BENEFITS AND VALUE OF

VersaLime

YWTG Grower Meetings

2011
Outline

• Value of spent lime to soil tilth
• Effects on other rotational crops
• Application methods
• Minnesota Pollution Control Agency (MPCA) policies & procedures
• American Crystal Sugar’s recommendation
No Lime

Resistant Variety
45 g Tachigaren

Susceptible Variety
No Tachigaren
10 Ton Lime

Resistant Variety
45 g Tachigaren

Susceptible Variety
No Tachigaren
No Lime

10 Ton Lime
Soil Tilth

• Windels/Brantner noted limed soil screened better than non-limed soil

• Better downward percolation of water and drainage

• Raise pH of acidic soils

• May increase beneficial soil microorganisms
Soil Tilth

- Increased Ca and Mg in lime improves soil structure by causing *flocculation* of clay particles.

- Soil structure is a major factor in the drainage characteristics of a soil:
  - Flocculated soils drain better.
  - Less restrictive to plant root growth.

- Lime can increase the buffering capacity of a soil.
Soil clay particles can be unattached to one another (\textit{dispersed}) or clumped together (\textit{flocculated}) in aggregates. Soil aggregates are cemented clusters of sand, silt, and clay particles.

Dispersed Particles  
Flocculated Particles

Flocculation is important because water moves mostly in large pores between aggregates. Also, plant roots grow mainly between aggregates.

In all but the sandiest soils, dispersed clays plug soil pores and impede water infiltration and soil drainage.

# Soil Test on Limed Soils

2005 Hillsboro Spent Lime Trials, Soil Collected and Analyzed in May of 2005

<table>
<thead>
<tr>
<th>Lime Rate</th>
<th>NO\textsubscript{3}-N</th>
<th>Olsen P</th>
<th>pH</th>
<th>EC</th>
<th>Ca</th>
<th>Mg</th>
<th>K</th>
<th>Na</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Tons A\textsuperscript{-1}</td>
<td>ppm</td>
<td>ppm</td>
<td>dS M\textsuperscript{-1}</td>
<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
<td>ppm</td>
<td></td>
</tr>
<tr>
<td>0 – 3 Inch Soil Depth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>12.1</td>
<td>19.5</td>
<td>7.42</td>
<td>0.67</td>
<td>3357</td>
<td>1038</td>
<td>768</td>
<td>35.4</td>
</tr>
<tr>
<td>5</td>
<td>12.1</td>
<td>24.1</td>
<td>7.66</td>
<td>0.71</td>
<td>4118</td>
<td>1097</td>
<td>768</td>
<td>35.4</td>
</tr>
<tr>
<td>10</td>
<td>12.1</td>
<td>31.5</td>
<td>7.74</td>
<td>0.69</td>
<td>4643</td>
<td>1185</td>
<td>768</td>
<td>35.4</td>
</tr>
<tr>
<td>20</td>
<td>12.1</td>
<td>41.7</td>
<td>7.75</td>
<td>0.73</td>
<td>5210</td>
<td>1280</td>
<td>768</td>
<td>35.4</td>
</tr>
<tr>
<td>30</td>
<td>12.1</td>
<td>56.6</td>
<td>7.78</td>
<td>0.76</td>
<td>5332</td>
<td>1402</td>
<td>768</td>
<td>35.4</td>
</tr>
</tbody>
</table>

Effect: none positive OK OK positive positive none none
### VersaLime Nutrient Summary

#### ACSC VersaLime Average Annual Nutrient Values

<table>
<thead>
<tr>
<th></th>
<th>Mhd</th>
<th>Hlb</th>
<th>Crk</th>
<th>EGF</th>
<th>Dtn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Nitrogen (As Received) lbs/ton</strong></td>
<td>5.2</td>
<td>4.7</td>
<td>5.7</td>
<td>4.8</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>Lime P₂O₅ Content (As Received) lbs/ton</strong></td>
<td>16.0</td>
<td>13.3</td>
<td>15.5</td>
<td>15.5</td>
<td>18.4</td>
</tr>
<tr>
<td><strong>Lime K₂O Content (As Received) lbs/ton</strong></td>
<td>1.2</td>
<td>1.3</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Lime Sulfur Content (As Received) lbs/ton</strong></td>
<td>7.0</td>
<td>4.8</td>
<td>5.0</td>
<td>4.4</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Moisture Content</strong></td>
<td>31%</td>
<td>34%</td>
<td>31%</td>
<td>36%</td>
<td>30%</td>
</tr>
</tbody>
</table>
# Nutrient Value

## Average Nutrient Content of Spent Lime, A. Sims, U of MN NWROC, 2005

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Lbs/Dry Ton</th>
<th>$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt; equiv.</td>
<td>20.0</td>
<td>$13.50</td>
</tr>
<tr>
<td>K&lt;sub&gt;2&lt;/sub&gt;O equiv.</td>
<td>3.5</td>
<td>$1.65</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$11.00</strong></td>
</tr>
</tbody>
</table>

## Total Nutrient Value at Recommended Application Rate of 10 Tons/Acre

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Total Lbs</th>
<th>$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt; equiv.</td>
<td>200</td>
<td>$135.00</td>
</tr>
<tr>
<td>K&lt;sub&gt;2&lt;/sub&gt;O equiv.</td>
<td>35</td>
<td>$16.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$151.50</strong></td>
</tr>
</tbody>
</table>

