Nitrogen in Pasture Soils

Brian Arnall

Feb 5. Tishomingo
Nitrogen in the Plant

• Part of
  – Amino Acids: Building blocks of proteins
  – Enzymes: responsible for all biological process
  – Nucleic Acids
  – Chlorophyll

• Needed for Carbohydrate use

• Increases root growth
Liebig's Law of the Minimum

- Growth is controlled **not** by the total of resources available, but by the scarcest resource.
  - Only by increasing the amount of the limiting nutrient (the one most scarce in relation to "need") was the growth of a plant or crop improved.
Bray’s Nutrient Mobility Concept

Plants respond to the **total amount of mobile nutrients** present

Plants respond to the **concentration of immobile nutrients** present

**Mobile Nutrients**

Nutrient limitation *directly related to yield potential*, and dependent on the environment

**Immobile Nutrients**

Nutrient limitation *expressed as a % of potential yield*, or “sufficiency”, and independent of the environment
Nitrogen is mobile.....
Nitrogen is mobile.....
N-Cycle

- OM
- 2 OM Processes
- 2 N Processes
- 3 Sinks
- 4 losses
- 5 additions
Organic Matter

• Central point of the Nitrogen Cycle
• In an acre furrow slice 1000 lbs N per 1% OM
• A continuous flow of N into and out of OM.
N rate recommendation

• Nitrogen Recommendation =

Yield Goal N rate – Residual N

• 35-60 lbs N per ton

• Residual N is
  – 0-6” (Top-soil) Soil Test NO3
  – 6-18” (Sub-soil) Soil Test NO3
  – NO3 from irrigation
  – Cover Crop Credits.
## N rates

<table>
<thead>
<tr>
<th>Forage</th>
<th>1 ton yield</th>
<th>3 ton yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermudagrass</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Cool Season</td>
<td>60</td>
<td>180</td>
</tr>
<tr>
<td>Old World</td>
<td>35</td>
<td>110</td>
</tr>
<tr>
<td>Love grass</td>
<td>35</td>
<td>110</td>
</tr>
</tbody>
</table>
4 R’s

1. Right Source
2. Right Place
3. Right Rate
4. Right Time

IPNI: International Plant Nutrition Institute
Nitrogen Sources

• Urea 46-0-0
  – Most available, cheapest / lb N
  – Worst for rain fed forage

• UAN 28-0-0
  – Most expensive, Applicators limited
  – Better for pre green up or post harvest

• Ammonium Nitrate 34-0-0
  – More Expensive, Limited Availability
  – The BEST Nitrogen Source for Forage
Urea vs AN

• Urea
  – Goes to NH$_3$ then NH$_4$.
  – Needs ½ inch of rain/irrigation or worked in.
  – Warmth, Wind, Humidity increases loss

• Ammonium Nitrate
  – Unless Soil pH is High >7.0 No loss
  – Can be applied any time any day.
This year?

• What does your pasture look like?
• Species, growth period
• Spotty rains
• Grazing pressure

• Did you lose any Stand?
Management Approach

• For severely-damaged pastures, recovery is the only option.
  – May require 1 year or longer for full recovery.

• For moderately-damaged pastures, focus on recovery early and production late.
  – May require 2 to 3 months of growth to fully recover.

• For slightly-damaged pastures, manage as usual focusing on maximum production potential.
  – Should recover in 2 months or less.
What are the primary factors that control forage production?

• Some we can control
  ✓ Fertility
  ✓ Stocking rate

• Some we have no control
  ✓ Water
  ✓ Growing season
Approach for Post-drought Pasture Management

• Water management (moisture conservation/use)
• Manage similar to recent/new plantings
• Reduce competition
  – Livestock
  – Plant
• Management focus (order of importance)
  – Weed control
  – Fertility
  – Grazing deferment
Top Three Pasture Management Practices for Drought Recovery

1. Arrange for aggressive weed control measures.
   • Mob graze grassy weeds.
   • Chemical control for broadleaf weeds.

2. Plan on fertilization.
   • Base on soil test.
   • Focus primarily on phosphorus (root growth).

3. Prepare for grazing deferment.
   • Don’t graze too early!
   • Allow time for adequate root growth.
Thank you !!!

Brian Arnall
373 Ag Hall
405-744-1722
b.arnall@okstate.edu
Presentation available @
www.npk.okstate.edu
Twitter: @OSU_NPK
YouTube Channel: OSUNPK

www.extensionnews.okstate.edu
Old World Bluestem with Slight Damage
Weeping lovegrass Pasture with Moderate Damage
Old World Bluestem Pasture with Moderate Damage
Old World Bluestem Pasture with Severe Damage