

# Managing spider mites in watermelon production

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# Insecticides

- Reliable and fast-acting to control insect pests
- Secure marketability and yields
- Broad-spectrum insecticides
  - Neonicotinoids
    - (e.g., imidacloprid)
  - Pyrethroids
    - (e.g., permethrin)




**MIDASH FORTE**  
INSECTICIDE

**ACTIVE INGREDIENT:** Imidacloprid: 1-[(6-Chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine ..... 40.7%  
**OTHER INGREDIENTS:** ..... 59.3%  
**TOTAL:** ..... 100.0%

Contains 4 lbs. of active ingredient per gallon.  
EPA Reg. No. 83529-6 EPA Est. No. 70815-GA-001

Shake well before using.  
STOP-READ THE LABEL BEFORE USE.  
**KEEP OUT OF REACH OF CHILDREN  
CAUTION**

See inside booklet for additional Precautionary Statements, First Aid, Directions for Use, and Limitation of Warranty and Liability.

Manufactured for:  
**Sharda USA LLC**   
7217 Lancaster Pike, Suite A  
Hockessin, DE 19707

**Net Contents: 1 gallon**

**RESTRICTED USE PESTICIDE**  
DUE TO TOXICITY TO FISH AND AQUATIC ORGANISMS  
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS, OR PERSONS UNDER THEIR DIRECT SUPERVISION, AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

**Warrior II**  
with Zeon Technology®

**syngenta.**

**Insecticide**

**KEEP OUT OF REACH OF CHILDREN.  
WARNING / AVISO**

**Active Ingredient:** Lambda-cyhalothrin<sup>1,2</sup> ..... 22.8%  
**Other Ingredients:** ..... 77.2%  
**Total:** 100.0%

Warrior II with Zeon Technology contains 2.08 lb of active ingredient per gal and is a capsule suspension.

<sup>1</sup>CAS No. 91465-08-6  
<sup>2</sup>Synthetic pyrethroid  
Contains petroleum distillate.  
EPA Reg. No. 100-1295  
EPA Est. 38578-TX-1

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.) See additional precautionary statements and directions for use in booklet.  
SCP 1295A-L2D 1114  
4047204

**1 gallon**  
Net Contents

# Broad-spectrum insecticides

- Non-target specific
- Detrimental effects on beneficial insects
  - **Lethal** and **sub-lethal**
- Impaired biological control

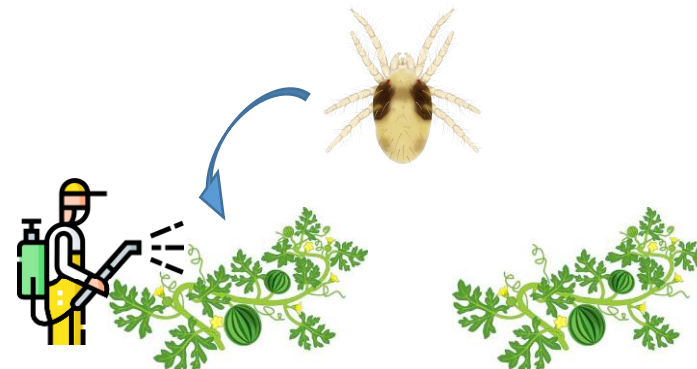
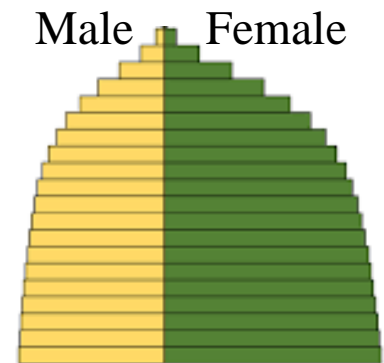
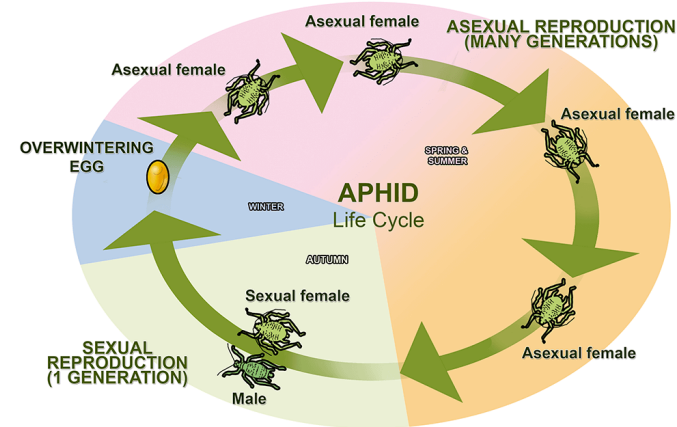


# Broad-spectrum insecticides

- Unexpected **effects on secondary pests**

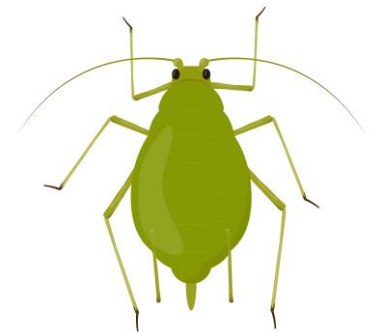
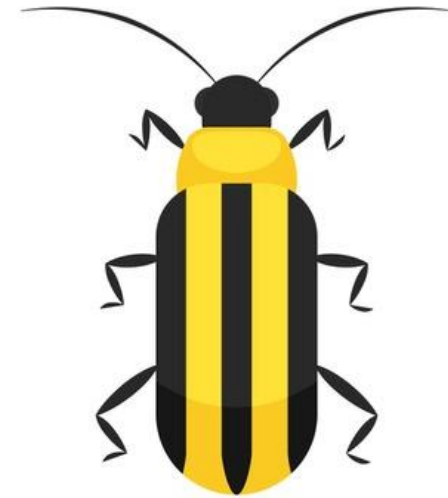
- Enhanced reproductive rate
- Reduced generation time
- Female-biased sex ratios

- **Suppressed plant defenses** that enhance crop susceptibility



# Broad-spectrum insecticides

- Targeting primary pests
  - Striped cucumber beetles
- **Secondary pest outbreaks**
  - Small arthropods
    - (e.g., spider mites, aphids)



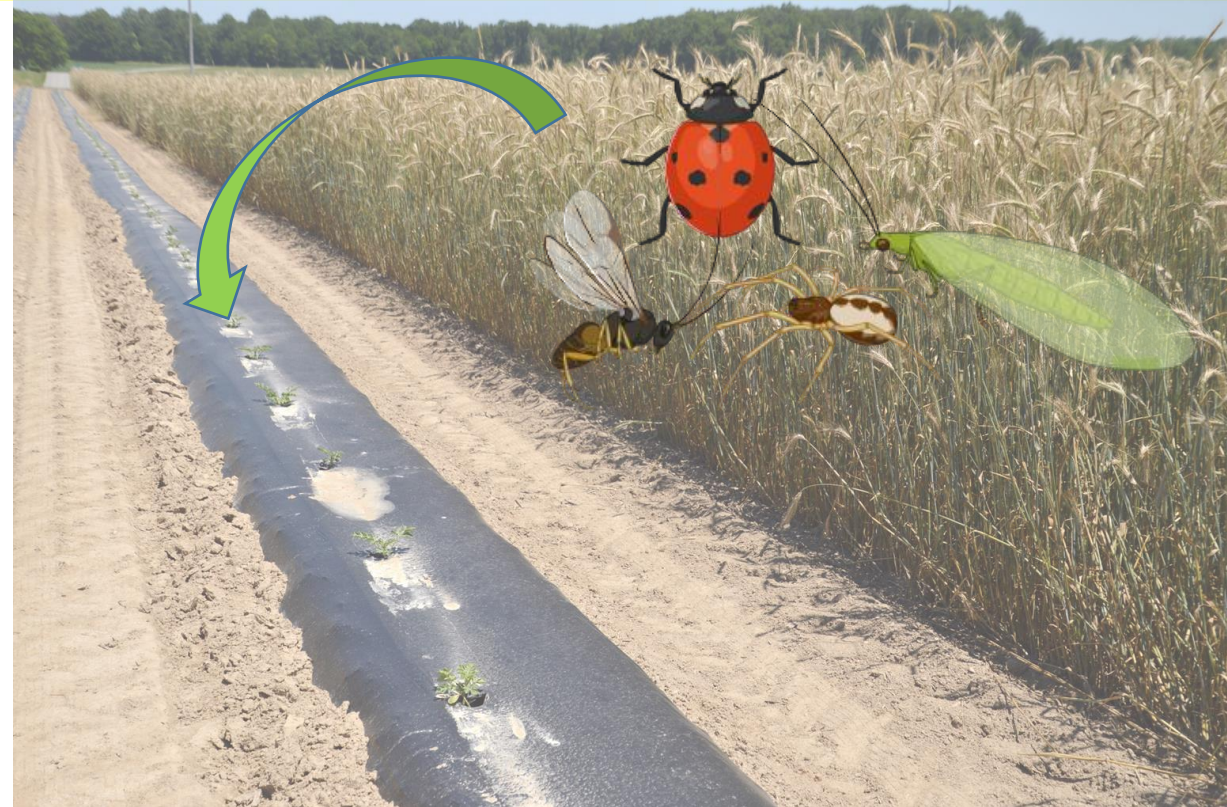
# Rye cover crop

- **Wind-break** function
  - Sand-blasting damage
- **Indirect and direct effects** on pests



# Rye cover crop

- Habitat for natural enemies
  - Biological control
- **Indirect negative effects on pests**



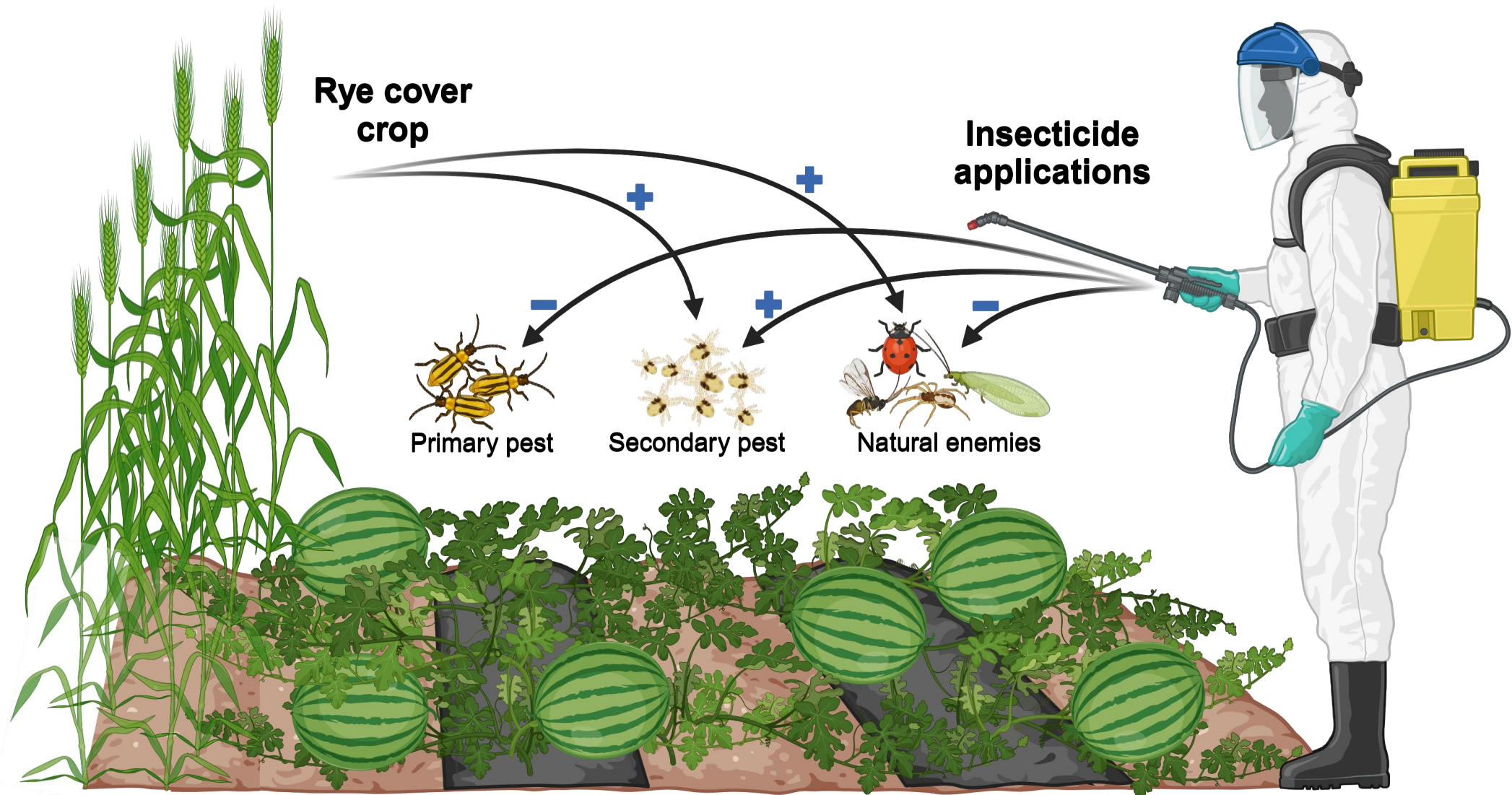
# Rye cover crop

- Rye can act as a “green bridge”
  - Exacerbating pest damage
- **Direct positive effects on pests**