11-52-0 @ $700 (P<sub>2</sub>O<sub>5</sub>)  0-0-60 @ $573 (K<sub>2</sub>O)

Prices based on DTN survey of retail dealers (Feb 8<sup>th</sup> 2011)
### Effects of Lime on Other Crops

**Dr. Larry Smith Results**  
**University of Minnesota**

2005 Soybean yield, oil and protein following sugarbeet at different spent lime rates applied in 2004. Trial shows lime applications had no effect on soybean yields.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Lime Treatment (TDM/A)</th>
<th>Yield (bu/A)</th>
<th>Oil (%)</th>
<th>Protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garst 0211RR Chlorosis Susceptible Variety</td>
<td>0</td>
<td>41.5</td>
<td>20.0</td>
<td>29.6</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>45.4</td>
<td>19.5</td>
<td>31.4</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>42.1</td>
<td>20.1</td>
<td>29.7</td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>42.6</td>
<td>19.5</td>
<td>31.1</td>
</tr>
<tr>
<td>Gold Country 923RR</td>
<td>0</td>
<td>42.9</td>
<td>19.8</td>
<td>30.5</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>45.7</td>
<td>19.1</td>
<td>32.2</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>43.8</td>
<td>19.8</td>
<td>30.4</td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>45.3</td>
<td>19.2</td>
<td>32.1</td>
</tr>
</tbody>
</table>

Different studies have found similar result for other crops grown in rotation with sugarbeet (wheat, canola, corn).
NDSU Canola Trials

Sugarbeet lime as a sulfur source for Canola, Langdon 2010

<table>
<thead>
<tr>
<th>Fall applied 2009</th>
<th>Spring applied 2010</th>
<th>Yield</th>
<th>Height</th>
<th>Phys. Mature</th>
<th>July date</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 lb el.S/a + 60 lb P/a</td>
<td>none</td>
<td>2059</td>
<td>113</td>
<td>23.3</td>
<td></td>
</tr>
<tr>
<td>10 ton lime material/acre</td>
<td>none</td>
<td>2030</td>
<td>111</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>60 lb P/a</td>
<td>7.5 lb SO4/a</td>
<td>2027</td>
<td>108</td>
<td>24.0</td>
<td></td>
</tr>
<tr>
<td>60 lb P/a</td>
<td>15 lb SO4/a</td>
<td>1966</td>
<td>114</td>
<td>21.5</td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>15 lb SO4/a</td>
<td>1915</td>
<td>107</td>
<td>22.3</td>
<td></td>
</tr>
<tr>
<td>5 ton lime material/acre</td>
<td>none</td>
<td>1906</td>
<td>103</td>
<td>22.5</td>
<td></td>
</tr>
<tr>
<td>60 lb P/a</td>
<td>80 lb el.S/a</td>
<td>1257</td>
<td>111</td>
<td>28.0</td>
<td></td>
</tr>
<tr>
<td>60 lb P/a</td>
<td>none</td>
<td>1045</td>
<td>106</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>none</td>
<td>818</td>
<td>111</td>
<td>29.3</td>
<td></td>
</tr>
</tbody>
</table>

LSD 5% | 420 | NS | 2.0 |
Yield Monitor Data

2008 Corn - Top portion had lime applied

2009 Soybeans +4 bu/acre

2010 Corn +14 bu/acre
### Liming Benifits

#### Query 1
**Layer 1 - Harvest - 1 Corn - Corn**

- **Total area**: 40.81 acre

**Description**: Average
- **Estimated Volume (Dry)**: 177.45 bu/ac
- **Moisture**: 15.67%
- **Elevation**: 883.77 ft

\[
14 \text{ bu/a} \times 6.70 \text{ Corn} = 94
\]

\[
4 \text{ bu/a} \times 14.50 \text{ Beans} = 58
\]

#### Query 2
**Layer 1 - Harvest - 1 Corn - Corn**

- **Total area**: 39.45 acre

**Description**: Average
- **Estimated Volume (Dry)**: 163.12 bu/ac
- **Moisture**: 15.82%
- **Elevation**: 884.81 ft
Spreading Equipment

• Common spreader types
  • Broadcast
  • Flail

• Spreader power
  • Ground drive (tire size is important)
  • Powered drive (PTO)
Vertical Auger spreader

Twin spinning disk broadcast spreader
Loading Spent Lime
Spreading Spent Lime
LI ME APPLICATION RECOMMENDATIONS

• Apply 7-10 wet Tons/Acre
• Apply 1 year prior to sugarbeets for best results
• Spread as evenly as possible
• Incorporate thoroughly with tillage
• Contact Ag Staff for any assistance with procedure
Policy and Procedures

- Soil test prior to application

- Lime can be stockpiled for 7 months at the field where it will be applied

- Only the amount of lime to be applied to the field may be stockpiled
Take Home Message

- No detrimental effects on rotational crops
- Increase yields of sugarbeet crops with severe Aph
- Every ton of lime applied will increase soil test P by 1 ppm
- Increase soil pH of acidic soils
- Addition of numerous micro-nutrients to soil
- Benefits of lime could last 7 years
- VersaLime is free
Thank You For Your Time

Any Questions