



# Keeping the Enemy of Your Enemy closer: How Sticky Tobacco Plants Provision Stilt Bugs (*Jalysus wickhami* Van Duzee) with Food When Times are Lean

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# Plant-provided food for predatory insects is a common phenomenon

- Nectar and pollen from flowers
- Nectar from extra-floral nectaries
- Plant sap (sucking predators)
- Elaiosomes
- CARRION



# Carriion on “sticky” plants

- Trichomes are often produced by plants to defend against small herbivores
  - Glandular trichomes (i.e., tobacco and tomato)
  - Hooked trichomes (bean leaves)
  - Many, many others
  - Have other functions as well (protection from light, moisture loss, etc.)
- Defensive trichomes work by entangling and impeding insects
- Trapped insects typically die
- Dead, trapped insects may become a food resource for specialist predators adapted to navigating protected surfaces

# *Jalysus wickhami* (the stilt bug)

- Hemipteran predator adapted to walking on sticky plants
- Most abundant predaceous insect in tobacco
- Prefers stickier varieties
- Extremely vigorous predator on caterpillar eggs and small larvae, and other small prey
- Has frequently been observed to feed on trapped insect carrion



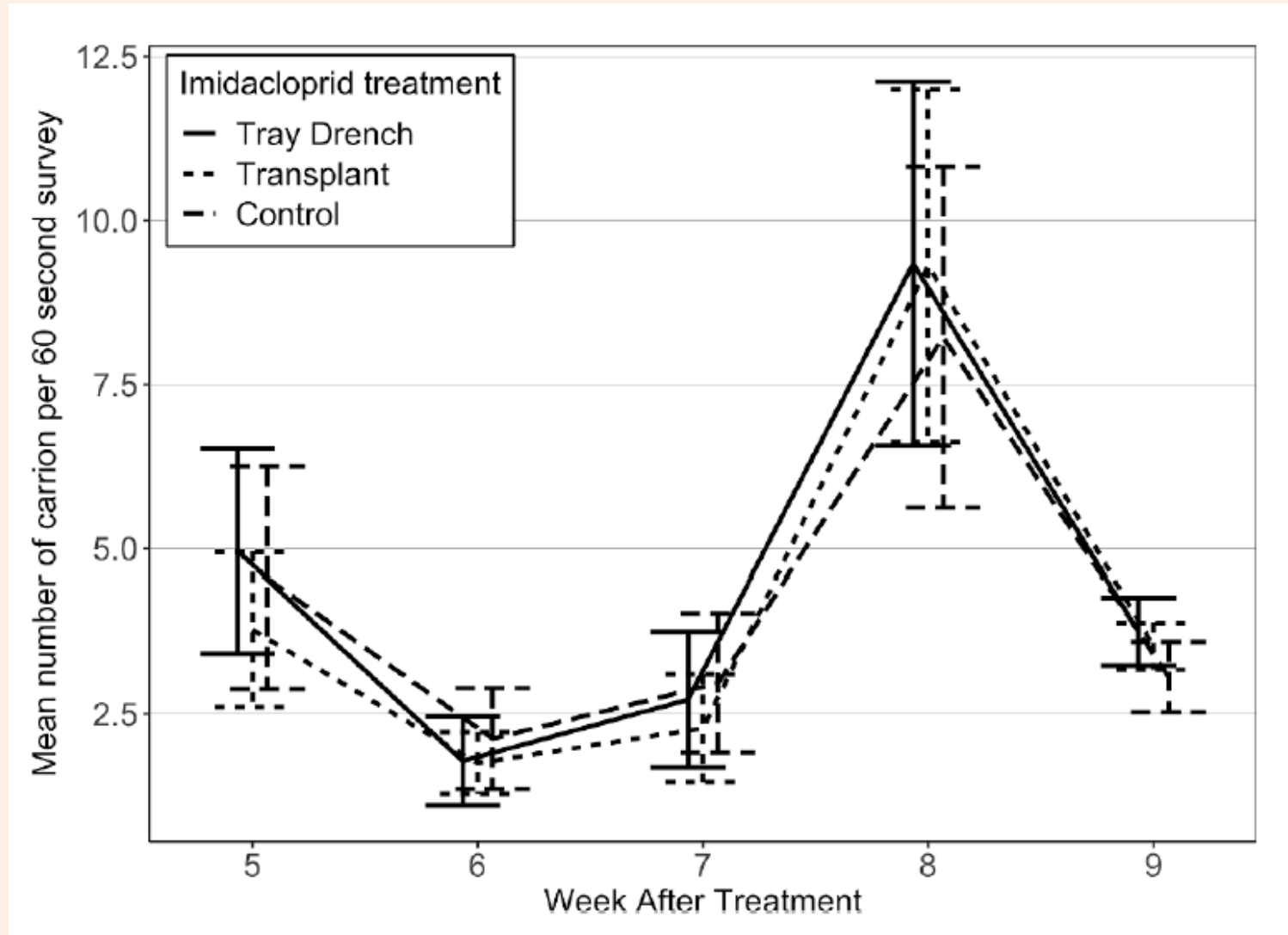
# Objectives

- Assess impact of augmentation of naturally occurring insect carrion on *J. wickhami* abundance
- Assess impact of augmentation of carrion on prey abundance and plant performance characteristics
- Assess effects of carrion on stilt bug preferences and behaviors

