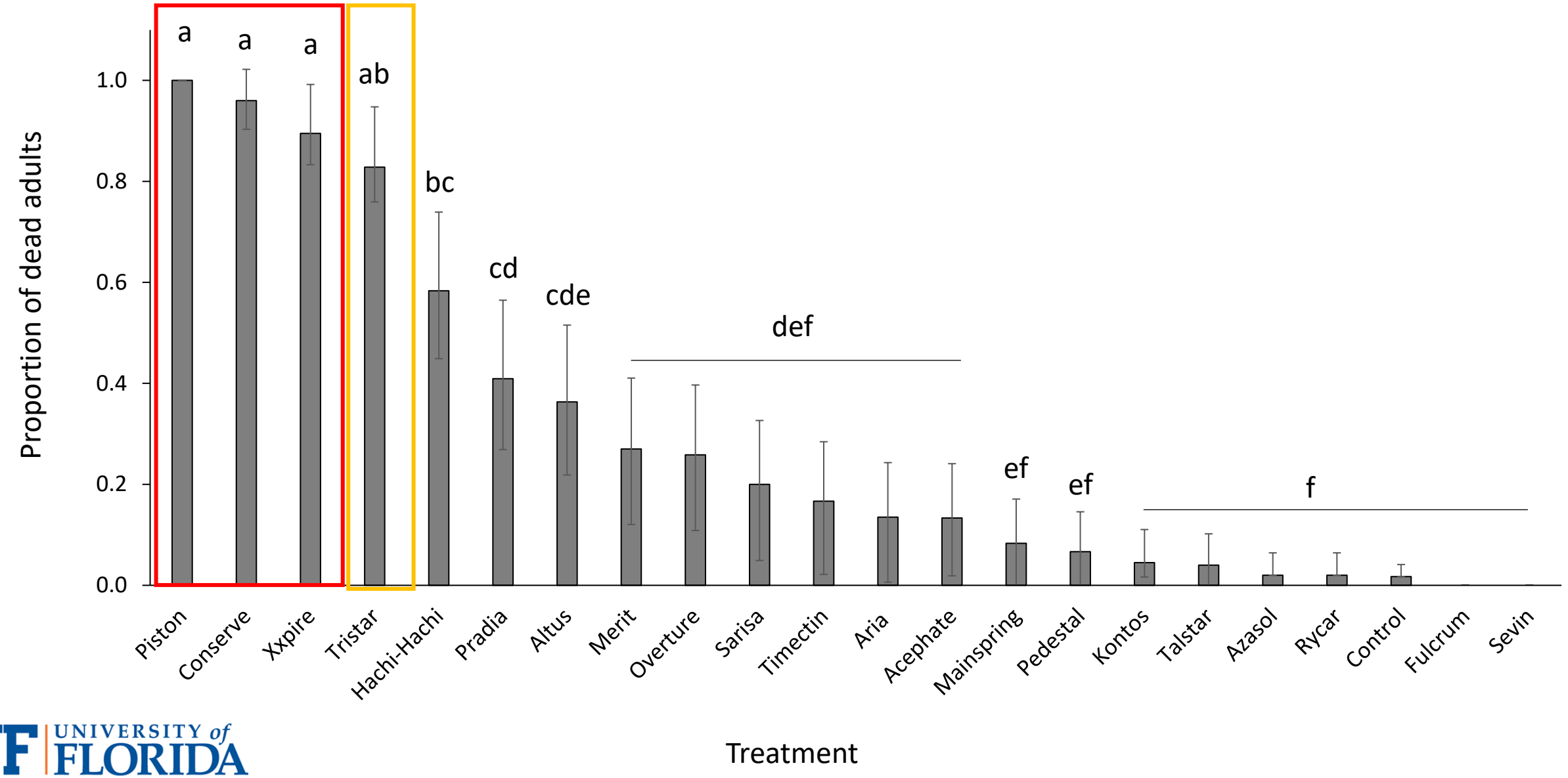
Adult Mortality (Direct)



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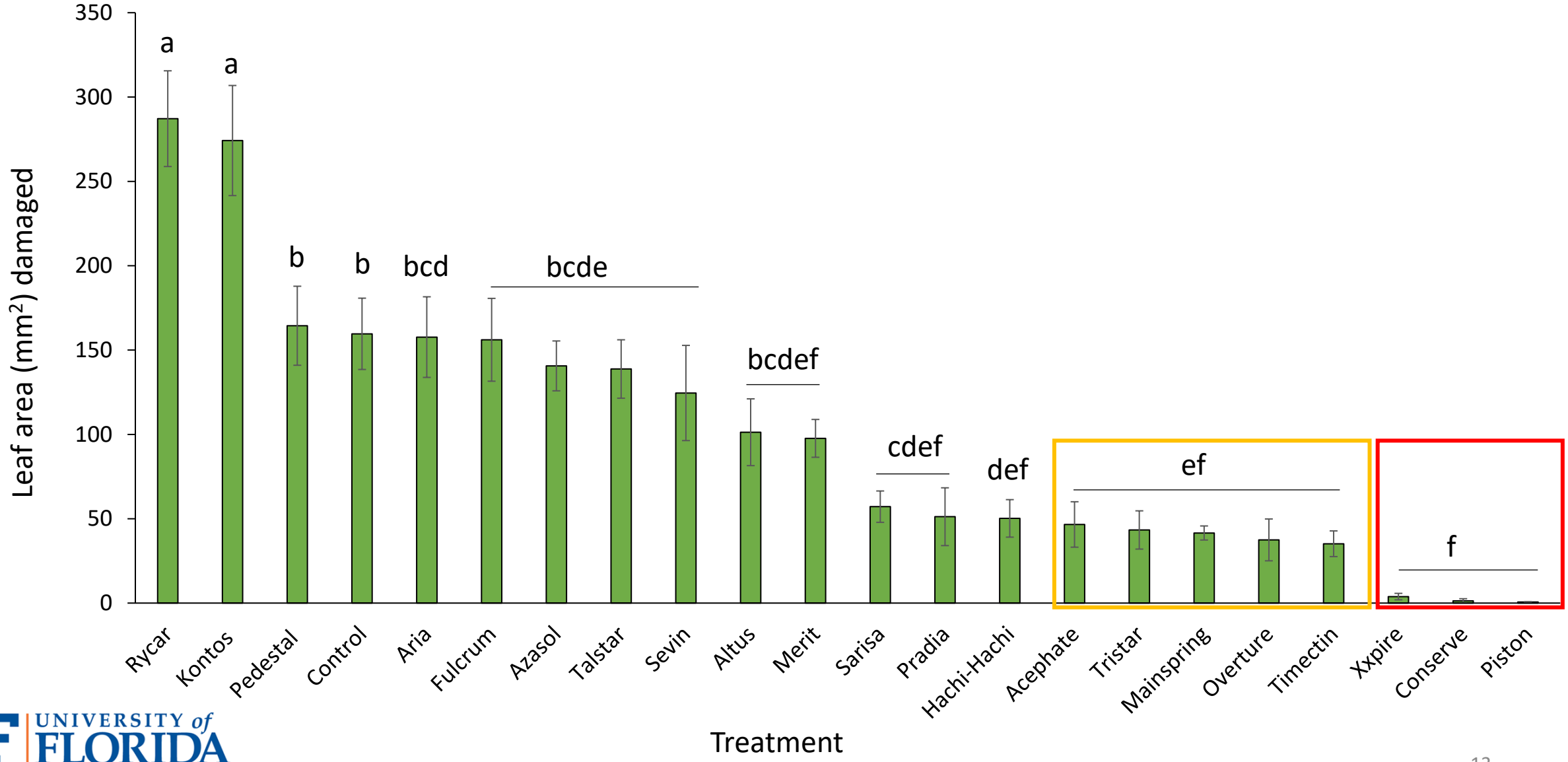
Feeding Damage – Adults (Direct)



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Feeding Damage – Adults (Direct)

Control

Rycar

Kontos

Piston

Xxpire

Conserve

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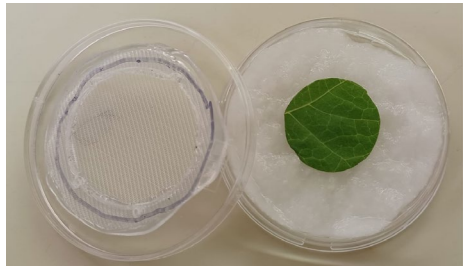
Spray on Plants – Indirect Spray

1. Treatment application → bean plants
2. Bean leaf discs 24mm diameter
3. Five L1, L2 or adults
4. Mortality at 24h and 48h post treatment
5. Feeding damage at 48h → Image J



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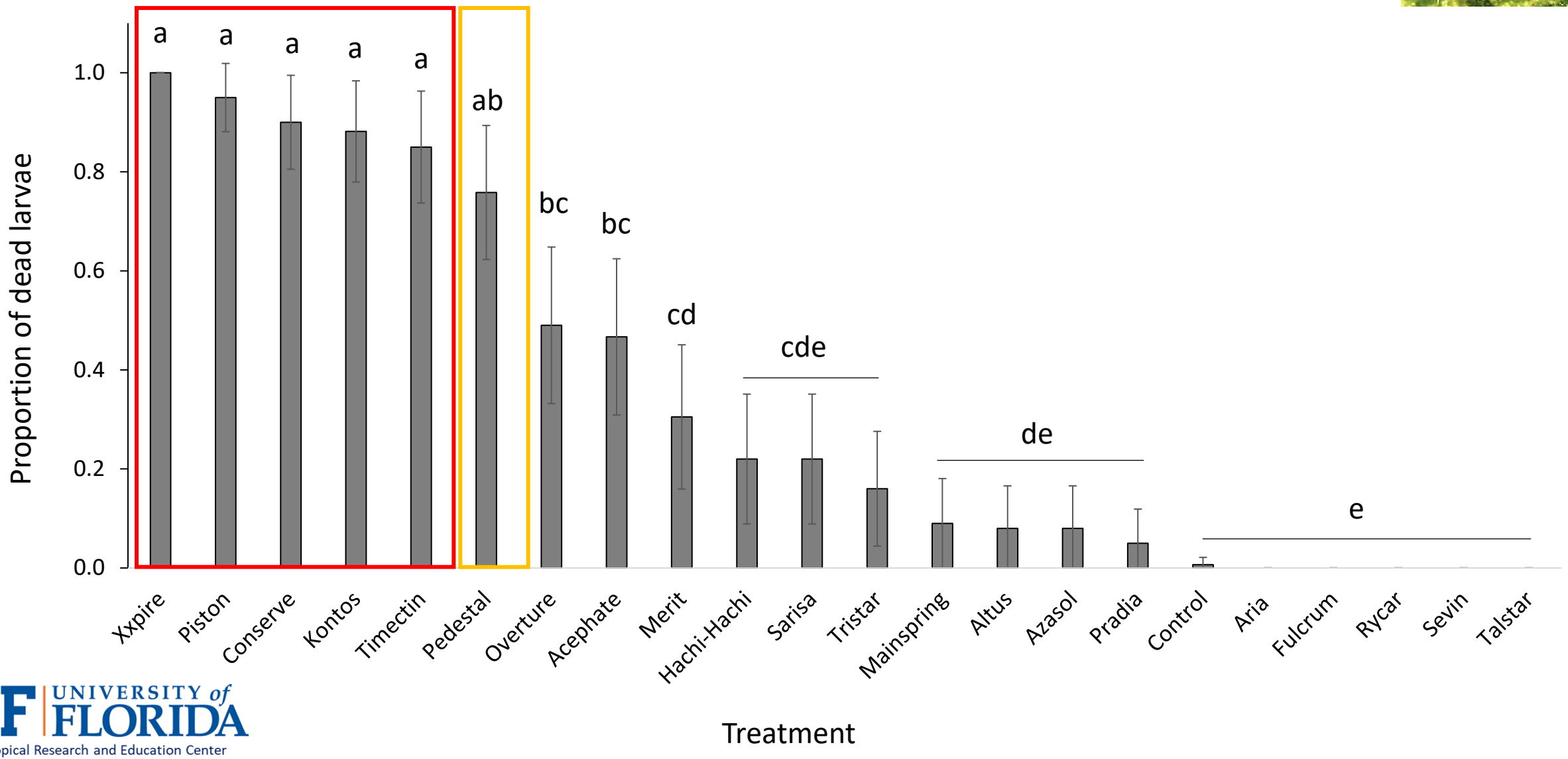
First-instar Larval Mortality (Indirect)



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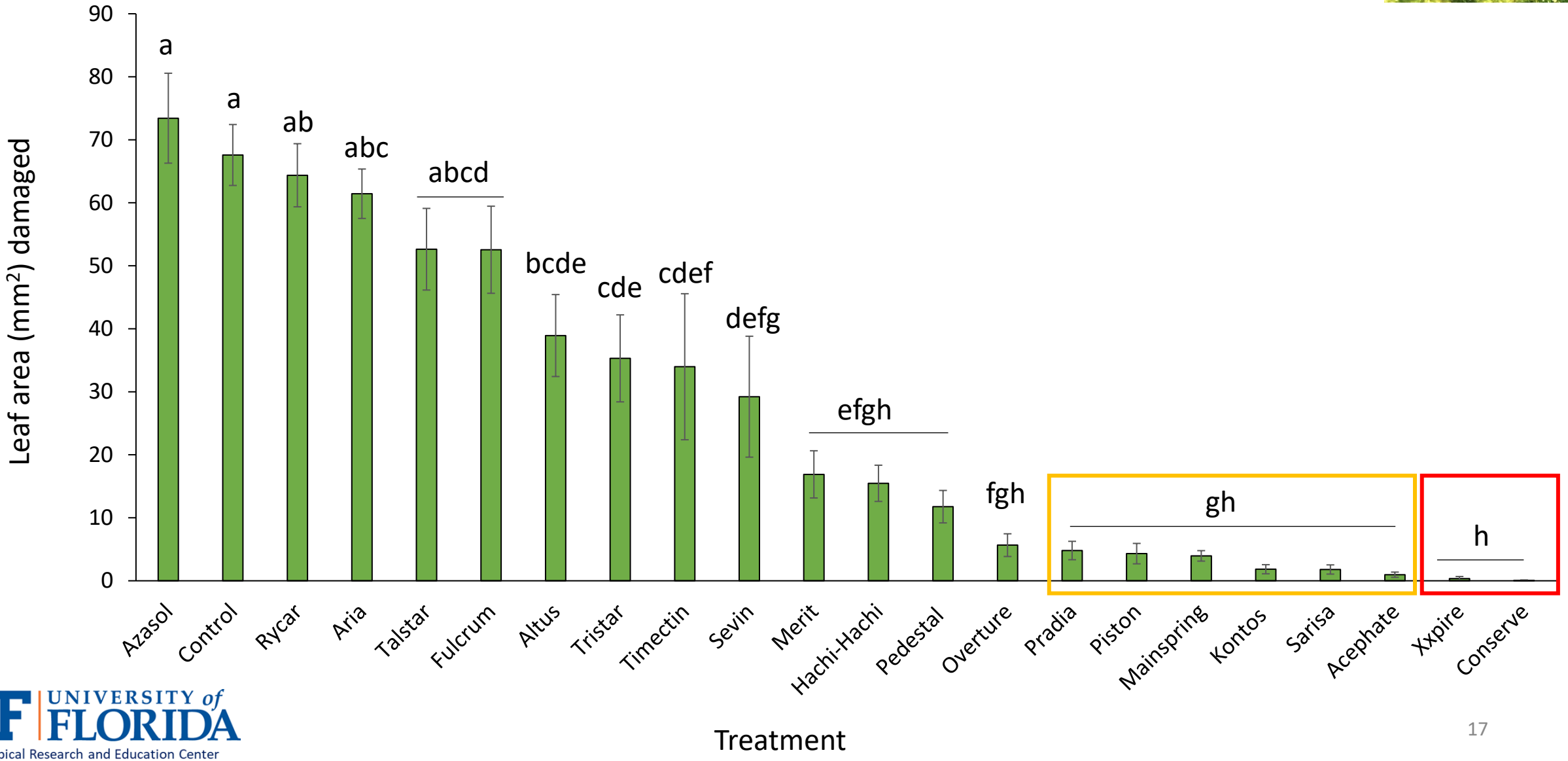
Feeding Damage - First-instar Larvae (Indirect)