# Broad-spectrum insecticides and rye cover crop in watermelon systems



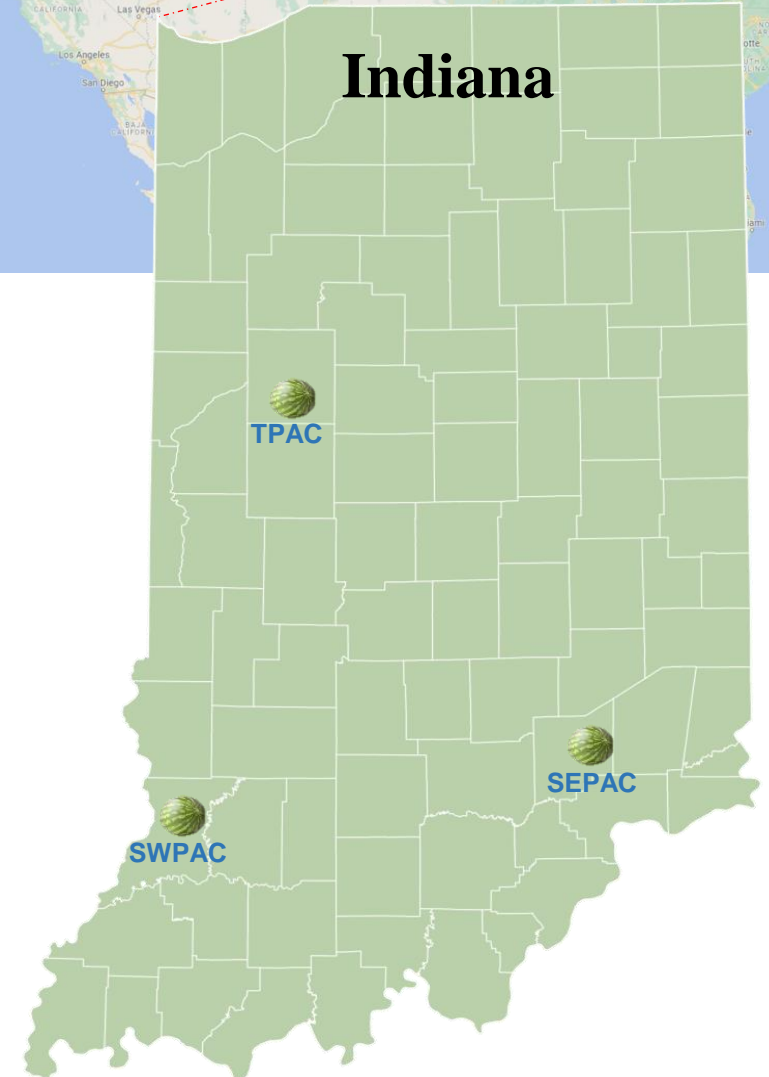
# Study location

## 3 locations across **Indiana**

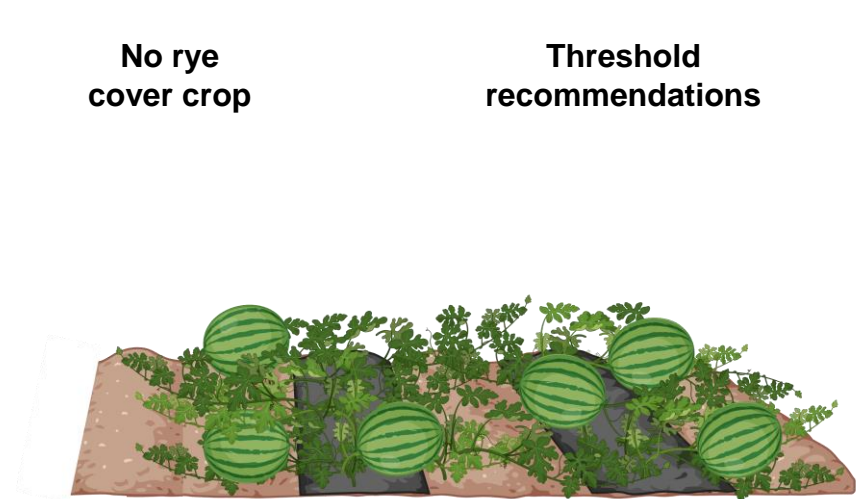
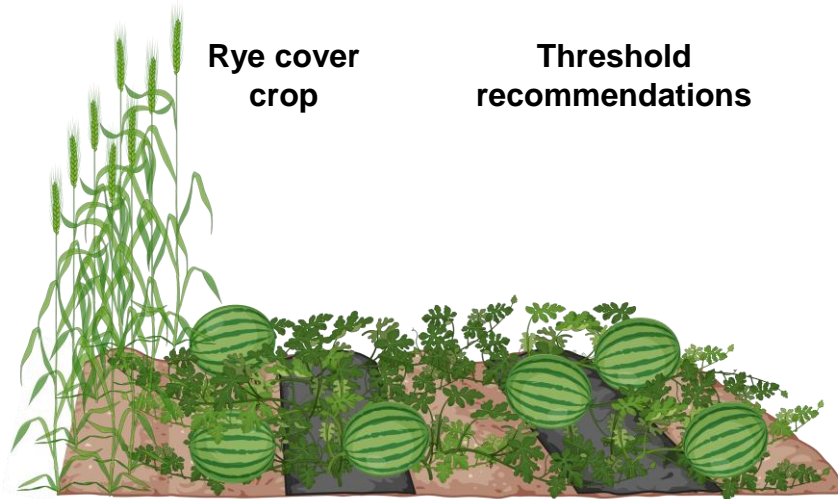
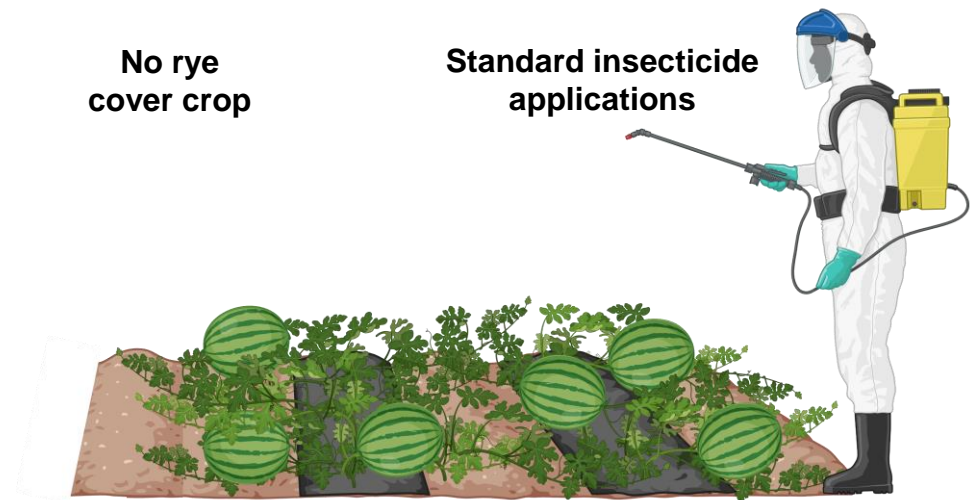
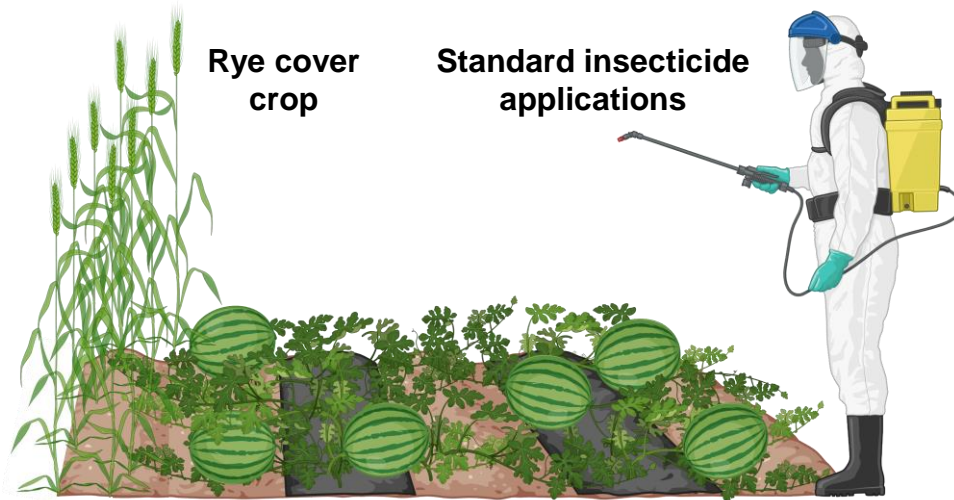
TPAC (Throckmorton Purdue Agricultural Center) 2023 & 2024

SWPAC (Southwest Purdue Agricultural Center) 2024

SEPAC (Southeast Purdue Agricultural Center) 2024

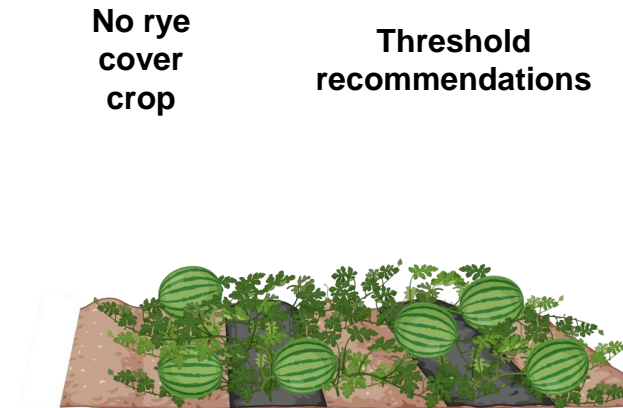
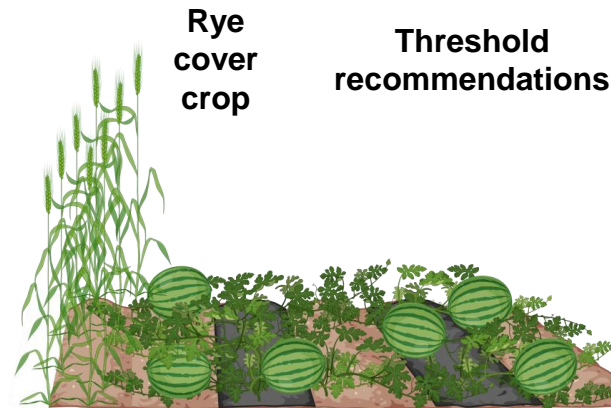
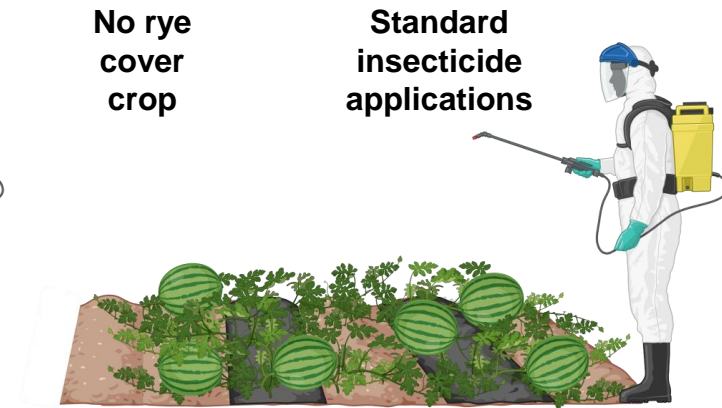
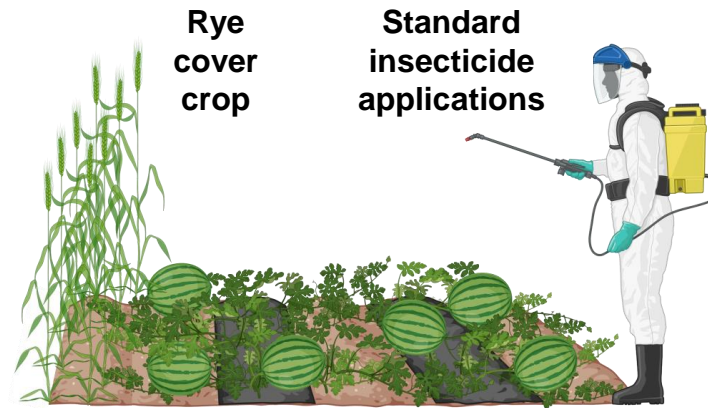


