

# Developing Attract-and-kill Strategies To Manage Spotted Wing Drosophila, *Drosophila Suzukii* Matsumara, In Raspberry.

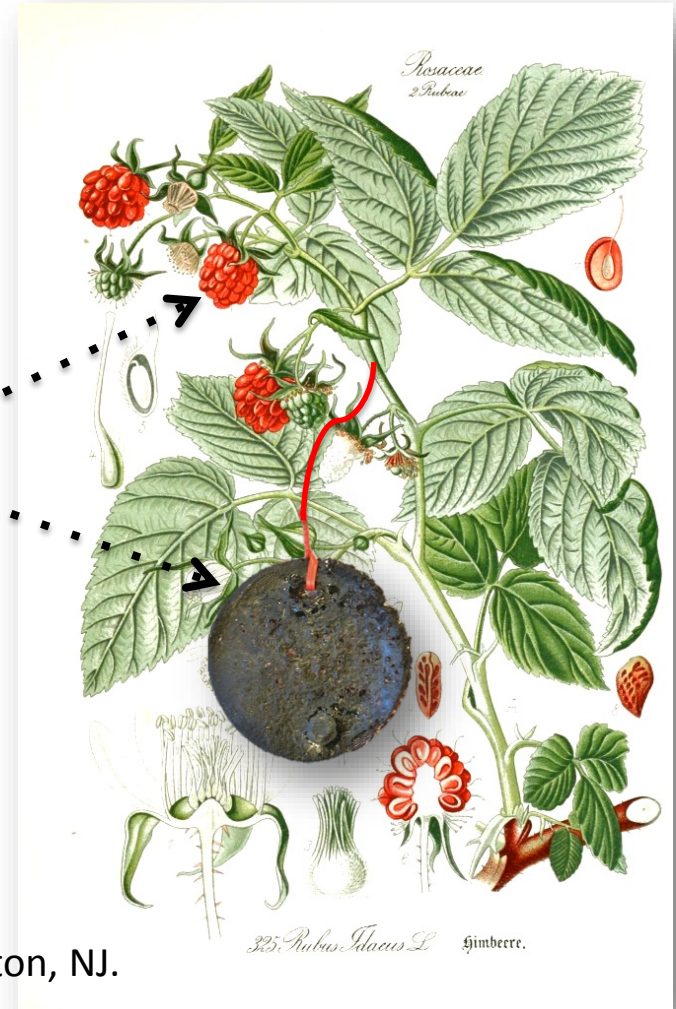


**Male**



**Female**

**Peter Jentsch**  
NE IPM SWD Working Group Mtg.  
Tuesday, February 13<sup>th</sup>, 2018  
Rutgers Ag. Research Center, Bridgeton, NJ.



# Methods: Development of Attract and Kill for Management of SWD in Small Fruit



## AtK Construction



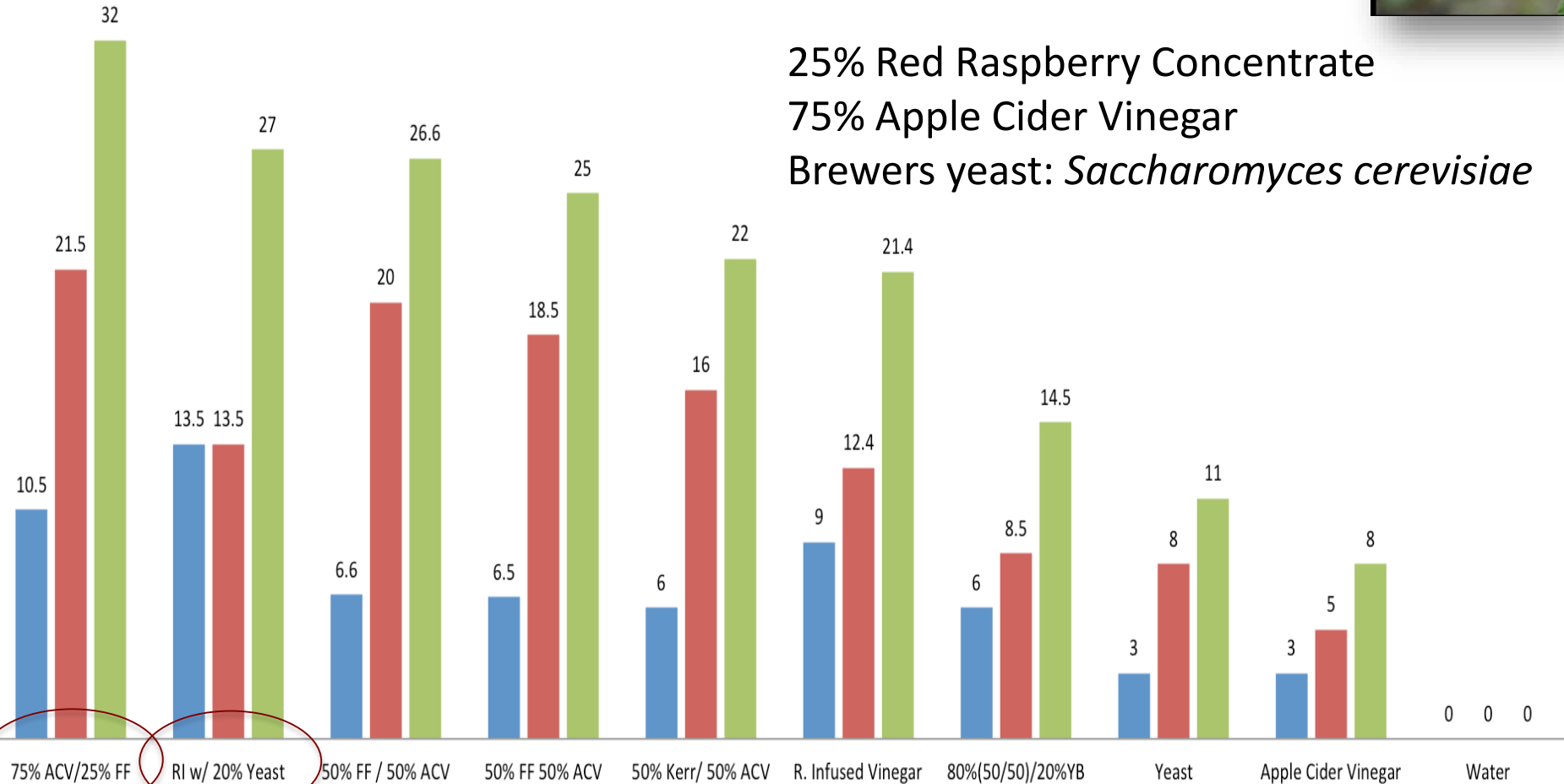
- 3" substrate woven polypropylene netting as a base
- Super Absorbent Polymer (SAP)
- Gelatin
- Red raspberry concentrate (8 mL)
- Apple cider vinegar (24 mL)
- Brewers yeast (1 g)
- 1% A.I.
- AtK solution field applied at 2 mL/disk

# SWD Adult Preference Binary Choice Tests

## Mean # AtK Component Attractiveness



# Male SWD # Female SWD # Total



25% Red Raspberry Concentrate  
75% Apple Cider Vinegar  
Brewers yeast: *Saccharomyces cerevisiae*



