



Harvest and post harvest impacts on infestation

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Key questions

Can harvest practices decrease SWD infestation?

How do (typical) post harvest practices impact SWD infestation?



Harvest practices

Consider exposure time...



What is a typical post harvest practice?

Assumption:

Fruit are stored at low temperatures for some duration before marketing

Post harvest storage temperature

Eggs in artificial diet

Methods for cold temperature experiments

Artificial diet

Each life state, temperature, and duration was replicated at least 8 times

10ml of standard diet in 60mm petri dishes; 5-10 eggs per dish

Controls for each temp held at 68F

Orange arrows indicate values significantly different from control for that temperature

Fruit

Fruit infested over the course of 7 days and held at 68F until desired life stage reached

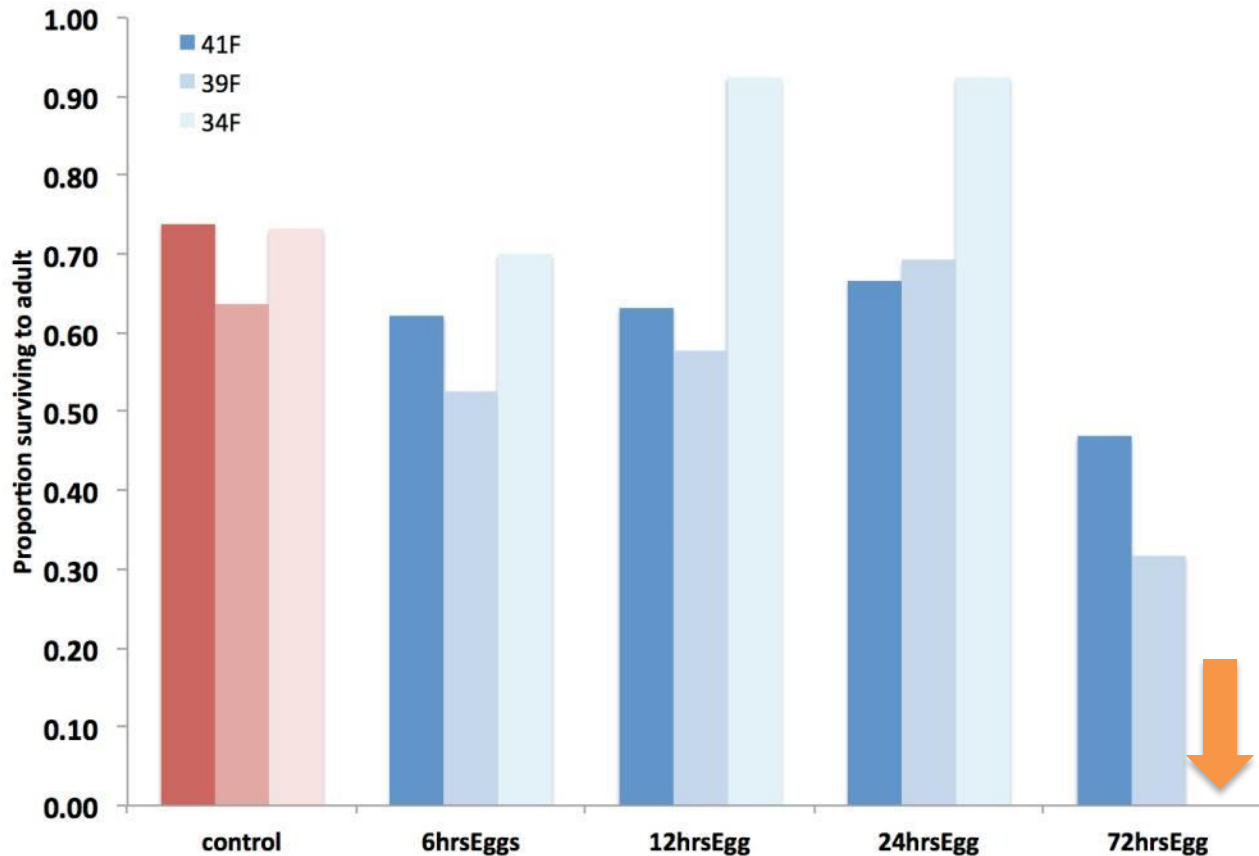
At least 24 treatment replicated and 8 control replicates were conducted for each life stage