# Augmentation effects on Predators, Prey, and Plants: Field Study Methods

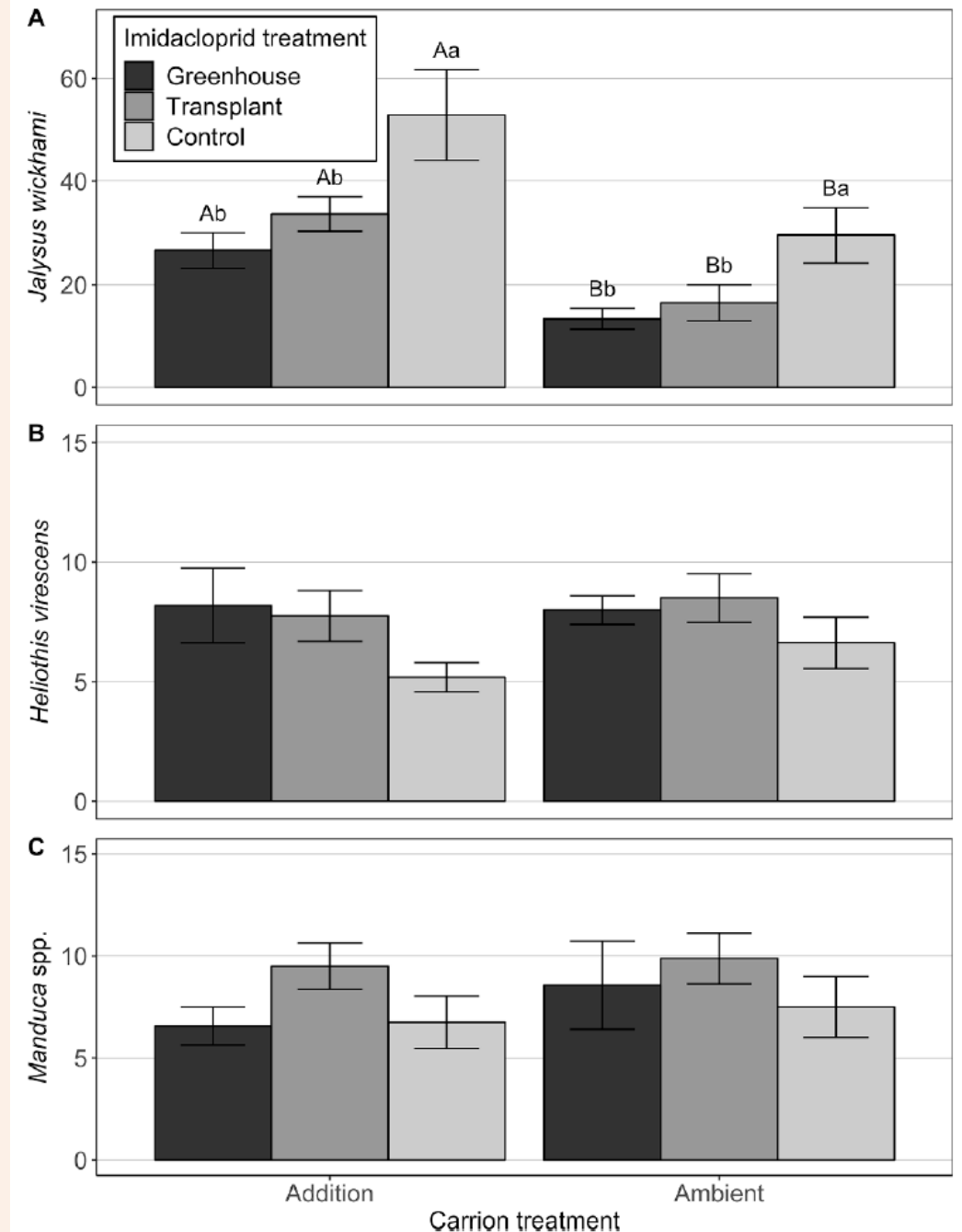
- Field studies conducted at the Lower Coastal Plain (Kinston) and Upper Coastal Plain (Tarboro) Research Stations in North Carolina 2016 and 17
- Individual plant (2016 and 2017) and whole plot (2017) trials with and without imidacloprid (as Admire), and with and with out carrion augmentation through application of frozen *Drosophila* pomace flies (at two rates in whole plot trials in 2017)
- Carrion entrapment was surveyed in 2016
- Whole plants inspected weekly for arthropods, including stilt bugs and prey species
- Assessed plant damage by herbivores by inspecting reproductive tissue and measuring green leaf weight (by stalk position)

