# Using Pesticidal Tactics and Rotations to Manage Chilli Thrips Populations

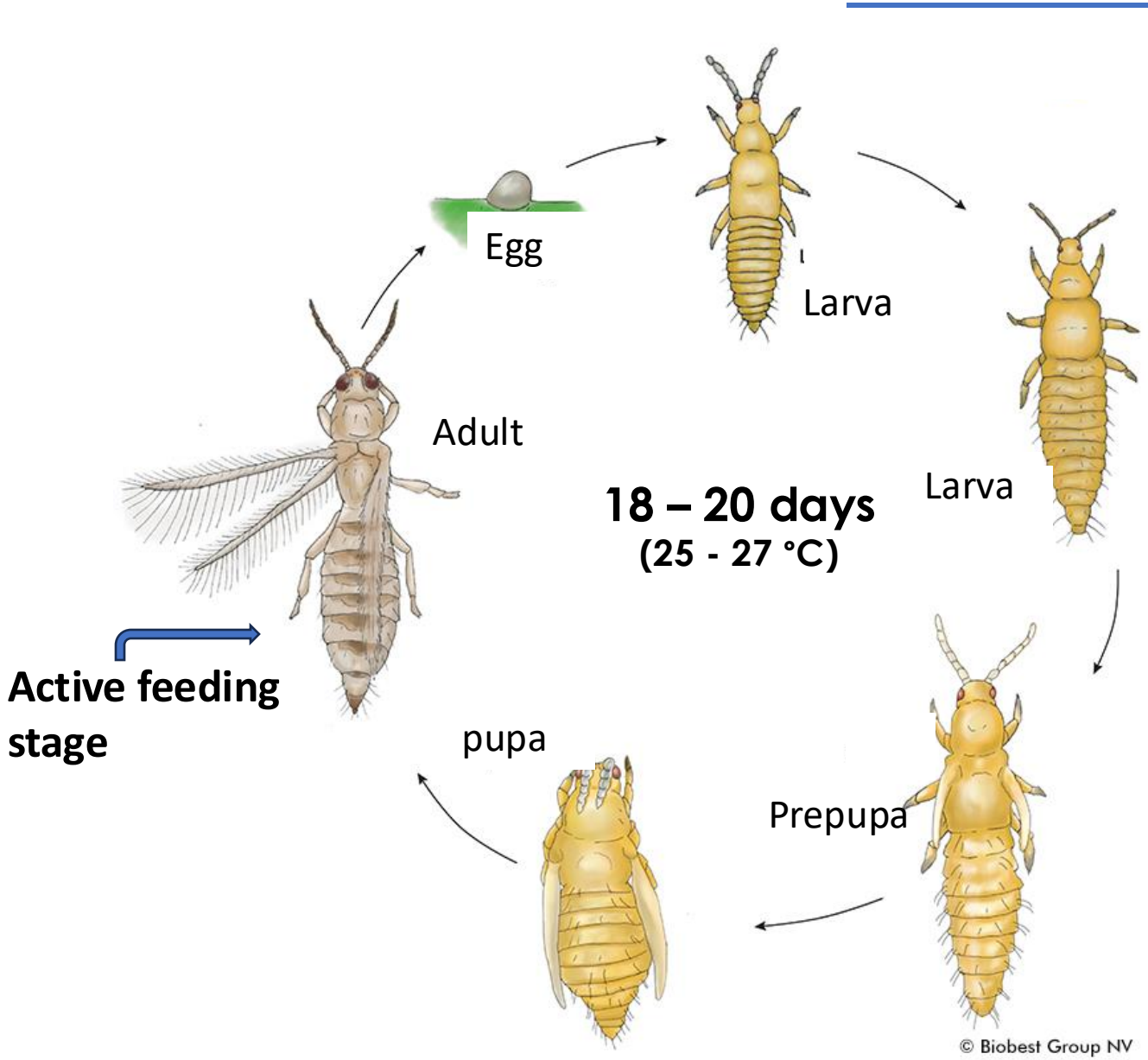

Oscar E. Liburd, Professor

Kendi P. Muthomi, Ph.D. student

Jasleen Kaur, Post-doctoral Research Scientist


UF | IFAS Extension
UNIVERSITY of FLORIDA

# Life cycle of chilli thrips




(Kang et al. 2015)

**Active feeding stages**

# Current management practices

## Cultural control

- Removal of plant debris
- Elimination of weeds
- Elimination of infested plants
- Hedging/pruning young plants

(Hedged SHB in 2024. Credit: **Kendi Muthomi**)

## Biological control

- **Natural enemies (NEs)**
- Predatory insects and mites
  - *Orius insidious*
  - *Amblyseius swirskii*
  - *Neoseiulus cucumeris*
- Mycoinsecticides
  - *Beauveria bassiana*
  - *Isaria fumosorosea*
- Nematodes

## Chemical control

- **Pesticides (Organic & conventional)**
  - Pyrazole (e.g., Tolfenpyrad - Apta)
  - Diamides (e.g., Cyantraniliprole – Exirel)
  - Spinosyns (e.g., Spinosad & Spinetoram)
  - Insect Growth Regulators (IGR) (e.g., Novaluron – Rimon)
  - Organophosphates (e.g., Malathion)
  - Carbamates (e.g., Carbaryl)

# **1. Efficacy trial 2025:** Determine the efficacy of selected insecticides against chilli thrips in SHB blueberries

**Treatments**

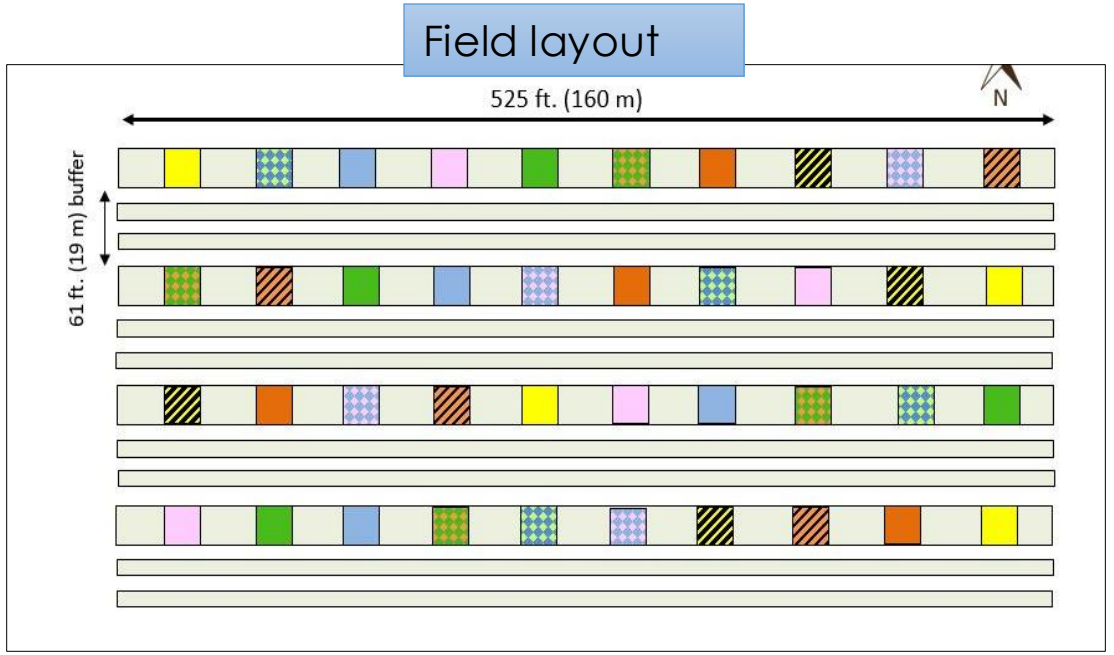
| | |
|---|---|
| 1. Tres Oil | 8. Sivanto |
| 2. Tres Oil + Exirel | 9. Exirel |
| 3. Tres Oil + Apta | 10. Transform |
| 4. Tres Oil + Surround | 11. Agrimek |
| 5. Rimon, TOE, TOA | 12. Apta |
| 6. Admire Pro, TOE, TOA | 13. Delegate |
| 7. Apta + Stik Kote | 14. Control |



