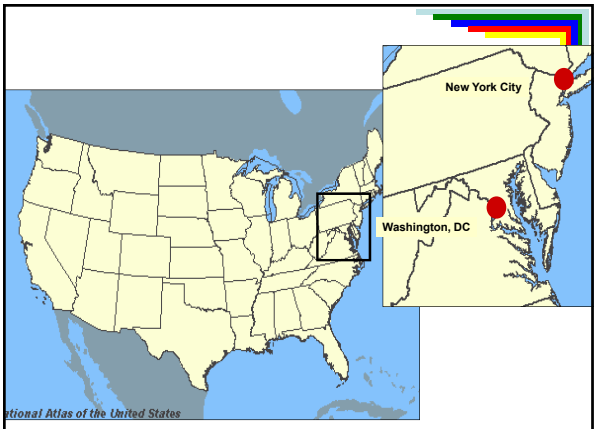
Conyza species

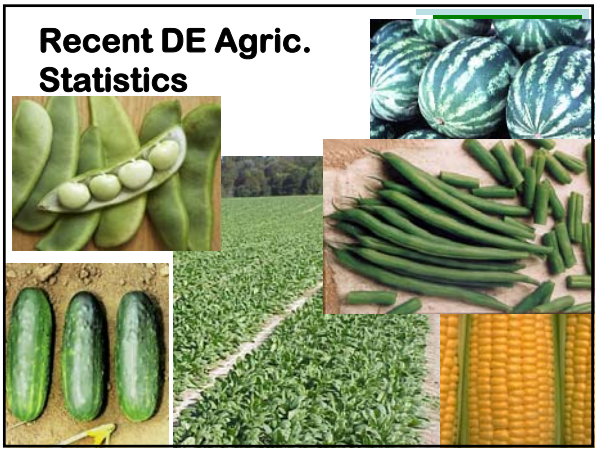
Mark VanGessel
Weed / Crop Management

Topics

- Introductions
  - Where am I?
- Overview of agriculture in USA
- *Conyza* species
- *Conyza* biology and ecology
  - Emphasizing *Conyza canadensis*
- *Conyza* and herbicide-resistance



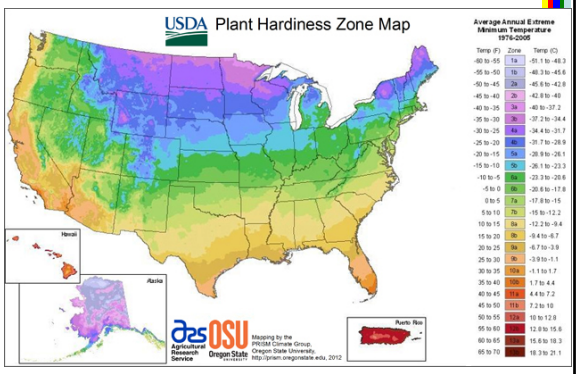
Recent DE Agric. Statistics



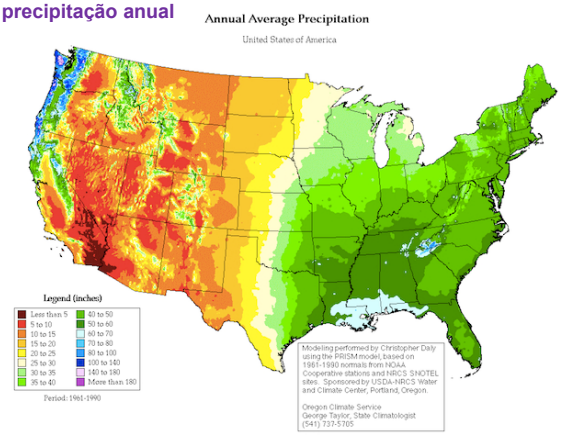
Recent DE Agric. Statistics

Milha 75,000 ha
Soja 80,000 ha (44,000 ha FSNT)
Trigo and cevada 35,000 ha
Vegetal (processo) 20,000 ha
Vegetal (fresco) 6,000 ha
Frango (carne) 252 million produced

