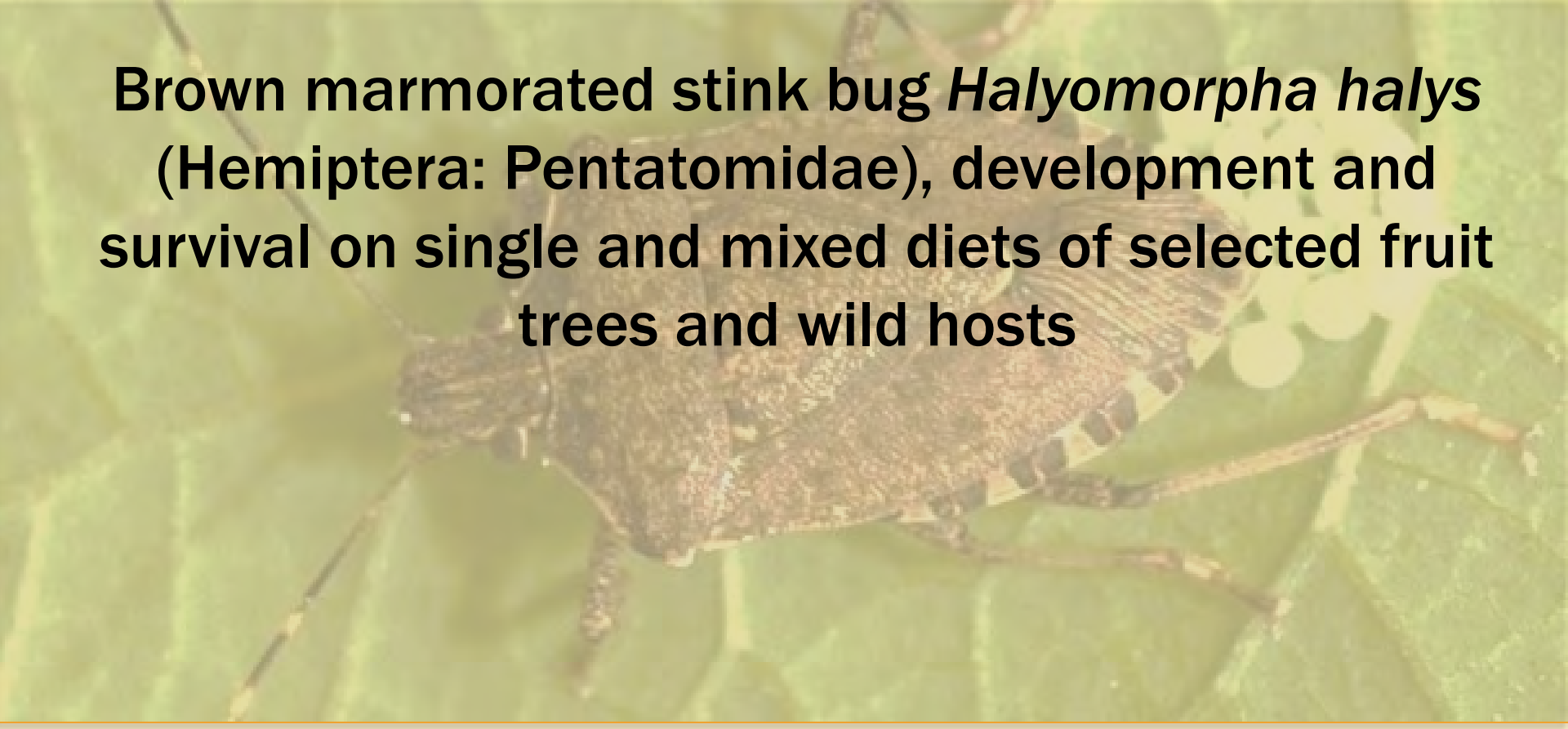
Brown marmorated stink bug *Halyomorpha halys* (Hemiptera: Pentatomidae), development and survival on single and mixed diets of selected fruit trees and wild hosts



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BACKGROUND





- Highly polyphagous:

agriculturally important crops and wild hosts

- Knowledge gap:

The relative suitability of different hosts on BMSB development and survival is unknown

OBJECTIVE

To investigate the development and survivorship of

***H. halys* on single and mixed diets of tree fruits and wild tree hosts**

Tree fruit hosts:

Malus domestica
Apple

Prunus persica
Peach

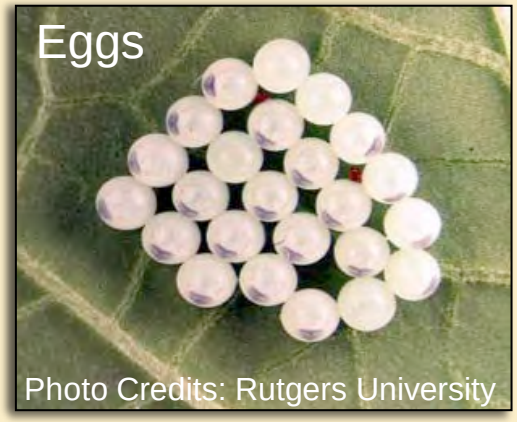
Wild hosts:

Catalpa speciosa
Catalpa

Ailanthus altissima
Tree of heaven

HYPOTHESIS

Mixed diets are more suitable for *H. halys* development and survivorship than single diets



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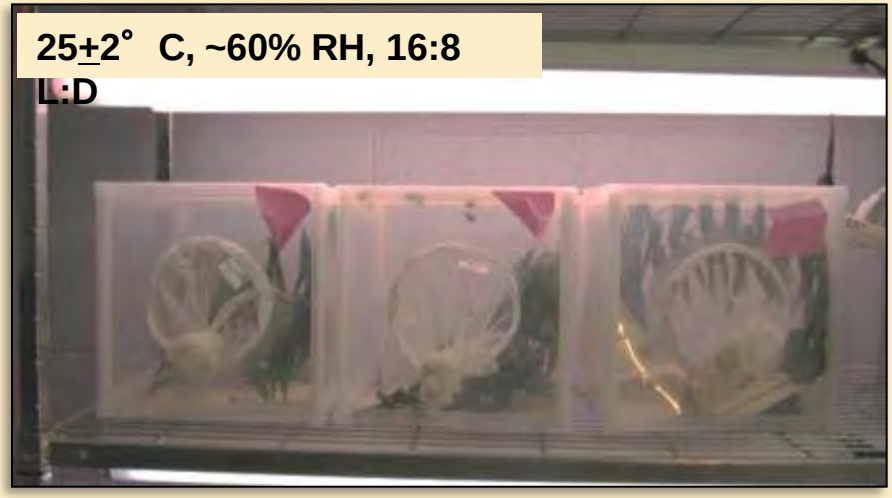
METHODS: EGG COLLECTION



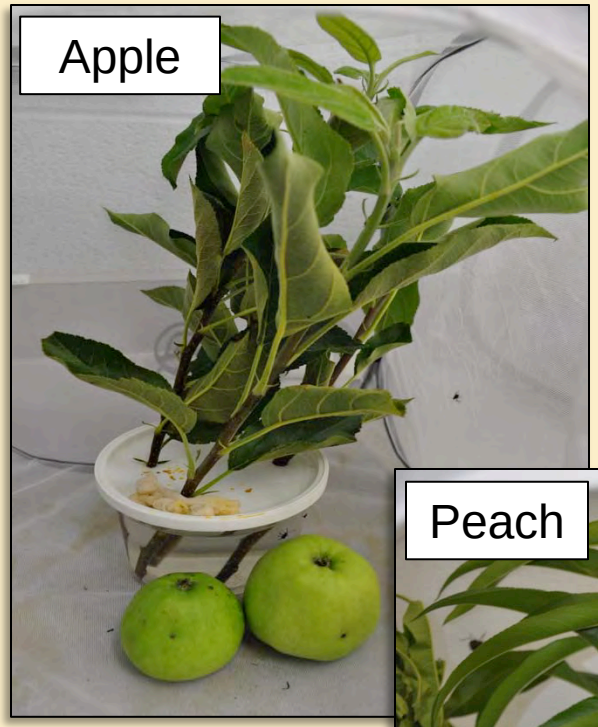
Mating cages with field-collected adults

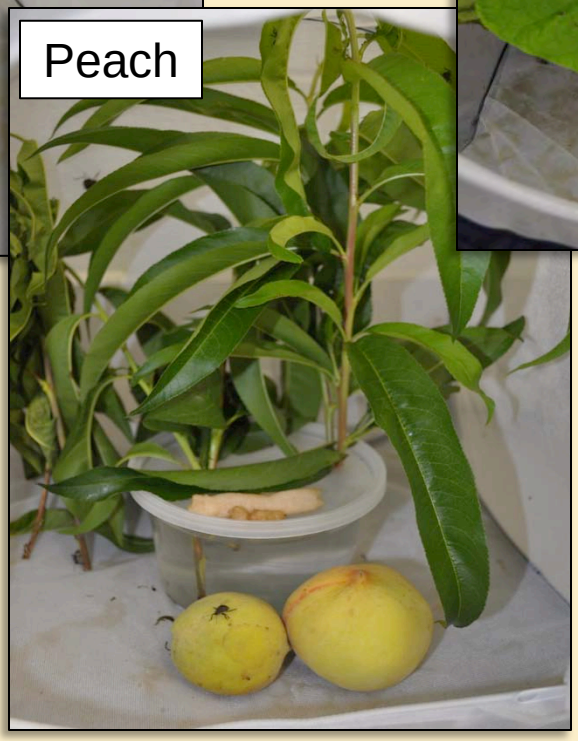
Tree of heaven foliage as oviposition substrate

