Weed Management in Berry Crops

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Road map

1. Recent research projects
   - Extending weed control in strawberries
   - Raspberry tolerance to Callisto
   - Blackberry tolerance to Matrix
2. What to do about bindweed
3. Weed watch

Extending Weed Control in Strawberries

Objectives

- 1. Refining current use patterns in first year strawberries with sequential applications, and assessing impact on strawberry growth and weed control.
- 2. Screening new products and developing acceptable use patterns.
- 3. Developing long-term solutions for field bindweed.

Post Transplant

May 8

1	Chateau	3	oz/A
2	Chateau +	3	oz/A
	Prowl H2O	3	pts/A
3	Spartan +	8	oz/A
4	Spartan	8	oz/A
	Prowl H2O	3	pts/A

* Not registered

Followed by

(on June 6)

1	Dual Magnum*	1 pt
2	Alion*	2.5 oz
3	Mission*	2.85 oz/A
4	Treevix*	2.01
5	Zidua*	1.00
6	Reflex*	1 pt
7	Spin-Aid*	6 pts/A
8	Upbeet*	1 oz
9	Python*	1.3 oz

Block I

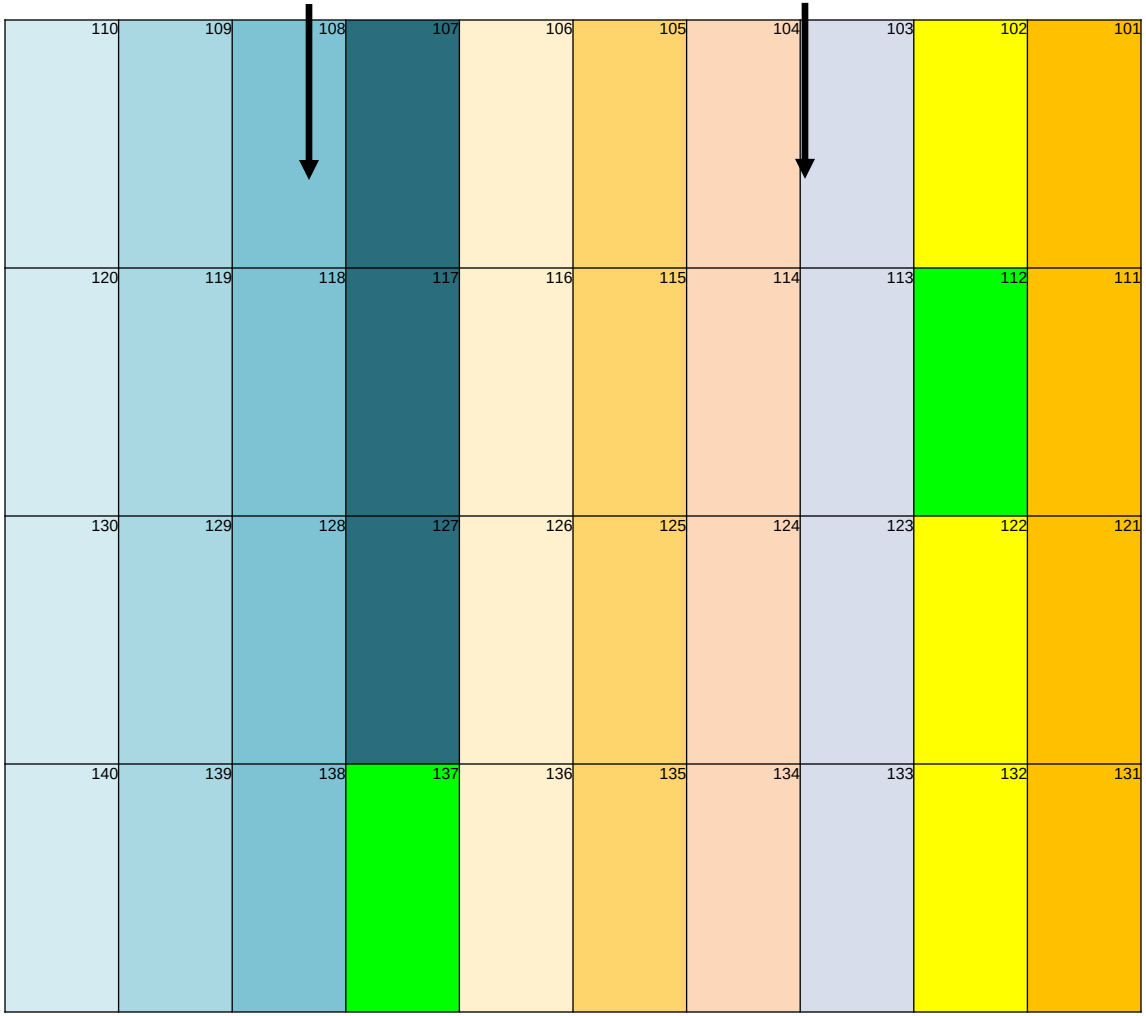
9 new products + 1 untreated

1. Chateau 3oz/A

2. Chateau + 3oz/A
   Prowl H2O 3pts/A

3. Spartan + 8oz/A

4. Spartan 8oz/A
   Prowl H2O 3pts/A



40 treatments

Main effects

Herbicide	Weed control				Crop injury
	Averaged cover all 9 new products		Stand alone		July 11
	----------% ----------				
Chateau	97.5	a	97.5	a	8
Chateau + Prowl H2O	98.3	a	98.0	a	5
Spartan	96.3	b	92.3	b	10
Spartan + Prowl H2O	98.2	a	98.3	a	15