zonas de robustez

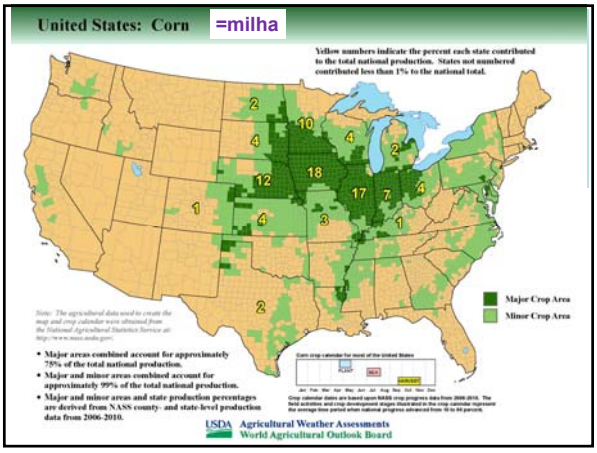


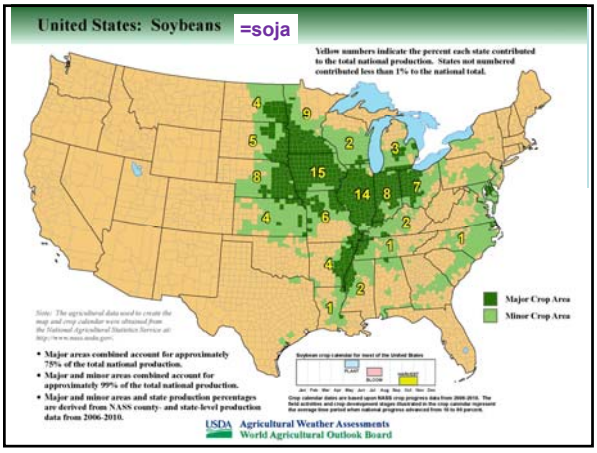
precipitação anual

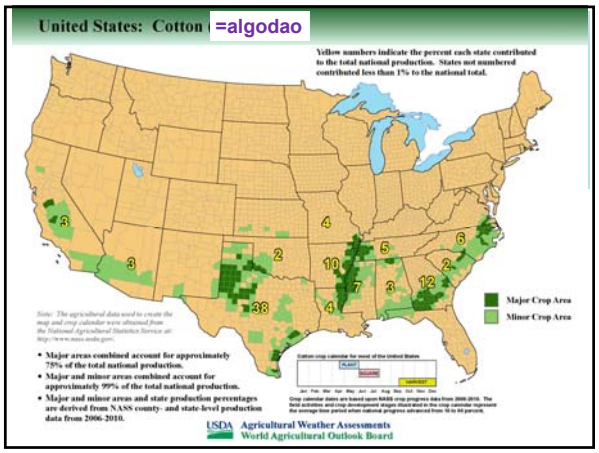


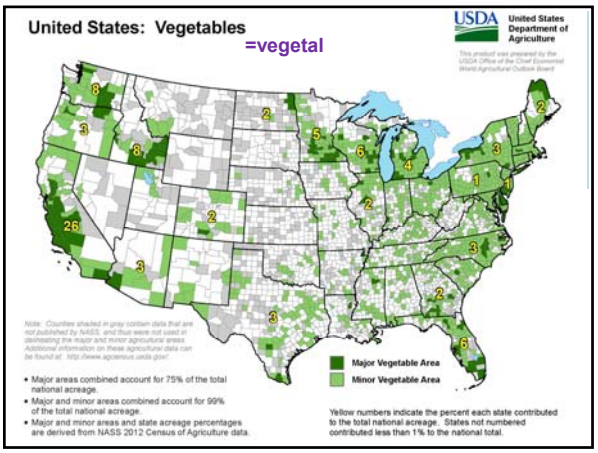
Area Planted

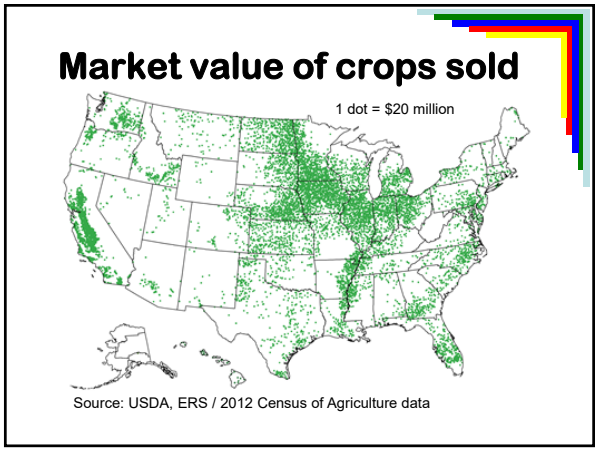
Crop	ha	%	Crop	ha	%
soja	32.8	24.9	arroz	1.1	0.8
milha	32.7	24.8	girassol	0.8	0.6
trigo (all)	22.1	16.8	canola	0.7	0.5
__inverno	16.0	12.1	feijoes secos	0.7	0.5
__primavera	7.7	5.8	centeio	0.6	0.5
choheita do feno	22.0	16.7	amendoins	0.6	0.5
__alfalfa	7.2	5.5	beterraba	0.5	0.4
__other hay	14.9	11.3	ervilhas secas	0.4	0.3
sorgo	3.4	2.6	batatas	0.4	0.3
algodão	3.3	2.5	vegetal (fresco)	0.6	0.5
cevada	1.5	1.1	vegetal (processo)	0.4	0.3
aveia	1.3	1.0			

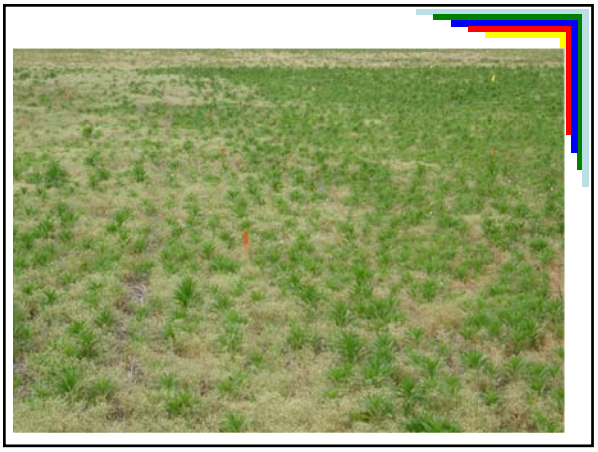





United States: Cotton
=algodao
Yellow numbers indicate the percent each state contributed to the total national production. States not numbered contributed less than 1% to the national total.
Major Crop Area
Minor Crop Area
• Major areas combined account for approximately 75% of the total national production.
• Major and minor areas combined account for approximately 99% of the total national production.
• Major and minor areas and state production percentages are derived from NASS county- and state-level production data from 2006-2010.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board


United States: Vegetables
=vegetal
USDA United States Department of Agriculture
Major Vegetable Area
Minor Vegetable Area
• Major areas combined account for 75% of the total national acreage.
• Major and minor areas combined account for 99% of the total national acreage.
• Major and minor areas and state acreage percentages are derived from NASS 2012 Census of Agriculture data.
Yellow numbers indicate the percent each state contributed to the total national acreage. States not numbered contributed less than 1% to the national total.


Market value of crops sold
1 dot = $20 million
Source: USDA, ERS / 2012 Census of Agriculture data



Conyza

- In Asteraceae family
- Genus contains about 50 species world-wide
- *Conyza canadensis* and *Conyza sumatrensis* most wide spread across the globe

Conyza Species

- *Conyza canadensis*; formerly *Erigeron canadensis*
  - horseweed, marestail, Canadian fleabane
- *Conyza bonariensis*
  - hairy fleabane, flaxleaf fleabane; *C. crispa*
- *Conyza sumatrensis*
  - Sumatran fleabane; *C. albida*
- *Conyza primulifolia*
  - Chilean fleabane