# Treatments



# Treatments

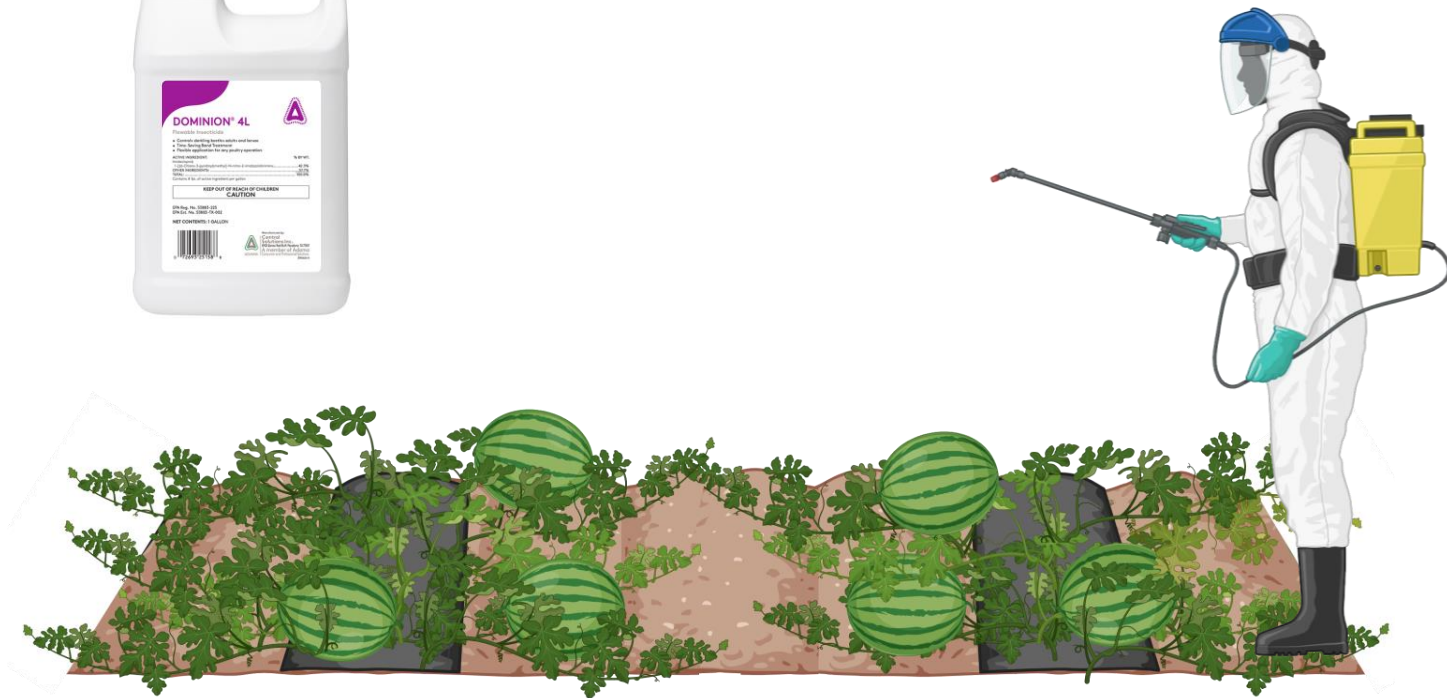
- Treatments were replicated **5 times** per location
- **20 replicates** in total!



# Treatments

- 1 **imidacloprid** application at transplant
- 4 **pyrethroid** applications every 2 weeks

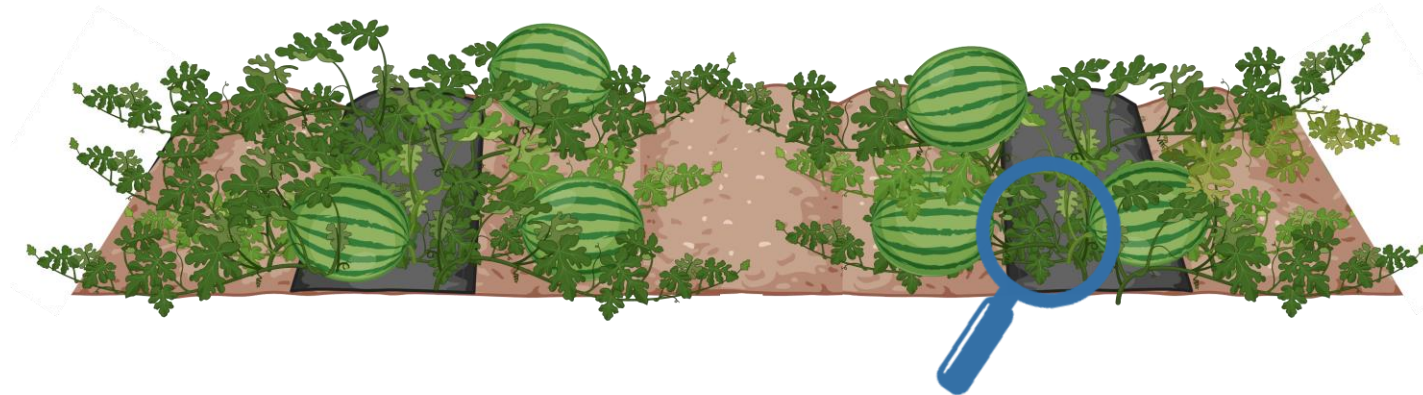
## Standard insecticide applications



# Treatments

## Threshold recommendations

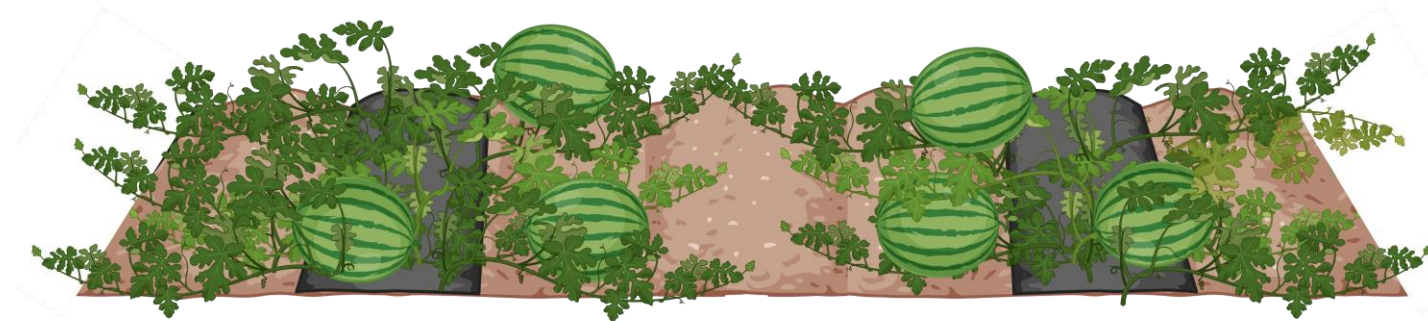
- 1 acetamiprid application in 2023 TPAC
  - Cucumber beetle and aphid outbreak



# Treatments

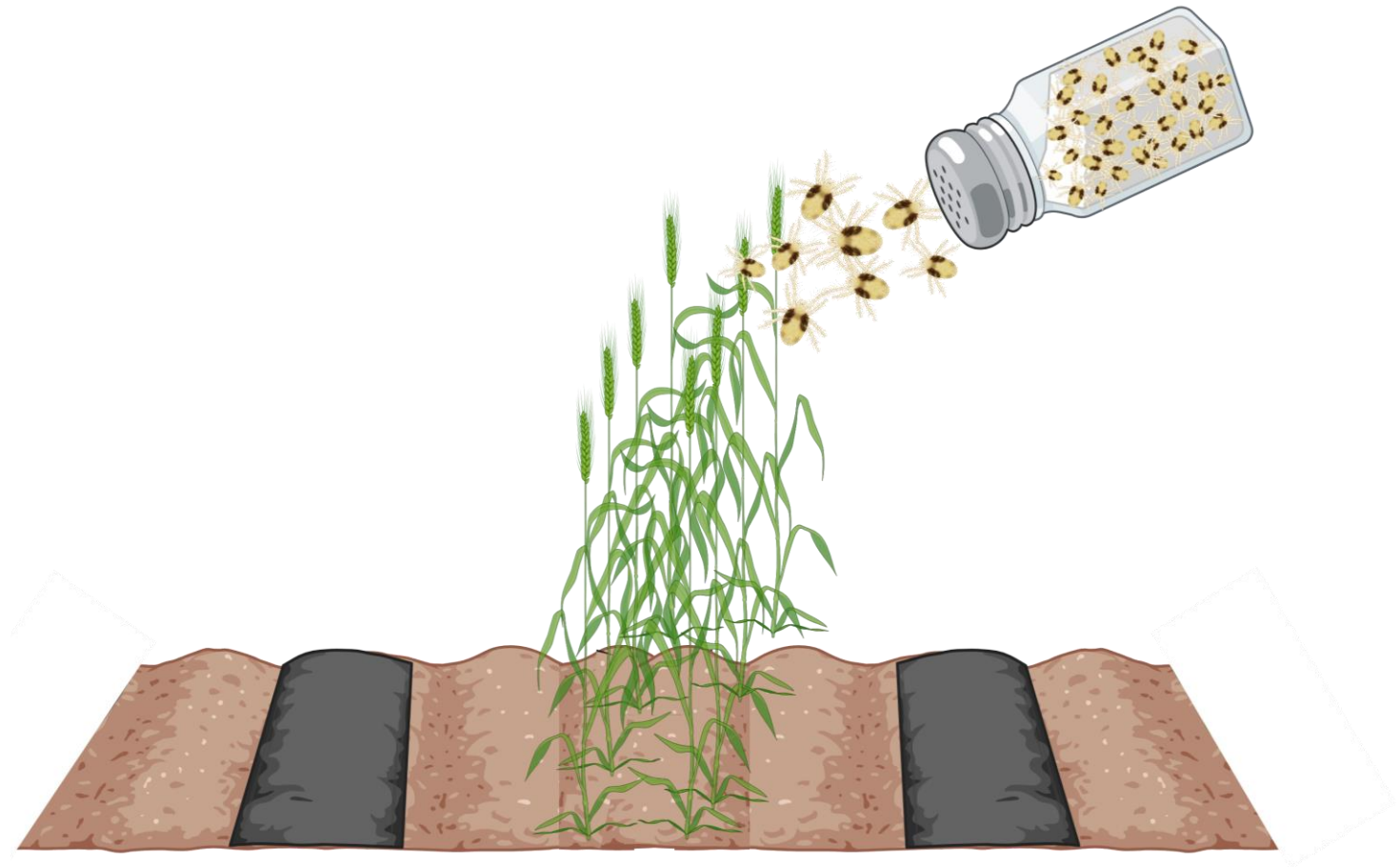
## Rye cover crop absence

- Presence vs. absence of rye cover crop



# Spider mite infestation

- 1 **rye** infestation prior to planting





# Spider mite infestation

- 1 **rye** infestation prior to planting
- 3 **watermelon** infestations over the summer
- ~**1,600 spider mites** released per plot