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Feeding Damage - First-instar Larvae (Indirect)

Azasol

Control

Conserve

Xxpire

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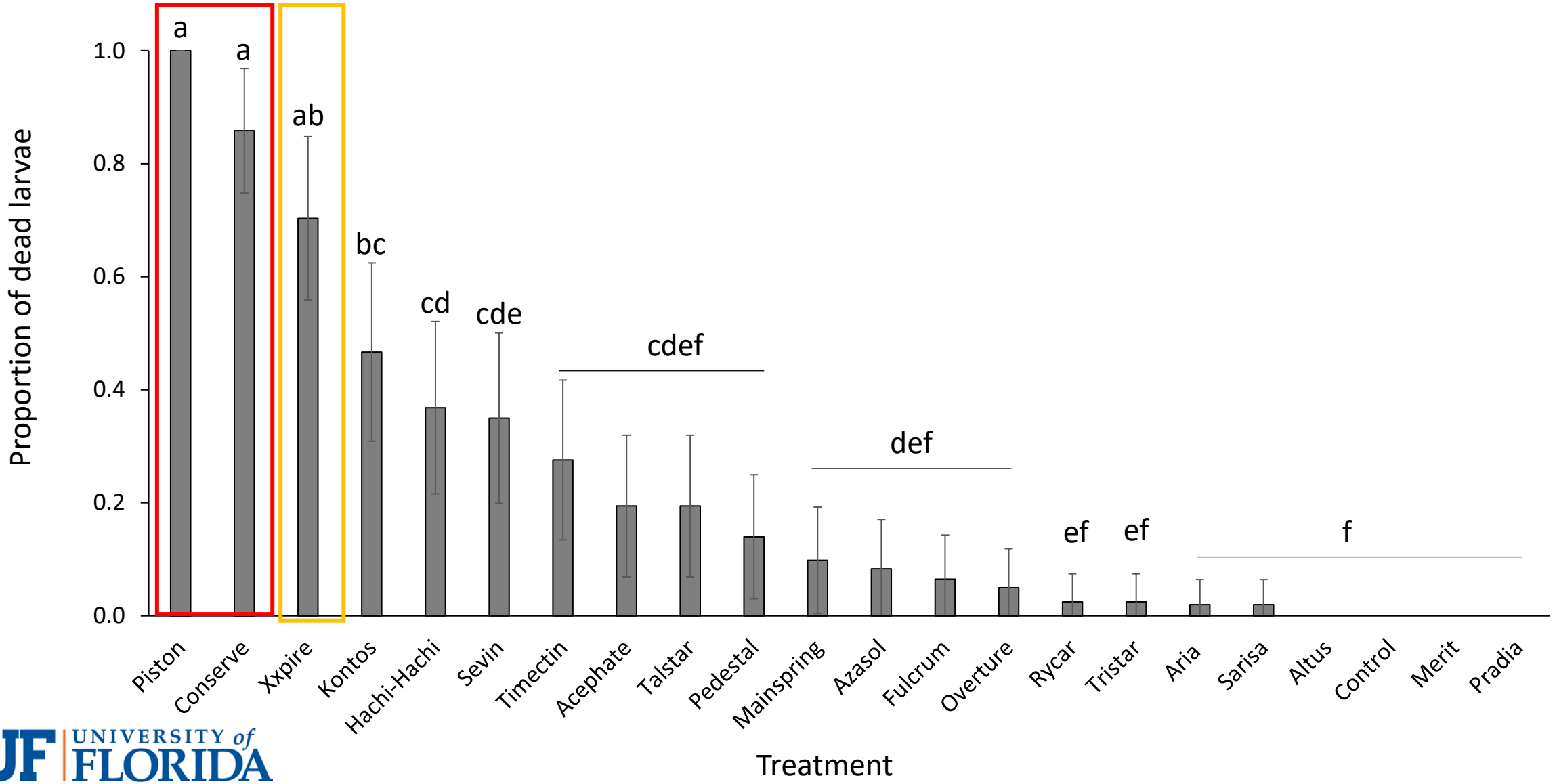
Second-instar Larval Mortality (Indirect)



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Feeding Damage - Second-instar Larvae (Indirect)

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Feeding Damage - Second-instar Larvae (Indirect)

Control

Merit

Conserve

Sarisa

Piston

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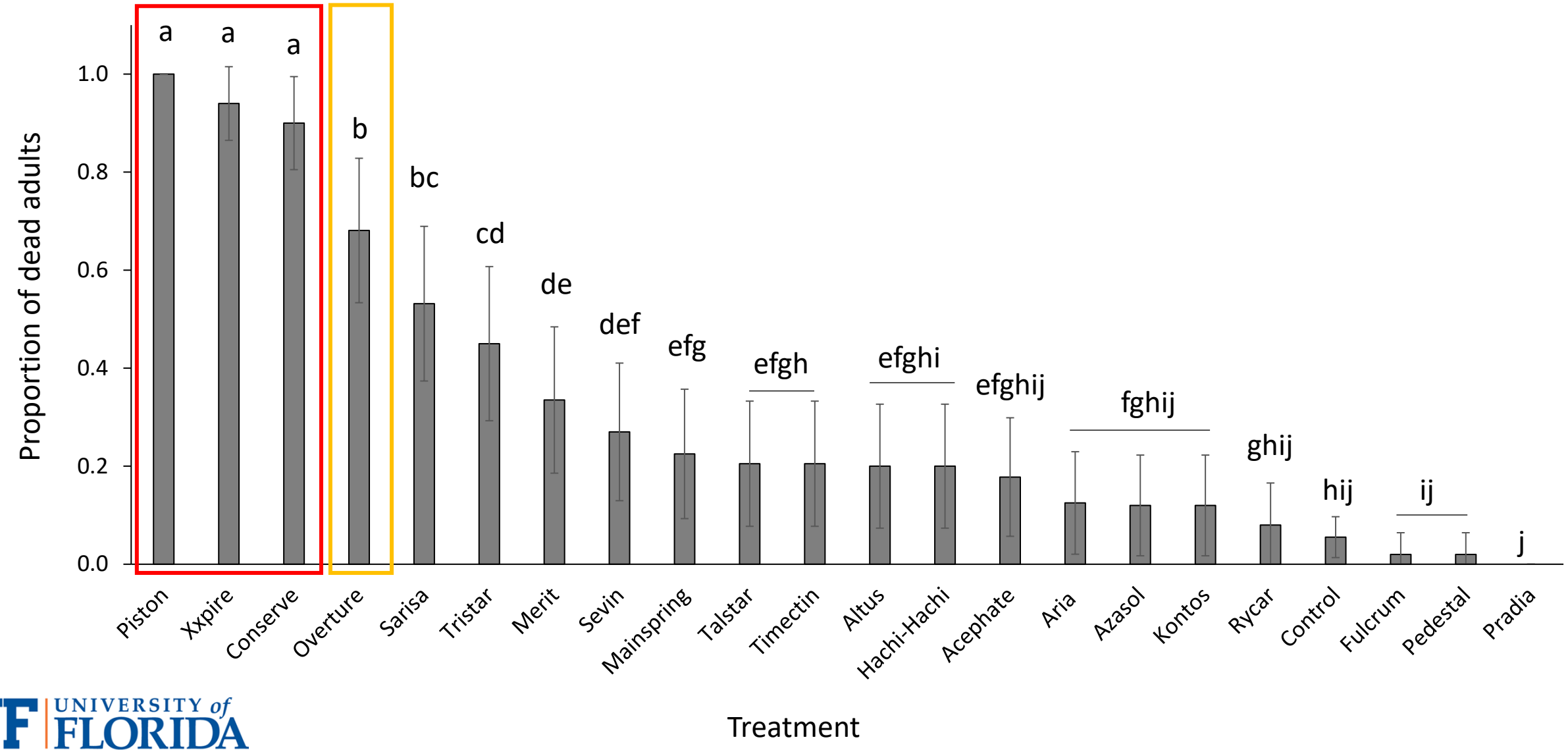
Adult Mortality (Indirect)



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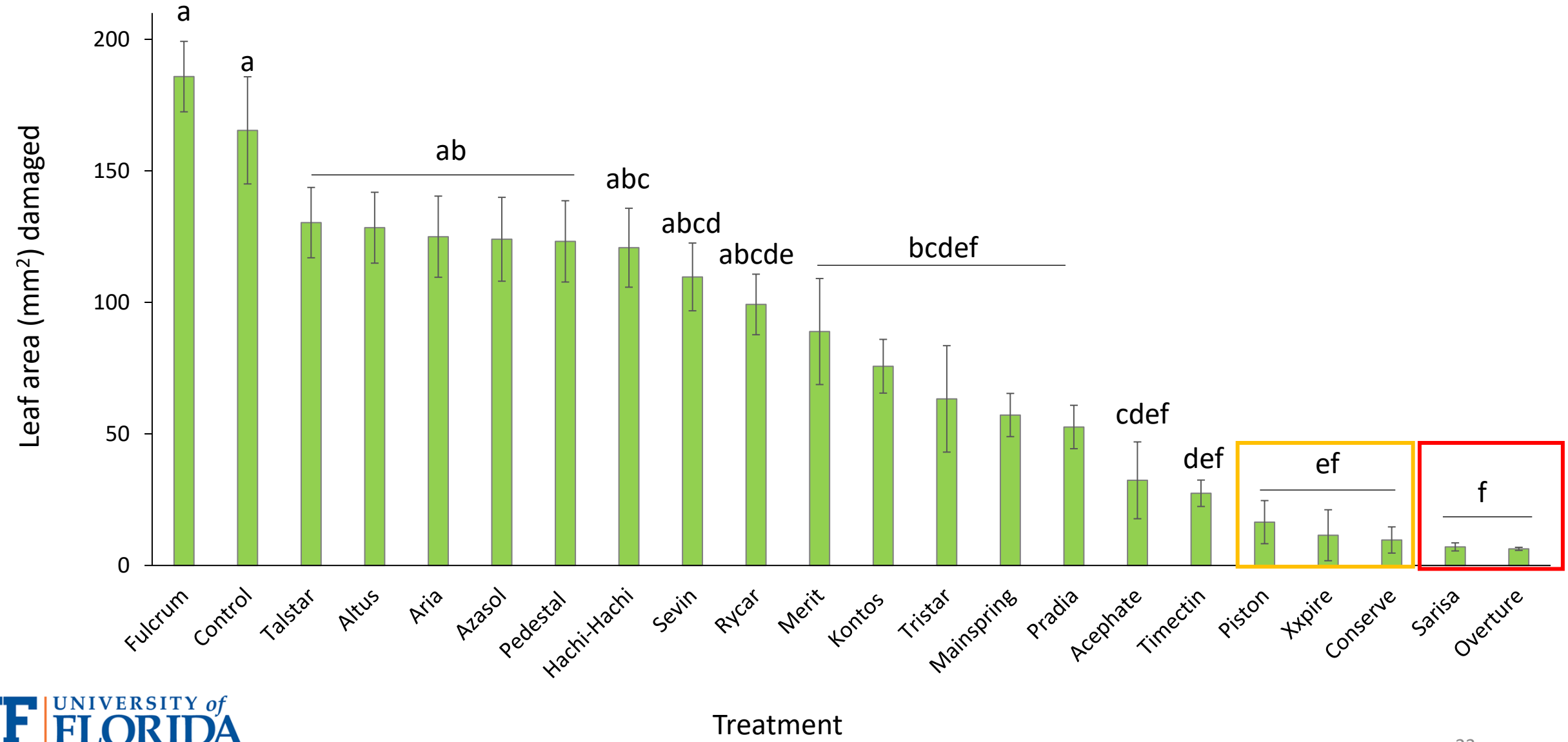
Feeding Damage – Adults (Indirect)



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Feeding Damage – Adults (Indirect)

Control

Fulcrum

Sarisa

Overture

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Tested Biorational Insecticides

- Included horticultural oils and one insecticidal soap

#	Product Name	Active Ingredient	Group	Rate	Site	EPA Registration #
1	Agropest	Thyme + Rosemary oil	Unclassified	0.5%	S, G, N, L	FIFRA 25 (b) exempt
2	Thyme Guard	Thyme oil	Unclassified	0.5%	S, G, N, L	FIFRA 25 (b) exempt
3	Bee Safe 3-in-1	Sesame oil	Unclassified	3 fl oz/ 1 gal	S, G, N, L	FIFRA 25 (b) exempt
4	Nuke EM	Citric Acid	Unclassified	8 fl oz / 1 gal	S, G, N, L	FIFRA 25 (b) exempt
5	Bush doctor force of nature insect repellent	Garlic oil	Unclassified	128 fl oz/ 100 gal	S, G, N, L	FIFRA 25 (b) exempt
6	Sierra Natural Science 209	Rosemary oil	Unclassified	54 fl oz/ 50 gal	S, G, N, S	FIFRA 25 (b) exempt
7	Arte + Guard	*Artemisia afra* + Canola oil	Unclassified	1 fl oz/ 1 gal	G, N, I, L	FIFRA 25 (b) exempt
8	Stylet JMS	Paraffinic oil	Unclassified	1 fl oz/ 1 gal	G, N, I, L	65564-1
9	SuffoilX	Mineral oil	Unclassified	2%	G, N, L	48813-1-68539
10	Ultrafine	Mineral oil	Unclassified	3%	G, N, L, I	86330-11
11	M-Pede	Potassium salts of fatty acids	Unclassified	2.5 fl oz/1 gal	G, N, L, I	10163-324

