Western Tarnished Plant Bug Ecology and Behavior

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Lygus hesperus

Variation in Adult Behaviors and Feeding Injury

Variation in Behaviors and Feeding Injury

- **Rationale:**
  - Account for variation in feeding behaviors and injury to squares
  - Improve assays to screen cotton germplasm for resistance/tolerance
- **Approach:**
  - Assess behaviors → Assess feeding injury

Methods: Plant Bugs

- Genders
  - Male
  - Female
- Reproductive States
  - Pre-reproductive
  - Reproductive and Unmated
  - Reproductive and Mated

HD Videos

Results: Trivial Movements

	Avg. duration of residence on square (min)	No. times leaving square
Gender		
Female	72.4 ± 10.3 a	4.9 ± 1.1 a
Male	44.8 ± 10.6 b	5.6 ± 1.1 a
Reproductive State		
Pre-reproductive	95.2 ± 13.0 a	2.2 ± 1.3 b
Reproductive Mated	35.6 ± 12.7 b	6.5 ± 1.3 a
Reproductive Unmated	44.9 ± 12.7 b	7.1 ± 1.3 a

Results: Trivial Movements

	Avg. duration of residence on square (min)	No. times leaving square
Gender		
Female	72.4 ± 10.3 a	4.9 ± 1.1 a
Male	44.8 ± 10.6 b	5.6 ± 1.1 a
Reproductive State		
Pre-reproductive	95.2 ± 13.0 a	2.2 ± 1.3 b
Reproductive Mated	35.6 ± 12.7 b	6.5 ± 1.3 a
Reproductive Unmated	44.9 ± 12.7 b	7.1 ± 1.3 a