# Weekly scouting

- **Pests**

- Striped and spotted cucumber beetles
- Spider mites
- Aphids

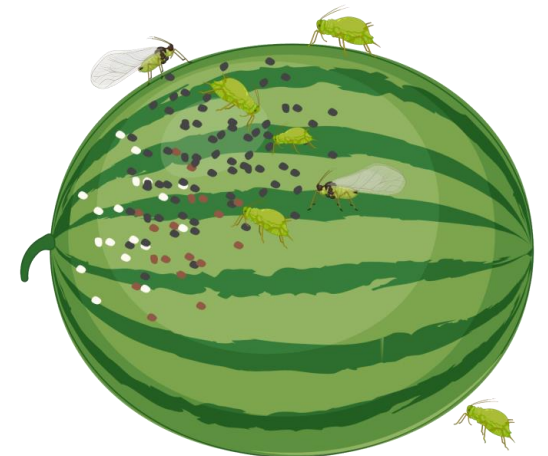
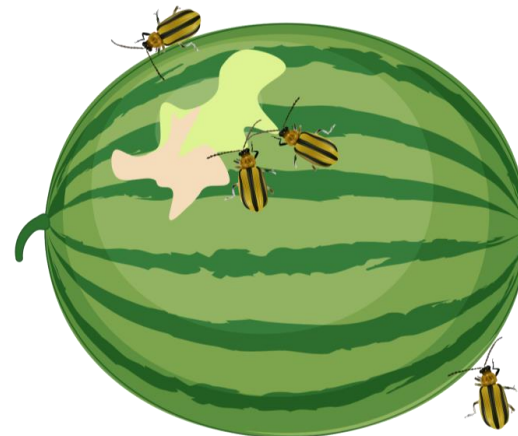
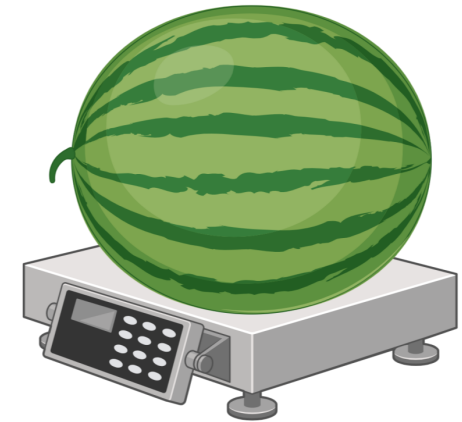
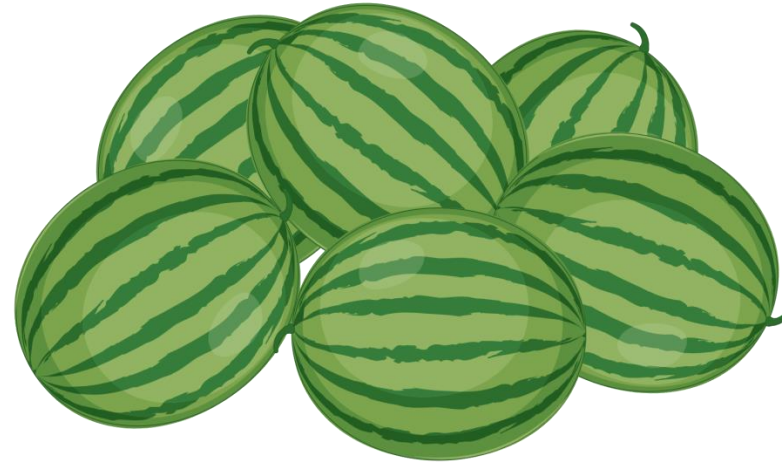
- **Natural enemies**

- From transplant to harvest
  - May - August



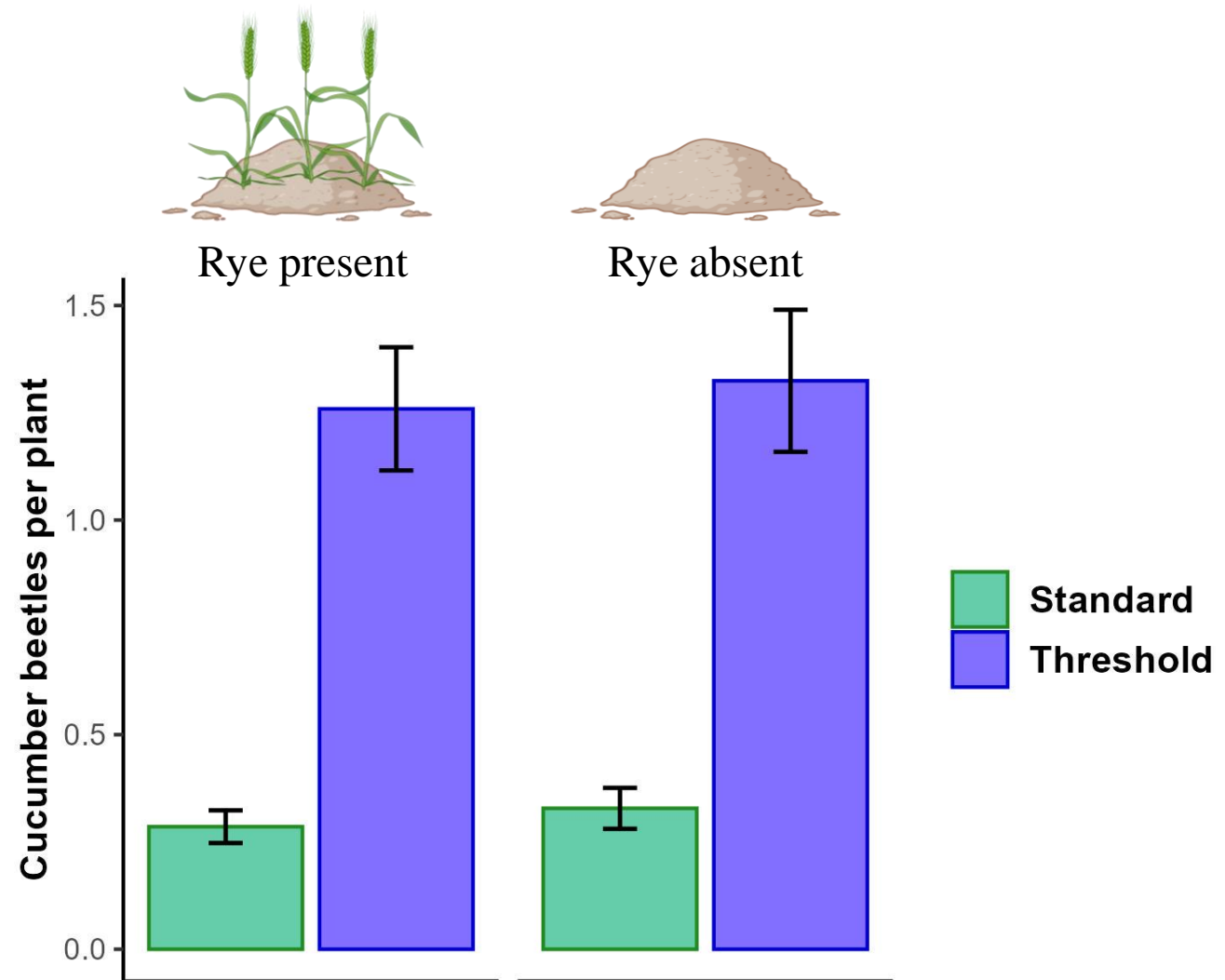
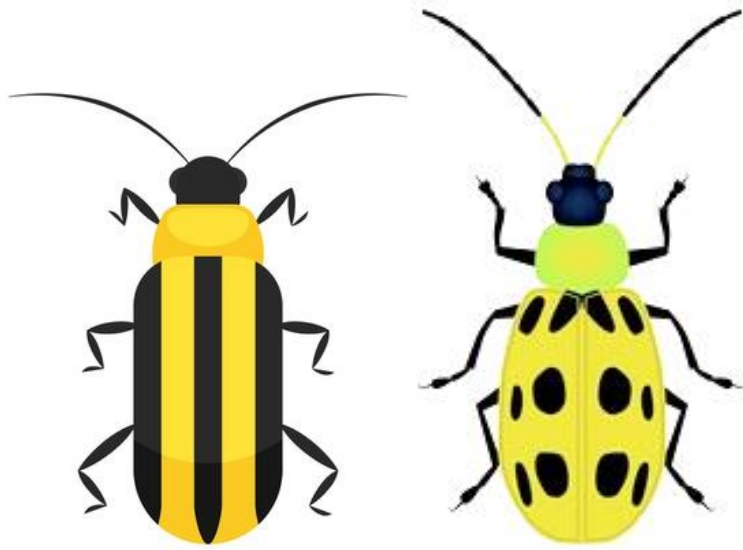
# Harvest

- **Fruit set**
- **Weight**
- **Rind damage**
- **Honeydew**

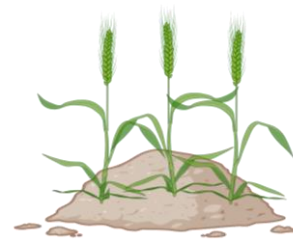


# Greater number of cucumber beetles in the threshold

No effect of rye



# Cucumber beetles under 5 beetles per plant threshold

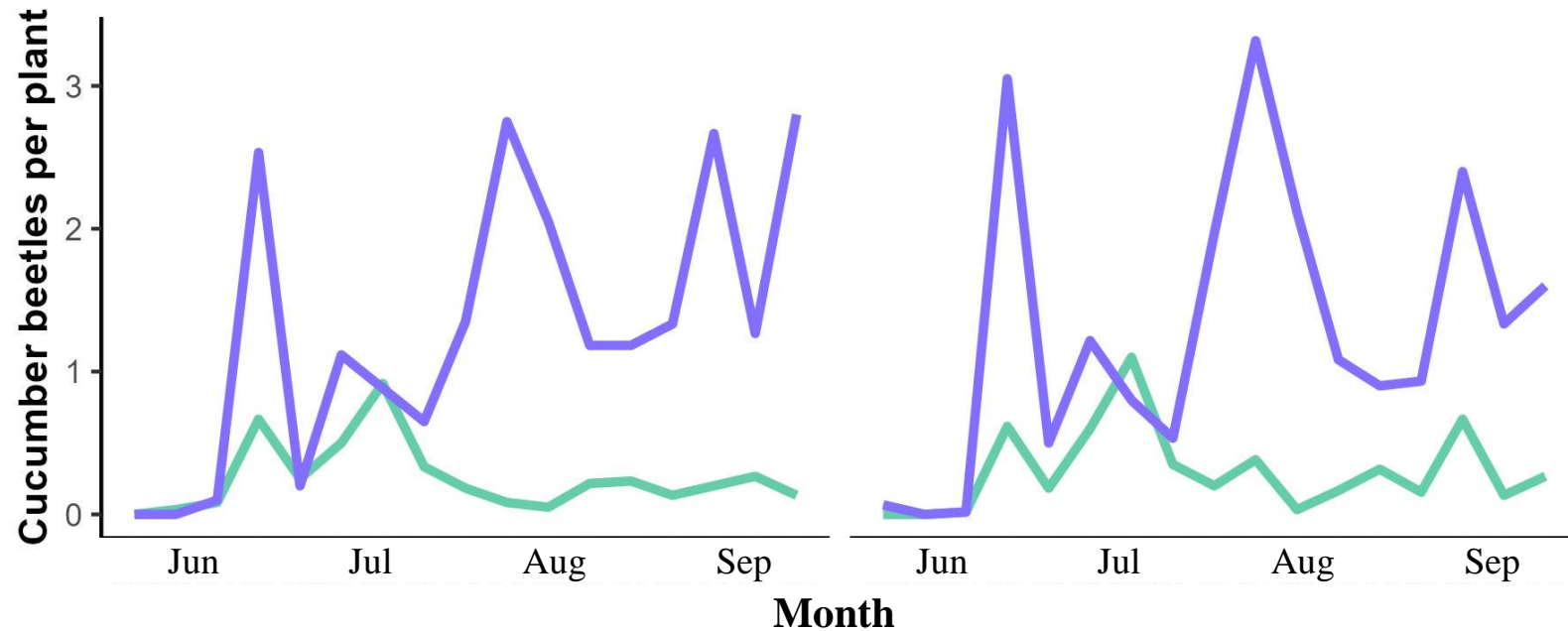
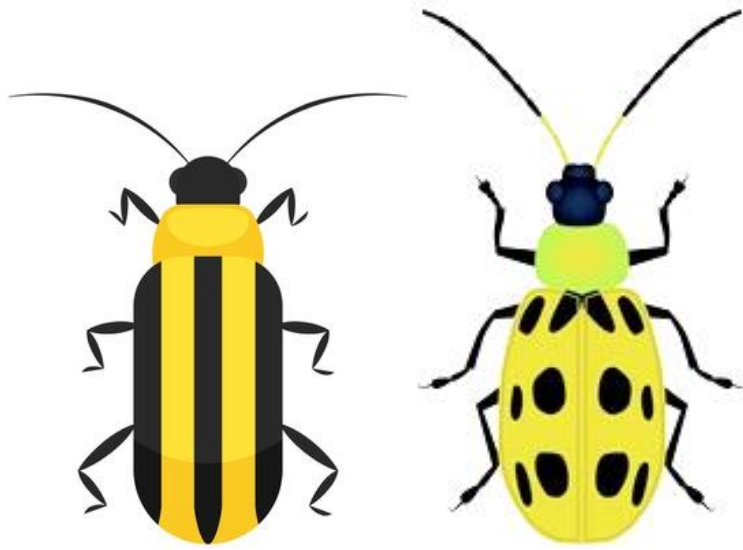