# Effects of imidacloprid on insect carrion abundance



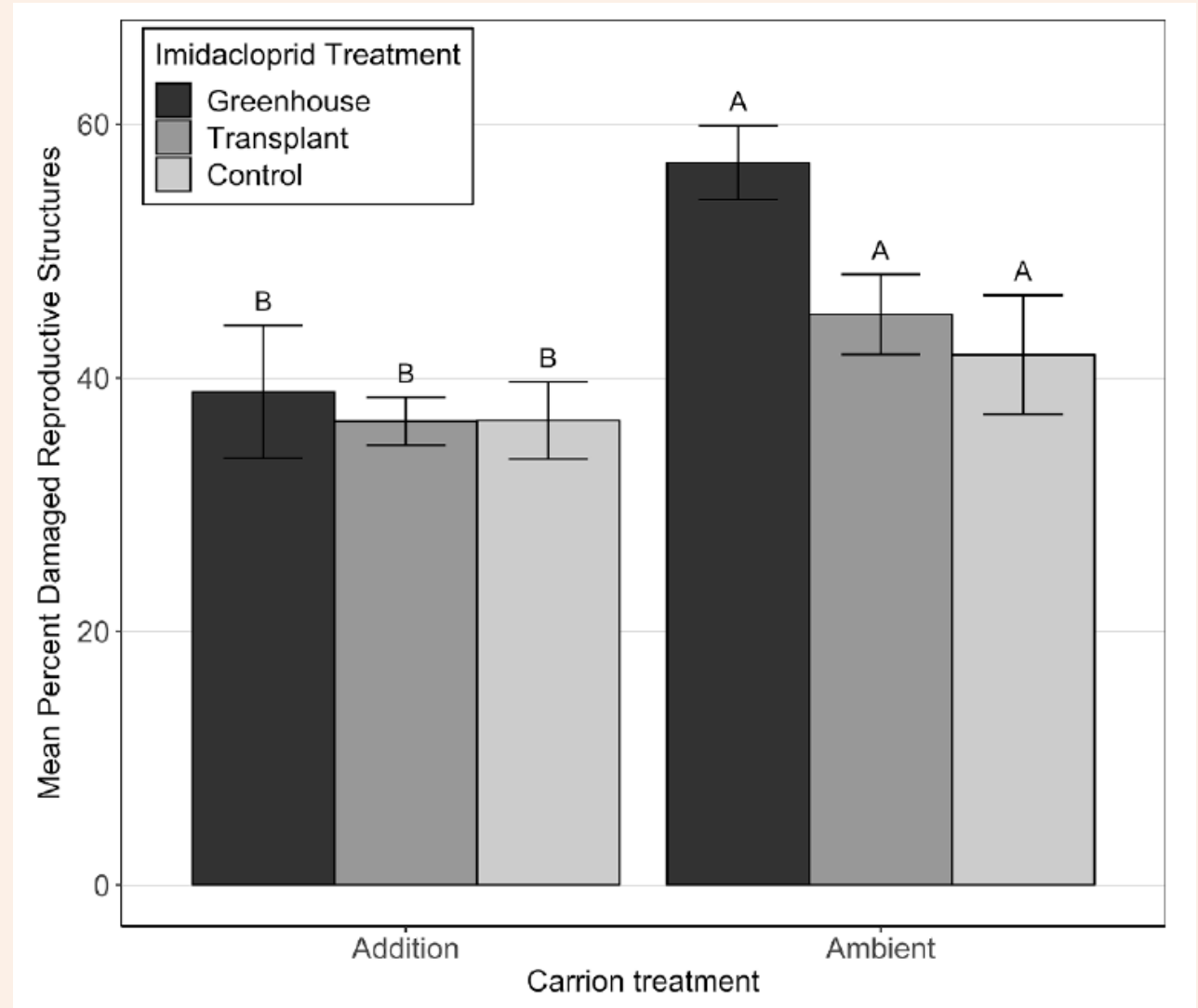
# Augmentation Field Studies 2016: Effects on Arthropods

- *J. wickhami* positively affected by carrion augmentation
- Prey species not affected
- *J. wickhami* affected by imidacloprid- prey not



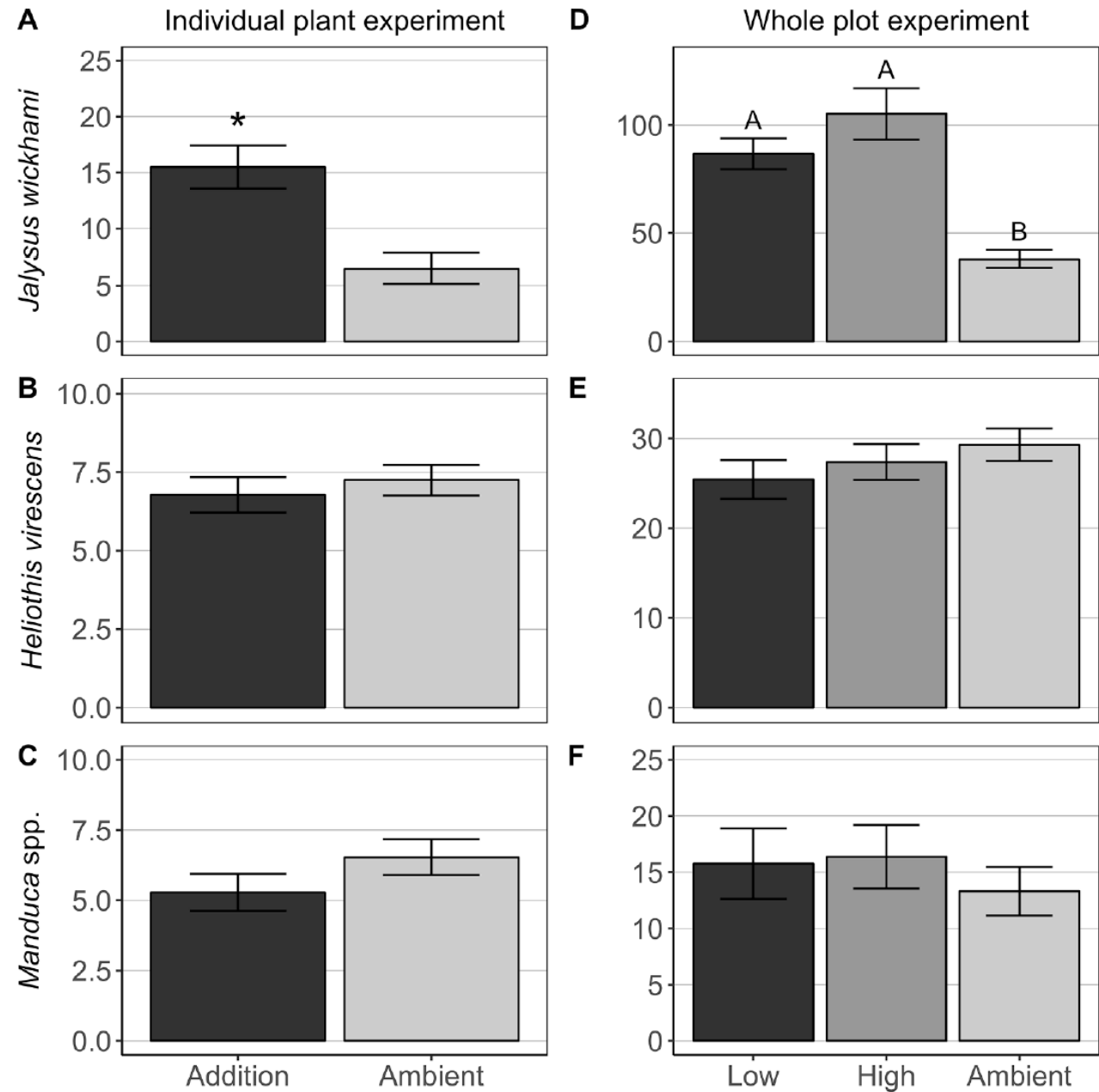
# Augmentation Field Studies 2016: Effect on Plant Damage