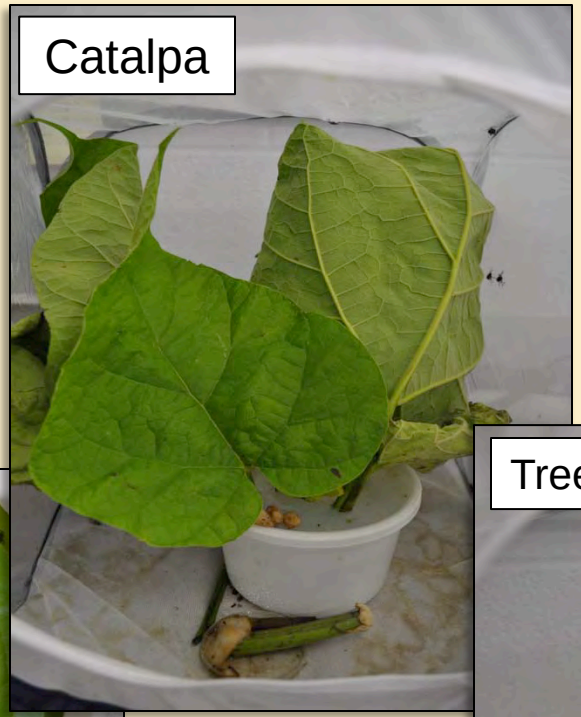
Individual egg masses in diet cups

1 egg mass (~28 eggs)/treatment

DIET TREATMENTS: SINGLE

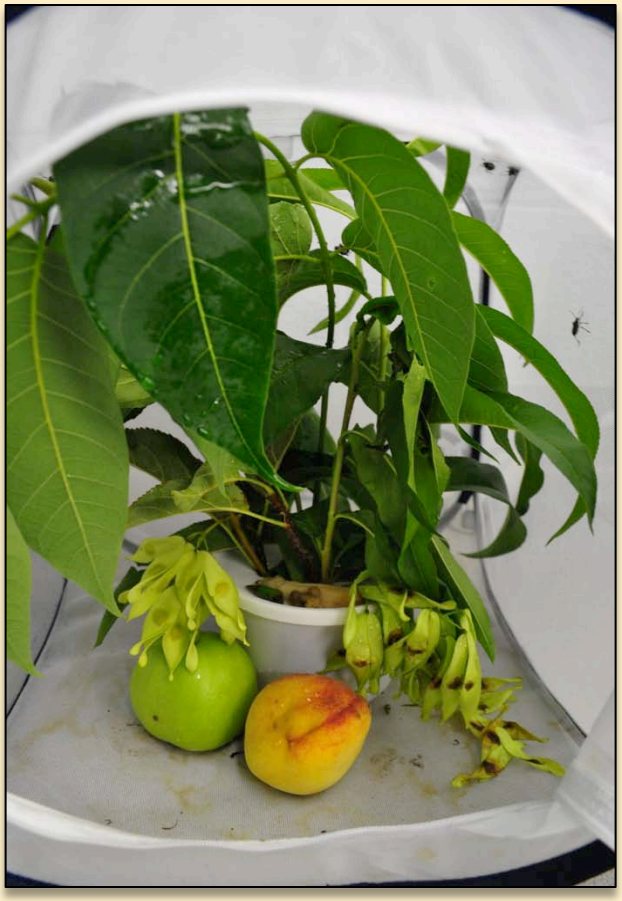




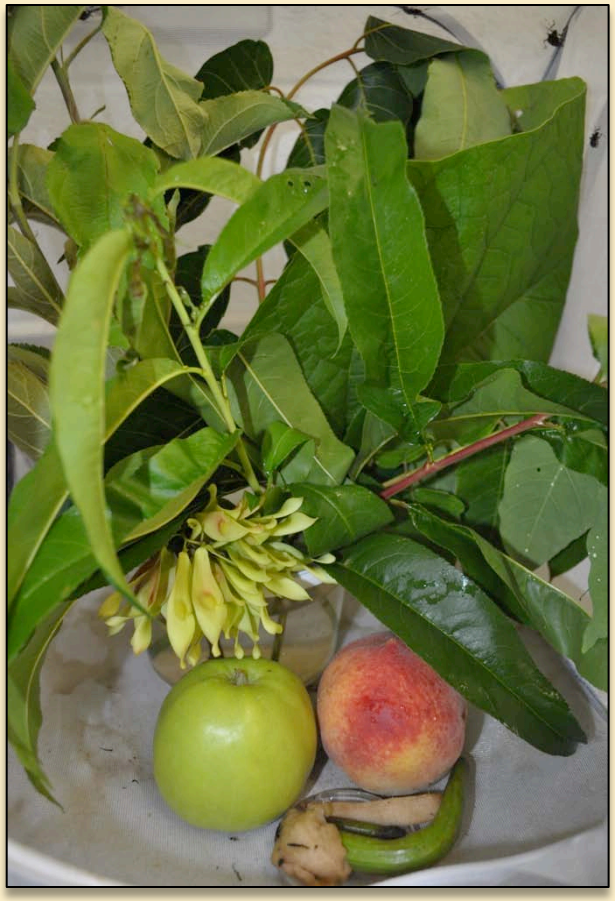


DIET TREATMENTS: MIXED

1. Apple
2. ToH



1. Apple
2. ToH
3. Peach



1. Apple
2. ToH
3. Peach
4. Catalpa

METHODS

- ✓ Plant materials collected from the field and replaced at 3- to 4-day intervals
- ✓ Experiment conducted twice:
  - ✓ Early-season – early June
  - ✓ Late-season – mid-August (on going)
- ✓ Reproductive structures used were dependent on their availability in the field


Collecting from a tree of heaven

ToH reproductive structures:

Early June | mid-June to early-September | Mid-September to Nov.

