Attract and Kill Tactics for SWD

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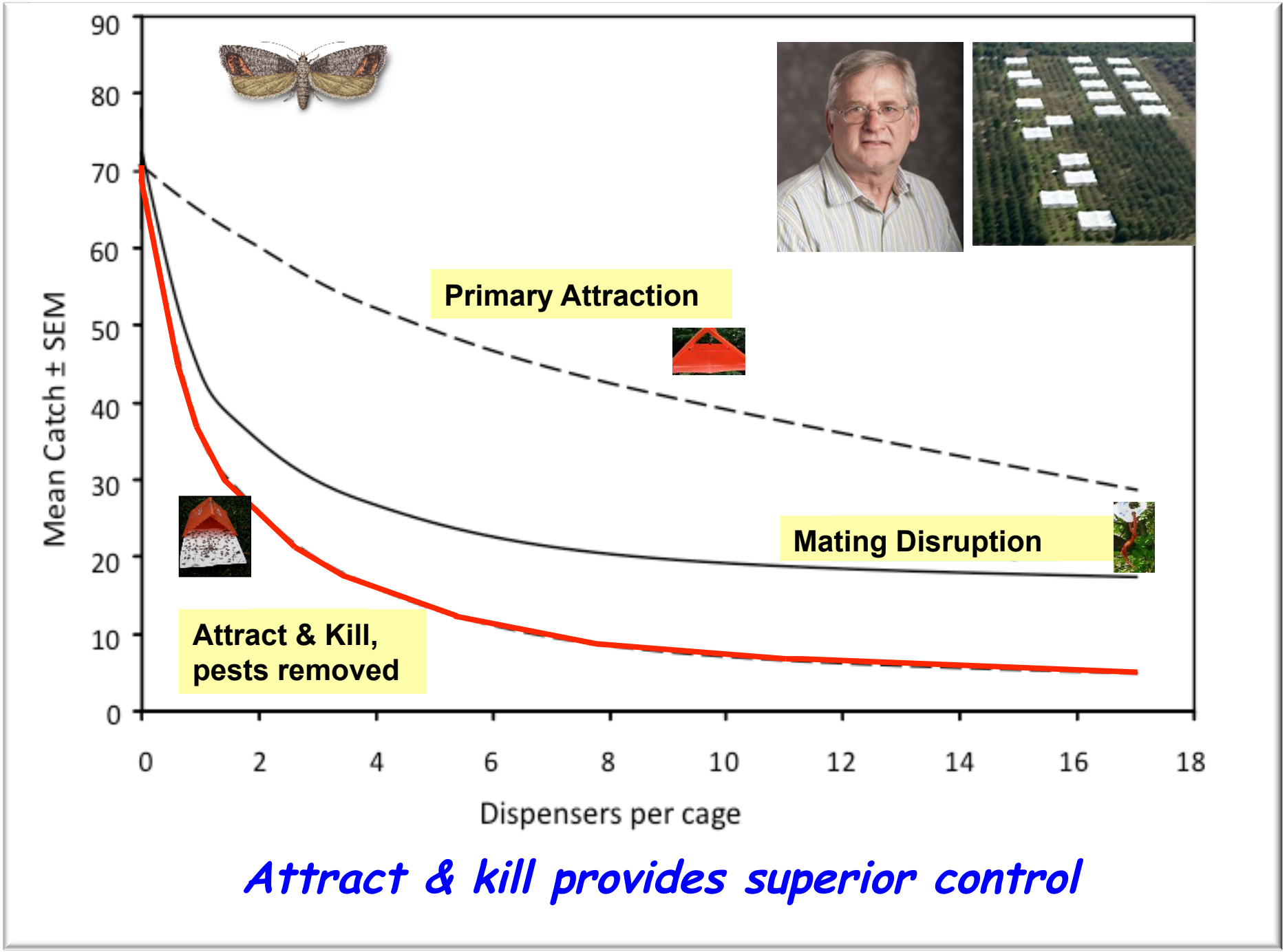
What is Attract and Kill?

Attract-and-Kill

Sex pheromones or other semiochemical

+

Insecticide or Physical Trapping System



Attract & kill provides superior control

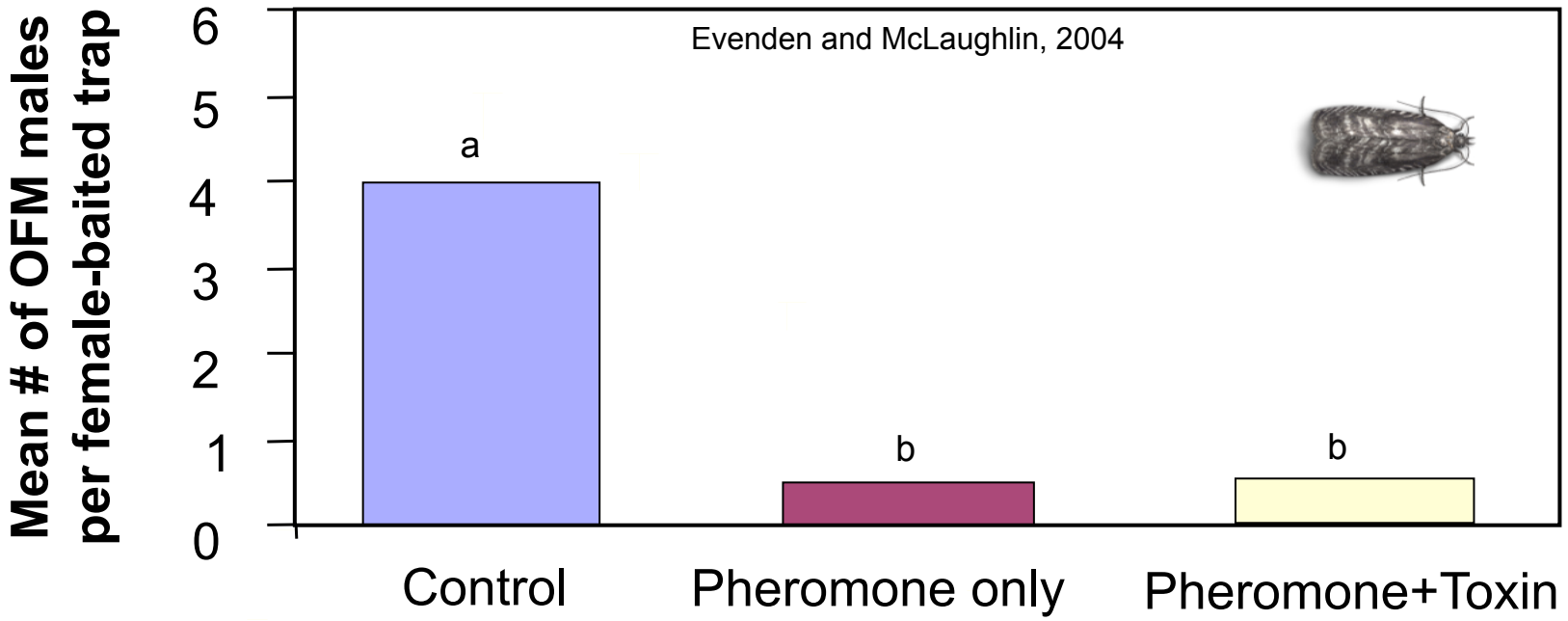
- Minimize insecticide residues on the fruits/ vegetables
- Low AI, reduce the cost, reduce selection pressure
- Selective, safe on non-targets
- Minimize secondary pest resurgence

Performance Characteristics of Successful Insecticide Based Devices

- Device has to attract insects from a distance
  - *Insects must land on and interact with the device*
- If the lure is too hot the insect may run
- If the device is too small the insect may not touch it

Current Attract and Kill Technology:

- Wax or polymer droplets with both pheromone and toxicant
- Insects have a very small surface to contact
- Insects have to contact semiochemicals and insecticides at the same time
- Increases the risk overloading insect sensory systems and not touching the formulation



Unfortunately, Many A&K formulations developed to date have:

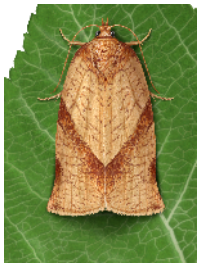
- Provided less or equivalent control compared to reservoir dispensers
- Many operate via disruption, not insecticide poisoning

Current “Droplet”

MSU Prototype
Pyrethroid Treated
“Pouch”

We've applied attract-and-kill pouch to other insect pests of tree fruit

?