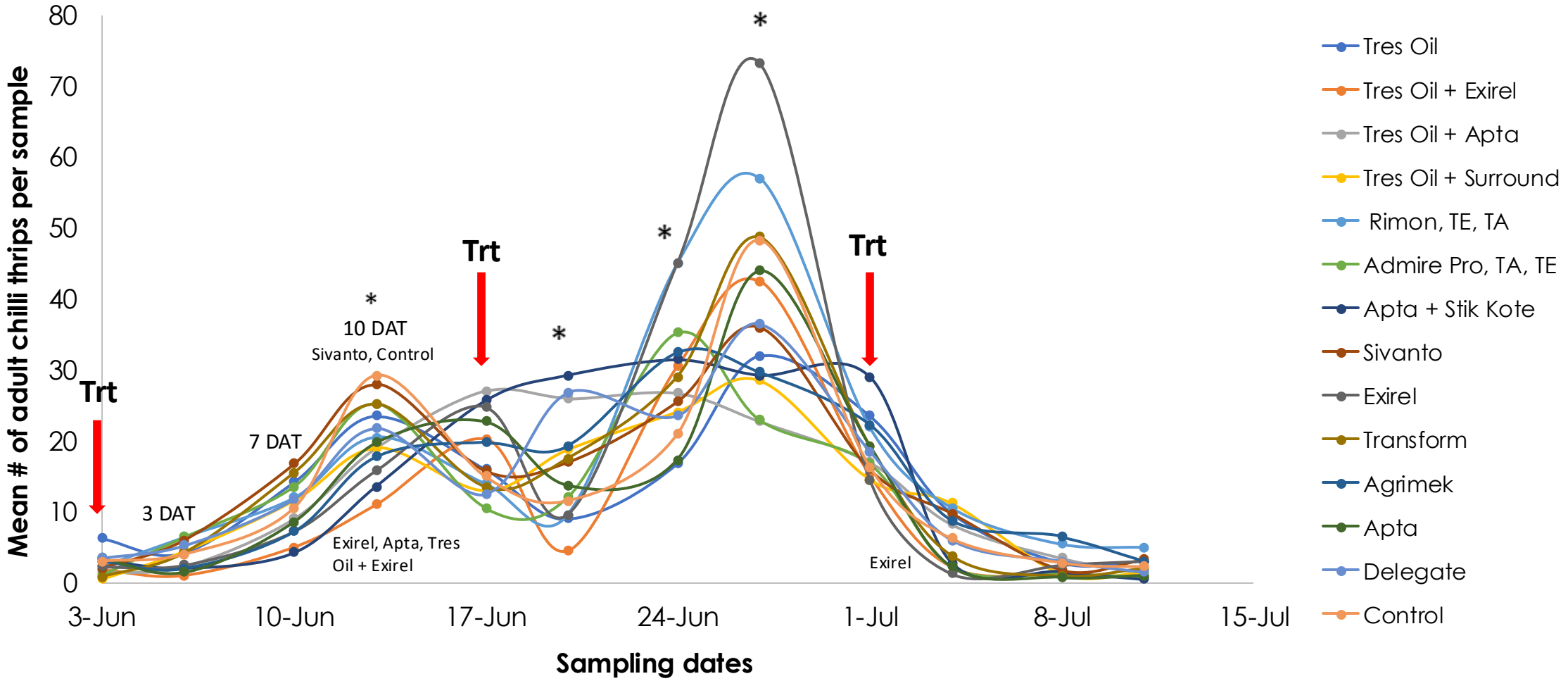



# Research design

- Plant arrangement:
  - 5 blueberry bushes per plot
  - 5-plant buffer zone between plots
  - RCBD, 14 treatments, 4 replicates
- Insecticide application:
  - **Treatments were applied thrice,14 days apart, using a CO2 sprayer**
- Sampling and analysis:
  - Leaf samples were collected **pre-treatment, 3, 7,10, and 14 days after each application** (from the 3 inner bushes)
    - ✓ 6 young blueberry shoots/sample (5-6 leaves)
- Thrips were **counted** in the SFVIPM lab – Gainesville
- Data analysis: repeated measures ANOVA; LSD; a=0.05