- Damage to reproductive structures reduced by augmentation
- This in spite of no reduction in herbivores

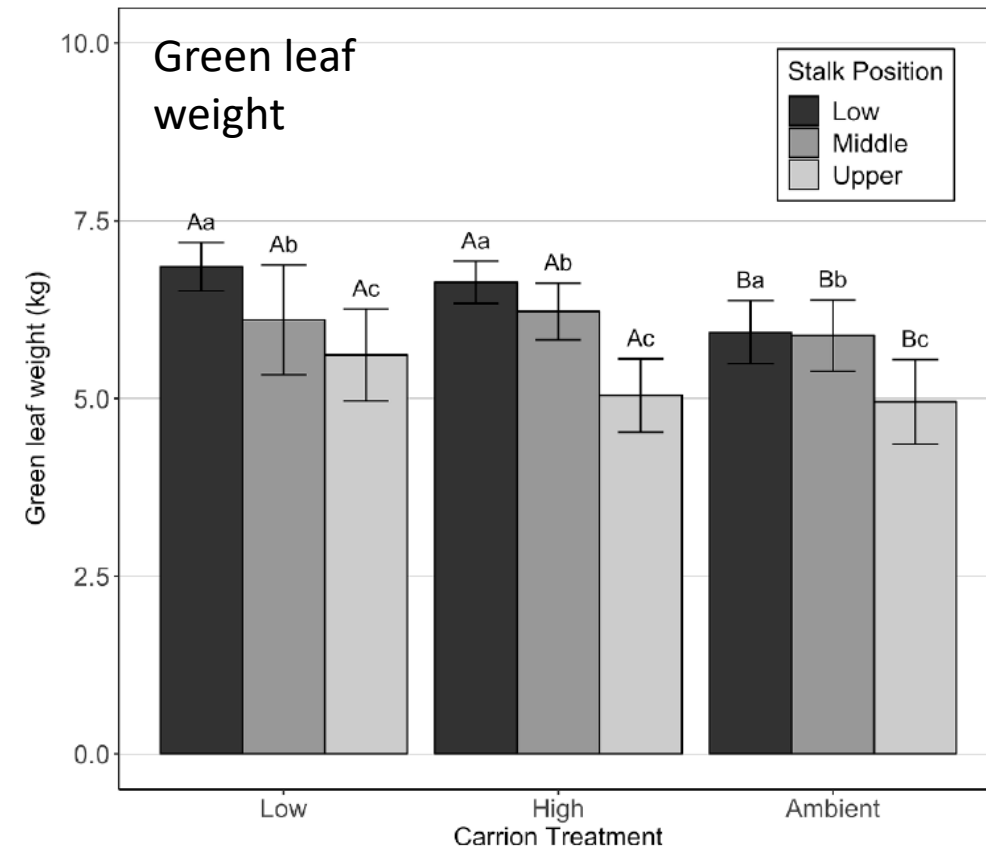
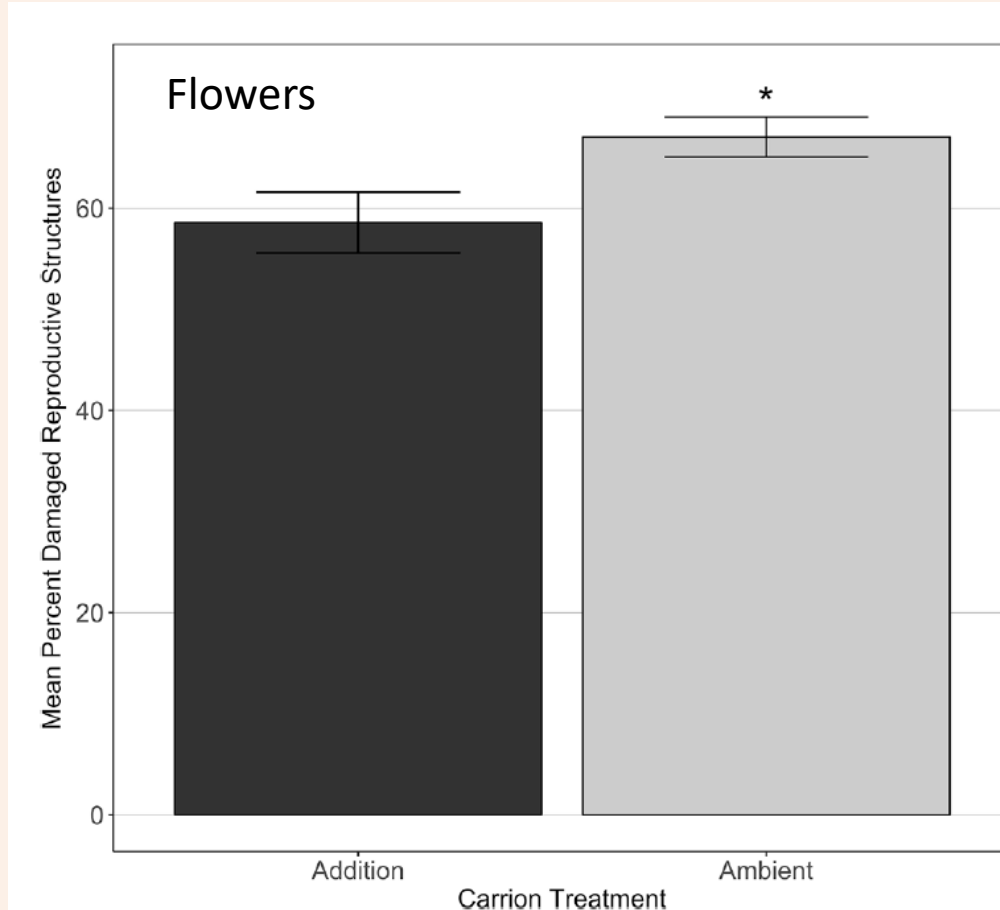