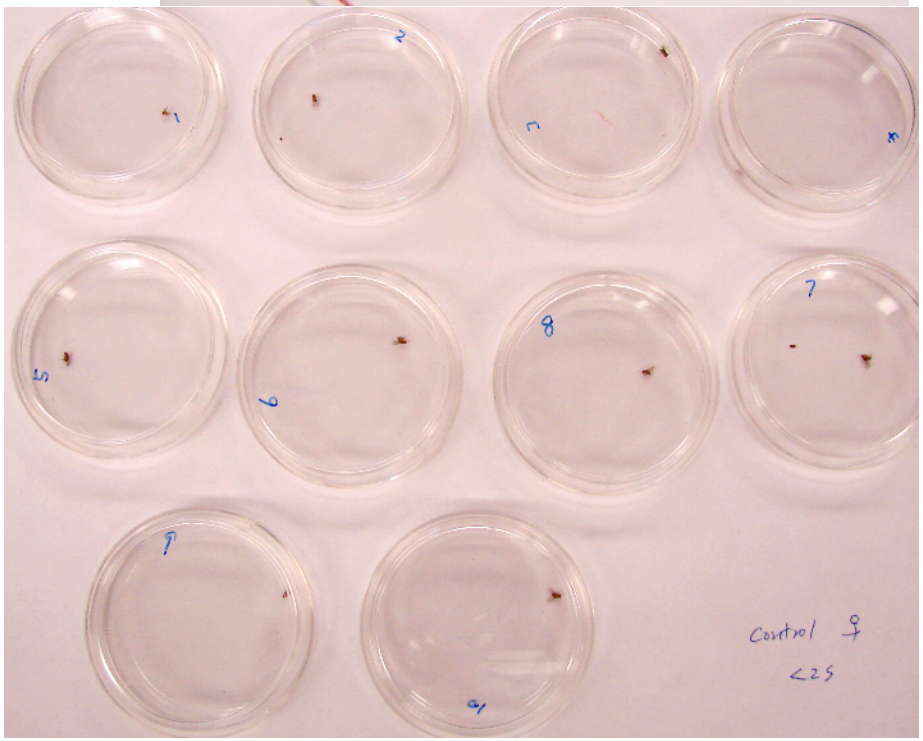
Steps for Developing Attract and Kill Device for SWD

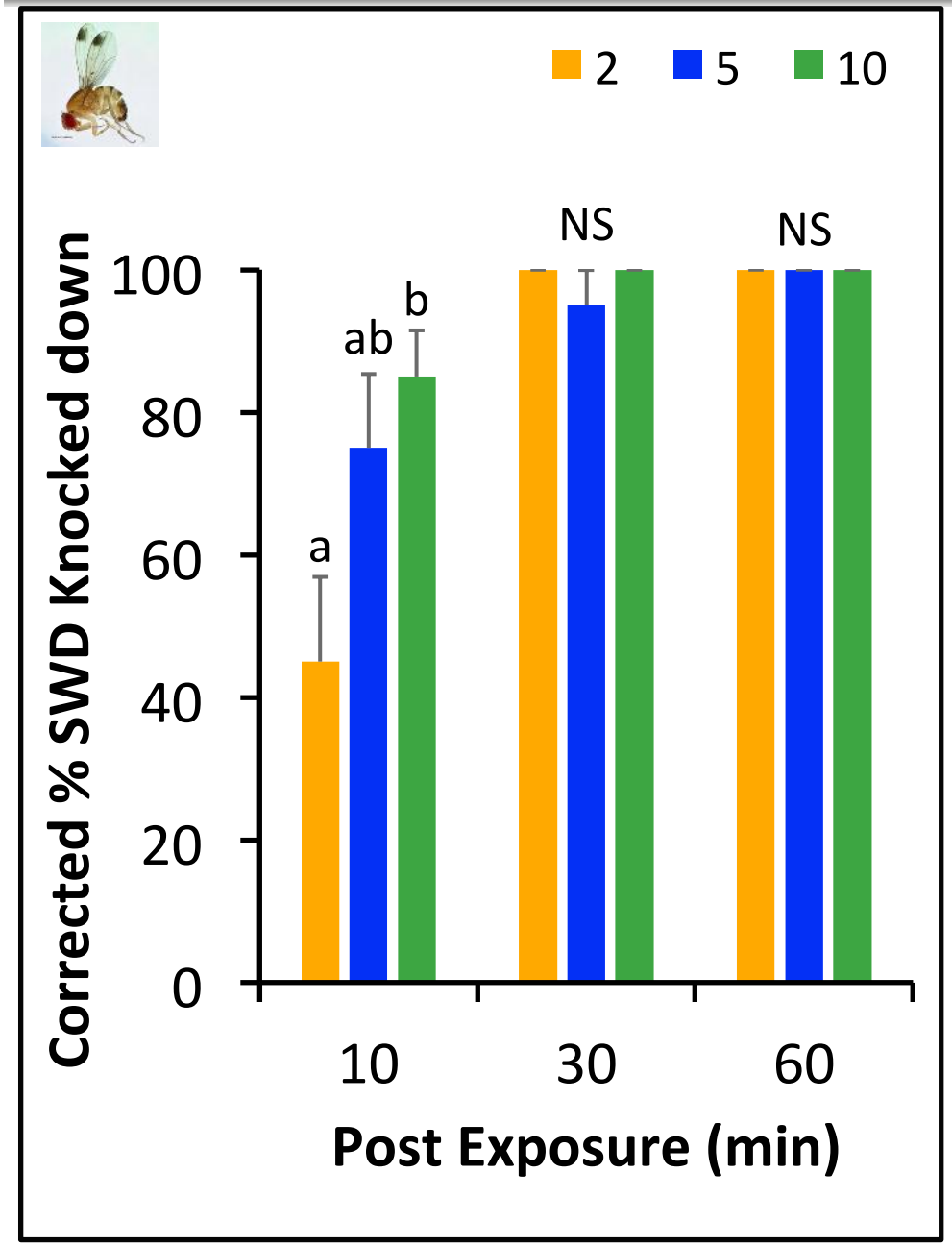
1. Identify attractants
2. Force contact bioassay to determine exposure time needed for mortality
3. Lab evaluation of the device
4. Field evaluation of trap shut down and damage reduction