RESPONSE VARIABLES

Developmental parameters:

- **Adult emergence**
- **Stage-specific survivorship**
- **Developmental time**
- **Adult live body weight**
- **Adult pronotal width (size)**
- **Nutrient analysis of resulting adults:**

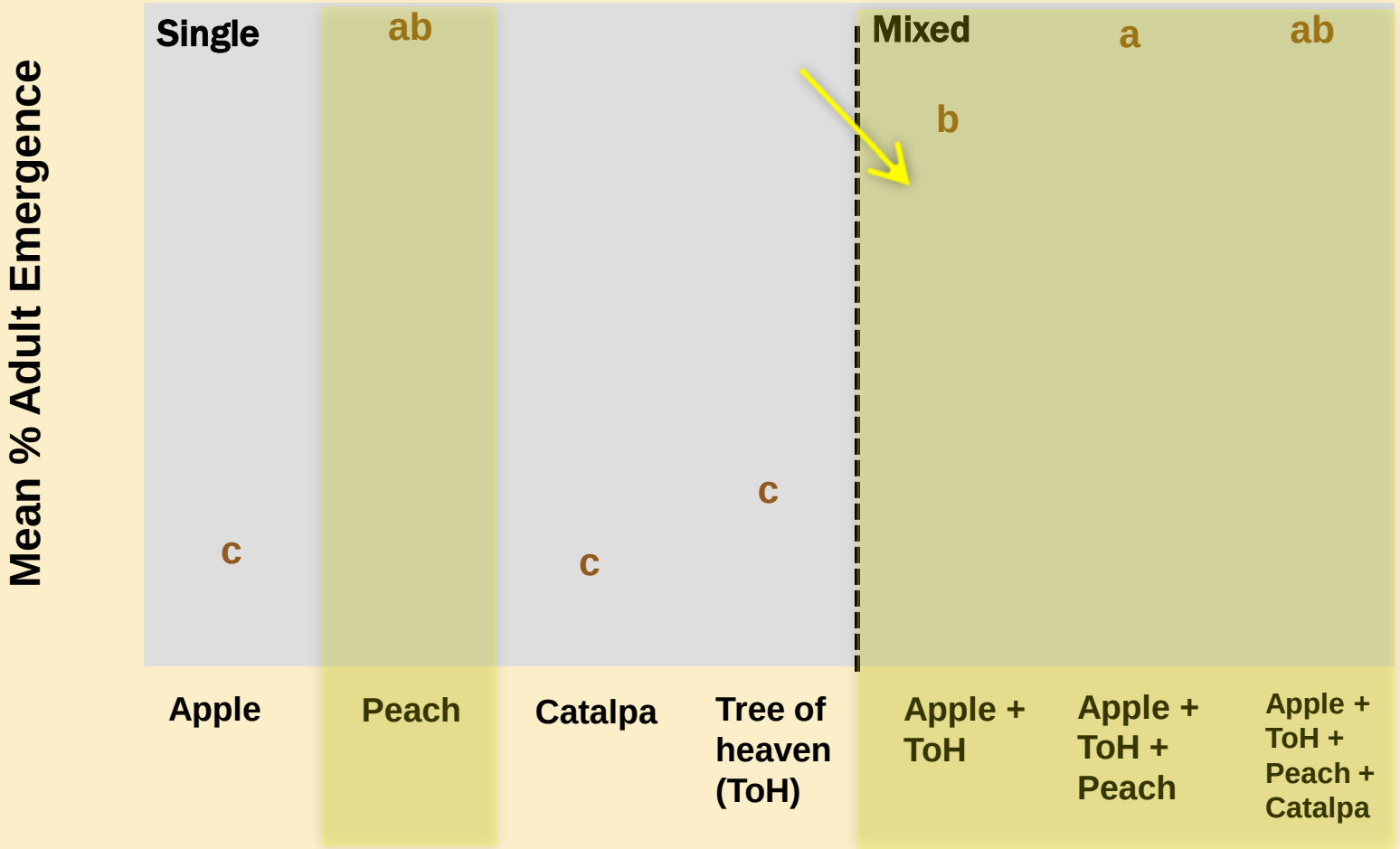
  sugar, lipid and protein

  - **spectrophotometric method** (Van Handel and Day, 1988)
  - **to be done**

RESULTS: ADULT EMERGENCE

Early-season:

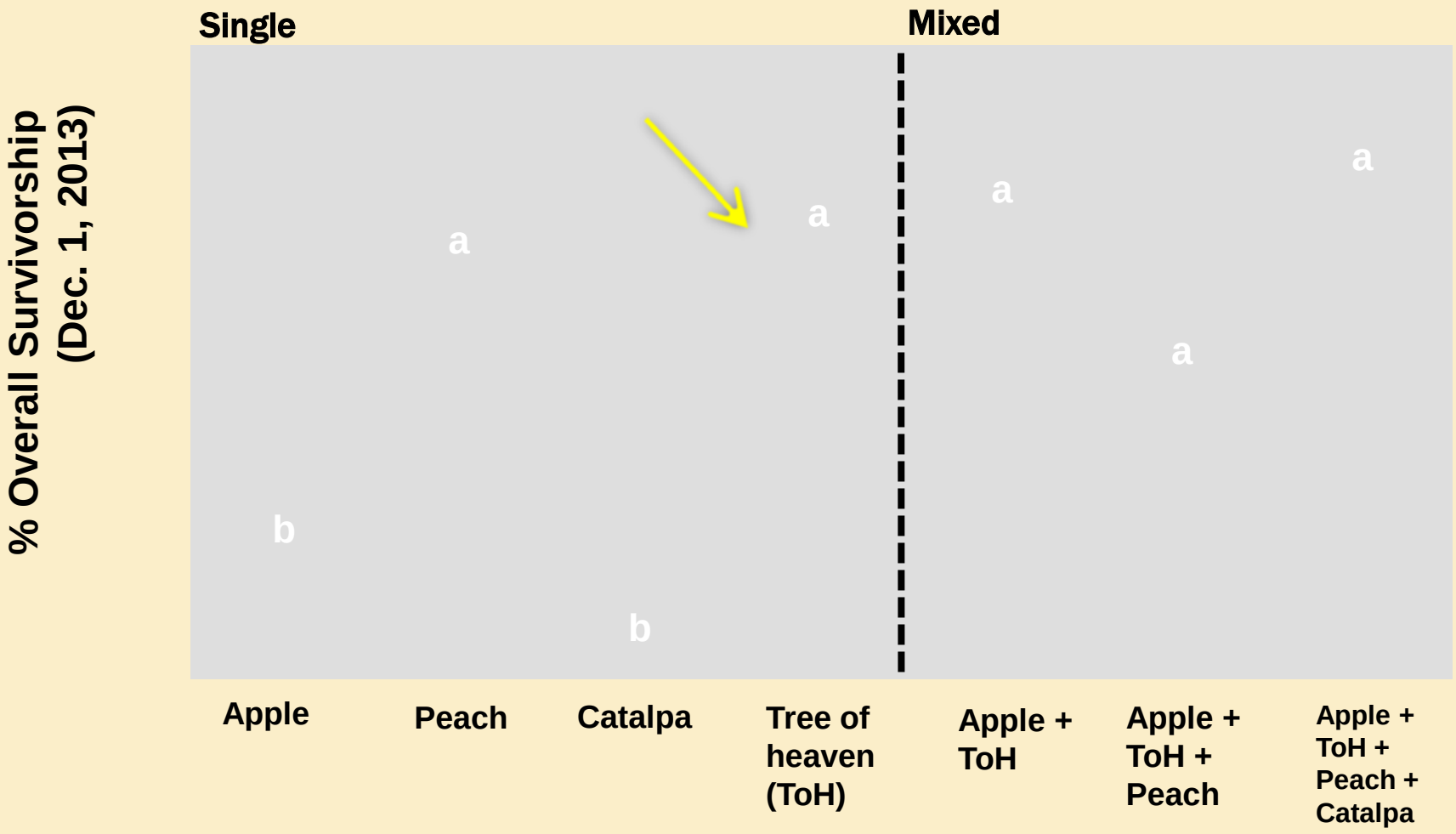
- ✓ High survivorship on mixed diets and single diets of peach $P < .0001$
- ✓ Apple and ToH as single diets are less suitable, but become suitable when combined



