



# 2022: a year of firsts (Washington research update)

Sam Tochen

Ag. Scientist-WA  
Ocean Spray Cranberries

2023 PNW Cranberry Congress

# What's on deck

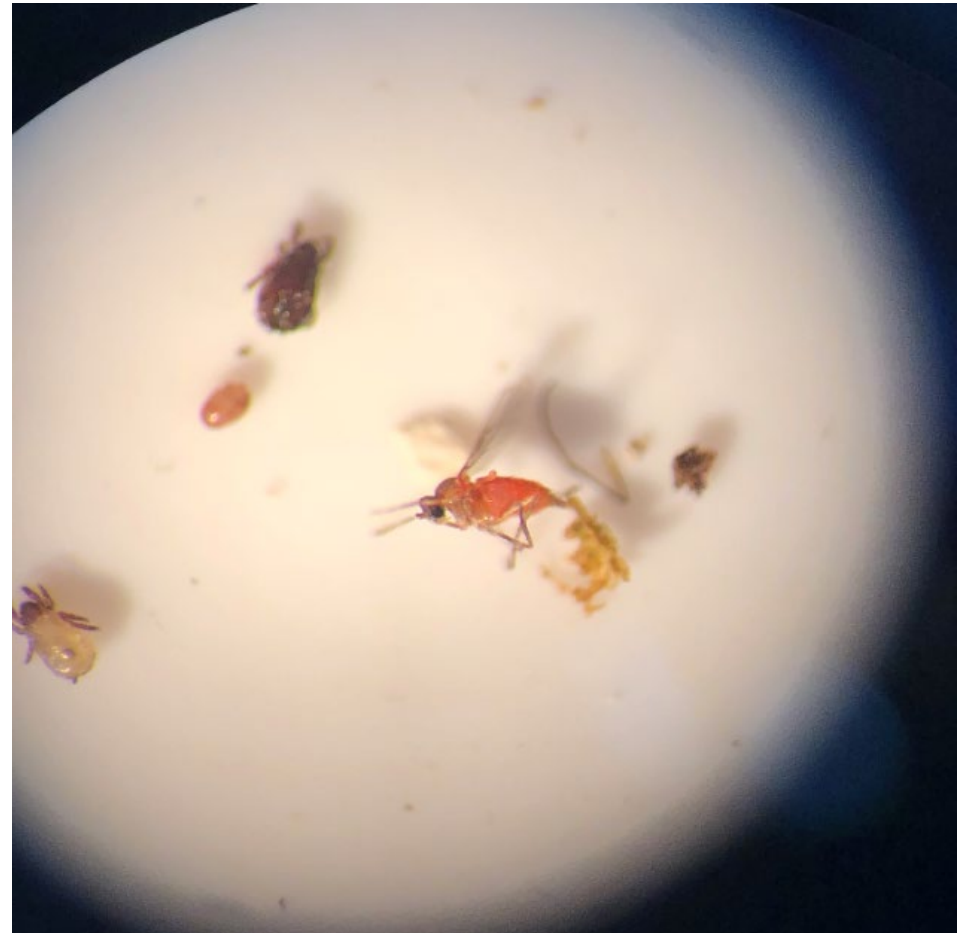
- Tipworm pre-bloom control
- Snailpocalypse
- ~~Herbicide trials~~

But my pesticides?



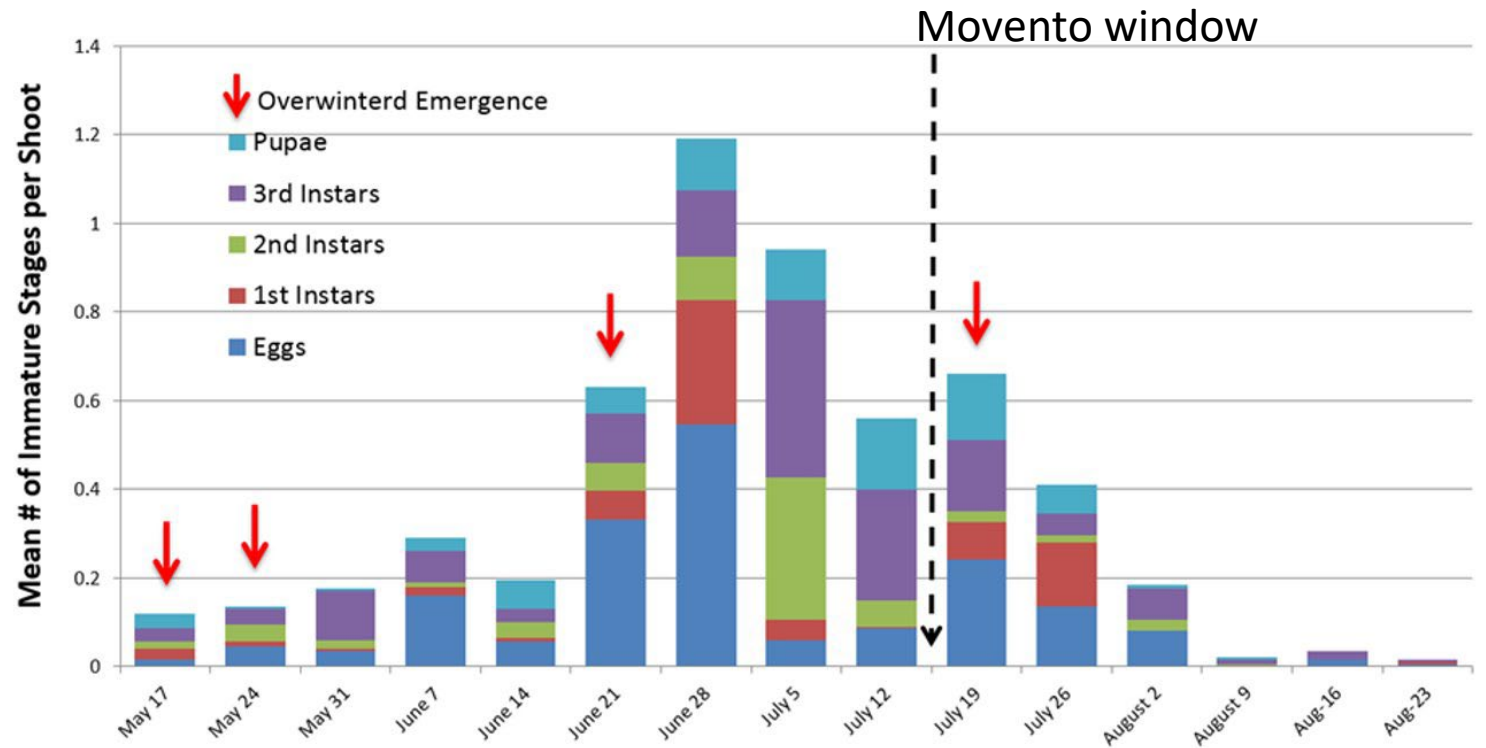


Everybody's favorite dipteran



# Targeting tipworm pre-bloom

- Populations are highest during the first three generations
- One well-timed early app may lead to lower populations for the season



# Most promising: Pyrethroids

**GROUP 3 INSECTICIDE**

**VALENT®**

**RESTRICTED USE PESTICIDE**  
DUE TO TOXICITY TO FISH AND  
AQUATIC ORGANISMS.  
For retail sale to and use only by  
Certified Applicators, or persons  
under their direct supervision, and  
only for those uses covered by the  
Certified Applicator's certification.

**DANITOL®**  
2.4 EC SPRAY

(INSECTICIDE-MITICIDE)

Active Ingredient	By Wt
Fenpropathrin*	30.9%
Other Ingredients	69.1%
Total	100.0%

\*alpha-cyano-3-phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate  
Contains 2.4 pounds fenpropathrin per gallon.  
Contains Petroleum Distillates  
EPA Reg. No. 59639-35  
EPA Est. 5905-GA-1©, 39578-TX-1©  
Superscript is first letter of lot number.

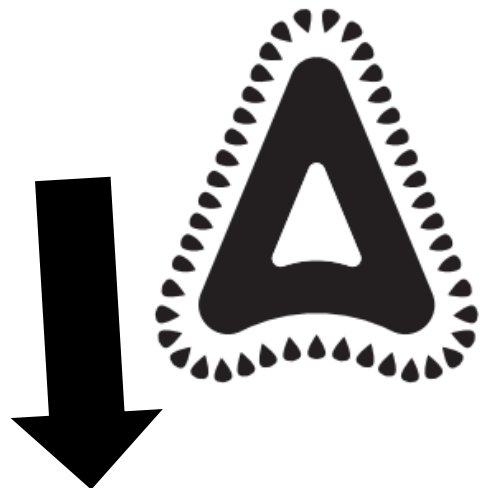
**RESTRICTED USE PESTICIDE**  
TOXIC TO FISH AND AQUATIC ORGANISMS  
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT  
SUPERVISION AND ONLY FOR THE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

**Fanfare® EC** **GROUP 3 INSECTICIDE**

**ACTIVE INGREDIENT:** % BY WT.  
Bifenthrin: (2 methyl[1,1'-biphenyl]-3-yl) methyl 3-  
(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-  
dimethyl-cyclopropanecarboxylate\* ..... 24.0%  
**OTHER INGREDIENTS\*\*:** ..... 76.0%  
**TOTAL:** 100.0%

\*Cis isomers 97% minimum, trans isomers 3% maximum.  
\*\*Contains petroleum distillates.  
This product contains 2 pounds active ingredient per gallon.

**EPA Reg. No. 66222-261**  
**EPA Est. No. 37429-GA-001<sup>BT</sup>; 37429-GA-002<sup>BO</sup>**  
Letter(s) in lot number correspond(s) to superscript in EPA  
Est. No.



Must have supplemental label!!

From last year

## What about Fanfare?

- Cheaper (approx. \$9/acre)
- Promising results in the past but
  - No trials with single applications
  - Probably long season control?
  - Will be trialed this year as a single pre-bloom app



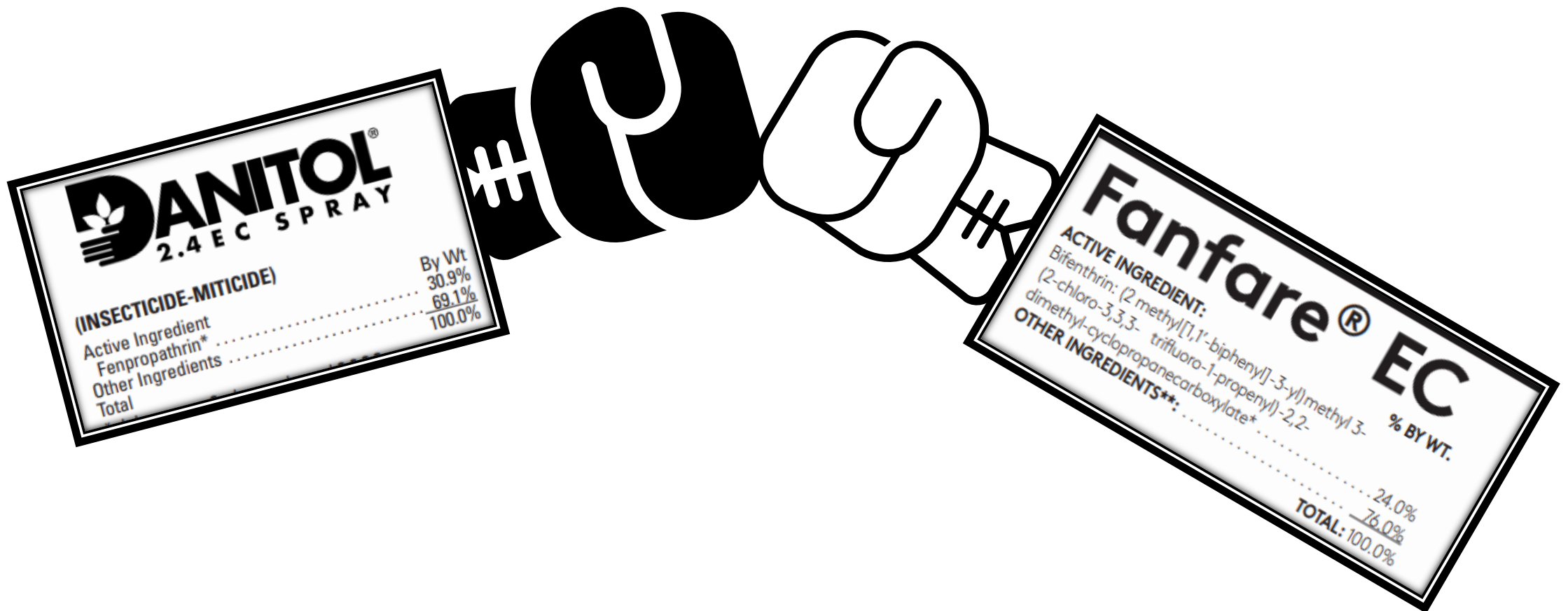
- Fanfare
- Pros
    - Good efficacy early generation(s)
    - ~\$5/ac
    - Also control BHFV & BVW
  - Cons
    - 2-3 application required
    - Restricted Use
    - Pre-bloom only