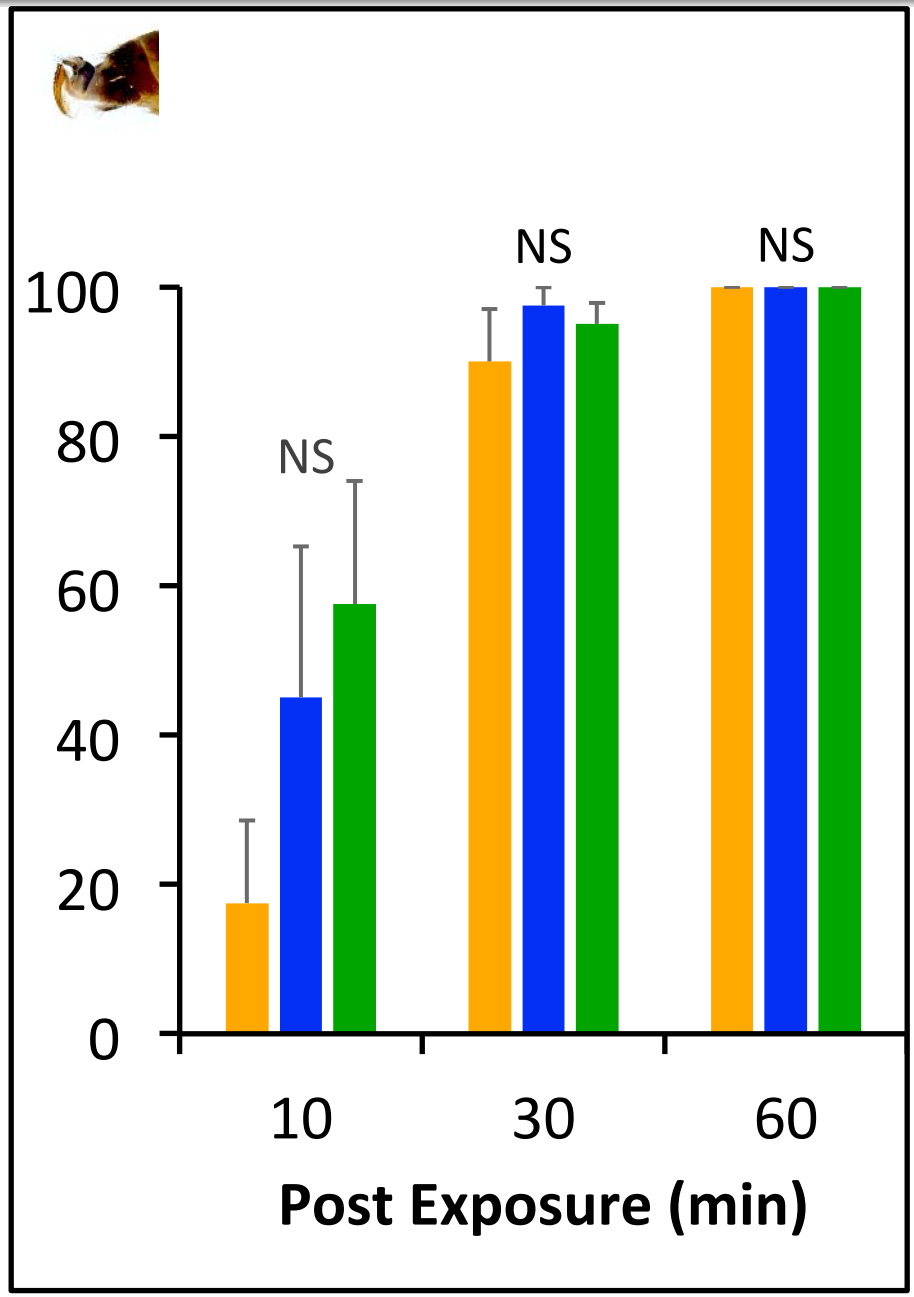
Baits

Force Contact Bioassays

- How long do SWD need to contact AK pouch to achieve 100% mortality?
- Nylon fabric treated with 0.2 ml/cm^2 deltamethrin
- 10 male and 10 female SWD forced to contact fabric for 2, 5, or 10 seconds.
- Mortality and knockdown assessed 10, 30, and 60 min after exposure.
- The experiment was replicated 4 times.




2
5
10
Corrected % SWD Knocked down
100
80
60
40
20
0
a
ab
b
NS
NS
10
30
60
Post Exposure (min)


100
80
60
40
20
0
NS
NS
NS
10
30
60
Post Exposure (min)

Force Contact Summary

- 2 seconds deltamethrin exposure leads to 100% mortality in less than 1 hour!!
  - 40% and 20% mortality at 10 minutes for males and females, respectively

Baits:


Apple cider
vinegar bait


Yeast-sugar
bait

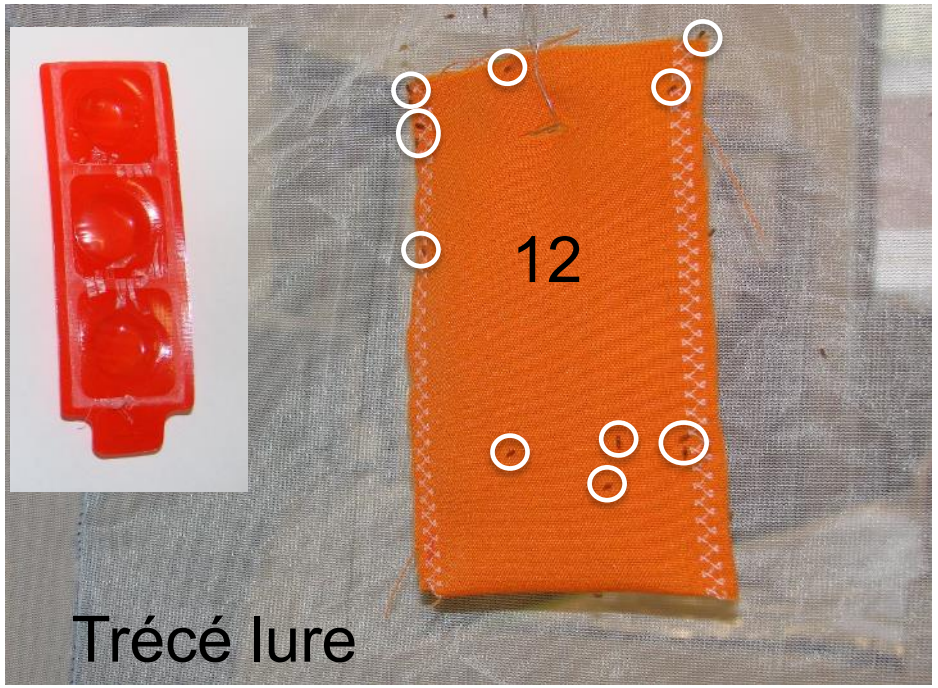

Scentry

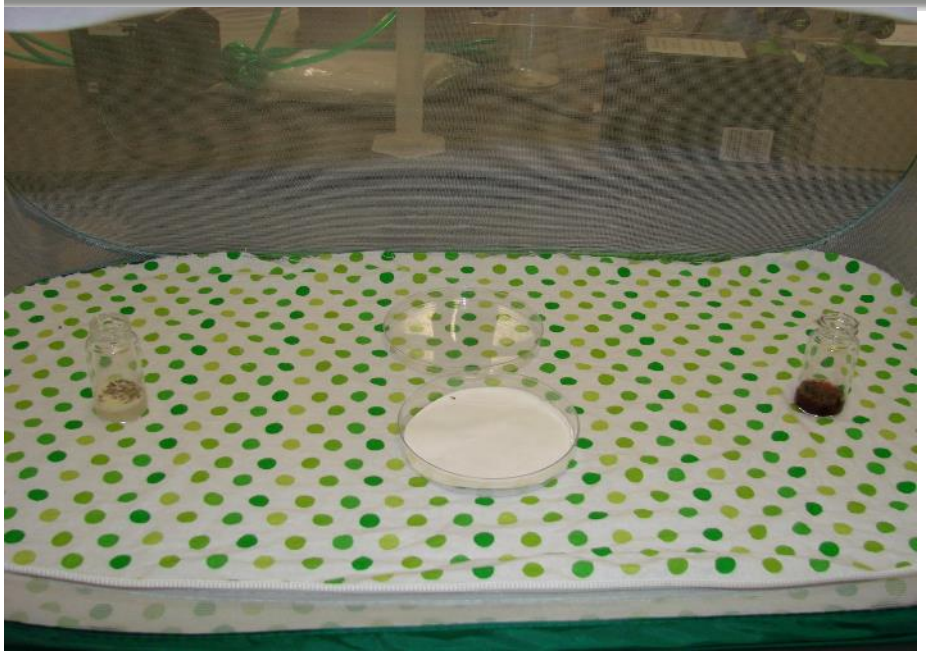

Trécé


Alpha Scents


Bait: Brewer yeast + sugar
25

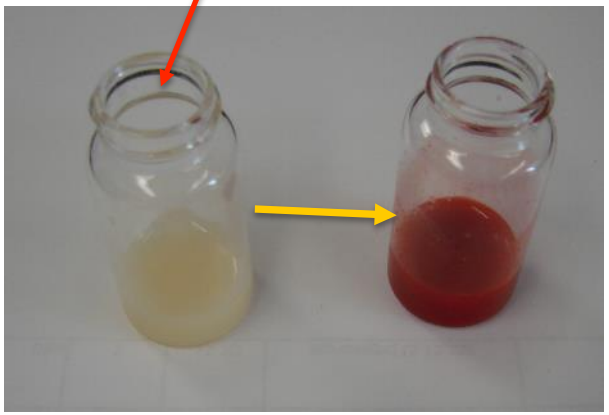

11
Scentry lure


12
Trécé lure