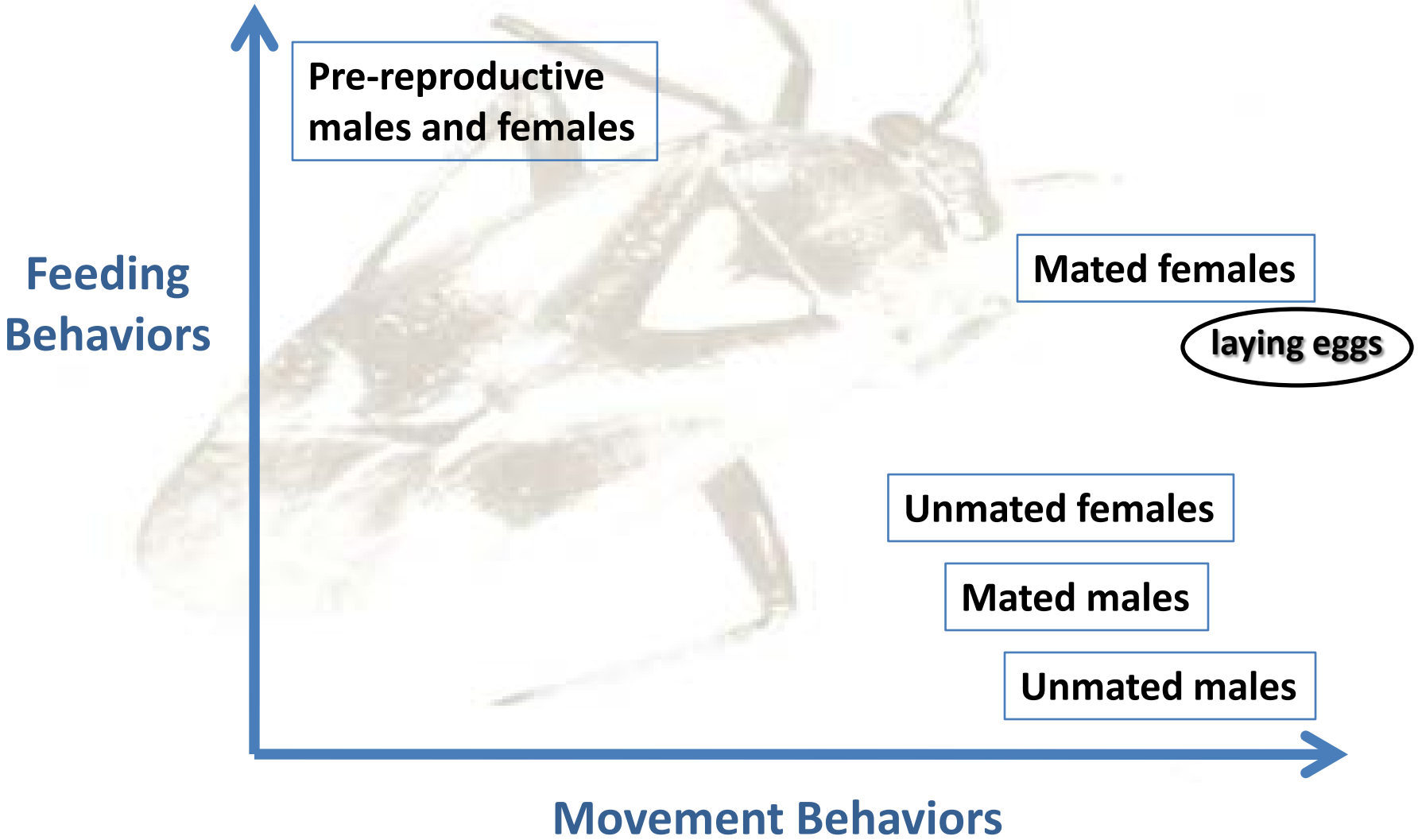
Results: Feeding Behaviors

Gender	Reproductive state	Avg. duration of feeding intervals (min)	No. of stylet-probes
Female	Pre-reproductive	7.3 ± 0.8 a	18.4 ± 4.1 b
	Reproductive Mated	2.6 ± 0.8 b	42.7 ± 3.9 a
	Reproductive Unmated	3.0 ± 0.8 b	24.7 ± 3.9 b
Male	Pre-reproductive	6.2 ± 0.8 a	22.4 ± 4.1 b
	Reproductive Mated	1.8 ± 0.8 b	24.8 ± 4.1 b
	Reproductive Unmated	1.8 ± 0.8 b	23.2 ± 4.1 b

Results: Feeding Behaviors

Gender	Reproductive state	Avg. duration of feeding intervals (min)	No. of stylet-probes
Female	Pre-reproductive	7.3 ± 0.8 a	18.4 ± 4.1 b
	Reproductive Mated	2.6 ± 0.8 b	42.7 ± 3.9 a
	Reproductive Unmated	3.0 ± 0.8 b	24.7 ± 3.9 b
Male	Pre-reproductive	6.2 ± 0.8 a	22.4 ± 4.1 b
	Reproductive Mated	1.8 ± 0.8 b	24.8 ± 4.1 b
	Reproductive Unmated	1.8 ± 0.8 b	23.2 ± 4.1 b

Results: Summary



Conclusions

- Documents previously unrecognized sources of variation in plant bug behaviors
- Do variations in feeding behaviors reflect variations in feeding injury to cotton squares?

Methods: Greenhouse Assays

Results: Greenhouse Assays

Reproductive State	Injured	Missing	Injured + missing
Pre-reproductive	1.8 ± 0.3 a	4.9 ± 1.5 a	6.7 ± 1.7 a
Unmated Reproductive	1.0 ± 0.3 b	1.1 ± 1.5 b	2.1 ± 1.7 b
Mated Reproductive	1.3 ± 0.3 ab	1.2 ± 1.5 b	2.4 ± 1.7 b

