Ecology and Management Options for *Thrips parvispinus*

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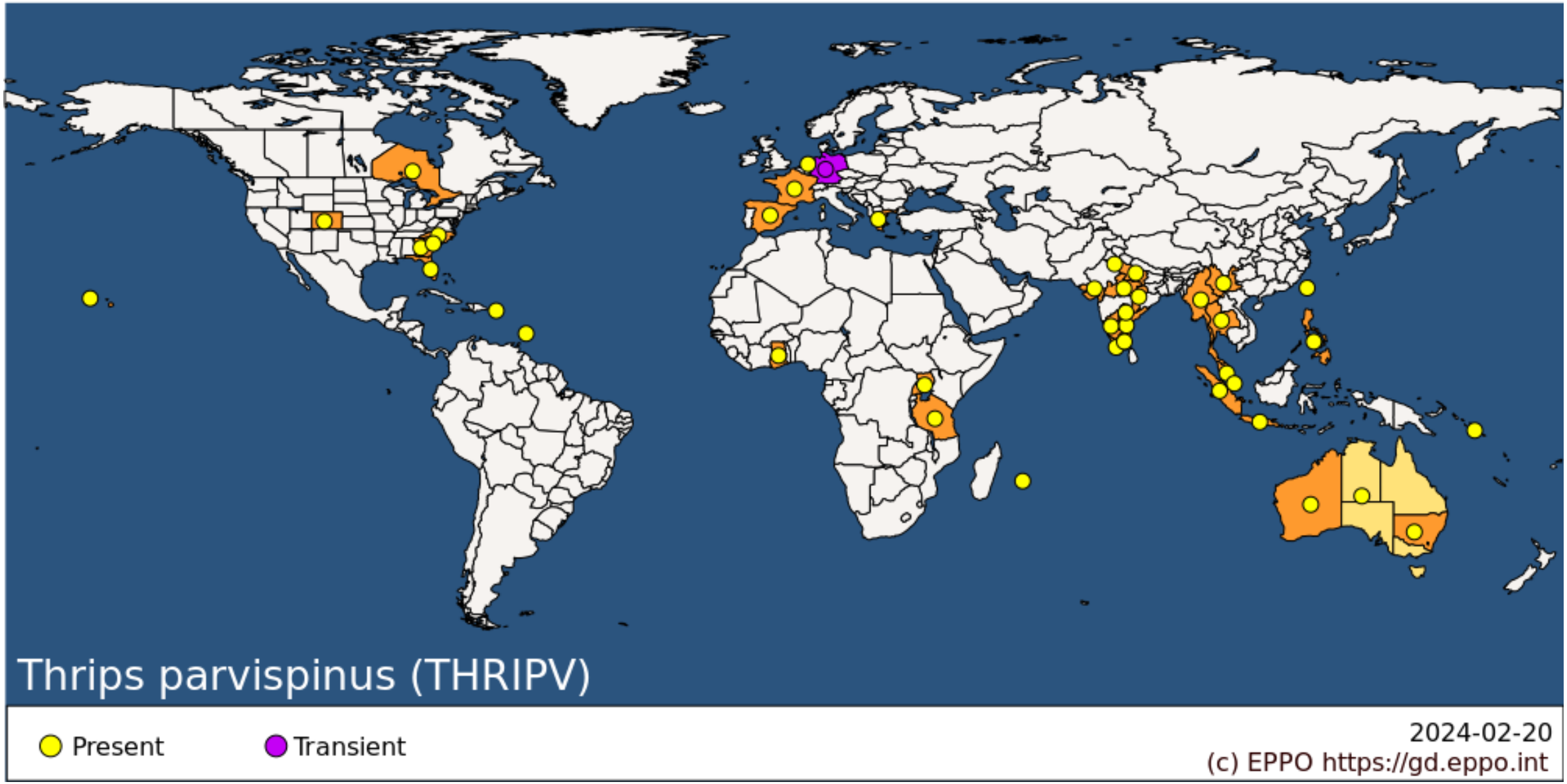
Current Worldwide Distribution



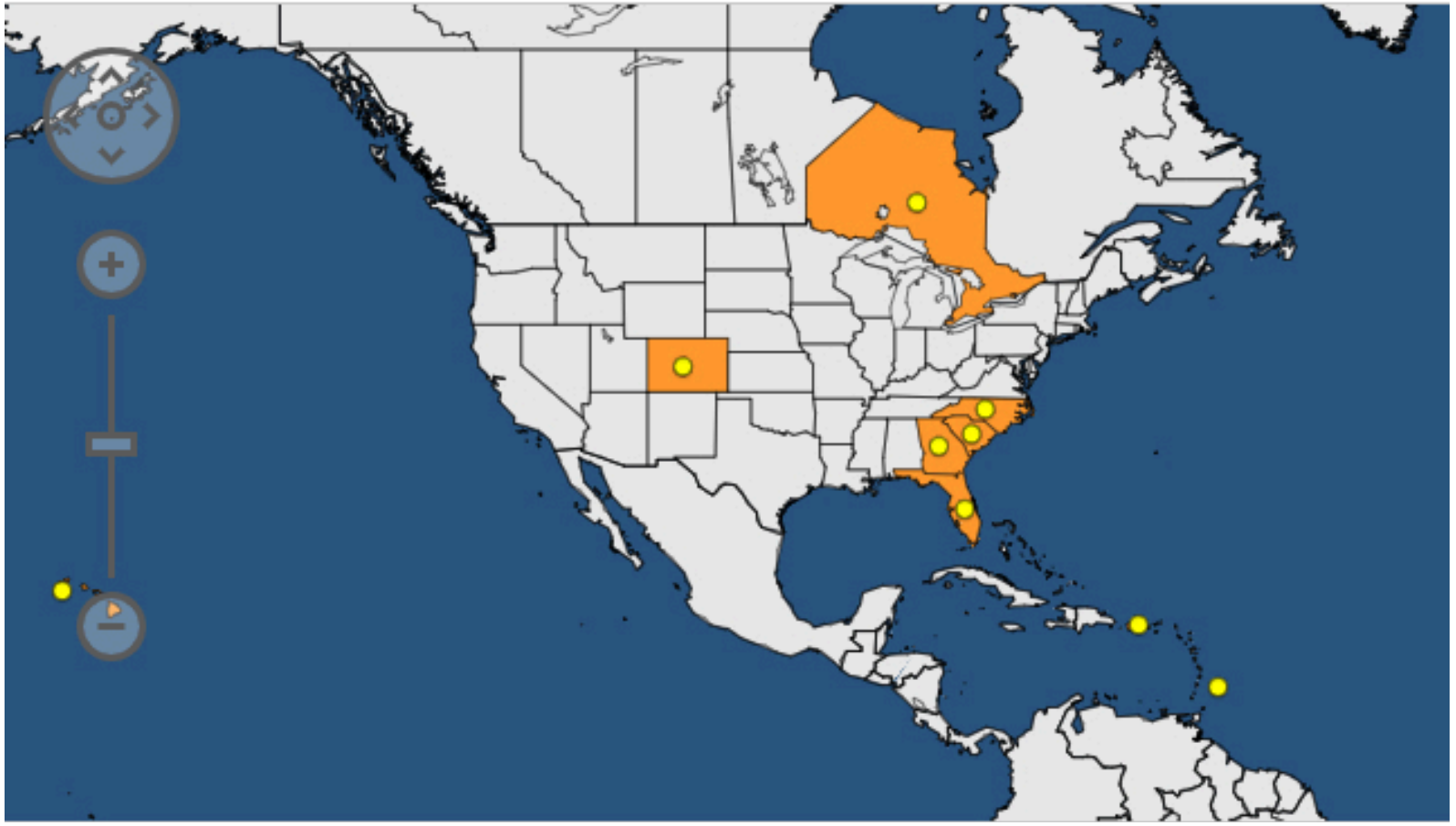
North America-Caribbean Distribution

Present in:

- Florida
- Georgia
- Colorado
- North Carolina
- South Carolina
- Puerto Rico
- Hawaii
- Barbados
- Ontario (Canada)

Intercepted in:

- Ohio
- Pennsylvania



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Ornamental Hosts in FL

1. *Anthurium*
2. Hoya
3. Gardenia
4. Mexican butterfly weed
5. Schefflera
6. Mandevilla/Dipladenia
7. Ixora
8. Ficus

9. Seagrape
10. *Phlox* sp.
11. Sweet alyssum
12. Marigold
13. Windmill jasmine
14. *Impatiens* sp.
15. Tropical hibiscus
16. *Ruellia* sp.