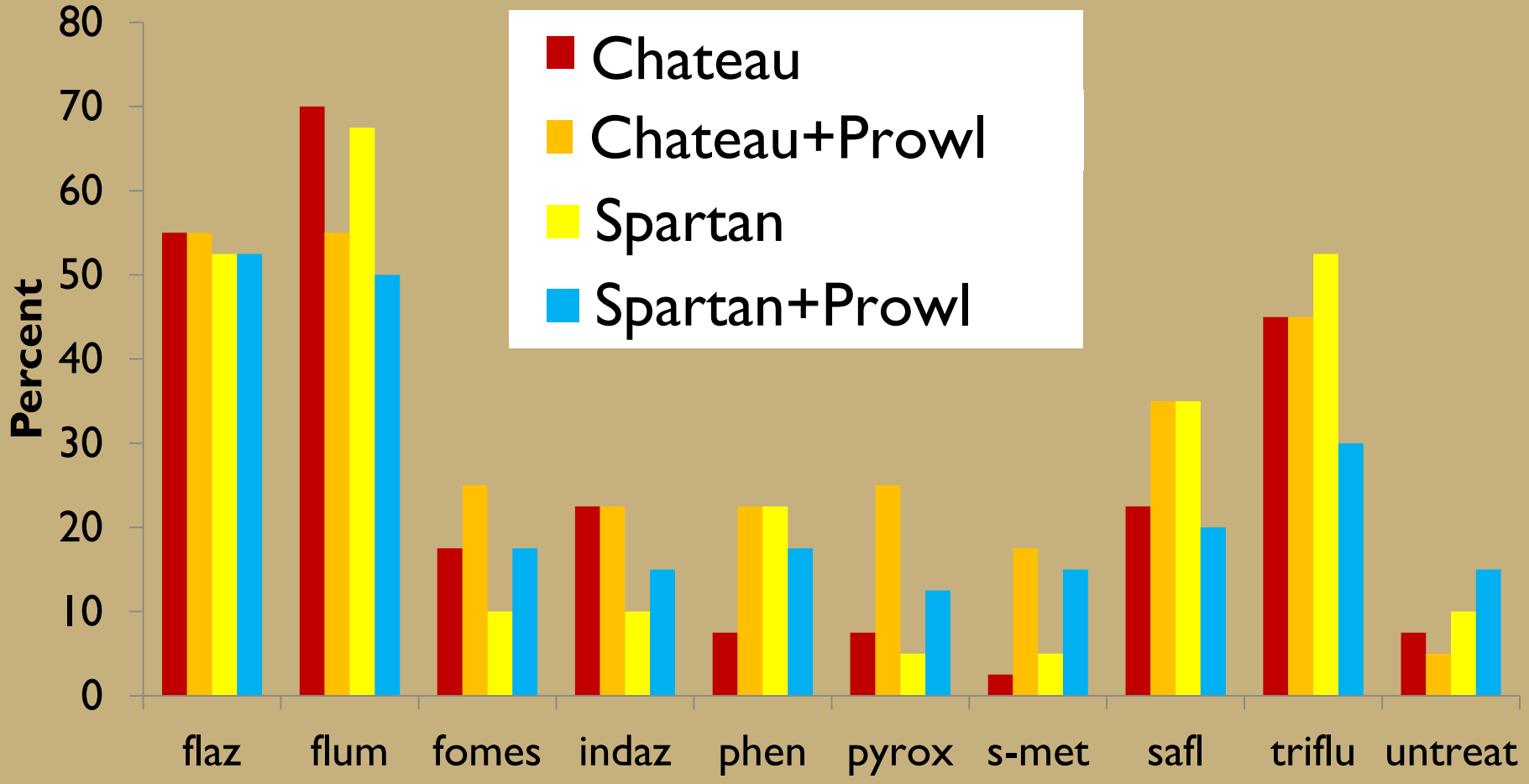
Crop injury

Crop injury

Mission (flazasulfuron)

Upbeet (triflusulfuron)

Crop injury


Chateau
Chateau+Prowl
Spartan
Spartan+Prowl
Percent
80
70
60
50
40
30
20
10
0
flaz
flum
fomes
indaz
phen
pyrox
s-met
safl
triflu
untreat