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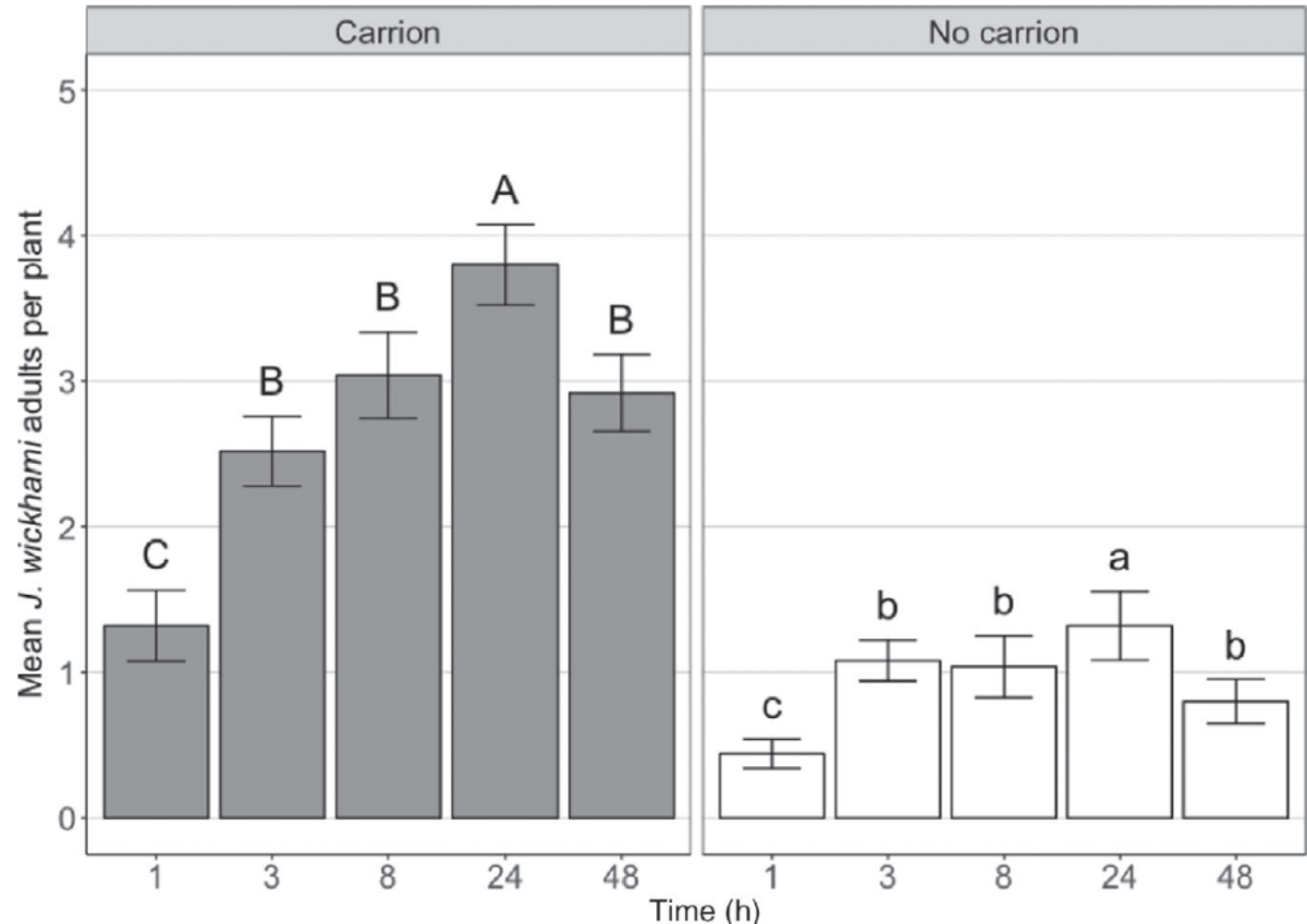


# Effects of Carrion Augmentation on Stilt Bug Behavior: Preference and Oviposition Methods

- Examined effect of carrion on augmentation on plant preference and oviposition through caged plant choice studies with two plants, one with carrion augmentation and the other without. 6 adult stilt bugs were introduced to each cage and position monitored at frequent intervals for two days
- Subsequent to adult removal at end of experiment, plants were destructively sampled to find stilt bug eggs