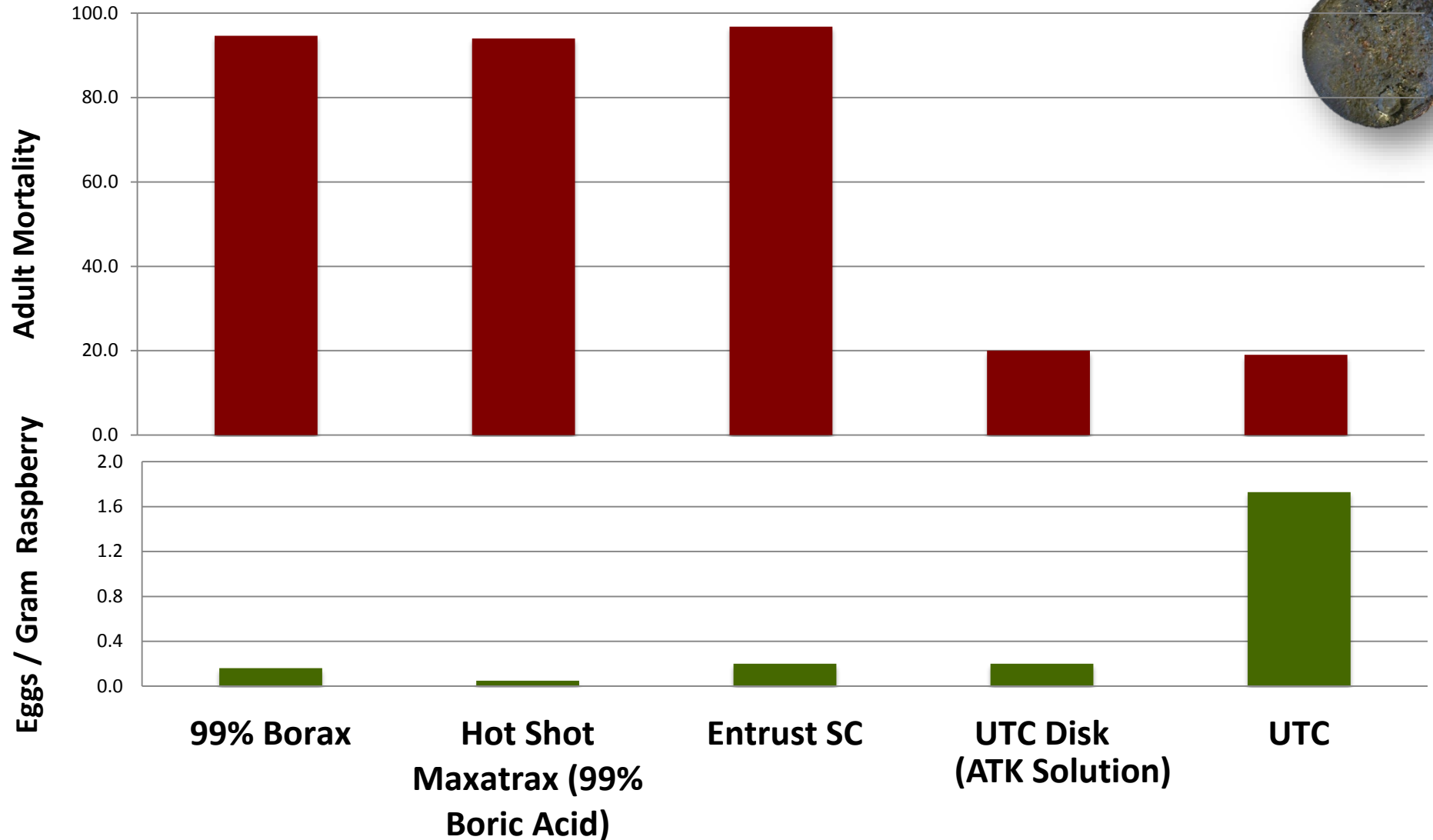
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Insecticide Product	Active Ingredient (IRAC Group)
Malathion 5EC	malathion (IRAC 1B)
Imidan 70W	phosmet (IRAC 1B)
Assail 30SG	acetamiprid (IRAC 4A)
Scorpion 35 SL	dinotefuran (IRAC 4A)
Brigade EC	bifenthrin (IRAC 3A)
Mutang Max	zeta-cypermethrin (IRAC 3A)
Pyganic EC 1.4	pyrethrin (IRAC 3A)
Triple Crown	bifenthrin, imidacloprid, zeta-cypermethrin (IRAC 3A, 4A)
Delegate WG	spinetoram (IRAC 5)
Entrust SC	spinosad (IRAC 5)
Exirel	cyazypyr (IRAC 28)
BotaniGard; Mycotrol	<i>Beauveria bassiana</i> strain GHA
BalEnce	<i>Beauveria bassiana</i> Diptera-specific strain (HF23)
Boric Acid	99% Boric Acid
Hot Shot Maxattrax Roach Powder	99% Boric Acid formulated

# Attract and Kill Station Efficacy

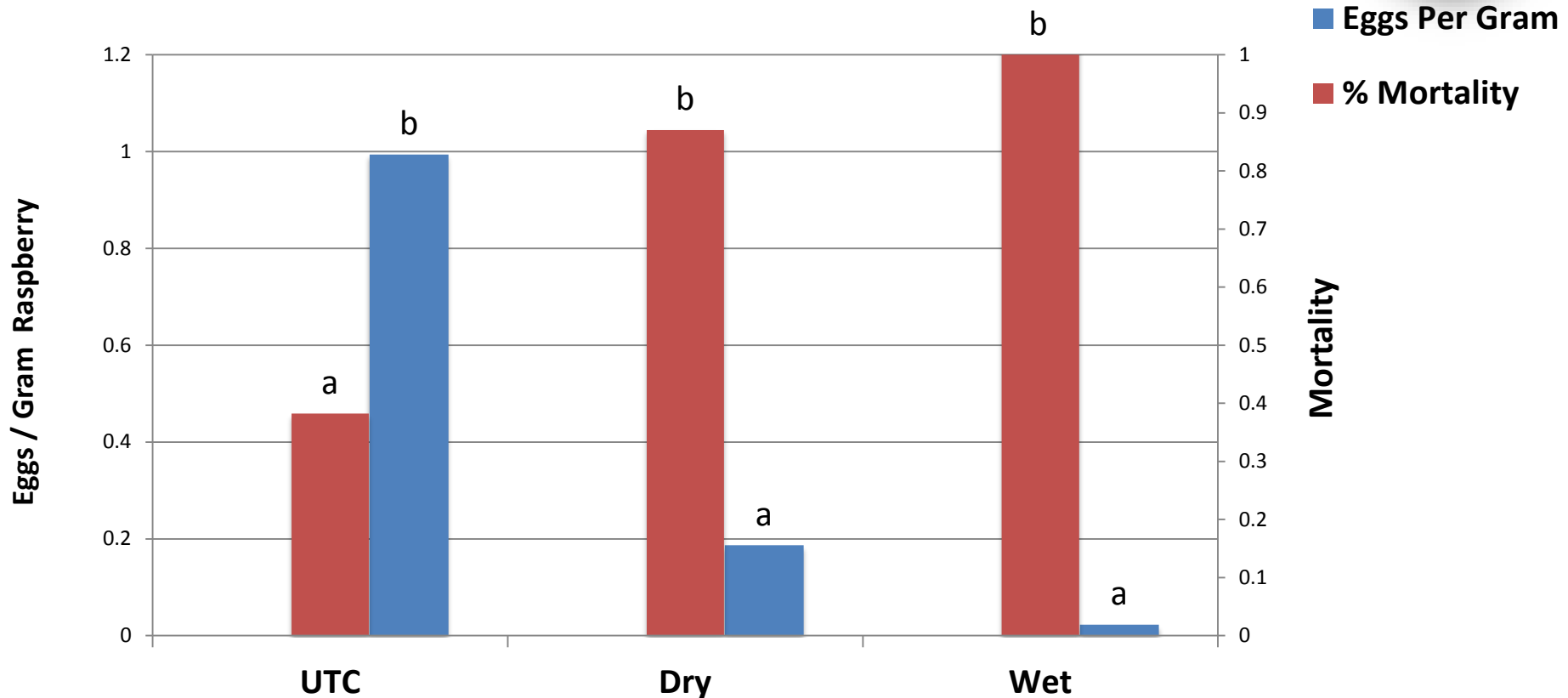
Lab Caged Studies (25 SWD 48h 75F 75%rH 14/10 LD)