Weed control

Herbicide	Averaged over all 9 new products		Stand alone	
	% control			
Chateau	97.5	a	97.5	a
Chateau + Prowl H2O	98.3	a	98.0	a
Spartan	96.3	b	92.3	b
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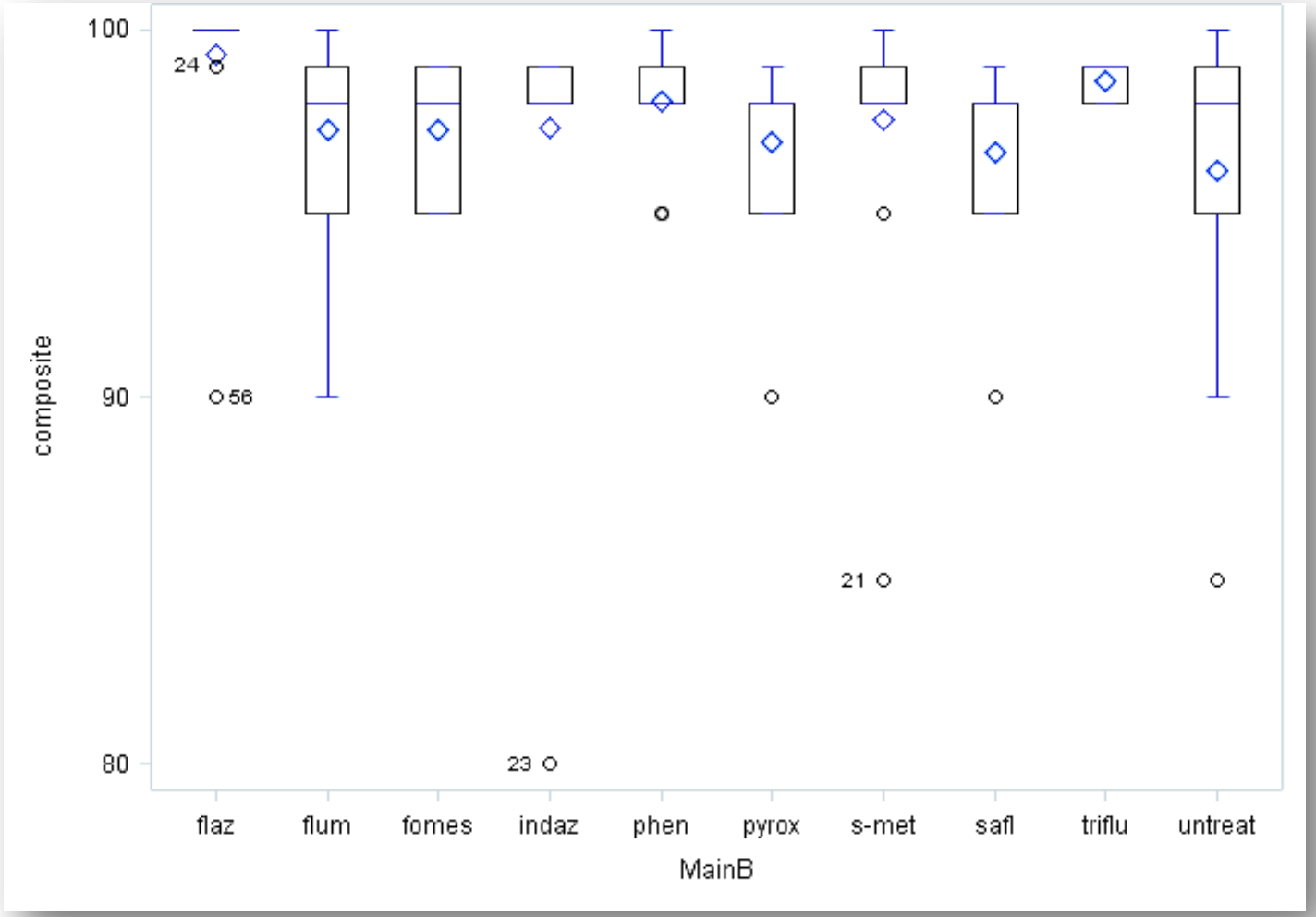
Overall weed control



Crop safety in blue and caneberries

CALLISTO, MATRIX, AND STINGER

CALLISTO

- Soil residual
- Selective POST
  - Seldom see phyto in blueberries
  - Often in blackberries
- Important to remember injury in caneberries is transient
- Must be balanced with the weed control potential

CALLISTO INJURY APRIL 11 2 WAT

WEED CONTROL WITH CALLISTO

Annual grasses

- ANNUAL BLUEGRASS
- BARNYARD GRASS
- CRABGRASS
- GREEN FOXTAIL
- ITALIAN (ANNUAL)
- RYEGRASS
- WILD OAT
- WITCHGRASS

Seedling control

- BEDSTRAW
- CHICKWEED
- CLOVER
- DANDELION
- DOCK
- GROUNDSEL
- HORSEWEED/MARESTAIL
- LAMBSQUARTER
- MUSTARD
- NIGHTSHADE
- PIGWEED
- SHEPHERDS-PURSE
- SMARTWEED
- SPEEDWELL
- WILD CARROT
- WILD MUSTARD

Suppression

- KNOTWEED
- MALLOW
- PUNCTURE VINE

WHY USE MATRIX?

- Quackgrass
- Mallow suppression
- Sunflower family
  - Groundsel
  - Dandelion
  - Marestail

TREATMENTS

1	Matrix fb*	Pre
	Goal	4-6"
2	Matrix fb*	Pre
	Aim	4-6"
3	Goal	4-6"
4	Aim	4-6"
5	Matrix	4-6"
6	Matrix +	4-6"
	Aim	4-6"
7	Matrix+	4-6"
	Goal	4-6"
8	Goal fb	4-6"
	Matrix	3 ft directed to bottom 1 ft of cane
9	Aim fb	4-6"
	Matrix	3 ft directed to bottom 1 ft of cane

AVOIDING INJURY

- Apply Matrix before primocanes emerge
- Apply Matrix after Goal or Aim
- Apply when canes are tall enough to avoid growing points

MATRIX LABEL CHANGES

MAY 14, 2013

Minimum Crop Age for Treatment

- Raspberries with at least one growing season
- Other caneberry crops, at least two growing seasons

Application Timing Based on Crop Stage:

For Every-year Bearing Crops:

- Apply before primocanes emerge in the spring, or wait until primocanes are approximately 3 feet tall or taller and make a directed application.

