Weed Management Considerations for Pastures in Missouri

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Integrated Pest Management

WEED AND BRUSH CONTROL
FOR FORAGES, PASTURES AND NONCROPLAND

Publication

• a guide for identifying weeds and selecting and comparing herbicides

• color photos of 75 weeds in various stages of development

• tables provide details on weed response to herbicides, herbicides currently labeled for control of various weeds, and crop replant restrictions

• Order at: www.extension.missouri.edu/p/ipm1031
The Importance of Proper Soil pH and Fertility
1. What are the most common weeds in Missouri pastures?

2. What is the seasonal distribution of weeds in Missouri pastures?

3. Are overall weed infestation levels associated with specific nutrient and/or soil pH levels in pastures?

4. Can we identify any specific weed-nutrient and/or weed-pH relationships?
Methods

- Survey conducted in Missouri pastures at 14-day intervals throughout each season (April-Oct)
- 1 representative 20-m$^2$ sampling area was surveyed per 10 acres of each pasture
- The center of each 20-m$^2$ sampling area was georeferenced in order to survey the same location throughout the season
The Importance of Proper Soil pH and Fertility

• 37 of 46 (80%) of pastures surveyed were classified as having LOW or VERY LOW soil P levels

• 17 Of 46 (37%) of pastures surveyed were classified as having LOW or VERY LOW soil K levels

• Average soil pH in the pastures surveyed was 5.8
The Importance of Proper Soil pH and Fertility

Based on a survey of 46 Missouri pastures in 2015-16:

– a 1-unit increase in soil pH corresponded to ~ 4,100 fewer weeds per acre

– each 0.1 ppm unit increase in P and K corresponded to 162 and 12 fewer weeds per acre, respectively.
Influence of Select Soil and Forage Properties on Weed Density in Missouri Pastures

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Change in Total Weed Density per acre for each unit Increase in Selected Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH</td>
<td>- 4,168</td>
</tr>
<tr>
<td>Forage Groundcover</td>
<td>- 283</td>
</tr>
<tr>
<td>Manganese</td>
<td>243</td>
</tr>
<tr>
<td>Sulfur</td>
<td>162</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>- 162</td>
</tr>
<tr>
<td>Zinc</td>
<td>- 162</td>
</tr>
<tr>
<td>Potassium</td>
<td>- 12</td>
</tr>
<tr>
<td>Magnesium</td>
<td>- 8</td>
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<tr>
<td>Calcium</td>
<td>- 4</td>
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</table>

*O.M. and forage groundcover represented as %, soil pH in 1.0-unit increments, and Ca, K, Mg, Mn, P, S, and Zn as 1-ppm.*
# Influence of Select Soil and Forage Properties on Weed Density in Missouri Pastures

<table>
<thead>
<tr>
<th>Parameter*</th>
<th>Common Ragweed</th>
<th>Horsenettle</th>
<th>Ironweed Species</th>
<th>Vervain Species</th>
<th>Annual Fleabane</th>
<th>Lanceleaf Ragweed</th>
<th>Yellow Foxtail</th>
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</thead>
<tbody>
<tr>
<td>Phosphorus</td>
<td>-59</td>
<td>71</td>
<td>-36</td>
<td>-----</td>
<td>-55</td>
<td>-176</td>
<td>-----</td>
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<tr>
<td>Potassium</td>
<td>-----</td>
<td>4</td>
<td>-8</td>
<td>8</td>
<td>-6</td>
<td>-28</td>
<td>-----</td>
</tr>
<tr>
<td>Magnesium</td>
<td>-----</td>
<td>-4</td>
<td>-----</td>
<td>-----</td>
<td>2</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Calcium</td>
<td>-----</td>
<td>-0.6</td>
<td>0.4</td>
<td>-----</td>
<td>0.4</td>
<td>-----</td>
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<tr>
<td>pH</td>
<td>-2454</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>834</td>
<td>-1993</td>
<td>-864</td>
</tr>
<tr>
<td>Sulfur</td>
<td>150</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-326</td>
</tr>
<tr>
<td>Zinc</td>
<td>-257</td>
<td>-----</td>
<td>-93</td>
<td>-----</td>
<td>-83</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Manganese</td>
<td>91</td>
<td>30</td>
<td>-63</td>
<td>28</td>
<td>-49</td>
<td>-----</td>
<td>-65</td>
</tr>
<tr>
<td>Forage Grndcover</td>
<td>-----</td>
<td>-----</td>
<td>-26</td>
<td>-20</td>
<td>-----</td>
<td>-158</td>
<td>-26</td>
</tr>
</tbody>
</table>

*O.M. and forage groundcover represented as %, soil pH in 1.0-unit increments, and Ca, K, Mg, Mn, P, S, and Zn as ppm.
What are the factors you should **before** you spray a herbicide on a grass pasture or hay field?
Spray or Mow?

