



Whoa, what happened to those trees? And whose fault is it?

# Orchard Herbicide Symptomology Refresher

# Herbicide safety and symptomology

- Most T&V herbicides “can” injury trees, safety is primarily due to placement



# Primary routes of exposure

- Foliar
  - Drift from off-site
  - Drift from within the orchard
  - Vapor movement (volatility, “fuming”)
  - Movement on dust
- Soil/root
  - Good applications vs poor applications
  - Water or soil movement from off site
- Trunk/bark
  - Good applications vs poor applications





Ok, let's see some damage!



# PRE - Root inhibitors (Prowl, Surflan, Treflan)

- Root inhibitors (Prowl, Surflan, Treflan)
  - Stops cell division at root tips
  - “never” see translocated symptoms, rarely and foliar activity (very lipophilic)
  - Above ground may have drought, nutrient deficiency symptoms





**urflan injury to corn**

Slide from W.T. Lanini



# PRE - Cellulose synthesis inhib (Alion, Trellis)

- Few foliar symptoms from root uptake.
  - Rarely translocated.
  - Mostly see stunting due to root system truncation and lack of cell wall components

# PRE – Pigment synthesis inhib (Serono, Command, Solicam, Callisto)

- The “bleachers”
  - Xylem-mobile
  - See in the newest tissue (carotenoids never form) or older tissue (carotenoids not replaced)



Clomazone on squash



Norflurazon on wheat

# Command on walnut (5% rate) 28 DAT



# PRE/POST - Photosystem II inhib (Princep, Karmex)

- Xylem-mobile herbicides. Move with transpiration
  - Chlorosis and necrosis appears at leaf margins first, then moves inward
  - Typically do not move basipitally
    - Can see veinal or interveinal chlorosis