# Attract and Kill Station Recharge Efficacy



## SWD Eggs Per Gram of Raspberry & Adult Mortality @ 72h 24h (Wet) vs 7d (Dry) Borax Treated Disks



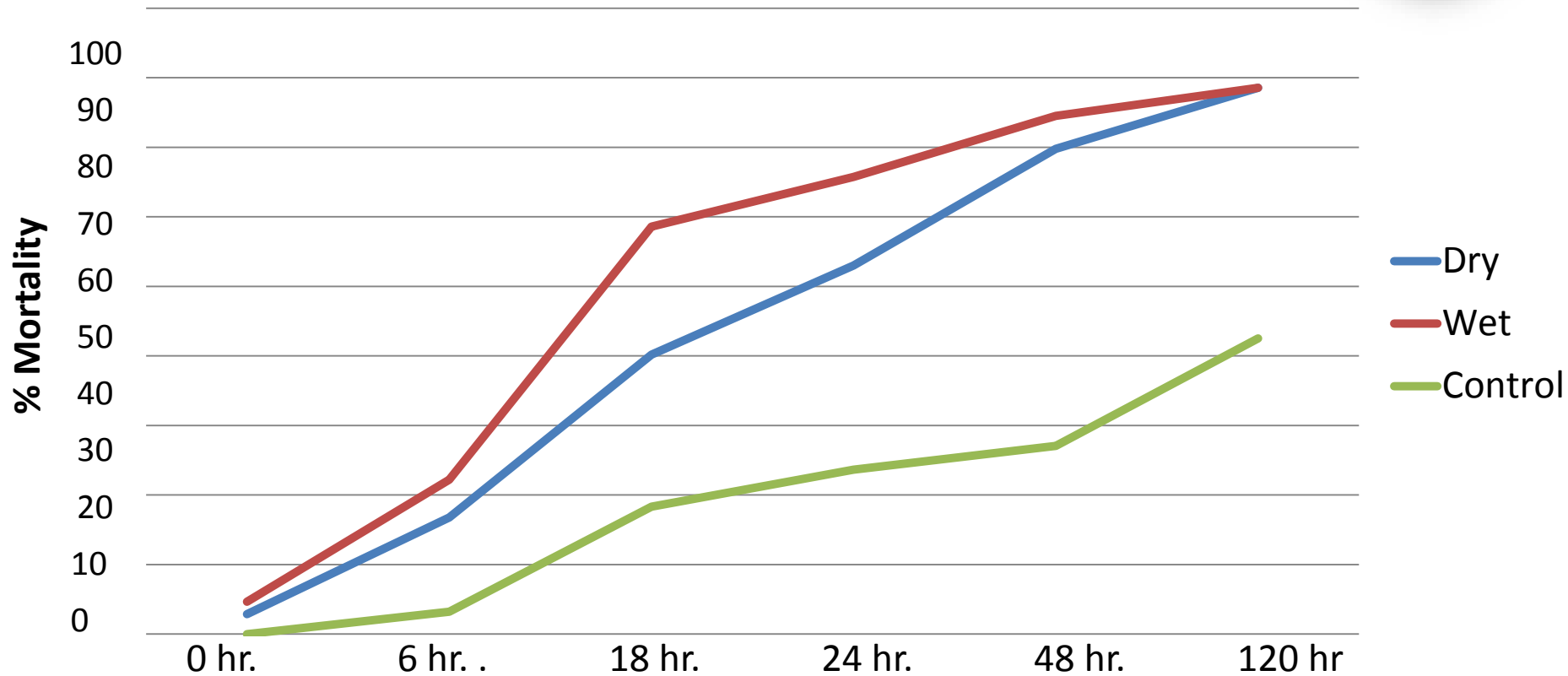
1% A.I. Entrust (spinosad-Dow)



# Attract and Kill Station Recharge Efficacy



## SWD Adult Mortality



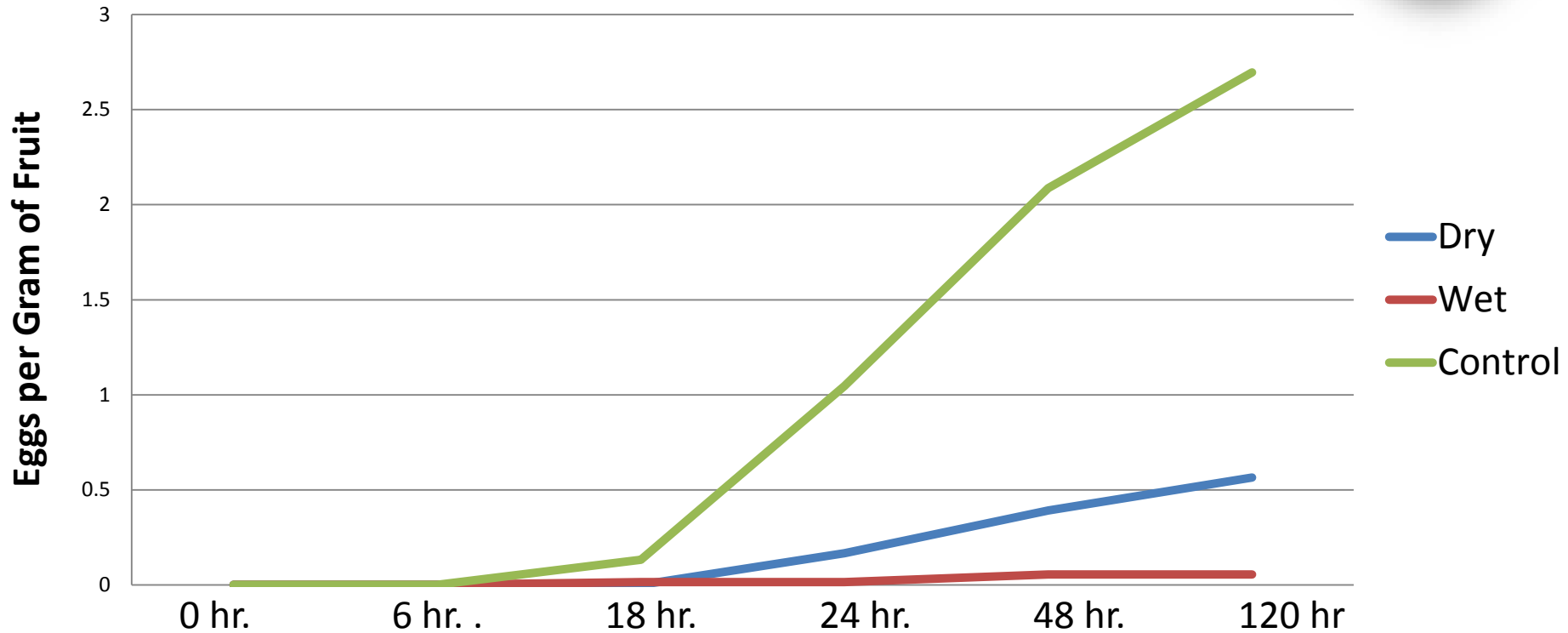
1% A.I. Entrust (spinosad-Dow)