Rye present



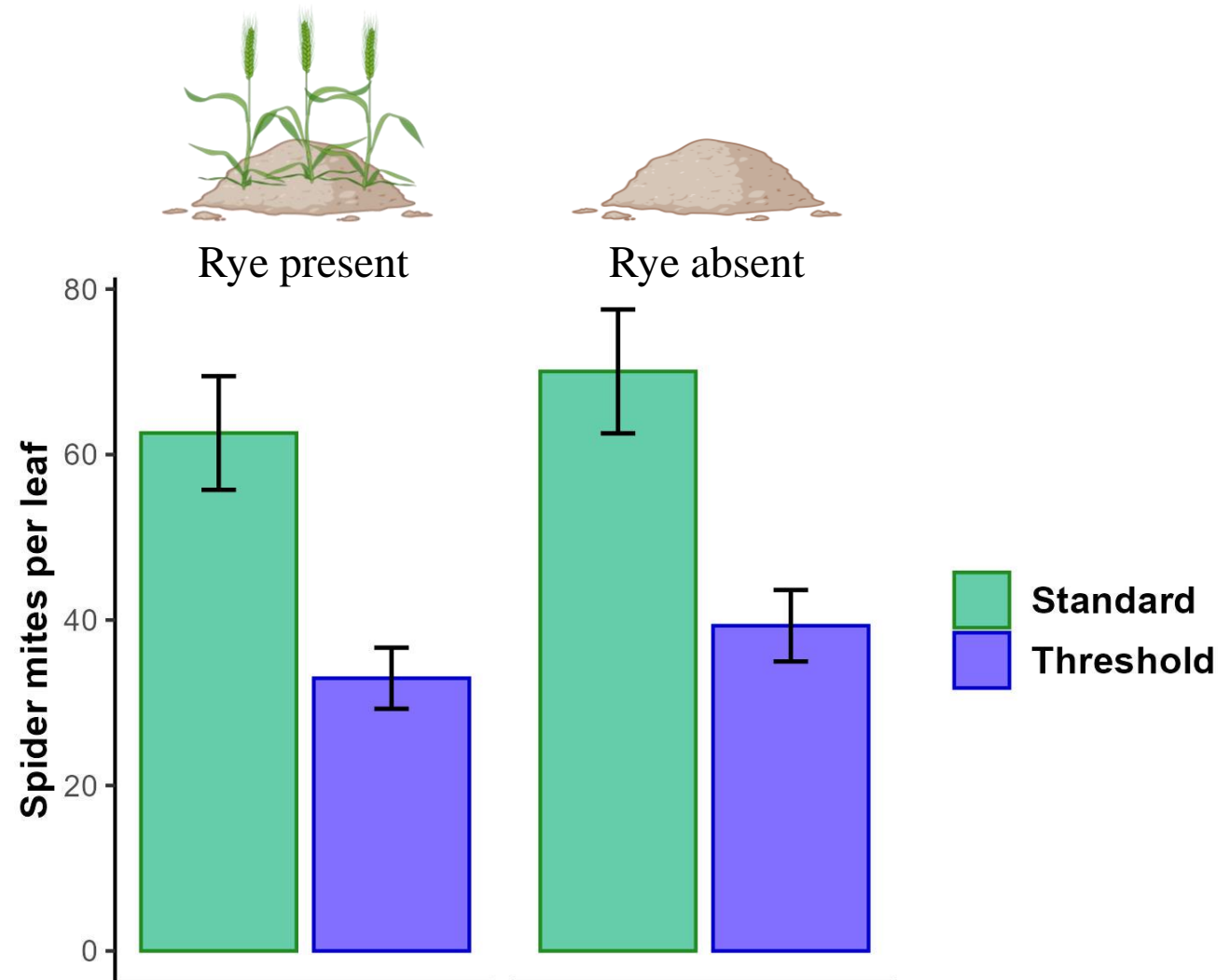
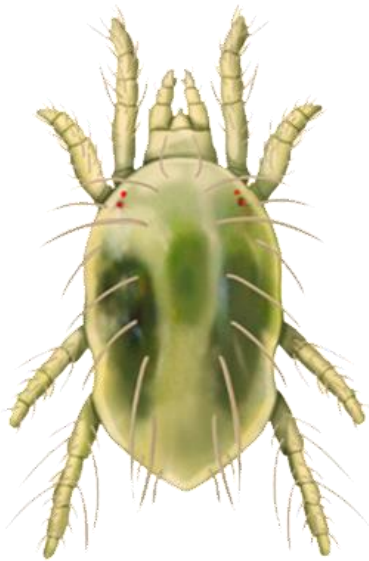
Rye absent

— Standard — Threshold



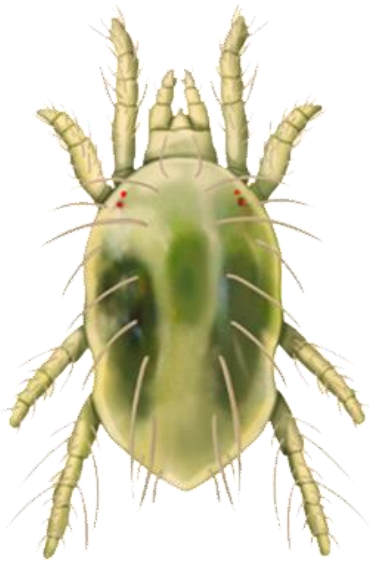
# More spider mites in the standard insecticide treatment

No effect of rye



# Spider mites were controlled over time in the threshold

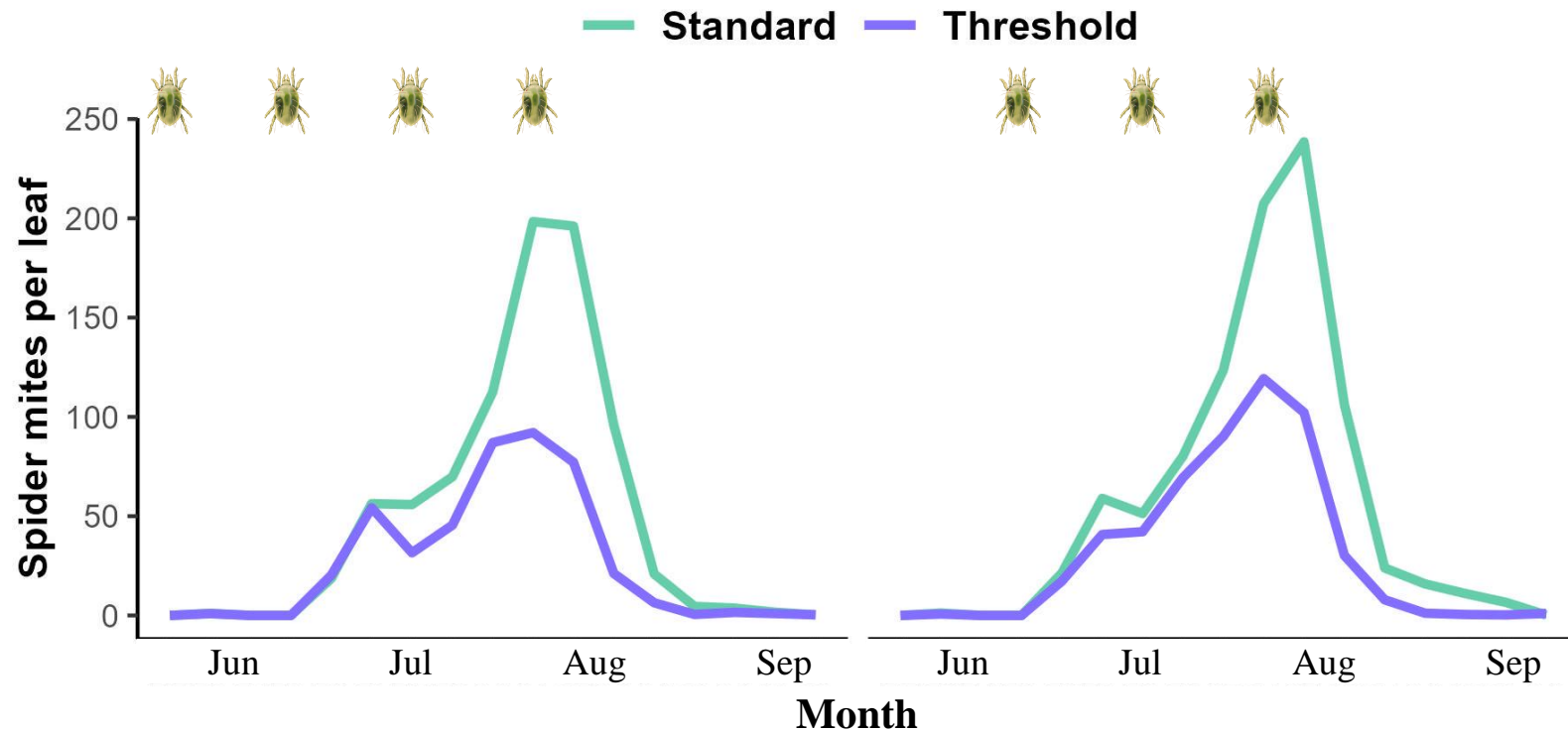
No green bridge effect!



Rye present

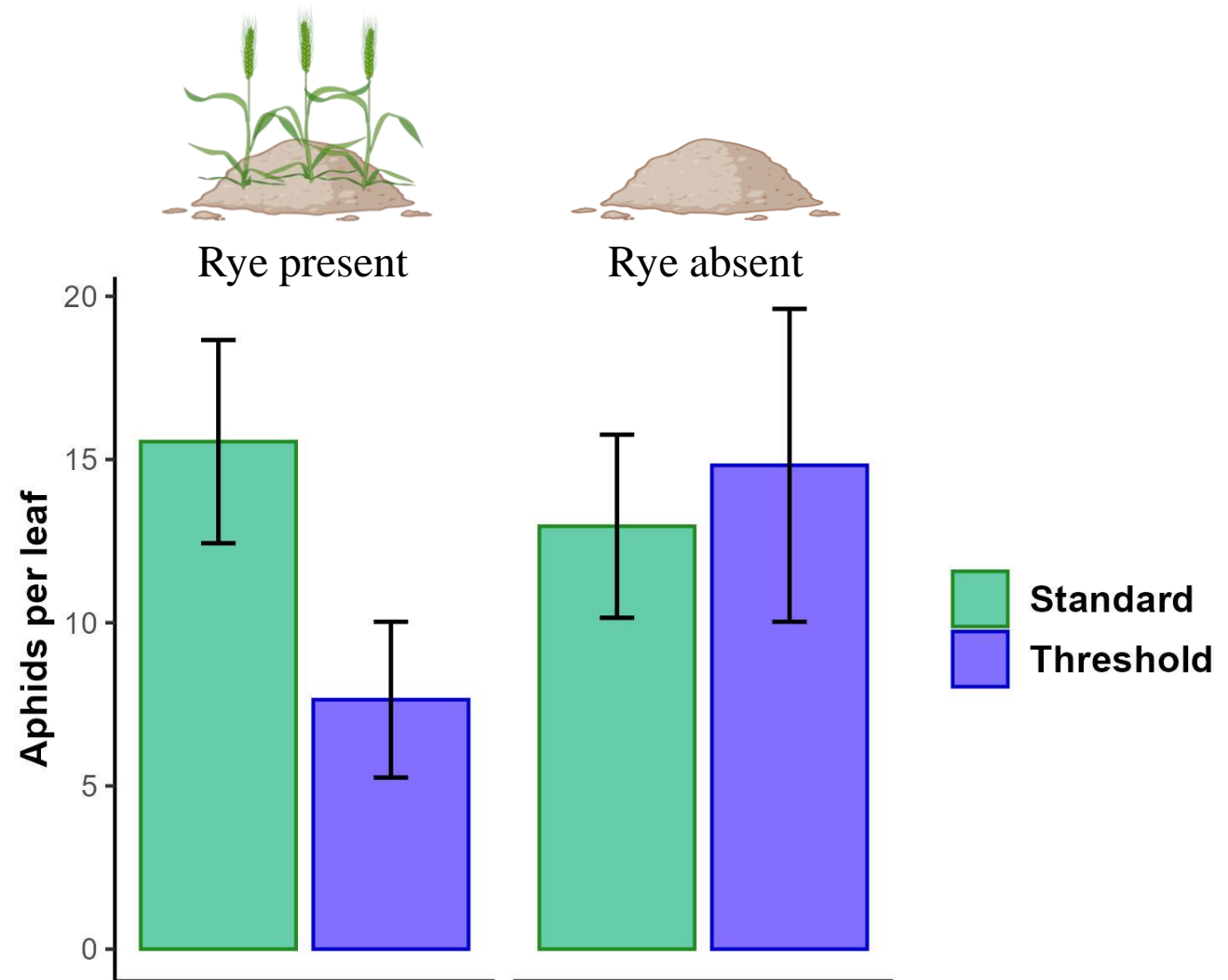
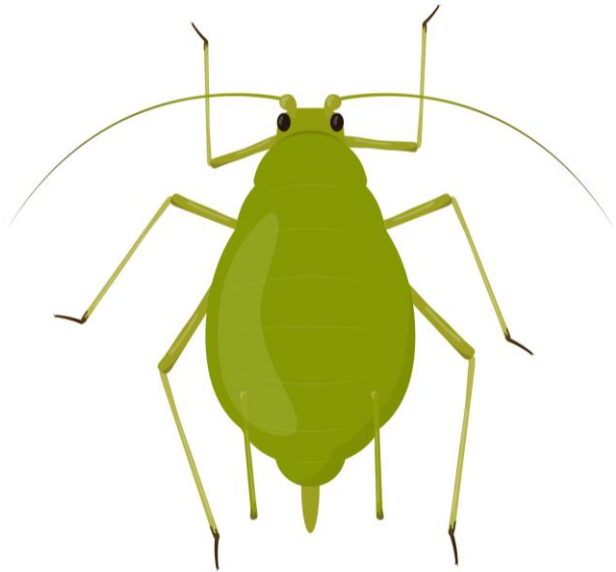