Kim-2019 Oregon cranberry school





# Tipworm pre-bloom control: a pyrethroid showdown



plus some softer chemistries



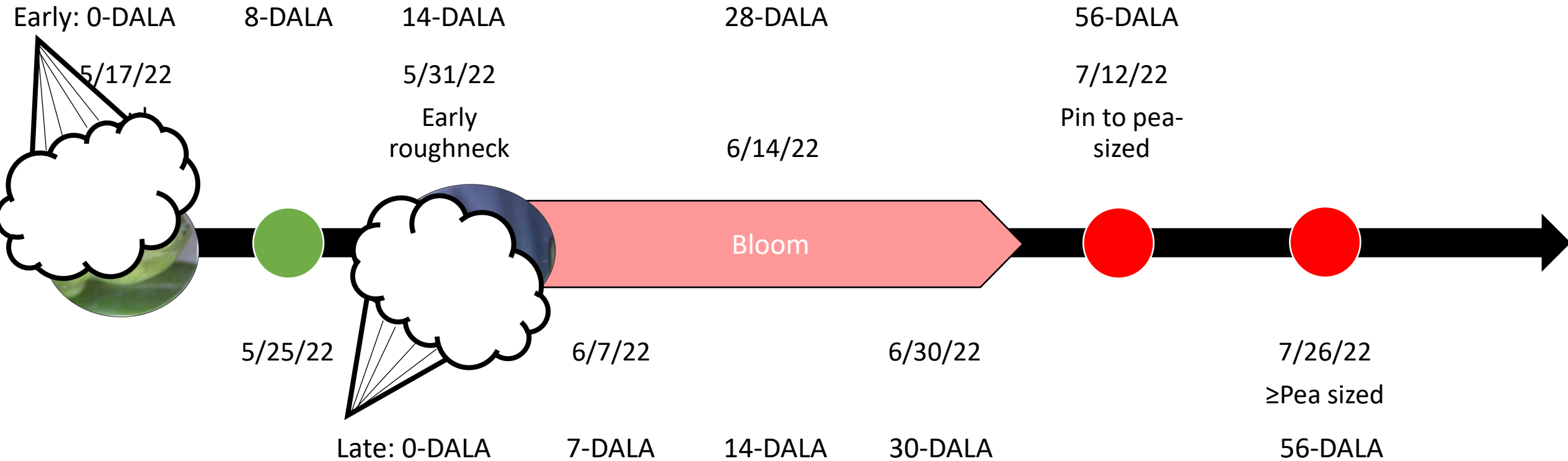
# Set-up

2022 Trial (repetition from 2021)

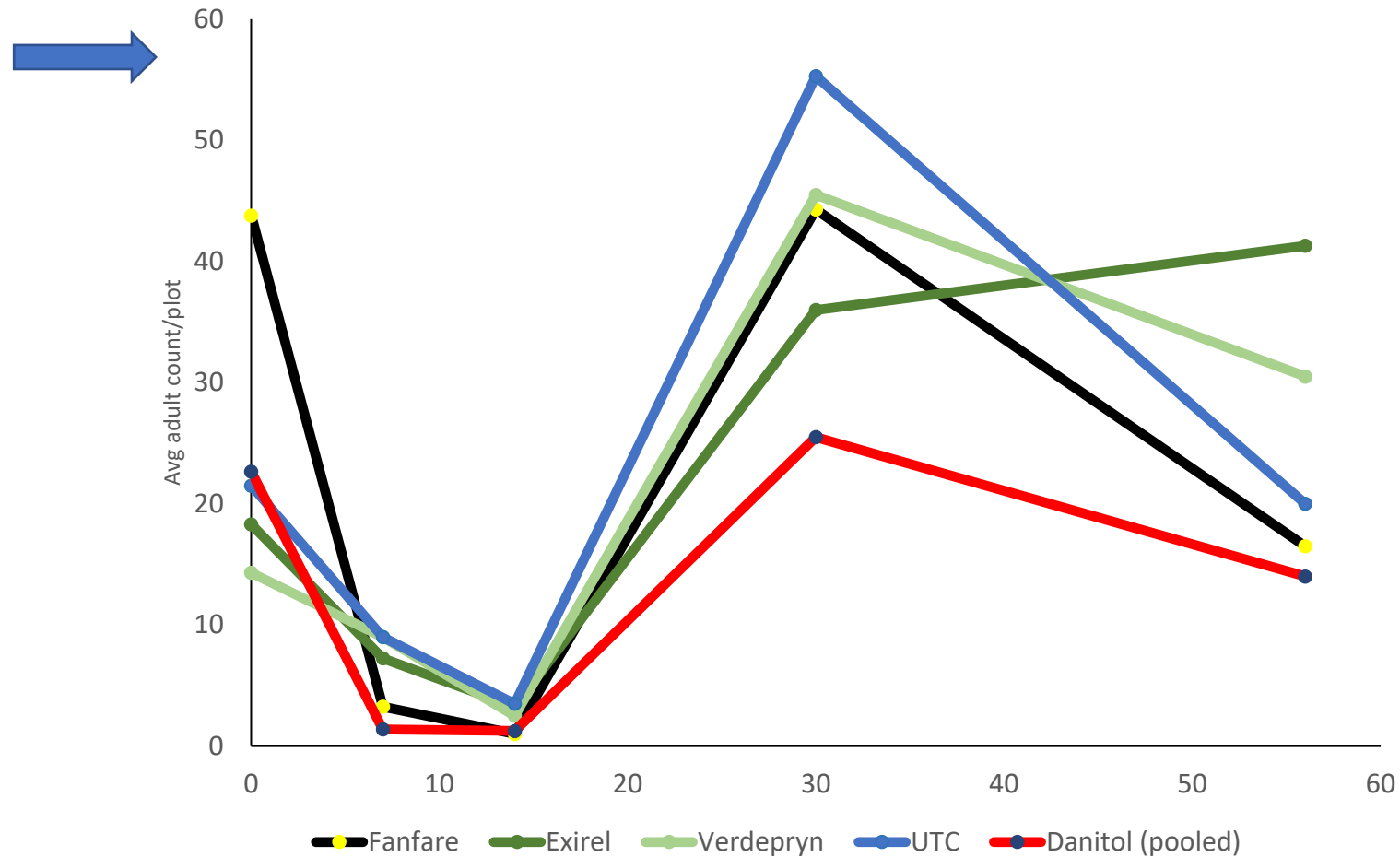
- Danitol (“low” and high rate)
- Fanfare
- Exirel
- Verdepryn (2 apps)
- “Early” and “Late” applications
  - May 17, May 31