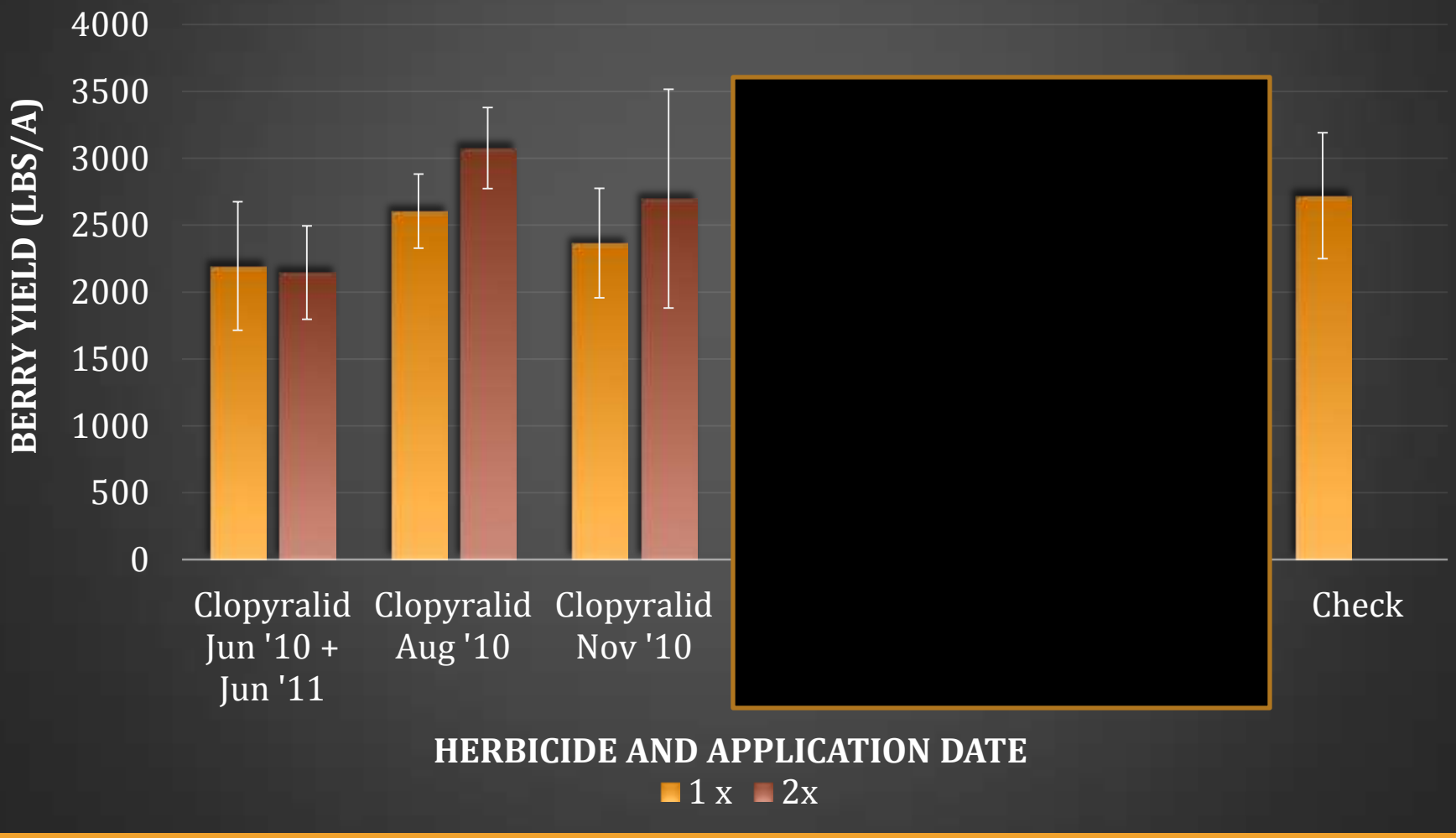
Alternate Year Bearing Crops:

- Apply in the dormant period before canes start new growth or wait until new growth canes are several feet tall so that a directed application can be used.

STINGER

- Ongoing saga
- Dow will not support label
- Despite several years and sites with minimal injury
- Concern of Dow is that consecutive years of use may suppress growth
- Minimizing injury
  - Directed applications
  - Wick applications
  - Alternate years
  - Spot treatments

Raspberry Tolerance to Clopyralid

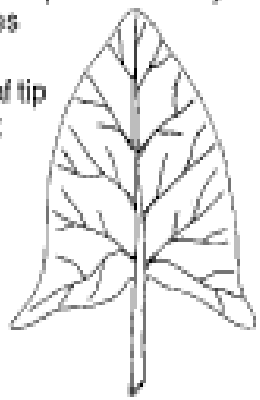
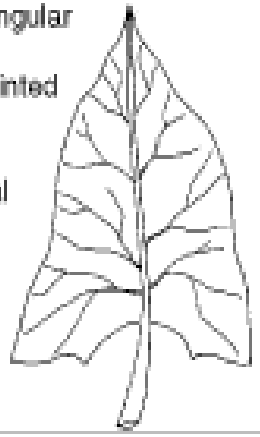
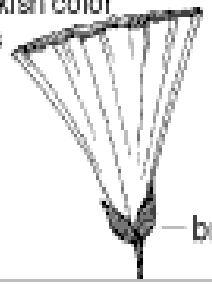
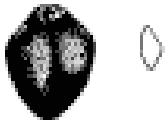


What to do about bindweed?