Rye absent



# More aphids in the standard insecticide treatment

Slight rye effect





# Aphid outbreaks later in the season in the standard insecticide treatment

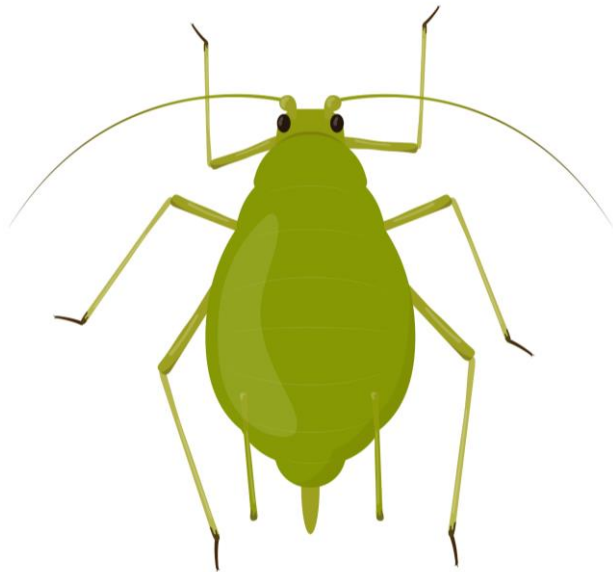
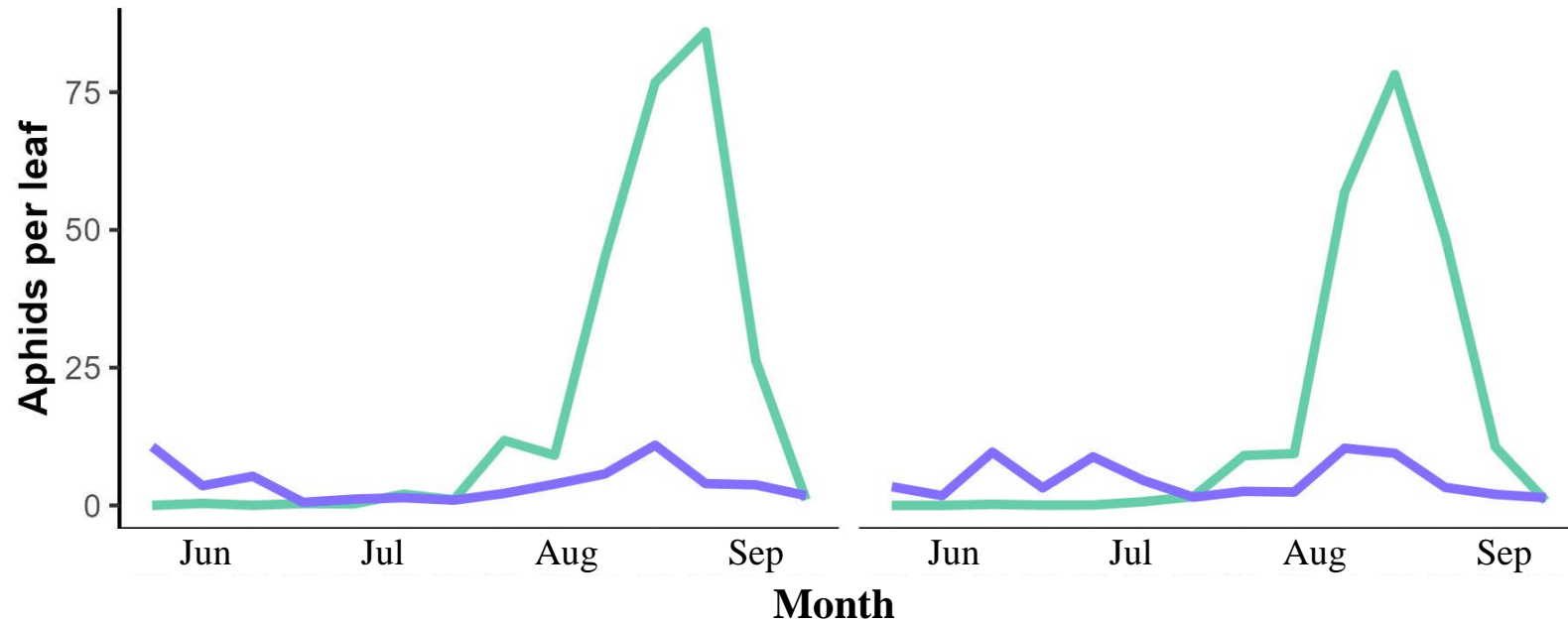


Rye present



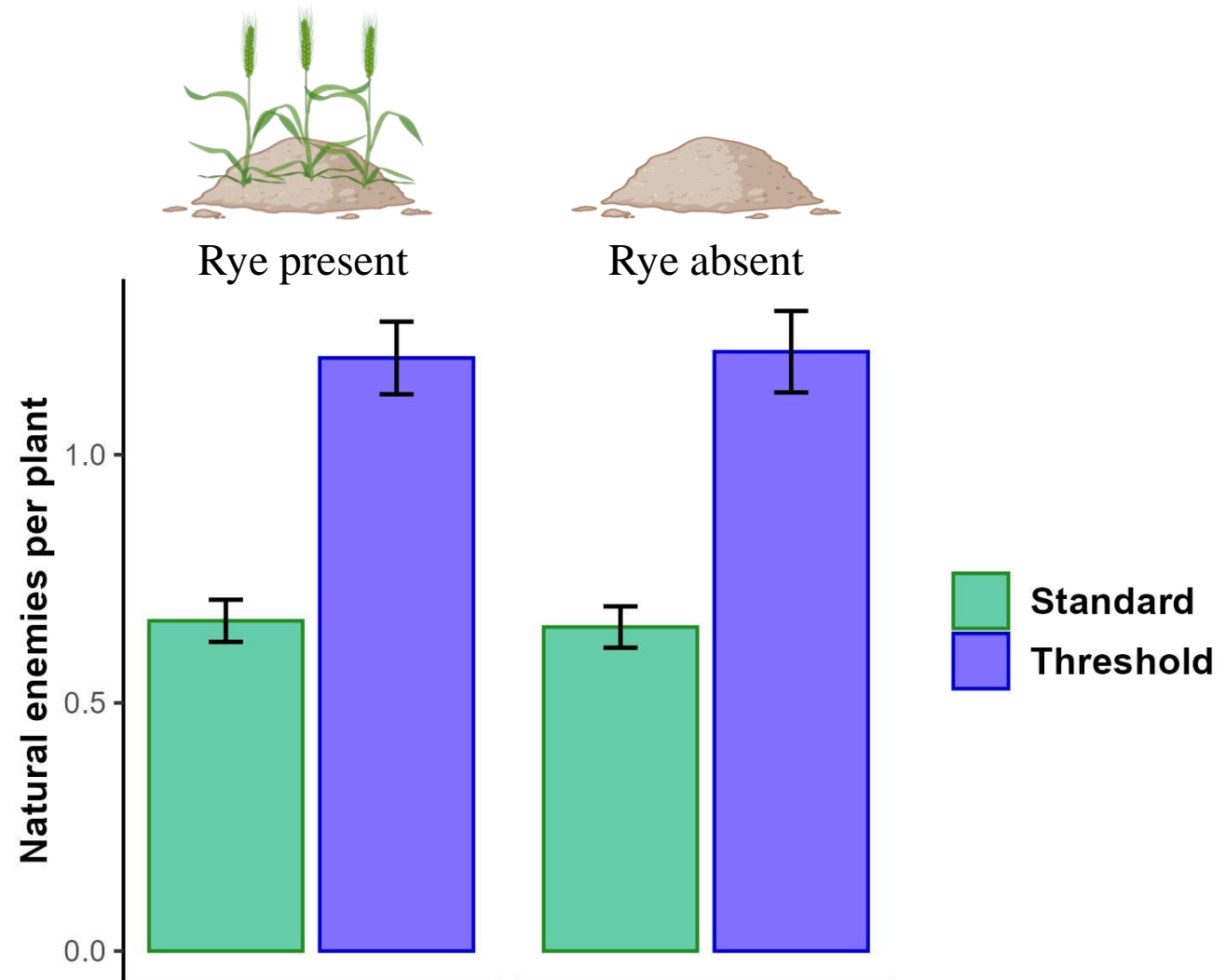
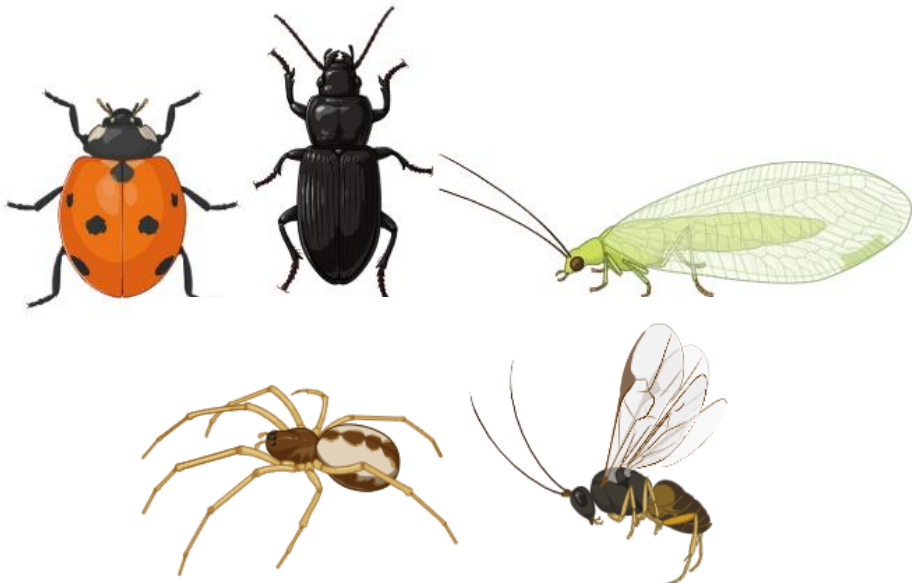
Rye absent