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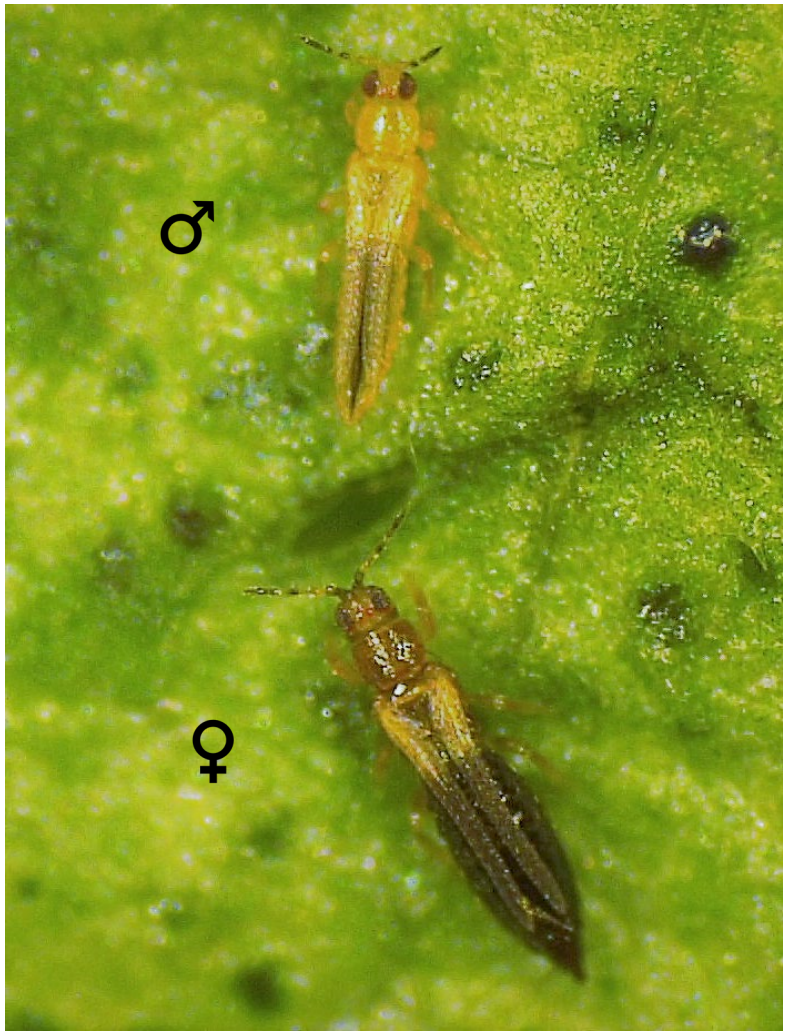
Info: Felipe Soto-Adames, FDACS-DPI

Thrips parvispinus

- Female: 1 mm long
- Male: 0.6 mm long



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Video: Yisell Velazquez

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

Soil??

27°C (80 °F)

12.73 days

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Does *T. parvispinus* Pupate in the Soil?

- Infest 20 bean plants with 7 L2
- Allow the L2 to infest the plant for 6 days
- At 6 days inspect leaves, stems and soil surface
- Then bag individually all the plant parts and pots
- Count #adults every 24h for 4 days

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Does *T. parvispinus* Pupate in the Soil?

Time post infestation	Total number of adults		
	leaves	stem	soil
6 days	0	0	0
7 days	0	0	0
8 days	0	0	8
9 days	0	0	17
10 days	0	0	31
Total	**0**	**0**	**56**

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Video & photo: Isamar Reyes Arauz & Yisell Velazquez

Adult *Thrips parvispinus* Emerging from the Soil

Video : Yisell Velazquez

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Does *T. parvispinus* Pupate in the Soil?

Yes!

At Which Depth does *T. parvispinus* Pupate?

- Infested 60 beans with 10 L2
- Destructively sample 10 plants/day for 6d
- Separate aluminum foil from pot in bags
- Count #adults every 24h for 6 days

Photo: Isamar Reyes-Arauz

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At Which Depth does *T. parvispinus* Pupate?

Time after infestation	Total number of adults	
	soil in foil	soil in pot
2 days	0	0
3 days	0	0
7 days	0	0
8 days	0	1
10 days	0	5
11 days	0	8
Total	0	14

Photo: Isamar Reyes-Arauz

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At Which Depth does *T. parvispinus* Pupate?

- Still an open question
- Not on the surface
- In depth > 0.2 inch (5 mm)

Photo: Isamar Reyes-Arauz

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Chemical Control - Contact Insecticides

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Life Cycle

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

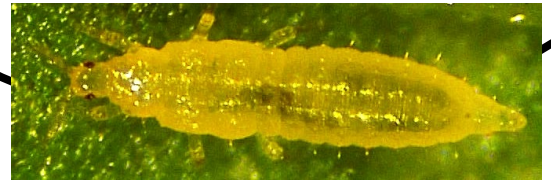
Adult

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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Tested Conventional 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	Sulfoxaflor-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

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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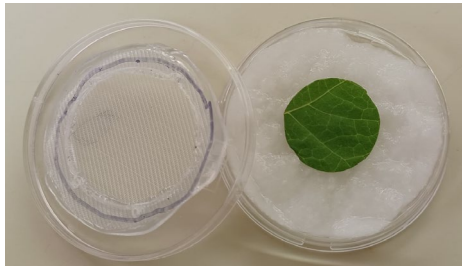
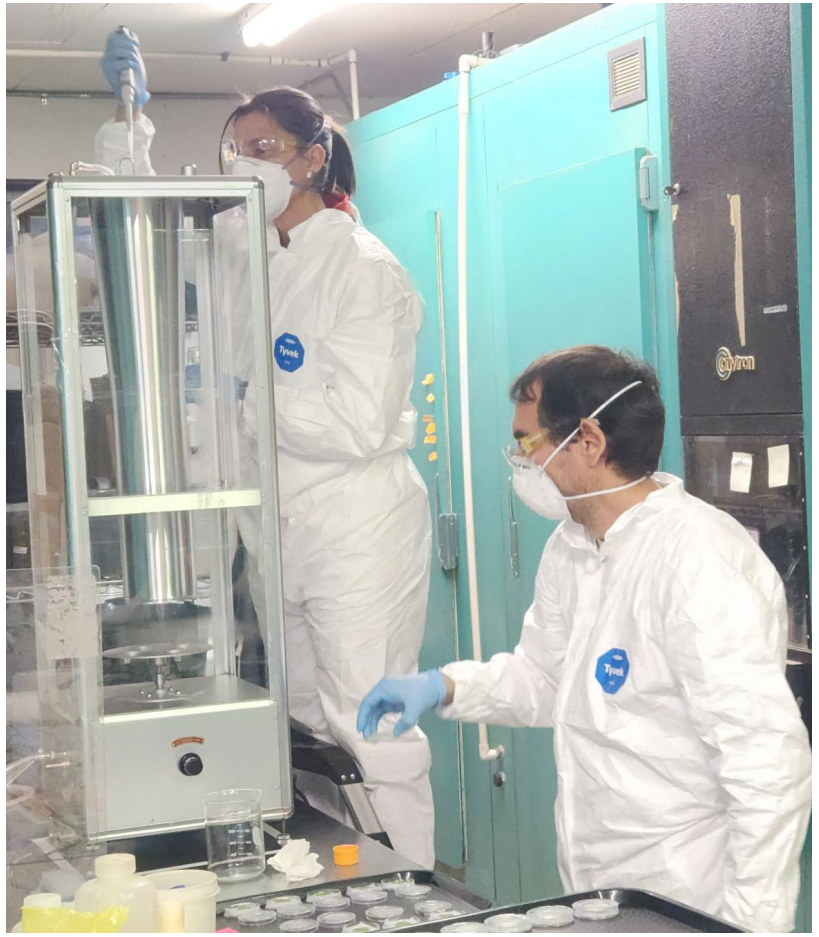
Spray on *Thrips parvispinus* – Direct Assays

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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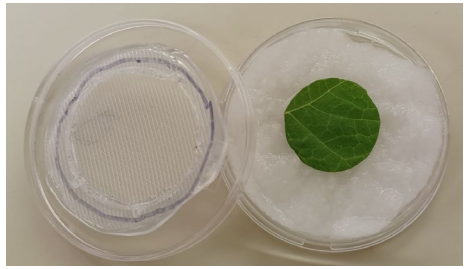
Spray on Plants – Residue Toxicity Assays