Propanil on almond

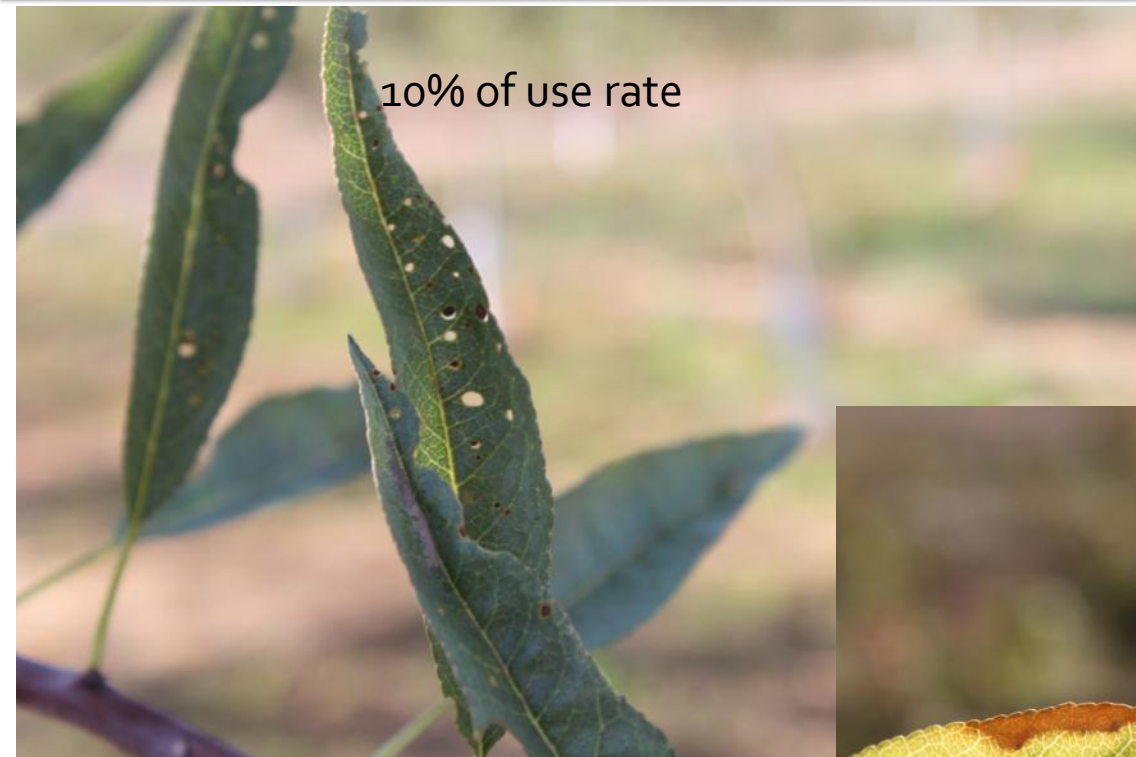


Propanil on cherry (7 DAT)

# Propanil – 28 DAT

10% of use rate

20% of use rate



**Diuron injury  
on Fruitless  
Mulberry**

**Note veinal  
chlorosis**



# PRE/POST - PPO inhibitors (Goal, Chateau, Zues, Treevix, Shark, Venue)

- Rapid injury from membrane disruption
  - Rarely translocated, rarely foliar symptoms from soil uptake
  - Usually see injury only on sprayed leaves, new tissue ok
  - Can look like paraquat, insects, or shot-hole



# PRE – Goal 2XL

- Peach seedling emerging through Goal-treated soil
- Very rare to see translocated symptoms from PPO (but not impossible)





# Goal 2XL



Cherry, 14 DAT

Almond, 28 DAT



# Treevix (7 DAT)



# Treevix soil uptake



# PRE/POST - Amino acid inhibitors - glyphosate

- #1 drift question in tree crops (mostly self-inflicted)
  - Foliar uptake. Slow acting (~7-10 d).
  - Symptoms on young tissue first
    - General chlorosis, stunting of new leaves
    - New growth may have shortened internodes causing “witches brooming”
- Glyphosate can persist in woody plants and show up next season if dose sufficient

# Glyphosate



Prune suckers

Exposed nursery stock  
– last season











# POST glyphosate -28 DAT

5% of use rate



20% of use rate



# PRE/POST - Amino acid inhibitors

## - Rely 280

- Symptoms can vary
  - General chlorosis, necrosis and drooping (ala glyphosate)
  - Sometimes necrotic spots more like a PPO or paraquat
  - Generally faster than glyphosate, slower than PPO
  - Some issues with trunk gumming in almond