Other *Conyza* species in USA

- *C. floribunda*
- *C. laevigata*
- *C. ramosissima*

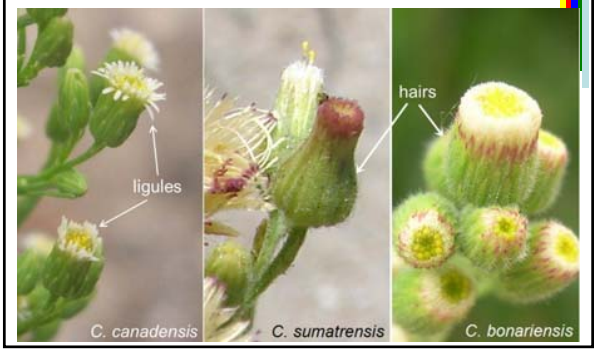
Conyza species

- *C. sumatrensis* is generally larger
  - hairy bracts but there are no long hairs near the top of the bracts
  - toothed leaves
- *C. bonariensis* is moderately sized
  - densely hairy bracts, is especially hairy on the stems and around the leaf axils
  - toothed leaves

Conyza species

- *C. canadensis* is moderately sized
  - glabrous (hair free) or almost glabrous
  - toothless leaves
  - smallest seedhead
- *C. primulifolia* is smaller
  - largest seedhead

Capitula (seedheads)



	Conyza canadensis	*Conyza bonariensis*	*Conyza sumatrensis*
LEAVES	yellowish green, seedling leaves hairy adult leaves glabrous, (hairless) except leaf edges	greyish green very hairy	greyish green very hairy
	petiole narrow	petiole narrow	petiole broader in middle
	single visible rib	single visible rib	secondary veins visible
STEMS	glabrous	very hairy	very hairy
Average height (m)	1.5	1	2
Branching habit	branching from middle of main stem	secondary branches often taller than main stem & from the base	branching towards top of main stem
FLOWERS	ray florets white, ligulate slightly protruding	tubular, ray florets greenish yellow	tubular, ray florets cream
	inner disc florets yellow	inner disc florets inconspicous, white	inner disc florets inconspicuous
Bracts of the involucre	glabrous brownish inner surface	densely hairy, some long hairs at apex are	hairy but no long hairs near apex
	pappus cream	red/purple tipped	pale at the top

Table 1. Distinguishing features of three Conyza species (Sansom 2011)

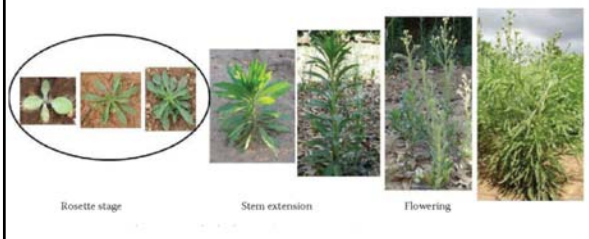
Figure 3. Horseweed seedling (left); hairy fleabane seedling (above). *Photos:* K. Hembree.

Identification to species can be difficult
Hybridization is suspected based on genetic research in Brazil

Similarities among *Conyza* spp.

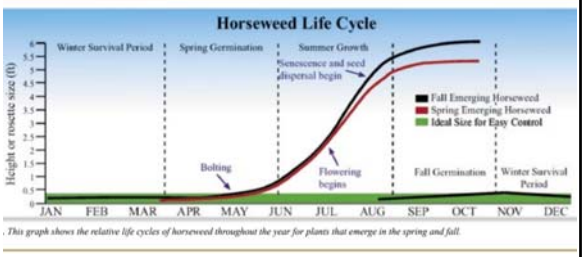
- Annual species
  - –also listed as biennial by some sources
- Early succession species
- Taproot
- Rosette followed by bolting (upright growth)
- Tall
- Large number of seeds with pappus

Stages of development



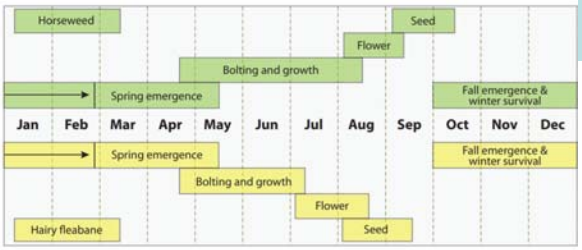
Conyza control options with glyphosate (Saborido 2011)