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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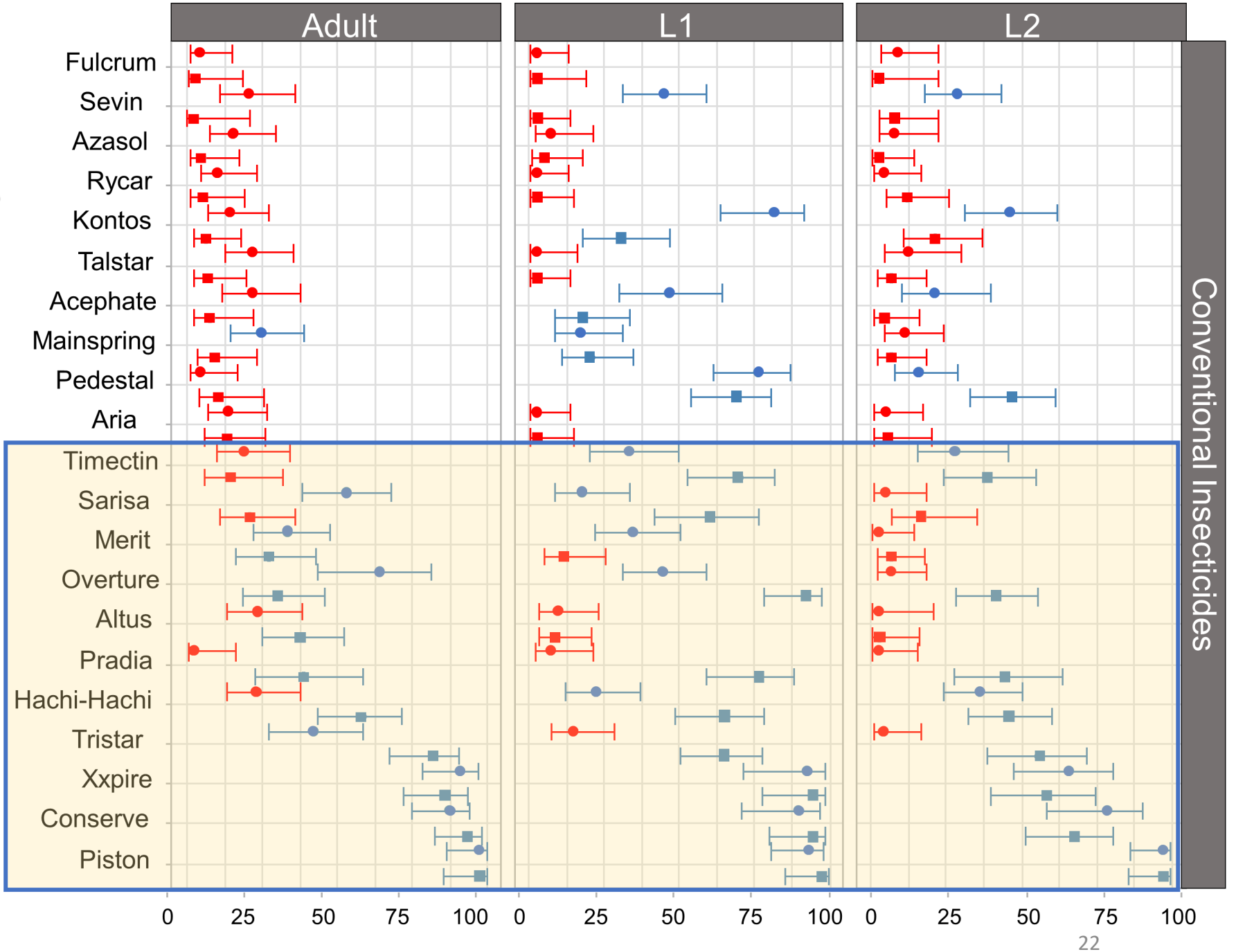
More Effective than Control: $p \geq 0.05$ / $p < 0.05$

Application Method: ■ Direct Assays ● Residue Toxicity Assays

Ataide et al., 2024, *Insects* 15(1), 48

Thrips Mortality



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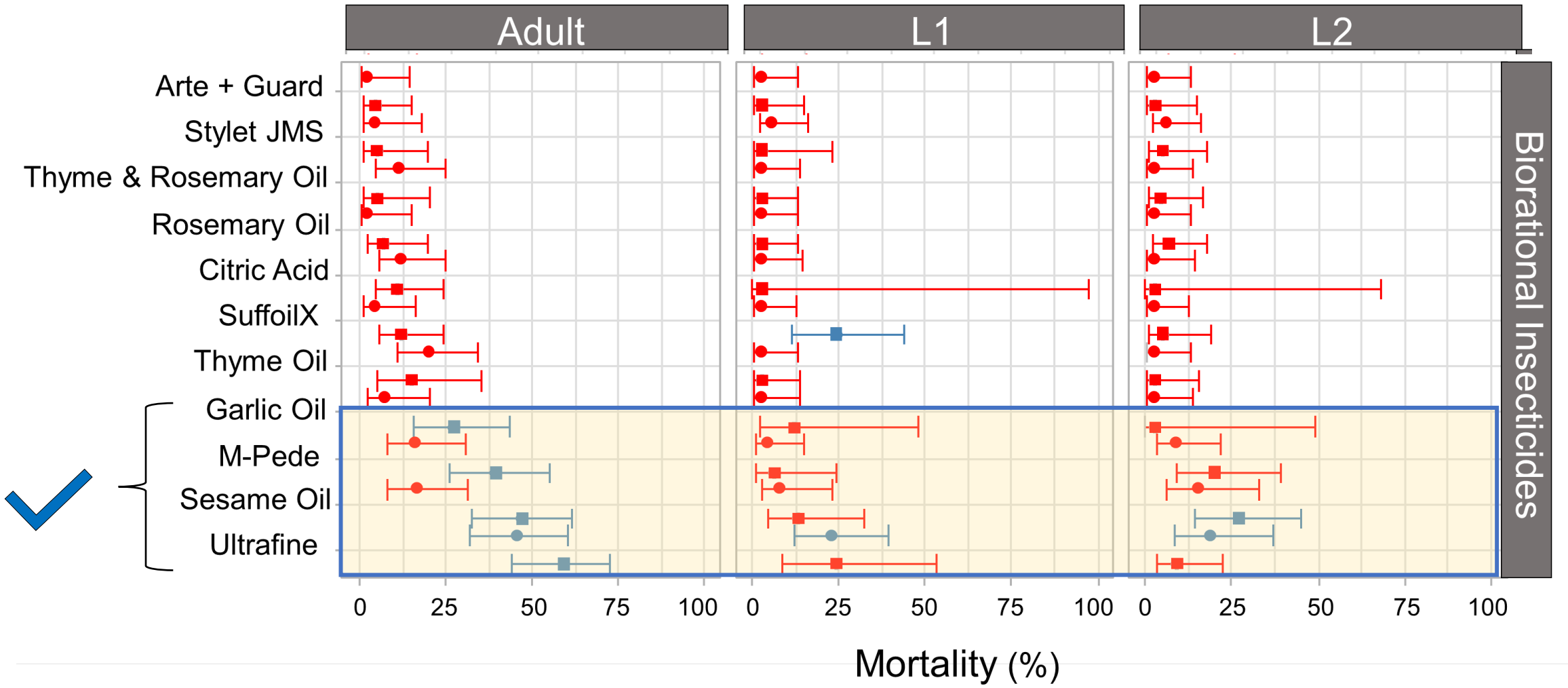
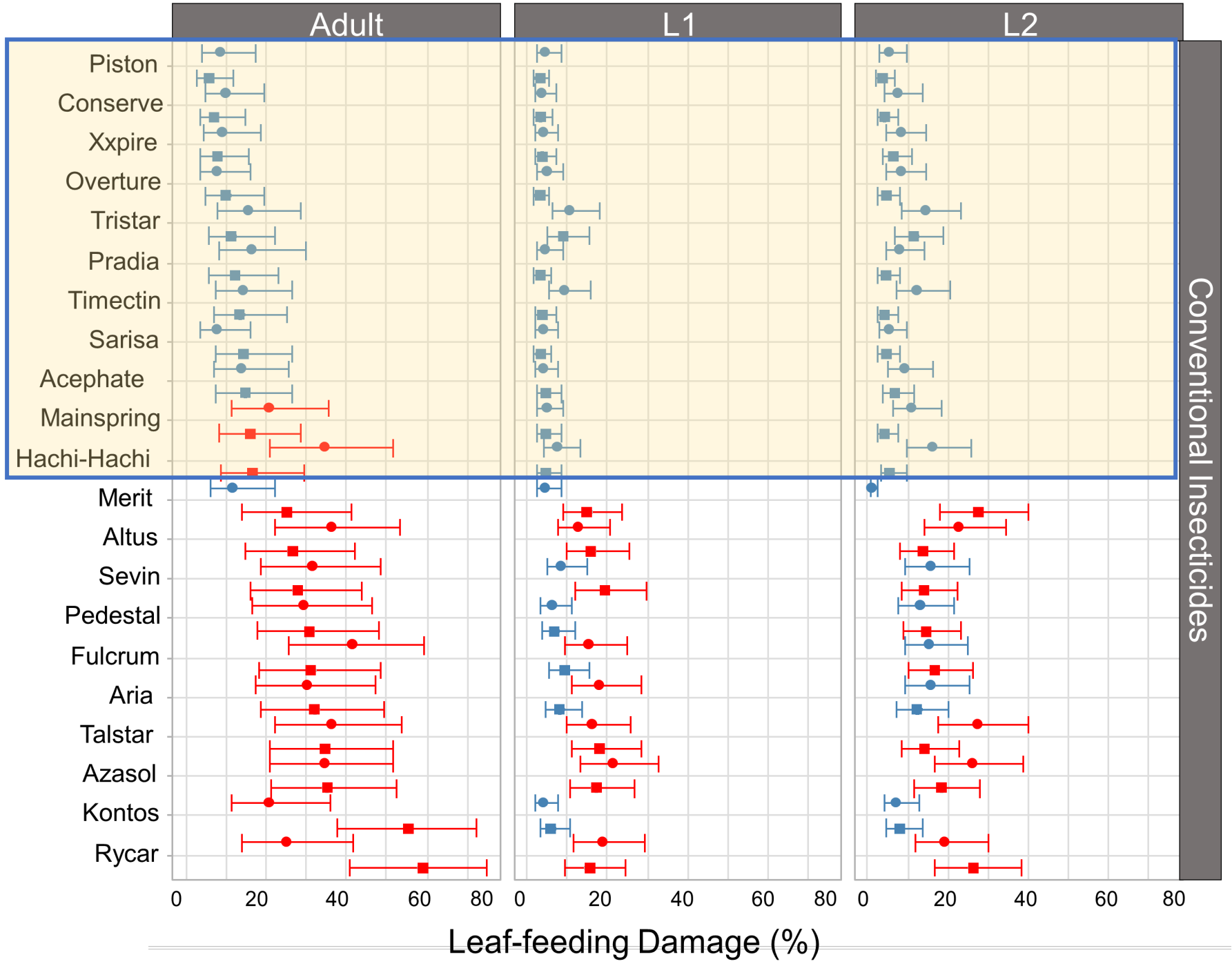
Thrips Mortality