RESULTS: OVERALL SURVIVORSHIP

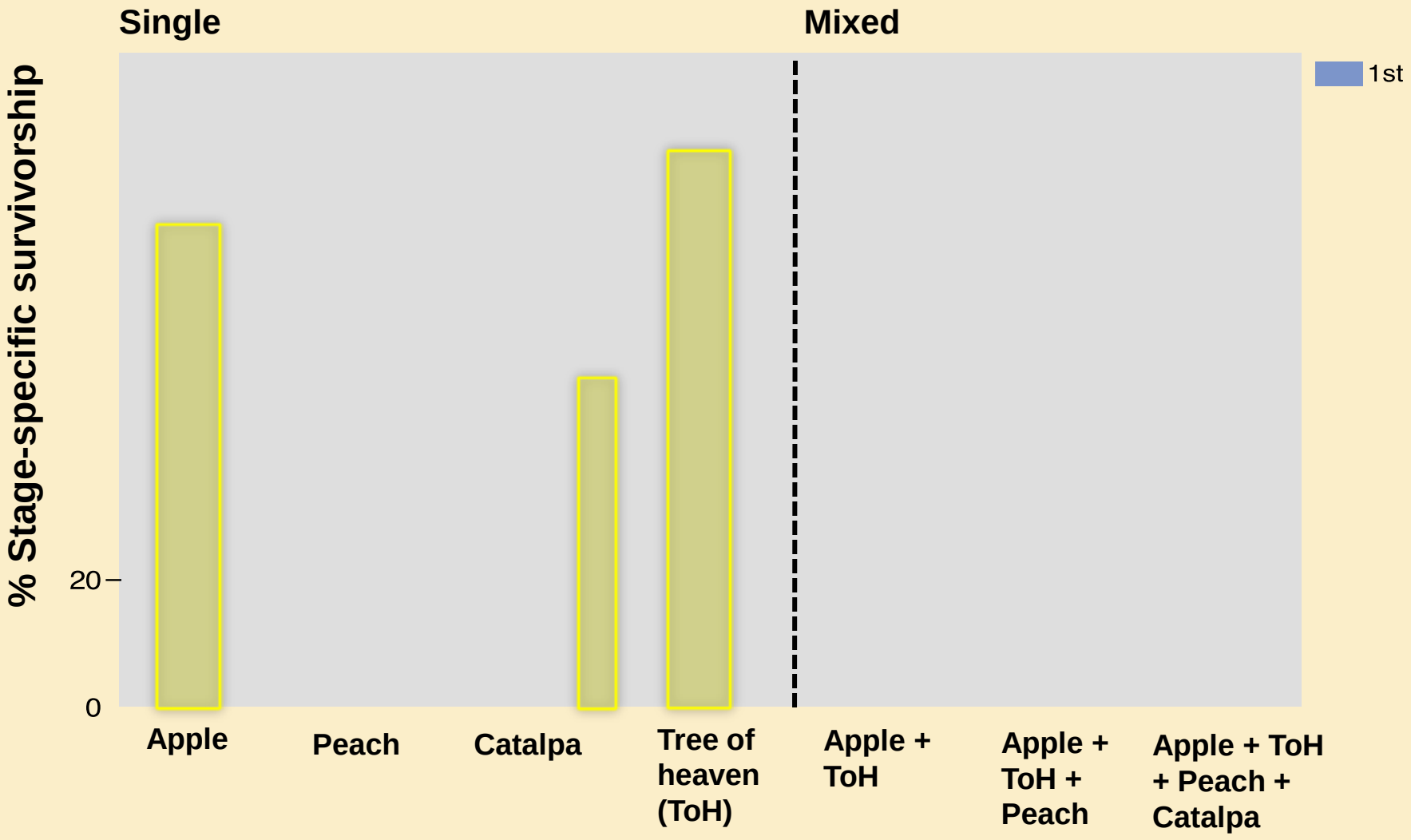
Late-season:

- ✓ Yes, similar trend was observed except for ToH as a single diet *P* = .0005



RESULTS: STAGE-SPECIFIC SURVIVORSHIP

- ✓ Low 2nd (P = .0453) and 3rd (P < .0001) instar survivorships on apple and ToH
- ✓ Low 5th instar survivorship on catalpa (P < .0001)