Life-cycle of C. canadensis in North America



Biology and Management of Horseweed, Purdue University

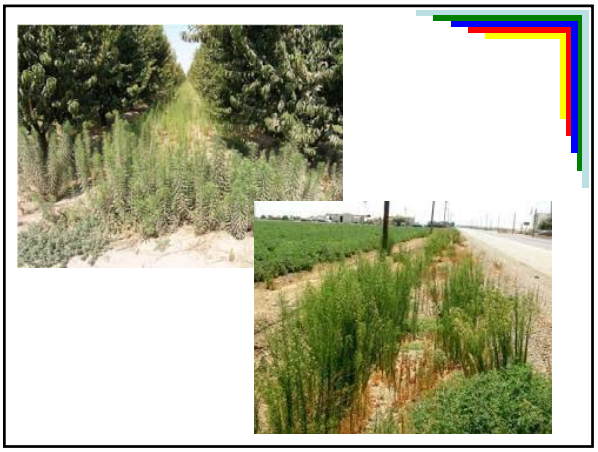
Life cycle of C. canadensis and C. bonariensis



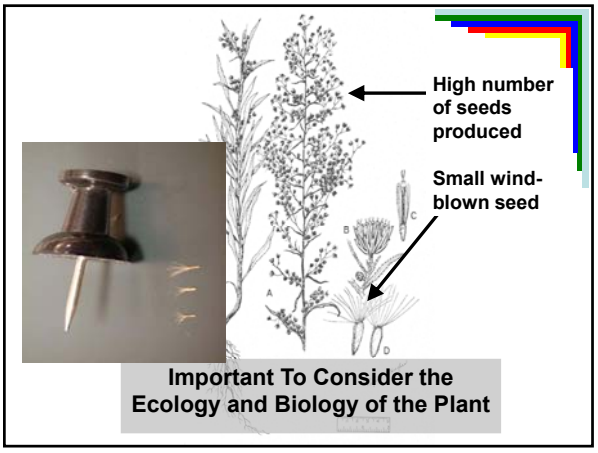
Shrestha etal. 2008, UCDavis Pub 8314

Infested sites

- Grain and row crops
  - corn, soybeans, cotton, wheat
- Perennial crops
  - coffee, orchards, grapes, nut crops, berries
- Nurseries
- Forests
- Industrial sites, roadsides, fencelines, railways




MM
1
2
3
4
5


High number of seeds produced
Small wind-blown seed
Important To Consider the Ecology and Biology of the Plant

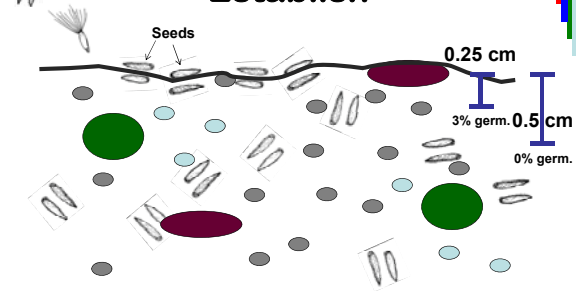
Dispersal

- Seed is capable of moving in the atmosphere for >100 km
- Are seeds able to move secondary movement?
  - Move with wind after reaching the ground

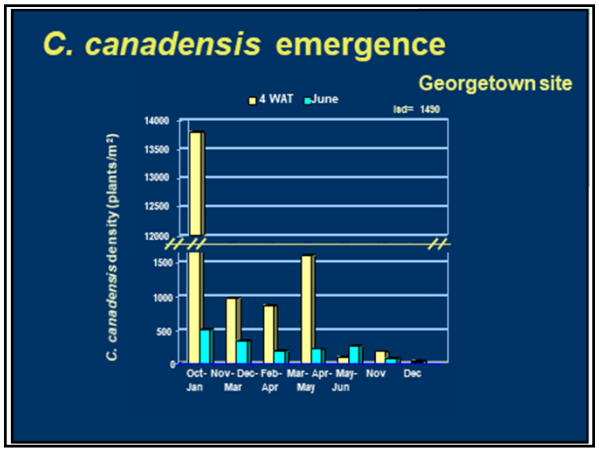
Seed Biology

- *C. canadensis* germinates readily in without light

Seeds Must be at Soil Surface to Germinate and Establish



Nandula, et al., Weed Sci. 2006



Emergence

- Similar patterns reported with *C. sumatrensis*
  - 80% fall emergence and 20% spring emergence in Argentina