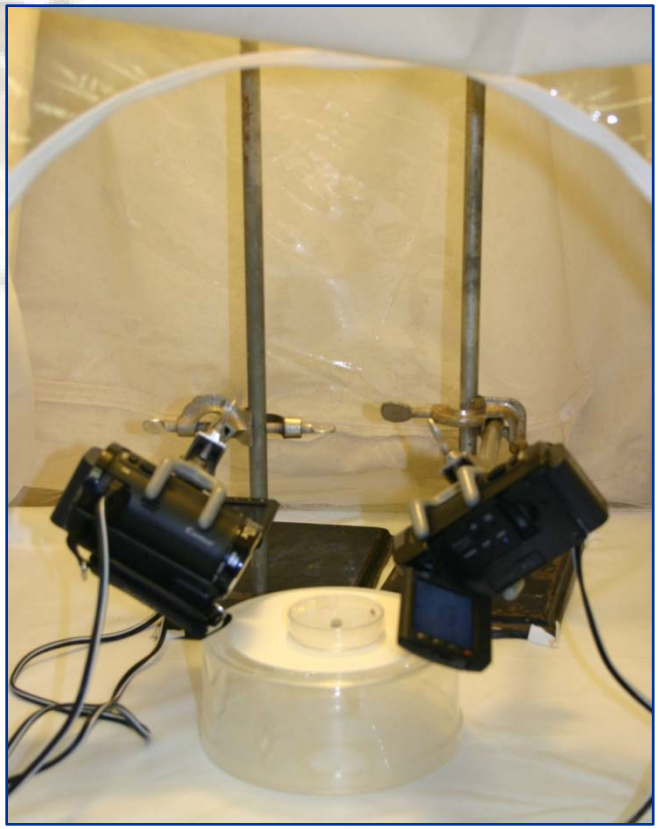
Summary: Behavior and Greenhouse Assays

- Pre-reproductive adults feed more and stay on squares longer than reproductive adults
- Pre-reproductive adults injure 3× more more cotton squares than reproductive adults