# **Weekly** performance of selected insecticides on **adult chilli thrips** in SHB blueberries (2025)




Weekly means with * are significantly different

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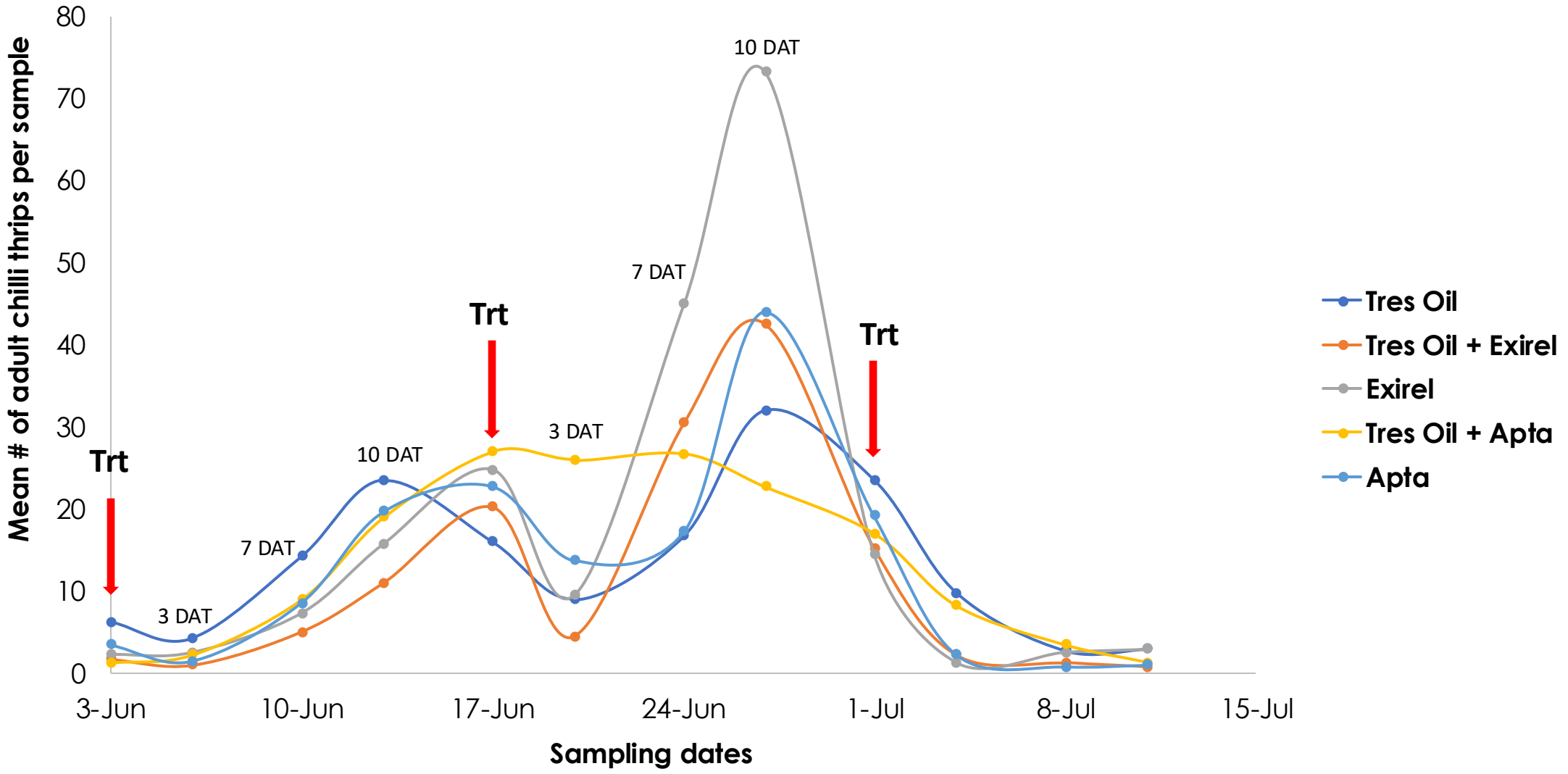
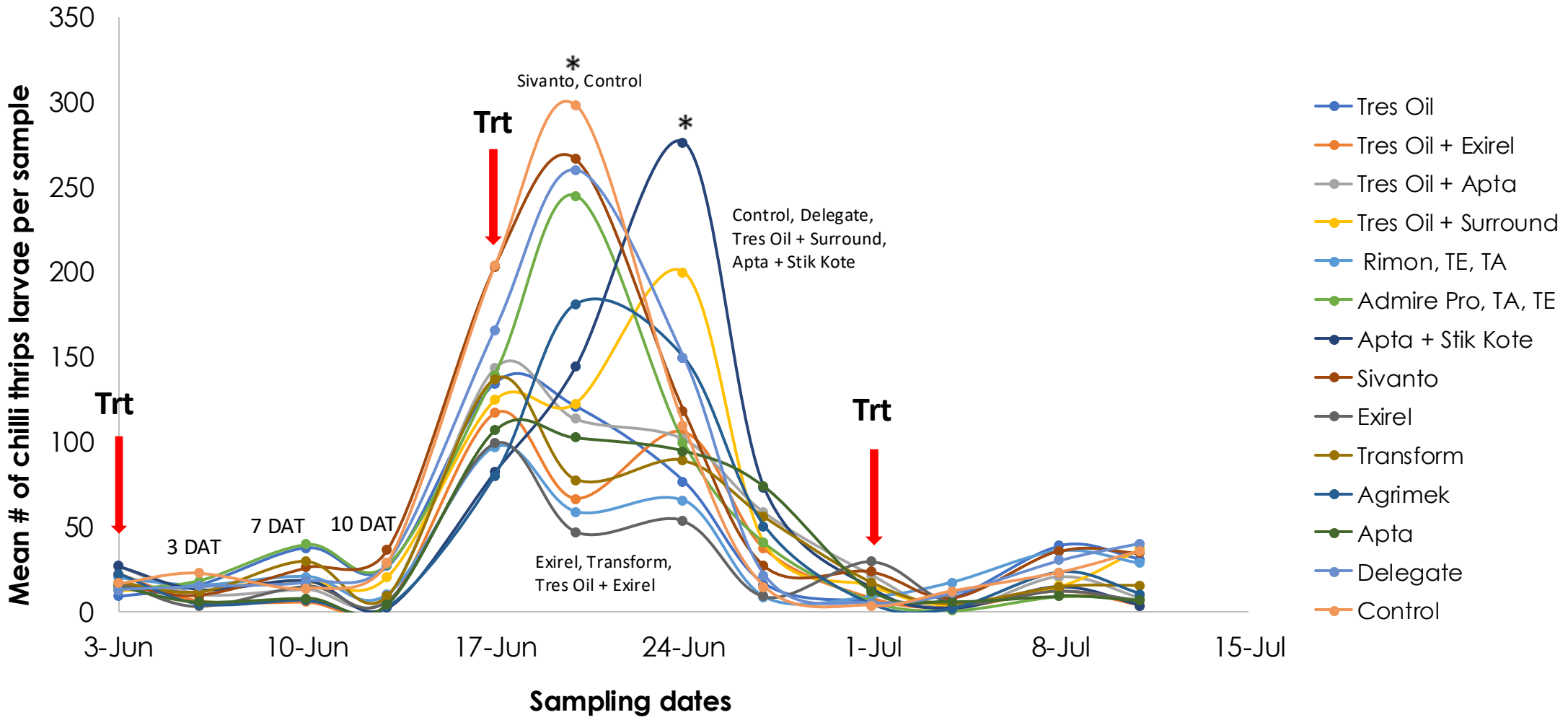