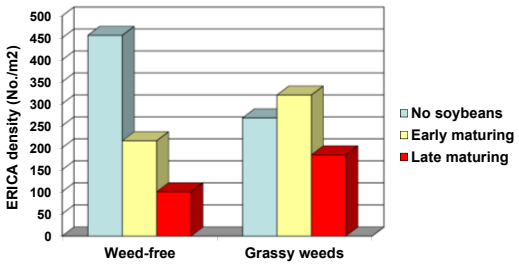
•Seedlings found in “open area”
•Seedling density much lower under crop canopy

•What is impact of plant canopy?

Impact of Open Canopy on Fall Density

- Soybeans
  - none
  - Group III
  - Group IV
- Annual grasses

Impact of Open Canopy on Fall Density



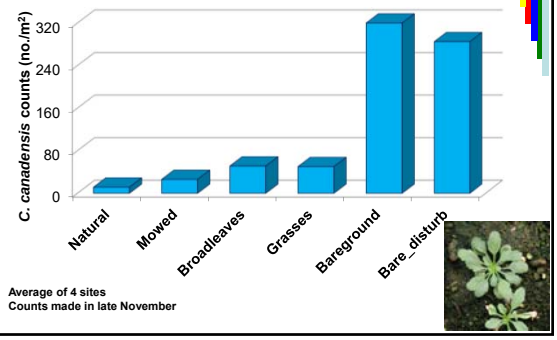
Safe-Sites for Development

Looked at number of plants to develop in:

- Natural vegetation
- Natural vegetation - mowed
- Perennial grasses only
- Broadleaves only
- Bare ground
- Bare ground - disturbed

Spread Seeds in the Fall and Monitored for Emergence

Seedling Establishment



Effect of Crop Residue on ERICA Establishment

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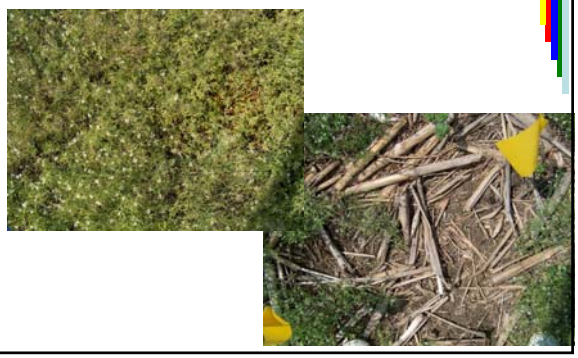


Effect of Crop Residue on ERICA Establishment

- Interaction with crop residue
  - Higher horseweed densities with less residues and/or “more fragile” residue
  - Quick establishment of other weed species may prevent horseweed from establishing

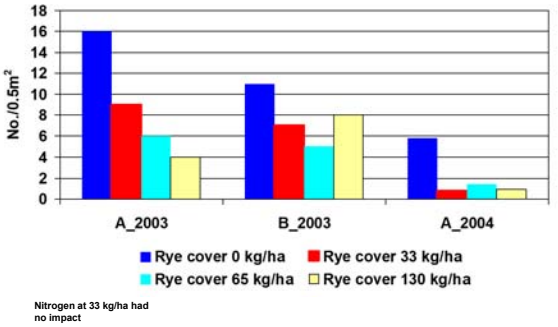
Effect of Winter Cover Crop

- Popularity of cover crops for nutrient management

Effect of Rye on ERICA Establishment

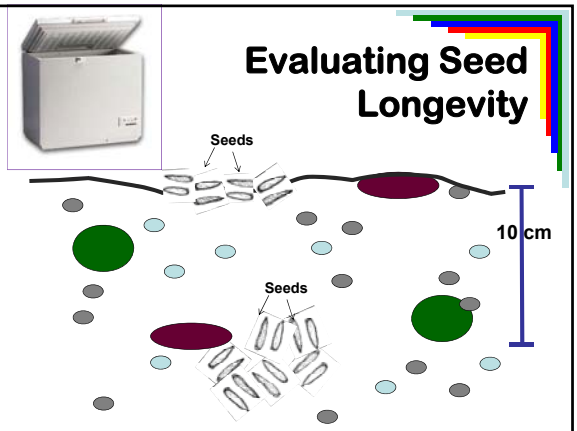
- Rye seedling rates
  - 0
  - 0.5 bu/A = 33 kg/ha
  - 1 bu/A = 65 kg/ha
  - 2 bu/A = 130 kg/ha
- Spring nitrogen applications
  - 0 or 33 kg/ha