Ataide et al., 2024, *Insects* 15(1), 48



Thrips Feeding Damage



Application Method: ■ Direct Assays ● Residue Toxicity Assays

More Effective than Control: $p \geq 0.05$ $p < 0.05$

Ataide et al., 2024, *Insects* 15(1), 48

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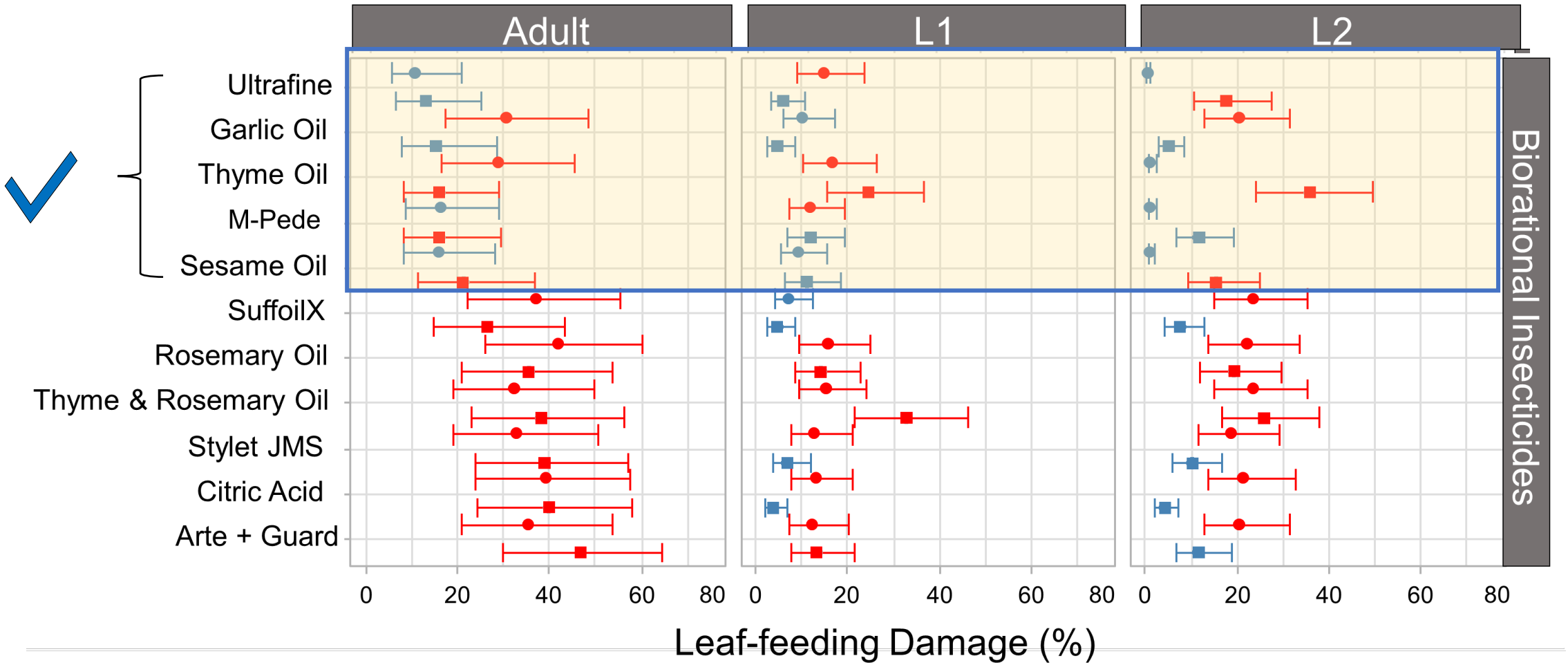
Thrips Feeding Damage

Ataide et al., 2024, *Insects* 15(1), 48



Overall Efficacy - Conventional 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	X
Conserve SC	5	X	X	X	X	X	X	X	X	X
Timectin	6	X	X	X	X	X	X			X
Piston	13	X	X	X	X	X	X	X	X	X
Pedestal	15	X	X	X	X	X				
Sarisa	28	X	X	X			X		X	X
Acephate	1B	X	X	X		X	X			X
Hachi-Hachi SC	21A	X	X	X	X	X	X	X		
Mainspring GNL	28	X	X	X			X		X	
Overture	Unclassified	X	X	X	X		X	X	X	X
Pradia	28 + 29	X		X		X	X	X		X
Tristar	4A	X		X	X		X	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
Thyme Guard	Thyme oil			X						
Bush doctor	Garlic oil	X		X						X
Suffoil-X	Mineral oil	X		X			X			
Ultrafine	Mineral oil		X			X	X	X	X	X
M-Pede	Potassium salts of fatty acids			X				X		X

Tested Insecticides – Greenhouse Evaluations

#	Product Name	Active Ingredient	Group	Rate	Site	EPA Registration #
1	Piston	Chlorfenapyr	13	10 fl oz/ 100 gal	G	91234-19
2	Xxpire	Sulfoxaflor-Spinetoram	4C-5	2.75 oz/ 100 gal	G, N	62719-676
3	Conserve SC	Spinosad	5	0.1 fl oz/ 1 gal	G, N, L	62719-291
4	Overture	Pyridalyl	Unclassified	8 oz/ 100 gal	G	59639-125
5	Hachi-Hachi	Tolfenpyrad	21A	27 fl oz/ 100 gal	G, N, S, L	71711-31-67690
6	Timectin 0.15 EC	Abamectin	6	8 fl oz/100 gal	S, G, N	84229-1
7	Pradia	Cyclaniliprole-Flonicamid	28-29	17.5 fl oz/ 100 gal	G, N, S	71512-33-59807
8	Ultrafine	Mineral oil	Unclassified	3%	G, N, L, I	86330-11
9	Bee Safe 3-in-1	Sesame oil	Unclassified	3 fl oz/ 1 gal	S, G, N, L	FIFRA 25 (b) exempt

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

Greenhouse Evaluations (*In progress*…)

- Curative and prophylactic spray
- Water control
- 6 plants/ treatment/spray type
- Total 120 Mandevilla plants
- Red (Scarlet), White (Chevy)

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Greenhouse Evaluations - Curative

- Release 10 L2 and 10 adult thrips
- Establish for 2 weeks
- Apply treatment
- Collect 3 leaves (bottom, middle, top) at 24h, 7 &14 days post treatment application
- Non-destructive sampling

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Greenhouse Evaluations – Prophylactic

- Apply treatment
- 24h later release 10 L2 and 10 adult thrips
- Collect 3 leaves (bottom, middle, top) at 24h, 7 &14 days post thrips release
- Non-destructive sampling

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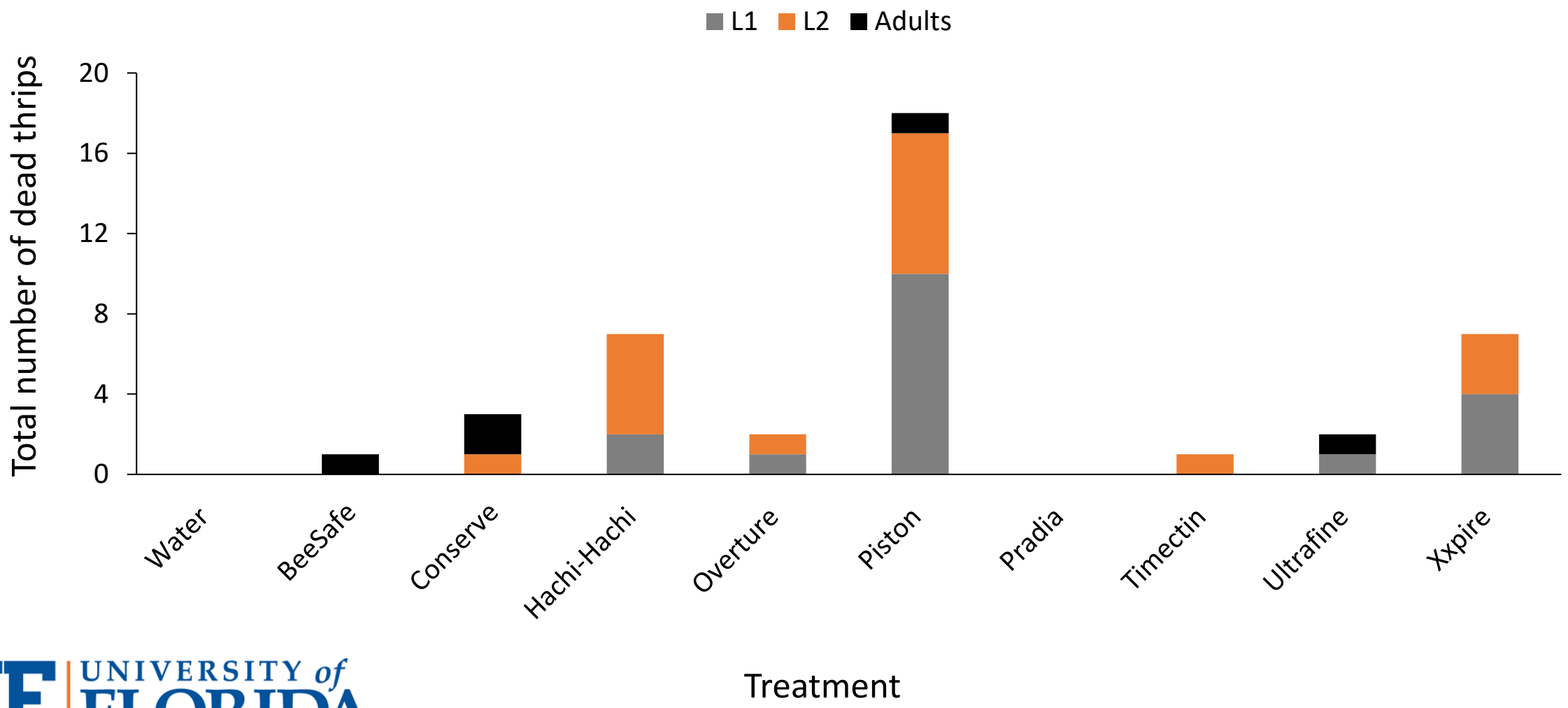
Greenhouse Results - Curative