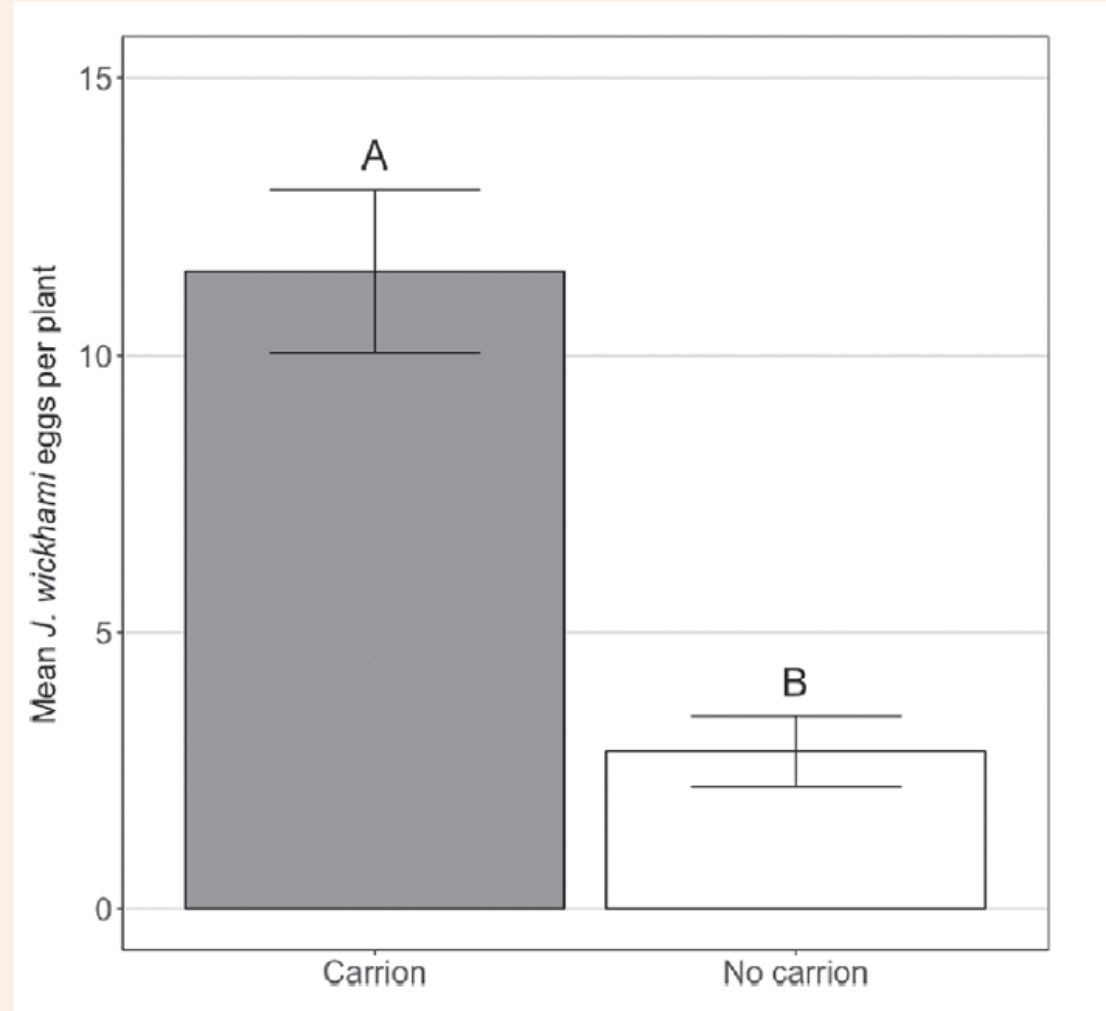
# Effects of Carrion Augmentation on Stilt Bug Behavior: Preference Results

- *J. wickhami* preferred plants with carrion



# Effects of Carrion Augmentation on Stilt Bug Behavior: Oviposition Results

- *J. wickhami* laid significantly more eggs on plants with carrion (4X as many)