# Timing of collections



# Results: Adults (late app only)



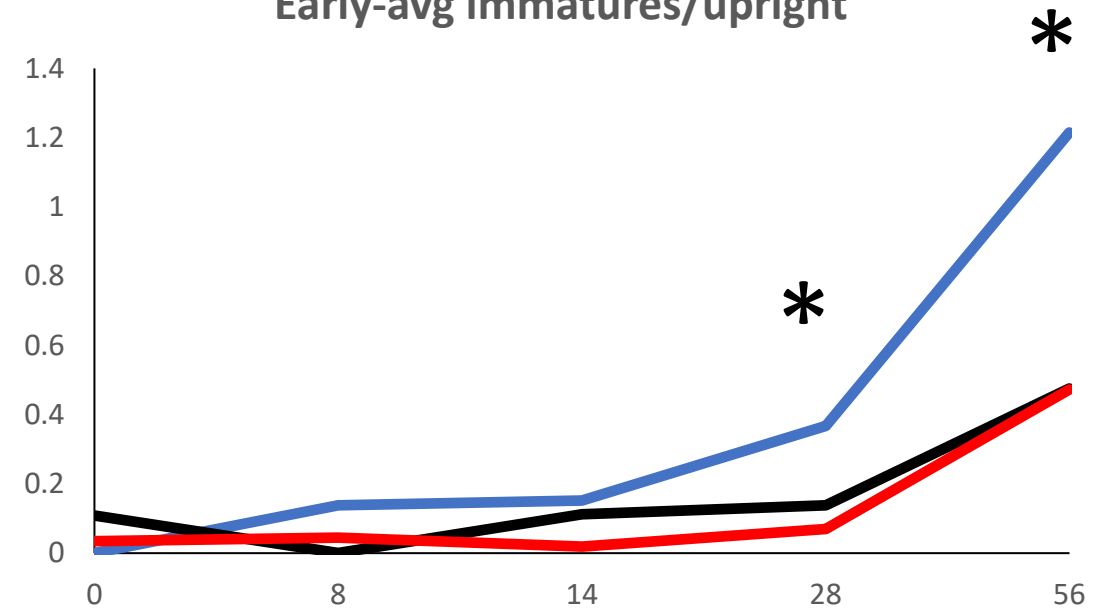
ND between treatments



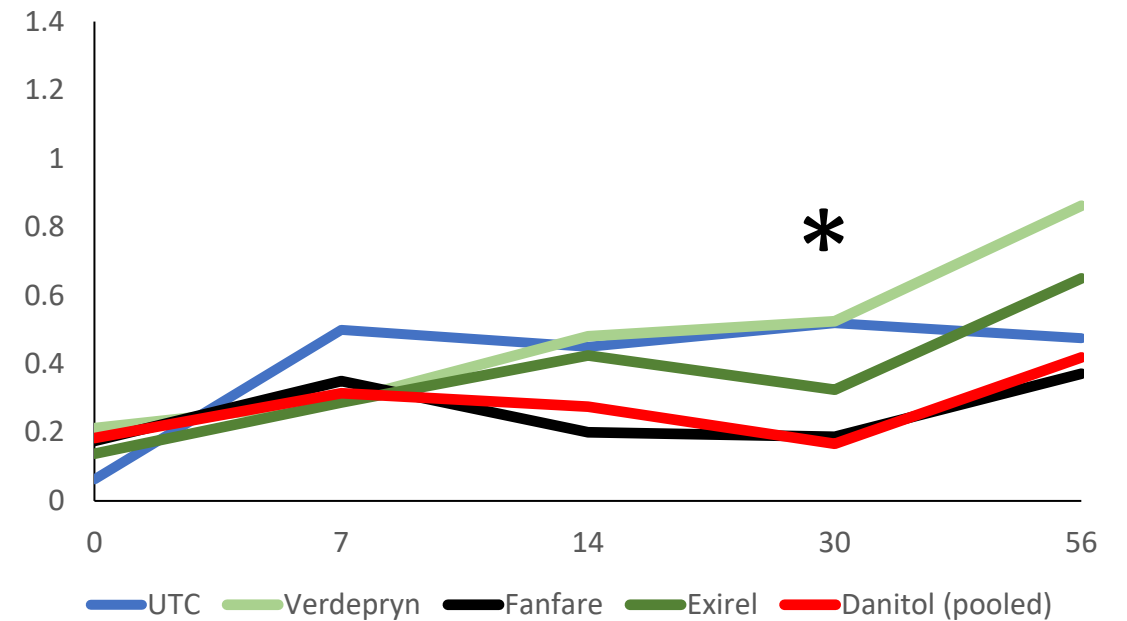
# Results: Immatures



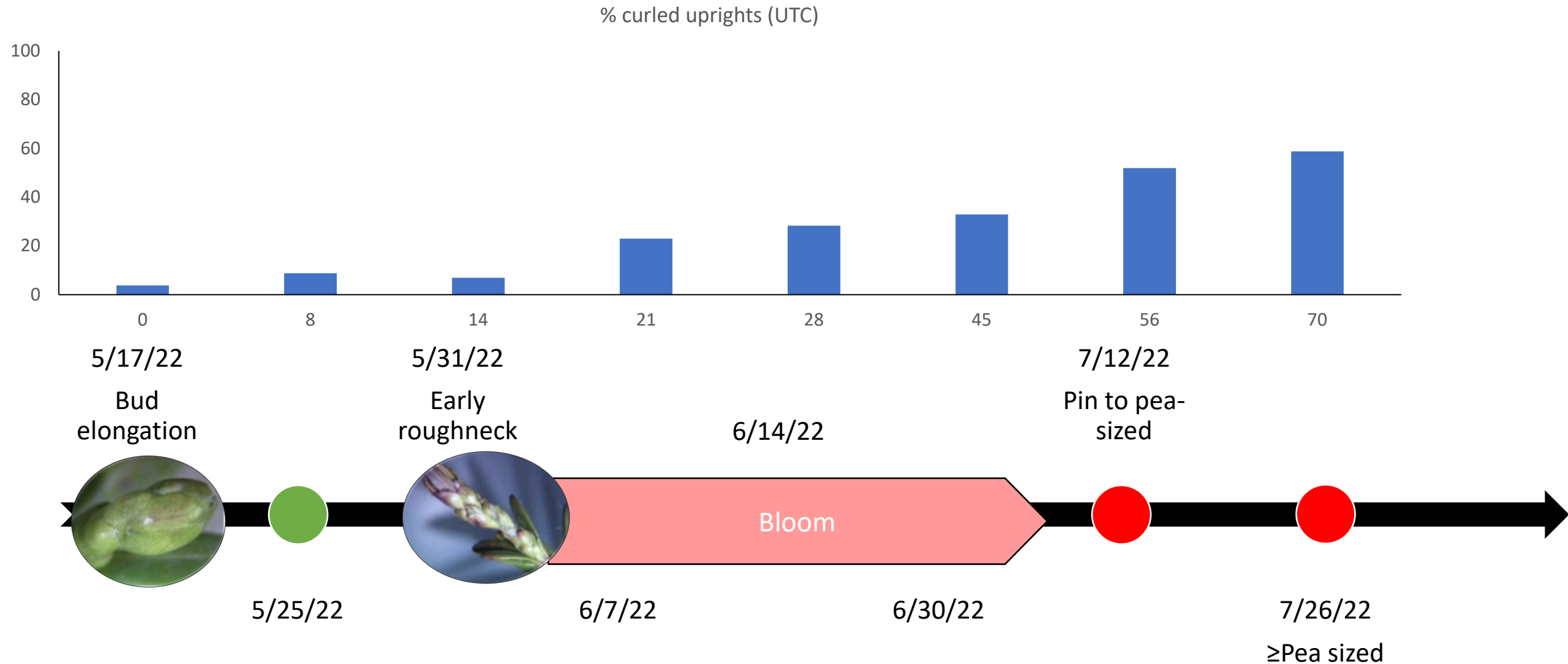
Early-avg immatures/upright



Late-avg immature/upright



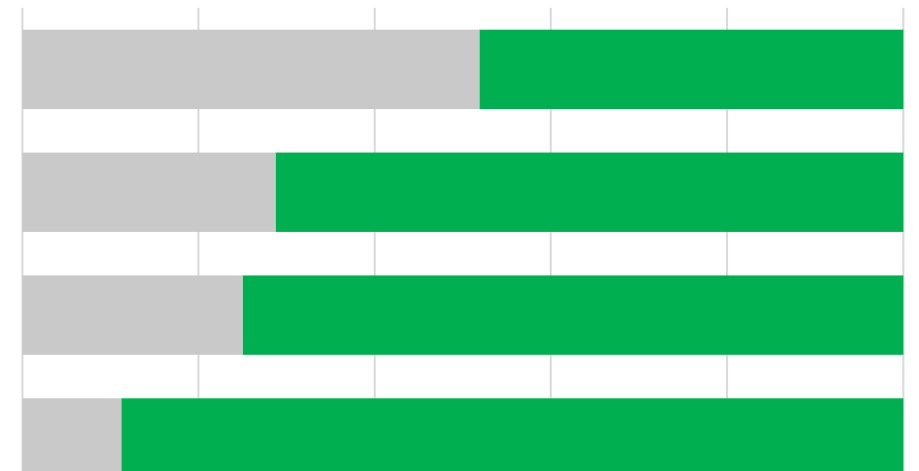
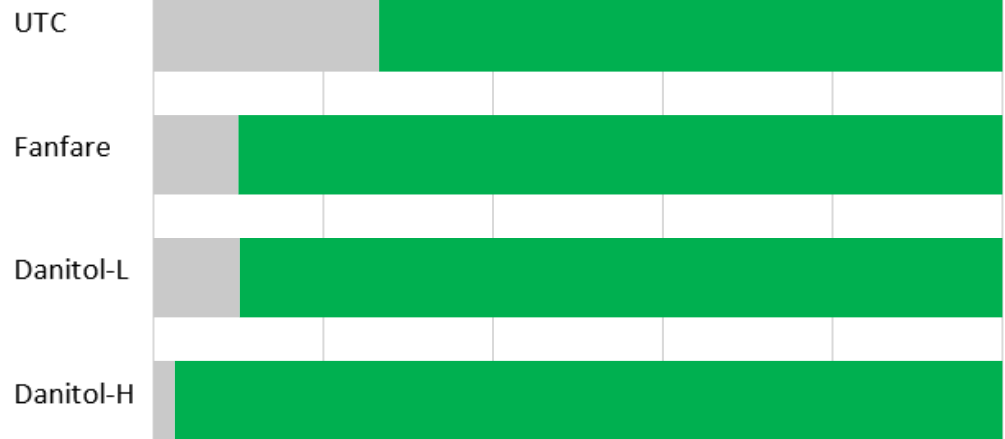
# Timing of curling



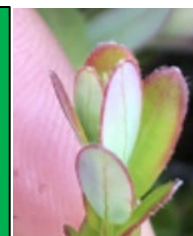
EARLY

~1-month post-spray

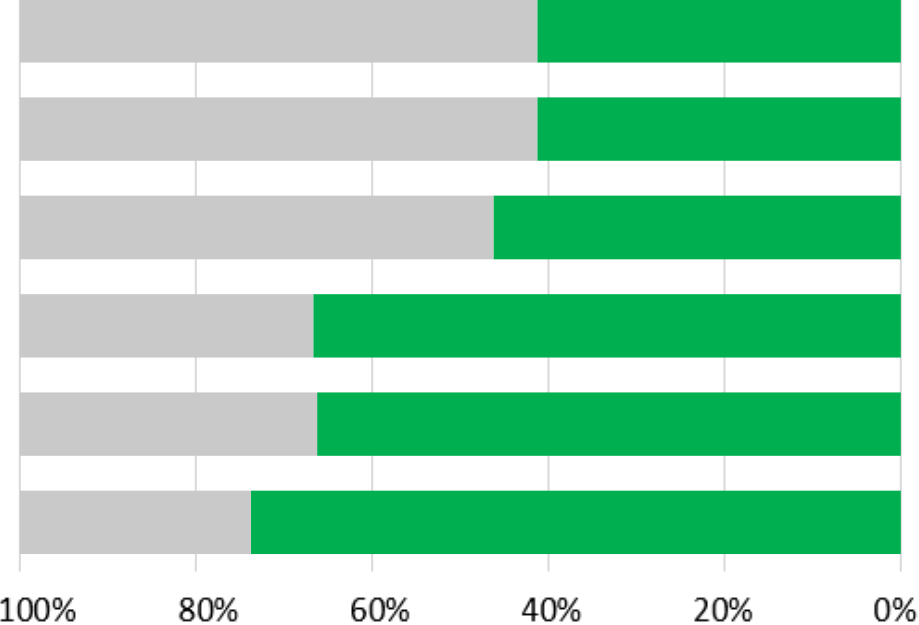
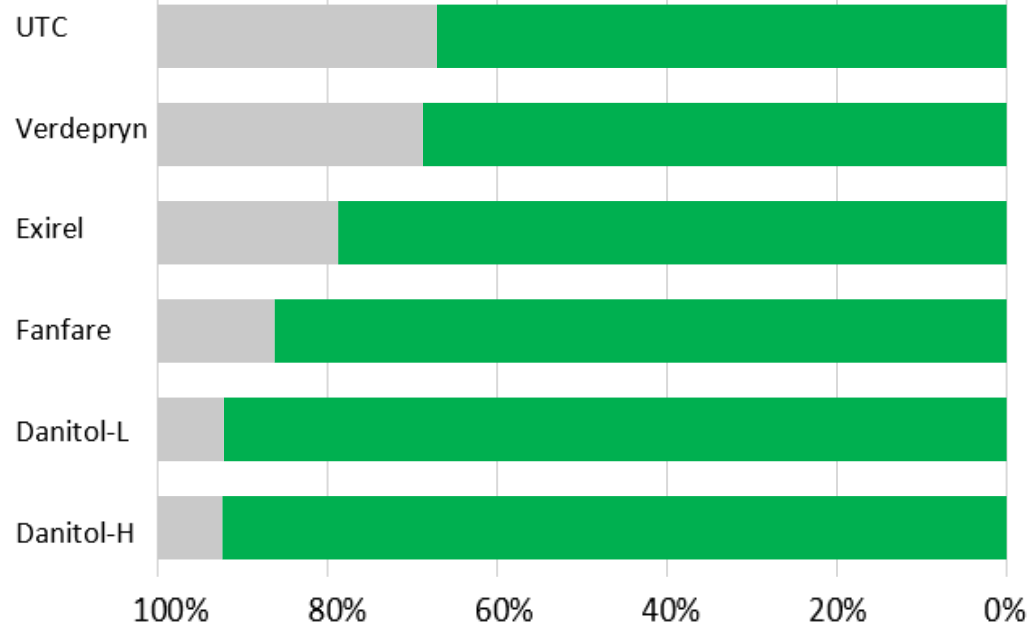
~2-months post-spray