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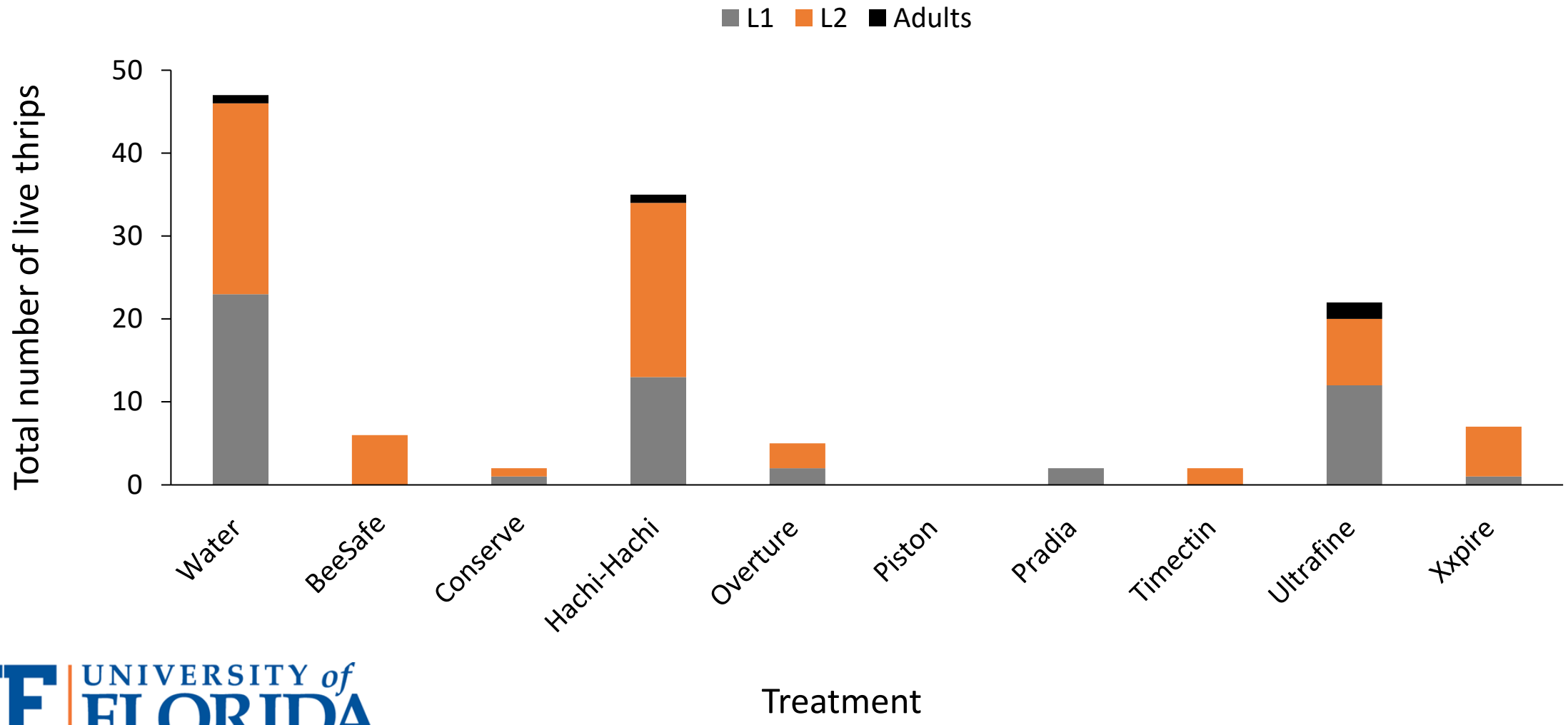
Greenhouse Results - Curative



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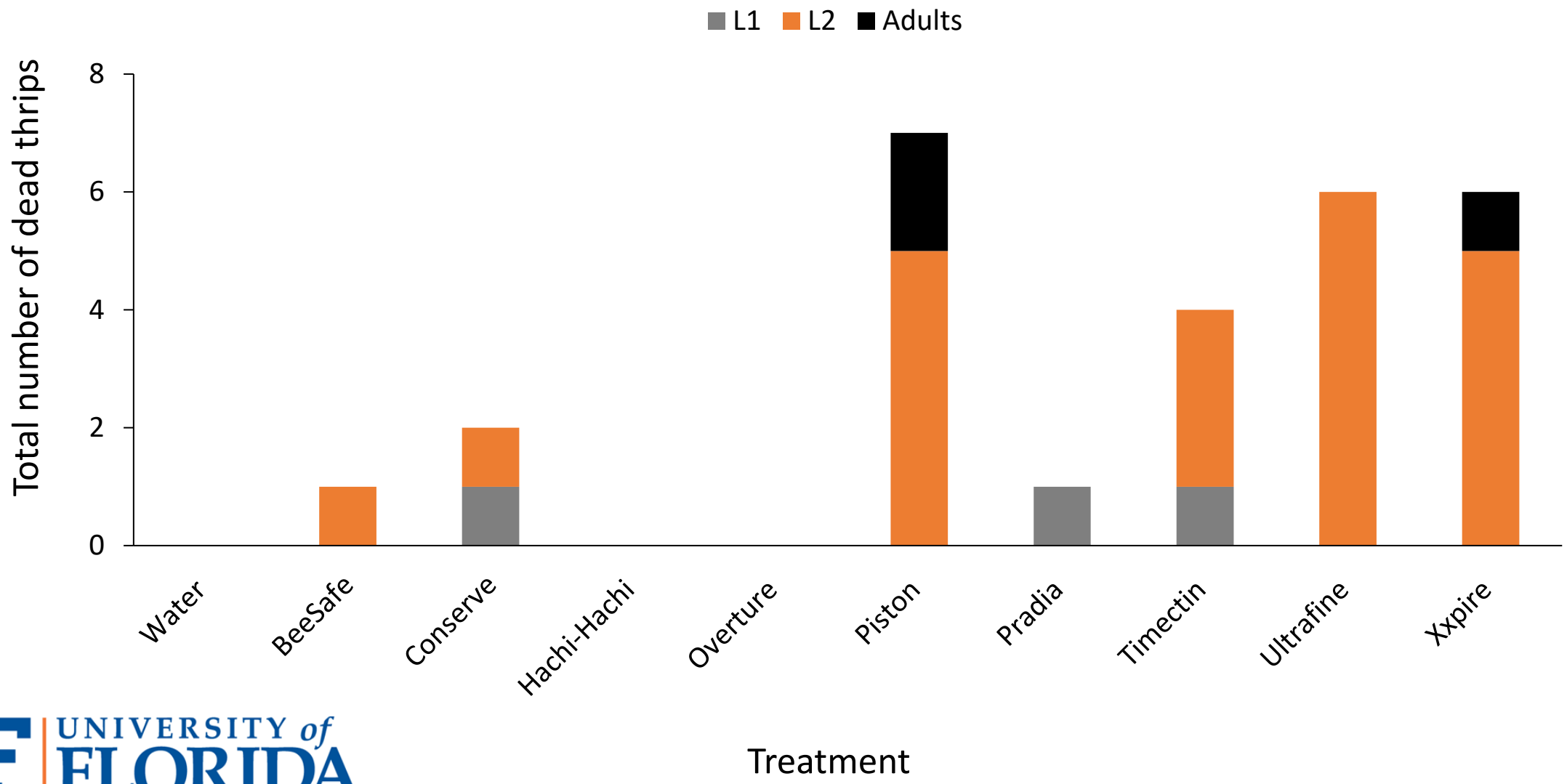
Greenhouse Results - Prophylactic