— Standard — Threshold

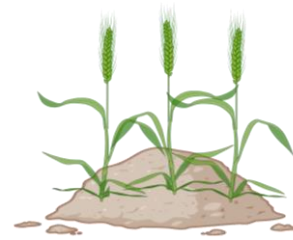


# Greater number of natural enemies in the threshold

No effect of rye



# Natural enemies consistently more abundant in the threshold

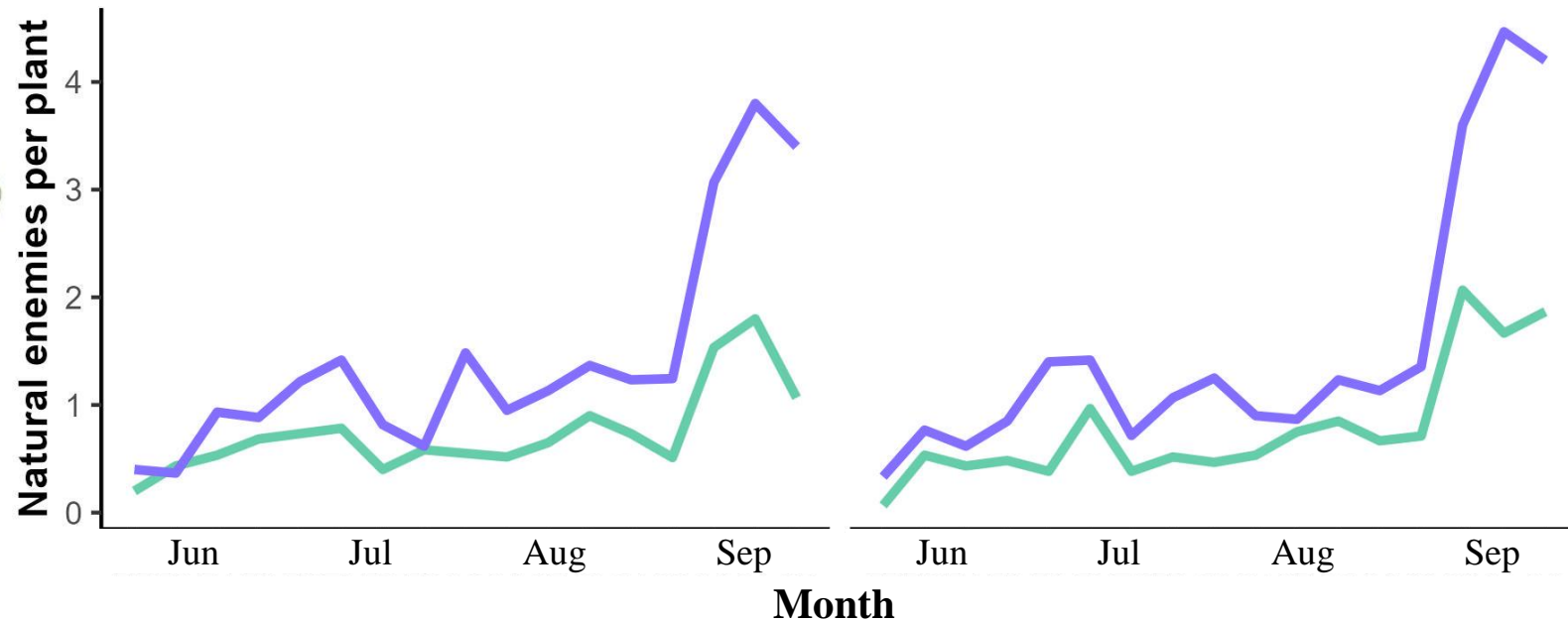
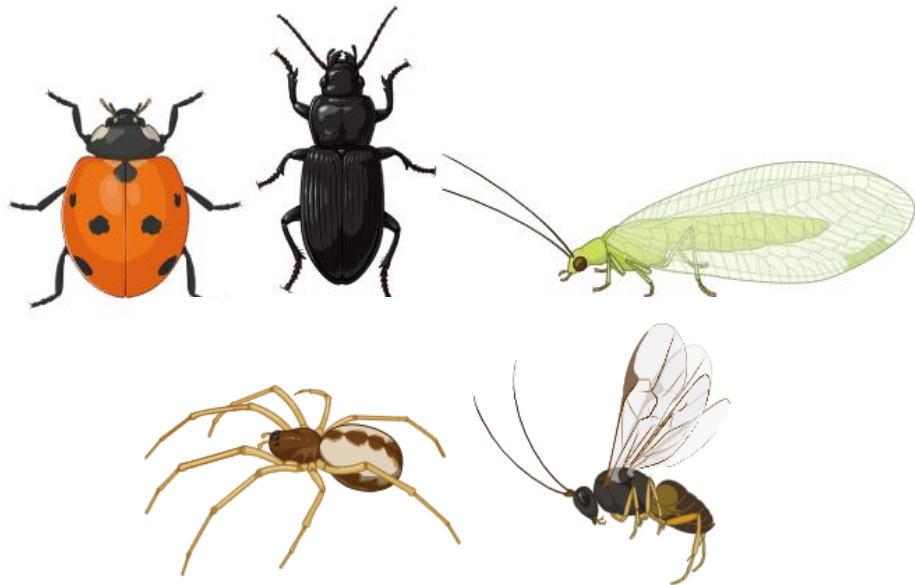


Rye present

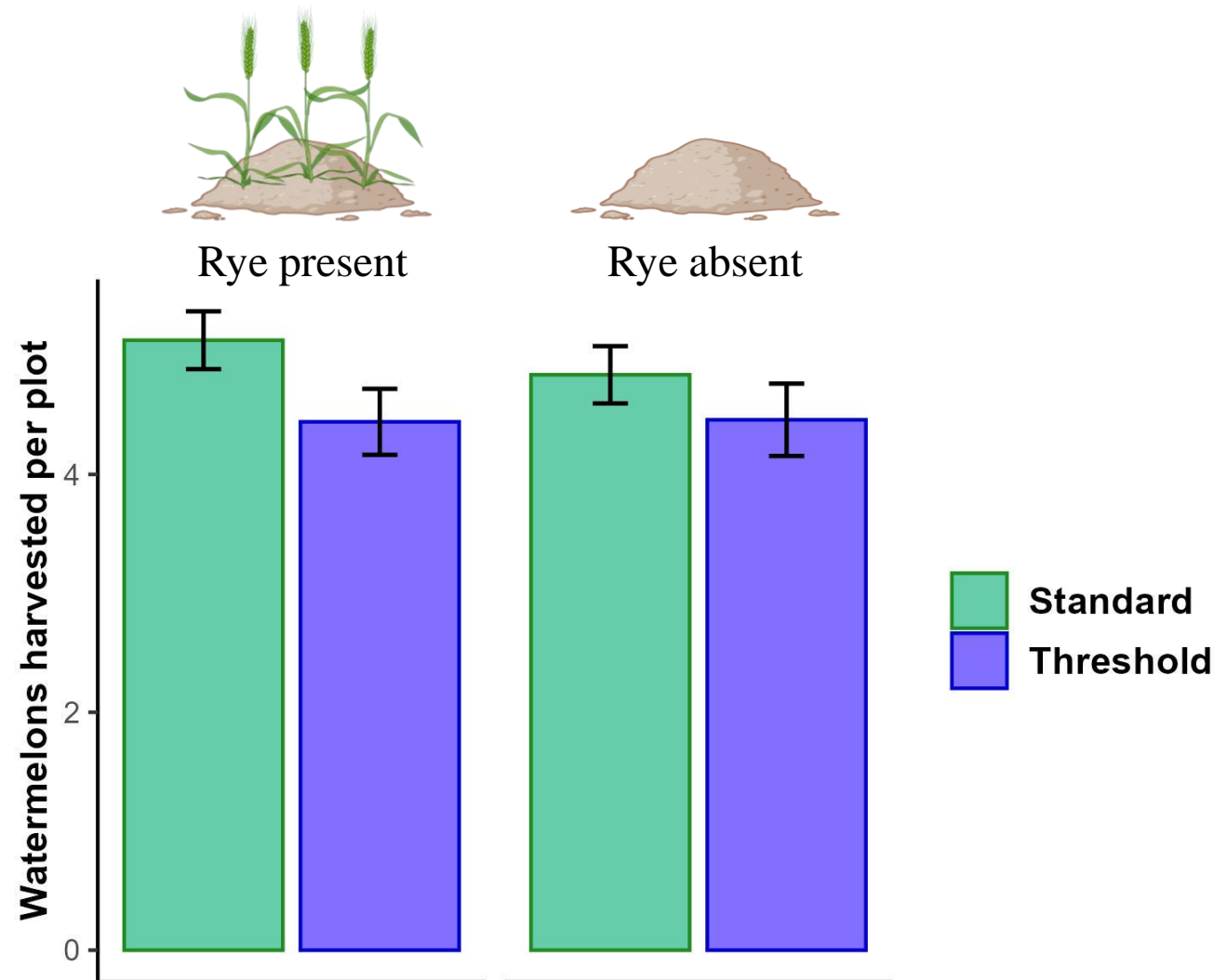
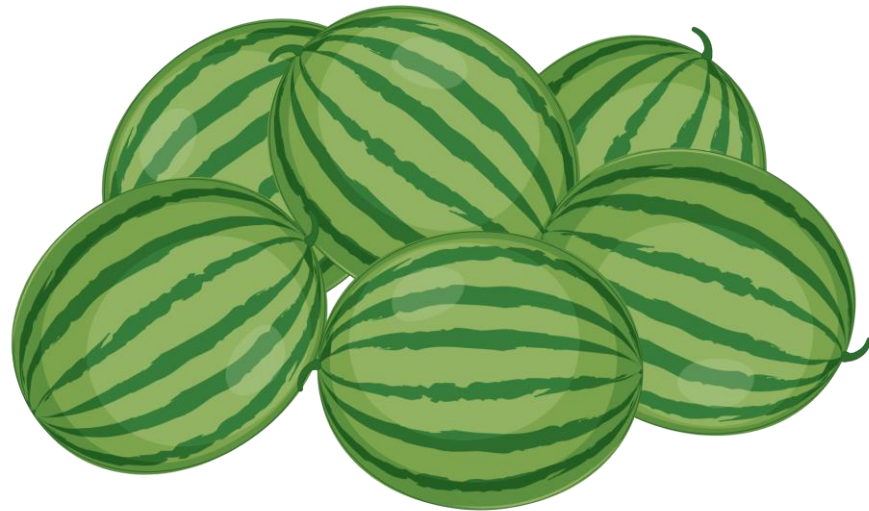


Rye absent

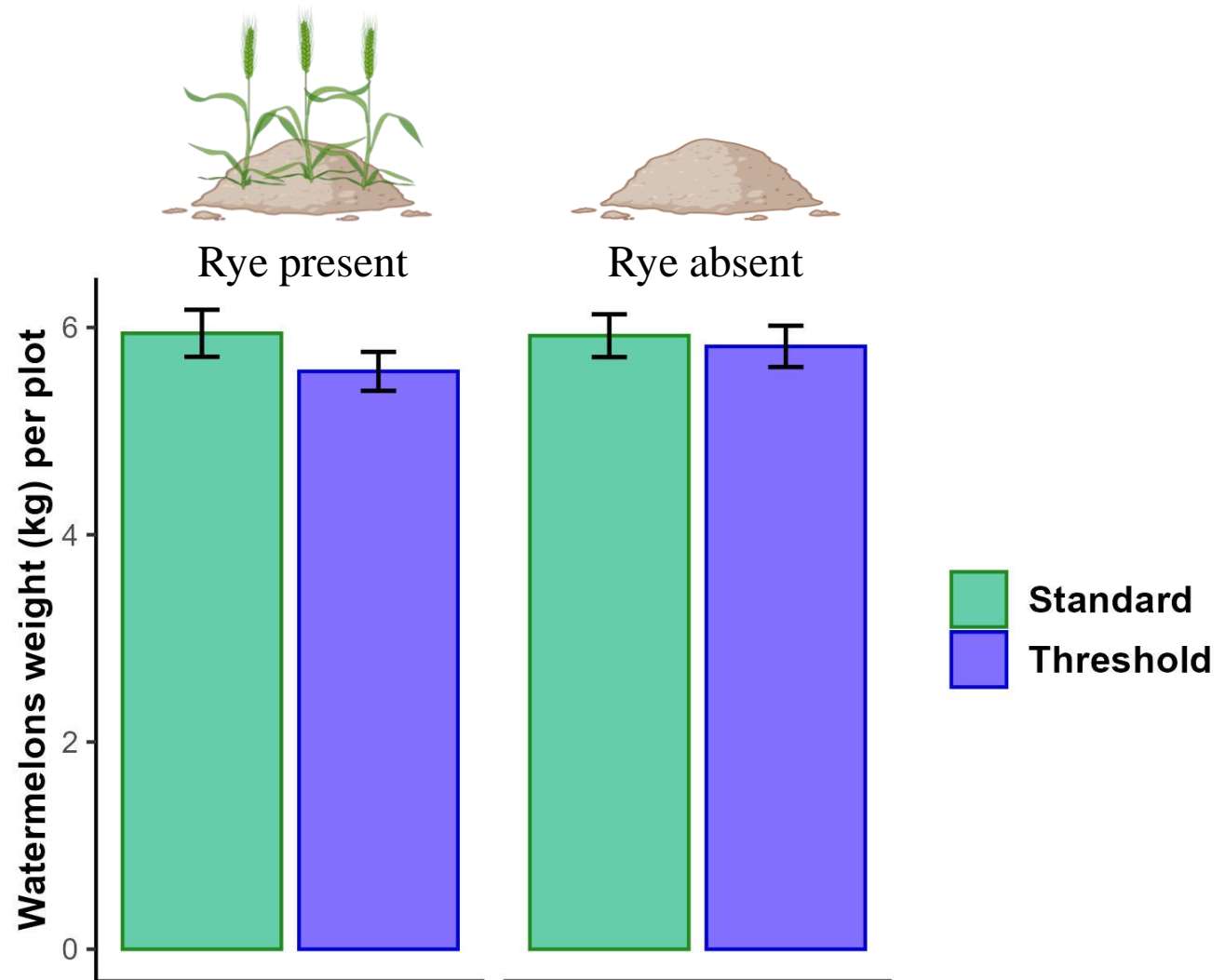
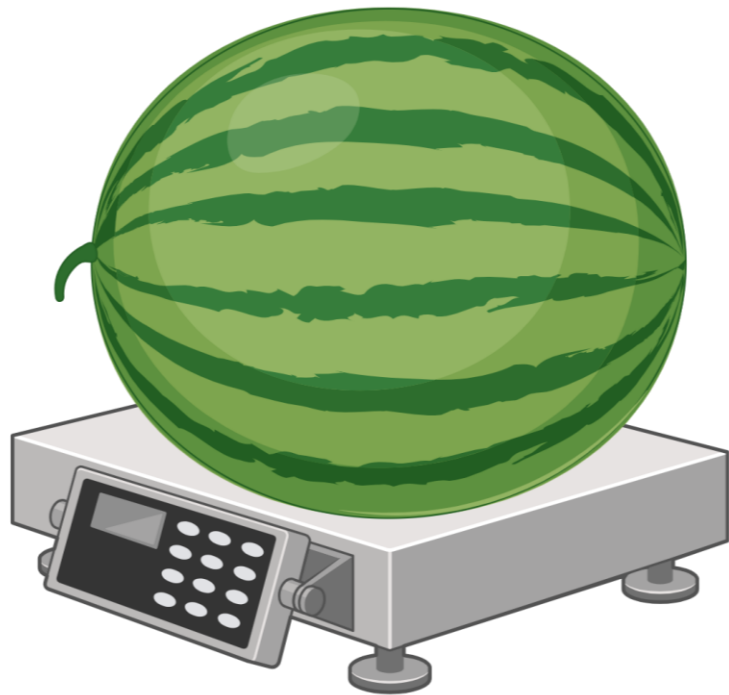
— Standard — Threshold