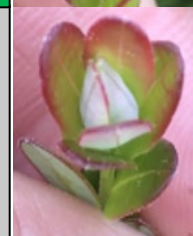
0



LATE



1



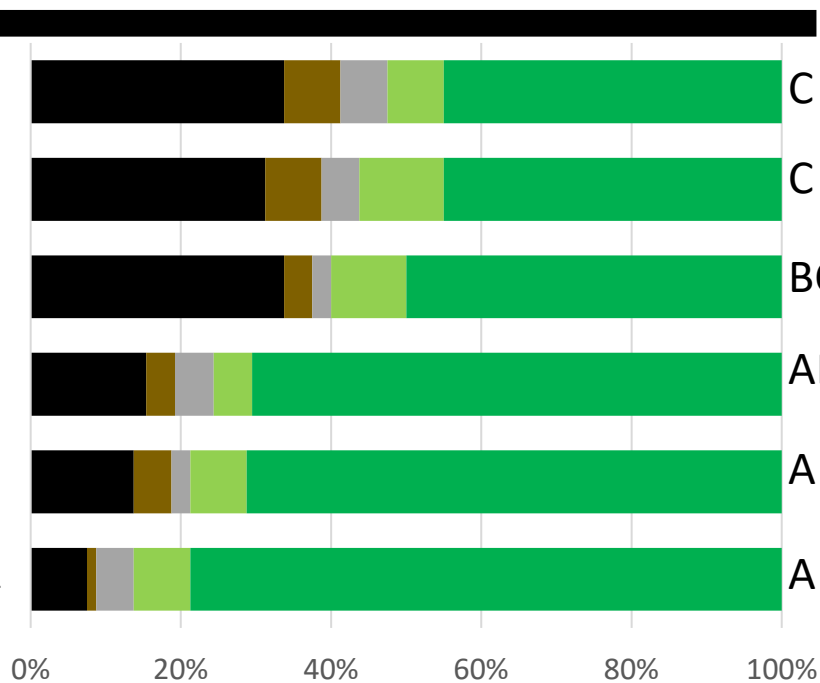
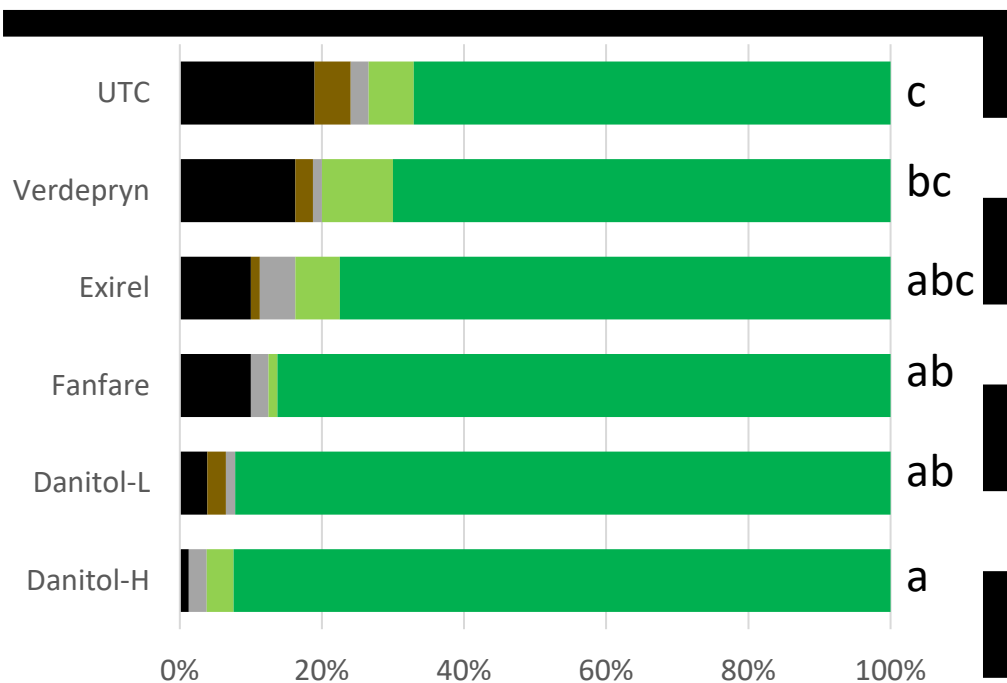
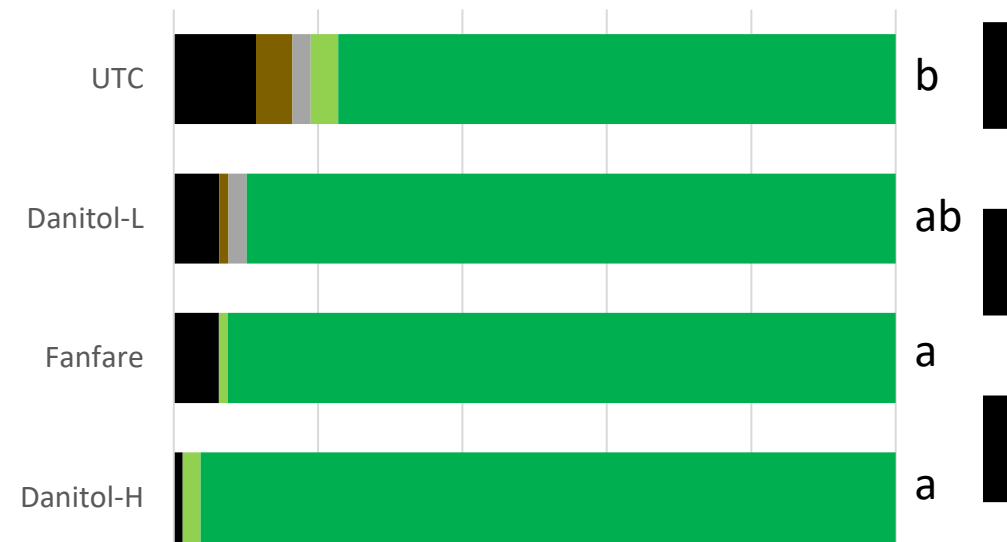


EARLY

LATE

~1-month post-spray

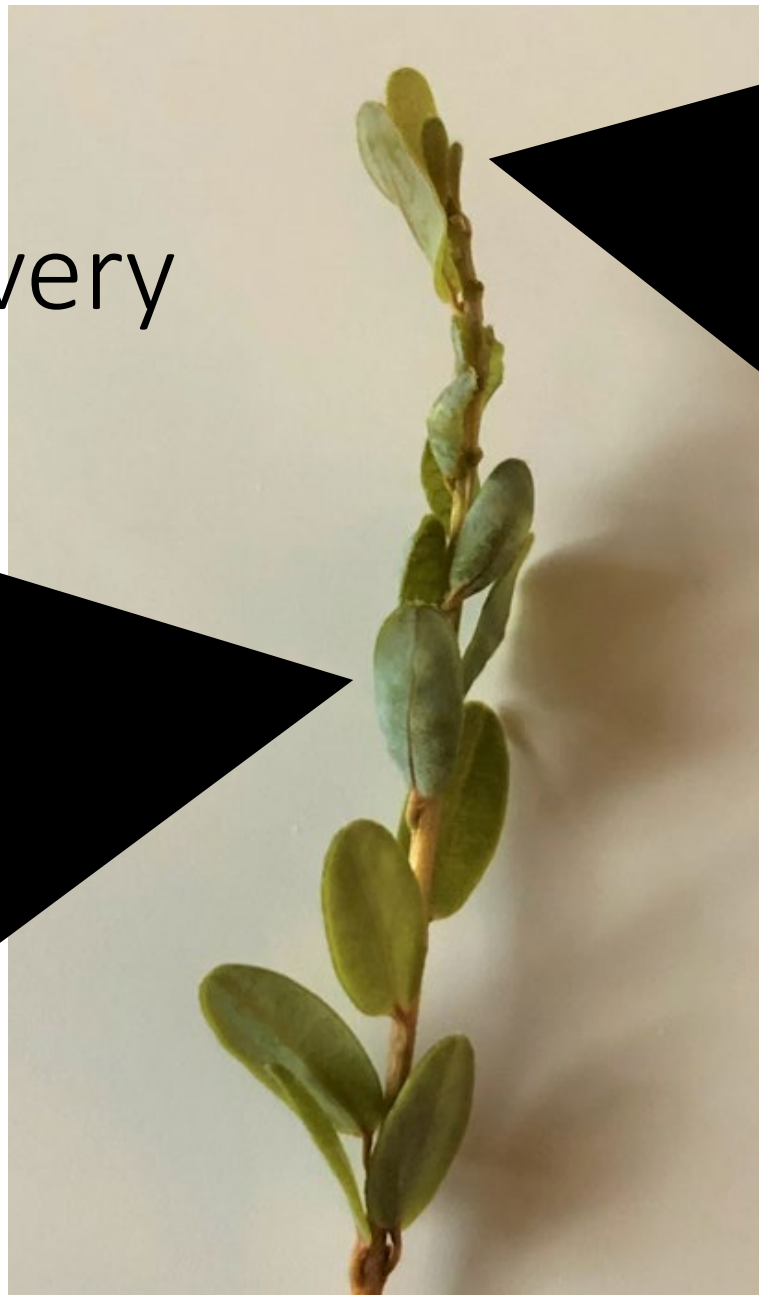
~2-months post-spray

Meristem damage  
rating

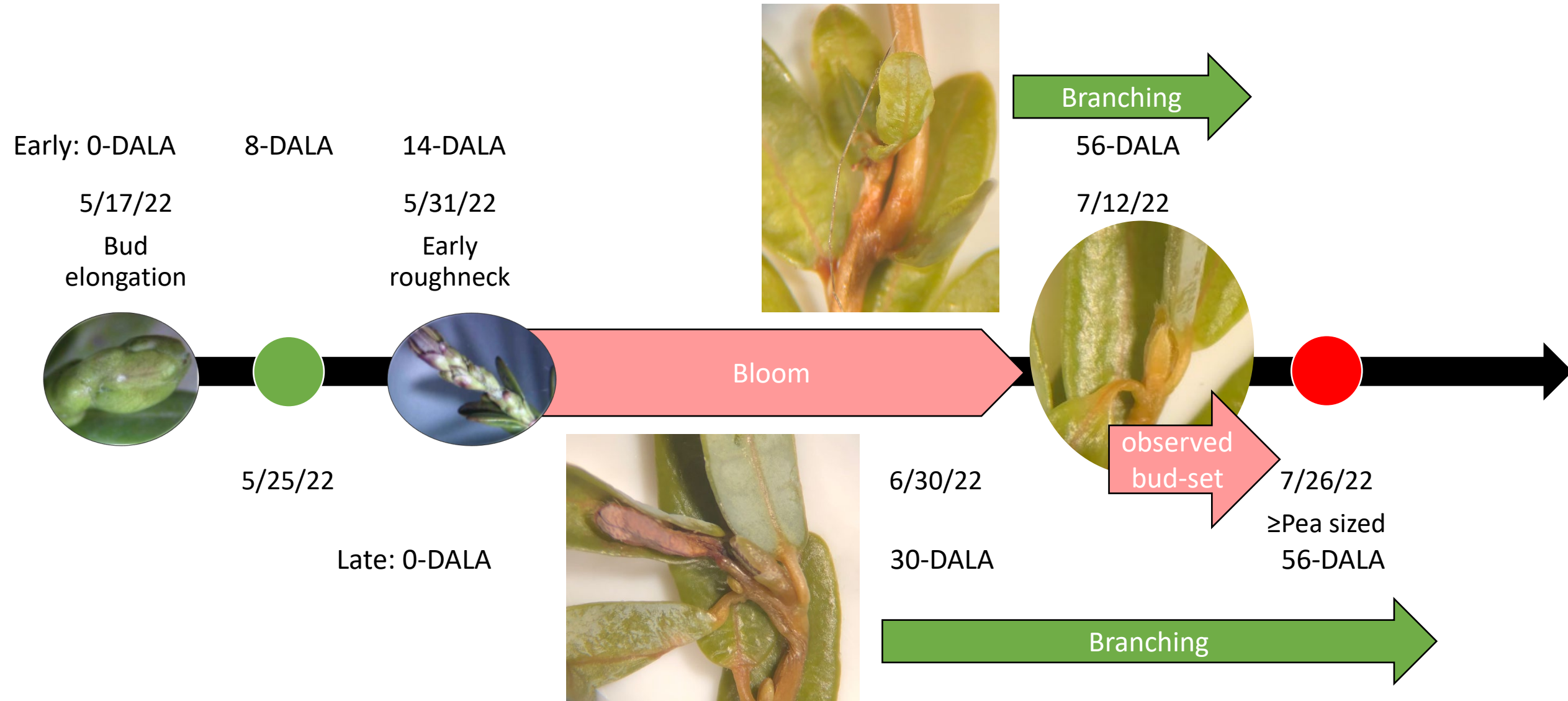
Damage threshold?