# **Weekly** performance of selected insecticides on **chilli thrips larvae** in SHB blueberries (2025)

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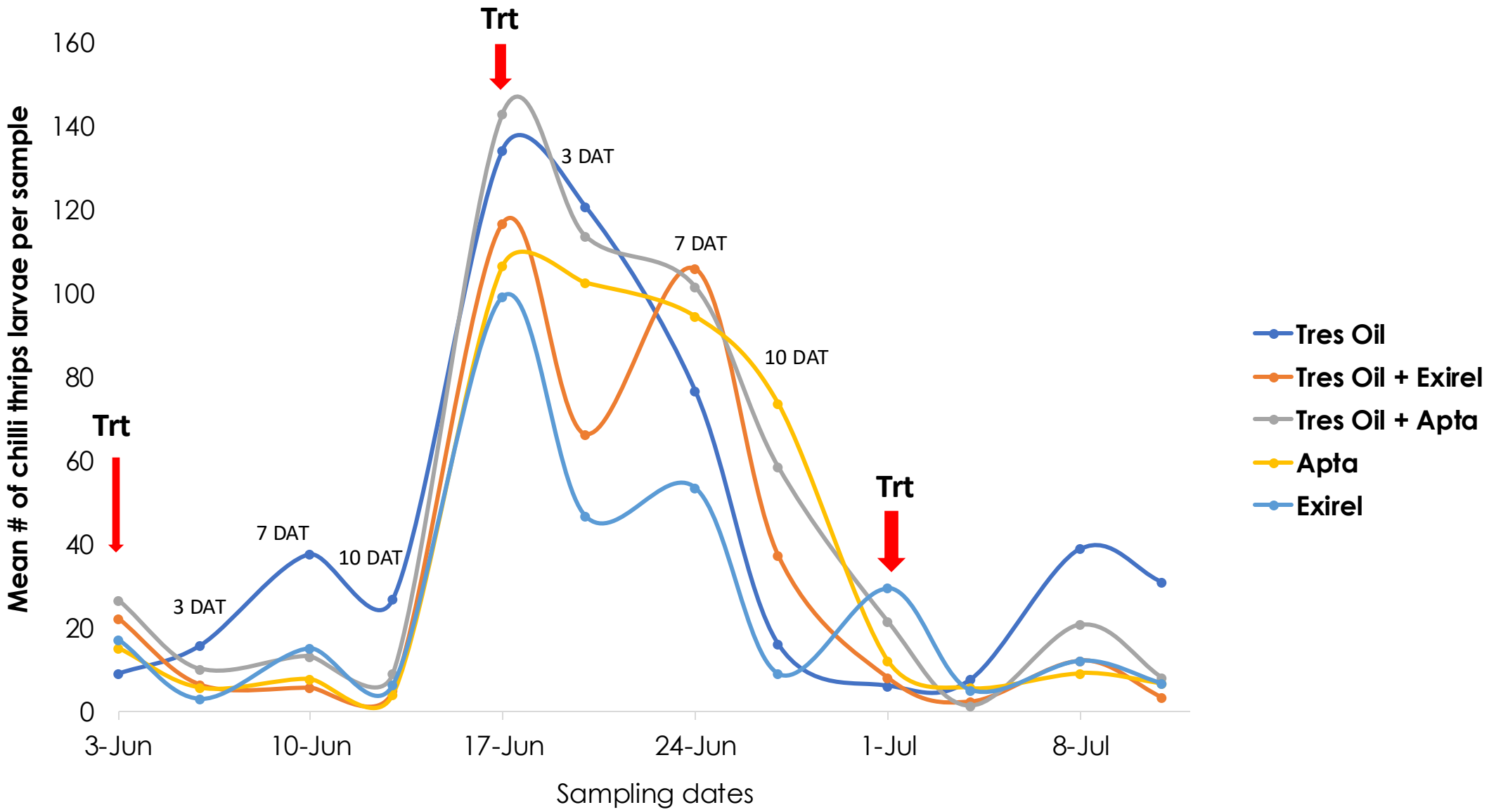
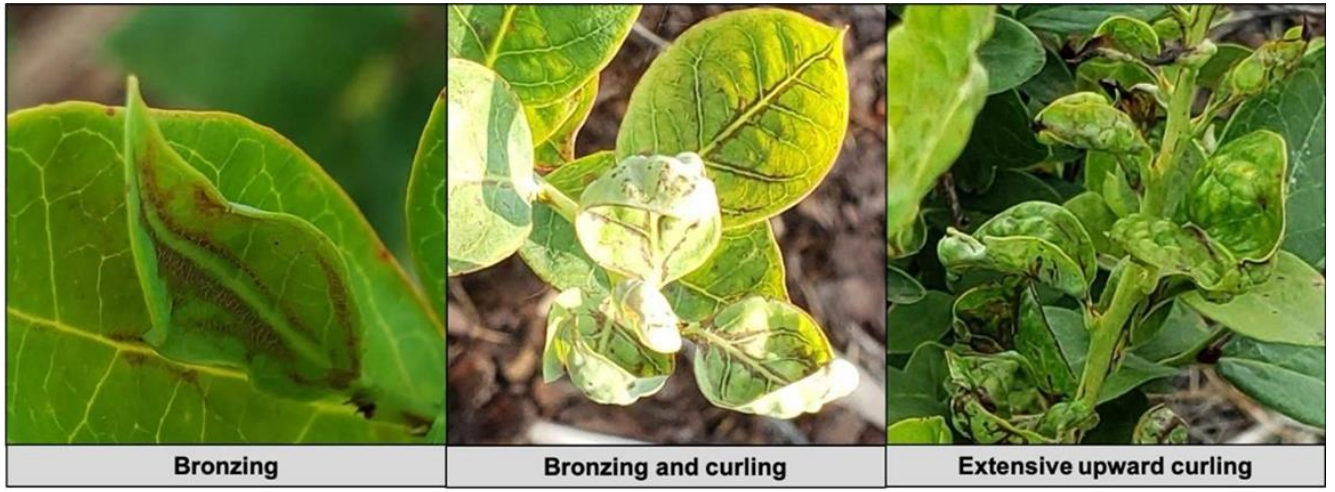