S: shadehouse, G: greenhouse, N: nursery, L: landscape, I: interior

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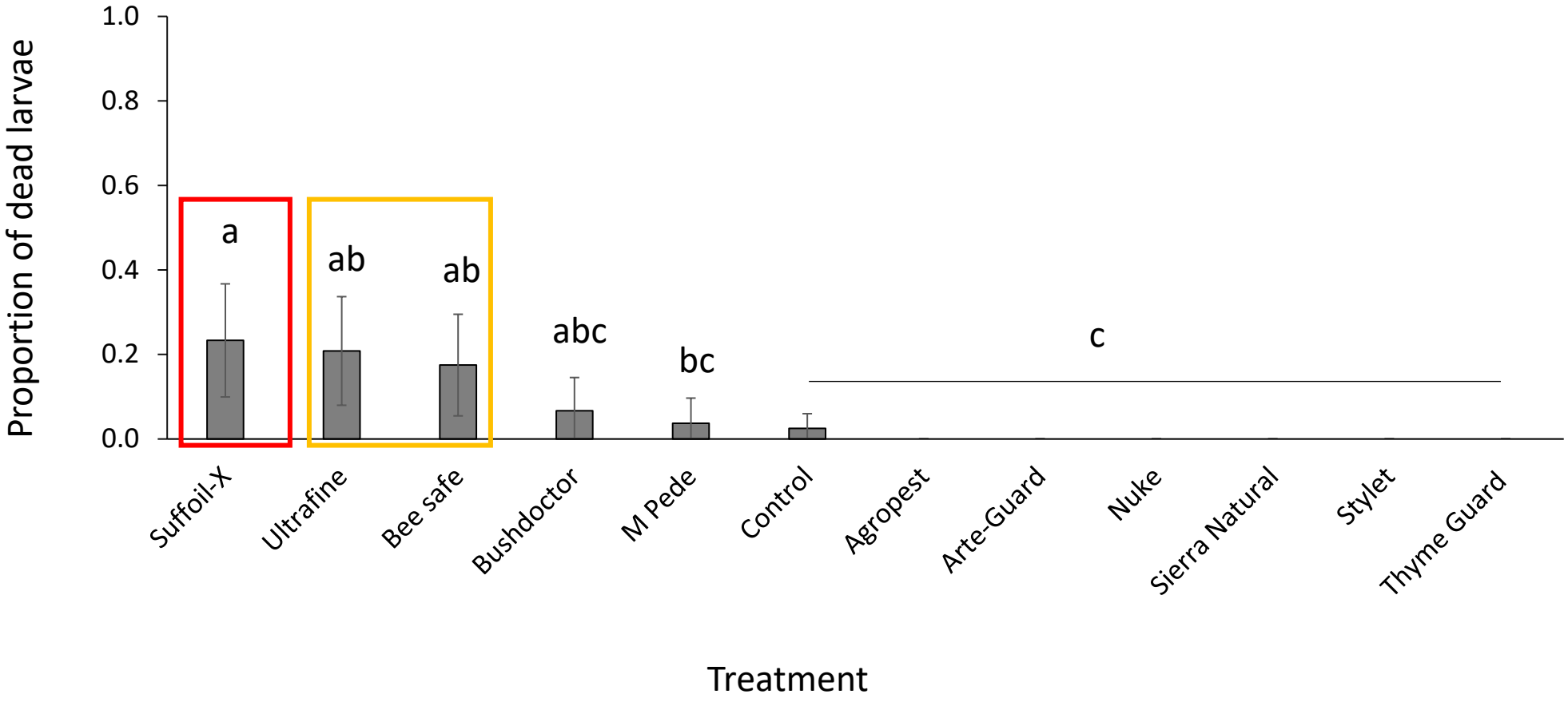
First-instar Larval Mortality (Direct)



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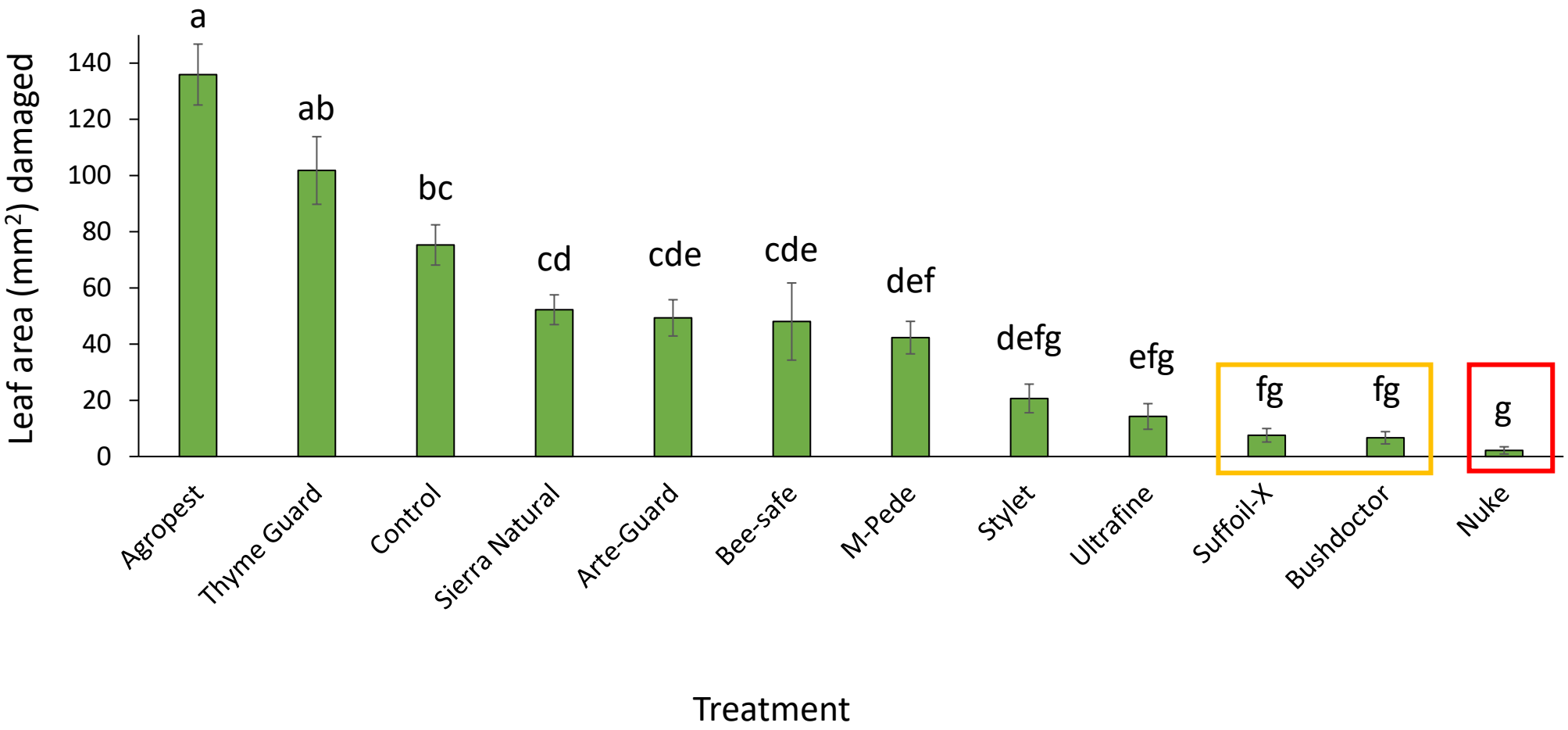
Feeding Damage - First-instar Larvae (Direct)



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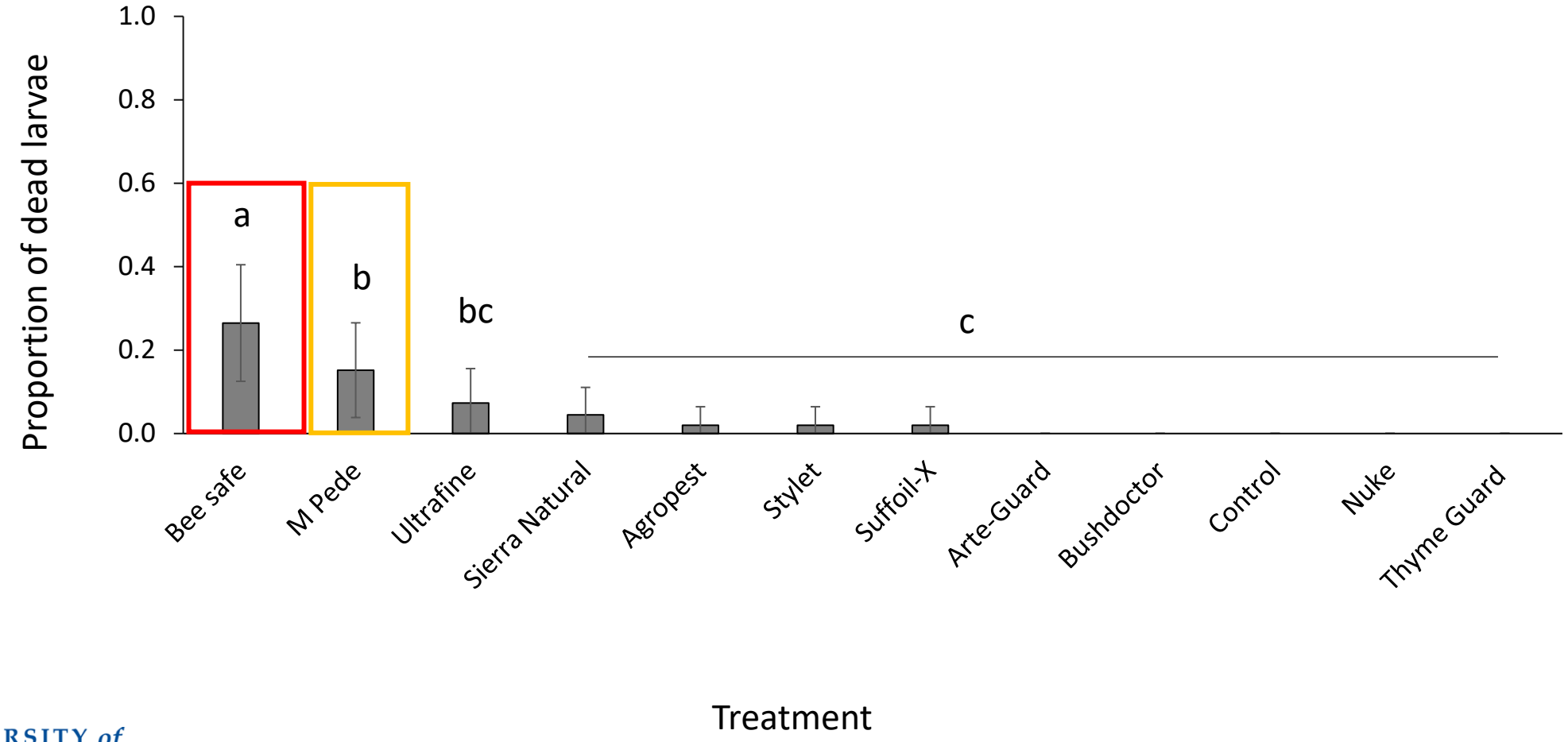
Feeding Damage - First-instar Larvae (Direct)

Control

Agropest
(Thyme + Rosemary)

Nuke (Citric acid)

Second-instar Larval Mortality (Direct)



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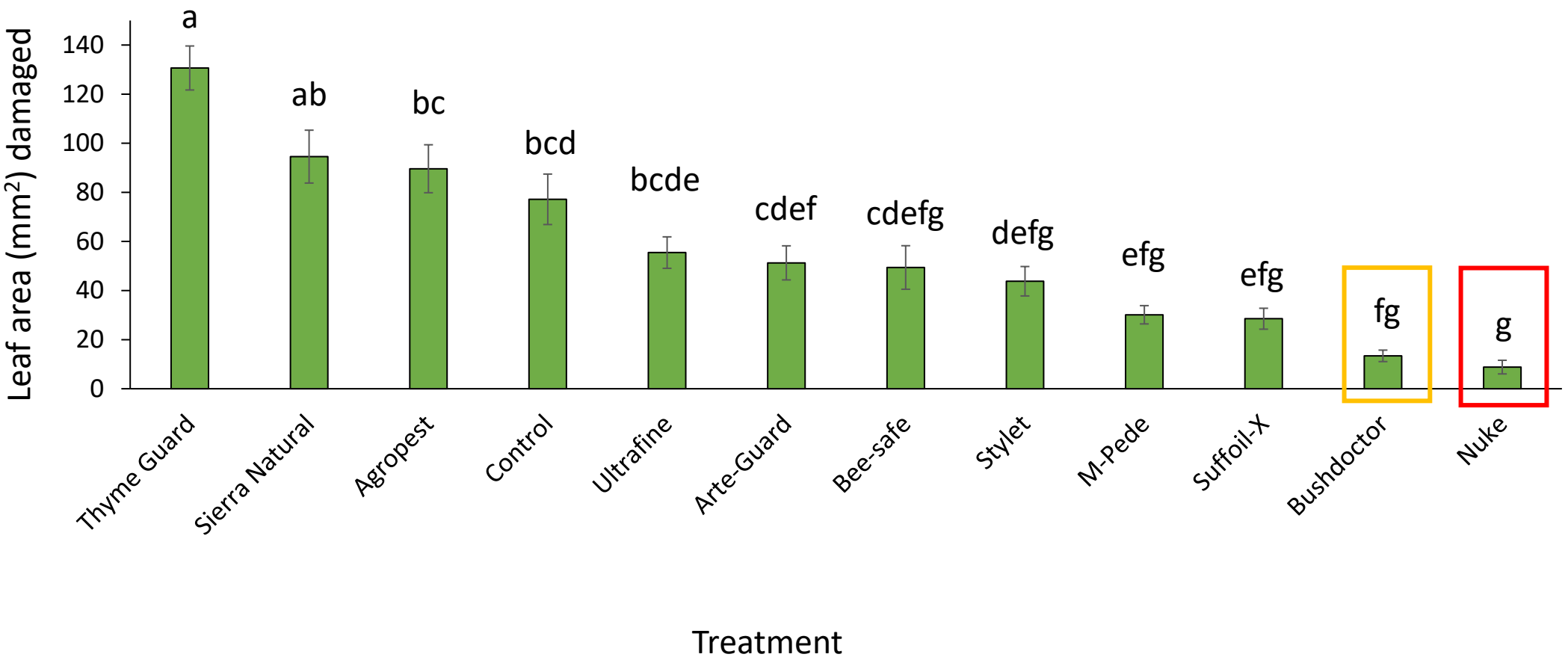
Feeding Damage - Second-instar Larvae (Direct)



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Feeding Damage - Second-instar Larvae (Direct)

Thyme Guard

Siera Natura Science (Rosemary oil)

Control

Nuke (Citric acid)