Variation in Nymph Behaviors and Feeding Injury

Methods: Behavior Assays

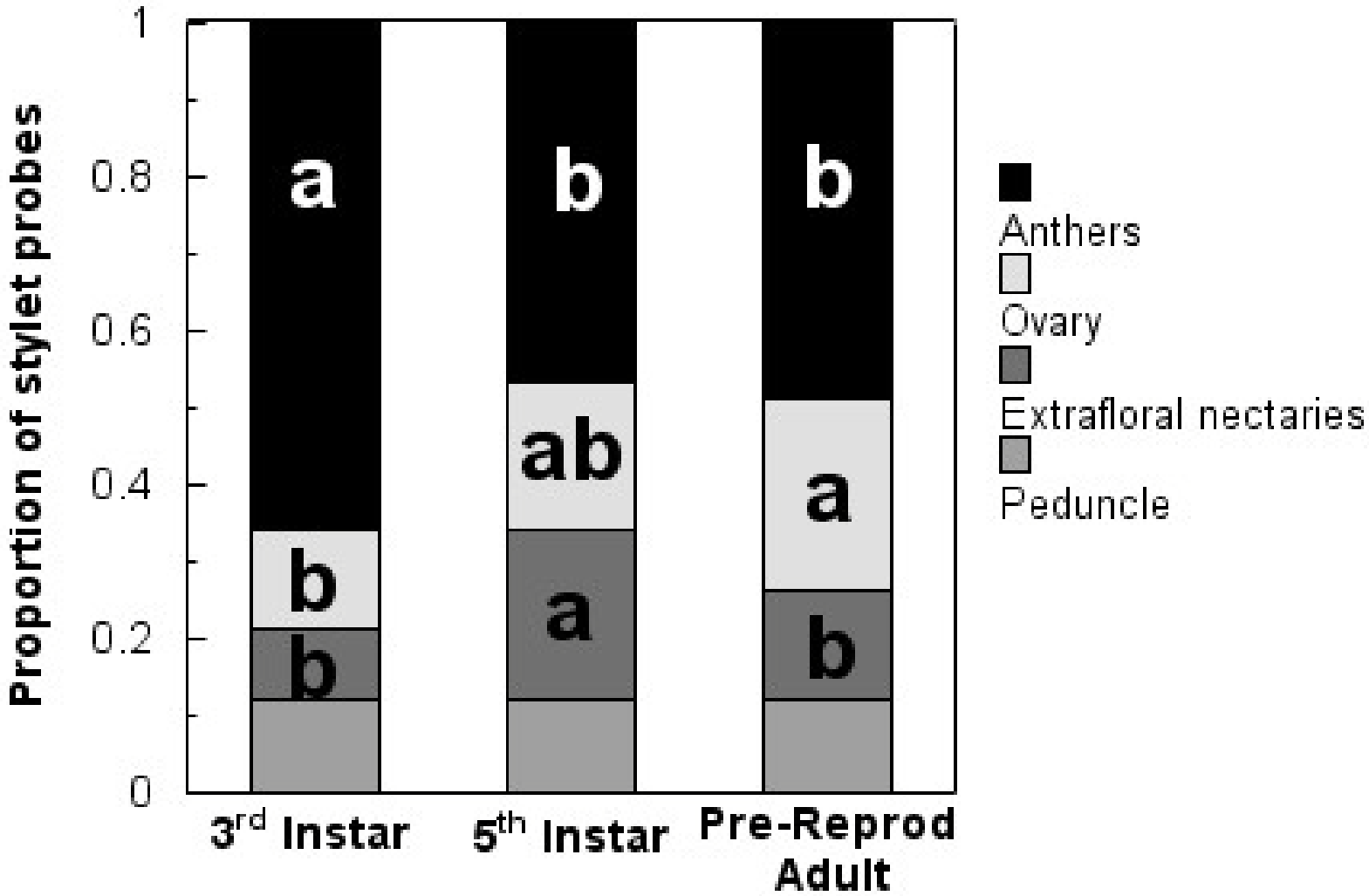
- Setup as described for adults
- *L. hesperus*:
  - 3rd instars
  - 5th instars
  - Pre-reproductive adults