# Attract and Kill Station Recharge Efficacy



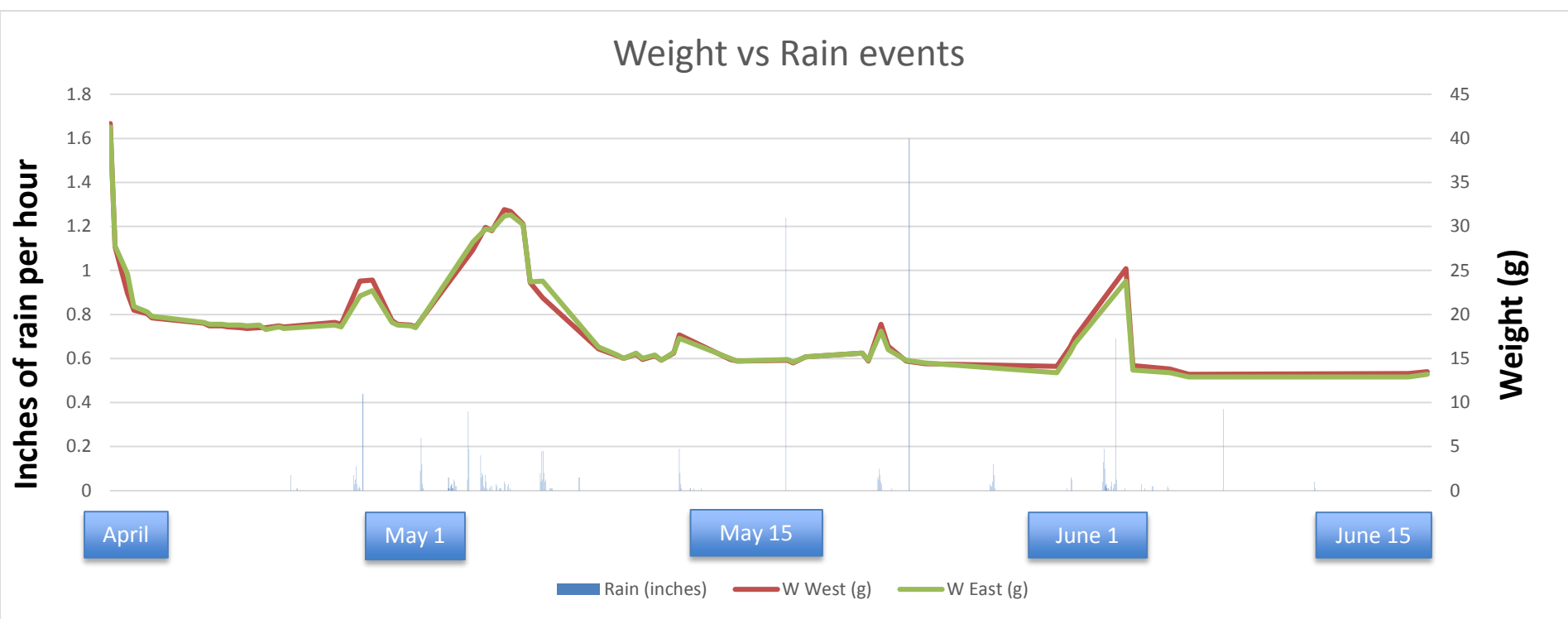
## Eggs Per Gram in Raspberry Fruit



1% A.I. Entrust (spinosad-Dow)



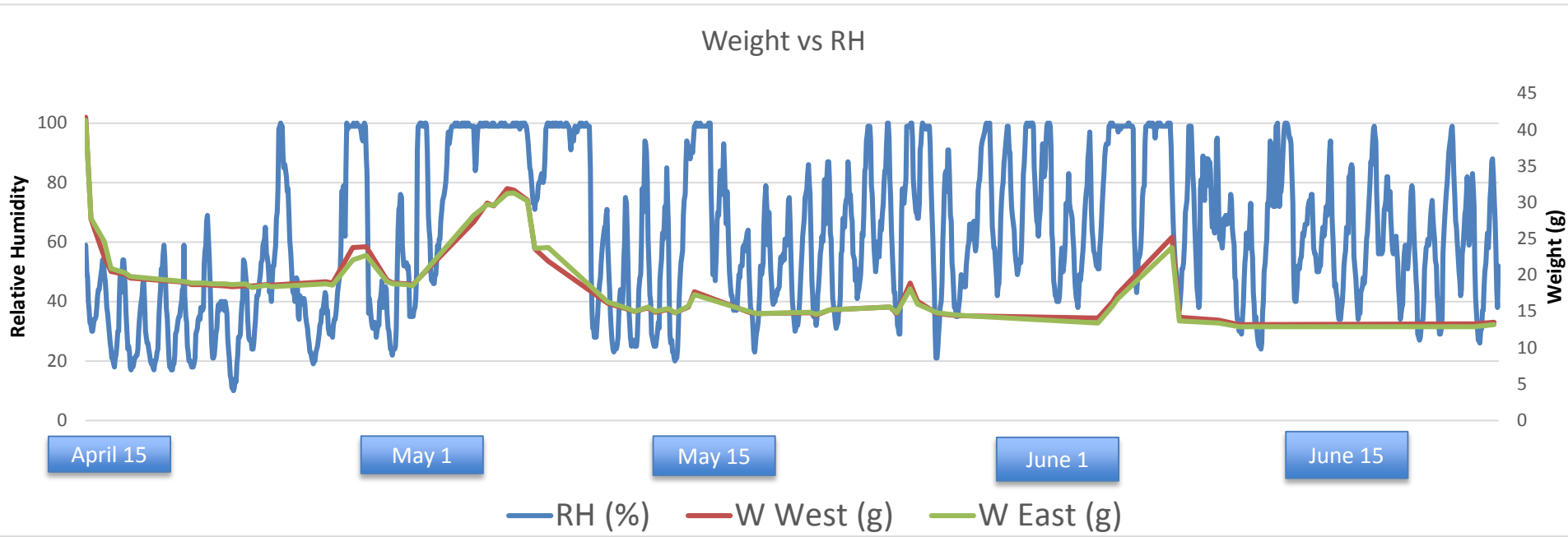
# Insecticidal Options for AtK Stations



## Observations

- Initial weight loss of  $\geq 50\%$  in 30 hours and overall seasonal weight loss of 70%.
- Extended rain events increase fluctuations in AtK disk weight.

# Attract and Kill Station Recharge Efficacy



## Observations

- Extended high relative humidity also increase weight.
- Inversely, low rH reduces weight.
- Morning dew is also absorbed by the disk.

