Problem Weed Management, Resistance, Research and Strategies

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IPM at Its Best

• *In the recent past, NC growers relied extensively on low rates of glyphosate*
  - White clover easily tolerated 8 oz glyphosate per acre
  - Dense clover ground cover suppressed other weeds without harming trees
  - We could *broadcast apply* low rates of glyphosate with no preemergent bands
  - Done right, **"chemical mowing"** provided total soil protection from rain and sun
  - It added to organic matter to our soil
  - It was capable of supplying Fraser fir’s annual nitrogen requirement
  - It provided really cheap weed control!
Some of the Best White Clover in WNC

- Jackson Co growers may have slightly earlier weed emergence
- Some use a pre-bud break glyphosate application of 10-12 oz. acre
- One mowing a year on some farms
- A good track record of results!

- *Makes you think…*
  How much earlier are your weeds these days?
Managing Your Problem Weeds?

• Do you need to *kill* or *suppress* your weeds?
• Either way, You need the right combination of:
  – Herbicide
  – Rate
  – Timing
  – Calibration
  – Application
  – Weather factors
Killing Rates of Glyphosate or other Postemergent Herbicide

- 24-32oz/acre
- More bare ground & soil erosion
- Greater loss of soil organic matter
- Open ground for summer annual germination *
- New cycle of explosive weed growth
- A “good job” kills 99.9% of weeds
- What does that 0.01% do?
- Flower and go to seed
- **Sowing the seeds of weed resistance**
Building Soil Organic Matter & Water Capacity

Baas & Curell, Ag & Ag Business Institute (MSU Webinar)

- SOM can hold 6 X its weight in water
- Occurs with every rain event
- Increases the size of the “container”
- More volume to supply water to crops
White Clover Ground Cover
reduced Horseweed Density

- Partial cover – 1 seedling / sq ft. (40,000/acre)
- Full stand – 1 seedling / 100 sq ft. (400/acre)

Weeds do not develop herbicide resistance by being shaded-out or out-competed by clover
Spot treatment of undesirable weeds

- 8 oz. per Acre
- 4 oz. per Acre
- 8 oz. per Acre

Current Approach
- 8 oz./acre Post-bud break early/mid-July

Targets late perennials and more summer annuals
Emergence of Glyphosate-Resistant (tolerant) Weeds is a Spectre over All Weed Management Strategies

- 1-2 year transition from small breakthrough population to a big problem
- Across the mountain region
  - Common & giant ragweed
  - Lambsquarters
  - Horseweed
- Of these, horseweed is the most widespread problem weed

Horseweed growing through 8 oz / Acre glyphosate
Horseweed
Conyza canadensis

Lambsquarters
Chenopodium album

Ragweed
Ambrosia artemisiifolia
A Meeting of the Minds: August 6, 2012

Weed seeds on Travis’ pant legs!
Lambsquarters: not considered to be glyphosate-resistant
The best strategy is to use a different chemical mode of action

• By changing chemistries and modes of action you can by-pass biological mechanisms for weed resistance to one group of herbicides
Working with the Concept:

Many row-crop farmers use at least three modes of action per tank to manage resistant weeds. They may rotate several mixes within a single season.
Wide Range of Herbicide Options and MOA

- Grasses
  - Postemergent
    - Glyphosate - 9
    - Vantage - 1
    - Intensity One (Clethodim) - 1
  - Banded preemergent
    - Pendulum - 3
    - Kerb - 3
    - Factor - 1
    - Westar – 2 + 5

- Broadleaf weeds
  - Postemergent
    - Glyphosate - 9
    - Garlon - 4
    - 2,4-D, WeedOne - 4
    - Goal - 14
    - Stinger - 4
  - Banded preemergent
    - Pendulum - 3
    - Oust - 2
    - Goal - 14
    - Gallery - 21
    - Sureguard - 14
    - Westar – 2 + 5
Take Home Message?

• It’s not enough to just know what herbicide kills grasses or broadleaf weeds
• Where does your herbicide fit in:
  – Mode of action?
    • On the front of every label (Group #)
  – Related products?
    • Chart are available online
  – How likely is weed resistance?
    • Chemical company websites discuss combating product-specific weed resistance
• As an industry, we need to learn how to effectively rotate modes of action
An ongoing hunt across different modes of action

• A balancing act between:
  – Weed Control
  – Tree Injury
  – Clover Injury

Why we are different
2017 Herbicide Study – Sexton Farm, Ashe Co.

Average Horseweed Height across Treatment Dates

- Pendimethalin
- Firstrate
- Harmony
- Butyrac
- glyphosate
- garlon
- 24-D
- check
2018 & 2019 Research

• Getting Dr. Joe Neal on-board
  – Member of the National IR-4 Committee
  – Established relationships with herbicide companies

• We repeated previous work under IR-4 parameters
  – Fraser fir phytotoxicity
  – Horseweed efficacy
Study Methods

• IR-4 Study:
  FirstRate, Harmony, 2,4-D, & glyphosate
  ALS inhibitors used on soybeans (legume)

• Single product treatments
  – Primarily focused on phytotoxicity

• Several rates & timings

• Two locations for each test
IR4 Study, Mitchell Co. Percent injury from herbicides
Treated May 2nd and June 11th; evaluated October 2018