Exposed in commercial scale cold room at 35F for 72 hrs



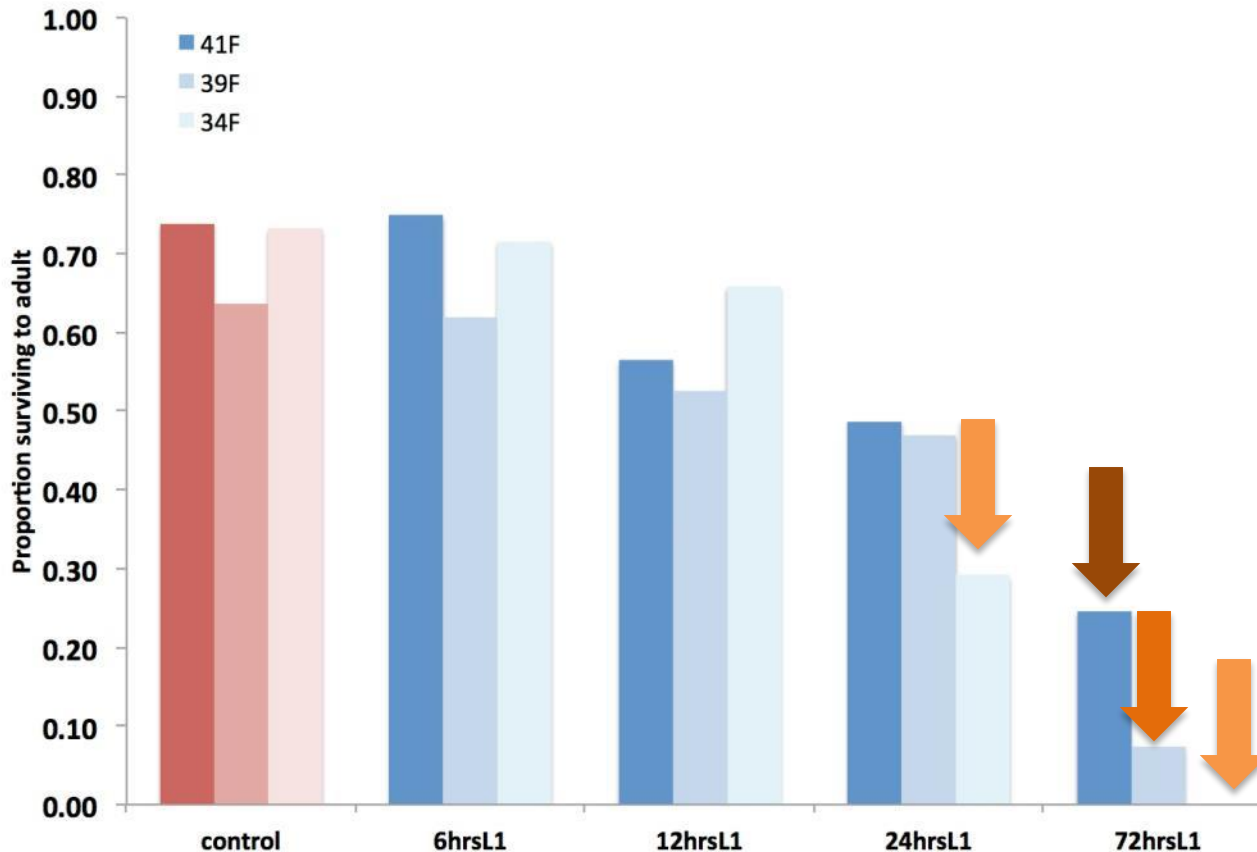
Post harvest storage temperature

Eggs in artificial diet



*No eggs held at 34F for 72 hrs survived to adults **in artificial diet***

Post harvest storage temperature *1st instars in artificial diet*

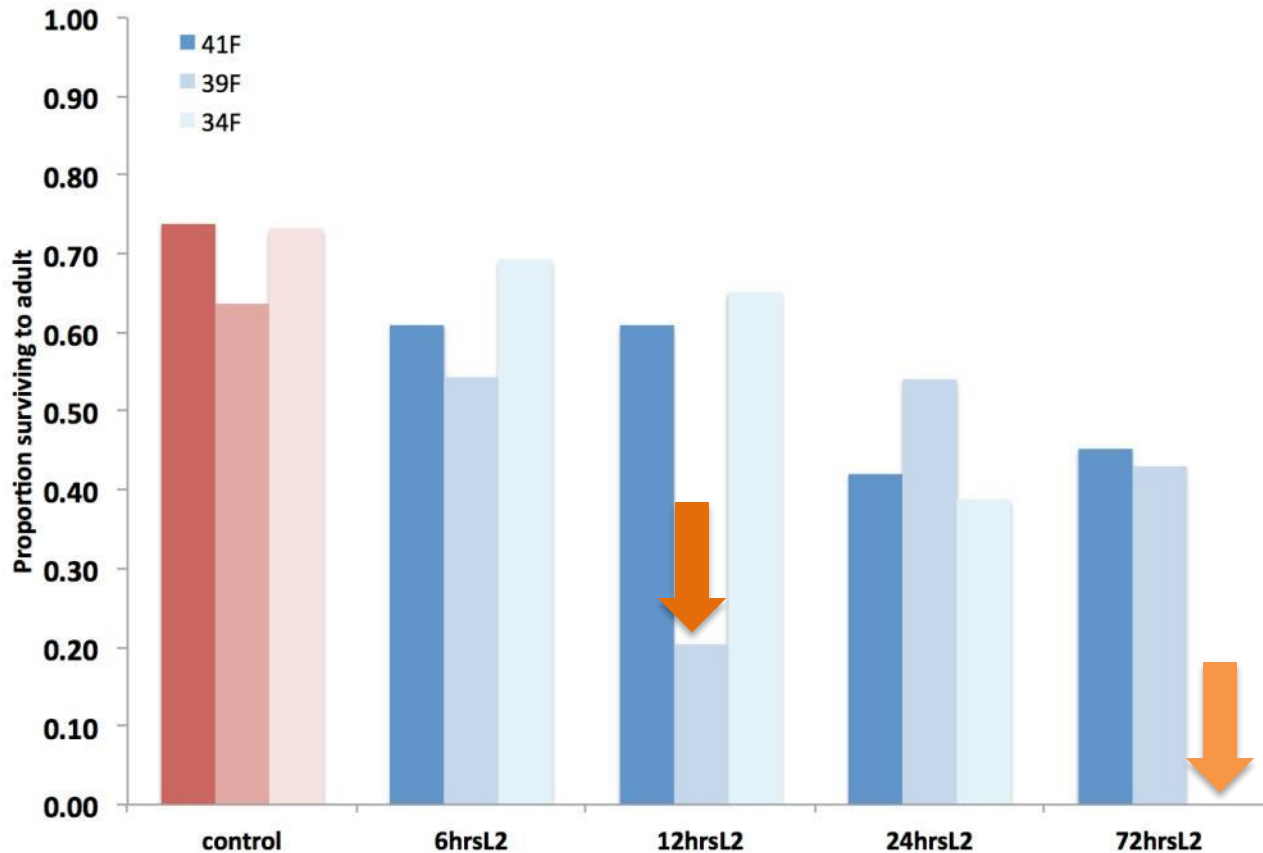


