Evaluations of Dicamba and 2,4-D Injury on Fruiting Trees and Various Other Woody Species

Brian Dintelmann, Michele Warmund, and Kevin Bradley
What is 2,4-D and Dicamba?

- Synthetic auxin herbicides
  - Control broadleaf weeds
  - Used in corn, wheat, pastures, turf, etc.

- Not “new” chemicals
  - 2,4-D = 1940’s
  - Dicamba = 1960’s

- New “less volatile” formulations
  - Dicamba = Engenia or Xtendimax
  - 2,4-D = Enlist
Why is Dicamba and 2,4-D relevant now?

- Dicamba and 2,4-D tolerant crop cultivars
Why is Dicamba and 2,4-D relevant now?

- Herbicide resistant weed species
Why is Dicamba and 2,4-D relevant now?

- Increased applications for in-season control of broadleaf weeds in soybean and cotton
  - Waterhemp, Palmer amaranth, marestail, etc
Increased 2,4-D and dicamba use

= 

Increased drift risk and injury potential
Estimates of Dicamba-injured **Soybean Acreage in the U.S.** as Reported by State Extension Weed Scientists (*as of October 15, 2017*)

*Total: ~3.6 million*
Nearby sensitive crops or plants can become injured with off-target movement of 2,4-D and dicamba.

Ex: non DT soybeans, non Enlist cotton, grapes, vegetables, trees, etc.
Being Aware of Sensitive Crops

• ~4.5 million acres in vegetable production on 72,000 farms (USDA, 2012)

• ~5 million acres in orchards on 107,000 farms (USDA, 2012)

• ~290,000 acres in berries on 31,000 farms (USDA, 2012)
Grapes

1,700 acres of vineyards in Missouri worth nearly $5 million (USDA, 2016)

Over 1 million acres of vineyards, producing over 7 million tons of grapes in the US (USDA, 2016)
Being Aware of Sensitive Crops

Peaches

- Over 300 peach orchards in Missouri (USDA, 2012)

- Over 94,000 acres of peach orchards, producing nearly 800,000 tons of peaches in the US (USDA, 2016)
Crops damaged as identified by complainants in Missouri (10/26/2017):
• 108,758 acres of soybeans
• 18,904 tomato plants
• 758 acres of peaches
• 122 acres of watermelons
• 132 acres of vineyards
• 35 acres of alfalfa
• 24 acres certified organic vegetables
• 15 acres of pecan trees
• 12 acres of apple trees
• 11 commercial gardens
• 10 acres of cantaloupes
• 2 acres of pumpkins
• 900 mums
• 40 residential properties (gardens/trees/shrubs)
Influence of 2,4-D and Dicamba Drift on Fruit and Shade Tree Species
# Herbicide Treatments

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active Ingredient</th>
<th>1x Rate</th>
<th>Drifttable Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enlist One</td>
<td>2,4-D Choline</td>
<td>0.95 lb ae/A</td>
<td>1/2, 1/20, 1/200</td>
</tr>
<tr>
<td>Enlist Duo</td>
<td>2,4-D Choline + Glyphosate</td>
<td>0.95 lb ae/A + 1.0 lb ae/A</td>
<td>1/2, 1/20, 1/200</td>
</tr>
<tr>
<td>Xtendimax</td>
<td>Dicamba (DGA + Vapor Grip Technology)</td>
<td>0.5 lb ae/A</td>
<td>1/2, 1/20, 1/200</td>
</tr>
<tr>
<td>Xtendimax + Roundup</td>
<td>Dicamba (DGA + VGT) + Glyphosate</td>
<td>0.5 lb ae/A + .98 lb ae/A</td>
<td>1/2, 1/20, 1/200</td>
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2,4-D + Glyphosate vs. Dicamba + Glyphosate at 1/2X Rates on Fruit, Nut, and Berry Species

Asterisk indicates significant difference between treatments within a species.

LSD \(_{(0.05)}\) =
Influence of Driftable Fractions of Dicamba on Peach Trees

*photos taken 28 days after treatment
Influence of Driftable Fractions of 2,4-D on Peach Trees

1/200X Enlist One  1/20X Enlist One  1/2X Enlist One

*photos taken 28 days after treatment
Influence of 2,4-D and Dicamba on Apple Trees

Non-Treated

1/2X 2,4-D + Glyphosate

1/2X Dicamba + Glyphosate

*photos taken 28 days after application
Influence of 2,4-D + Glyphosate vs. Dicamba + Glyphosate on Black Walnut Trees

Non-Treated

1/2X 2,4-D + Glyphosate

1/2X Dicamba + Glyphosate

*photos taken 28 days after application
Influence of 2,4-D + Glyphosate vs. Dicamba + Glyphosate on Pecan Trees

1/2X 2,4-D + Glyphosate

1/2X Dicamba + Glyphosate

*photo taken 28 days after application
Differences in 2,4-D and Dicamba Symptomology on Grapes
2,4-D + Glyphosate vs. Dicamba + Glyphosate at 1/2X Rates on Shade Tree Species

Asterisk indicates significant difference between treatments within a species.

LSD (0.05) =
Symptomology of Driftable Fractions of Dicamba on Maple Leaves
Symptomology of Driftable Fractions of 2,4-D on Maple Leaves

Non-Treated 1/200X 2,4-D 1/20X 2,4-D 1/2X 2,4-D
Influence of 2,4-D on Pin Oak
Influence of Dicamba on Pin Oak
# Sensitivity of Various Species to Injury from Driftable Fractions of Dicamba Products

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<th>Extreme (≥20% Injury)</th>
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<td>Elderberry</td>
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<td>Raspberry</td>
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Conclusions

• Significant differences in sensitivity to 2,4-D and dicamba among various tree species
  
  • Peach and Black Walnut Trees responded differently to 2,4-D and dicamba

• The addition of glyphosate enhances the degree of injury