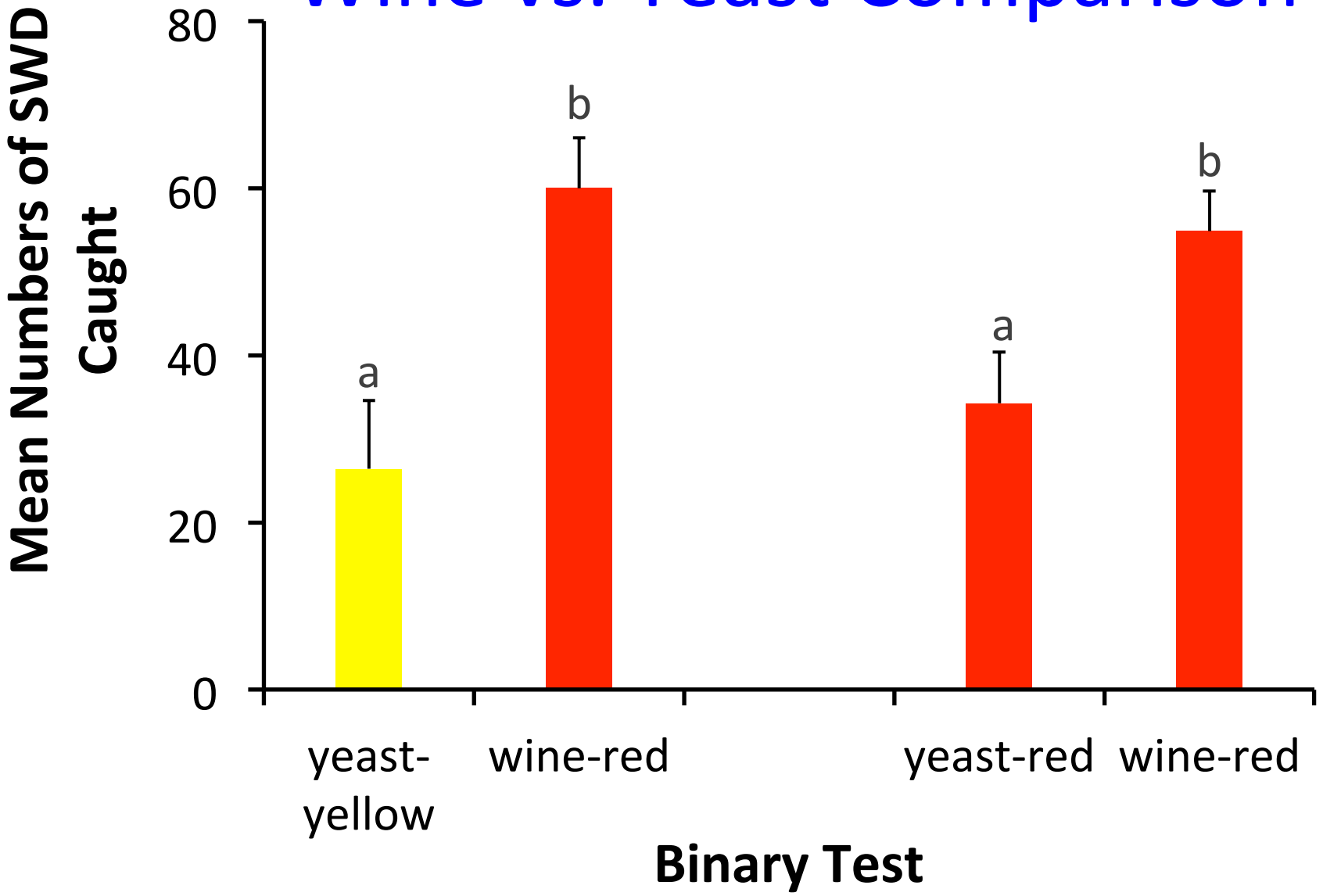


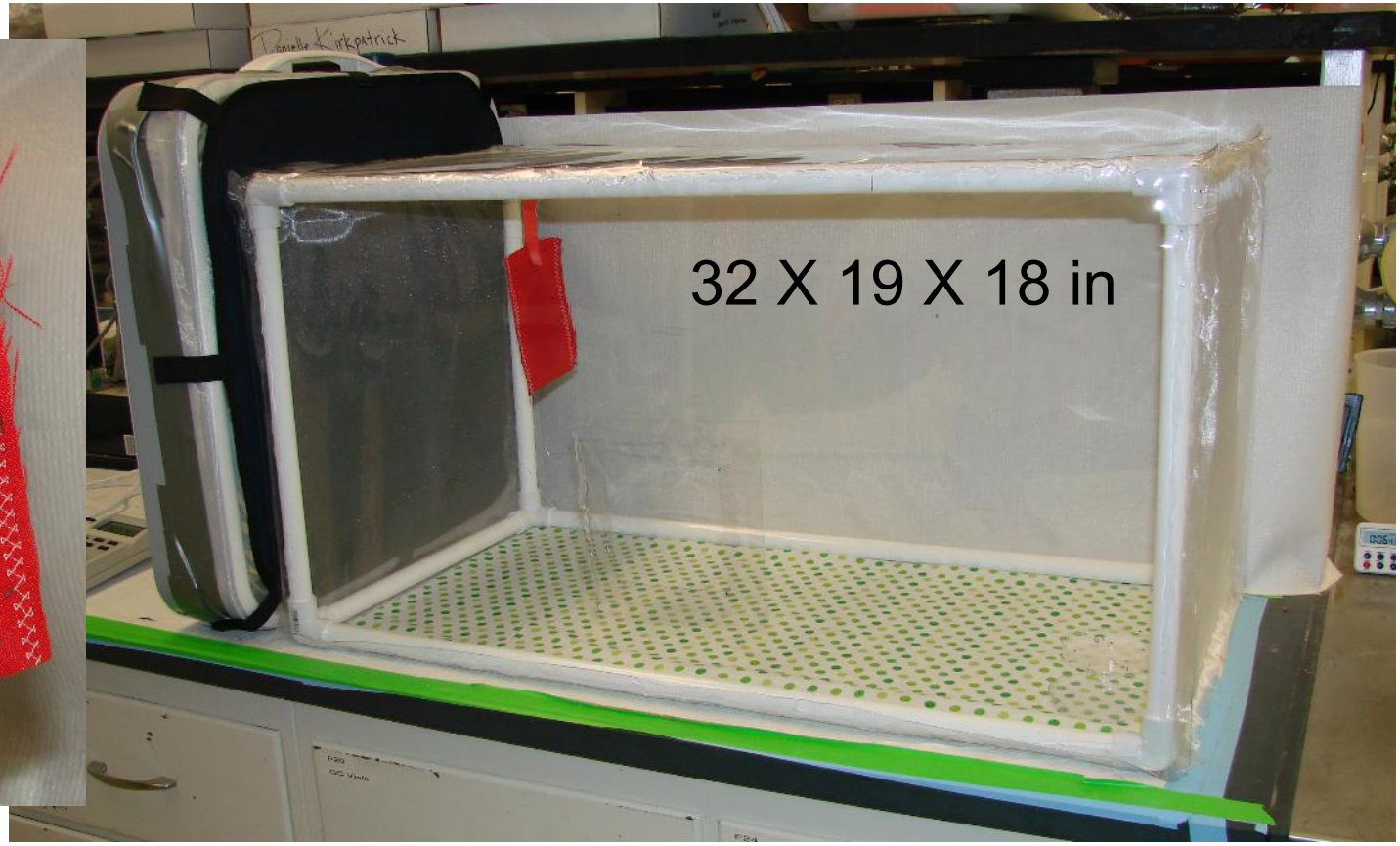
Wine vs. Yeast Comparison

Add red food dye



Wine vs. Yeast Comparison

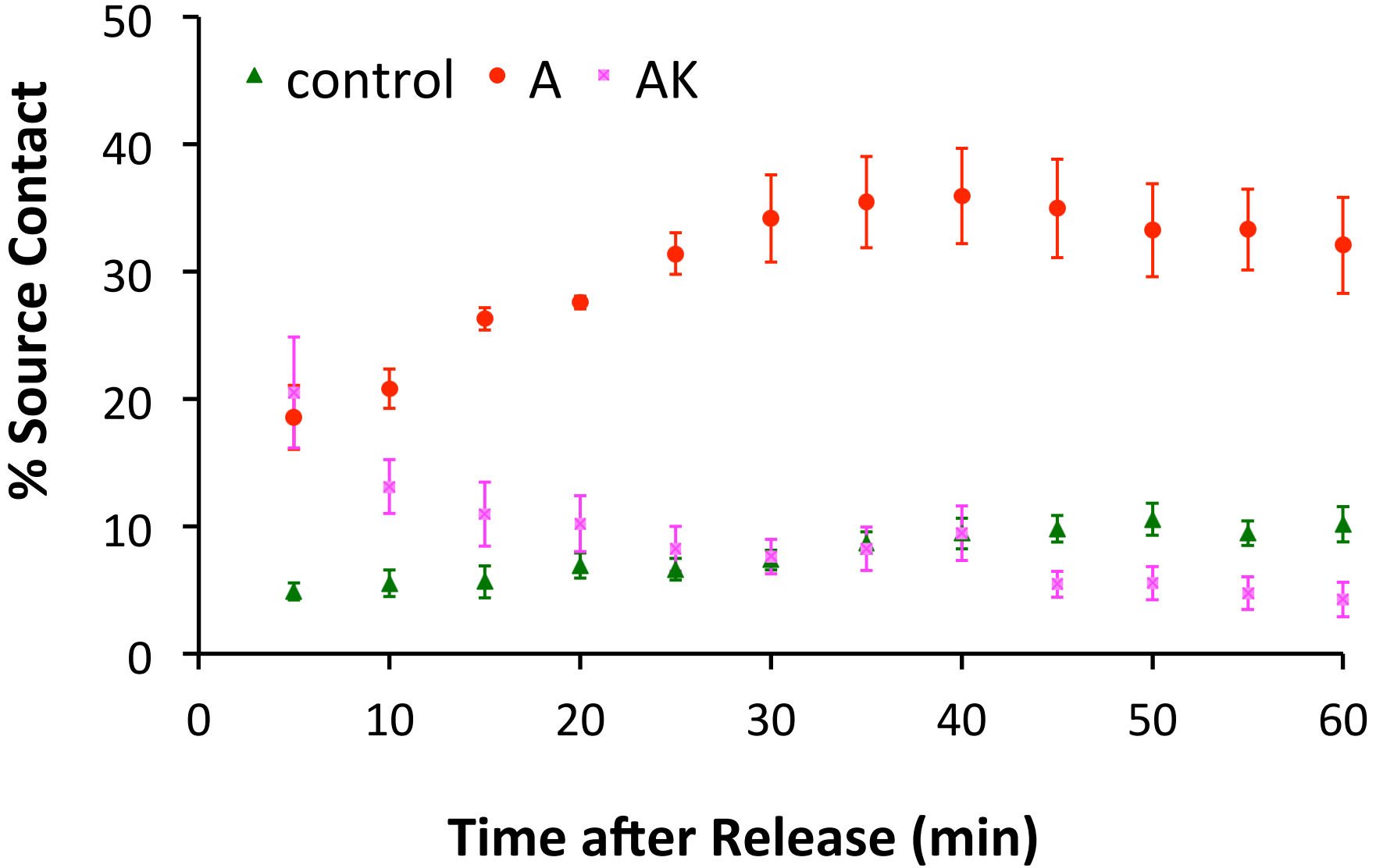




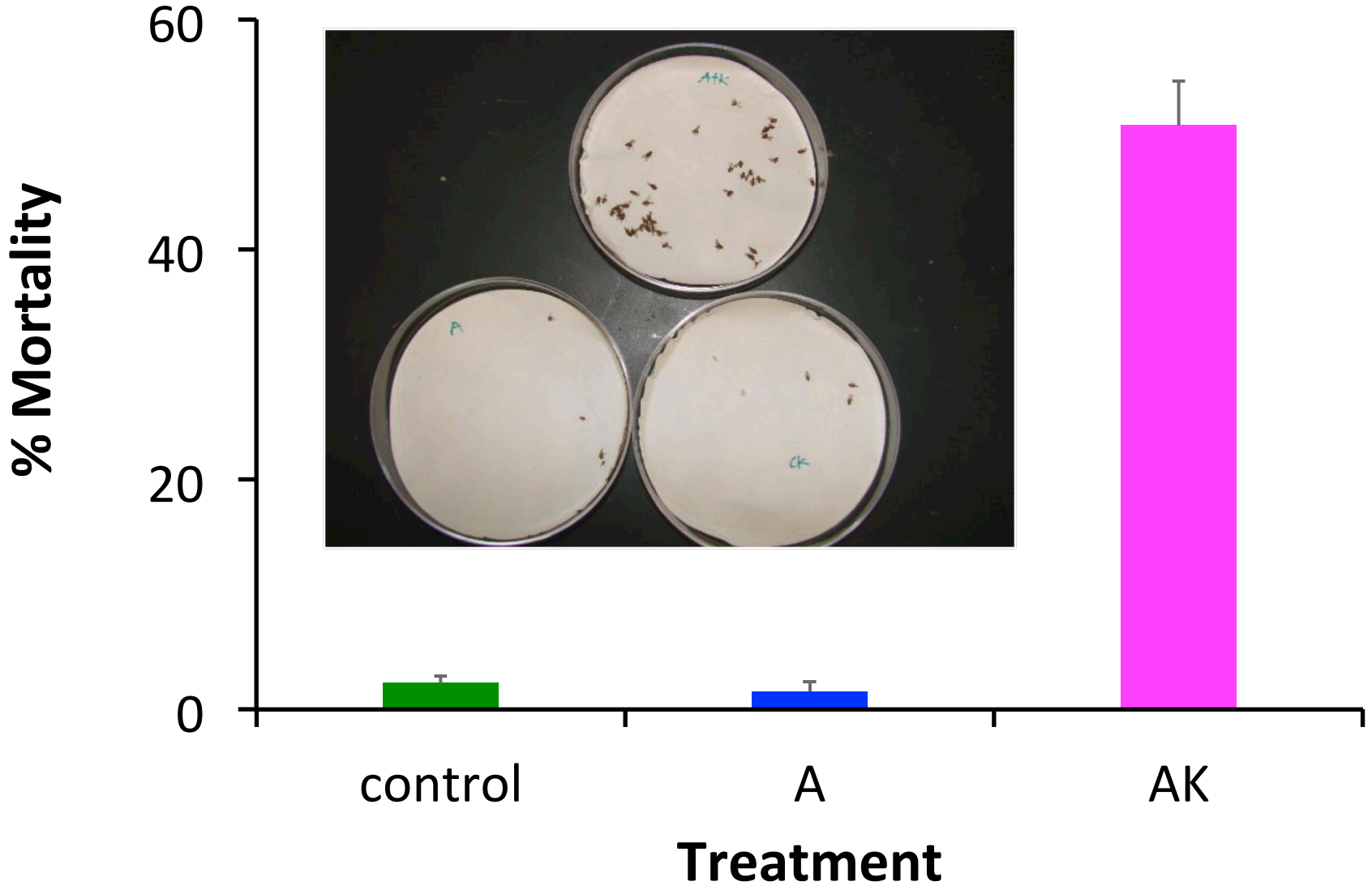
Mini Wind Tunnel Bioassay:

- AK pouch+wine (A+K)
- pouch+wine (A)
- pouch+water (control)

Mini-Wind Tunnel Bioassays

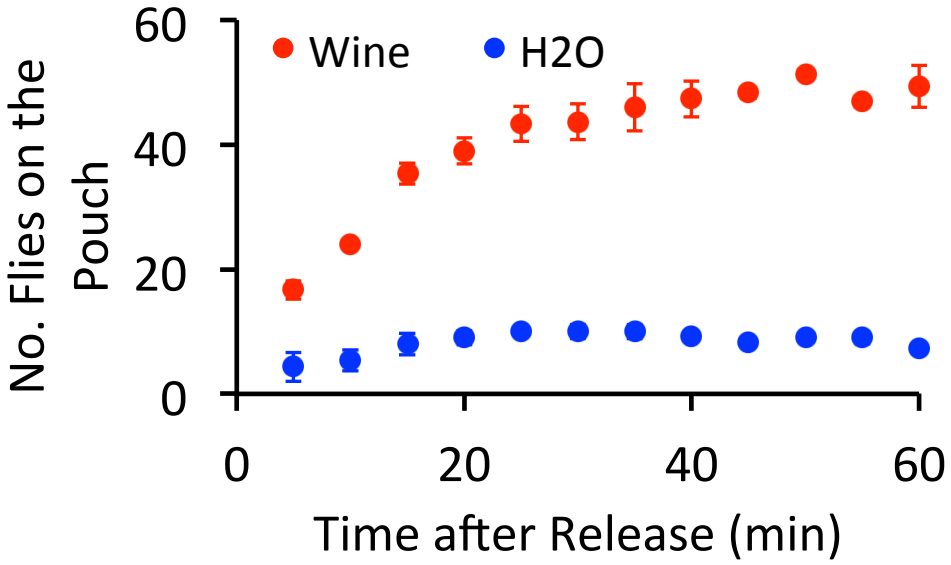


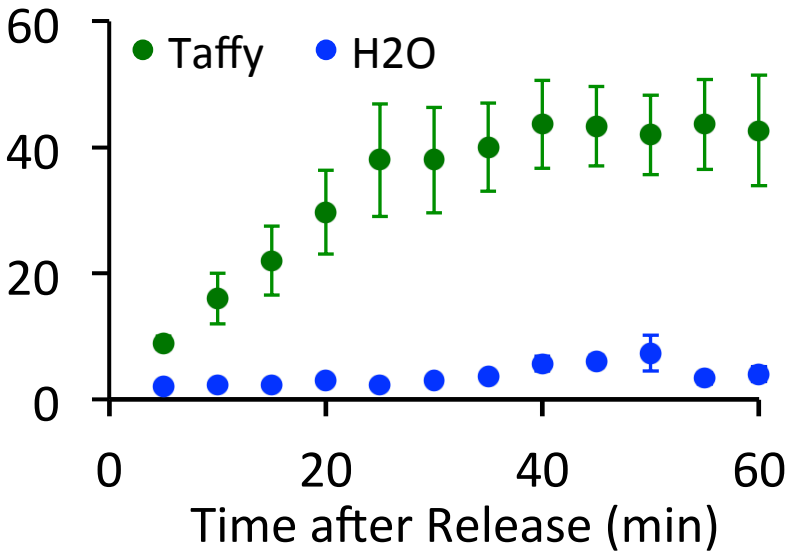
Mini-Wind Tunnel Bioassays

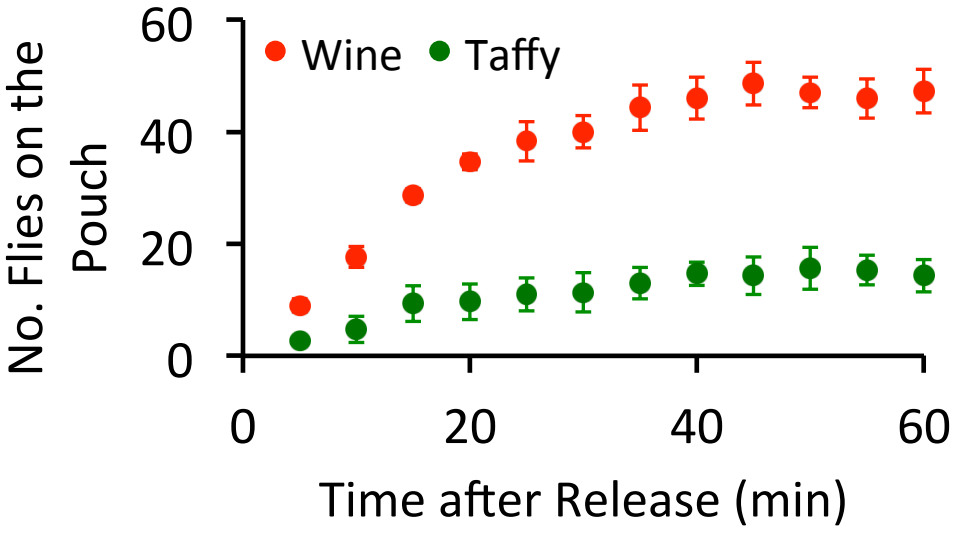


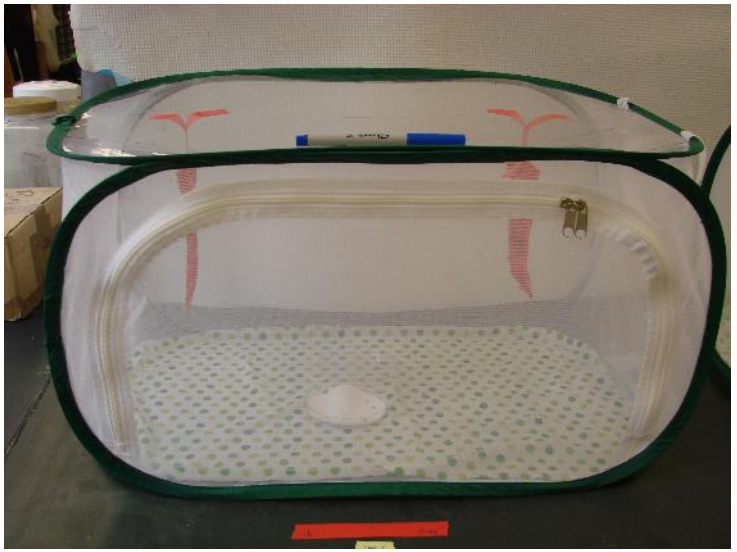
Taffy Bait

Binary Choice Tests

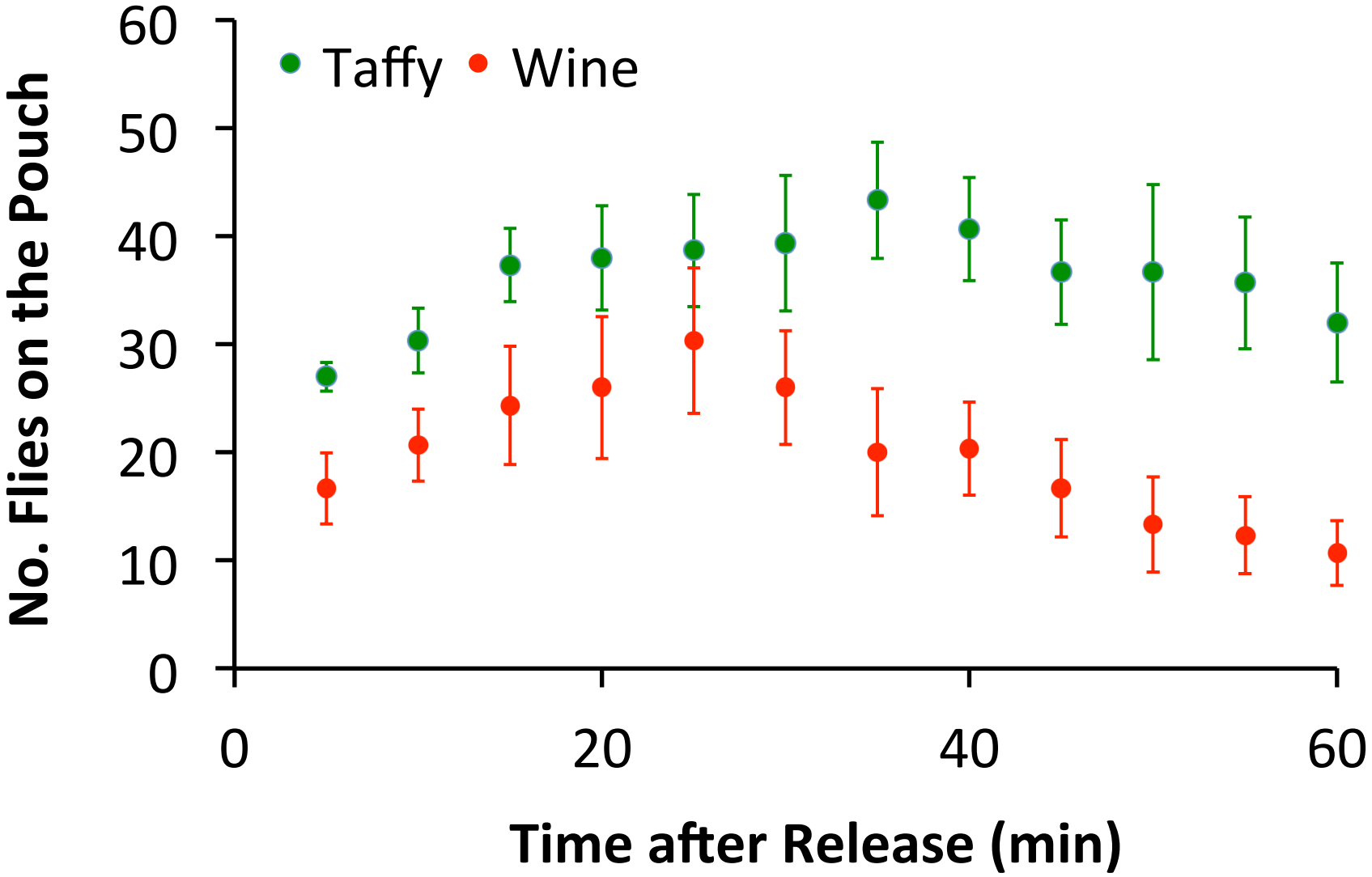






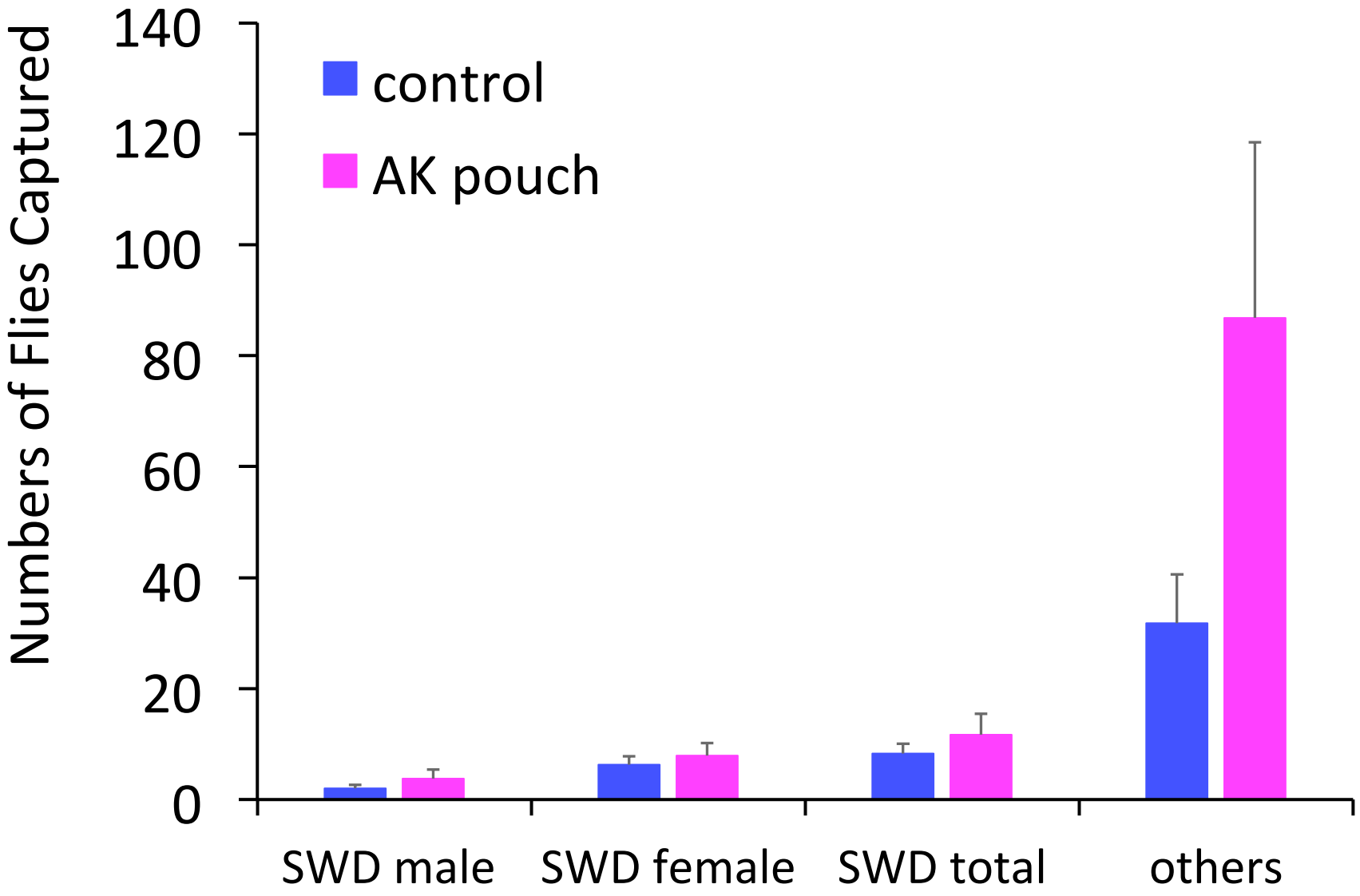


3-d old Taffy vs. 3-d old Wine



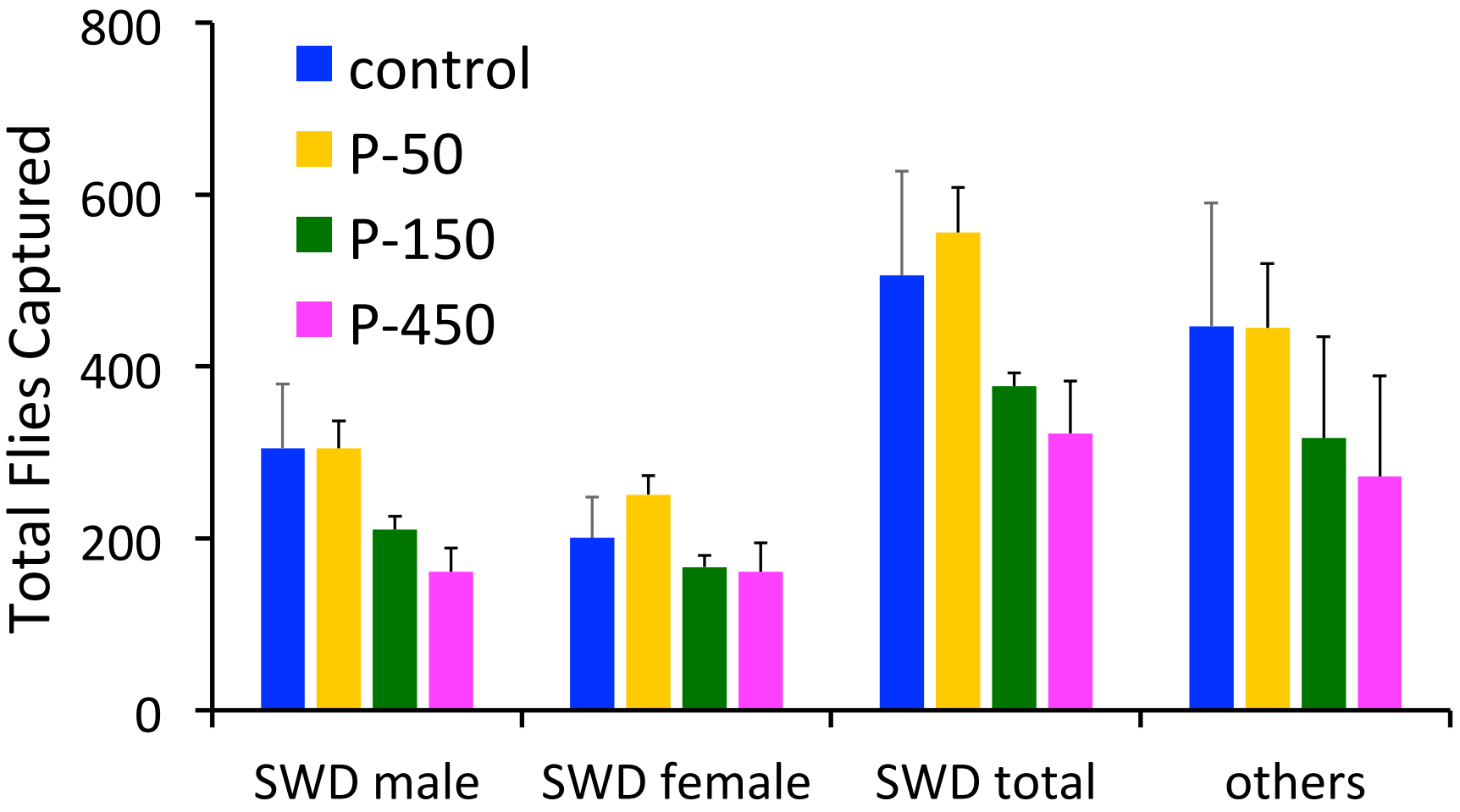
AK field study done by Dr. Harit Bal

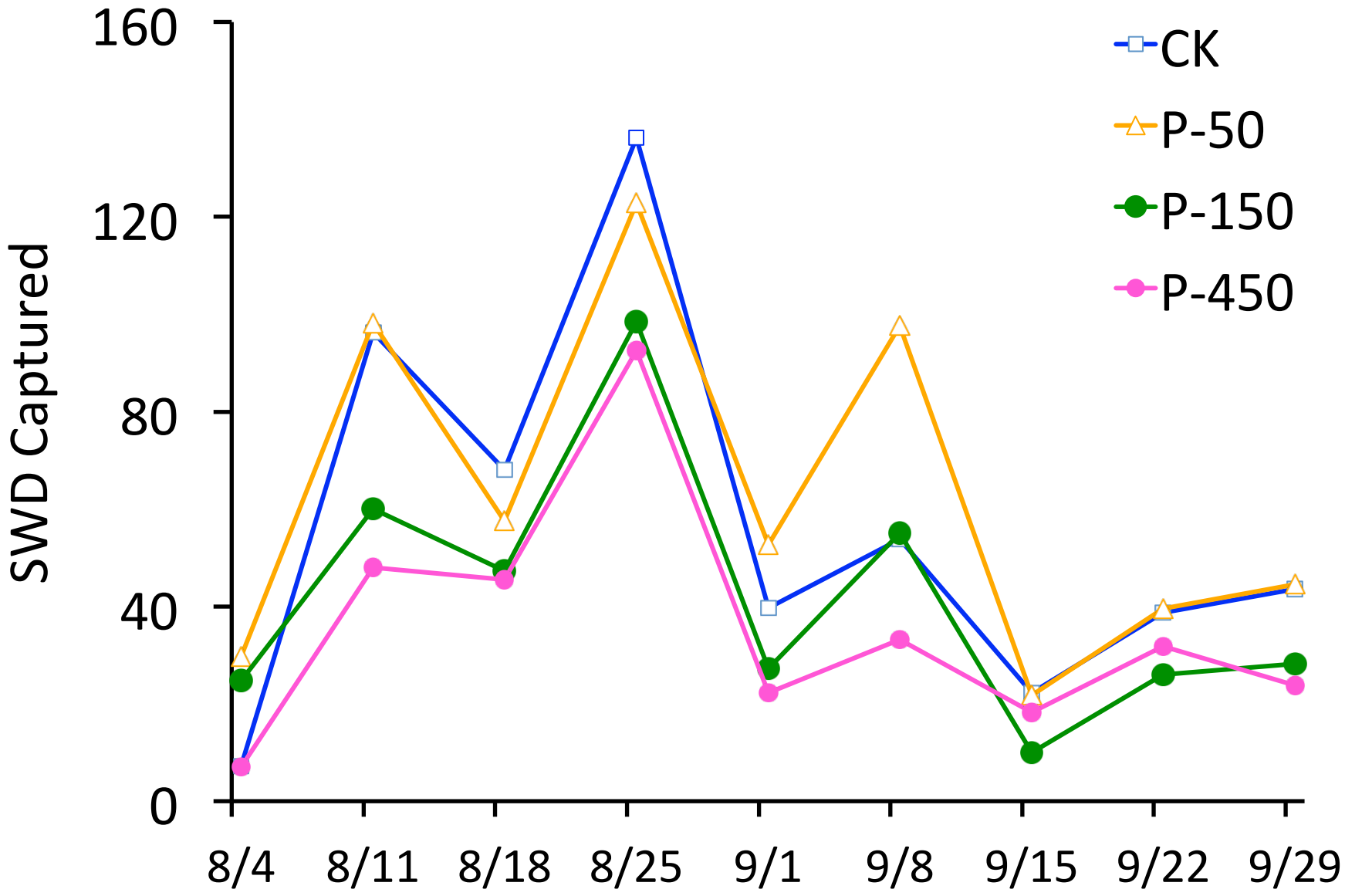