# SHB injury ratings (2025)

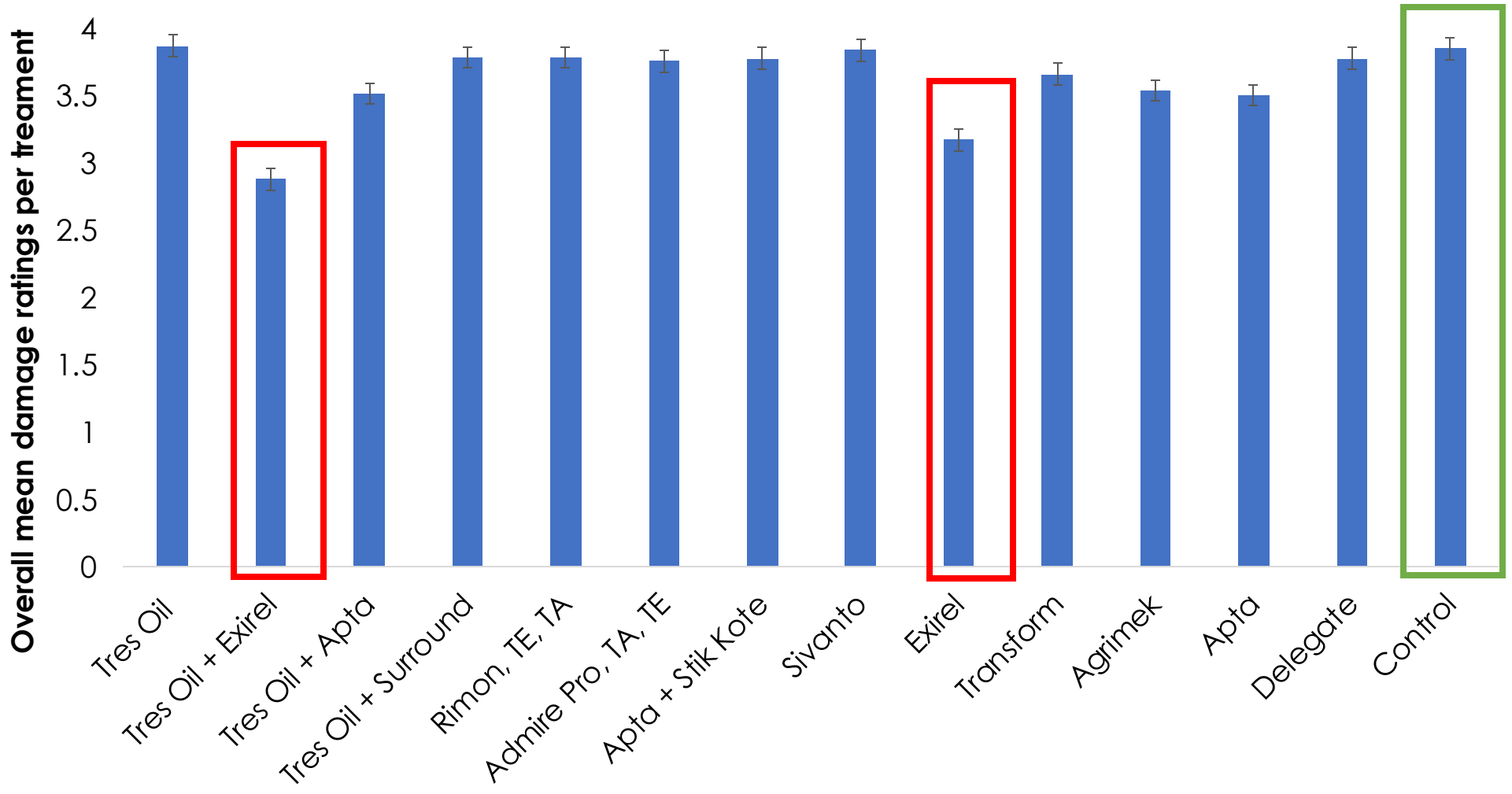
## Assessment

- **Damage ratings** were assessed based on the **amount of feeding injury**
  - 0 = no injury;
  - 1 = <10% (bronzing of leaf and petiole);
  - 2 = 10-30% injury (bronzing);
  - 3 = 31-60% injury (bronzing and curling);
  - 4 = > 60% injury
- Data were obtained from the **3 inner bushes of each plot**




(Liburd et al. 2020; Babu Panthi; Kendi Muthomi – images below)

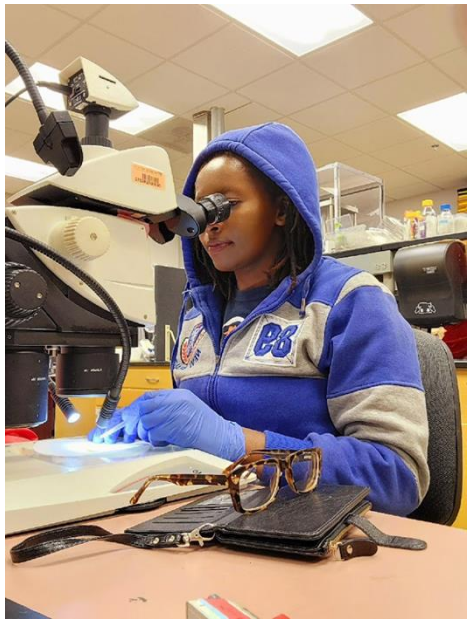
# Overall thrips **injury ratings** after insecticide application in SHB blueberries (2025)



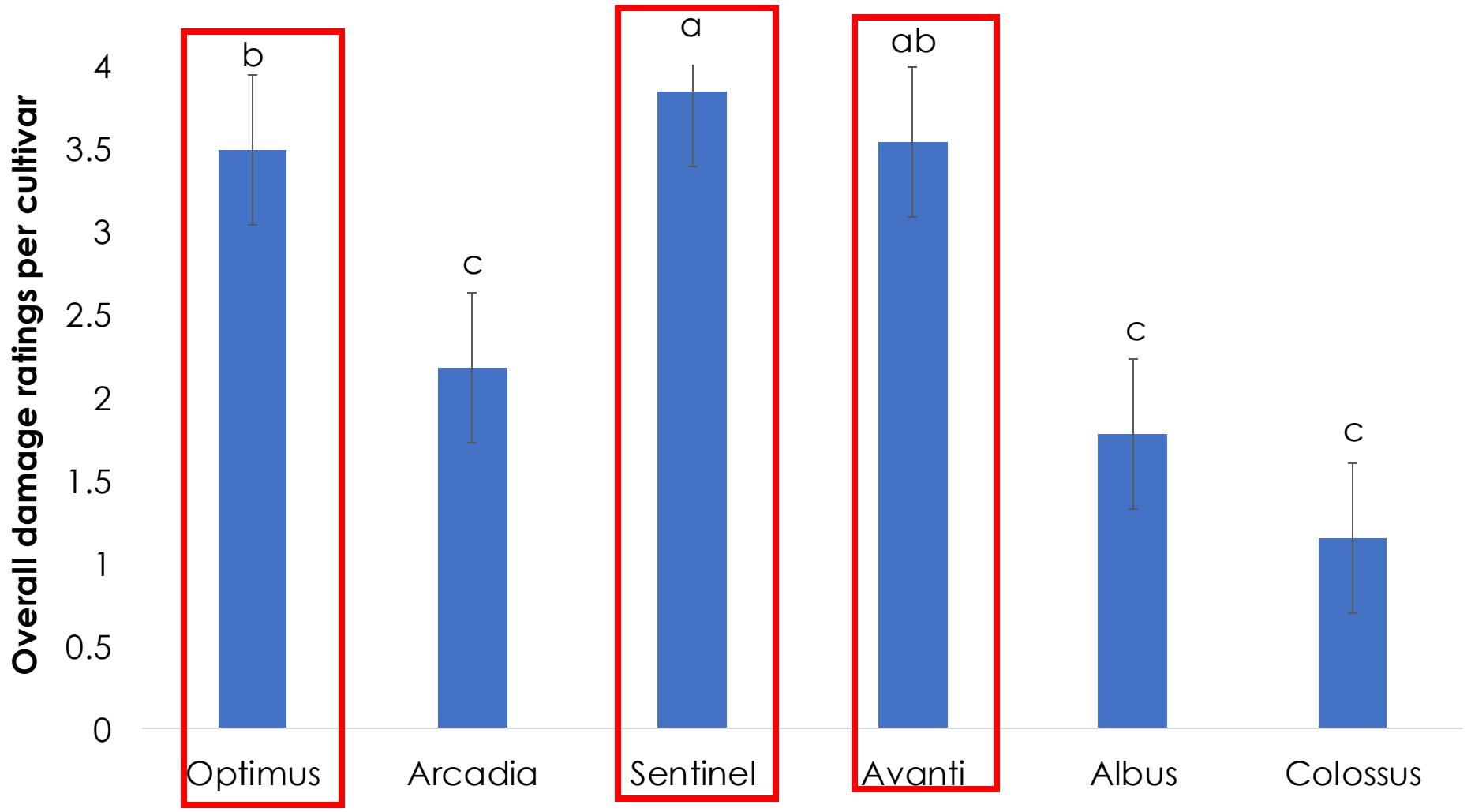
# **2. Cultivar study:** Determine the abundance of chilli thrips in selected SHB cultivars in the field(2025)

- **SHB cultivars**: Avanti, Arcadia, Sentinel, Optimus, Colossus, Albus
- **Design** & plant arrangement:
  - RCBD (6 SHB cultivars, 4 replicates)
    - 6 bushes per plot
    - 6-plant buffer zone between plots
- **Sampling** and analysis:
  - **6 young blueberry shoots/plot** (with 6 -10 leaves) were collected, placed in 50mL centrifuge tubes, and transported to the SFVIPM lab
  - The **total # of larvae and adult thrips/cultivar** was counted
  - **Damage ratings** were recorded based on the amount of feeding injury (from the 4 inner bushes) – As shown earlier
  - Data analysis - Repeated measures ANOVA; LSD; a = 0.05