2,4-D Amine 34 oz/a
- glyphosate + cloransulam
- glyphosate
- thifensulfuron 1 oz + NIS
- thifensulfuron 0.5 oz + NIS
- thifensulfuron 0.25 oz + NIS
- cloransulam 1.2 oz/A +NIS
- cloransulam 6 oz/A + NIS
- cloransulam 3 oz/A + NIS

2,4-D
- 1qt / acre
- 4oz + 0.6oz/ acre
- 4 oz / acre
- 1oz / acre
- 0.5oz / acre
- 0.25oz / acre
- 1.2oz / acre
- 0.6oz / acre
- 0.3oz / acre

Flat
V'
PRE
2,4-D amine applied post bud break
So, what about the Horseweed?
## IR4 Study

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Dose oz/A</th>
<th>Pre-budbreak</th>
<th>Round to V stage</th>
<th>Flat shoots</th>
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</thead>
<tbody>
<tr>
<td>Nontreated</td>
<td></td>
<td>0 c</td>
<td>0 c</td>
<td>0 d</td>
</tr>
<tr>
<td>glyphosate</td>
<td>4 oz</td>
<td>27 b</td>
<td>8 bc</td>
<td>0 d</td>
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<tr>
<td>cloransulam (FirstRate) + NIS</td>
<td>0.3 oz</td>
<td>100 a</td>
<td>93 a</td>
<td>86 ab</td>
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<tr>
<td>cloransulam (FirstRate) + NIS</td>
<td>0.6 oz</td>
<td>100 a</td>
<td>95 a</td>
<td>100 a</td>
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<tr>
<td>cloransulam (FirstRate) + NIS</td>
<td>1.2 oz</td>
<td>100 a</td>
<td>95 a</td>
<td>100 a</td>
</tr>
<tr>
<td>2,4-D Dimeth. Amine</td>
<td>1 qt</td>
<td>100 a</td>
<td>95 a</td>
<td>63 bc</td>
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<tr>
<td>glyphosate + cloransulam</td>
<td>4 oz</td>
<td>95 a</td>
<td>100 a</td>
<td>58 c</td>
</tr>
<tr>
<td>glyphosate + cloransulam</td>
<td>0.3 g</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Only FirstRate had all green lights…

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Pre or at bud break</th>
<th>Post bud break</th>
<th>Horseweed control</th>
<th>Clover tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirstRate (cloransulam)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmony (thifensulfuron)</td>
<td></td>
<td></td>
<td>Early</td>
<td></td>
</tr>
<tr>
<td>Detail (saflufenicil)</td>
<td></td>
<td>Early</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,4-D Amine</td>
<td></td>
<td>Early</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plateau</td>
<td>Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency (topramzone)</td>
<td></td>
<td></td>
<td></td>
<td>Red</td>
</tr>
</tbody>
</table>
2019 Preliminary Results

• Still analyzing data
• Slightly earlier timings in 2019 (about a week)
• Excellent horseweed control using Firstrate
  – 90 to 100% control across 3 rates and 3 dates
  – No Firstrate treatments were significantly different from each other in 2019
Chlorosis from both Firstrate & Harmony

• Noticeable, but variable problem
• Have seen it in previous years
• Seasonal factors in play?
• Chlorosis from ALS inhibitors is almost always temporary
• Still moving forward with the labelling process through IR-4
Some Management Considerations
# A Range of Treatment Strategies are Available

**Spray Treatments:**
- **Banded herbicide spray**
  - Preemergent, Postemergent, or mixed
- **Separate treatment between tree rows**
  - Postemergent
- **Broadcast application**
  - Back pack sprayers
    - Directed
    - Semi-directed
    - Broadcast over lower branches
    - Broadcast over whole tree
  - Cannon mistblower sprayers
  - Boom sprayer on small tractors

**Other Types:**
- Mowing
- Weed-eating or chopping
- Cultivation or plowing
- Weed fabrics
- Mulches
- Even grazing with trained sheep
More than one tool in the toolbox, More than one product in the spray tank

- We can address problem weeds with a rotation of products & modes of action
- Tank mixes will become the rule
- Include glyphosate to suppress most weeds and grasses
- Add a herbicide with a different mode of action for resistant broadleaf weeds
- Then switch to a different product or approach next time or next year
- High weed resistance potential with repeated applications of ALS inhibitors, so only use 1 time per year
Possible Product Rotations

- **2,4-D or Garlon (& glyphosate)**
  - ONLY before bud break in the spring
  - OR after foliage matures in the fall

- **Stinger & Goal**
  - summer suppression rates where no clover is present

- **Bands of pendemethalin, etc. (& glyphosate)**
  - in fall before weed germination
  - or early spring before weed germination

- **Alternate years ONLY -- FirstRate or Harmony depending on the weed** (Never double up ALS inhibitors, Group 2) with Intensity1 for grasses (Late May/June)
Distilling the 1st Six years of this Research to 1 Slide

- **Stinger** is effective on problem weeds but kills clover
- Postemergent **Goal** provides burn down but is also hard on clover
- **2,4D** is effective but injures tree foliage after bud break
  (Garlon & Butyrac are in same group)
- **Harmony** works on Lambsquarters, but not on Horseweed (not labeled)
- **Firstrate** is broader spectrum, kills Horseweed, but not Lambsquarters
Remember, the best tool isn’t in any “box”
It’s already free for the growing

(Or bought for the sowing)
Once again, this is why we go to the extra effort…
Thanks to:
Any Questions?