No first instar larvae held at 34F for 72 hrs survived to adults in artificial diet

Significantly fewer first instar larvae survived after 72 hrs at 39F and 41F than in untreated controls

Significantly fewer first instar larvae survived after 24 hrs at 34F than in untreated controls

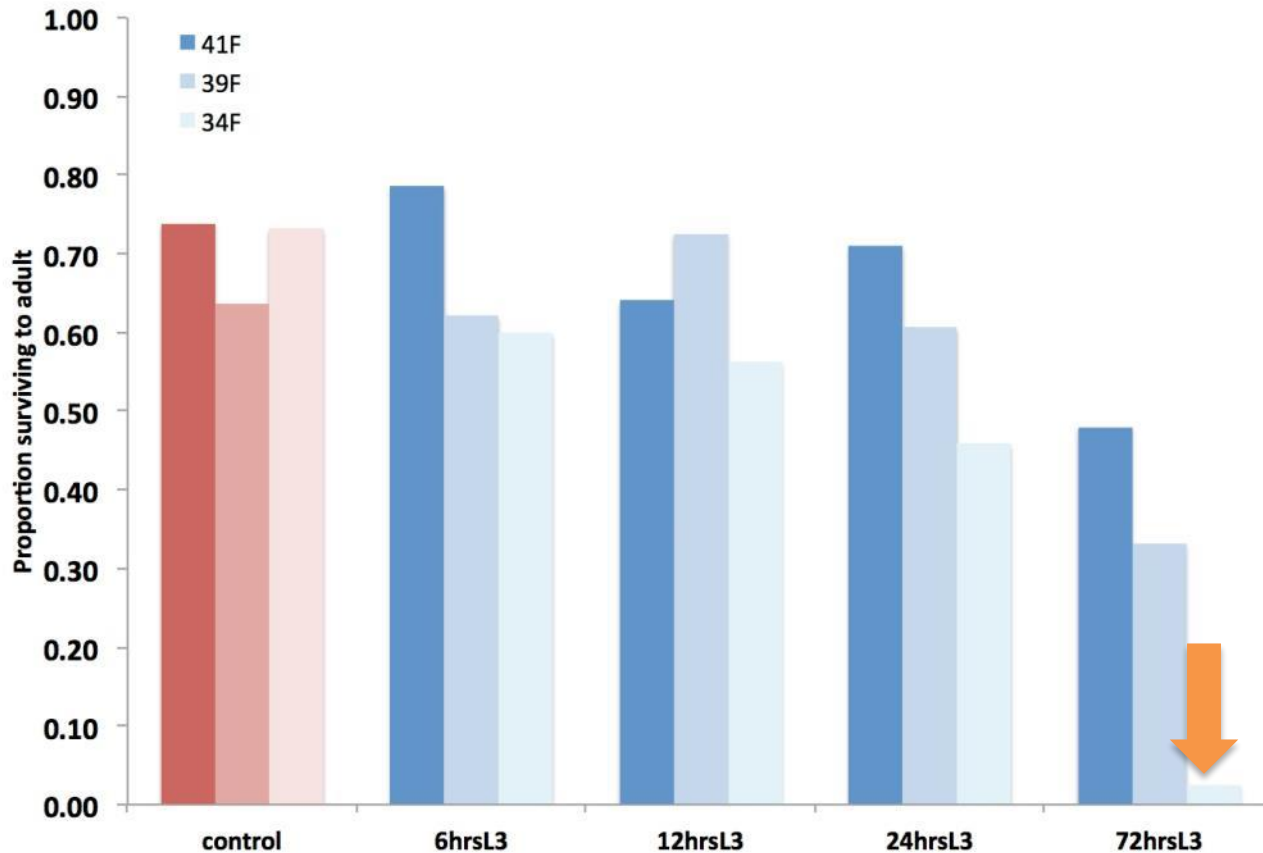
Post harvest storage temperature *2nd instars in artificial diet*