# No differences in the number of watermelons harvested



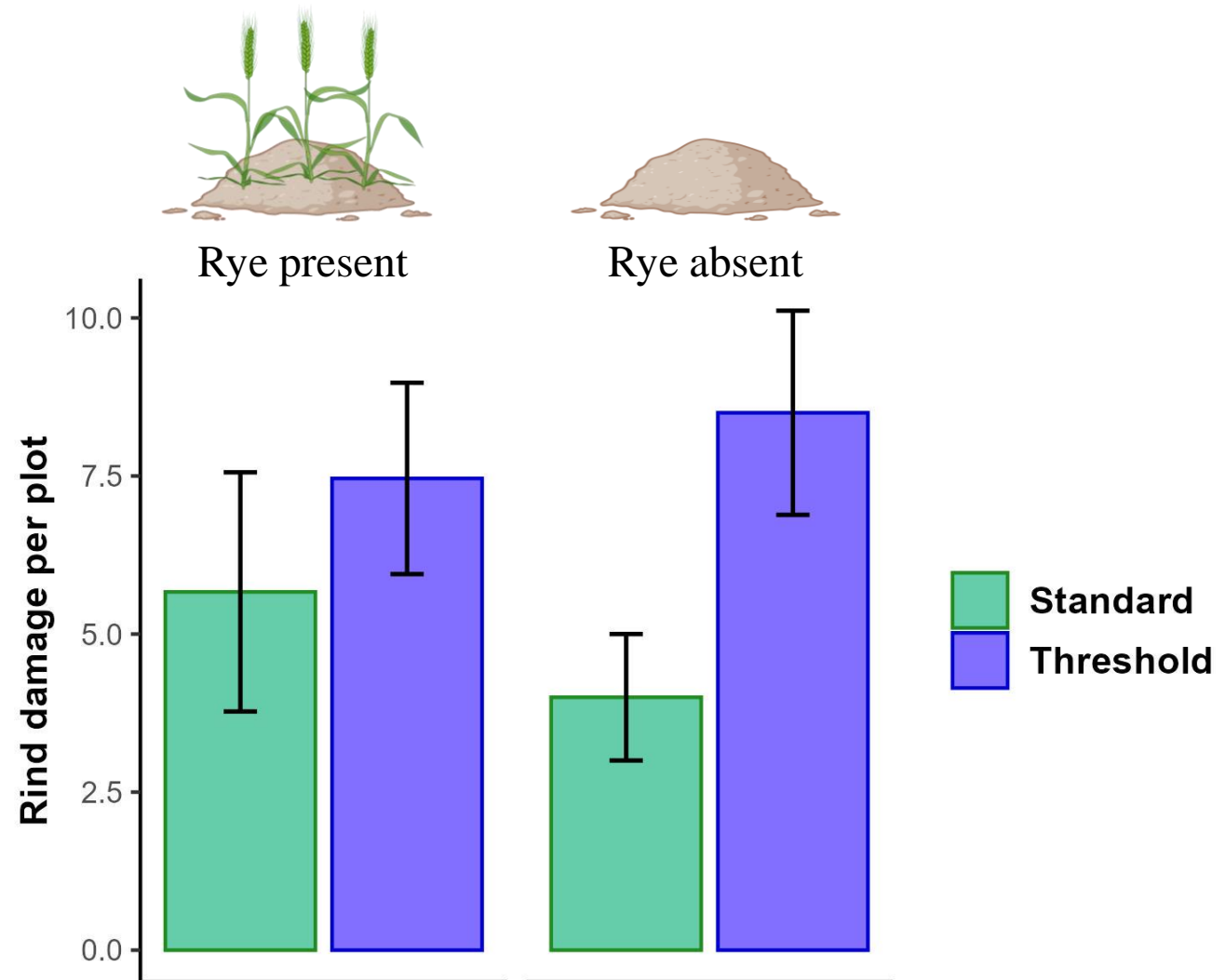
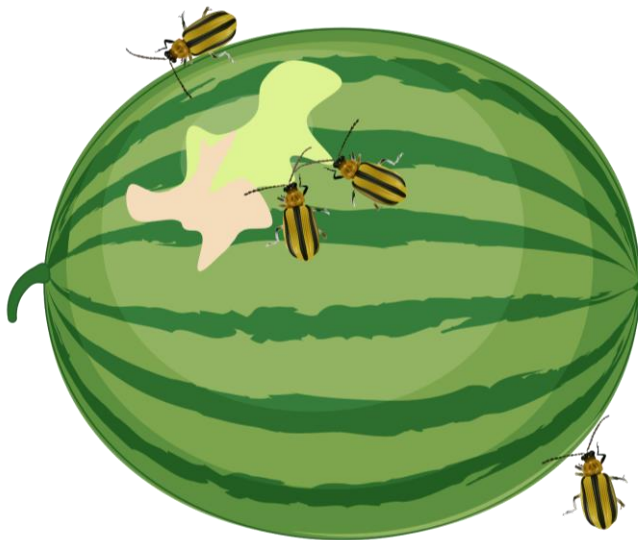
# No differences in individual watermelon weight



# Slightly greater rind damage in the threshold

USDA marketability standards: 7 in<sup>2</sup>

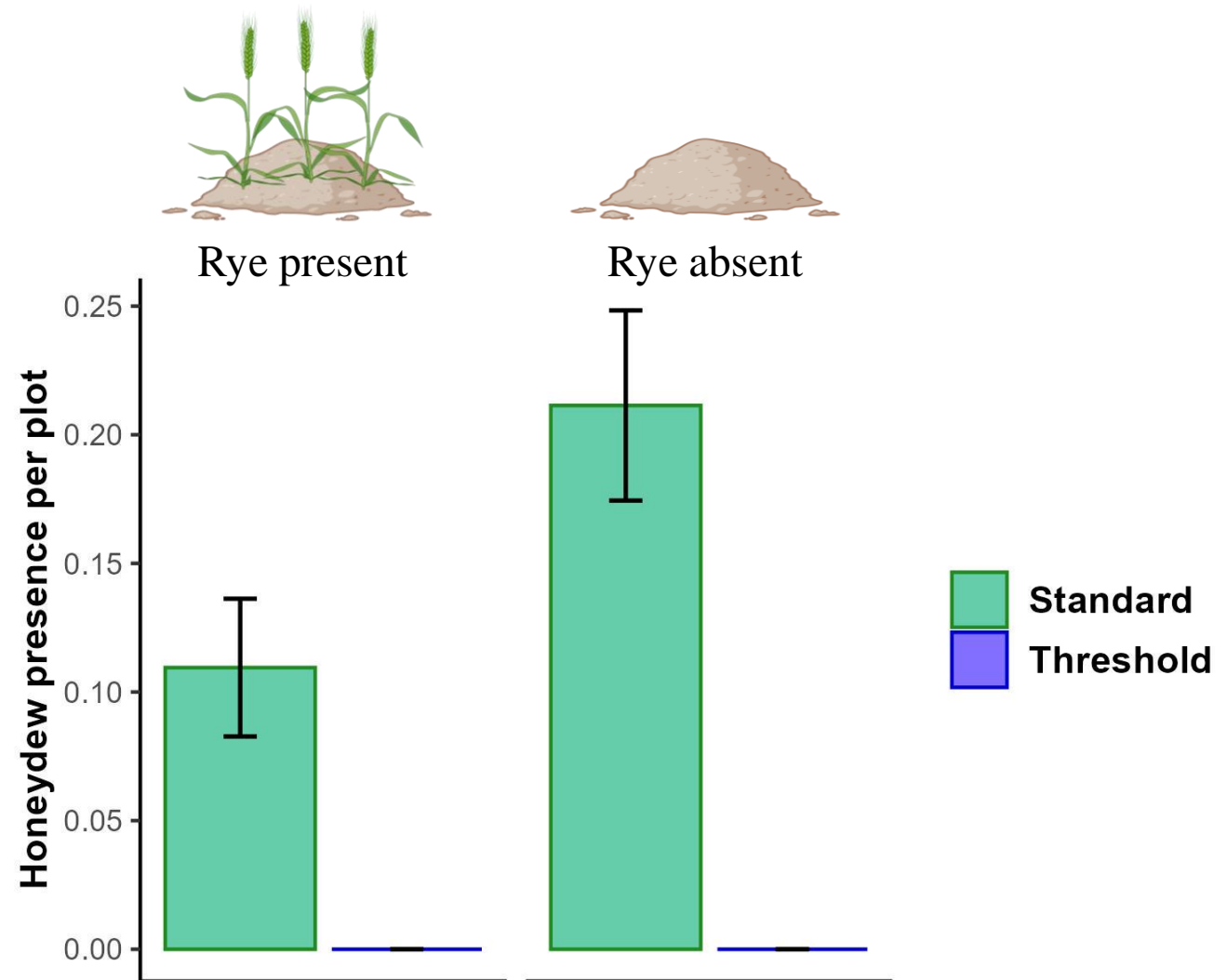
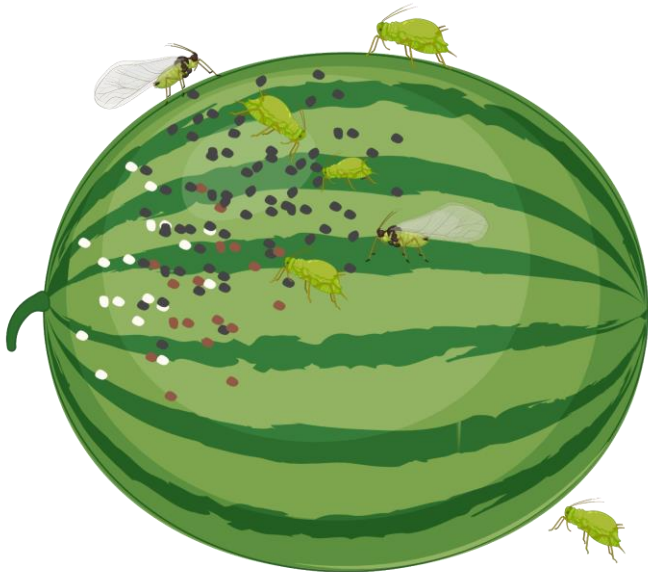
- 822 watermelons assessed
  - 1 in the standard insecticide (**0.1%**)
  - 6 in the threshold (**0.7%**)



# No honeydew observed in the threshold

## USDA marketability standards

- 518 watermelons assessed
  - 41 in the standard insecticide (**10.8%**)
  - None in the threshold



# Conclusions and recommendations

- Broad-spectrum insecticides can trigger spider mite and aphid outbreaks probably because of the reduction in natural enemies
- We recommend adopt integrated pest management (IPM) programs and apply insecticides when pests exceed economic thresholds
- IPM can protect beneficial insects and minimize secondary pest outbreaks
- Spray programs based on threshold recommendations can save costs on insecticides and miticides
- Spider mites do not seem to use rye as a green bridge to move into the crop nor do natural enemies
- Rye might have a negative effect on aphids and can help control them



# Acknowledgements



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# Thank you!

- **USDA**
  - Grant number 2022-67019-36365
- **PAC managers**
  - Chloe Henscheid - TPAC
  - Dennis Nowaskie - SWPAC
  - Joel Wahlman - SEPAC
- **Technicians, students and staff**



# Interested in collaborating with us?

**Flowering cover crop trial in 2025** in commercial fields!

We'll provide **free scouting** and **weekly reports** for threshold-based recommendations!



Entomology

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