Results: Behavior Assays

Life Stage	Avg. duration on square (min)	Avg. duration stylet-probing (min)	No. Stylet-probes
3rd instar	142.8 ± 18.2 a	4.5 ± 0.8 ab	37.2 ± 3.5 a
5th instar	77.1 ± 18.2 b	3.3 ± 0.8 b	21.5 ± 3.5 b
Pre-reproductive adult	106.1 ± 18.2 ab	6.7 ± 0.8 a	21.0 ± 3.5 b

Results: Behavior Assays



Summary: Nymph Behaviors

- Third Instars:
  - Longest duration on squares
  - Intermediate stylet-probe durations
  - Largest number of stylet-probes (2×)
  - Greatest proportion of stylet-probes to anthers
- Fifth Instars:
  - Shortest stylet-probe durations
  - Greatest proportion of stylet-probes to extrafloral nectaries
- Pre-reproductive Adults:
  - Longest stylet-probe durations

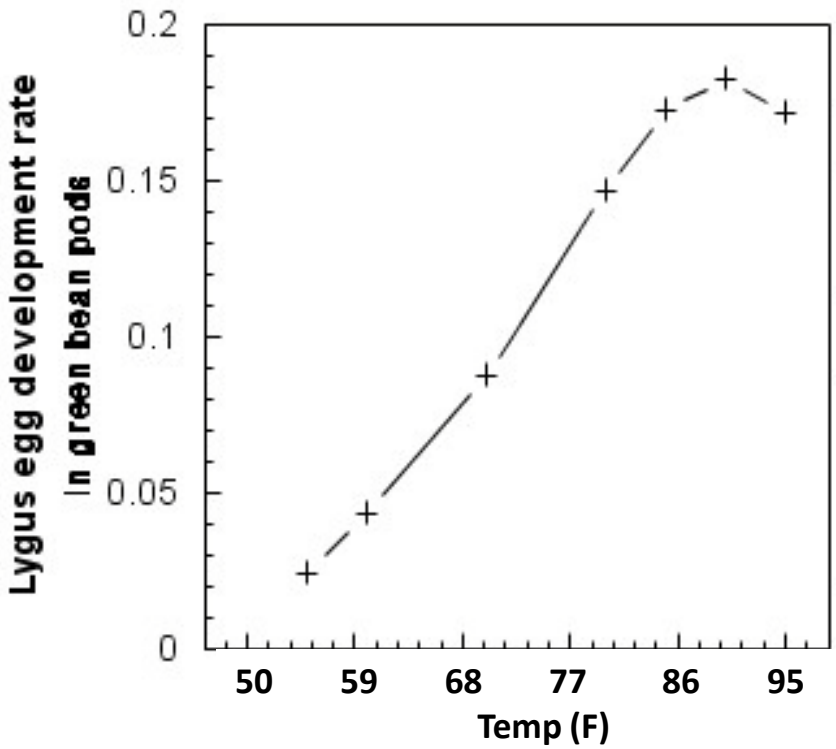
Future Studies: Greenhouse Assays

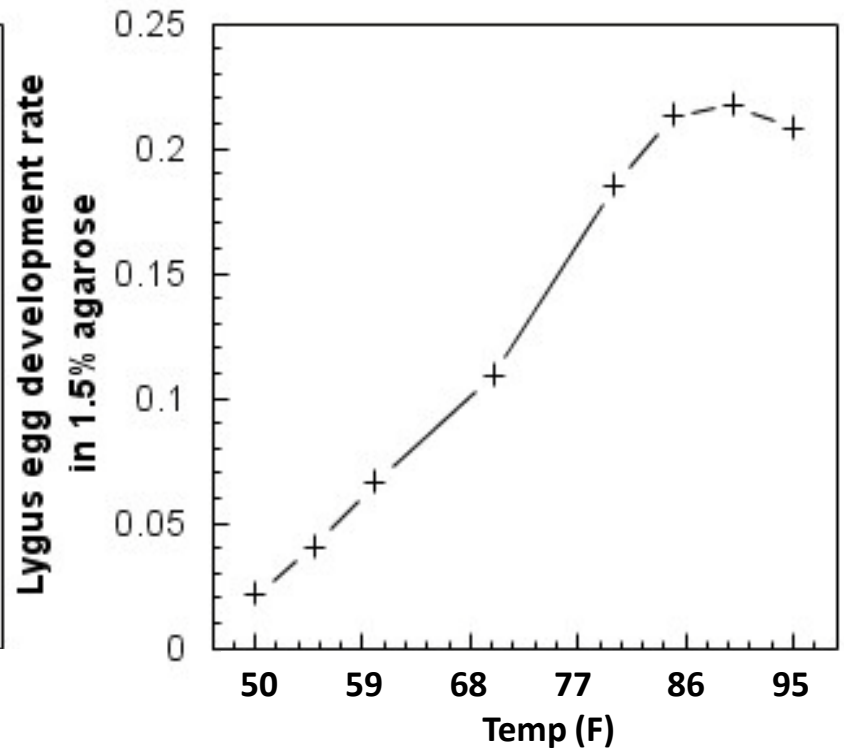
Temperature-Dependent Development

Temperature-Dependent Development

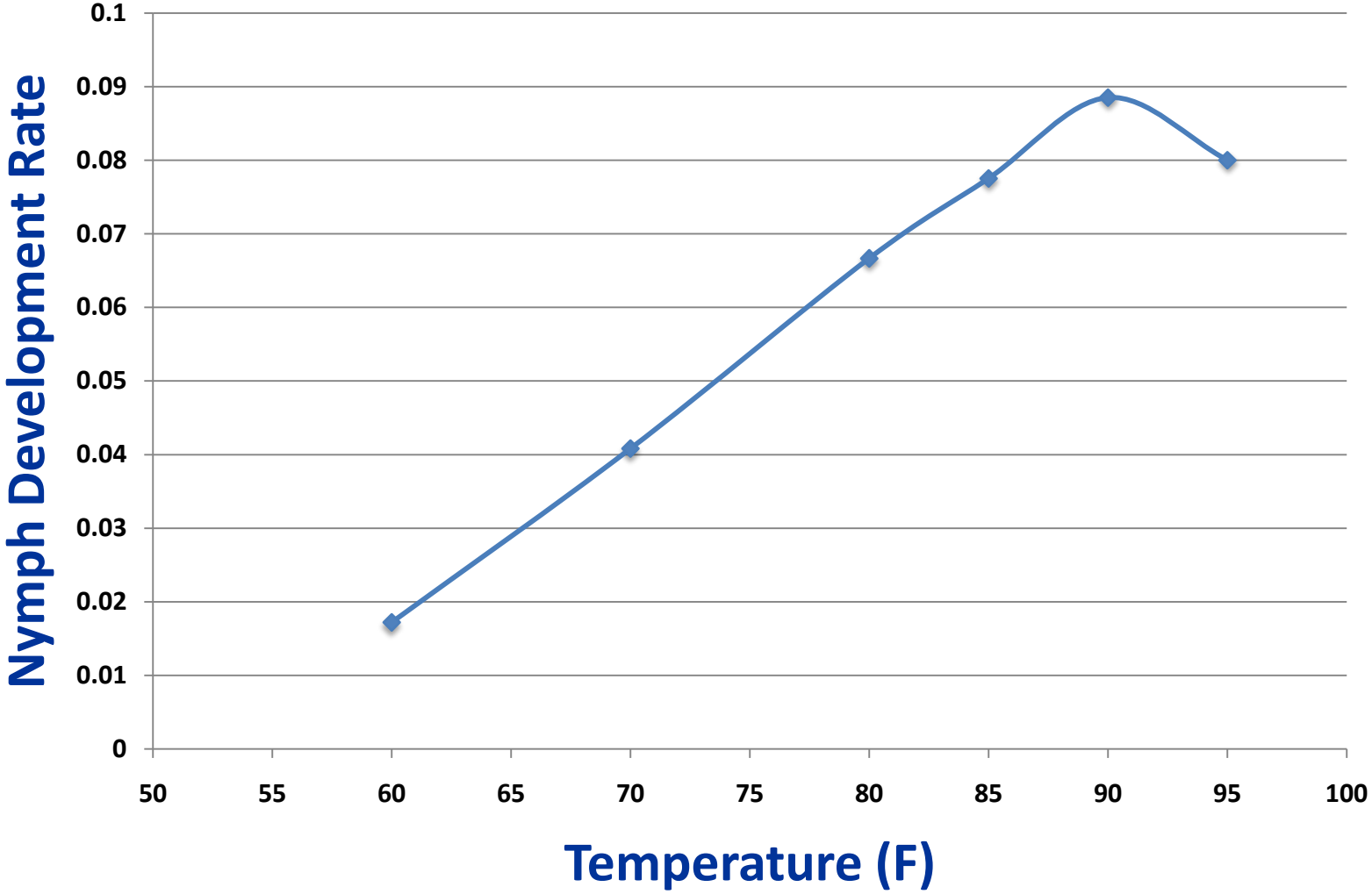
- Rationale
  - Improved temperature-dependent development rate models for lygus eggs and nymphs
  - Improve experimental design
  - Improve degree-day models

Temp Dependent Egg Development





Temp Dependent Nymph Development



Summary

- **Egg and nymph development:**
  - **Threshold at or below 55°F**
  - **Development rates do *not* increase with temperatures above 90°F**
  - **Development stops at temperatures above 95°F**