(Avanti bushes, leaf samples, and microscopy. Credit: **Kendi Muthomi**)

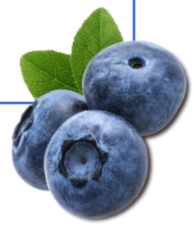
# Overall **damage ratings in selected cultivars (2025)**




Means on bars followed by the same letters are not significantly different

# Findings & conclusions (2025)

- **Exirel**, and **Tres Oil + Exirel** demonstrated the **highest effectiveness** in controlling chilli thrips and resulted in the **lowest** damage ratings
- **Delegate** was the **least effective pesticides** in controlling chilli thrips and resulted in the highest damage ratings
- **Sentinel and Avanti** had the **highest** damage ratings
- Optimus and Arcadia harbored an equal number of chili thrips; however, Arcadia had significantly lower damage ratings (further investigation is warranted)

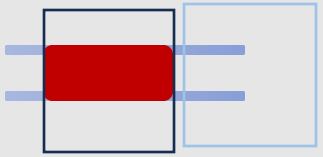


# The Solutions: #1. Spray rotation program

Evaluate insecticide rotation strategies against *Scirtothrips dorsalis* (chilli thrips) & the non-target effects on beneficial insects in parallel.

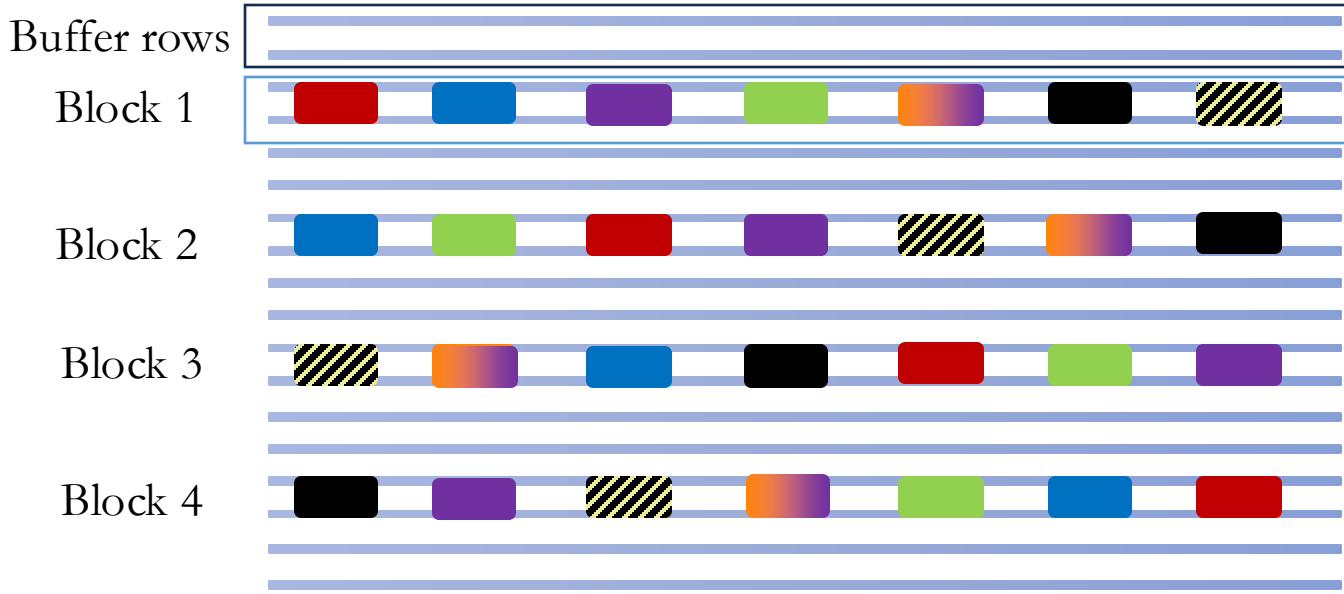
- Rotate insecticides across different Modes of Action (IRAC groups)
- Benefits of rotation:
  - ✓ Slows down resistance development
  - ✓ Maintains effectiveness of existing tools
  - ✓ Improves sustainability of control programs
  - ✓ Aligns with IPM & resistance management best practices

# Experimental design




## 7 spray program treatments

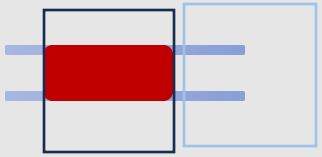
- T1 = Rimon → Assail → Exirel
- T2 = Exirel → Transform → Apta
- T3 = Apta → Exirel → Transform
- T4 = Exirel → Rimon → Assail
- T5 = Sivanto → Apta → Transform
- T6 = Untreated Control
- T7 = Rimon → Apta → Transform




Sprayed thrice on: June 3 June 17 July 1

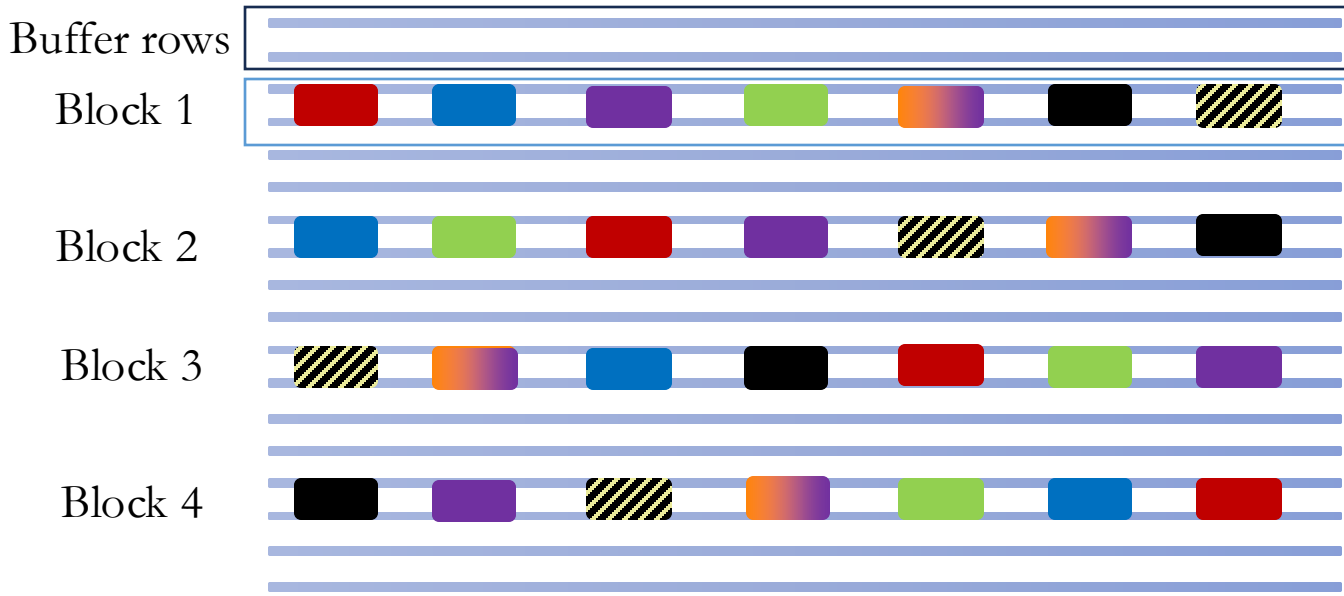
RCBD, 4 blocks, 7 treatments = 28 plots
Buffer between blocks= 2 rows
Buffer between plots in block = 5 bushes
Generalized linear mixed model analysis.