*No first second instar larvae held at 34F for 72 hrs survived to adults **in artificial diet***

Increased mortality of second instar larvae held at 39F for 12 hrs likely experimental issue

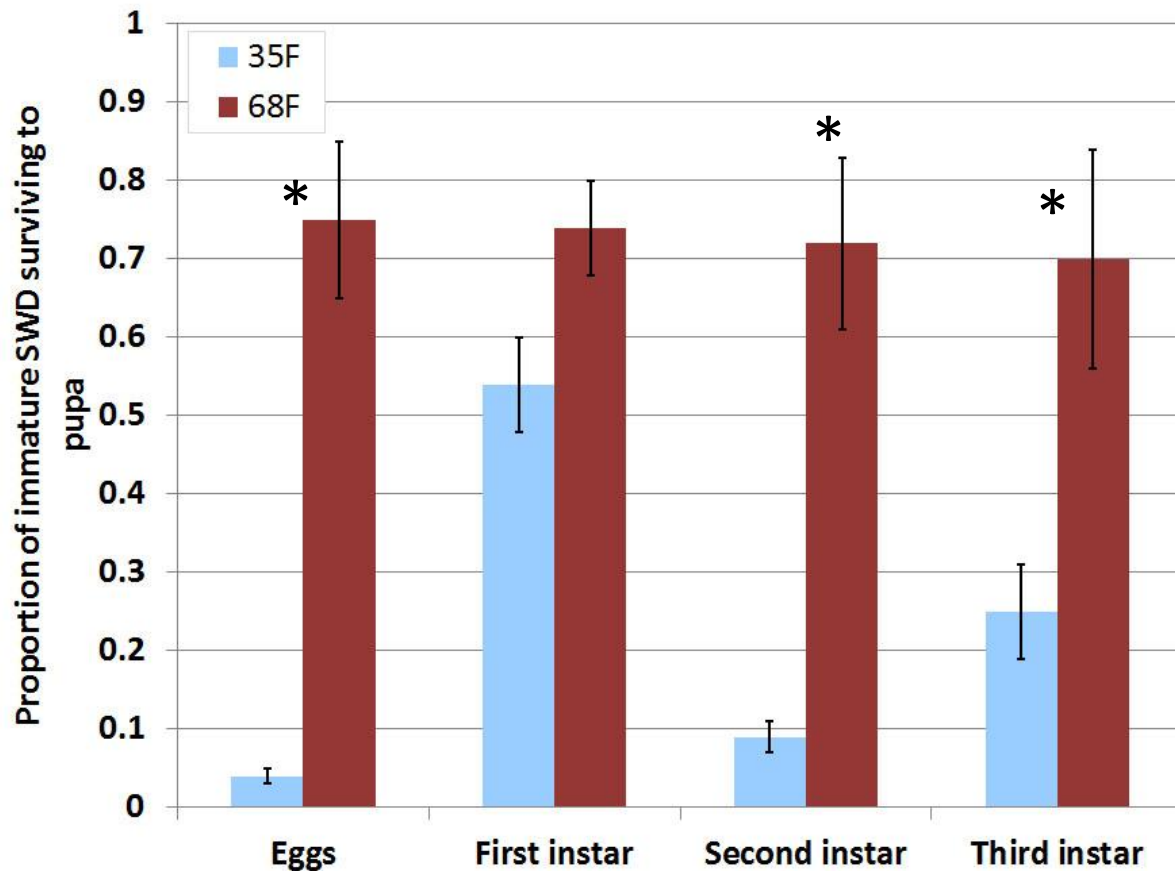
Post harvest storage temperature *3rd instars in artificial diet*