Upright recovery

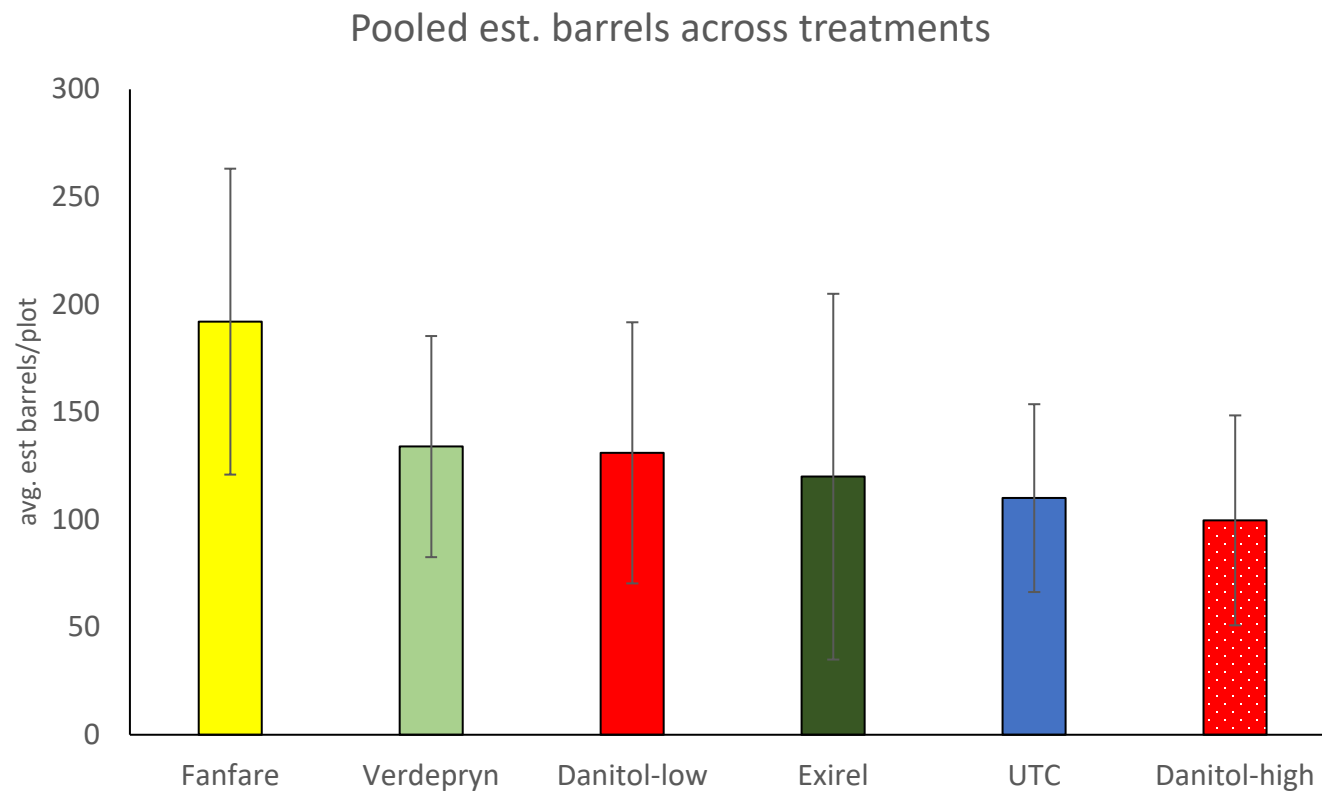


# Timing of observations





# Yield



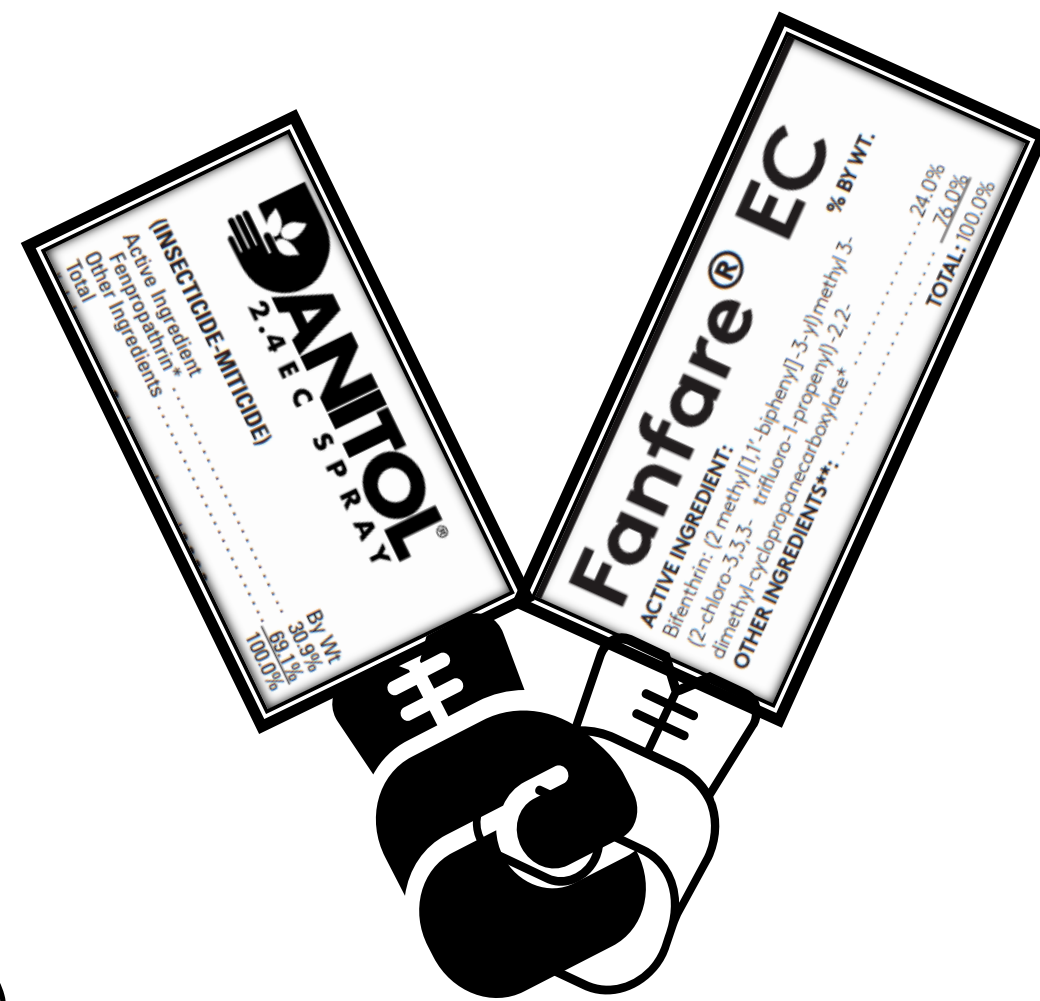
No difference in yield; early/late pooled

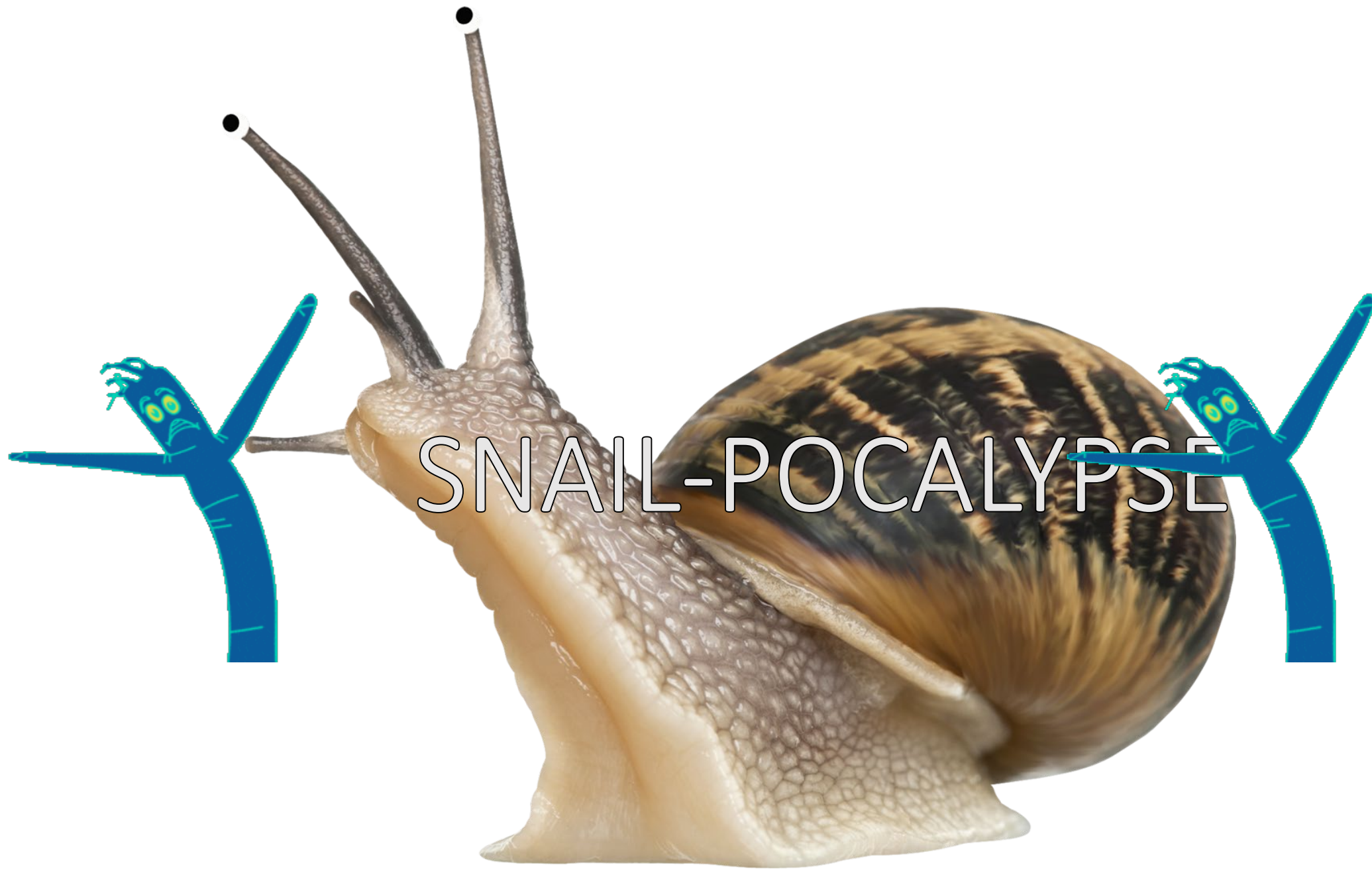
# Take-away:

- Both pyrethroids reduced tw damage when applied pre-bloom
- Considerations for use:
  - Cost
  - Handler restrictions
  - Export market (MRL thresholds)
  - # apps allowed
  - PHIs

## Reminders for either:

- Hold water 3 days post-application (aquatic tox!)
- Bad news for your beneficials
  - Timing is critical to minimize impacts
  - Evaluate if needed
- Rotating other chemistries is a must





Aka snails really suck

What I thought



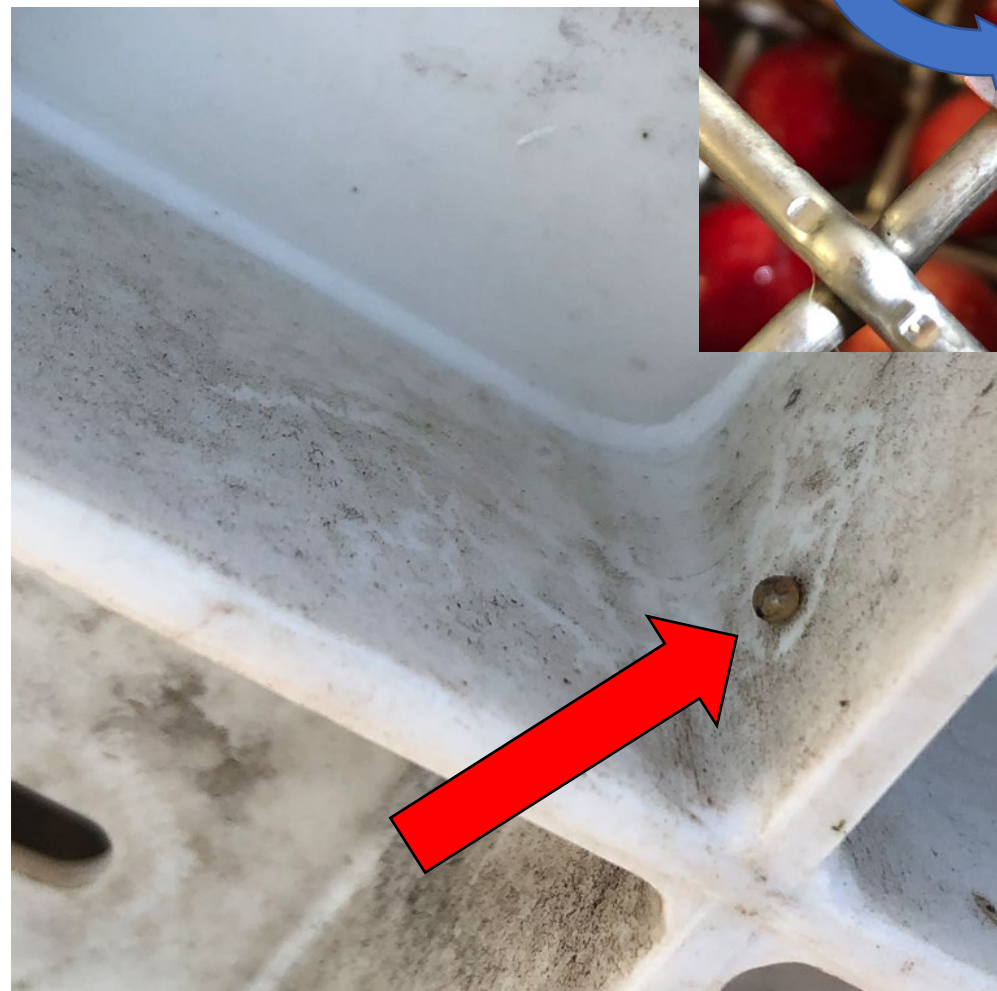


What I got

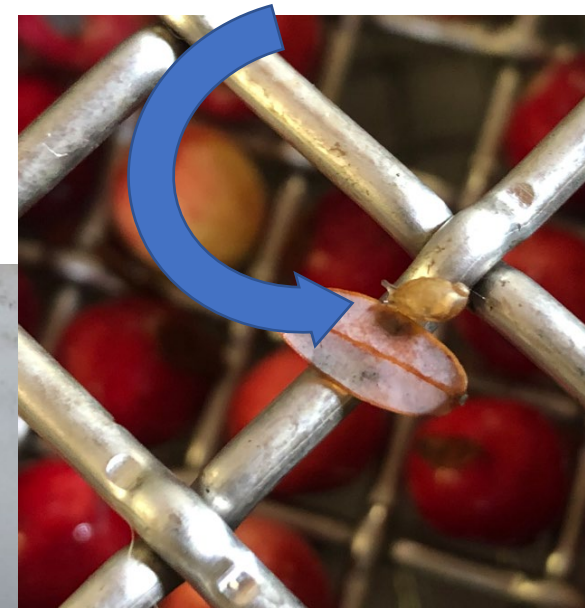




# The gift that kept on giving



Bonus hitchhiker from TW trials



# The issue with snails on fresh fruit

- Allergen?
  - Not recognized in US
  - Regulation targets processed food production
- Disease potential?
  - Parasitic worms: sub-tropic/tropic environments
  - E-coli (slugs)



## • Foreign material

- Blueberries: optical sorter issues
- OSC: zero tolerance 2022

# Main culprits



# Amber snail



- Terrestrial but close association w/water
- Relatively small at maturity (1/2")
- Reproduces May-Sept
- 10 clutches/individual (clutch=20-30 eggs)
- Egg hatch w/in 8-22 days
- Mature after 1 year, lifespan 2-3 years
- Feeds on detritus
- Phytosanitary/quarantine pest in nursery crops
- Upright climbing behavior during fall



# Black gloss snail

- Terrestrial but close association w/water
- Small at maturity (.25")
- Reproduces May-Oct
- 3 clutches/individual (clutch=2-9 eggs)
- Egg hatch w/in 21-27 days
- Mature after ~1 year, lifespan up to 3 years
- Feeds on detritus
- Pest in other crops (?)





# Brown garden snail



- Widespread distribution
- Large(r) size at maturity (1.5")
- Reproduces May-Oct
- 6 clutches/year (clutch =50-110)
- Egg hatch w/in 15-30 days.
- Mature at 2 years, lifespan up to 4 years
- Primarily herbivore/omnivorous scavenger
- Agricultural pest (and edible delicacy)

# Environment and snails

- Ectotherms: relies on external forces for body heat
- Active between 40-70°F (preference 60°F +)
- Humidity necessary
- Seek out microclimates for optimal conditions
- Hibernate during winter to avoid mortality
  - Initiated by photoperiod and temperature drop