# Attraction of *Drosophila* to AtK from Morning Dew

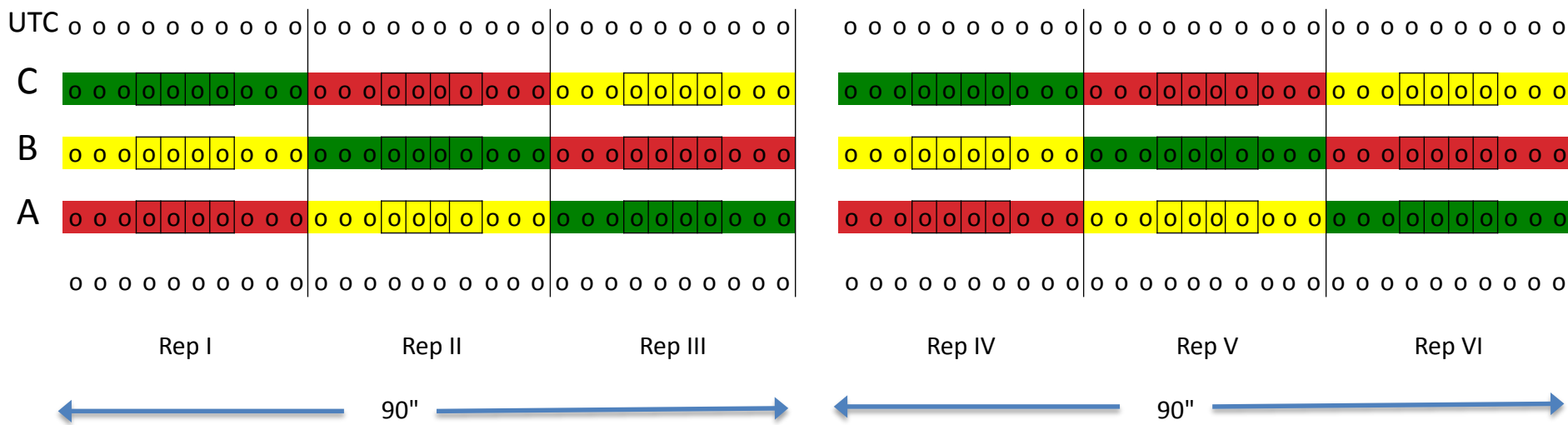


June 14<sup>th</sup> – September 19<sup>th</sup> 8:30 AM,





# Experimental Field Design \*



## 3 Raspberry Plantings on 3 Farm sites in two NY counties 1 Conventional & 2 Organic Production Systems

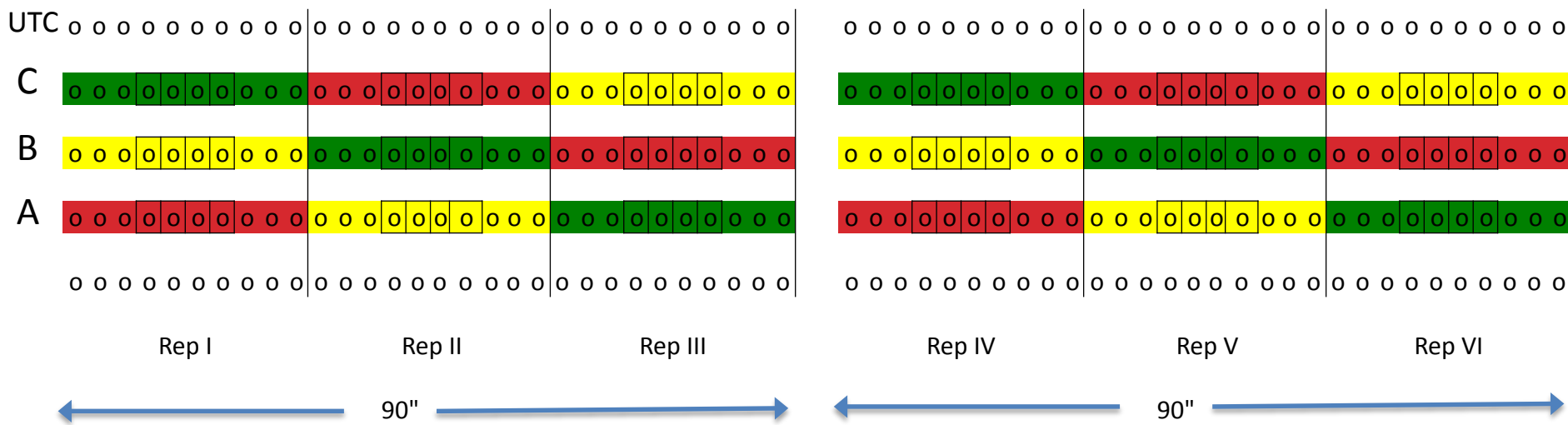
**AtK placement** timed for each row (A,B,C)

- A. 1<sup>st</sup> SWD in NY (14<sup>th</sup> June)
- B. 1<sup>st</sup> SWD on site (19<sup>th</sup> June)
- C. 1<sup>st</sup> SWD oviposition of fruit (25<sup>th</sup> June)

\* Row spacing- 11'; plant spacing 3'; 2 of 3 sites used wire trellis used to hang AtK stations



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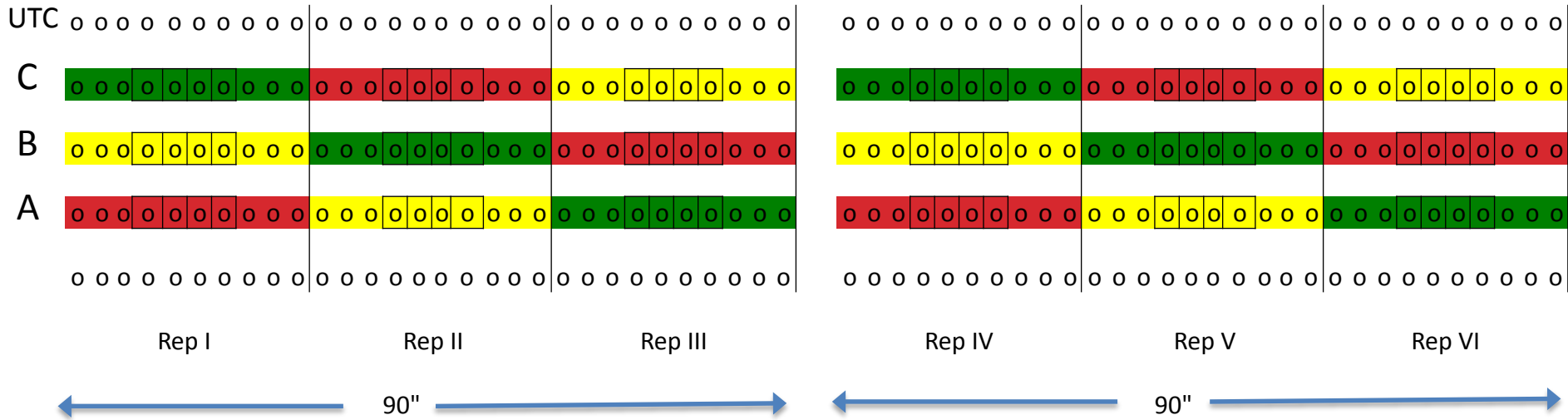
### Split Block

(Reps I-III)  
Red and Yellow Disk sprayed weekly

(Reps IV-VI)  
Red and Yellow Disk sprayed 2x/week



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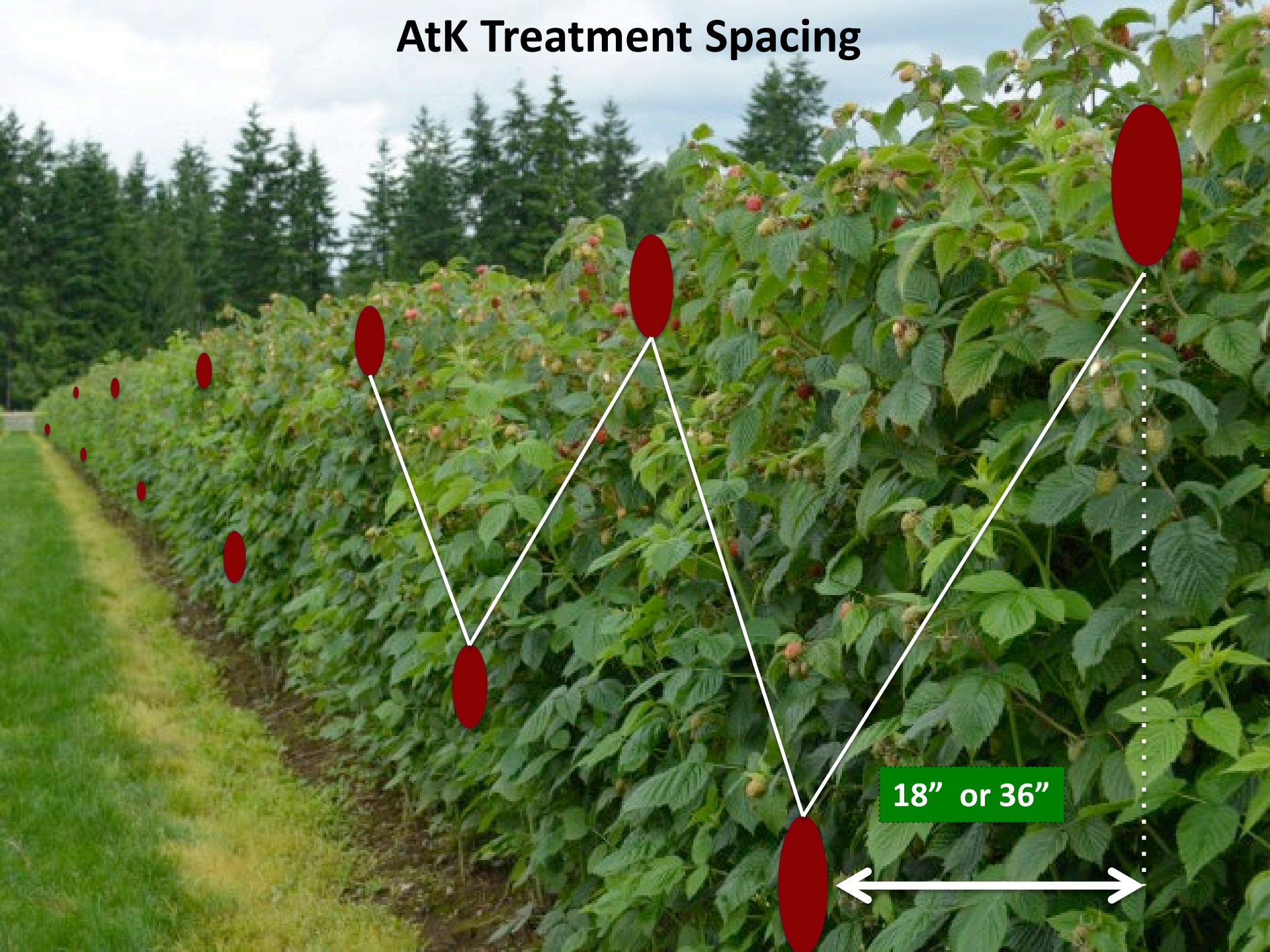
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### Treatments