Host-Free Adult Survival

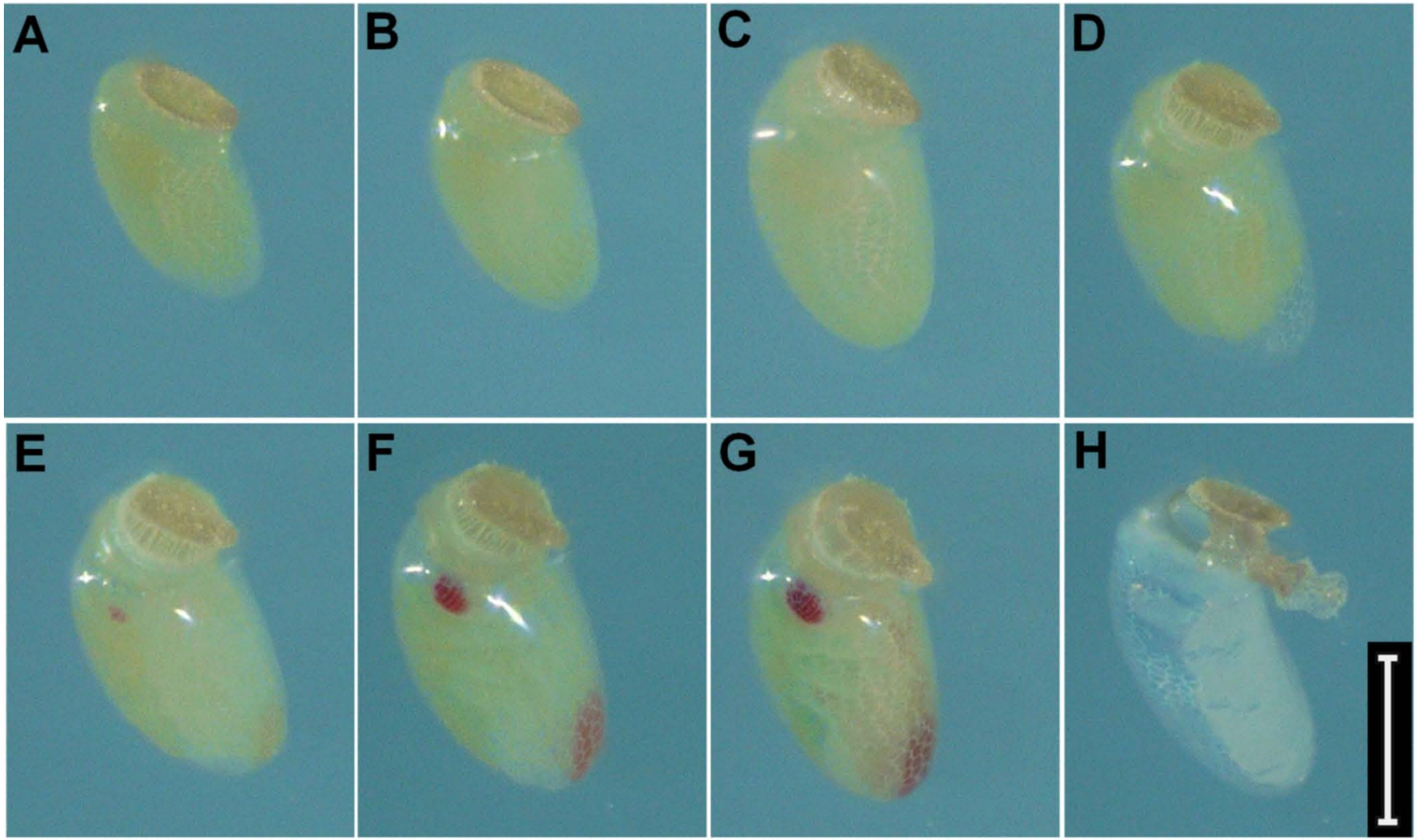
Temperature	Median survival (days)	Max. survival (days)
50	33	55
55	24	36
60	14	26
70	10	15
80	6	15
85	4	10
90	5	8
95	1	9

Characteristics of Embryo Development

Embryo Development

- **Rationale:**
  - Assess embryo mortality
  - Predict age of eggs

Embryo Development



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