16 AK pouches in 4 × 4 grid (41 m^2=0.01 ac), hung on a 1 m tall bamboo sticks in a woodlot containing wild berry bushes, nearby an organic blueberry field. Monitoring trap: yeast-sugar trap for 5 wks from July 8 to Aug. 3, 2016


Numbers of Flies Captured
140
120
100
80
60
40
20
0
control
AK pouch
SWD male
SWD female
SWD total
others

Small AK field trial using Scentry lures at Clarksville Research Station from 7/29-9/30

Pouch density: 0, 50, 150, 450/ac in 0.25 ac plots


800
600
400
200
0
Total Flies Captured
control
P-50
P-150
P-450
SWD male
SWD female
SWD total
others


160
120
80
40
0
SWD Captured
8/4
8/11
8/18
8/25
9/1
9/8
9/15
9/22
9/29
CK
P-50
P-150
P-450

Possible reasons why AK is not so effective:

- Scentry lure could not compete with background attractants—billions fruits/leaf volatiles
- Treatments were too close together: ¼ ac, with no buffer zone

Next Step: Identify effective attractants

- This is our main challenge…
- Sex pheromones not important to this species….
- Food and oviposition attractants are available throughout the environment….
  - Also tend to be very volatile and short lived.
- No-target flies won't be issue for AK pouch

Acknowledgements

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Thank you