How much does it cost per acre?

$15-25 per acre?

more than $15-25 per acre...

$$ dependent on the product...
What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

Spring applications of metsulfuron-containing herbicides (Cimarron products, Chaparral, etc.) can have good and bad consequences.
What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

1. Spring applications of most metsulfuron-containing herbicides can reduce tall fescue seed heads.

14 to 61% tall fescue seed head reduction when applied to 6-inch vegetative tall fescue (early to mid April); 53 to 88% reduction when applied to 12-inch boot stage tall fescue (early May).

What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

2. Spring applications of most metsulfuron-containing herbicides will likely cause tall fescue yield reductions!

careful application timing (boot stage or later) can minimize this
Principles of Pasture and Hayland Weed Control with Herbicides

1. Weed Identification
   We Have an App for that!
# Most Common Weeds in Missouri Pastures
(results based on 46 Missouri pastures surveyed in the 2015 and 2016 growing seasons)

<table>
<thead>
<tr>
<th>Weed</th>
<th>Scientific Name</th>
<th>Frequency of Occurrence</th>
<th>Avg. Density per Acre</th>
<th>Grazing Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horsenettle</td>
<td><em>Solanum carolinense</em></td>
<td>100%</td>
<td>2,873</td>
<td>Avoided</td>
</tr>
<tr>
<td>Common Ragweed</td>
<td><em>Ambrosia artemisiifolia</em></td>
<td>96%</td>
<td>5,059</td>
<td>Grazed</td>
</tr>
<tr>
<td>Nutsedge spp.</td>
<td><em>Cyperus spp.</em></td>
<td>93%</td>
<td>1,862</td>
<td>Avoided</td>
</tr>
<tr>
<td>Annual Fleabane</td>
<td><em>Erigeron annuus</em></td>
<td>93%</td>
<td>1,740</td>
<td>Avoided</td>
</tr>
<tr>
<td>Vervain spp.</td>
<td><em>Verbena spp.</em></td>
<td>80%</td>
<td>1,174</td>
<td>Avoided</td>
</tr>
<tr>
<td>Yellow Foxtail</td>
<td><em>Setaria pumila</em></td>
<td>80%</td>
<td>3,440</td>
<td>Grazed</td>
</tr>
<tr>
<td>Broadleaf Plantain</td>
<td><em>Plantago major</em></td>
<td>80%</td>
<td>931</td>
<td>Grazed</td>
</tr>
<tr>
<td>Virginia Copperleaf</td>
<td><em>Acalypha virginica</em></td>
<td>80%</td>
<td>971</td>
<td>Avoided</td>
</tr>
<tr>
<td>Dandelion</td>
<td><em>Taraxacum officinale</em></td>
<td>78%</td>
<td>1,619</td>
<td>Grazed</td>
</tr>
<tr>
<td>Tall Ironweed</td>
<td><em>Vernonia gigantea</em></td>
<td>72%</td>
<td>1,781</td>
<td>Avoided</td>
</tr>
</tbody>
</table>
Principles of Pasture and Hayland Weed Control with Herbicides

1. Weed Identification
2. Growth Habit Identification
3. Timing of Application
Predominant Weed Types in Missouri Pastures

- Annual Grasses: 31.2%
- Annual Broadleaves: 43.4%
- Perennial Broadleaves: 8.9%
- Brush/Woody Species: 5.4%
- Perennial Grasses: 4.7%
- Biennial Broadleaves: 3.8%
- Sedge Species: 2.3%
Seasonal Distribution of Weed Species in Missouri Pastures
(results based on an average of 46 pastures surveyed in 2015-2016)
Proper Herbicide Application Timing is Critical

What weed species are you targeting? When is the best time for control?

Typical Timeline of Emergence of Some Common Summer Annual Pasture Weeds

- Common Ragweed
- Spiny Amaranth/Pigweed
- Lanceleaf Ragweed
- Woolly Croton
- Common Cocklebur
- Annual Marshelder
- Nodding Spurge
- Foxtails

*Can vary based on grazing pressure, cutting frequency, tall fescue height, temperature, etc.