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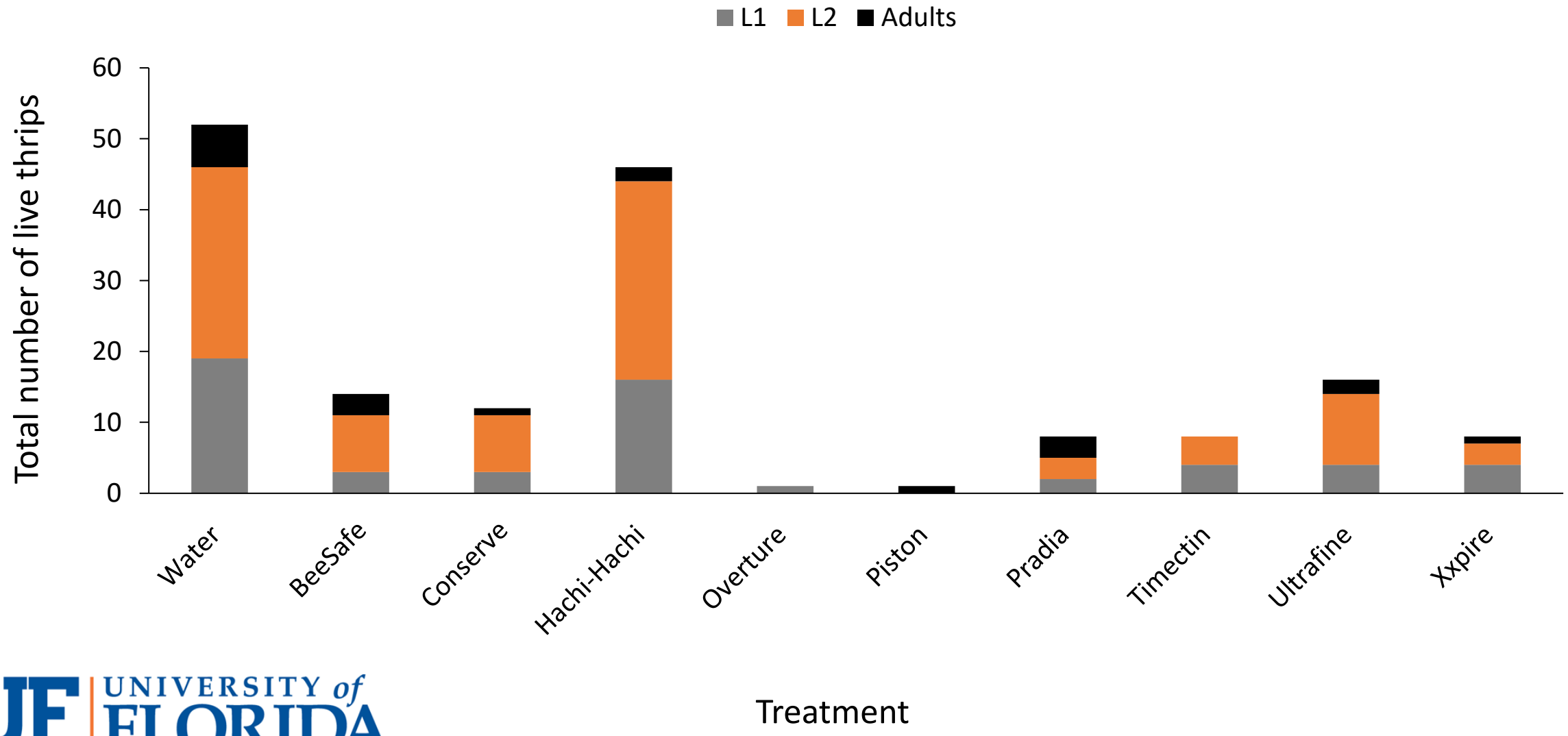
Greenhouse Results - Prophylactic



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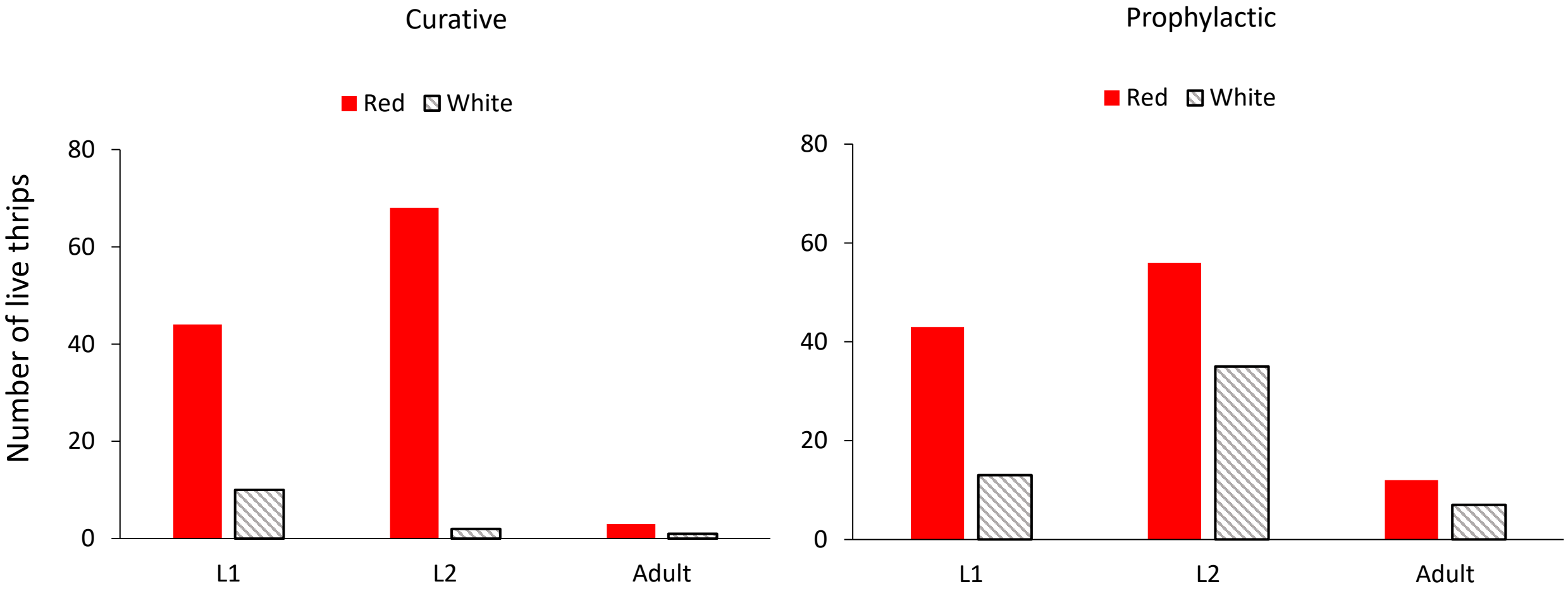
Greenhouse Results – Mandevilla Variety



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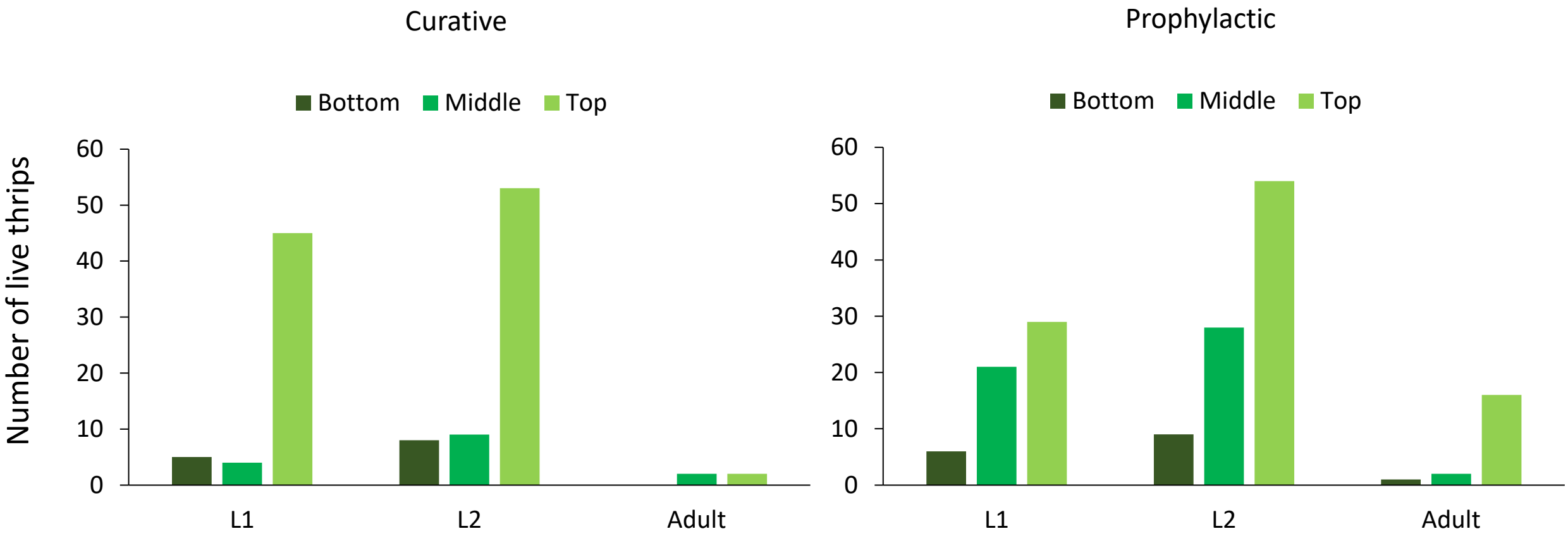
Greenhouse Results – Position in the Canopy