*Significantly fewer third larvae held at 34F for 72 hrs survived to adults than untreated controls **in artificial diet***

Post harvest storage temperature

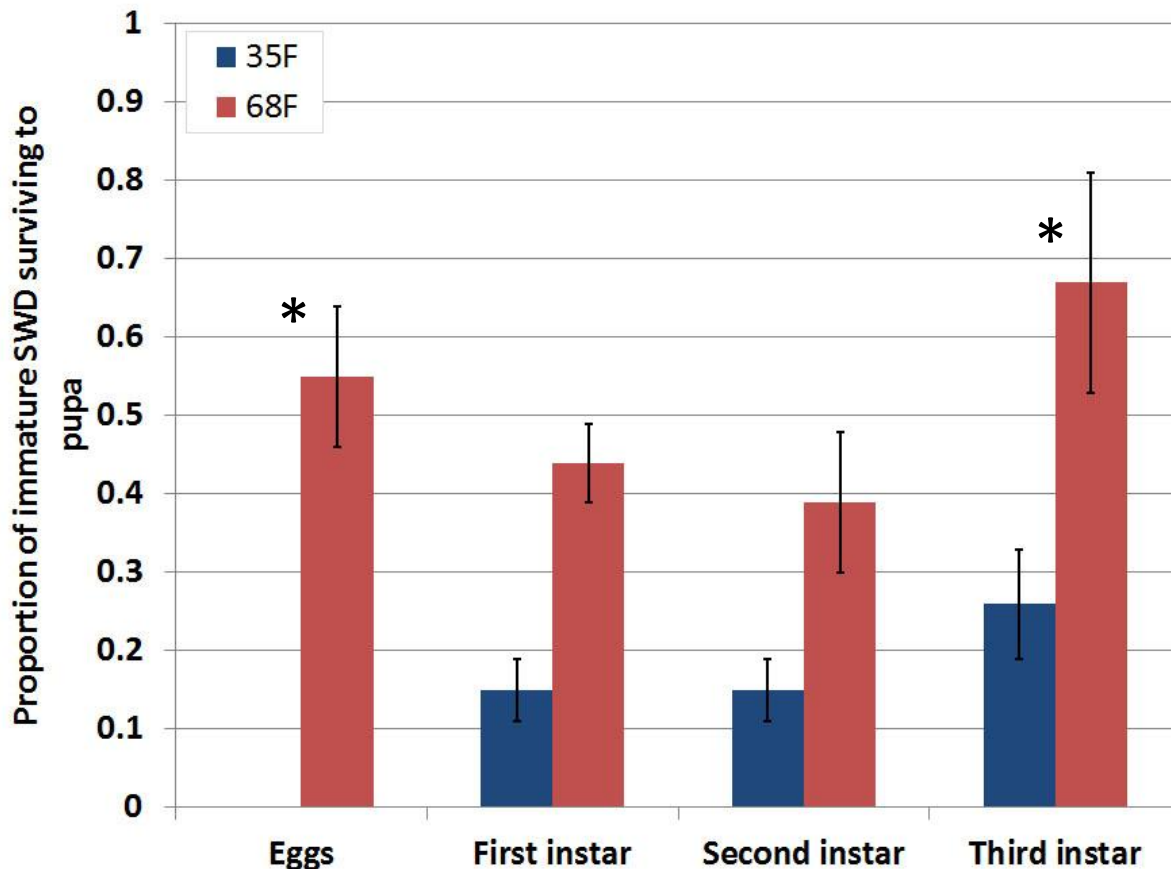
Survival to pupa in raspberries



First instar larvae in raspberries were not impacted by storage at 35F for 72 hrs, but other life stages were impacted