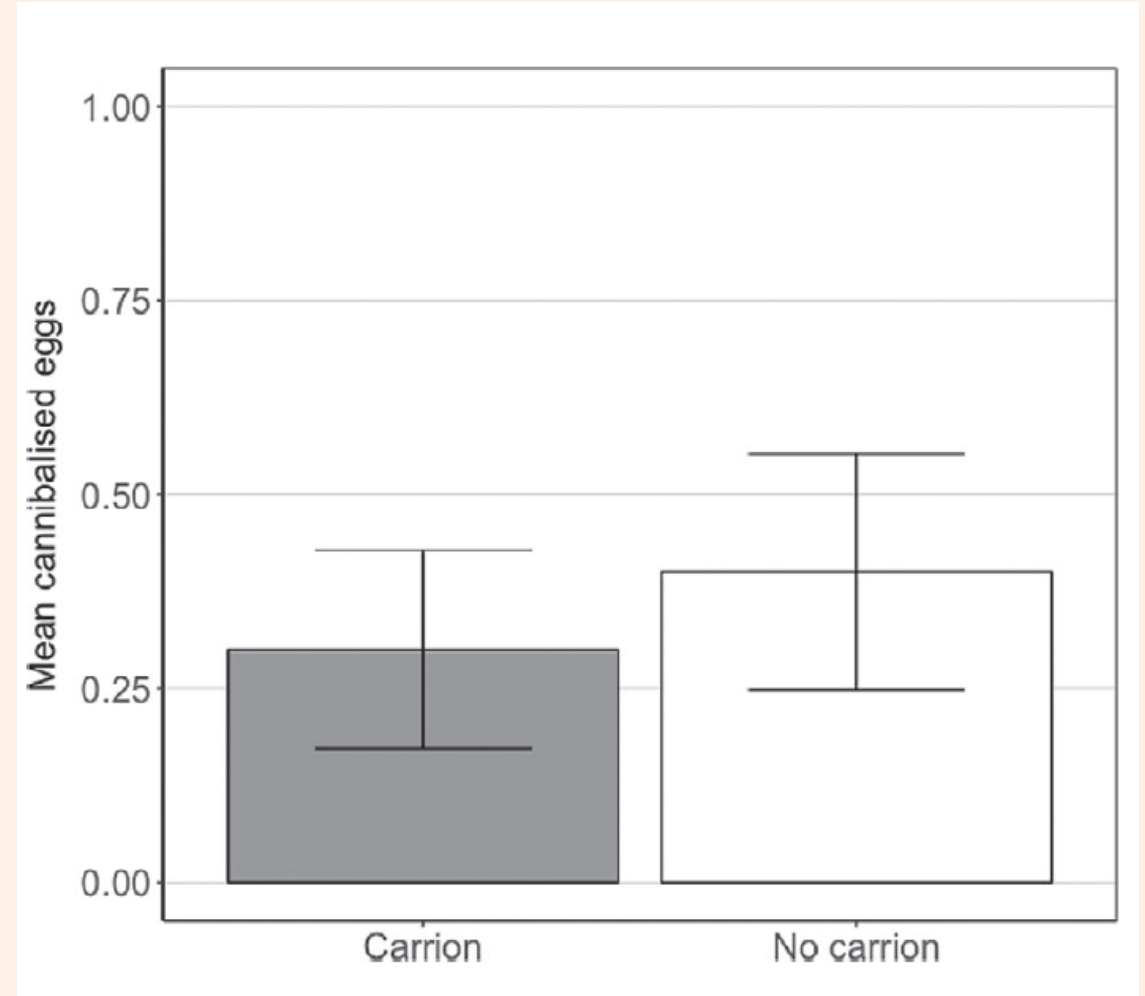
# Effects of Carrion Augmentation on Stilt Bug Behavior: Egg Cannibalism Methods

- Adult cannibalism assessed through caged, whole plant no-choice trials with plant supplemented with stilt bug eggs and six adult bugs. Egg cannibalism assessed at 48 h.
- Adult and 5<sup>th</sup>-stage nymphal cannibalism assessed through microcosm studies on leaf discs in plastic cups – one predator, five eggs, carrion or no. Egg loss assessed daily for three days



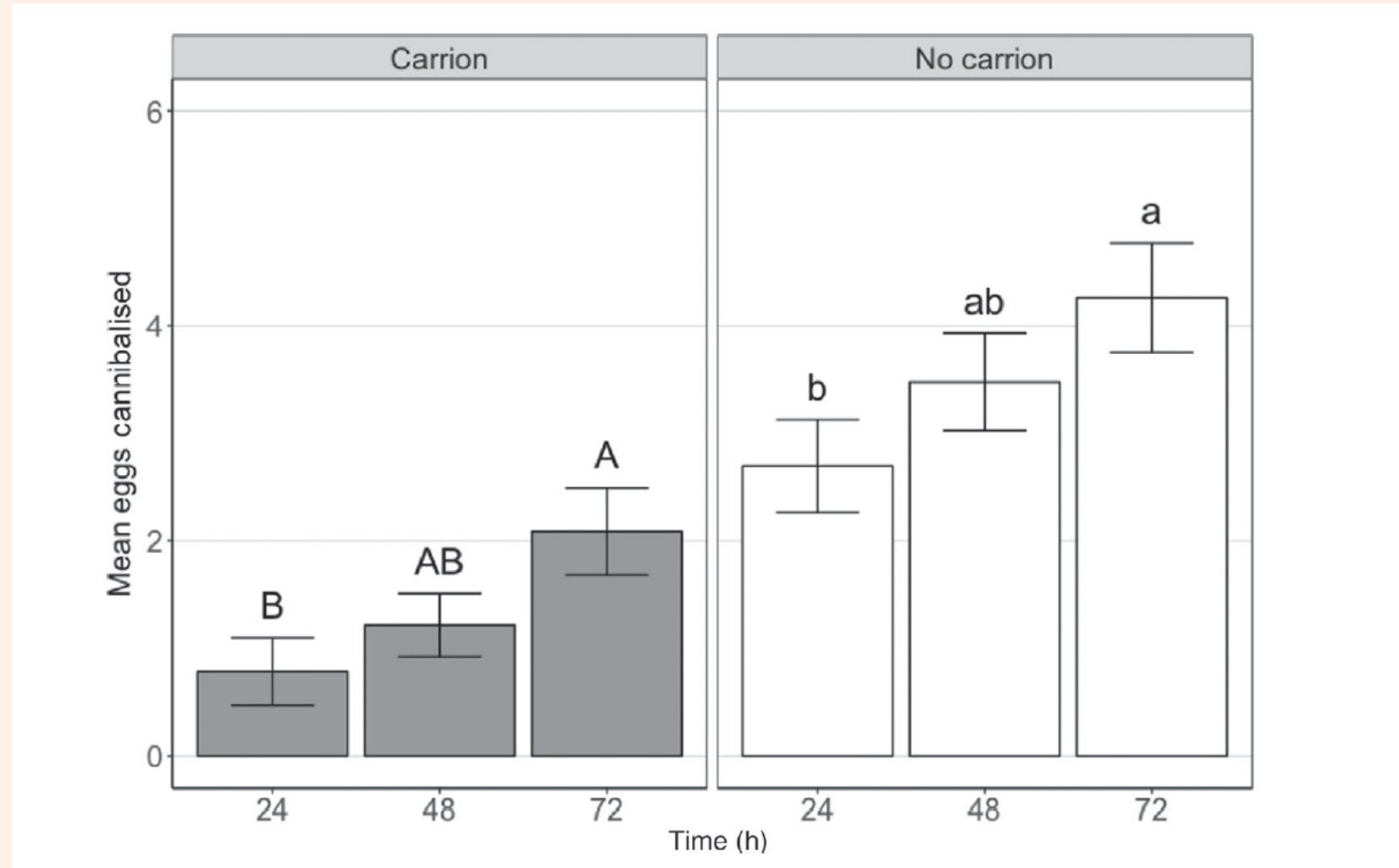
# Effects of Carrion Augmentation on Stilt Bug Behavior: Adult Egg Cannibalism on whole plants