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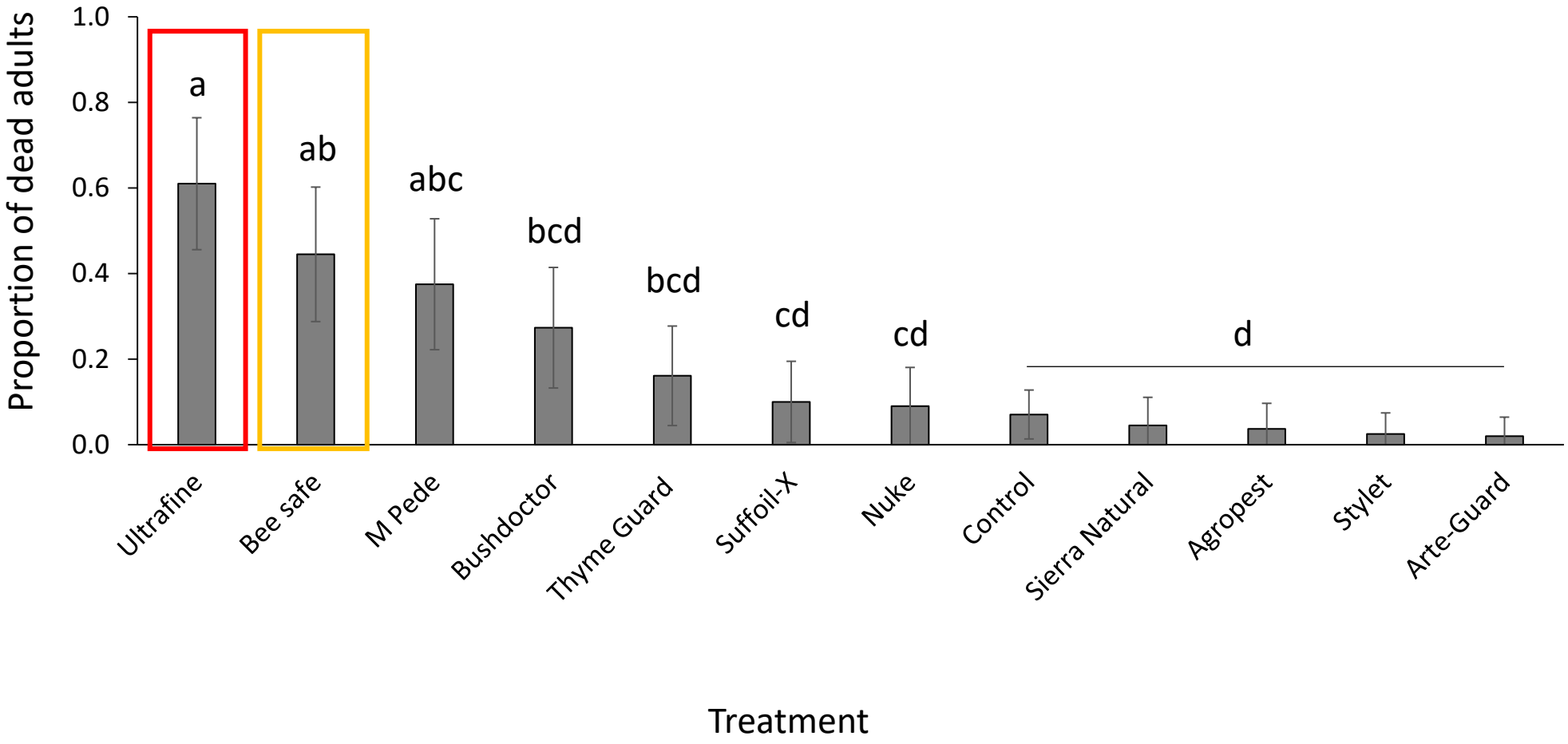
Adult Mortality (Direct)



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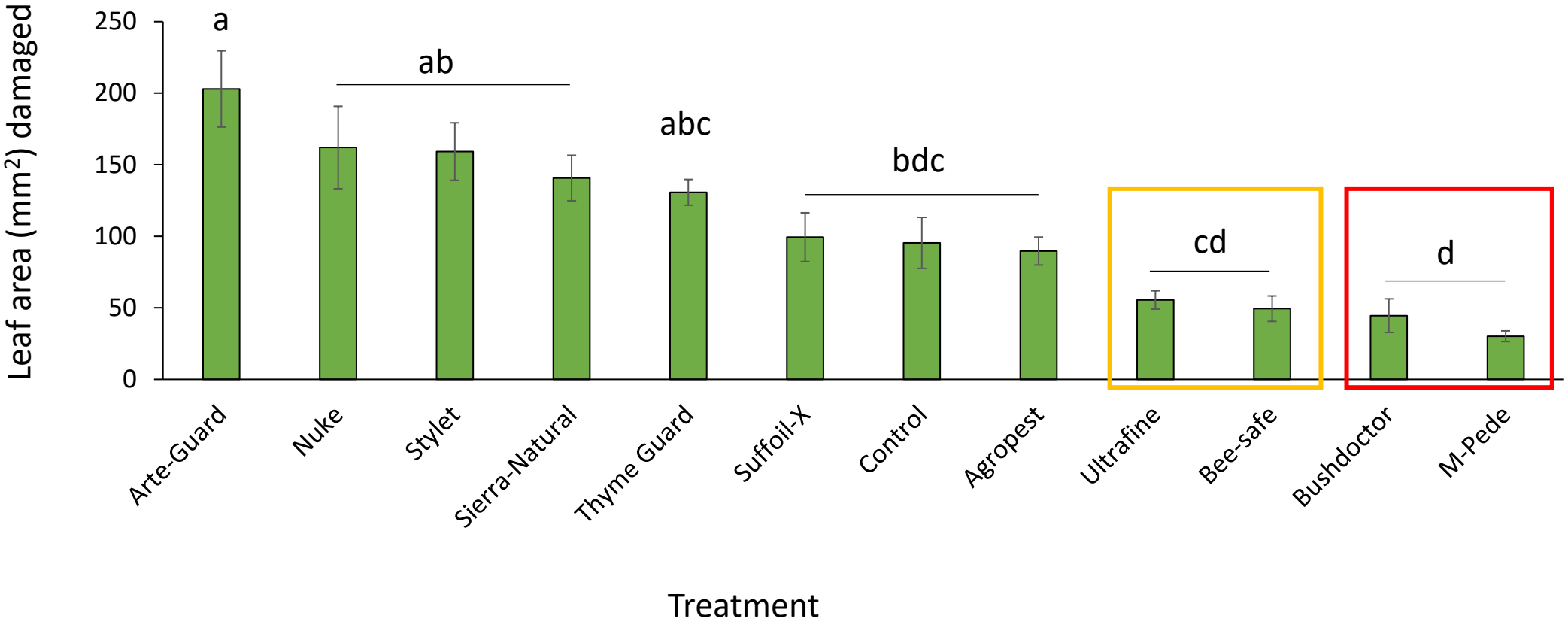
Feeding Damage – Adults (Direct)



Feeding Damage – Adults (Direct)

Arte-Guard

Control

Bushdoctor
(Garlic oil)

M-Pede

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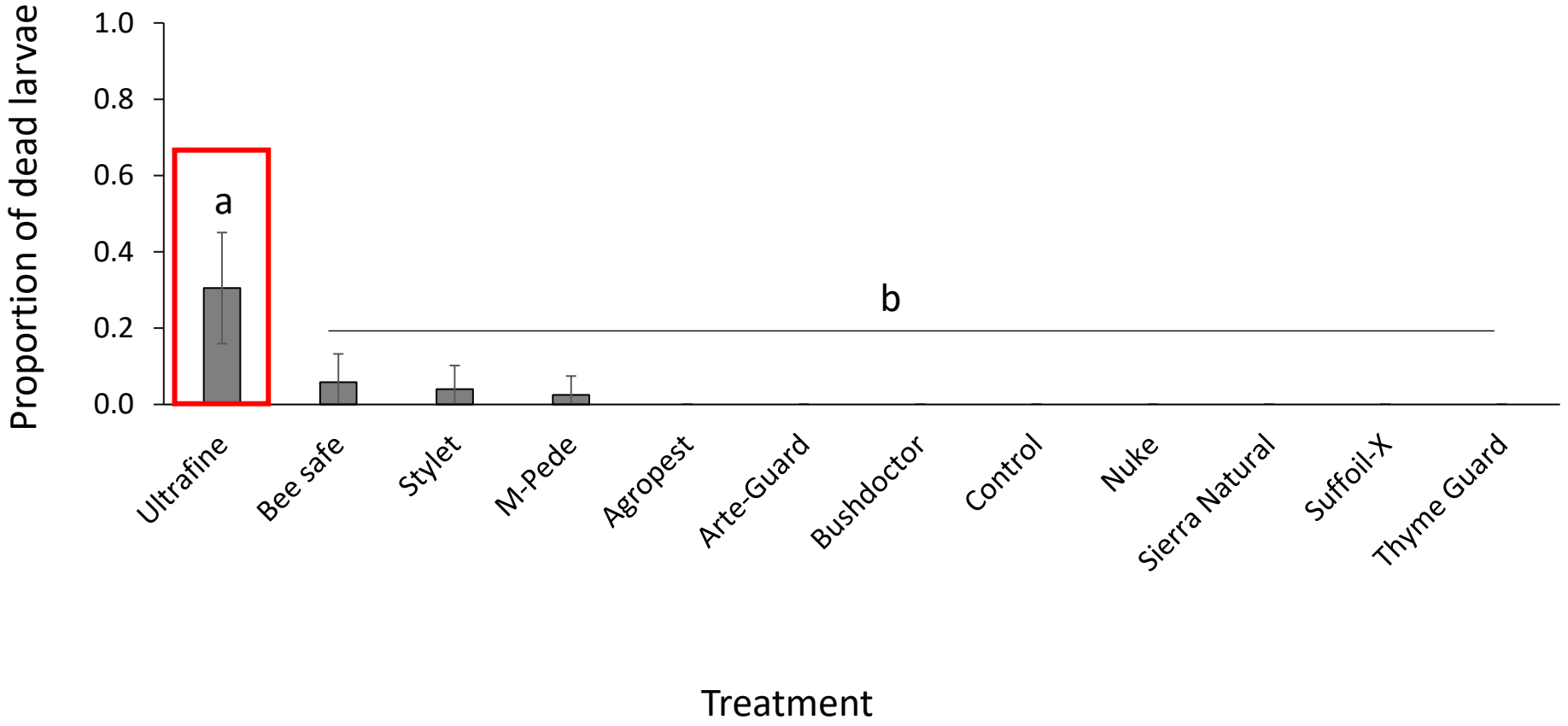
First-instar Larval Mortality (Indirect)



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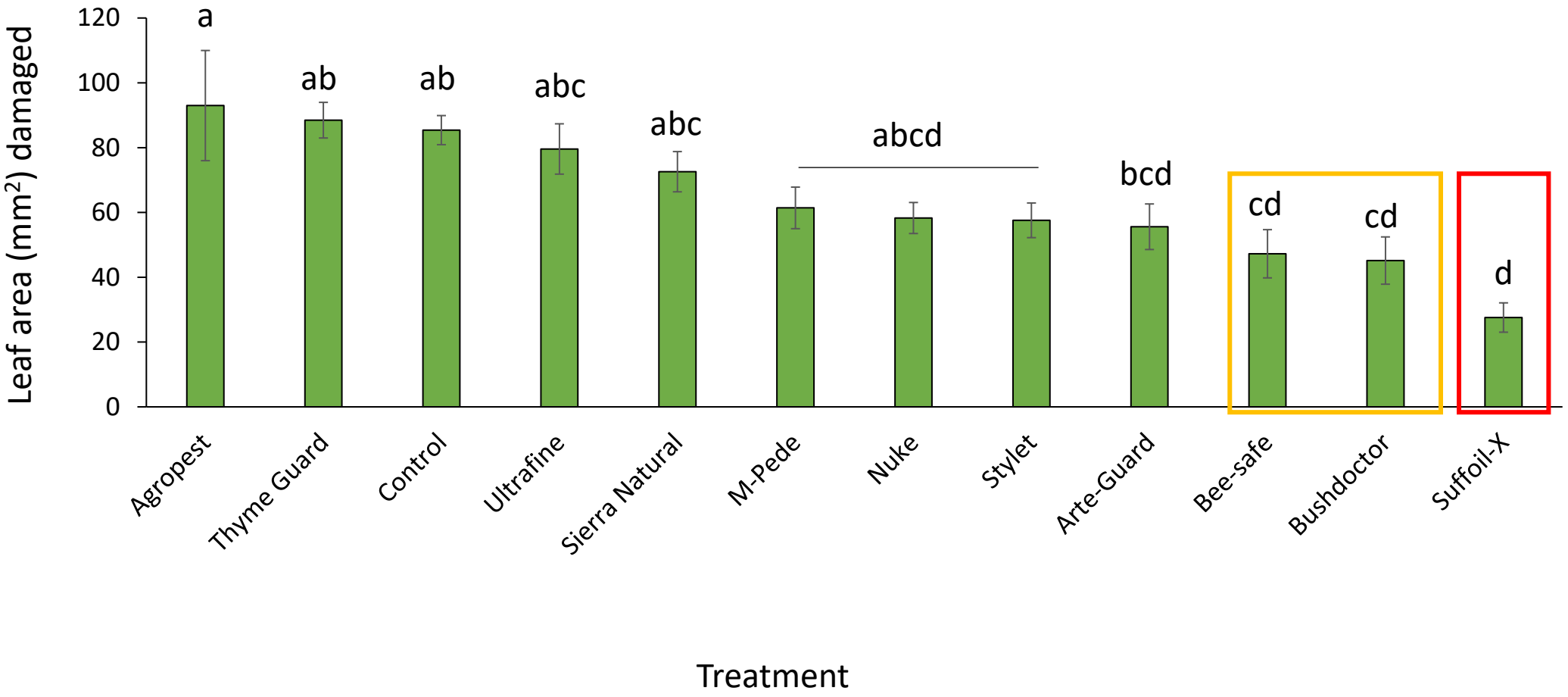
Feeding Damage - First-instar Larvae (Indirect)



Feeding Damage - First-instar Larvae (Indirect)

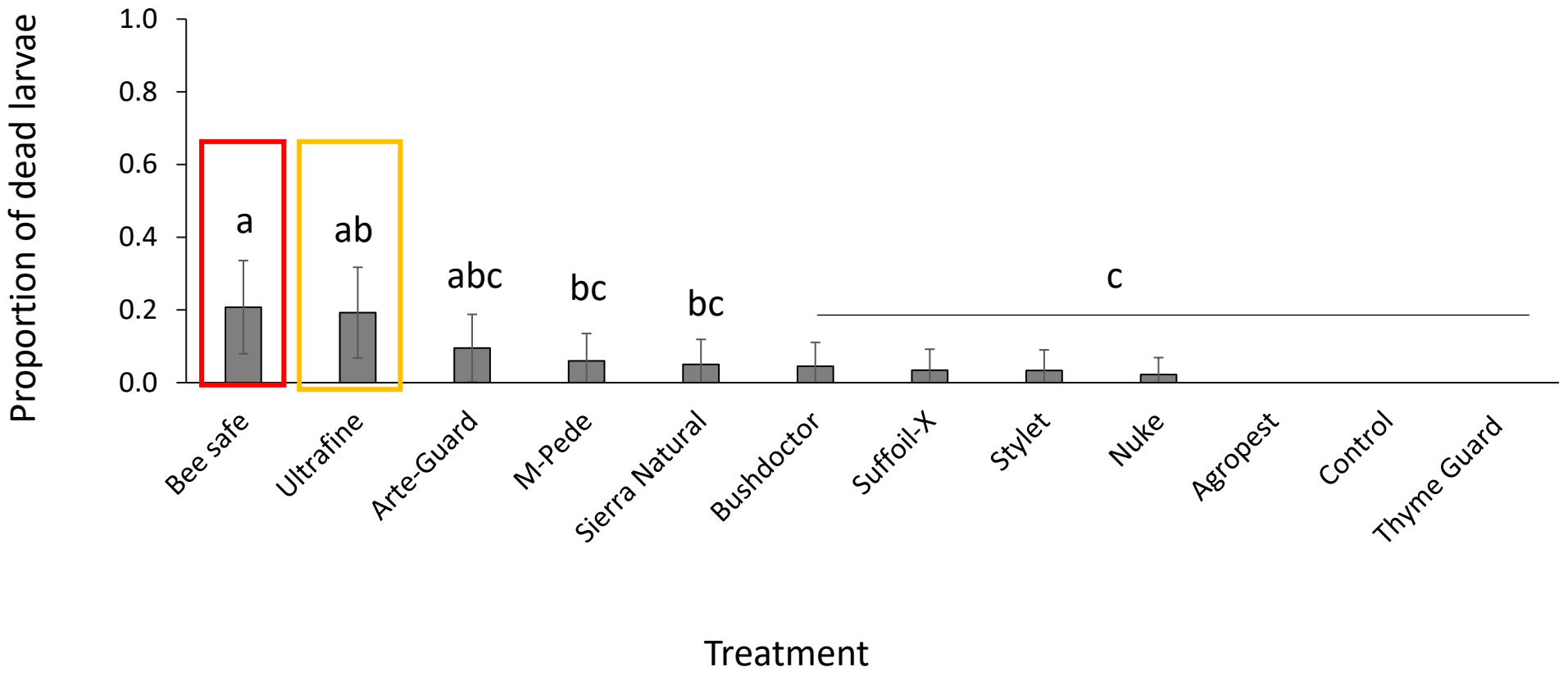
Agropest
(Thyme + Rosemary)