Field Bindweed

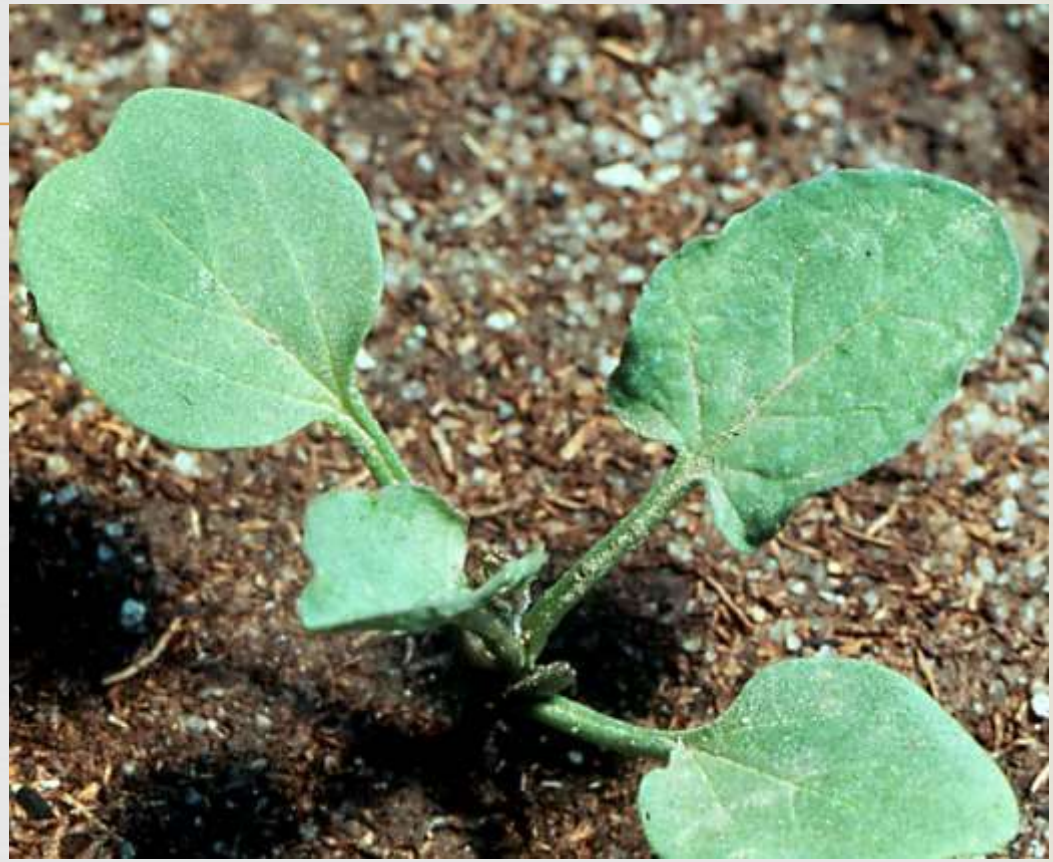
Hedge Bindweed

Hedge vs Field Bindweed

Plant Characteristic	Field bindweed	Hedge bindweed
Leaves	Arrowhead shaped with nearly parallel sides Somewhat rounded leaf tip Single point basal lobe of leaf 	Generally triangular shaped Somewhat pointed leaf tip Double point (square) basal lobe of leaf 
Flowers	¾ to 1 inch wide and ¾ to 1½ inches long White or pink color Flower stalk has two bracts ½ to 2 inches below flower 	1½ to 2 inches wide and 1 to 2 inches long White or pinkish color Large bracts at base of petals 
Roots	Deep perennial taproot	Perennial taproot
Seeds	Dark brownish gray, roughened, 1/3 to 3/16 inch long, with 1 rounded and 2 flattened sides 	Reddish brown to black, with one rounded and two flattened sides, about 1/4 inch long

Courtesy of Richard Zollinger, NDSU

Bindweed: Shoots vs Seedlings



Back to the basics

- Prevention
- Cultural controls
- Mechanical
- Chemical
- Biological

Prevention

- Start with a clean field
- Avoid following perennial crops
  - Low or no tillage sites,
  - Poor herbicide selectivity
  - Think mint
- Do not introduce seeds

Is it possible to deplete carbohydrate reserves of bindweed?

- Rely
  - Burning new shoots of blueberries
- Roundup
  - Unintended contact, too late often
- Paraquat
- Multiple times
- Breaking dormancy of shoots
- Carbohydrate exhaustion

Selective Control with Herbicides?

Quinclorac (Quinstar, Albaugh)

- Postemergence
- Selective control!
- Broadleaves

Weeds controlled with Quinstar

Bindweeds
Canada thistle (suppression)
Clover
Dandelion
Perennial sowthistle

Bedstraw
Dodder
Lambsquarters
Prickly lettuce
Ragweed
Sunflower

Foxtail (green and yellow)
Barnyard grass
Crabgrass

Experiments Testing Caneberry Tolerance to Quinclorac

Blackberries

- 2 sites in AY Marion berries near Dayton in 2008, 2009
- 1 site in EY Marion's (2008, 2009) OSU Botany Farm
- 1st year transplants (tissue culture 2009 OSU Veg Farm)