Effect of Rye on ERICA Establishment



Nitrogen at 33 kg/ha had no impact

Evaluating Seed Longevity



Seed Longevity

- Seeds maintained in freezer had almost 100% germination at 36 mos
- Seeds buried 10 cm 30% germination at 18 mos and 15% at 36 mos
- Seeds on soil surface had 5% germination at 12 mos and continued to decline to 36 mos

Other

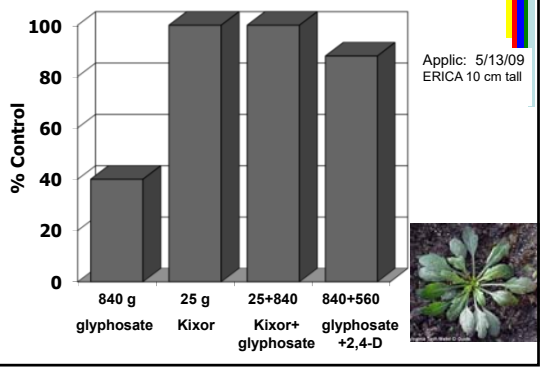
- Allelopathic compounds have been identified that suppress germination and growth of other weed species
- At high densities, plants respond with reduce height, branching, and biomass, as well as fewer seeds
- C. bonariensis also host for important insect pests in Brazil
  - Stinkbugs and caterpillars

GR *Conyza canadensis* Management in DE

- Not an issue to control in maize
- Tillage
- Use of 2,4-D (soybeans) pre-plant
  - re-plant restrictions / more management
- Glufosinate or saflufenacil
- Use of residual herbicides

2009 UD-REC

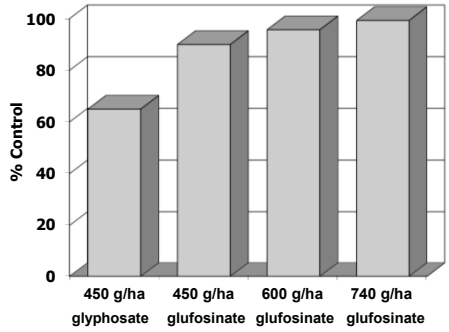
Control 4 WAT



2009 UDREC

C. canadensis Control 2 WAT

10 cm tall at application



Apply Based On Weed Size

Brazil Trial

- glufosinate (400 g/ha)
- glyphosate (1440 g/ha)
- glufosinate + metribuzin (400 + 960 g/ha)
- glyphosate + metribuzin (1440 + 960 g/ha)
- glyphosate + diuron (1440 + 1000 g/ha)
- glufosinate + diuron (400 + 1000 g/ha)
- **Hairy fleabane: *Conyza bonariensis***
- **Horseweed: *Conyza canadensis***

Brazil Summary

- Treatments containing glufosinate were more effective in horseweed and hairy fleabane control than glyphosate
- Glufosinate plus metribuzin or diuron provided residual control for more than 60 days after the application

Delaware

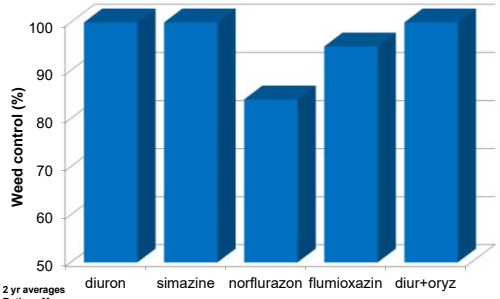
- Conducted two years
  - Peach trees with GR-ERICA seeds
- Applied in late fall of 2007 and 2008
- Visual weed control ratings in May after application

Treatments

- Glyphosate (840 g/ha) alone
  - + diuron (1700 g/ha)
  - + simazine (2800 g/ha)
  - + norflurazon (1700 g/ha)
  - + flumioxazin (336 g/ha)
  - + diuron + oryzalin (1680 + 2240 g/ha)