Thyme Guard

Control

Suffoil- X

Second-instar Larval Mortality (Indirect)



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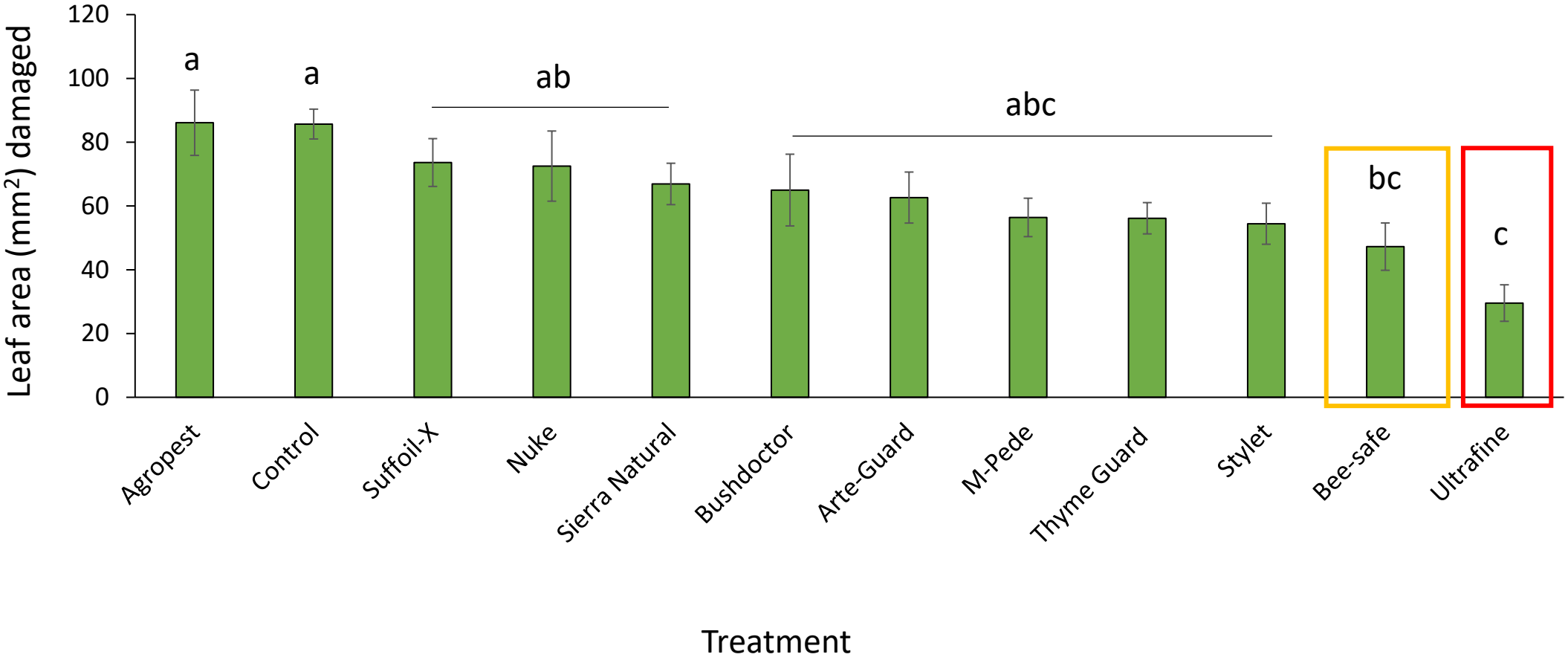
Feeding Damage - Second-instar Larvae (Indirect)



Feeding Damage - Second-instar Larvae (Indirect)

Agropest
(Thyme + Rosemary)

Control

Ultrafine

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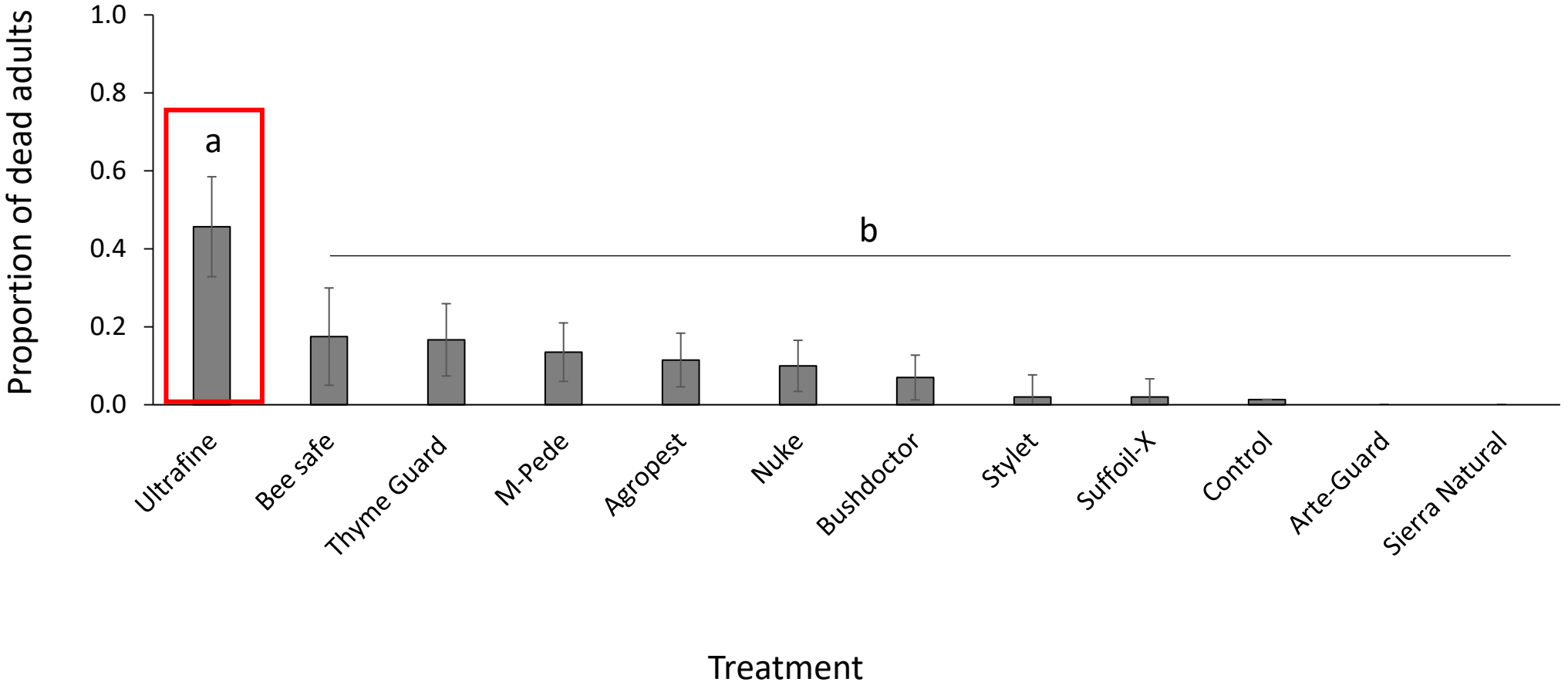
Adult Mortality (Indirect)



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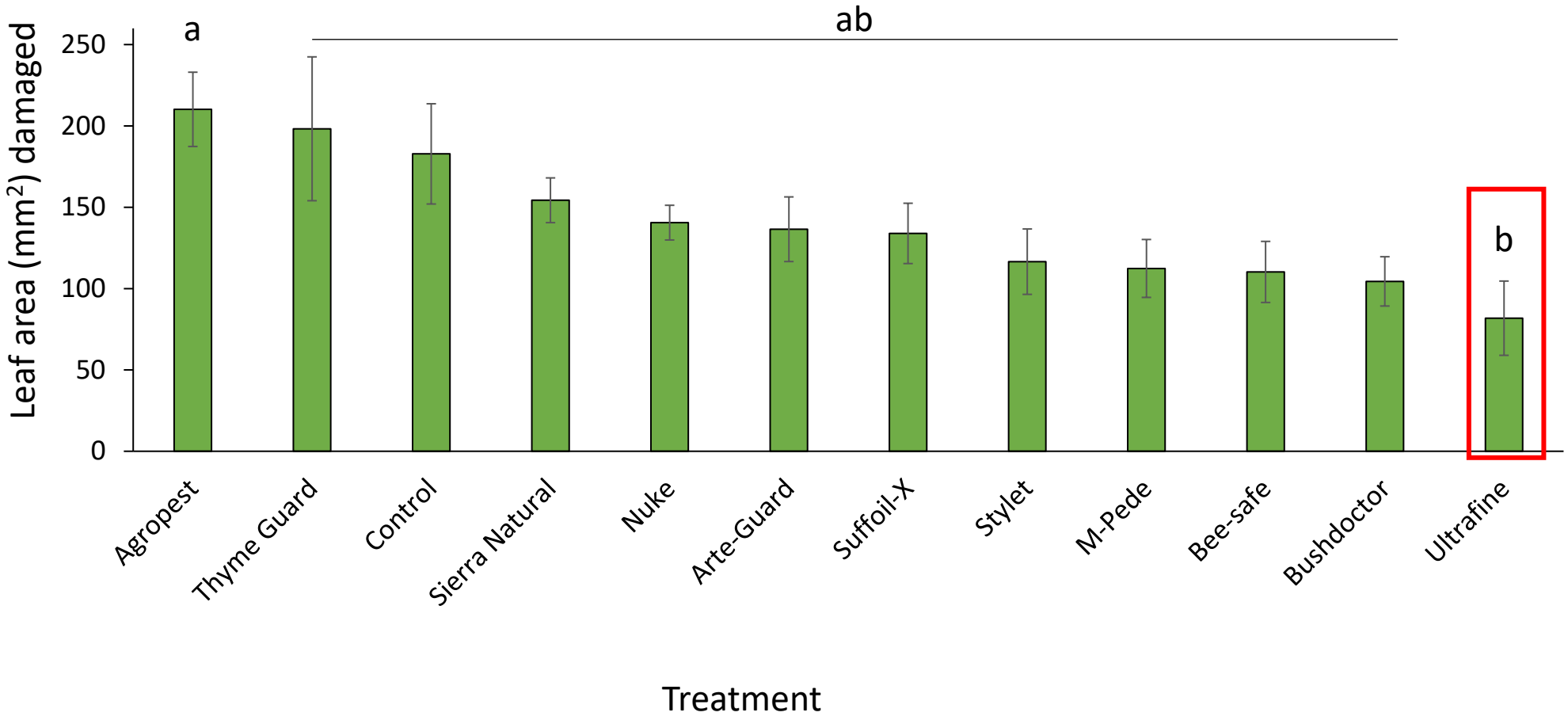
Feeding Damage – Adults (Indirect)



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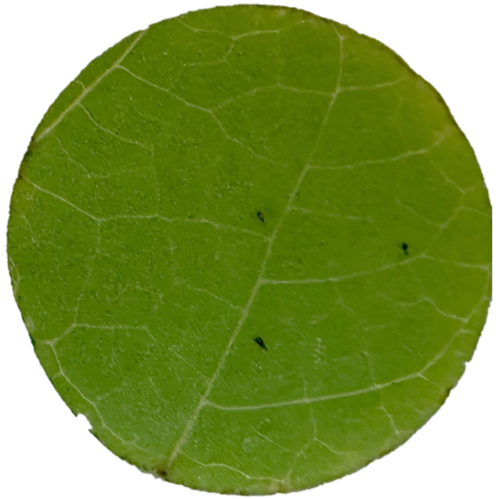
Feeding Damage – Adults (Indirect)

Agropest
(Thyme + Rosemary)

Control



Ultrafine

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Tested Microbial Insecticides

#	Product Name	Active Ingredient	Rate	Site	EPA Registration #
1	Bioceres WP	*Beauveria bassiana* Strain ANT-03	3 lbs/ 100 gal	G, N, L	89600-2
2	Bioceres EC	*Beauveria bassiana* Strain ANT-03	4 ml/L	G, N, I	334-93
3	BotaniGard 22 WP	*Beauveria bassiana* Strain GHA	2 lbs/ 100 gal	G, N, L, I	820774-2
4	PFR-97 20% WDG	*Isaria fumosorosea* Apopka strain 97	2 lbs/ 100 gal	G, N	70051-19
5	Met Master	*Metarhizium anisopliae*	32 oz/ 100 gal	G, N, L	-
6	Grandevo	*Chromobacterium subtsugae* strain PRAA4-1T	0.55 oz/ 0.2 gal	G, F, L	84059-27

S: shadehouse, G: greenhouse, N: nursery, L: landscape, I: interior, F: field

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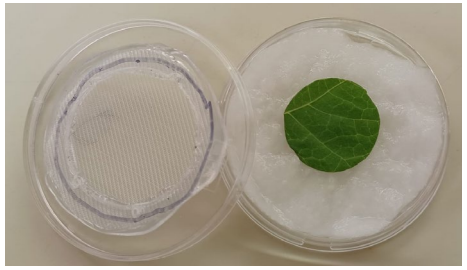
Direct spray on *Thrips parvispinus*

1. Bean leaf discs 24mm diameter



2. Five L1, L2 or adults
3. Treatment application → Potter Tower
4. Mortality at 24h, 48h, 72h, 96h and 144h (6 days) post treatment
5. Feeding damage at 144h → Image J