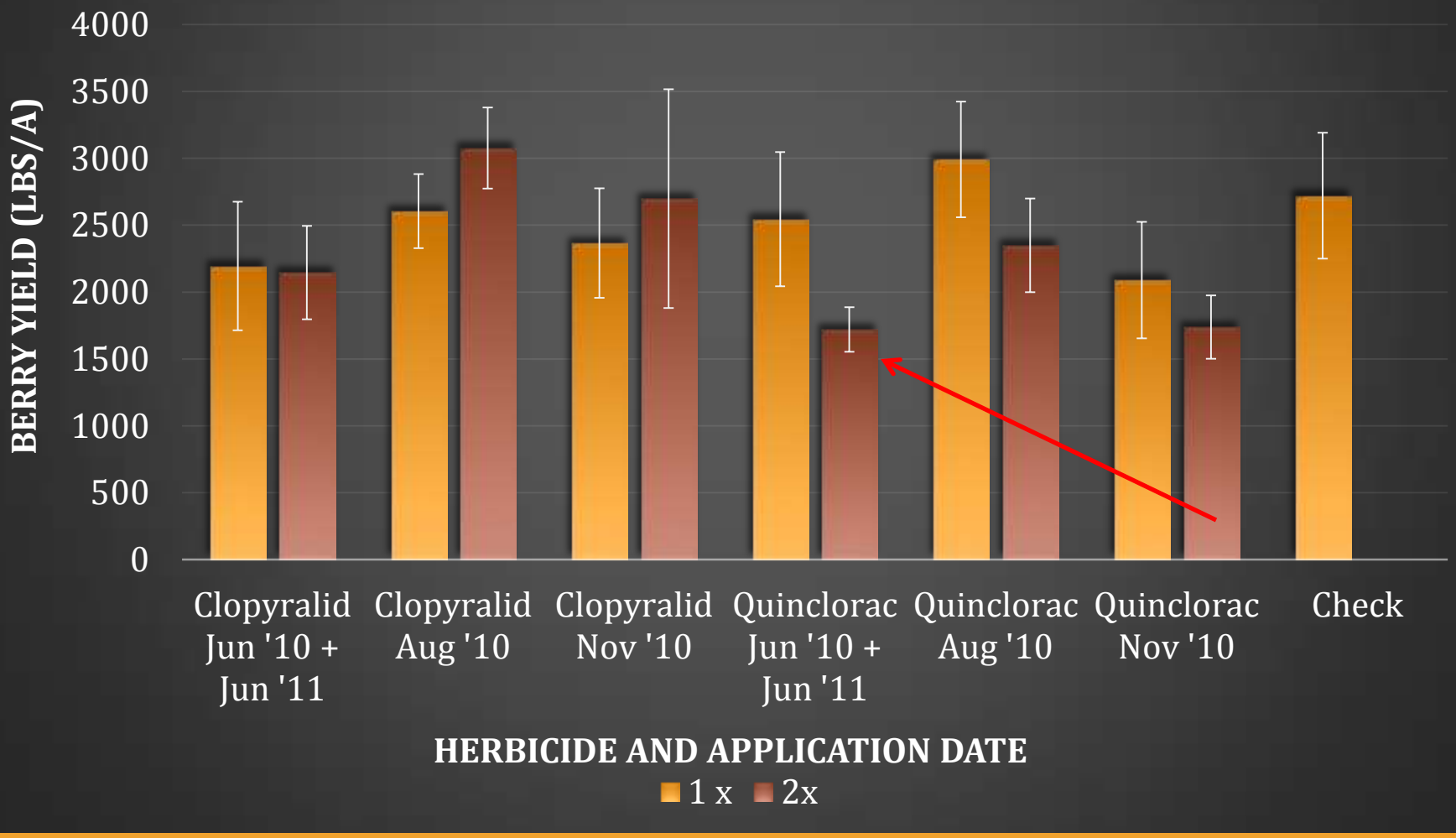
Raspberries

- 1 site at OSU Veg farm (from rooted cuttings, 2009)
- 1 site at Lebanon (2010)
- 1 site at Dayton (2010)

No sign of impact on crop yield at expected label rates

IR-4 residue field studies should be complete

Raspberry Tolerance to Quinclorac



Biological control

Eriophyiid mite
Aceria mahlerbae

All photos by Jessica Green

Bindweed moth

Tyta luctuosa

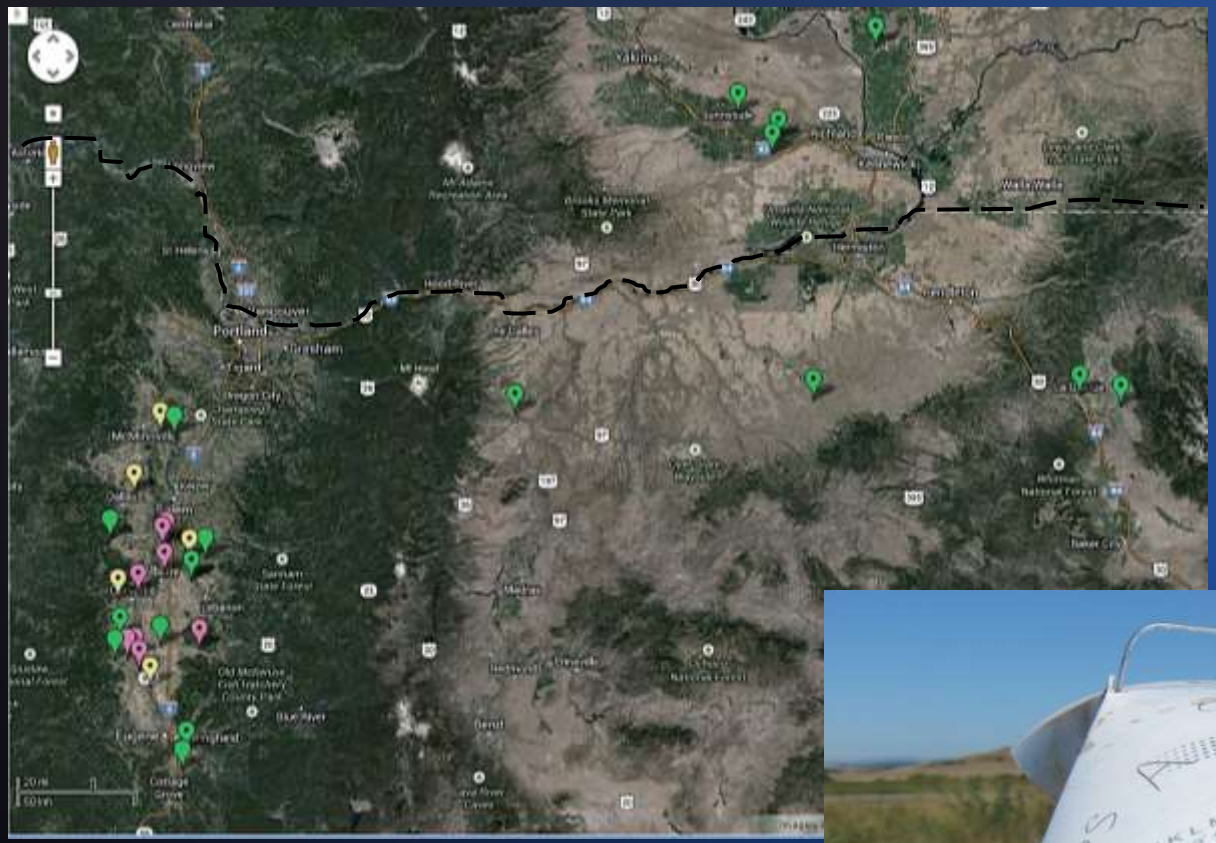
Tyta luctuosa

Tyta luctuosa

- Lep.: Noctuidae
- Distribution in PNW unknown
- Defoliating larvae
- 1-2 generations / year
  - Pupal diapause
  - Daylength, temp cues
- Adults are diurnal

