**Coryza species**

emphasis on *Coryza canadensis*

M. VanGessel

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**Topics**

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

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**Recent DE Agric. Statistics**

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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.

Area Planted

<table>
<thead>
<tr>
<th>Crop</th>
<th>ha (mil)</th>
<th>%</th>
<th>Crop</th>
<th>ha (mil)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>soja</td>
<td>32.8</td>
<td>24.9</td>
<td>arroz</td>
<td>2.6</td>
<td>1.1</td>
</tr>
<tr>
<td>milha</td>
<td>32.7</td>
<td>24.8</td>
<td>girassol</td>
<td>0.8</td>
<td>0.6</td>
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<tr>
<td>trigo (all)</td>
<td>22.1</td>
<td>16.8</td>
<td>canola</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>_inverno</td>
<td>16.0</td>
<td>12.1</td>
<td>feijoes secos</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>_primavera</td>
<td>7.7</td>
<td>5.8</td>
<td>antelo</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>chouette do feno</td>
<td>22.0</td>
<td>16.7</td>
<td>amendons</td>
<td>0.6</td>
<td>0.5</td>
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<tr>
<td>alfalfa</td>
<td>7.2</td>
<td>5.5</td>
<td>beterraba</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>_other hay</td>
<td>14.9</td>
<td>11.3</td>
<td>ervilhas secas</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>sorgo</td>
<td>3.4</td>
<td>2.6</td>
<td>batatas</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>algodao</td>
<td>3.3</td>
<td>2.5</td>
<td>vegetal (fresco)</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>cevada</td>
<td>1.5</td>
<td>1.1</td>
<td>vegetal (processo)</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>aveia</td>
<td>1.3</td>
<td>1.0</td>
<td></td>
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</tbody>
</table>

Precipitação anual

Area Planted

<table>
<thead>
<tr>
<th>Crop</th>
<th>A ha</th>
<th>ha (mil)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>soybean</td>
<td>32.8</td>
<td>24.9</td>
<td></td>
</tr>
<tr>
<td>corn</td>
<td>32.7</td>
<td>24.8</td>
<td></td>
</tr>
<tr>
<td>wheat (all)</td>
<td>54.6</td>
<td>22.1</td>
<td></td>
</tr>
<tr>
<td>_winter</td>
<td>39.5</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>_spring</td>
<td>19</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>hay crop</td>
<td>54.4</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>_alfalfa</td>
<td>17.7</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>_other hay</td>
<td>36.7</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td>sorghum (grain)</td>
<td>8.5</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>cotton</td>
<td>8.08</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>barley</td>
<td>3.6</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>vegetables</td>
<td>4.4</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>

United States: Corn
Trends in Soil-applied Herbicides for Soja (US)

- Brlrvs: (C1, C2) linuron, metribuzin
- Grass: (K3) alachlor, dimethenamid, metolachlor
- PPO: (E) flumioxazin, sulfentrazone

Percent area treated (%)

USDA, NASS
8 to 19 top producing States
Trends in POST Herbicides for Soja (US)

Conyza species
- *Conyza canadensis*; formerly *Erigeron canadensis*
  - horseweed, marestail, Canadian fleabane
- *Conyza bonariensis*
  - hairy fleabane, flaxleaf fleabane
- *Conyza sumatrensis*
  - Sumatran fleabane
- *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)
Comparison of C. canadensis and C. bonariensis

**Hembree and Shrestha, UC-Davis**

Table 1. Key characteristics of hairy and non-hairy Bidens

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Hairy Bidens</th>
<th>Non-hairy Bidens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>Hairy, serrated, toothed</td>
<td>Non-hairy, smooth</td>
</tr>
<tr>
<td>Stems</td>
<td>Hairy, slightly pubescent</td>
<td>Non-hairy, smooth</td>
</tr>
<tr>
<td>Flowers</td>
<td>Yellow, disc-like</td>
<td>Yellow, tubular</td>
</tr>
<tr>
<td>Roots</td>
<td>Hairy, long, slender</td>
<td>Non-hairy, short, stout</td>
</tr>
</tbody>
</table>