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Principles of Pasture and Hayland Weed Control with Herbicides

1. Weed Identification
2. Growth Habit Identification
3. Timing of Application
4. Herbicide and Rate Selection
Some Common Pasture Herbicides

Plotter/Purestand/others (*metsulfuron*)
2, 4-D/Weedar / etc. (*2,4-D*)
Banvel/Clarity (*dicamba*)
Milestone (*aminopyralid*)
Remedy (*triclopyr*)
Stinger (*clopyralid*)
Tordon (*picloram*)
Crossbow (*2,4-D+Remedy*)
Graslan L (*Tordon + 2,4-D*)
Surmount (*Tordon+Starane*)
Weedmaster (*2,4-D+Banvel*)
Chaparral (*Milestone+Cimarron*)
PastureGard HL (*Remedy+Starane*)
Cimarron Max (*Cimarron+Banel+2,4-D*)
Forefront/GrazonNext (*Milestone+2,4-D*)
Grazon P+D/Gunslinger (*Tordon+2,4-D*)
Some weeds should be removed because they are poisonous...
Some of the Most Common Poisonous Weeds in Missouri

- Black Cherry
- Black Locust
- Black Nightshade
- Jimsonweed
- Johnsongrass
- Milkweed Species
- Perilla Mint
- Poison Hemlock
- Pokeweed
- Snow-on-the-Mountain
- White Snakeroot
- Nodding Spurge
- Woolly Croton
Perilla Mint

Poisonous weed that primarily occurs in shady environments around pastures and hay fields.

Control: Timing is the key! Most pasture herbicides will provide excellent control if applied to small plants that are young and actively growing.
Nodding Spurge:  
Chamaesyce nutans or Euphorbia nutans
Nodding Spurge:  
Chamaesyce nutans or Euphorbia nutans
• Typically emerges later (July/Aug)
• Metsulfuron products = excellent
• 2, 4-D + dicamba products = good
Poison Hemlock

- Fresh poison hemlock tissue has been reported to be lethal at amounts ranging from 2 to 6 grams of plant material per pound of body weight in cattle, sheep, and pigs (Keeler and Balls 1978; Panter et al. 1988)

- Rosette applications of Grazon P+D, GrazonNext, or mixes of either with Remedy are very effective as a broadcast spray

- Many options for spot treatment
Woolly Croton

– Plant covered with short, dense hair

– Toxic only in large quantities; usually avoided by grazing animals

– Common pasture herbicide premixes will provide good control
Snow-on-the-Mountain (Euphorbia marginata)

Most pasture herbicide pre-mixes will provide good control when applied in the vegetative stage.
Wild Indigo:

Spot treatment of picloram-containing products Grazon P+D, Tordon, etc) will provide good control of these species
Some weeds cattle are unlikely to eat because they contain spines, prickles, or thorns.
Horsenettle Control Recommendations

Herbicides: Grazon P+D, Grazon Next, Weedmaster (or any 2,4-D + dicamba combination), Cimarron Max, and Chaparral all provide similar control 1 year after treatment. Choose based on price, legume replant interval, etc.

Timing: pre-bloom to bloom stage (can occur several times during the year).
Musk Thistle
Bull Thistle
Bull Thistle
Musk and Bull Thistle Recommendations

The key is the timing. We can get good control with Grazon P+D, GrazonNext, Milestone, 2,4-D + Banvel, Weedmaster, Cimarron Max, Chaparral, etc. with rosette stage applications.

Bolted plants are more difficult to control.
Canada Thistle  
(*Cirsium canadensis*)

- Often incorrectly identified and/or confused with musk thistle in Missouri.
- Rarely occurs in Missouri! Much more common in more northern states.
- The only true perennial thistle (with creeping roots or rhizomes).
- Pre-bloom applications the most effective: Grazon P+D, GrazonNext, Milestone, Tordon

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Blackberry Species in Missouri

Upright, Cane-type (Blackberries)
- *Rubus allegheniensis*, Common Blackberry
- *Rubus argutus*, Smooth Blackberry
- *Rubus occidentalis*, Black Raspberry
- *Rubus pensilvanicus*, Penn. Blackberry
- *Rubus armeniacus*, Himalaya Blackberry

Prostrate, Creeping-type (Dewberries)
- *Rubus flagellaris*, Dewberry
- *Rubus trivialis*, Southern Dewberry

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Upright Blackberry Recommendations

• Do not mow the season of treatment; mowing stems the year before treatment is OK

• Early fall is the better application timing; ~ 2-3 weeks before 1st frost

• Metsulfuron alone seems to provide best control at 0.4-0.5 oz/A; similar but slightly lower control achieved with PastureGard or with mixes of Remedy (2,4-D + Remedy, Grazon P+D + Remedy)

• Spot-spraying will provide better results and is more economical
Recommendations for the Control of Dewberry Species in Missouri
Northern Dewberry Control with Selected Herbicide Treatments (Salem, MO 2008-2011)

% Dewberry Stem Reduction Summer Following Treatment

Treatments (Late-Sep/Early-Oct Application Timing)

LSD (0.05) = 15

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Some weeds cattle are unlikely to eat because of bitter taste and/or poor palatability...
Sericea Lespedeza
(Lespedeza cuneata L.)