# Suspected Rely drift on nursery almond



# Glufosinate – 28 DAT

20% of use rate

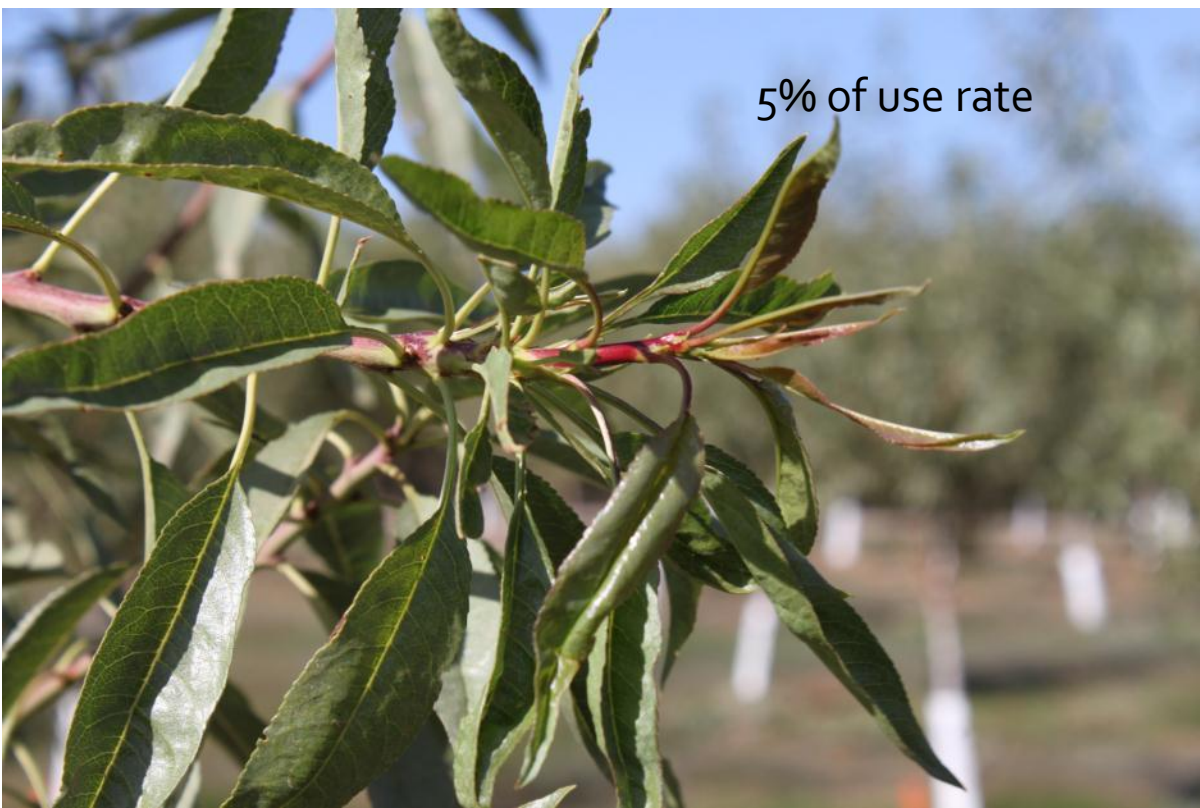


# PRE/POST - Amino acid inhibitors

## - ALS inhibitors (Matrix, Pindar, etc)

- Foliar exposure usually causes a general chlorosis leading to necrosis and leaf drop
  - Newest tissue (meristems) affected first
  - Typically does not “witches broom” like glyphosate
  - Sometimes kill growing points and release lateral buds (branching)

# Penoxsulam – 28 DAT (foliar)



5% of use rate



20% of use rate

# Penoxsulam – 3 MAT (soil)

Mis-spray – rate unknown



# Suspected Pindar GT soil uptake





# ALS inhibitors on walnut 28 DAT



Londax (bensulfuron)



Regiment (bispyribac-sodium)

# Suspected Oust injury on grape -probable soil or water movement from roadway



# POST - Lipid synthesis inhib

## (Poast, Fusilade, Prism)

- Grass-specific herbicides
- Rarely injury on trees or other broadleaf plants (different form of ACCase enzyme)
  - Ex. Hypersensitivity to Clincher in peach



Poast on corn



# POST - Photosystem I inhib (Gramoxone)

- FAST acting.
  - Not translocated (usually).
  - Spotting, and rapid necrosis with limited chlorosis.



Paraquat, cherry, 7 DAT

# Gramoxone - 7 DAT simulated drift



# POST - Synthetic auxins (2,4-D, Transline, Clarity, MCPA, Garlon)

- Hormone mimic. Fast acting (epinasty)
  - More common to see foliar injury, occasionally soil issues (tomato sensitive)
  - Grapes are VERY sensitive



Garlon on watermelon



Garlon on grape cane

# MCPA drift on walnut



# POST - “membrane disruptors” (oils, acids, and organic herbicides)

- Drift damage limited to treated tissue (spots)
  - Looks like many of the PPO inhibitors and Gramoxone
  - Light dose could look like shot-hole or insect damage too
- None of the current products have soil activity at “reasonable” rates



# Symptom variability

- Symptoms can vary widely among:
  - Species
  - Dose/rate
  - Time since exposure

# Not every problem is an herbicide issue

Any ideas?



This turned out to be a natural gas leak!



# Troubleshooting suspected herbicide injury

- A cell phone photo of a completely dead plant from 10 ft away is pretty hard to diagnose!
- Helpful info:
  - Descriptive symptoms and photos
  - Symptom timeline
  - Herbicides and other practices used at site
  - Surrounding crops and weed management
  - Symptoms on other plants?
  - Is there a pattern in the field? (rarely a “magic bullet”)
  - Pull and freeze samples for lab analyses if necessary



# Thanks



Littlejohn Farm