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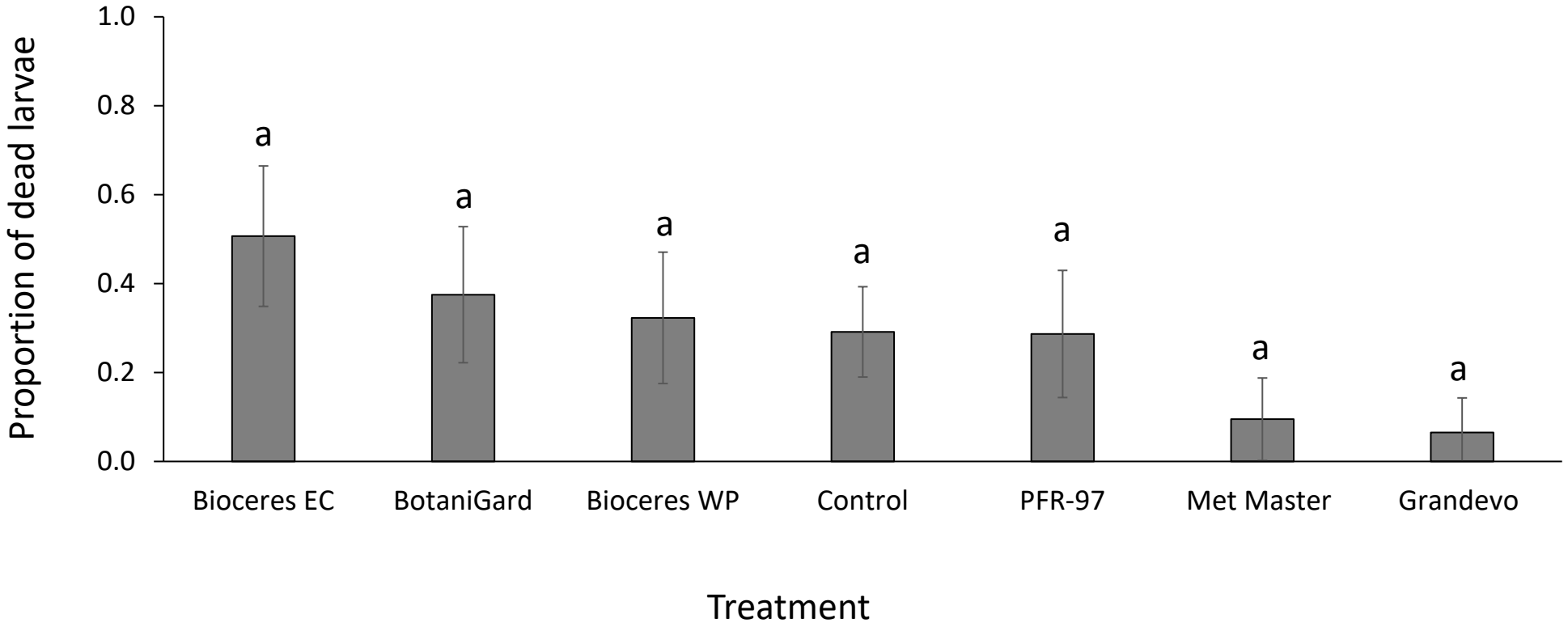
First-instar Larval Mortality (Direct)



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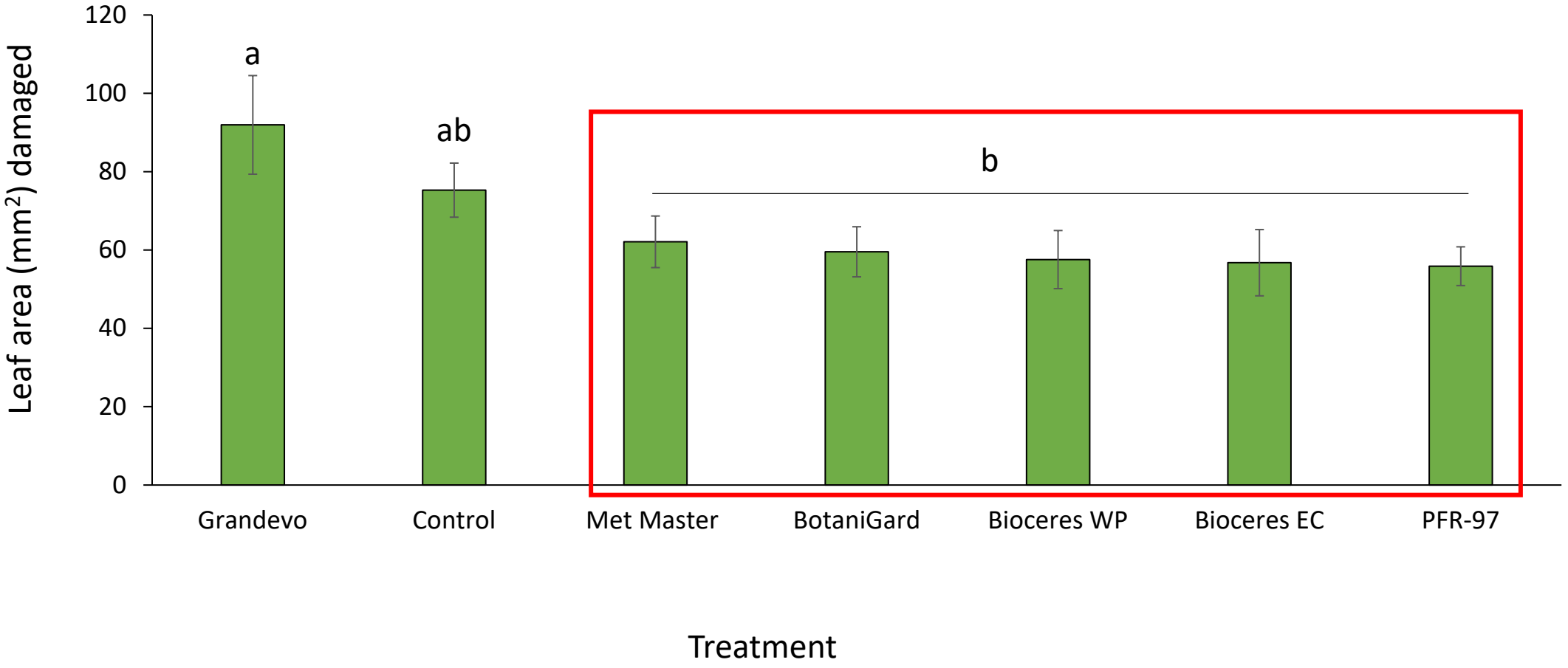
Feeding Damage - First-instar Larvae (Direct)



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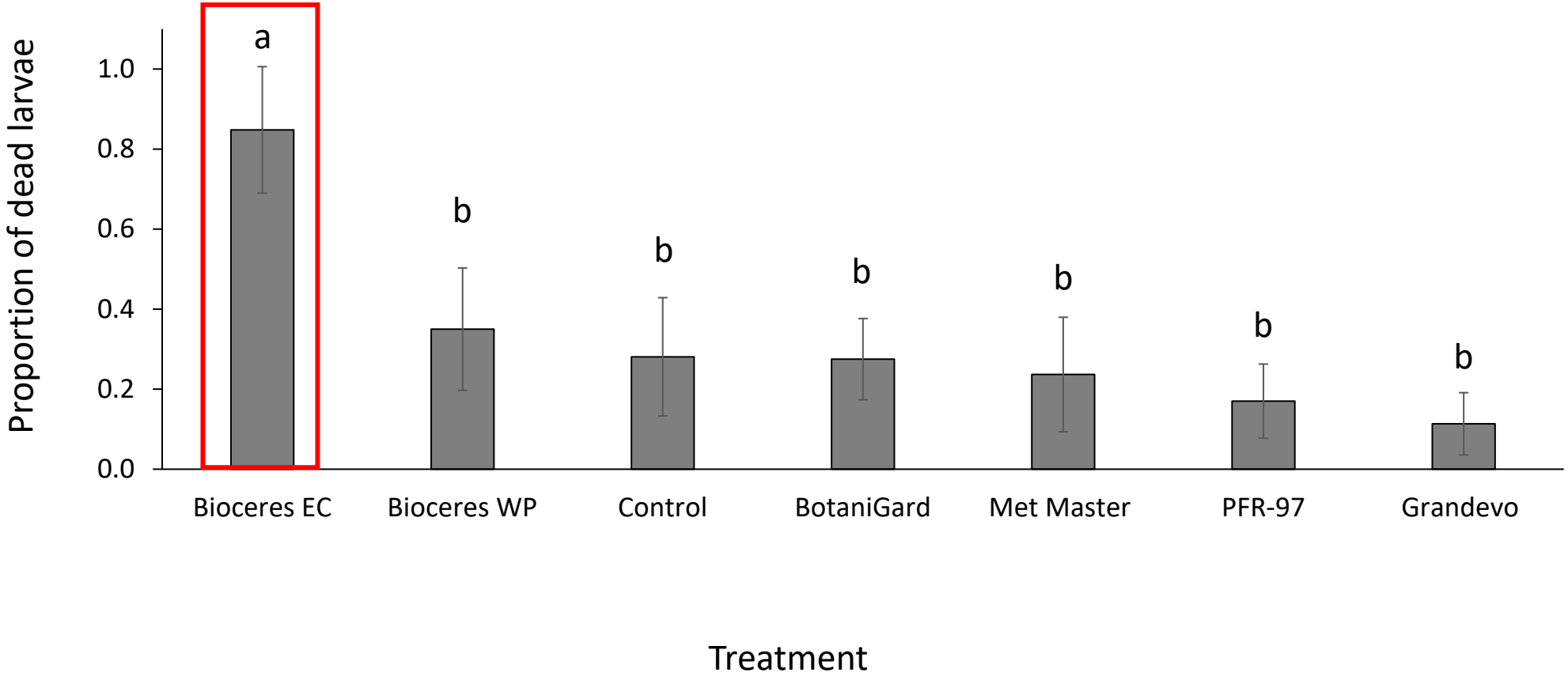
Feeding Damage - First-instar Larvae (Direct)

Grandevo

Control

PFR-97

Second-instar Larval Mortality (Direct)



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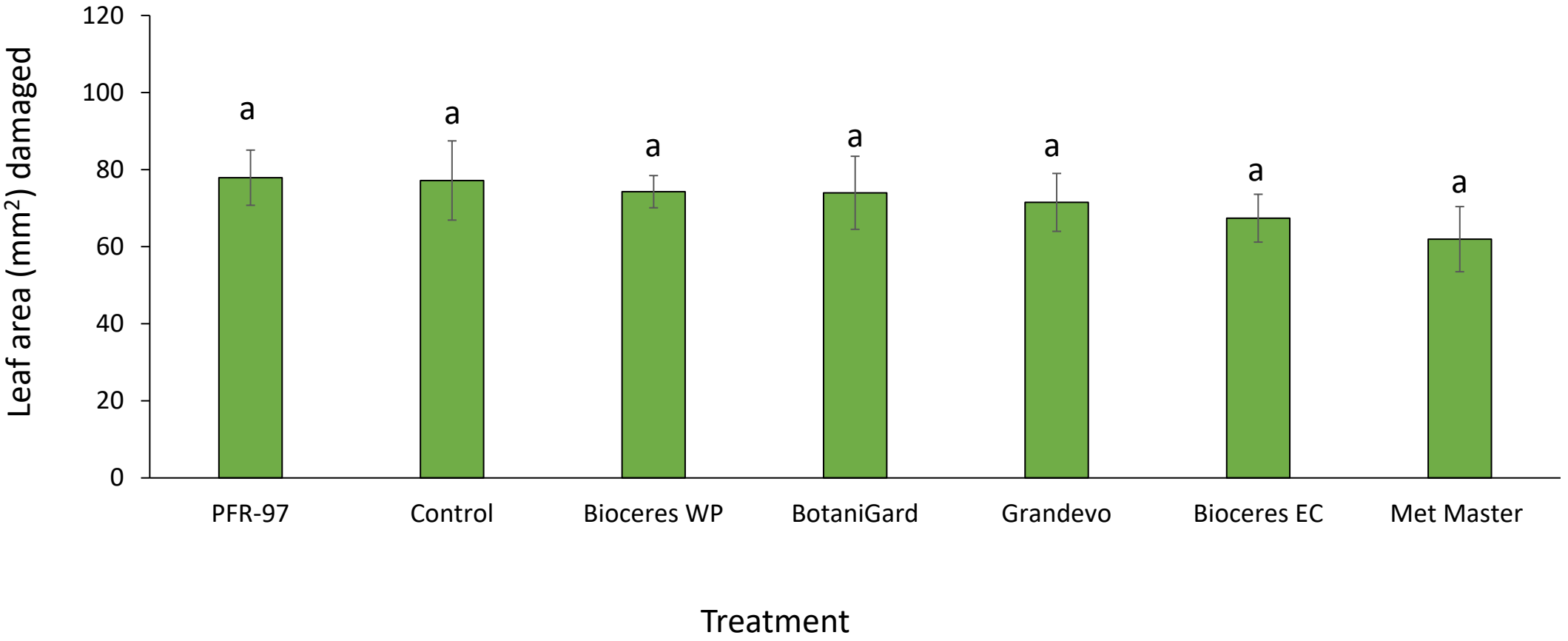
Feeding Damage - Second-instar Larvae (Direct)



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Feeding Damage - Second-instar Larvae (Direct)

PFR-97

Control

Met Master

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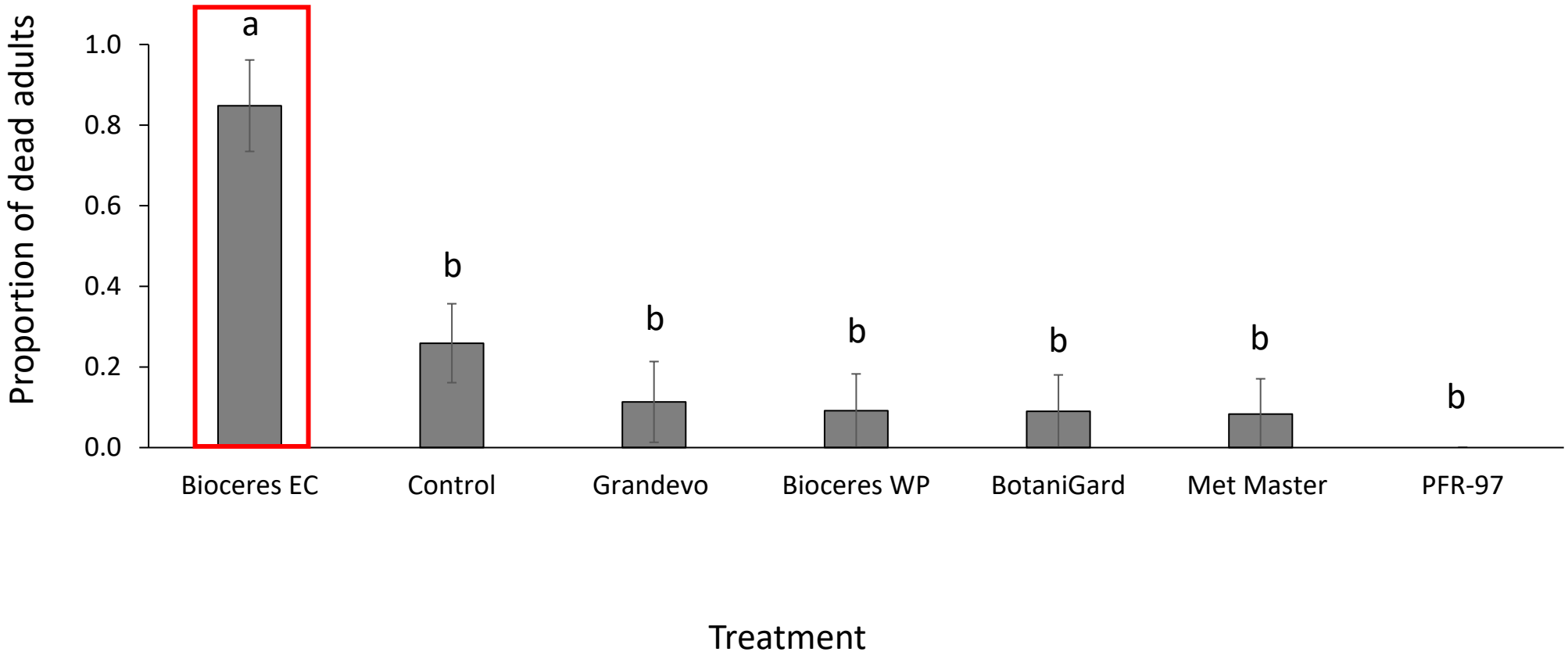
Adult Mortality (Direct)