# Experimental design




## Thrips collection 3, 7, 10 DAS

Leaf samples were collected from each plot (0, 3, 7, 10 days after spray)


## Damage Ratings

Plants were evaluated for damage symptoms at pre-treatment, 7 and 10 days after spray:

Scale

0 = no injury

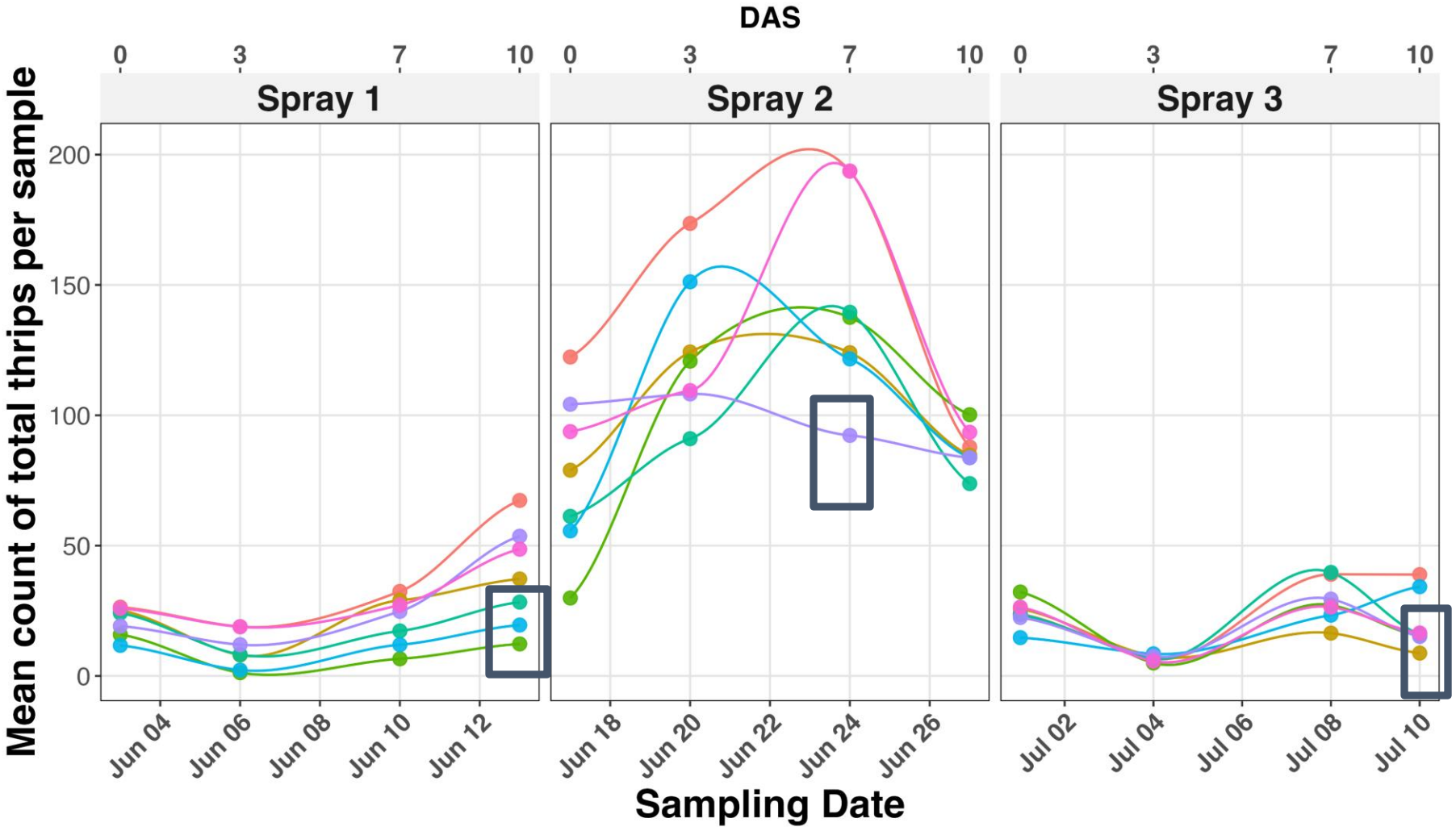
1= <10% bronzing of stem and petiole

2=10-30% bronzing of leaf and petiole

3=31-60% bronzing symptoms &curling of leaf

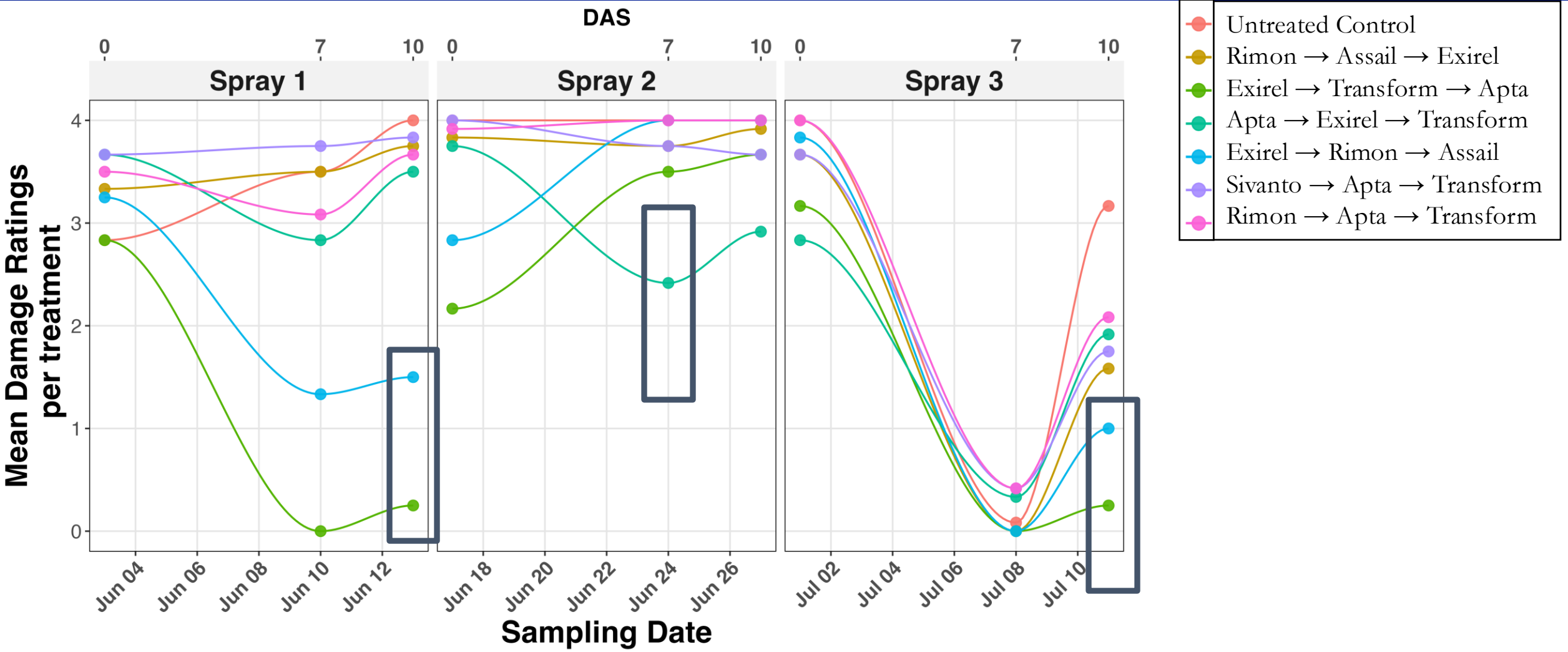
4= > 60% bronzing and curling

# Effectiveness of Insecticide rotation programs on all stages of chilli thrips (total count)




- Untreated Control
- Rimon → Assail → Exirel
- Exirel → Transform → Apta
- Apta → Exirel → Transform
- Exirel → Rimon → Assail
- Sivanto → Apta → Transform
- Rimon → Apta → Transform

# Effectiveness of Insecticide rotation programs on damage symptoms on southern highbush blueberries



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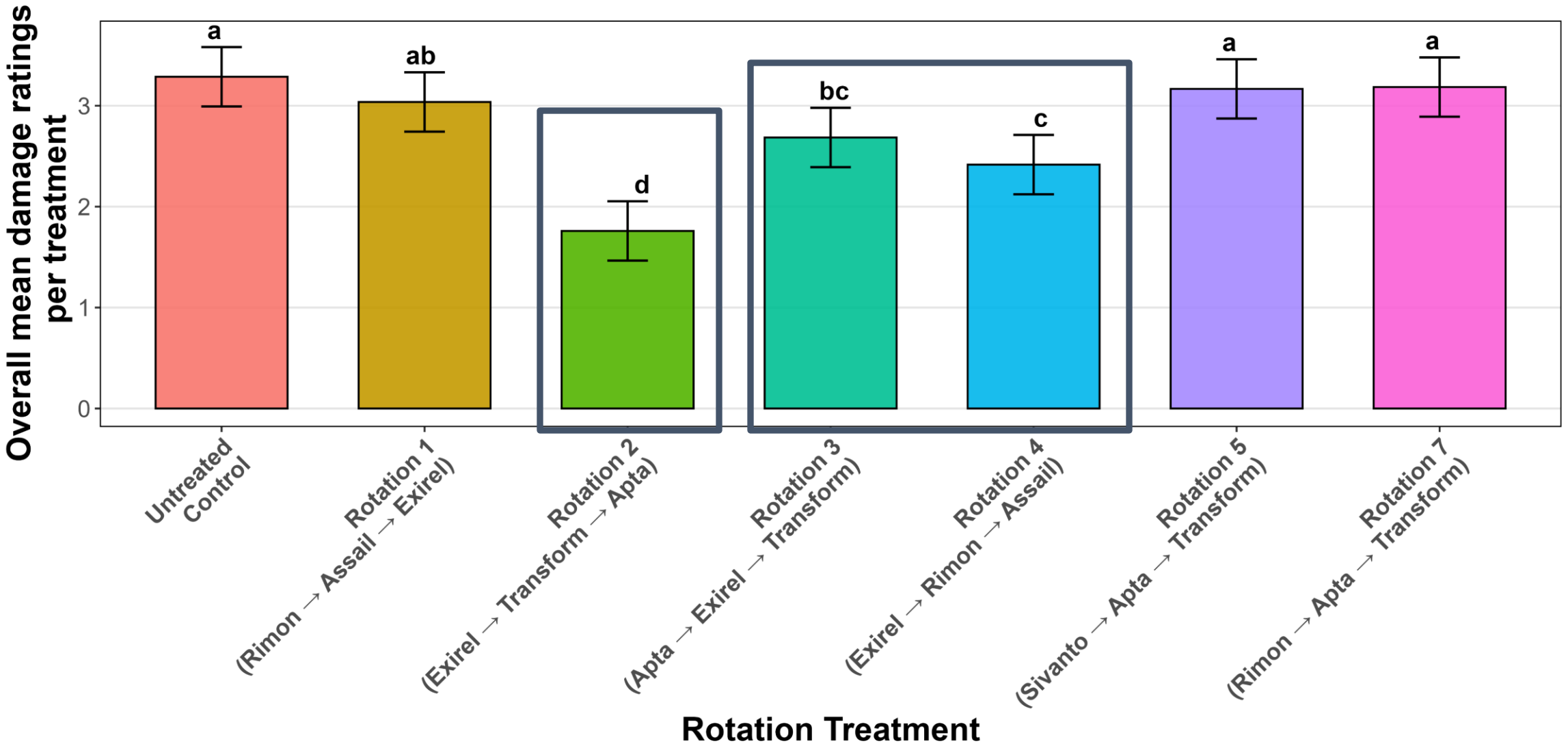


# Conclusions

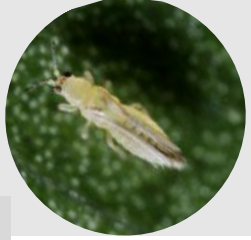
## Overall Rotation Performance

- Rotation 2 (Exirel → Transform → Apta) delivered the best overall protection: lowest thrips numbers, least canopy damage, and consistent performance across sprays.
- Apta was most effective at knocking down total thrips during spray 2, if followed after Sivanto from Spray 1.
- But, Apta was not effective if followed after Rimon.
- By the third spray, as populations naturally declined, all products performed similarly.