- |        |  |  |
|--------|--|--|
| Red    |  | 1% Borax treated disks spaced at 1.5' (120) Disks/ side = 240 disks/ row |
| Yellow |  | 1% Borax treated disks spaced at 3' (60) Disks/ side = 120 disks/ row    |
| Green  |  | UT disks / no recharge spaced at 3' (60) Disks/ side = 120 disks/ row    |



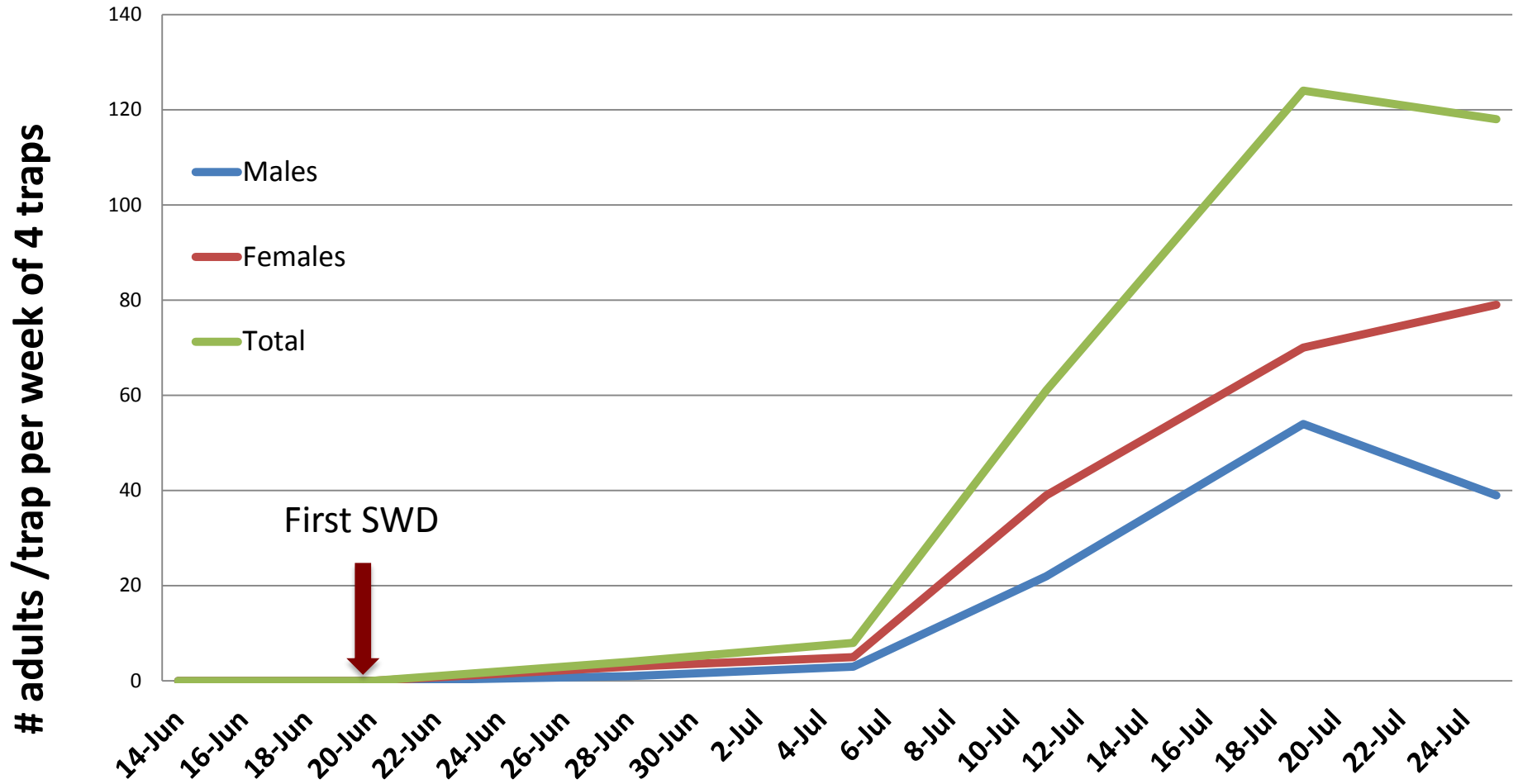
# AtK Treatment Spacing



18" or 36"



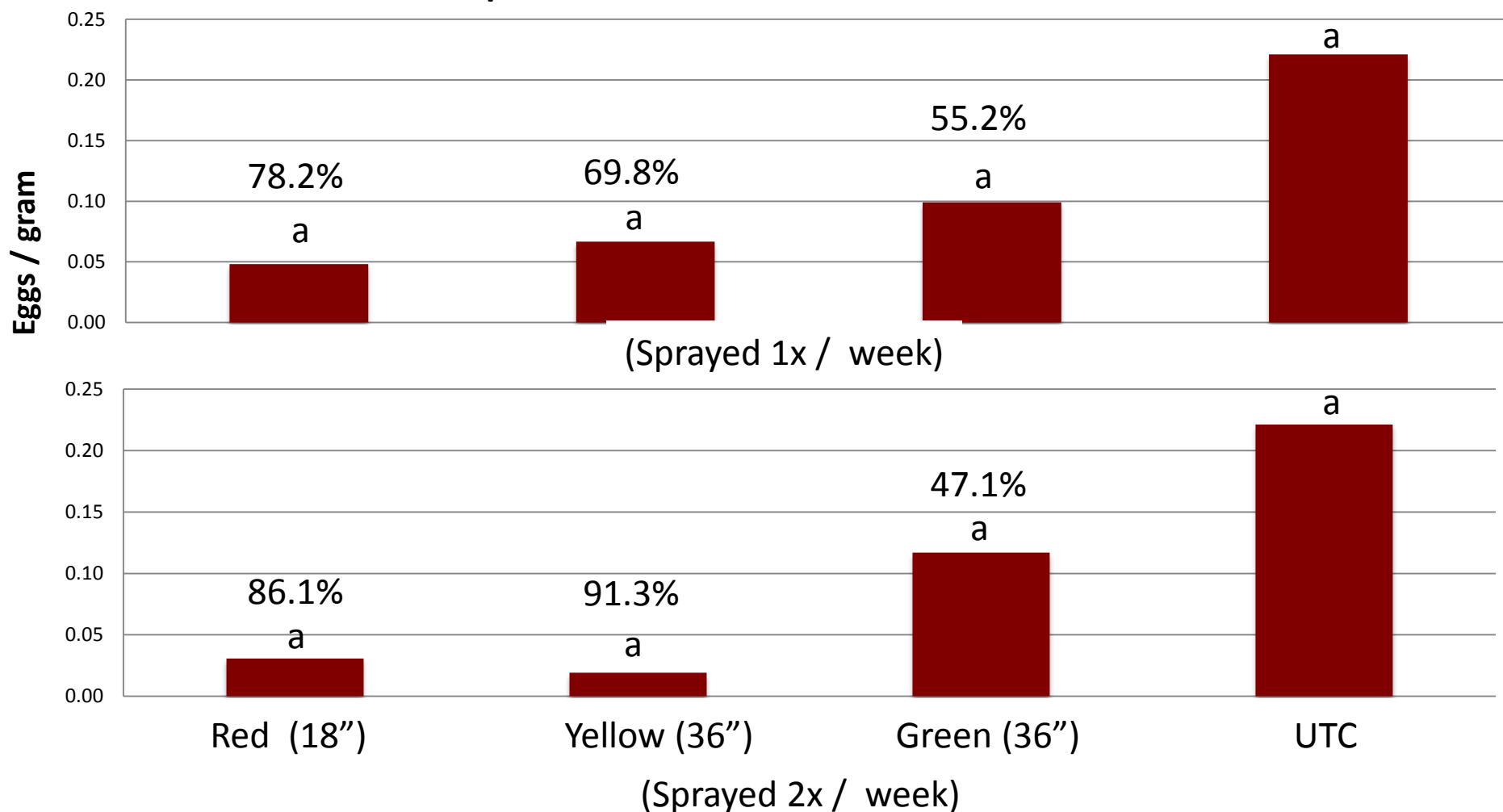
# SWD in Conventional Red Raspberry Planting Milton, NY - 2016