- *J. wickhami* adults ate few eggs and carrion presence had no effect on egg cannibalism



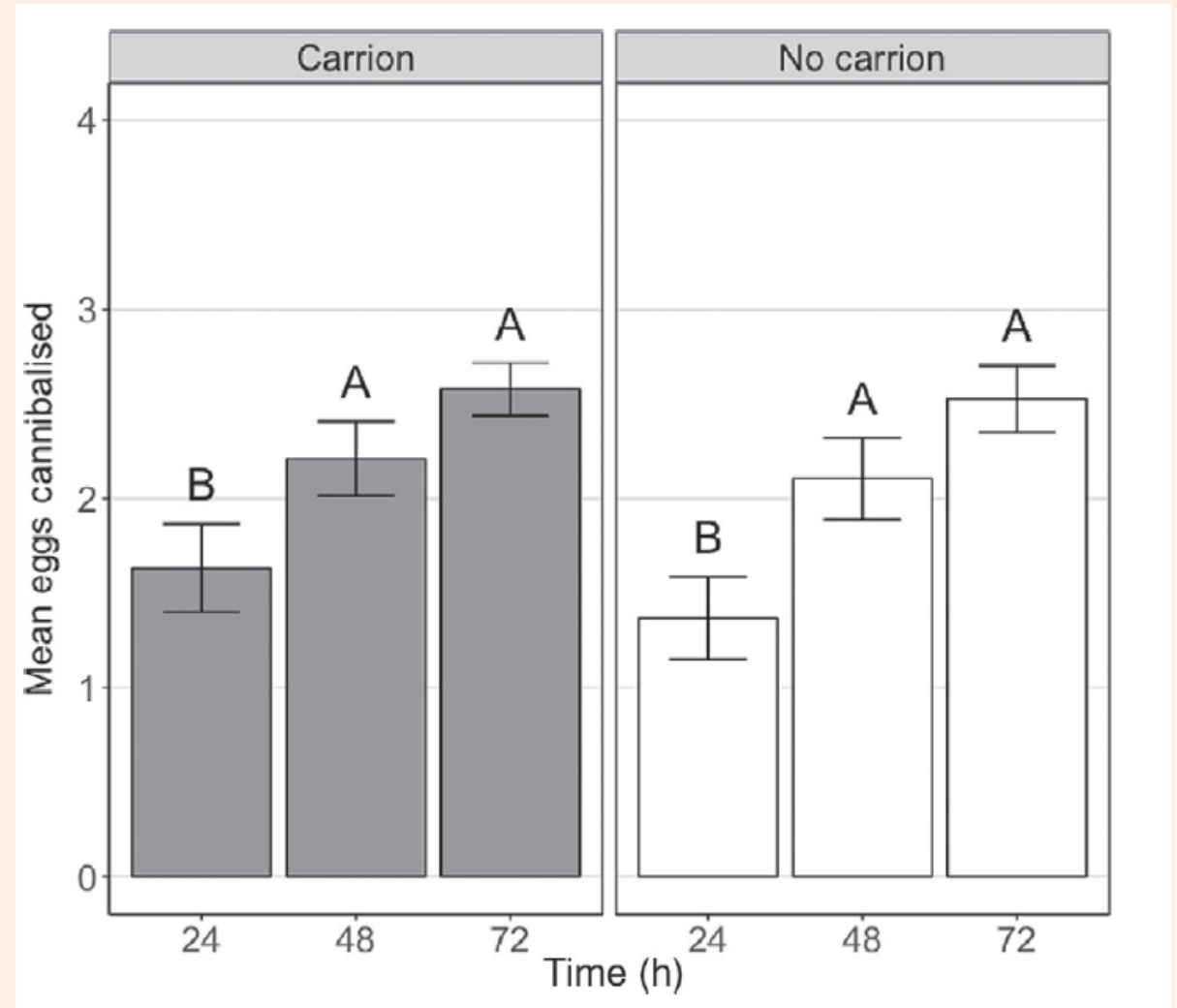
# Effects of Carrion Augmentation on Stilt Bug Behavior: Adult Egg Cannibalism in Microcosms

- The presence of carrion reduced adult egg consumption



# Effects of Carrion Augmentation on Stilt Bug Behavior: Nymphal Egg Cannibalism in Microcosms

- The presence of carrion did not reduce nymphal egg consumption



# Conclusions

- Insect carrion is an important alternate food source for a sticky plant-adapted, hemipteran predator, the stilt bug *J. wickhami*
- Carrion augmentation increases stilt bug abundance in the field
- Carrion augmentation reduces plant damage in the field
- Carrion augmentation enhances stilt bug oviposition and reduces adult egg cannibalism
- So, should you be spreading dead bugs around your fields...?