Post harvest storage temperature

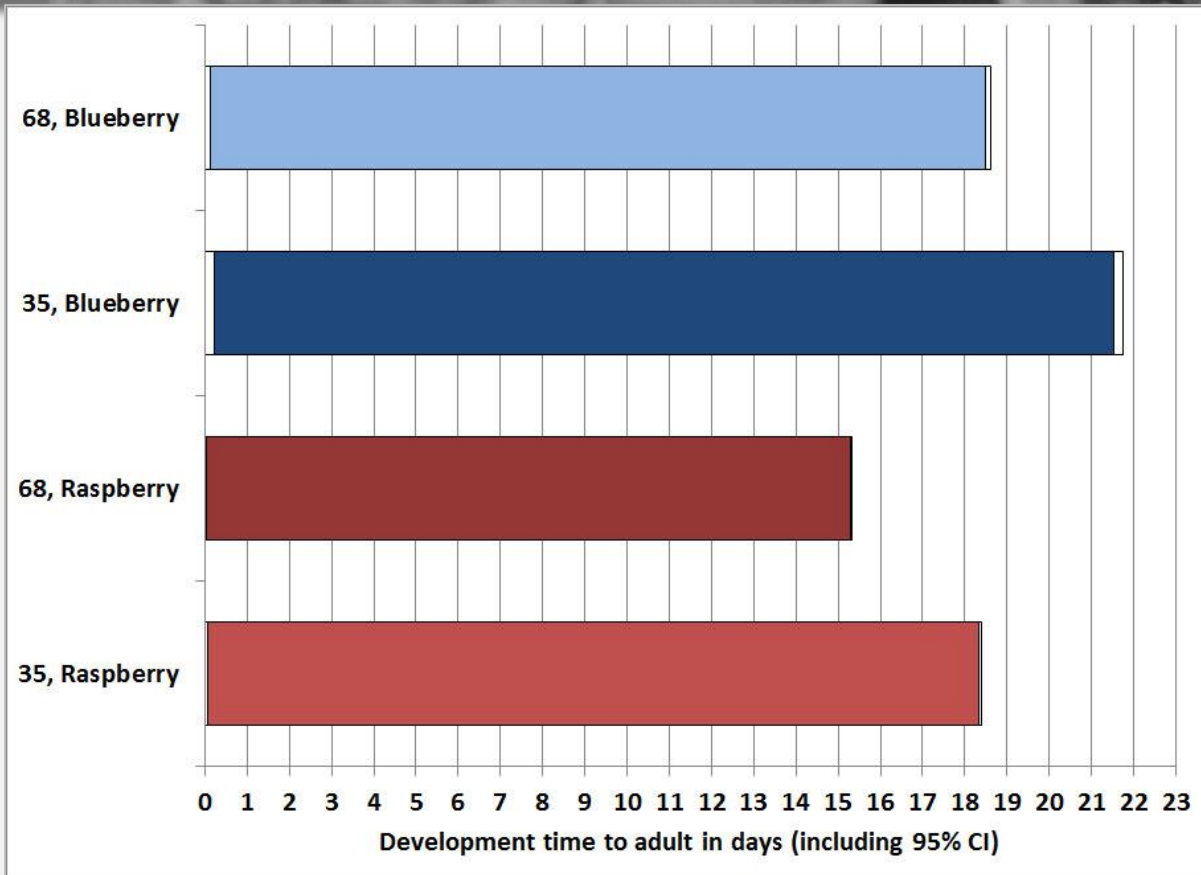
Survival to pupa in blueberries



*No eggs survived to pupation in blueberries held at **35F for 72 hrs**, but some of all other life stages did*

No significant difference in survival for first and second instar

Post harvest storage temperature *Development time*



Development took 3 days longer in cold treated fruit, meaning larvae did not develop at 35F

Similar development time increases for temps in artificial diet

Development was faster in raspberries than in blueberries



Post harvest storage temperature *Summary*

**First instar larvae were the most sensitive to cold temperatures
in artificial diet and much less sensitive in fruit**

Eggs were the most significantly impacted in fruit

*Of the 434 eggs exposed to 35F for 3 days in blueberries, none
survived*

*For a treatment to be quarantine acceptable, 93,613 individuals
must be tested with no survivors*

**Larval development was essentially stopped at potential post
harvest temperatures, at least for 3 days**

What are we doing to help?

USDA Specialty Crops Research Initiative Proposal

Objective 1: Develop tactics and tools that predict SWD risk

Movement, Non crop hosts, Risk models, Selective monitoring methods

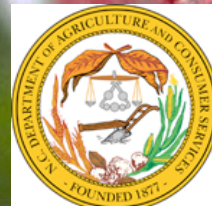
Objective 2: Optimize sustainable management programs

Enhance insecticide management, Develop resistance management strategies, Biological control, Post harvest management, Genetic pest management