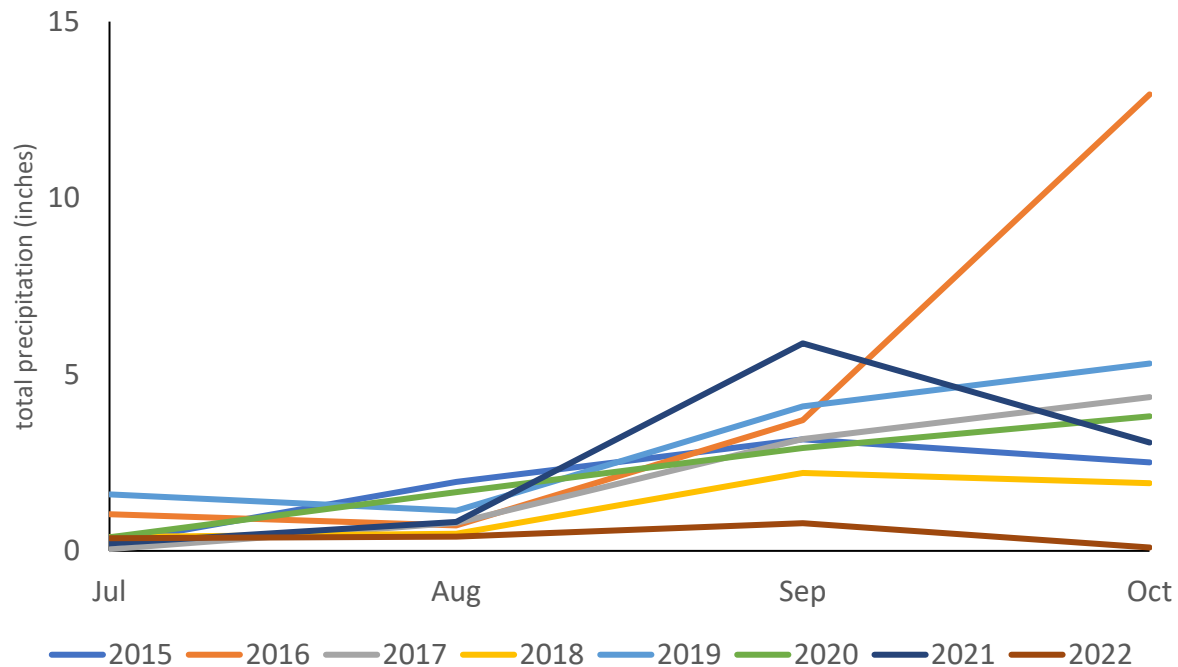


# So how did we get here?

- July-Oct: “Warm” and dry

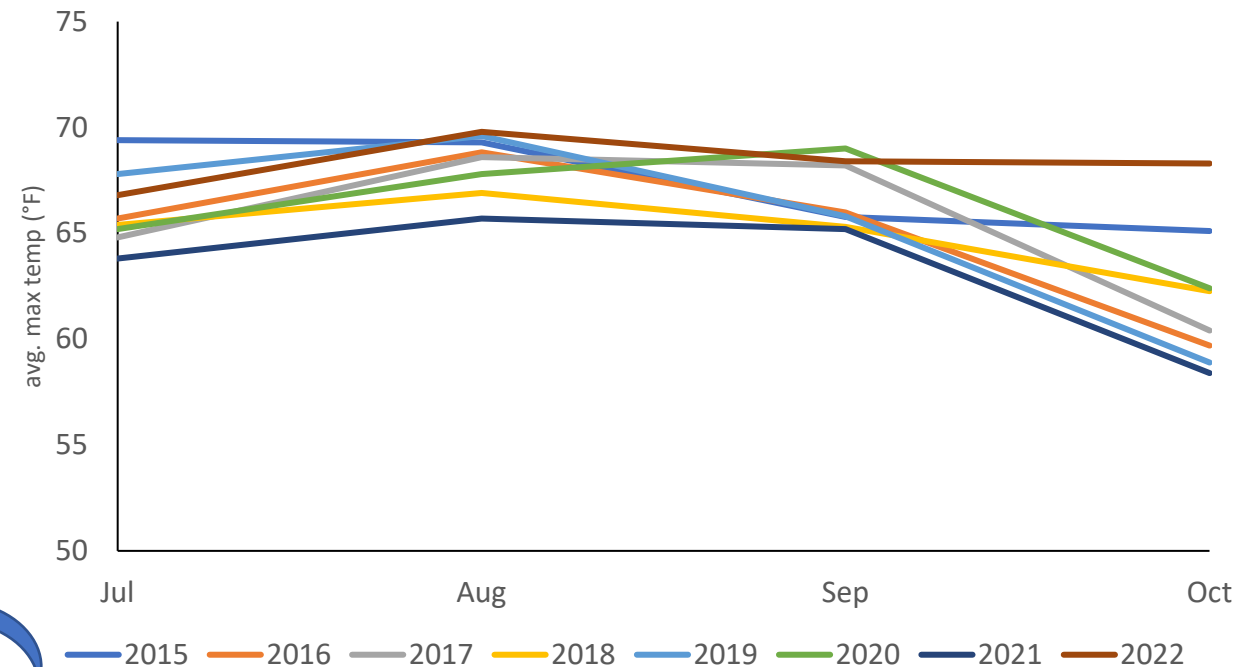


Rainfall



< 0.10" rain

Monthly High Temperatures

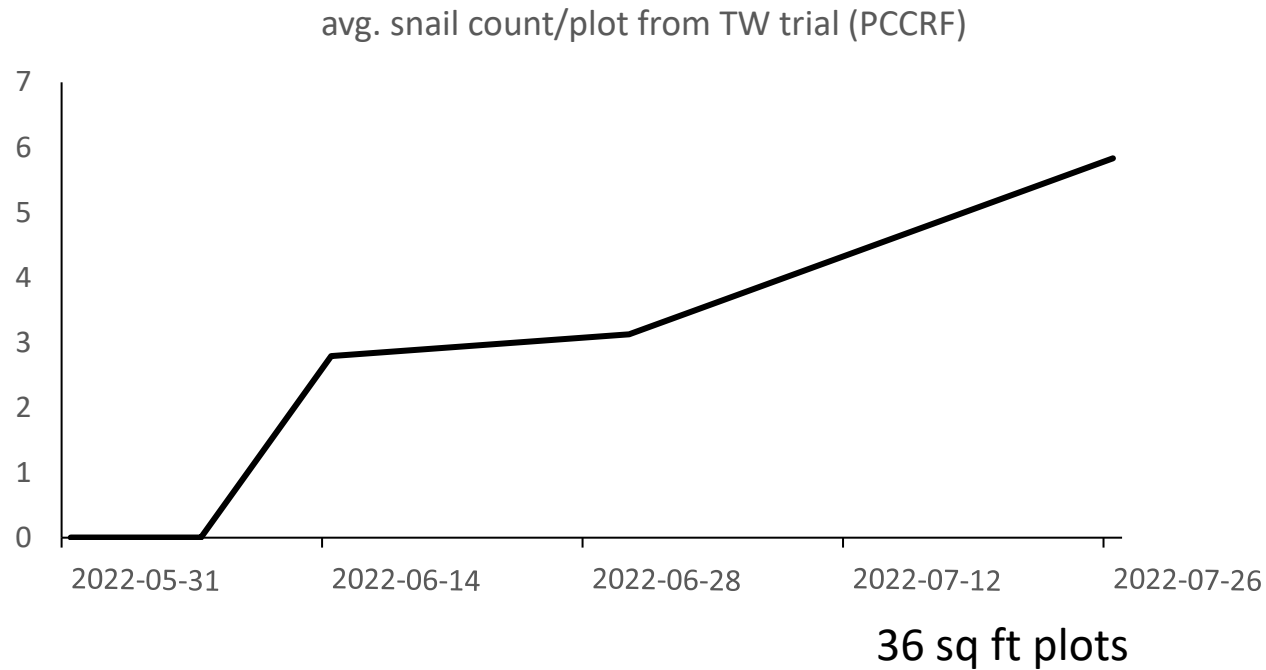


Irrigated cranberry beds look quite inviting



# Side-note: Distribution

- Not limited to wet harvest or fresh
- Baited trap effort: snails throughout Grayland
  - Not a good indicator



Hiding under moss



Hanging out on cribbing

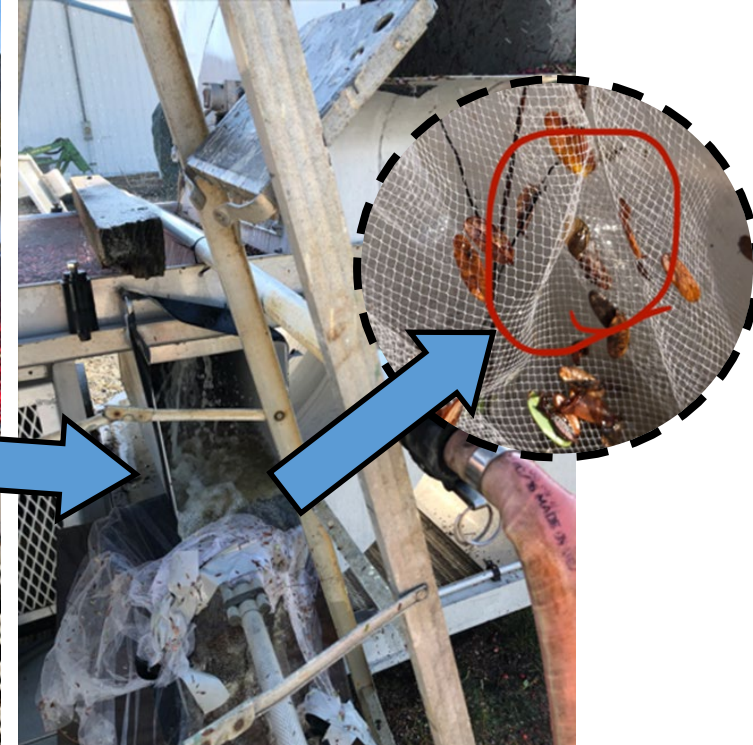
# Typical methods of management: other crops

- Physical/mechanical: Copper barriers, removal via water/shakers, crushing, limit soil moisture
- Cultural: Weed control, tilling, sanitation
- Biological: predatory insects and snails, nematodes, vertebrates
- Chemical: Baits (iron phosphate or metaldehyde), liquid metaldehyde sprays, copper hydroxide, garlic oil



# How to apply in cranberries:

- Physical/mechanical: ~~Copper barriers~~, removal via water/shakers, ~~crushing~~, ~~limit soil moisture~~ incorporation of screens/brush rollers?



Typically, low flow rate needed to remove

# How to apply in cranberries:

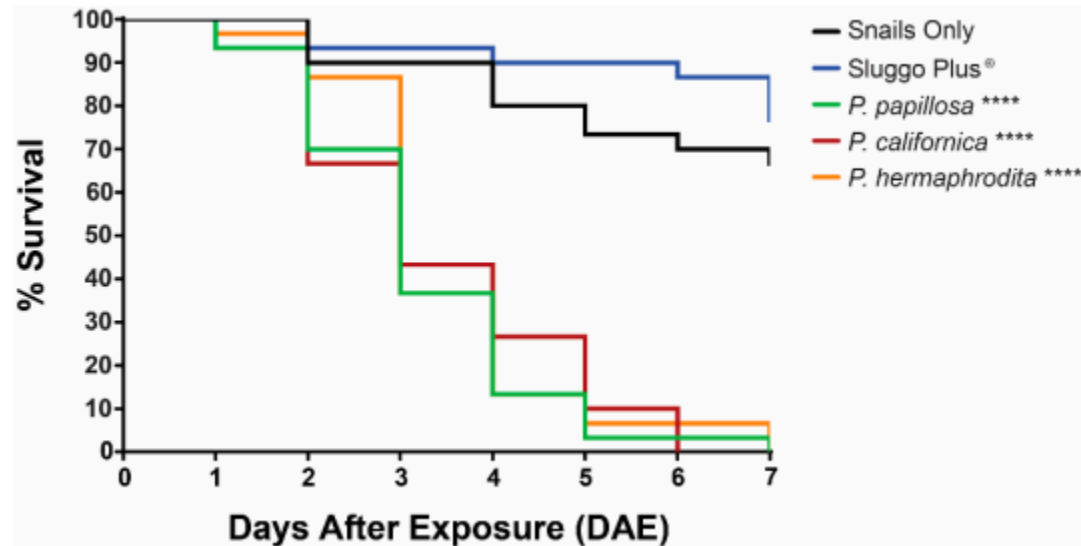


- Cultural: ~~Weed control, tilling,~~ **sanitation**
  - Likely widespread, but avoid introducing to new areas
  - Clean vine source for renovations



# How to apply in cranberries:

- Biological: predatory arthropods ~~and snails, nematodes, vertebrates~~
  - Limit broad-spectrum pesticide applications



**Lethality of Three *Phasmarhabditis* spp. (*P. hermaphrodita*, *P. californica*, and *P. papillosa*) to *Succinea* Snails**

by Jacob Schurkman , Irma Tandingan De Ley and Adler R. Dillman \*



- Nematodes very effective
  - No commercial strains available
  - Native species exist, status unknown in Grayland

# Chemical management: drawbacks

- Sprays
  - Need to apply while actively moving
  - Shell provides protection
- Baits
  - Ability to recover from poisoning
  - Some species are bait-avoidant
  - Juveniles less likely to feed on due to mouthparts
  - Weather dependent
- Limited options available



# Chemical options cont.

- Products registered in WA:
  - Sluggo (iron phosphate bait)
  - Slug-fest (liquid Metaldehyde)
  - Slugger (metaldehyde bait)
  - Stomp Slug (garlic oil)
- Products containing metaldehyde (baits or sprays) CANNOT be applied to cranberry beds
  - residential, and athletic fields, playgrounds, parks, recreation areas, etc.
  - Broadcast applications and applications of this product directed to plant parts are prohibited
- Copper-hydroxide fungicides: primarily thought to be repellent
- Note: Insecticides (Diazinon, Sevin, Fanfare, etc) will NOT kill snails
  - 0.02-0.05% mortality



# Botanical oils: promising new option?

- Pro's

- GRAS: Generally recognized as safe
- Exempt from pesticide registration and residue tolerance requirements
- Application to crop allowed
- 0-day preharvest interval
- Comparable control to liquid metaldehyde
  - Ex: thyme, spearmint, clove, lemongrass, garlic

- Con's

- Snail species vary in response to different oils (trial and error)
- Lab grade essential oils vs commercialized products (%v/v)
- Formulations may cause phytotoxicity or impact fruit quality (strip waxy bloom)
- Off-flavor depending on botanical source (garlic)?
- May be \$\$\$ (rates volume dependent)

# A quick and dirty trial-Thyme oil

## Cup arenas

- Direct spray
- Contact w/canopy
- Residue w/canopy

## Berry quality

- Boom
- Chemigation



<b>ACTIVE INGREDIENTS:</b>	
Thyme oil	23.0%
<b>INERT INGREDIENTS:</b>	
Soap and isopropyl alcohol	77.0%
<b>TOTAL</b>	<b>100.0%</b>

### PRODUCT INFORMATION

**THYME GUARD** is a unique and innovative thyme oil extract based product. It is a 100% biodegradable broad spectrum contact and systemic liquid bactericide, fungicide and insecticide for use in all crops (food and non-food).

### DIRECTIONS FOR USE

Dilute into water at a ratio of 0.5% (2 qt/100 gal) to 0.125% (1 pint/100 gal). Do not exceed 0.25% (1 qt/100 gal) on newly planted crops or crops with a thin leaf wax layer such as tomatoes and cucurbits.

Thyme Guard is tank mixable with most other chemicals. Do not mix with peroxides and/or sulfonated fungicides which may cause phytotoxicity. It can also be used at any time, including on harvest day. Always perform a compatibility jar test prior to mixing with other chemicals. If tank mixing with hard water, lower pH with a pH buffer (acid) to 4 prior to adding Thyme Guard. **SHAKE WELL BEFORE USE.**

**KEEP PRODUCT AGITATED IN THE TANK.**

**THYME GUARD is exempt from EPA registration under FIFRA 25 (b).**

*From the farm to the table... sustainably*

**CAUTION**  
**KEEP OUT OF REACH OF CHILDREN**

### PRECAUTIONARY STATEMENTS

**Precaution:** Avoid getting in eyes, on skin or on clothing. **Thyme Guard requires the use of side shield safety glasses and gloves.** Harmful if swallowed.

**First aid:** If skin contact occurs, remove contaminated clothing and wash with large amounts of soap and water. If in contact with eyes, rinse repeatedly with clean water for 15 minutes. Obtain medical attention for any persistent irritation.