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Conclusions – Contact Insecticides

- At least 12 conventional and 3 biorational insecticides show potential
- Greenhouse evaluations ongoing
- Red Mandevilla variety had more thrips than white
- Thrips target primarily the upper part of canopy

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Chemical Control – Dip Treatments

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Tested Biorational Insecticides as Dip Treatments

#	Product Name	Active Ingredient	Rate	Site	EPA Registration #
1	Velifer	*Beauveria bassiana* strain PPRI 5339	13 fl oz/ 100gal	G	71840-22
2	SuffoilX	Mineral oil	0.5%	G, N, L	48813-1-68539
3	Bee Safe 3-in-1	Sesame oil	3 fl oz/ 1 gal	S, G, N, L	FIFRA 25 (b) exempt
4	Bush doctor force of nature insect repellent	Garlic oil	128 fl oz/ 100 gal	S, G, N, L	FIFRA 25 (b) exempt
5	Ultrafine	Mineral oil	1%	G, N, L, I	86330-11
6	M-Pede	Potassium salts of fatty acids	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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Evaluation of Dipping Against *T. parvispinus*

- Cuttings of Gardenia and Mandevilla (red)
- Release 5 L2
- Dip cutting for 15s – gentle agitation
- Treat with root hormone and move to rooting substrate

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Evaluation of Dipping Against *T. parvispinus*

- Score number of live and dead L2 - 1, 24 and 48h post treatment
- Score phytotoxicity
- Water control
- Experiment repeated twice
- Total N = 20 per treatment

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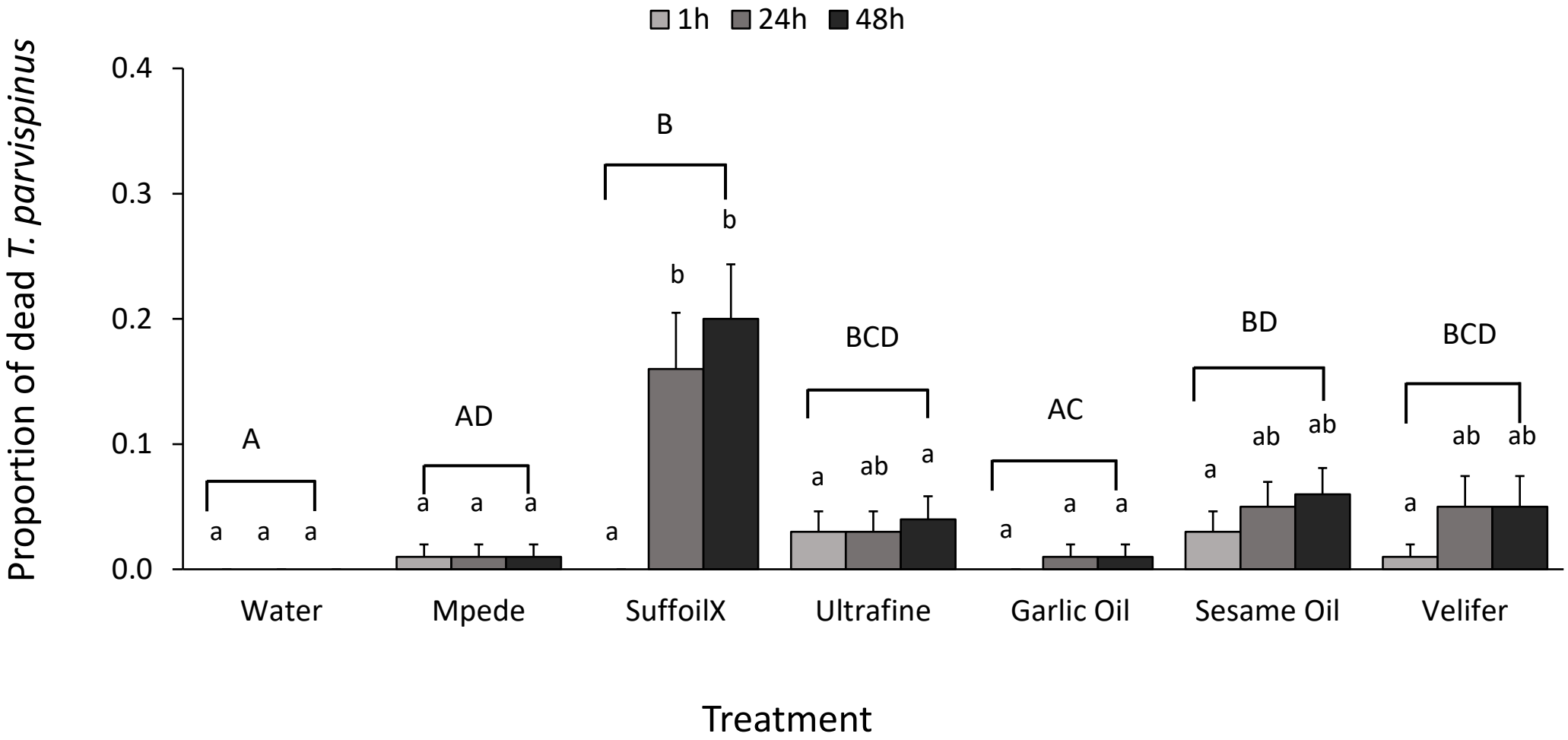
Mortality of *T. parvispinus* – Gardenia Cuttings



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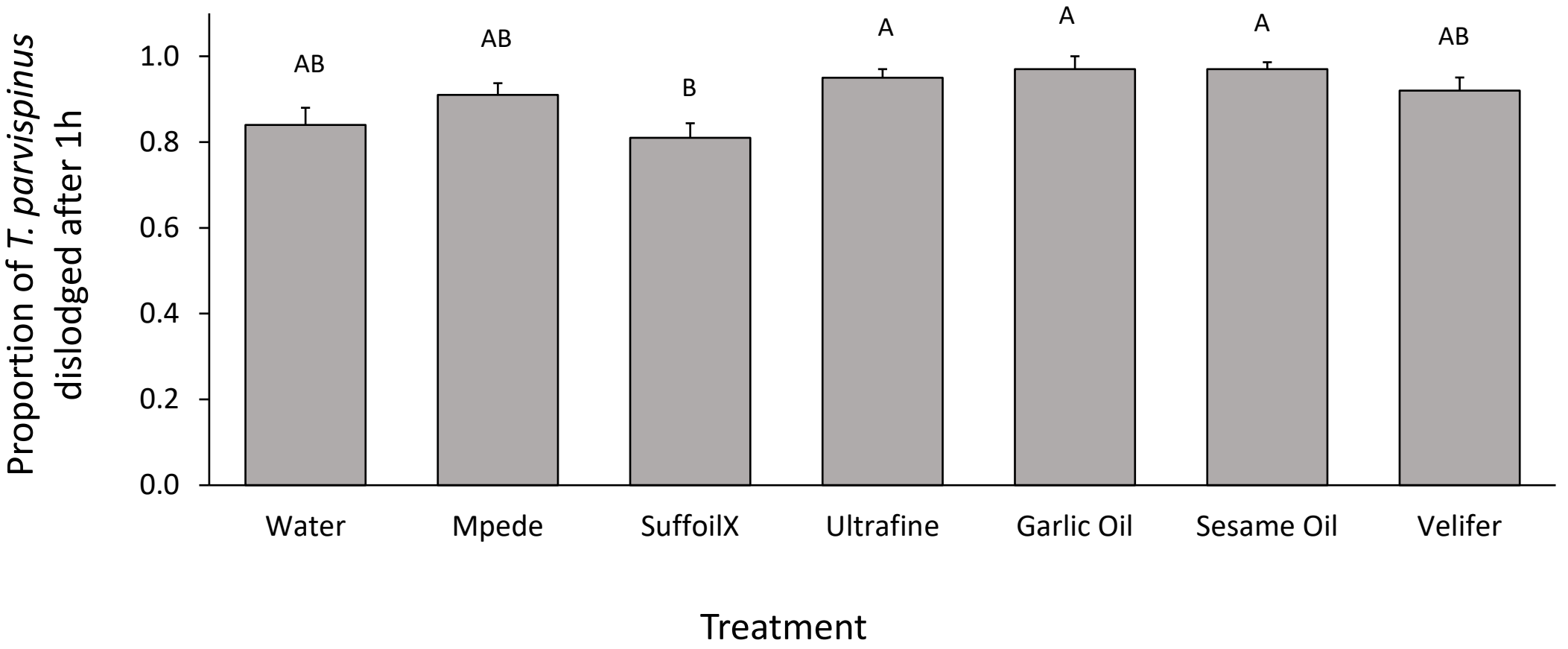
Treatment: Kruskal-Wallis; χ^2= 54.17, df= 6, P < 0.001
Time: Kruskal-Wallis; χ^2= 14.2, df= 2, P < 0.001