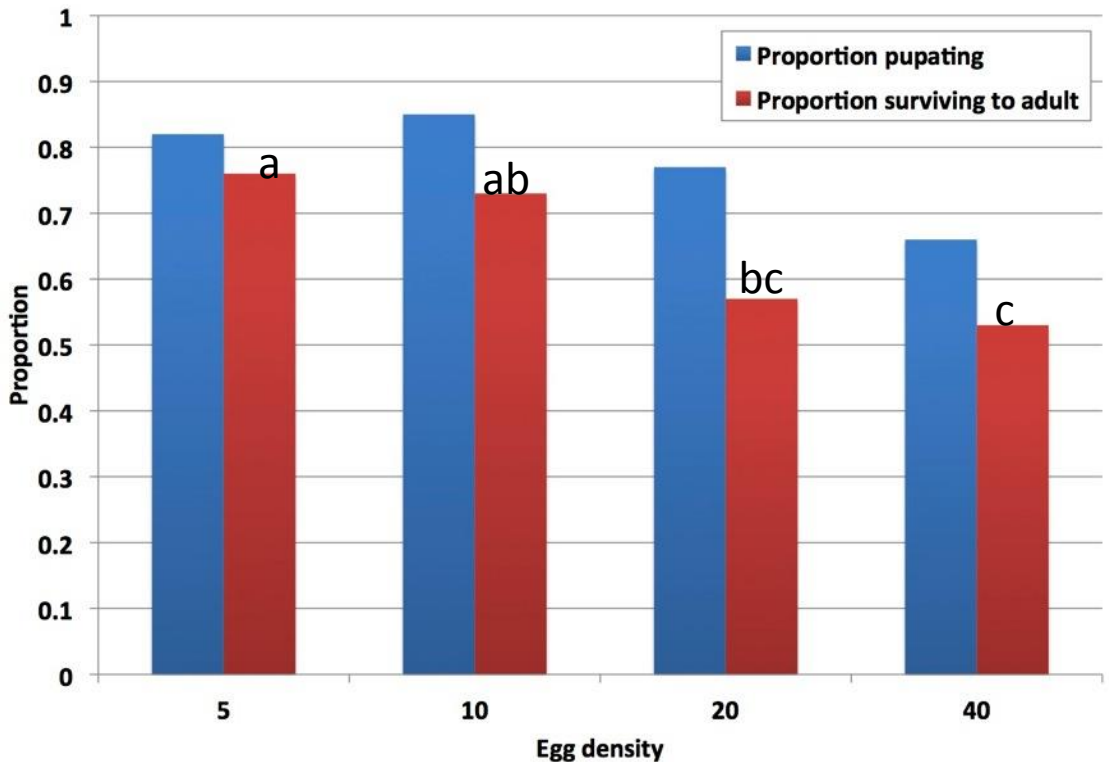
Objective 3: Implement and evaluate management programs

Implement sustainable & integrated programs, Measure impacts & evaluate programs, Deliver outputs to stakeholders

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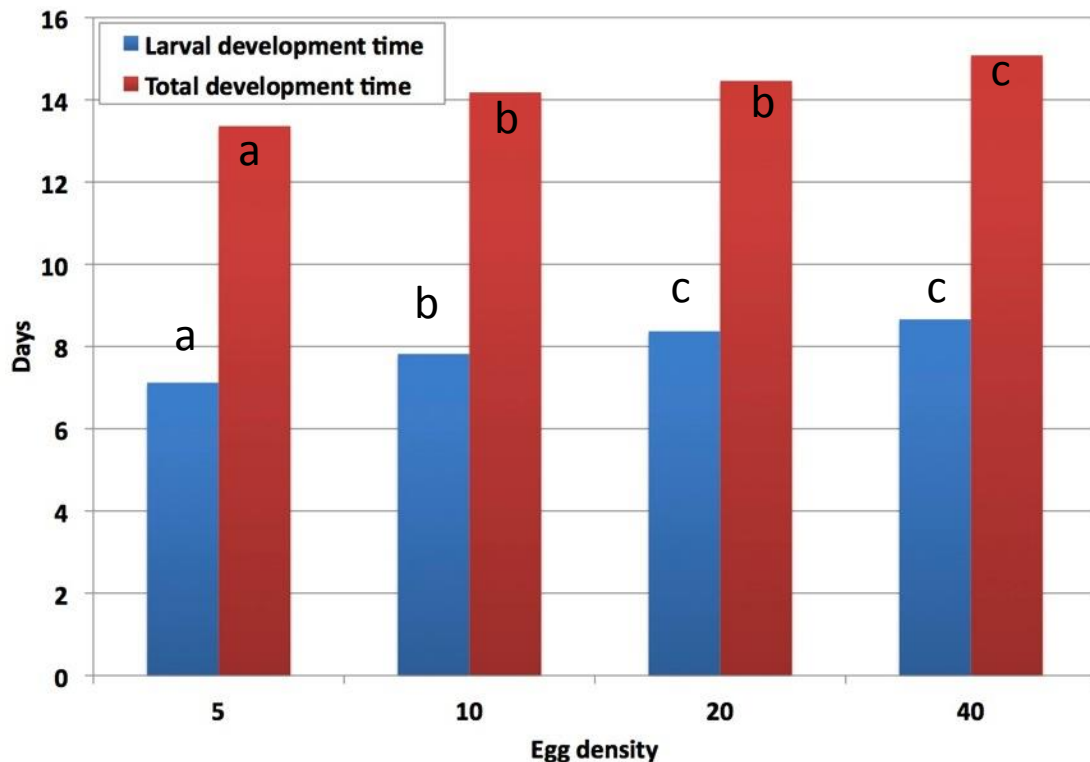
Effects of diet on intraspecific competition