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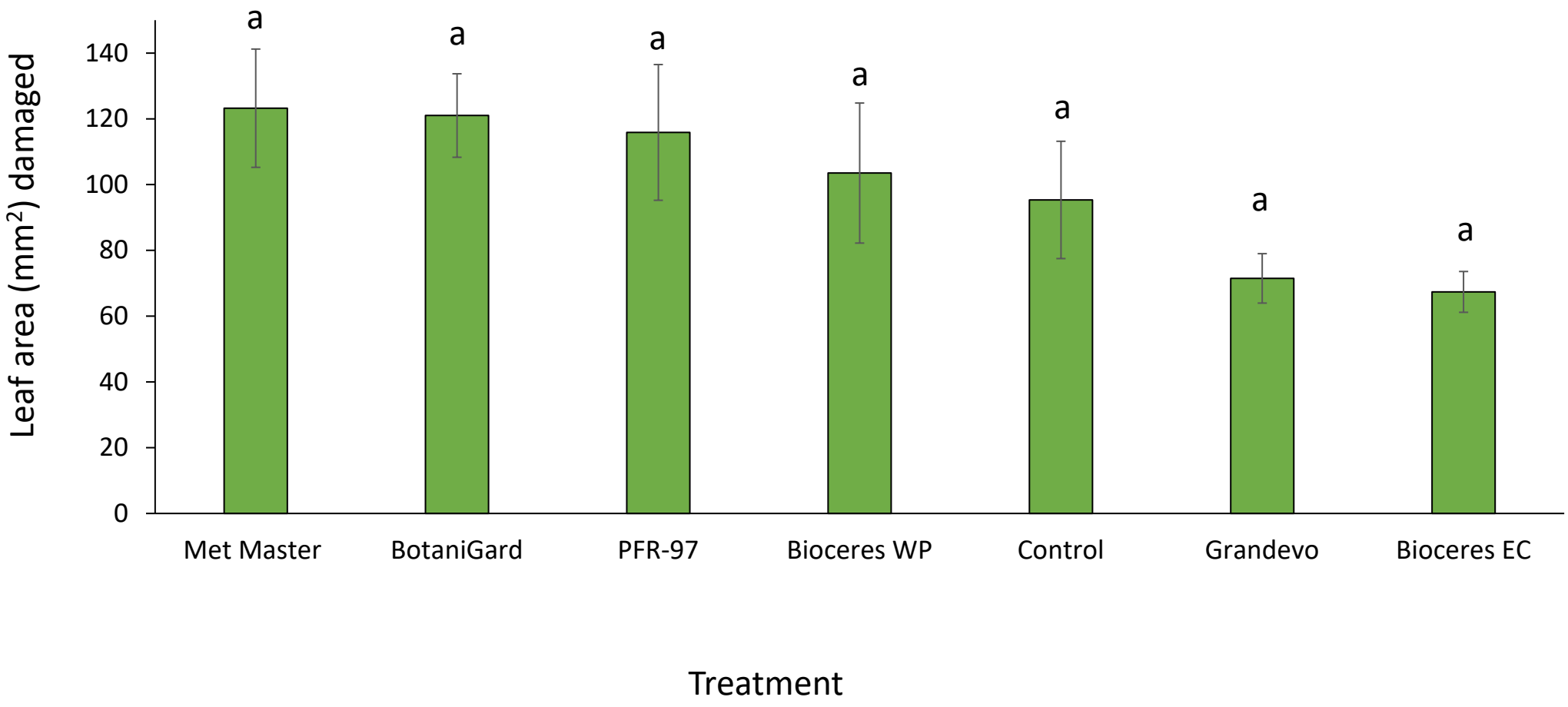
Feeding Damage – Adults (Direct)



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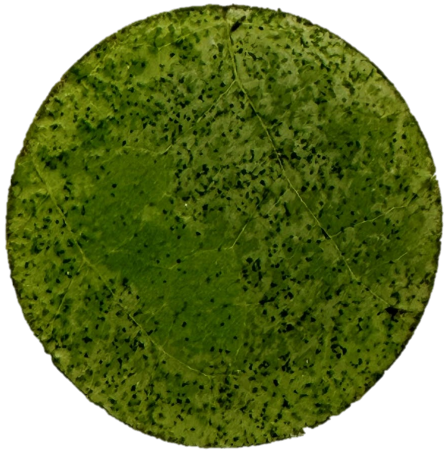
Feeding Damage – Adults (Direct)

Met Matser

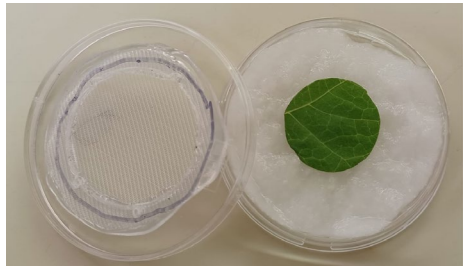


Control

Bioceres EC

Spray on Plants – Indirect Spray

1. Treatment application → bean plants
2. Bean leaf discs 24mm diameter
3. Five L1, L2 or adults
4. Mortality at 24h, 48h, 72h, 96h and 144h (6 days) post treatment
5. Feeding damage at 144h → Image J



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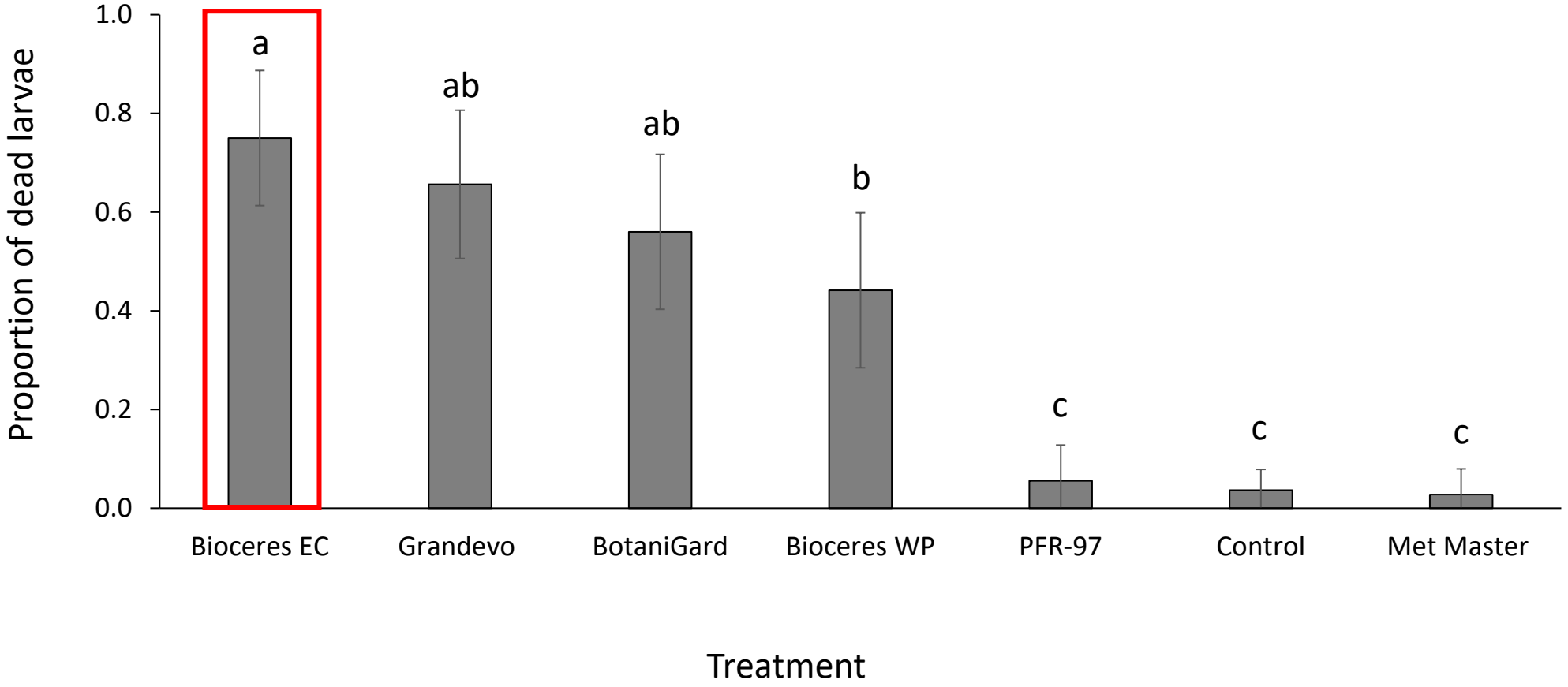
First-instar Larval Mortality (Indirect)



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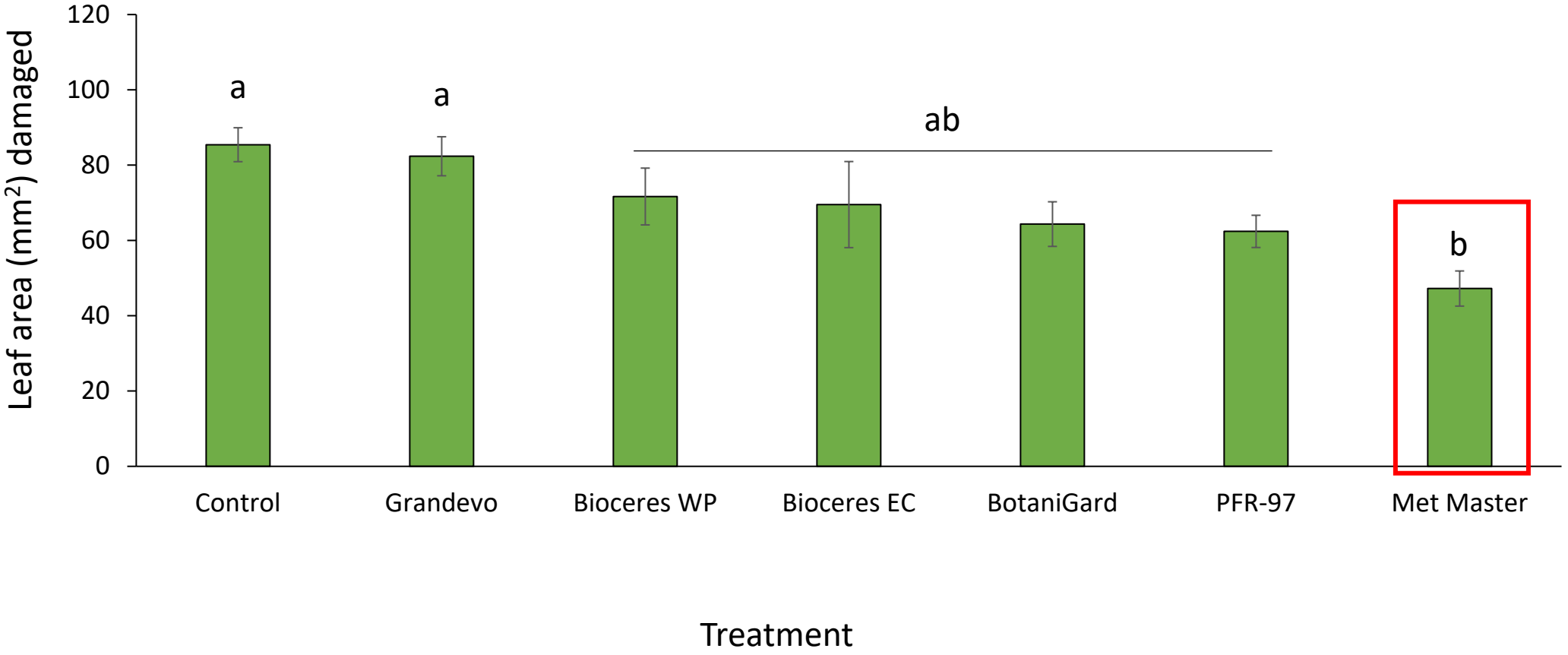
Feeding Damage - First-instar Larvae (Indirect)