# SWD Damage Means in Raspberry Fruit

AtK Management of SWD in Conventional Raspberry  
Trapanni Orchard, Marlboro, NY - 2016

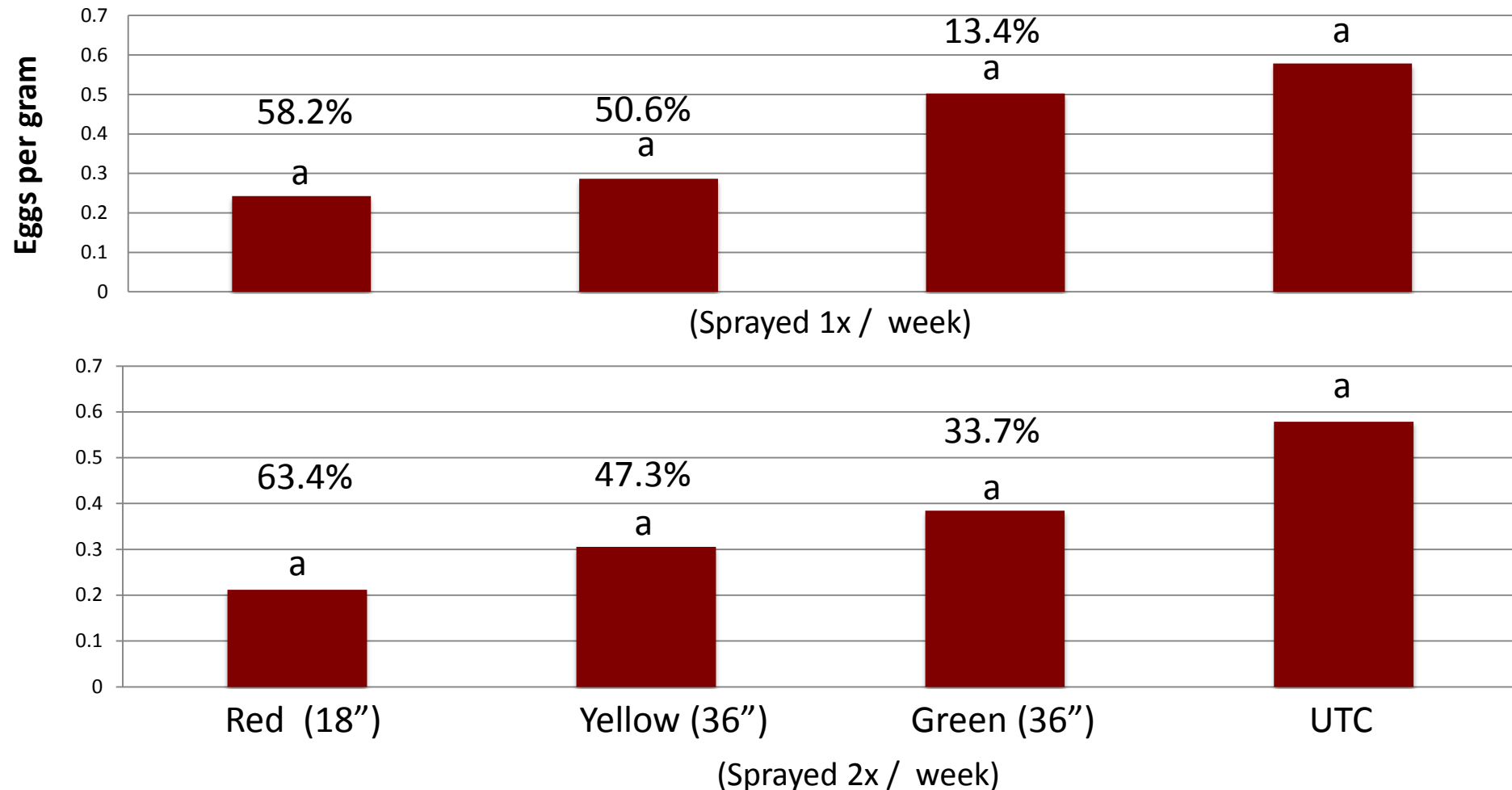
P-Value  
0.8108



# SWD Damage Means in Raspberry Fruit

AtK Management of SWD in Organic Treated Raspberry  
WestWind Orchard, Accord , NY - 2016