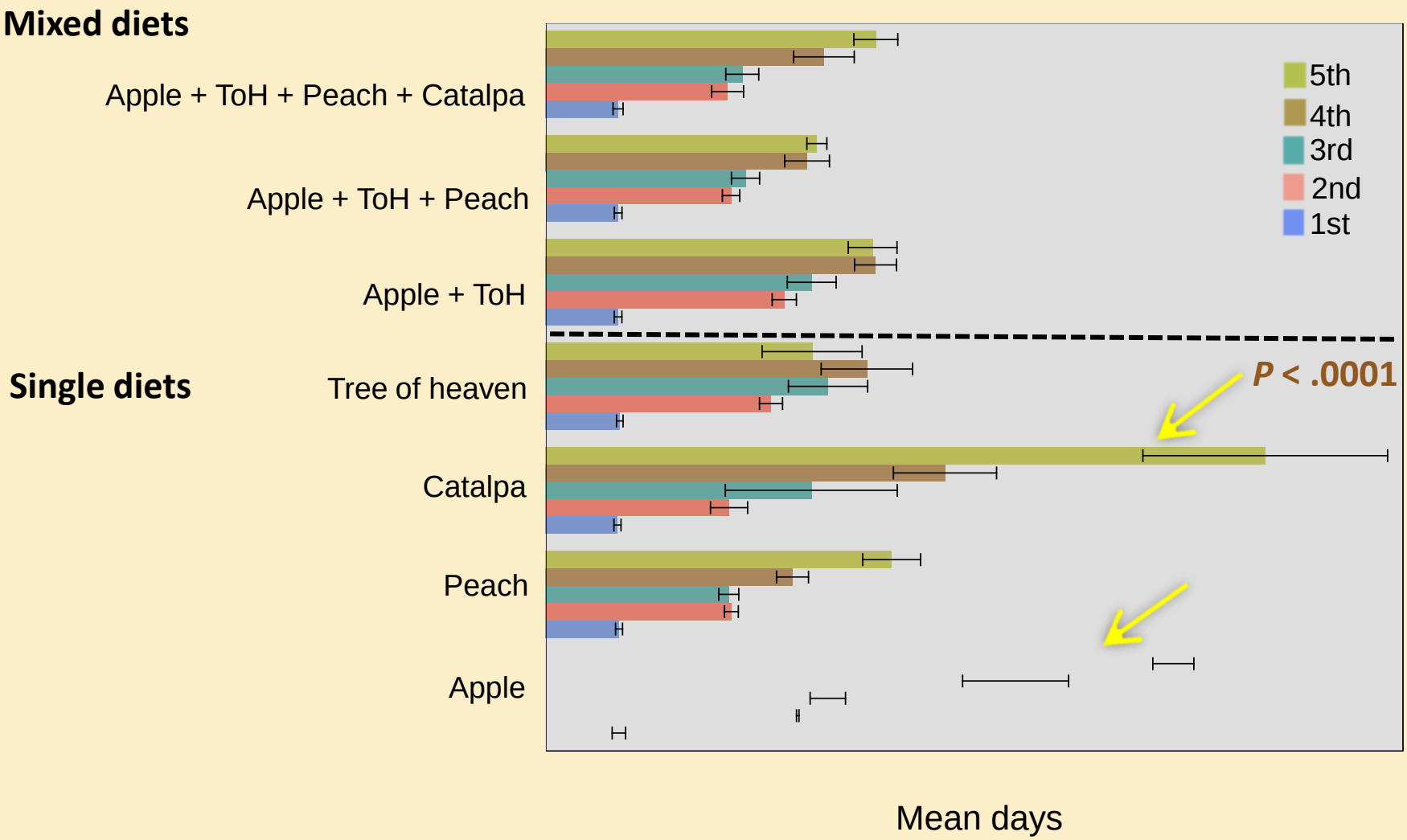
RESULTS: DEVELOPMENTAL TIME

- ✓ BMSB developed faster on mixed diets and single diets of peach and ToH
- ✓ Longer development on single diets of apple and catalpa

Numbers in each bar indicate the number of individuals that reached adulthood.

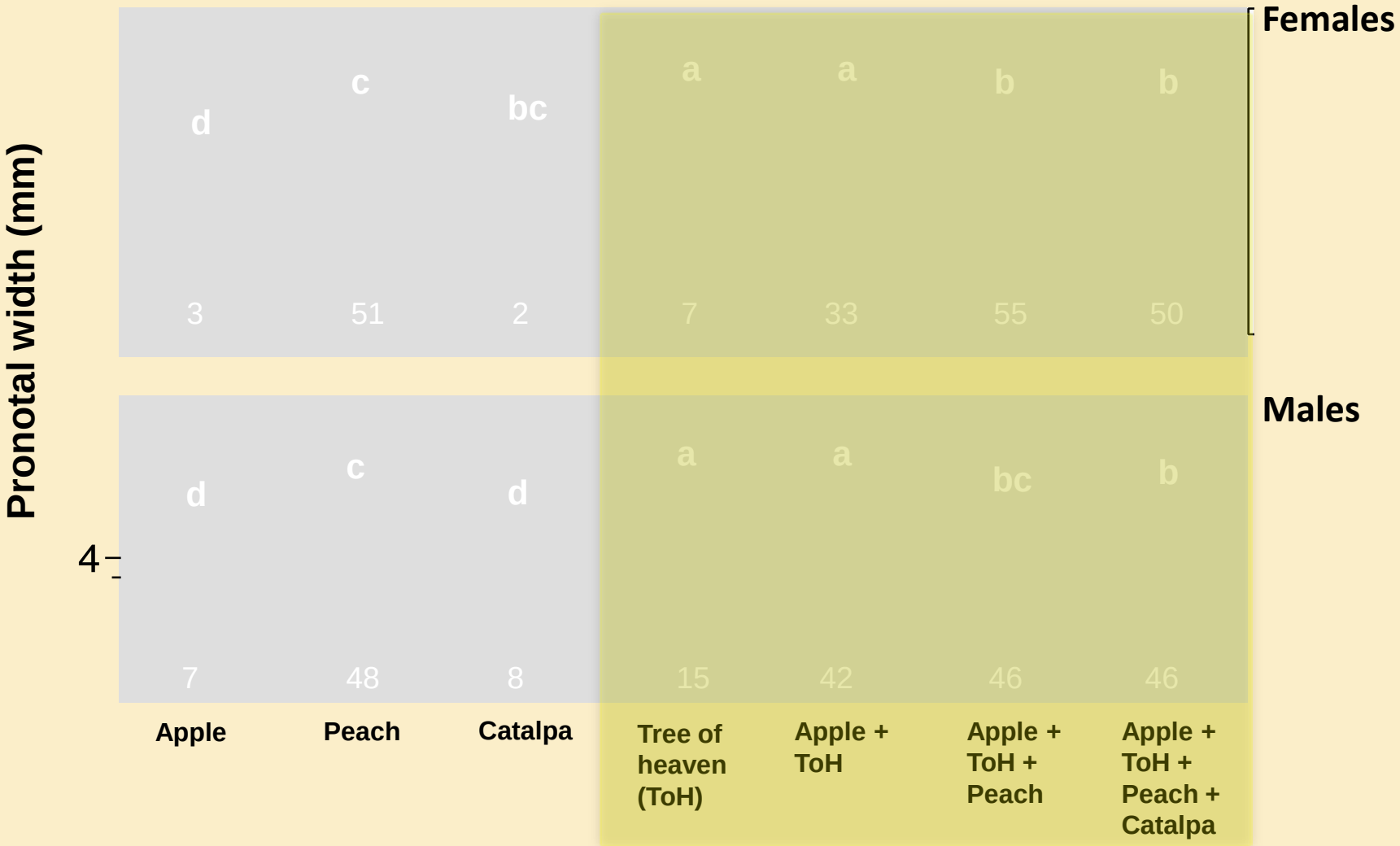
RESULTS: STAGE-SPECIFIC STADIUM

- ✓ General trend: The shortest stage was 1st instar, followed by 2nd and 3rd, then 4th and 5th
- ✓ 5th instar nymphs on apple and catalpa (single) required the longest time to molt