- All products gave reasonable control by the third spray, as natural thrips pressure declined.
- Strategic sequencing matters: using the right follow-up spray reduces rebound.

## Take-Home Points

- Start the rotation with Exirel for strong, lasting early suppression.
- Follow with Transform or Apta to maintain control and delay resistance.
- Avoid repeating weak sequences like Rimon → Apta, which led to quick rebounds.
- By alternating chemistries and using strong follow-ups, thrips populations and plant damage can be reduced dramatically.

# The Solutions: #2. Identify resistant genotypes



Identify cultivars with resistance or tolerance to chilli thrips in the blueberry breeding program.

- Evaluated the plant damage levels in response to chilli thrips infestations : overall health, resistance, tolerance & susceptibility levels.
- Developing scalable screening protocols for breeders and growers.
- Long-term goal: integrate host plant resistance into blueberry IPM strategies

# Progress

- Greenhouse screening have been completed for 1000s of plants.
- Selected seedlings ready for transplanting in the field for next season evaluation.
- Goal is to make progress towards developing resistant/ tolerant variety to chilli thrips through blueberry lab’s breeding program.

# THANK YOU

# QUESTIONS?

## Check out my lab and our work!

**UF IFAS Small Fruit and Vegetable IPM Laboratory**

UF IFAS
UNIVERSITY of FLORIDA

**Email:** oeliburd@ufl.edu

**Tweet me @OscarLiburd**