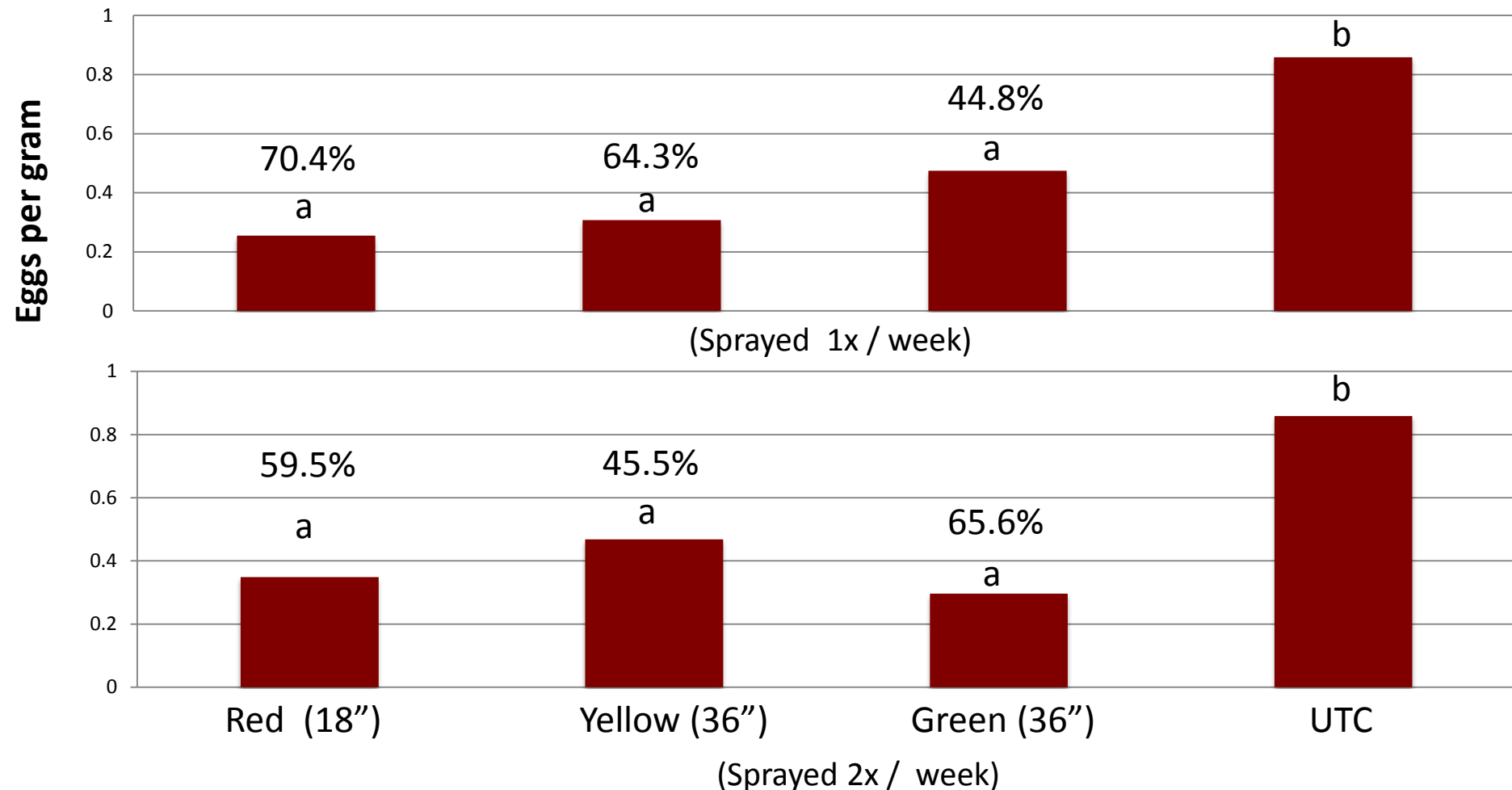
P-Value  
0.7993



# SWD Damage Means in Raspberry Fruit

AtK Management of SWD in Organic Untreated Raspberry  
PFP Organic CSA, Poughkeepsie, NY - 2016

P-Value  
0.0001



# Combined Farm & AtK Application Timing

% Reduction of Combined Sites

P Value: 0.0013

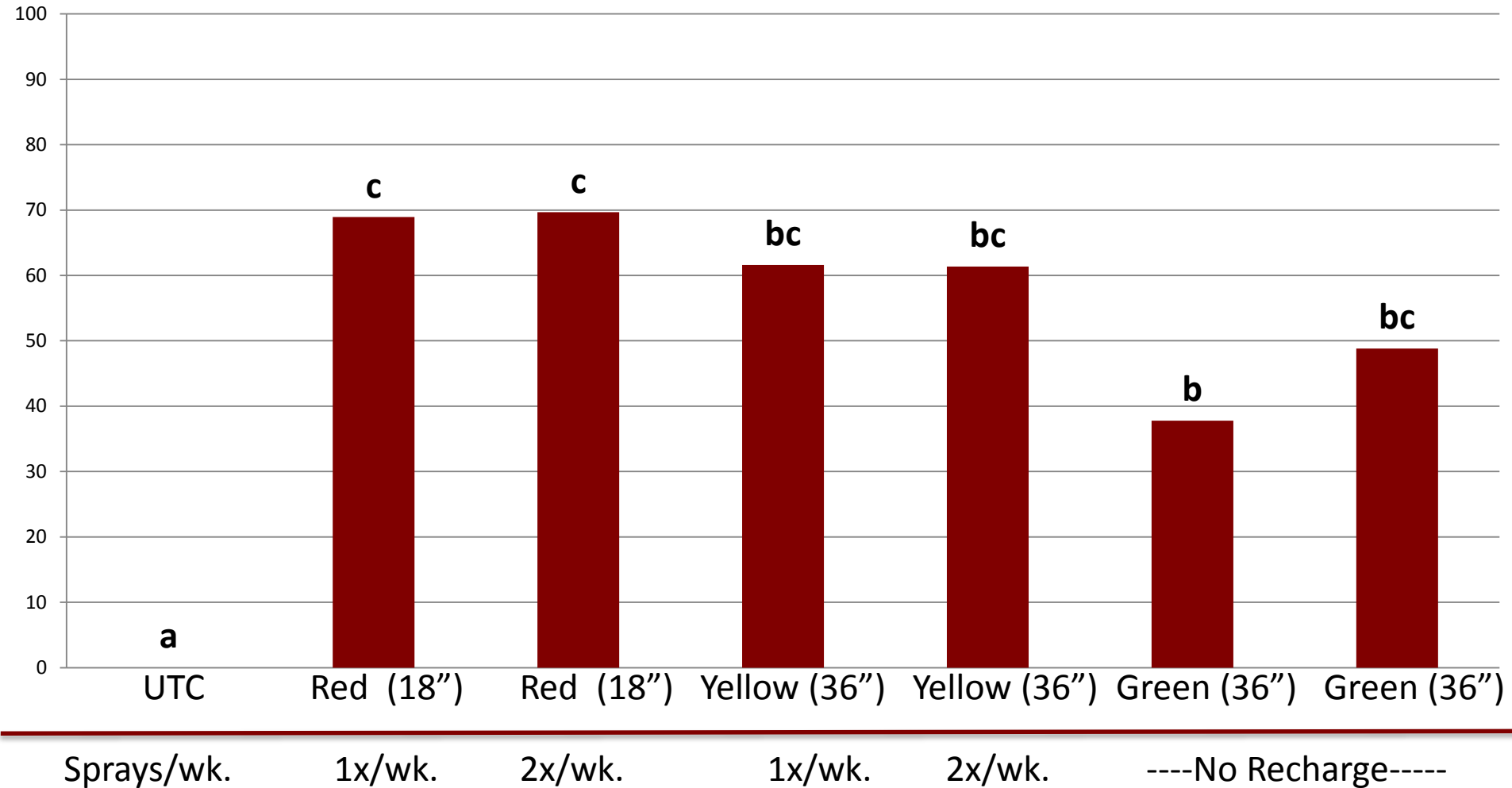


Table 1. Evaluations Of Attract and Kill stations For Controlling Spotted Wing Drosophila in Raspberry <sup>a</sup>. Hudson Valley Research Lab. Highland N.Y. - 2016



Treatment / Spacing	Timing	% Reduction in Oviposition at each Site			
		WW	PFP	Trapani	All Sites
Boric Acid 18" (Red)	1x Weekly	58.2 a	70.4 a	78.2 a	68.9 c
Boric Acid 36" (Yellow)	1x Weekly	50.6 a	64.3 a	69.8 a	61.6 bc
Means		54.4	67.4	74.0	65.3
Boric Acid 18" (Red)	2x Weekly	63.4 a	59.5 a	86.1 a	69.7 c
Boric Acid 36" (Yellow)	2x Weekly	47.3 a	45.5 a	91.3 a	61.4 bc
Means		55.4	52.5	88.7	65.6
Untreated Disk 36" (Green)		13.4 a	44.8 a	55.2 a	37.8 b
Untreated Control		0.0 a	0.0 b	0.0 a	0.0 a
P value for transformed data		0.7993	0.0001	0.8108	0.0013

<sup>a</sup> Evaluation made on Raspberry June to September. Data were transformed using  $\log_{10}(x+1)$  using Fishers Protected LSD ( $P \leq 0.05$ ). Treatment means followed by the same letter are not significantly different. Arithmetic means reported.



# Conclusion



- **Attract and kill strategies have been shown to provide reduced levels of infestation from spotted wing drosophila in conventional and organic raspberry production systems.**
- **Further study of placement density and reapplication intervals of AtK disks for optimal control is needed prior to recommendations for use.**
- **Use of AtK + 1% Boric Acid in combination with cultural control, frequent harvest intervals, berry sanitation and harvest low temperature storage strategies may decrease the impact of SWD while reducing the resistance potential in SWD populations from frequent insecticide use.**



# Partnership Thanks

- **New York Farm Viability Grant - OAR 15 013**
- **Greg Loeb, NYSAES, Geneva, NY**
- **Juliet Carroll, NYS IPM, Geneva, NY**
- **Tim Lampasona, Jonathon Binder, Mike Fraatz  
Hudson Valley Research Laboratory**

**Fabio Chizola, WestWind Farm, Accord, NY**

**Poughkeepsie Farm Project, Poughkeepsie, NY**

**Trapani Farm & Orchard, Marlboro, NY**



**WESTWIND  
ORCHARD**