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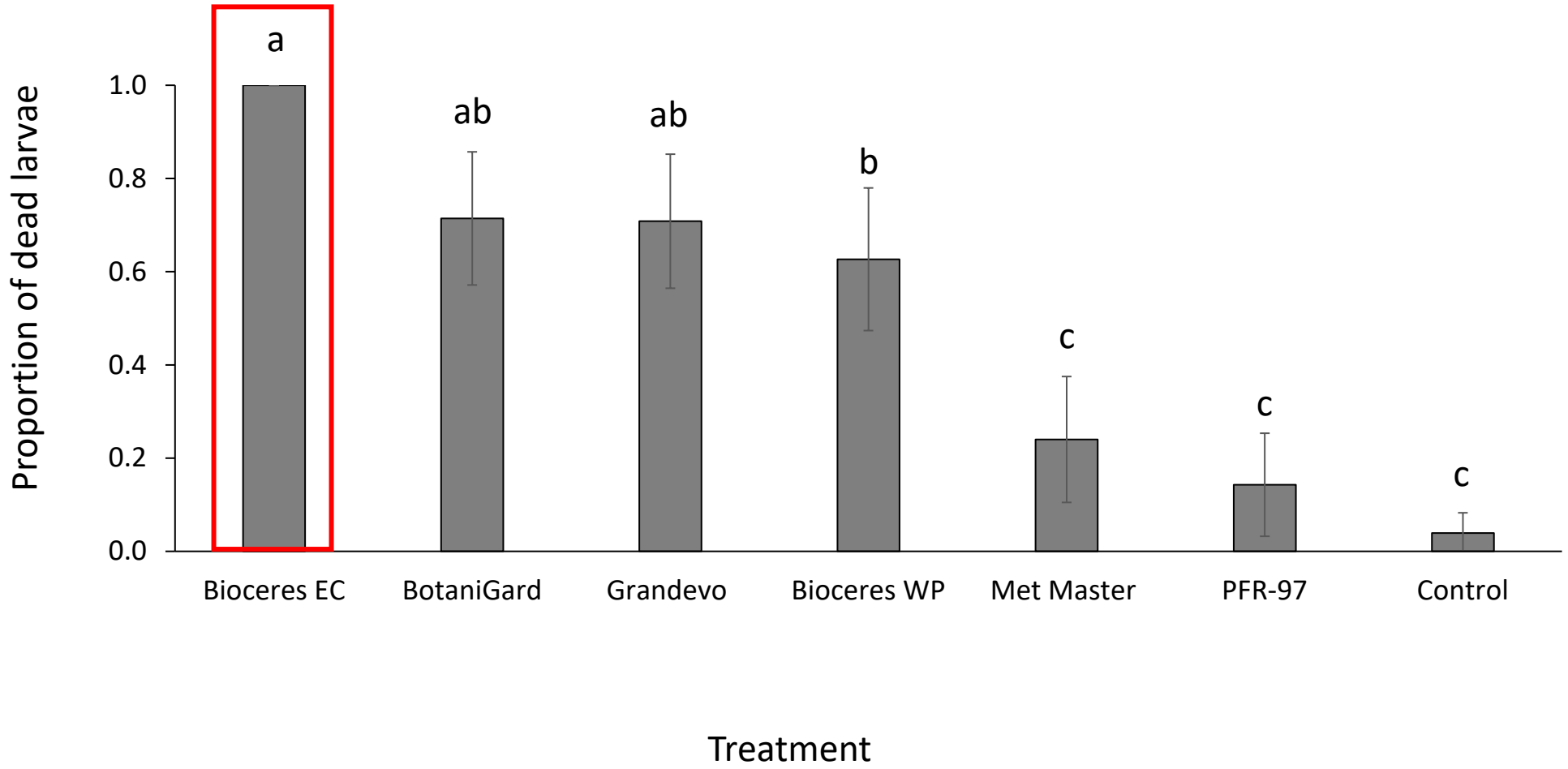
Feeding Damage - First-instar Larvae (Indirect)

Grandevo

Control

Met Master

Second-instar Larval Mortality (Indirect)



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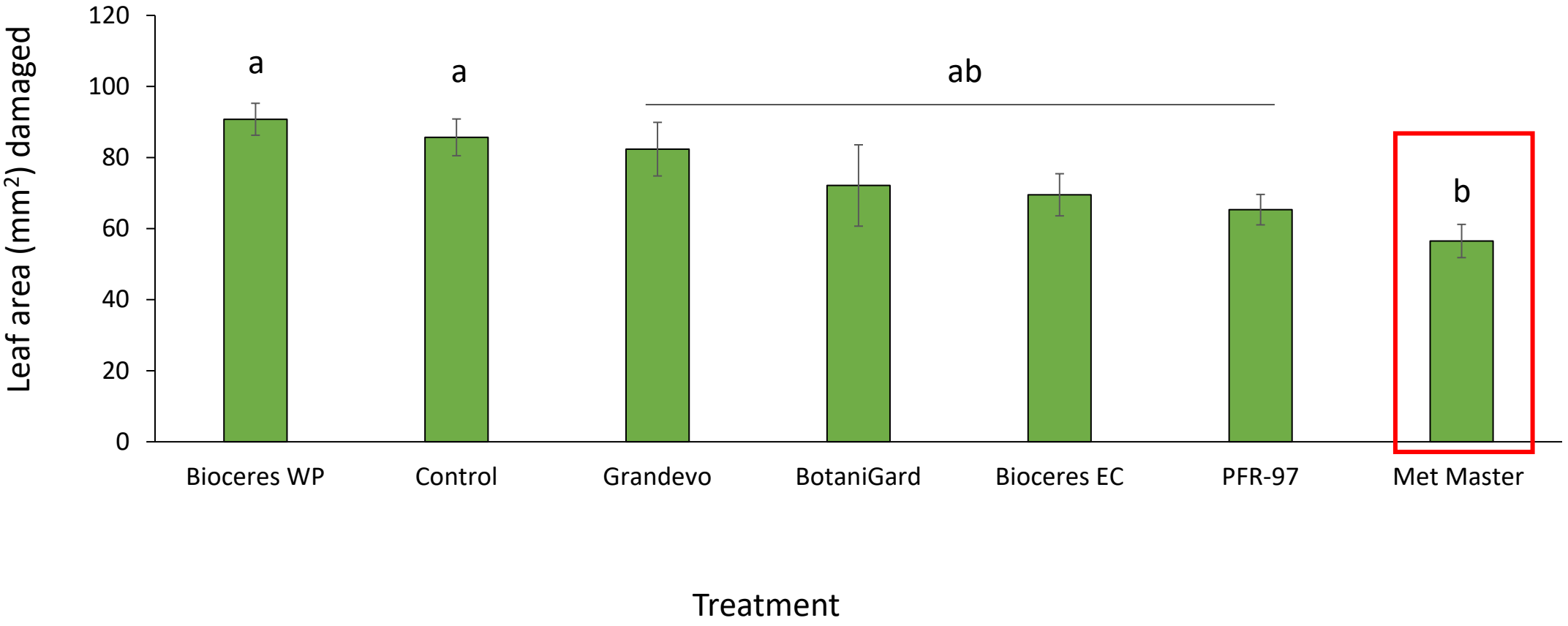
Feeding Damage - Second-instar Larvae (Indirect)



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Feeding Damage - Second-instar Larvae (Indirect)

Bioceres WP

Control

Met Master

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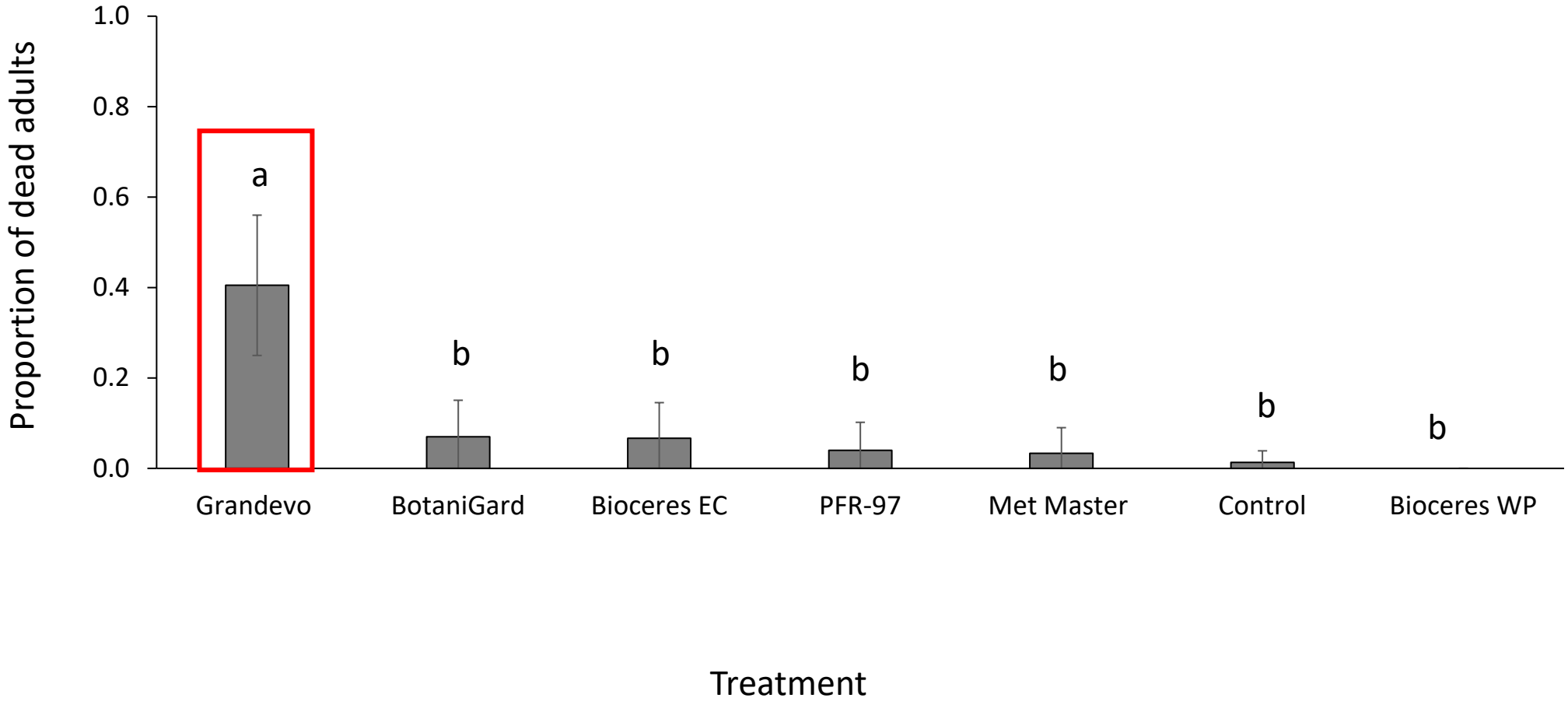
Adult Mortality (Indirect)



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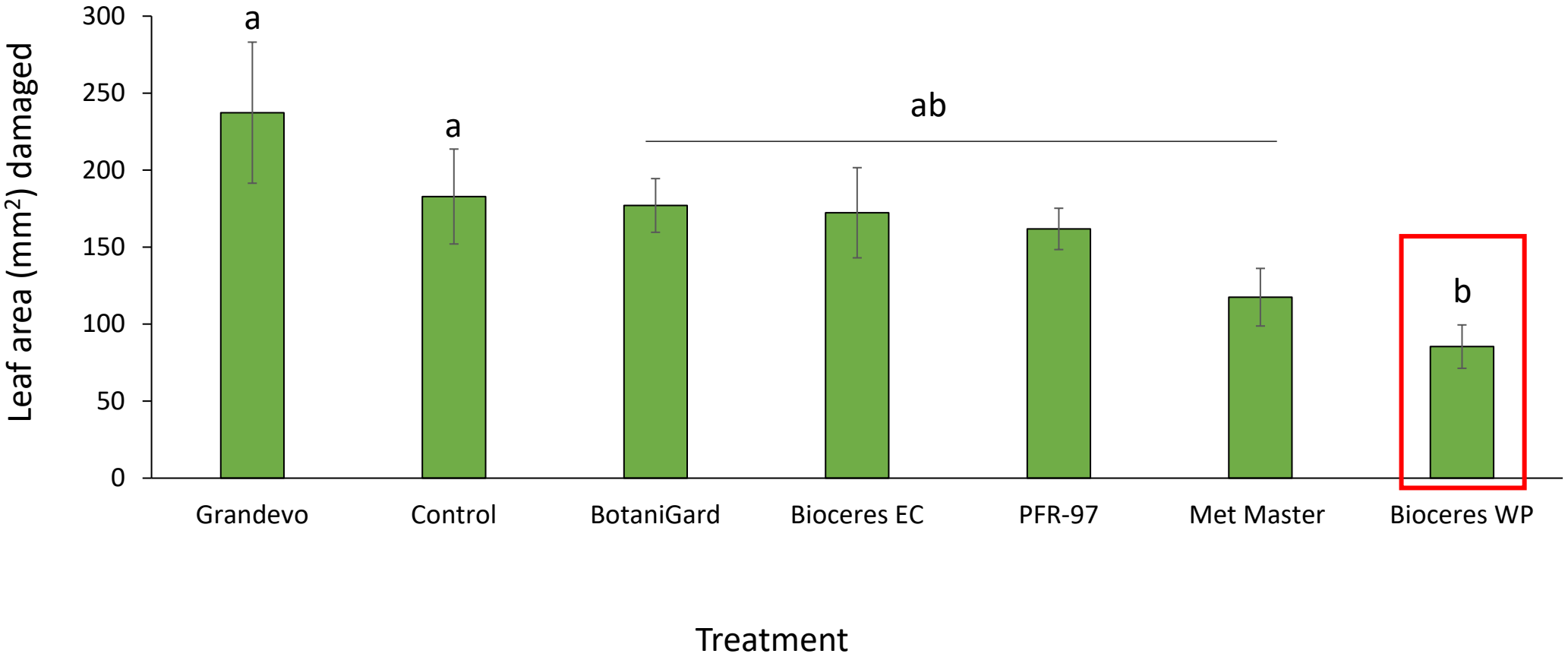
Feeding Damage – Adults (Indirect)



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Feeding Damage – Adults (Indirect)

Grandevo

Control

Bioceres WP

Overall Efficacy - Chemical Insecticides

Treatment	L1 Direct	L1 Indirect	L1 Feeding	L2 Direct	L2 Indirect	L2 Feeding	Adult Direct	Adult Indirect	Adult Feeding
Xxpire	X	X	X		X	X	X	X	X
Conserve SC	X	X	X	X	X	X	X	X	X
Timectin	X	X	X			X			X
Piston	X	X	X	X	X	X	X	X	X
Kontos		X	X			X			
Pedestal	X	X							
Sarisa	X		X			X			X
Acephate			X			X			X
Hatchi-Hatchi SC	X			X	X	X			
Mainspring GNL			X			X			X
Overture			X			X		X	X
Pradia	X		X			X			
Tristar	X						X		X

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Overall Efficacy - Chemical Insecticides

Treatment	Group	L1 Direct	L1 Indirect	L1 Feeding	L2 Direct	L2 Indirect	L2 Feeding	Adult Direct	Adult Indirect	Adult Feeding
Xxpire	4C + 5	X	X	X		X	X	X	X	X
Conserve SC	5	X	X	X	X	X	X	X	X	X
Timectin	6	X	X	X			X			X
Piston	13	X	X	X	X	X	X	X	X	X
Kontos	23		X	X			X			
Pedestal	15	X	X							
Sarisa	28	X		X			X			X
Acephate	1B			X			X			X
Hatchi-Hatchi SC	21A	X			X	X	X			
Mainspring GNL	28			X			X			X
Overture	Unclassified			X			X		X	X
Pradia	28 + 29	X		X			X			
Tristar	4A	X						X		X

Overall Efficacy - Biorational Insecticides

Treatment	Active Ingredient	L1 Direct	L1 Indirect	L1 Feeding	L2 Direct	L2 Indirect	L2 Feeding	Adult Direct	Adult Indirect	Adult Feeding
Bee Safe	Sesame oil	X		X	X	X	X	X		X
Nuke EM	Citric Acid			X			X			
Bush doctor	Garlic oil			X			X			X
Suffoil-X	Mineral oil	X		X						
Ultrafine	Mineral oil	X	X			X	X	X	X	X
M-Pede	Potassium salts of fatty acids				X					X

Take-home Messages

- Rotation is the key to avoid resistance!
- Horticultural oils, biorational insecticides and insecticidal soaps should be considered for rotation
- 1st instar larvae more susceptible
- Adults cause more feeding damage than larvae
- Microbial insecticides show potential → more research

Resources

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Thank You!

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Thrips parvispinus Task Force
Miami-Dade County Agricultural Manager's Office

FNGLA
FLORIDA NURSERY, GROWERS AND LANDSCAPE ASSOCIATION
MIAMI-DADE CHAPTER

FLORIDA FARM BUREAU
VOICE OF AGRICULTURE
DADE COUNTY

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