RESULTS: PRONOTAL WIDTH

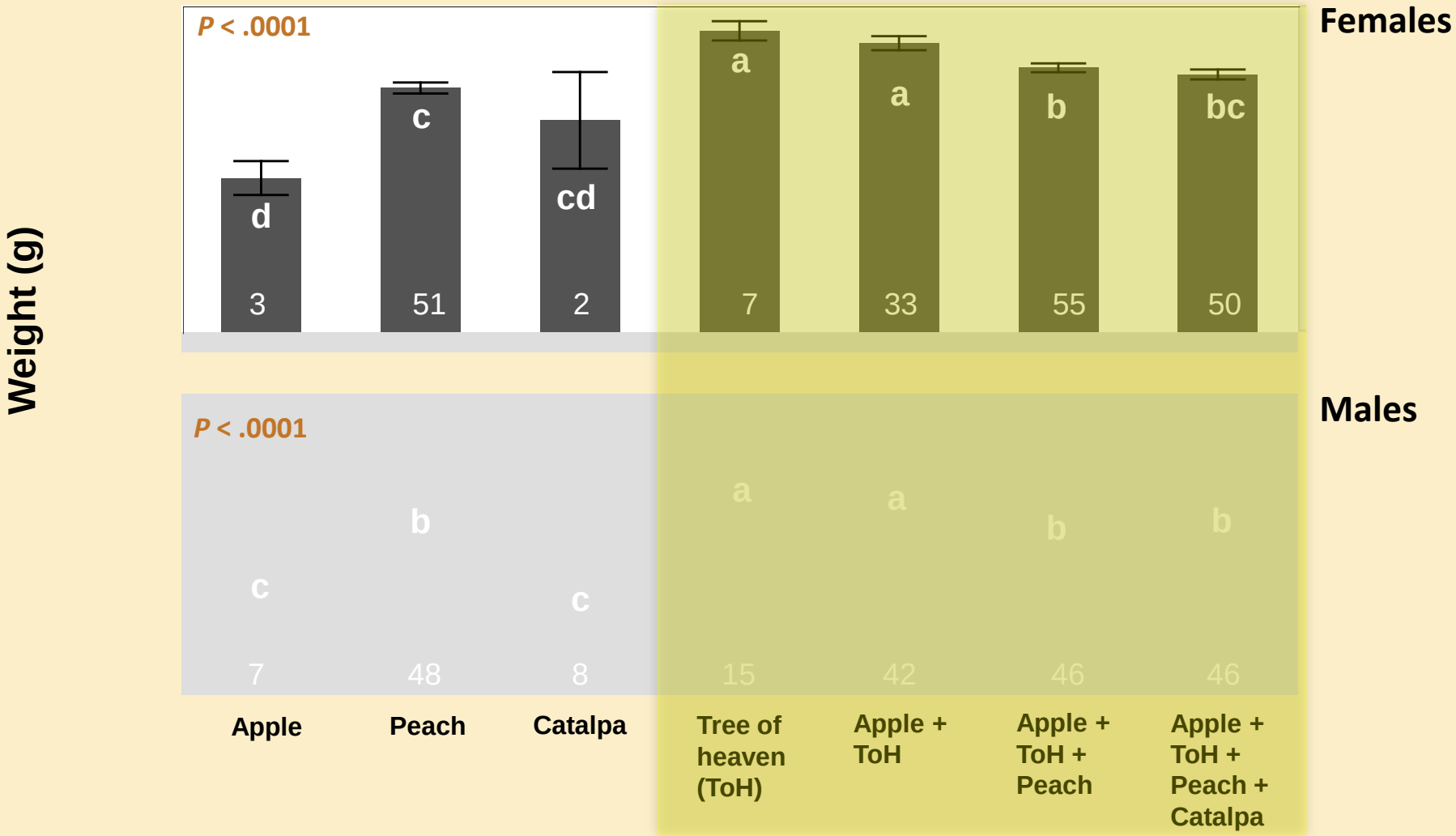
- ✓ Adults reared on mixed diets and ToH (single diet) were larger



Numbers in each bar indicate the number of individuals that reached adulthood.

RESULTS: ADULT WEIGHT

✓ Adults reared on mixed diets and ToH (single diet) were heavier



Numbers in each bar indicate the number of individuals that reached adulthood.

RESULTS SUMMARY

- Mixed diets proved to be optimal for nymphal survivorship and development
  - Combining 2 sub-optimal single diets (apple & ToH) resulted in increased survivorship
  - Nymphs reared on mixed diets and ToH resulted into bigger and larger adults
- Peach appeared to be the most suitable single host for BMSB development among the host plants tested
- Apple and catalpa were found to be least suitable as single diets
- Tree of heaven showed higher suitability toward the latter part of the growing season

FUTURE RESEARCH DIRECTIONS

- **Is nymphal feeding preference influenced by host plant quality?**
  - **Host-choice experiment**
- **What is the pattern of nymphal dispersal throughout the growing season involving fruit tree and wild tree hosts?**
  - **Trunk traps**

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QUESTIONS & COMMENTS?