- Perennial legume native to eastern Asia
- Introduced into the U. S. in the late 1890’s as a potential forage species and also planted for erosion control
- Declared a noxious weed in Kansas and Colorado, spreading and becoming more problematic in many other states
Sericea Lespedeza

- **Prolific Seed Producer:** at least 1,000 seed per stem; ~600 lbs seed/A (Guernsey 1970; Ohlenbusch et al. 2001)

- **Allelopathic:** Sericea lespedeza residues reduced the germination, emergence, and biomass of rye and tall fescue (Kalburtji and Mosjidis 1993)
Economic Impact?

- Average annual forage loss of $29 million in Flint Hills region of Kansas (Scott 1995)

- Long-term economic impact studies have shown a reduction in the 30-yr net present value of grazing land in Kansas from $294/acre for non-infested land to $74/acre for infested land
Grazing?

- Tannin content increases dramatically with maturity; 6% in 4-inch plants, 21% in 36-inch plants (Stitt 1943)
- Cattle may graze it when young, but almost never when plants are >4-6 inches tall
- Dead stems from previous year persist into the summer, making it difficult for cattle to graze new growth (Koger et al. 2002)
Sericea Lespedeza Recommendations

• In MO research, application timing does not usually influence Sericea lespedeza control 1 yr after treatment. When it does, it is typically with metsulfuron-containing products.

• 1.5 pts PastureGard HL per acre has been the most consistent treatment across many years of our research, regardless of application timing.

• Triclopyr alone (Remedy Ultra) can also provide good control but generally not as good as PastureGard.

• Metsulfuron-containing products can also provide good control but are typically best later in the season in the pre-bloom to post-bloom timeframe.
Ironweed Species

Very common perennial weed of pastures and hay fields in Missouri.

**Chemical:** Triclopyr (Remedy Ultra, PastureGard) is the key! Grazon P+D, Grazon Next, Cimarron Max will provide high levels of suppression, but addition of Remedy will improve control dramatically.

**Mowing:** 3 times per year for 2 years provided 80-90% control.
Spotted Knapweed
Spotted Knapweed

- biennial or short-lived perennial from a taproot
- soil disturbance favors higher plant densities
- plants are allelopathic
- produce an average of 1000 seed per plant; > 50% of seed remain viable after burial in the soil for 5 years (Davis et al. 1993)

**Control:** at least 5 fl oz Milestone/A, 1.5 pt GrazonNext, or 1 pt Tordon 22k/A, whichever costs less
Maypop Passionflower
Passiflora incarnata
Influence of Selected Herbicide Treatments on Maypop Passionflower Control in Mixed Grass-Legume Forages (Nevada, Missouri 2010)

% Control Season After Treatment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>% Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pt Tordon</td>
<td>38</td>
</tr>
<tr>
<td>3 ozs DPX-MAT 28</td>
<td>46</td>
</tr>
<tr>
<td>0.4 oz Cimarron</td>
<td>38</td>
</tr>
<tr>
<td>Cinarron Rate 1</td>
<td>33</td>
</tr>
<tr>
<td>Cinarron Max Rate 2</td>
<td>37</td>
</tr>
<tr>
<td>2 pts Grazon P+D + 1 pt Remedy</td>
<td>38</td>
</tr>
<tr>
<td>7 fl ozs Milestone</td>
<td>16</td>
</tr>
<tr>
<td>3 ozs Chaparral</td>
<td>24</td>
</tr>
<tr>
<td>2 pts 2,4-D Ester + 1 pt Banvel</td>
<td>33</td>
</tr>
<tr>
<td>4 pts Surmount</td>
<td>39</td>
</tr>
<tr>
<td>6 pts Surmount</td>
<td>55</td>
</tr>
<tr>
<td>6 pts Pasturegard</td>
<td>19</td>
</tr>
</tbody>
</table>

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New options available for the control of sedges in grass pastures and haylands:

**Permit:** 2/3 to 1 1/3 ozs/A; no grazing restriction, 37-day harvesting interval

**Yukon:** 4 to 8 ozs/A; no grazing restriction, 37-day harvesting interval