In artificial diets, performance suffers as density increases

$$F_{df} = 6.25_{3,26}, p = 0.0024$$

Effects of diet on intraspecific competition



Larvae: $F_{df} = 42.44_{3,25}$, $p < 0.0001$

Total: $F_{df} = 32.82_{3,27}$, $p < 0.0001$

In artificial diets, performance suffers as density increases

Fruit observations

Larvae consistently performed better in raspberries despite densities of up to 3.5 eggs/g fruit

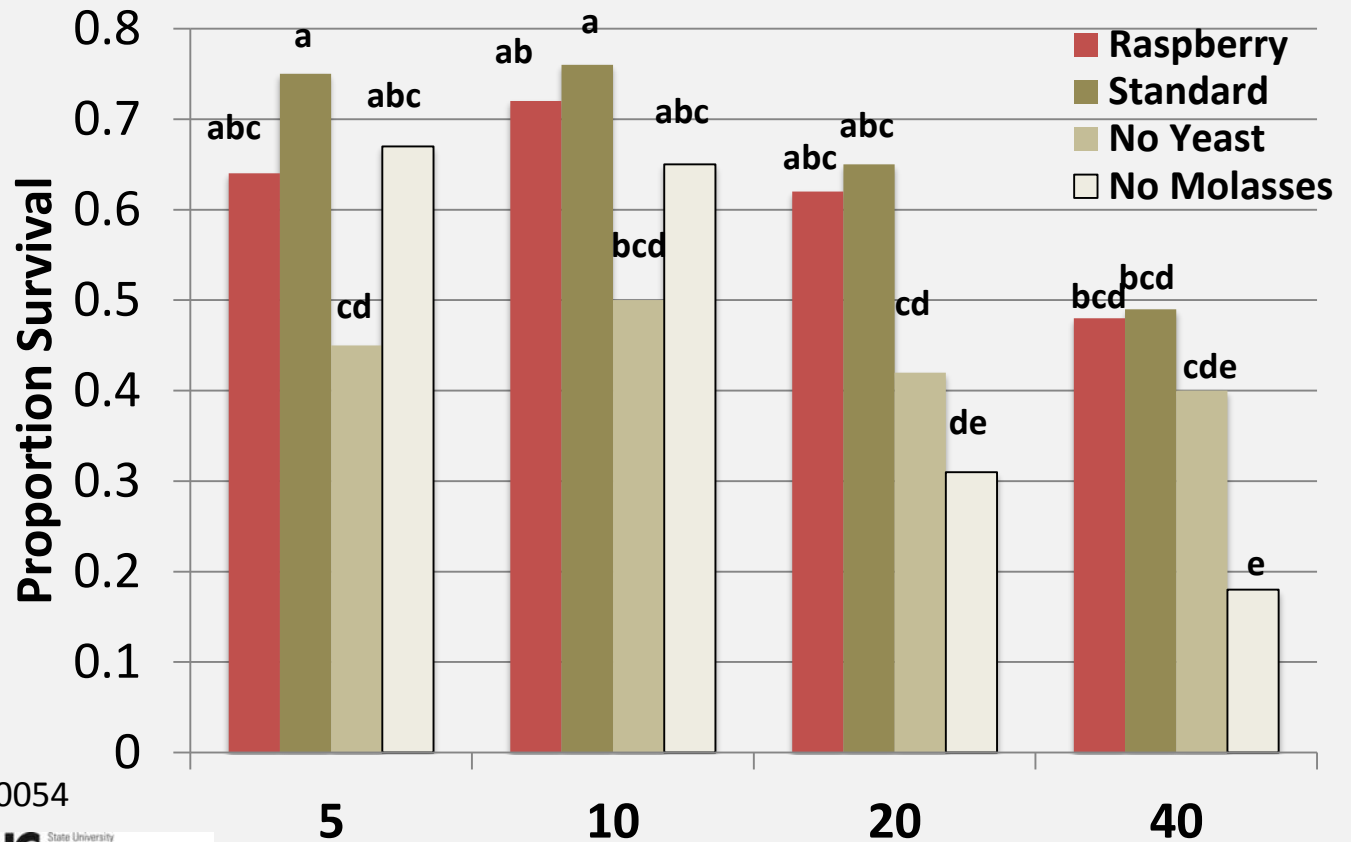
(40 larvae/10 ml = 3/g diet)

Effects of diet on intraspecific competition

Survival reduced in poor quality diets

Competition more acute in low carbohydrate diets

Standard diets and raspberry comparable



Diet*Eggs: $F_{9,403} = 2.65$, $p = 0.0054$

Effects of diet on intraspecific competition

Development time extended in poor quality diets

More acute in low amino acid diets

Standard diets and raspberry comparable

Total Development Time