Thrips Dislodgment – Gardenia Cuttings



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Treatment: Kruskal-Wallis; χ^2= 29.5, df= 6, P < 0.001

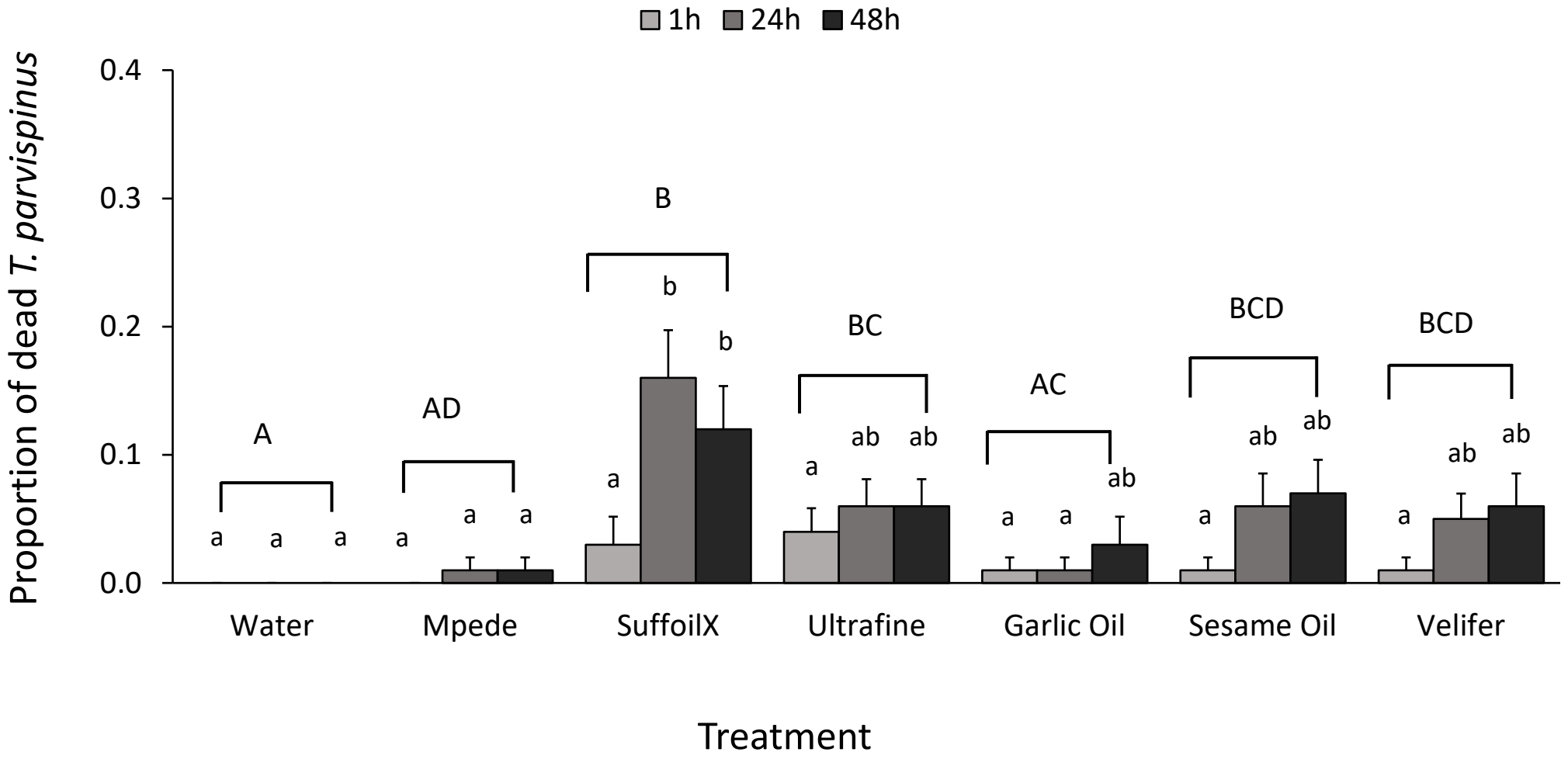
Phytotoxicity– Gardenia Cuttings

Water

SuffoilX

Sesame Oil

Mortality of *T. parvispinus* – Mandevilla Cuttings



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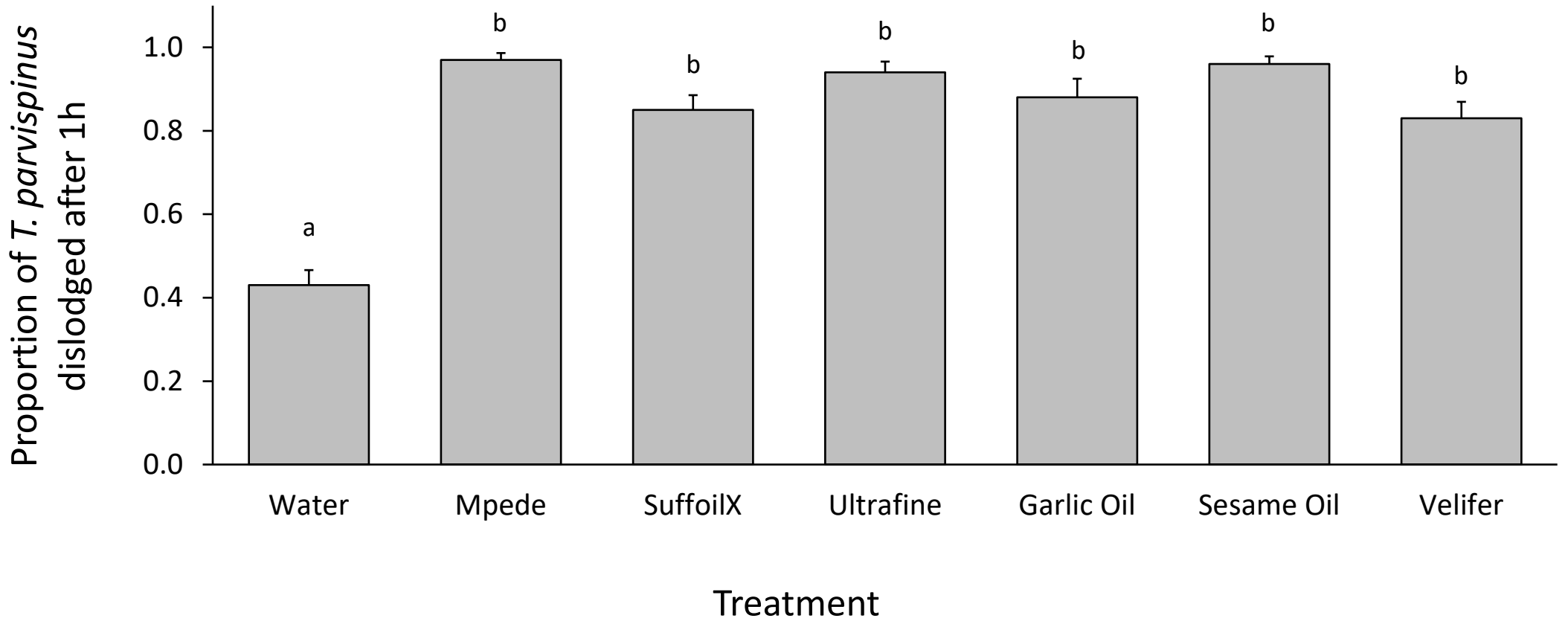
Treatment: Kruskal-Wallis; χ^2= 48.97, df= 6, P < 0.001
Time: Kruskal-Wallis; χ^2= 14.36, df= 2, P < 0.001

Thrips Dislodgment – Mandevilla Cuttings



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Treatment: Kruskal-Wallis; χ^2= 67.95, df= 6, P < 0.001

Phytotoxicity– Mandevilla Cuttings

Water

SuffoilX

Sesame Oil

Conclusions – Dip Treatments

- Suffoil-X most efficacious – no phytotoxicity
- Suffoil-X and Velifer registered for dipping
- Sesame oil caused phytotoxicity to Mandevilla cuttings
- Plants should not have thrips damage when dipped to oils
- Dipping dislodges thrips larvae

Take-home Messages

- *Thrips parvispinus* pupates in the soil
- Rotation is the key to avoid resistance!
- Biorational insecticides should be considered for rotation
- Dip treatments should be used for production of clean cuttings
- Thrips target the upper part of the canopy
- Better establishment on red Mandevilla than white → more research

Ongoing Research

- Greenhouse experiments – contact insecticides
- Biological control of *Thrips parvispinus:*
  - Nematodes
  - Insects
  - Mites
  - Entomopathogenic fungi
- Evaluation of *T. parvispinus* tolerance to cold
- Life cycle of *T. parvispinus*
- Greenhouse experiments – systemic insecticides (start in the Fall)

Resources

insects

MDPI

Article

Efficacy of Conventional and Biorational Insecticides against the Invasive Pest *Thrips parvispinus* (Thysanoptera: Thripidae) under Containment Conditions

Livia M. S. Ataide [1,*], German Vargas [2], Yisell Velazquez-Hernandez [1], Isamar Reyes-Arauz [1], Paola Villamarin [1], Maria A. Canon [1], Xiangbing Yang [3], Simon S. Riley [4] and Alexandra M. Revynthi [1,*]

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Thank You!

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