### STORAGE AND DISPOSAL

**Storage:** Keep container sealed tightly when not in use. Store product in a cool location away from direct sunlight and in temperatures between 41° F (5°C) and 77° F (25°C).

**Container disposal:** Dispose of waste material in accordance with federal, state and local environmental laws and regulations.

### CONDITIONS OF SALE

Seller warrants that this product conforms to the chemical description on the label and is reasonably fit for purposes stated on the label when used in accordance with directions under normal use and conditions. Crop injury, inefficacy or other unintended consequences may result from factors such as weather conditions, presence of other materials or the manner of use or application which is beyond the control of seller. In no case shall seller or its affiliates be liable for consequential, special or indirect damages which result from the use, handling or shipping of this product. No warranty is expressed or implied, including





Gather some snails



Simulated canopy



Check for activity before spraying





Recover snails 48-hrs after treatment



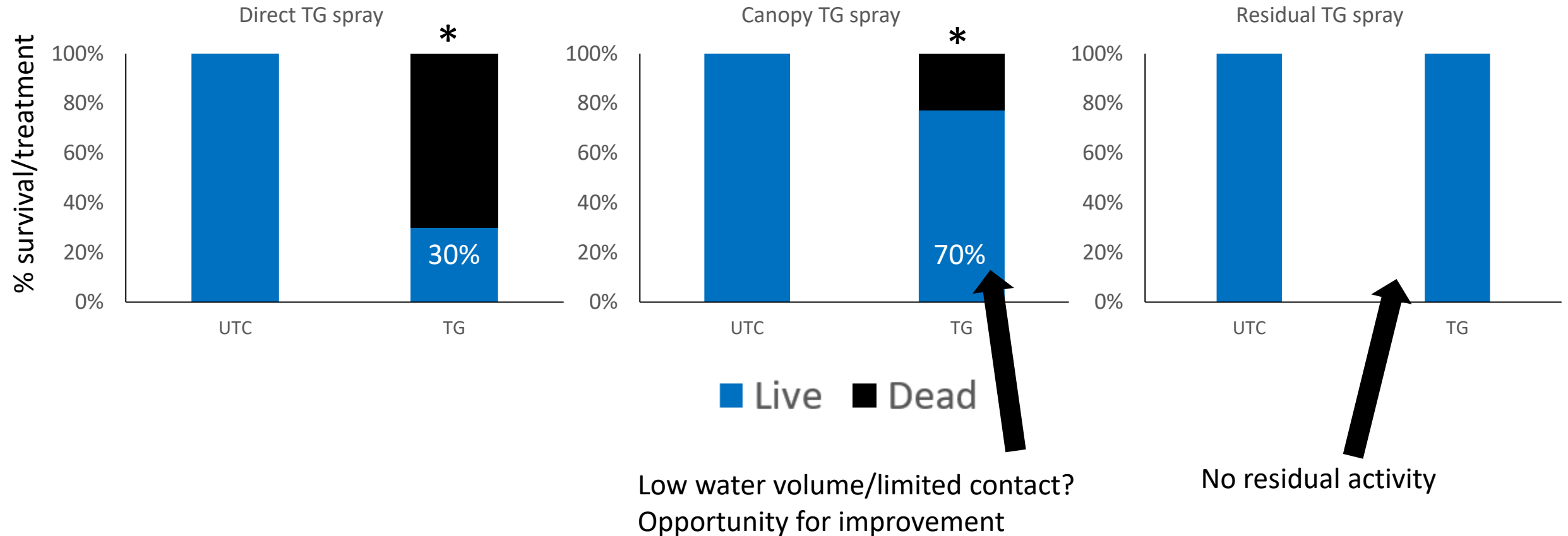
Record mortality



Monitor for zombies because of course they're not dead



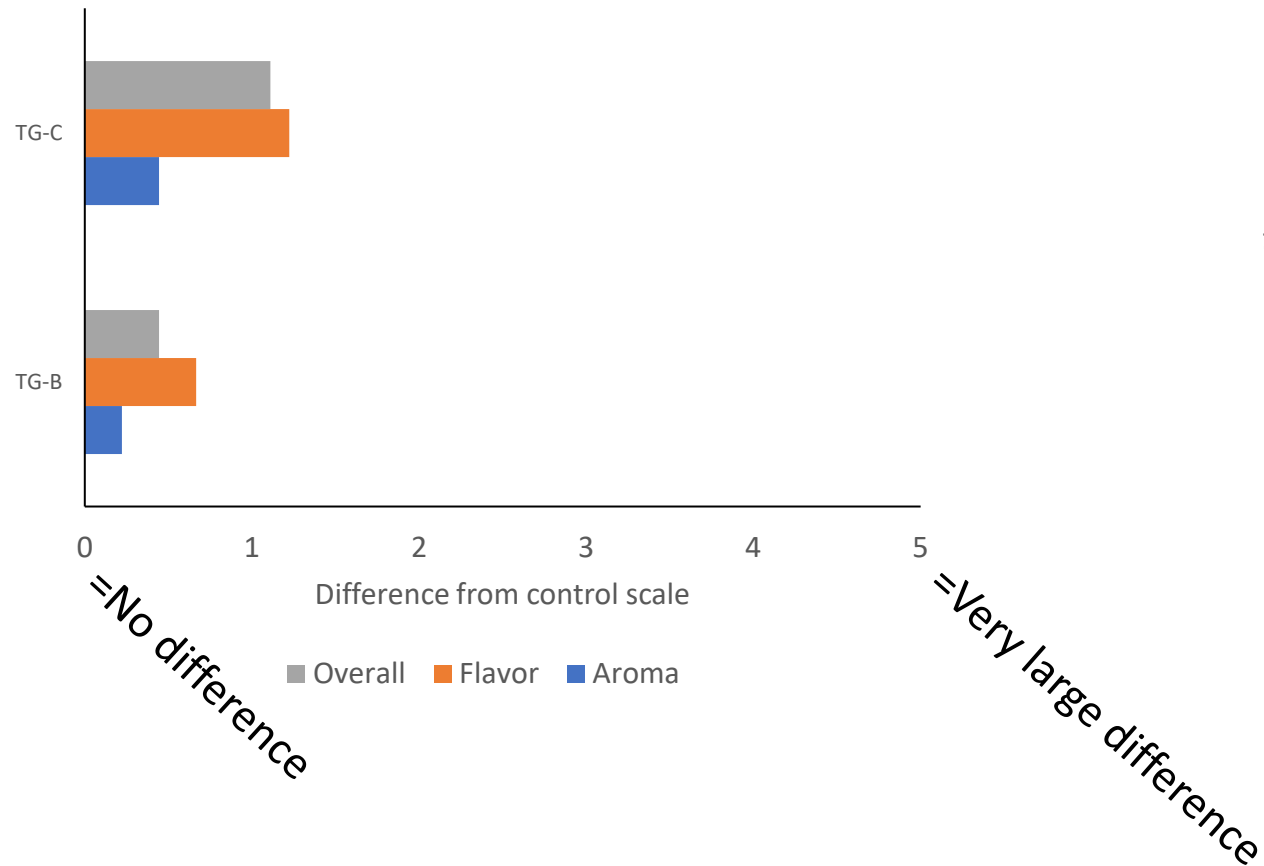
# Thyme Guard snail results



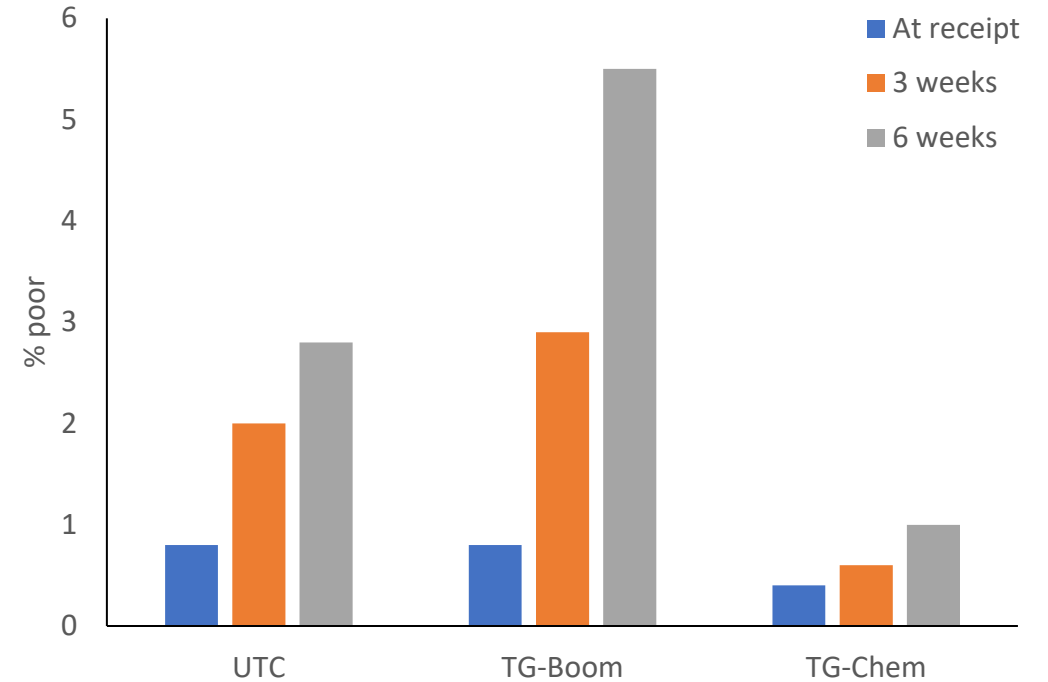
# Post-harvest evaluations

Acceptable to consumer

Sensory evaluation



Keeping quality



Oils can strip waxy bloom in blueberries  
Accelerates decay & decreases shelf-life  
Not replicated=other factors?

# Thyme Guard take-away

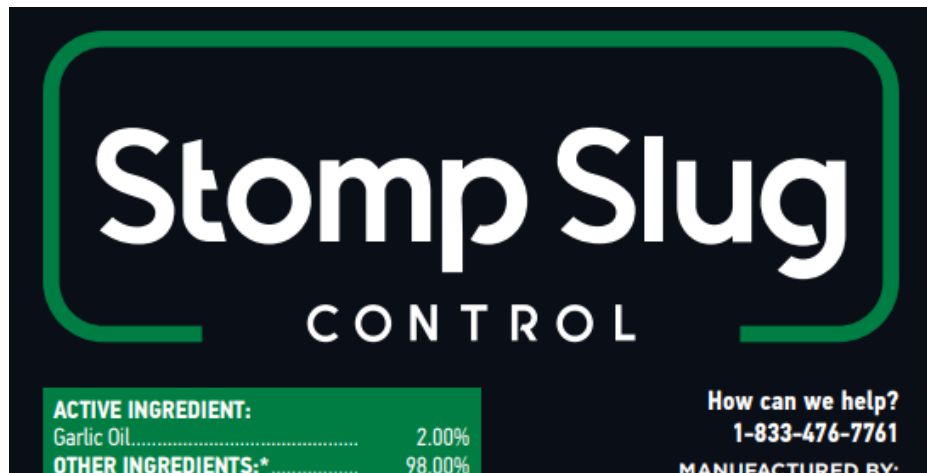
- Applications must be made while snails are active
- Coverage important (higher water volume)
- Low water volume may lead to decreased KQ
- No residual activity, time applications accordingly
  - Migration from non-treated areas?

# What about this year: good news?

- One-off event? TBD
  - High winter mortality w/late on-set of hibernation possible
    - Drained energy reserves (adults)
    - Juveniles not as resilient
- Ability to be proactive: Monitor snail populations



- Opportunity to trial management options before snails become a problem







Questions?