Jessica Green
Research Associate

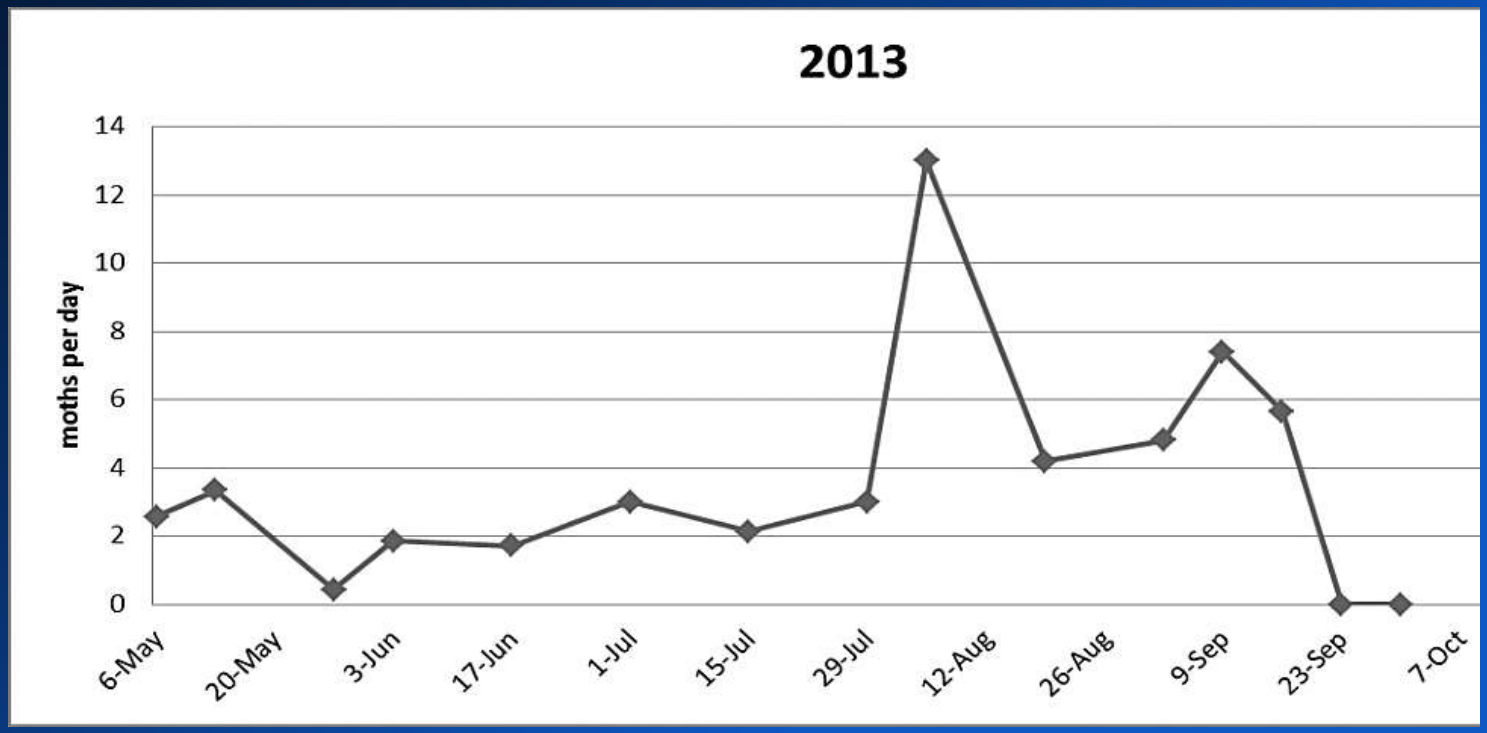
Eric Coombs
ODA



Basket Slough

- Monitoring Adult TL
  - 22 larval release sites
  - ♀ Pheromone
  - Presence / Absence
  - Seasonal activity

- Monitoring Adult TL
  - 22 larval release sites
  - Found moths at 9 sites
  - Seasonal activity possible at Basket Slough



Integrating Biocontrol

- Herbicide timing
- Dispersal capacity
- Refuge

Table 1. List of biological control insects, target weed species and herbicides that can be applied without damage to the insect.

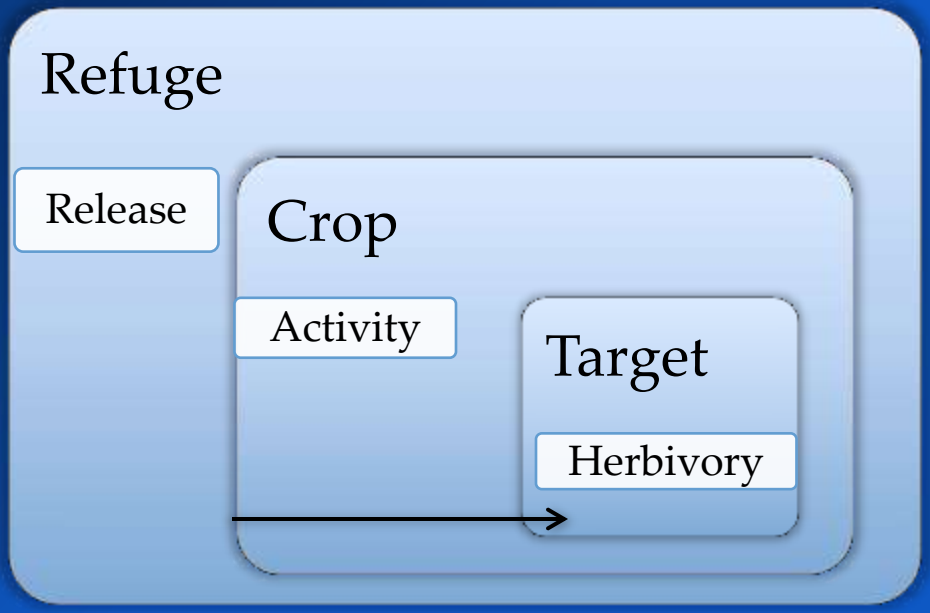
Insect biocontrol agent	Target weed species	Herbicide	Reference
Rhinocyllus conicus Froehlich	*Carduus* spp.	2,4-D	Trumble and Kok, 1980
Cleuthorhynchidius horridus Panzer	*Carduus* spp.	2,4-D	Trumble and Kok, 1980
Sphenoptera jugoslavica Obenberger	*Centaurea diffusa* Lam.	Picloram, Clopyralid	Wilson *et al.*, 2004
Cyphocleonus achates Fahraeus	*Centaurea maculosa* Lam.	Picloram	Jacobs *et al.*, 2000
Urophora affinis Frfld. and *U. quadrifasciata* Meig.	*Centaurea maculosa*	2,4-D, Picloram	McCaffrey and Calihan, 1988; Story *et al.*, 1988
Eustenopus villosus Boheman and *Chaetorellia succinea* Costa	*Centaurea solstitialis* L.	Clopyralid	DiTomaso *et al.* 2006
Hyles euphorbiae L.	*Euphorbia esula* L.	2,4-D, Picloram	Rees and Fay, 1989
Spurgia esulae Gagne	*Euphorbia esula*	2,4-D, Picloram	Lym and Carlson, 1994
Galerucella calmariensis L.	*Lythrum salicaria* L.	Glyphosate, Triclopyr	Lindgren *et al.*, 1999

