Drought Issues Related to Alfalfa

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Topics to be covered

- Stand regrowth in dry parts of the field
- How soil moisture will effect regrowth this spring
- Effect of drought on forage quality.
- Thin alfalfa stands – reseed or interseed?
How alfalfa grows

- When alfalfa is cut or enters winter
  - Roots die back
  - Roots must regrow ahead of top growth for high yield

- Good soil moisture needed
  - For root regrowth in March
  - For growth after cutting during first two weeks
Water Stress

- Will occur when available soil moisture decreases below 50% of capacity.
- Water stress results in reduced evapotranspiration and usually reduced yield.
- This lost yield can never be "made up" by irrigating more or more rain than necessary following the stress!
Moisture deficit

- inhibits cell enlargement
- delays plant maturity (if early)
- decreases plant height
- increases leaf to stem ratio
- increases stem N%, decreases leaf N% (results have varied)
- generally decreases NDF
- effect varies with drought severity/timing
Drought-stressed alfalfa will bloom right after cutting
High temperature increases NDF

Night temperature influence on alfalfa quality

<table>
<thead>
<tr>
<th>Night Temp.</th>
<th>ADF %</th>
<th>NDF %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain 45°F</td>
<td>28.2</td>
<td>35.5</td>
</tr>
<tr>
<td>Lowland 70°F</td>
<td>31.9</td>
<td>39.1</td>
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</tbody>
</table>

(Kay and Horrocks, 1993)
Higher temperature reduces NDF digestibility

Effect of daily high temperature on chemical and digestibility characteristics of alfalfa

<table>
<thead>
<tr>
<th>Plant Part</th>
<th>NDF %</th>
<th>NDF digestibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>72°F</td>
<td>90°F</td>
</tr>
<tr>
<td></td>
<td>72°F</td>
<td>90°F</td>
</tr>
<tr>
<td>Leaf</td>
<td>10.1</td>
<td>10.6</td>
</tr>
<tr>
<td>Stem</td>
<td>42.0</td>
<td>41.9</td>
</tr>
</tbody>
</table>

(Wilson, 1991)
Higher temperature reduces NDF digestibility
Increasing Temperature of the Growing Environment

- decreases stem diameter
- accelerates rate of maturity
- increases lignification
- decreases plant height
- decreases leaf to stem ratio
- decreases digestibility
Alfalfa Water Use

- Mature, healthy alfalfa with an extensive crown and root system, can better withstand adverse conditions.
- Younger stands have less as well developed crowns and root structures and are more prone to water stress.
- Diseased stands will suffer be more prone to water stress.
Diseased plants suffer more drought stress

Aphanomyces reduces root growth and potential to take up water

Healthy  Infected  Drought stress due to Aphanomyces
New seedings may be stunted by drought

- Dry land plants (left)
  - Less root depth
  - Less root system
  - Shallow branching
  - Fewer nodules

Dry land       Good moisture
Effect of Seeding Year Drought on Future Yields

- 3 years of Alfalfa Variety Trials at Arlington
- 30 to 40 entries per year
- 2011 drought during year

<table>
<thead>
<tr>
<th>Year planted</th>
<th>2012 Yield (t/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>8.42</td>
</tr>
<tr>
<td>2010</td>
<td>7.63</td>
</tr>
<tr>
<td>2011</td>
<td>5.92</td>
</tr>
</tbody>
</table>

2011 seeding yielded 1.6 to 2.4 t/a less than seeding from previous years
Drought effect on Winter Survival

- Alfalfa roots store starch for the winter survival and spring growth

- Fully charged crown and roots
  - under normal conditions, survive winter well.
- Plants more stressed in the fall
  - more vulnerable to the environment.
Frequent cutting effects

- Frequent cutting at immature stage
  - reduces root diameter of the crown (29% by two cuttings at early bud against one cutting at full bloom).
  - reduces stored products in the root and crown, and leaves the plant in a weakened state.

- Each successive premature cutting results in increased detrimental effects.

For good stand survival, let at least one cutting go to 10% bloom.
Harvesting drought stressed alfalfa

- If stand is over 10 inches tall and flowering, harvest **if economic** to do so.
  - let the plants approach 100% bloom before harvest
  - mow at normal cutting height;
  - no advantage to raising the cutting height, it will simply reduce harvested yield.
Harvesting drought stressed alfalfa

- If stand is 10 inches or shorter and flowering, **do not cut**.
  - Let regrowth come through existing growth.
  - Mowing will not increase regrowth but adds labor and fuel costs and increases wheel traffic damage.
- Scout and control potato leaf hopper, army worm and other insects.
Harvesting drought stressed alfalfa

- Drought stressed new seedings
  - Should not be harvested during the season (after first cutting)
  - May be harvested in late August if adequate growth is present to harvest.
  - A late fall cutting may also be taken
What can you do in Spring 2013?

- Evaluate alfalfa stands and replant if necessary for top yield
- Plant alfalfa with oat or ryegrass cover crop to increase early season yield
- Prepare to fertilize alfalfa after first cutting.
- Maximize pasture use.
  - Fertilize
  - Allocate forage (small paddocks).
Poor Alfalfa Stands Seeded in 2012

- What is a poor stand?
  - Want 20 plts/sq ft
  - Want 55 stems/sq ft
Poor Alfalfa Stands Seeded in 2012

- Alternatives to Improve Stand

Interseeding alfalfa
- Minimal autotoxicity
- Competition from existing plants
- Therefore interseeding will improve stand only slightly
Poor Alfalfa Stands Seeded in 2012

- Alternatives to Improve Stand

Interseeding clover
- Minimal autotoxicity
- Get good stand for 2 years
- Poor drying for hay or haylage
Poor Alfalfa Stands Seeded in 2012

- Alternatives to Improve Stand

Interseeding grass
- Minimal autotoxicity
- Orchardgrass, tall fescue slow to establish – provide yield next year
Poor Alfalfa Stands Seeded in 2012

Alternatives to Improve Stand

Disc and reseed alfalfa
  1) No autotoxicity
  2) No competition
  3) Can use cover crop to increase early season yield
Summary

- Last year’s drought weakened stands for winter survival
- Diseased stands weaker than non-diseased
- Evaluate stands early (both hay fields and pasture)
  - 2013 new alfalfa seedings can be reseeded
  - Older alfalfa stands may need to be turned over if less than 55/stems ft²
- Fertilize alfalfa with potassium and sulfur
- Maximize pasture use (fertilize, subdivide)