Stages of development

- **Bud stage**
  - Tiny, green, ovate, with fine pappus at the top of the plant
- **Bloom stage**
  - Small, yellowish, daisy-like, at the ends of branched stems at the top of the plant
- **Flowering**
  - Yellow, daisy-like, with fine pappus at the top of the plant

**C. sumatrensis**

- **Hairy stem**
  - C. sumatrensis, left
  - C. bonariensis, right

**C. canadensis**

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

**Similarities among Conyza spp.**

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

**Life-cycle in N. America**

**C. canadensis**

- Annual
- Early successional
- Taproot
- Rosette followed by bolting (upright growth)
- Tall
- Large number of seeds with pappus

**Table 1. Distinguishing features of three Conyza species (Ley's 2011)**

<table>
<thead>
<tr>
<th>Species</th>
<th>C. canadensis</th>
<th>C. sumatrensis</th>
<th>C. bonariensis</th>
</tr>
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<tbody>
<tr>
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**Figure 1. The Lifecycle of Conyza canadensis – adapted from Ley’s et al. (2004)**
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
High number of seeds produced
Small wind-blown seed

Seeds Must be at Soil Surface to Germinate and Establish

Nandula, et al., Weed Sci. 2006

C. canadensis emergence
Georgetown site
C. canadensis emergence

Impact of Open Canopy on Fall Density

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

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

Average of 4 sites
Counts made in late November

Effect of Crop Residue on *C. canadensis* Establishment

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

Effect of Crop Residue on *C. canadensis* Establishment

Effect of Winter Cover Crop

- Popularity of cover crops for soil health and nutrient management
Effect of Rye on *C. canadensis* 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 *C. canadensis* Establishment

- **No. of Stems**
  - A_2003
  - B_2003
  - A_2004

Evaluating Seed Longevity

- **Germination (%)**
  - Freezer
  - Site 1-Surface
  - Site 1-10cm
  - Site 2-Surface
  - Site 2-10cm

10 mos | 12 mos | 18 mos | 24 mos | 30 mos | 36 mos
Untreated Check

Glyphosate preplant followed by glyphosate POST

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?

- *Amaranthus* species (6)
- *Avena*
- *Chenopodium*
- *Ambrosia trifida*
- *Ambrosia artemisiifolia*
- *Kochia*
- *Sorghum* (2)
- *Setaria* (3)
- Others (15)
### Herbicide Site of Action

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Site of Action</th>
<th>Active Ingredient</th>
<th>Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>G / 9</td>
<td>EPSP</td>
<td>glyphosate</td>
<td>D + G</td>
</tr>
<tr>
<td>D / 22</td>
<td>PS I Electron diverters</td>
<td>paraquat</td>
<td>B + G</td>
</tr>
<tr>
<td>C1 / 5</td>
<td>Photosystem II</td>
<td>atrazine</td>
<td>B + C1</td>
</tr>
<tr>
<td>B / 2</td>
<td>ALS</td>
<td>chlorimuron</td>
<td>C1 + C2</td>
</tr>
<tr>
<td>C2 / 7</td>
<td>Photosystem II</td>
<td>linuron</td>
<td></td>
</tr>
</tbody>
</table>

First report was C1 in 1989

### Glyphosate-Resistant Conyza canadensis in Delaware

#### Confirmed sites
- 2000 (6)
- 2001 (23)

#### Untreated check

R. Ritter, UMD
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 *C. canadensis* Unique?**

- It’s ability to disperse locally as well as over great differences
- Treat as if it is the predominate biotype in the area
- Well adapted to no-till crop production

**Saflufenacil preplant – 25 g/ha**

**Glufosinate Preplant**