DiTomaso 2008

Future research

- Refuge concept
  - Release larvae, adults on field edges
  - Baited live traps to pull females into crop
  - Monitor herbivory on targeted FBW patches

- Evaluate
  - Movement
  - % defoliation
  - Weed fitness



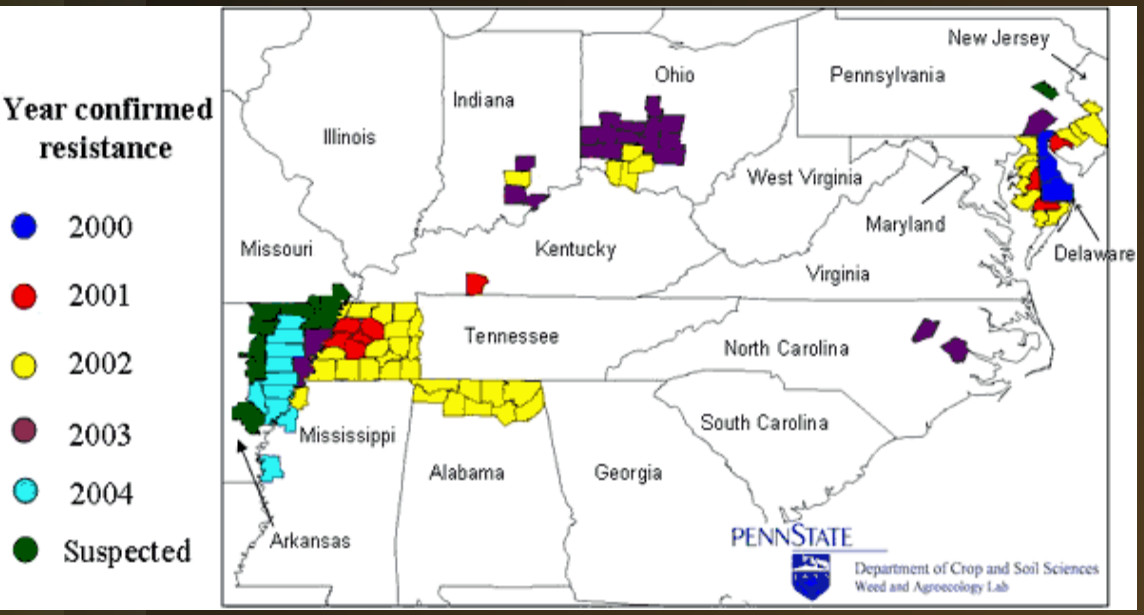
Sharp point fluvellin (*Kickxia elatine*)

Horseweed/ Marestail

Conyza canadensis

- Not horsetail (Equisteum)
- Asteraceae (sunflower family) *think dandelion*
- Annual, winter, summer
- Glyphosate resistant in many places in E US, CA

History of Glyphosate Resistance



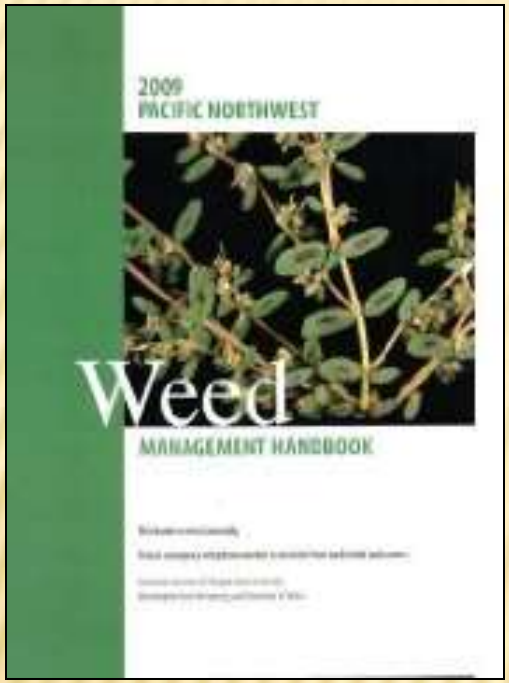
Testing for Roundup Resistance

1	Wilsonville, Nursery
2	Canby, NWREC
3	Schultz, Monroe
4	Old River Rd, Monroe
5	Bellfountain
6	Talbot
7	Dayton
8	Jefferson I
9	Lincoln
10	Stayton
11	Jefferson II
12	Aurora
13	Boardman I Poplars
14	Boardman II Poplars
15	Patterson, WA, blueberries
16	Grandview, WA, vineyard,I
17	Grandview, WA, vineyard, II
18	Sunnyside, WA, mint
19	Gly susceptible Hanson CA

Not glyphosate resistant

Weed Management

Horticulture Dept
OSU



Hazelnuts, cane and blueberries, Christmas trees, nursery, rhubarb, bindweed control

Research Reports

http://hort.oregonstate.edu/faculty-staff/peachey

Weed Management Handbook

Google: PNW WEED HANDBOOK