Peach Trees

***Conyza canadensis* control**



2 yr averages
Ratings May
6 mos after applicaiton

How resistance in agronomics can impact vegetables:

- **More seed production (seedbanks) and greater likelihood for seed movement**
- **GR resistance can be issue for cover crop management**

MJV1

Herbicide Site of Action

C. canadensis

Herbicide group	Site of Action	Active ingredient		Multiple
G / 9	EPSP	glyphosate		D, B
D / 22	PS I Electron diverters	paraquat		G
C1 / 5	Photosystem II	atrazine		C2, G
B / 2	ALS	chlorimuron		G, C1
C2 / 7	Photosystem II	linuron		C1

First Report in 1980, Group D

C. bonariensis: G, D, C1, D+G
C. sumatrensis: G, B, D, E, B+G, B+D+G

First report 1987, Group C1
First report 1980, Group D

Weedscience.org April 2018

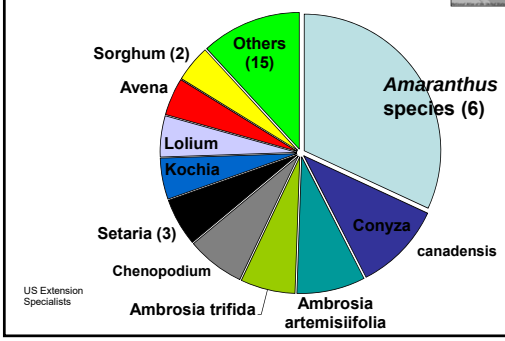
Slide 77

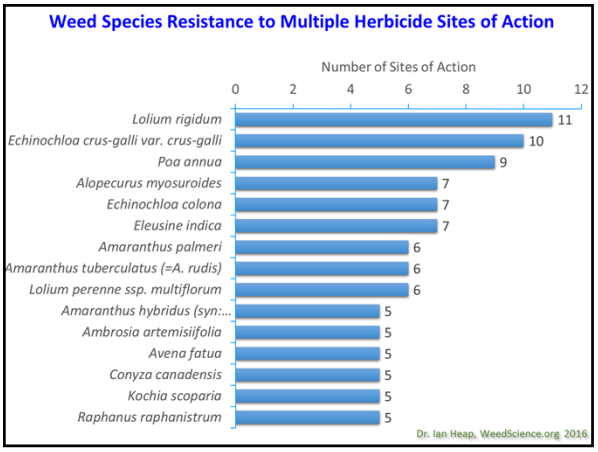
MJV1 Mark J. VanGessel, 4/10/2018

HR *Conyza* species

- *Conyza canadensis* (62)
  - Australia, Asia, Europe, Middle East, North America, South America
- *Conyza bonariensis* (18)
  - Australia, Europe, Japan, Middle East, North America, South America, South Africa
- *Conyza sumatrensis* (10)
  - Asia, Europe, South America
- *Conyza primulifolia* (none reported)

What Species Are Most Troublesome?





Resistance in *Conyza*

- In Israel, C.c and C.b collected from roadsides 90% resistant to pyrithiobac
  - However, very little of this herbicide is used
- *C. canadensis* glyphosate non-target site (reduced translocation) is most commonly reported
  - also target-site (Pro-106-Ser), higher level of resistance
- Reduced translocation also reported in *C. bonariensis*

Resistance

- Outcross of HR genes (R to S populations) occurs (~5% in controlled studies)
- Pollen movement
  - 2.5% of pollen from source was deposited ~450 m downwind
  - Pollen able to rise up to 100 m in atmosphere

Applying *C. canadensis* Ecology to Management

- Has been beneficial for making more informed decisions – i.e. need for residual herbicides; need for more integrated approaches (cover crops); eliminating *C. canadensis* from seedbank not practical
- Still more work to be done; has not found the "silver bullet"
- Concern with multiple resistance
  - Cover crops in combination with fall herbicide treatments look promising

What Makes *Conyza* Unique?

- It's ability to disperse locally as well as over great distances
- Treat as if HR biotype is the predominate biotype in the area
- Well adapted to no-till or perennial crop production