Managing Annual Ryegrass as a Cover Crop

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Natural Resources Management

Reasons to Use Cover Crops
- Improved soil tilth
- Increase Organic Matter
- Increase soil biological activity
- Improve soil structure
- Increase soil moisture holding capacity
- Add nitrogen
- Cycle nutrients

Annual Ryegrass
- Winter annual forage grass
- Used as a lawn grass for new lawns
  - Easy to establish
  - Quick greenup
- Used as summer and winter forage
- Used in critical area seedings for quick cover

What does it look like?

Growth Characteristics
- Winter annual
  - Planted in fall
  - Grows all winter
  - Matures in May
  - Dies in June
- Biennial- can act like one but isn’t
  - Planted in spring
  - Grows vegetatively all year
  - Matures following spring

Uses of Annual ryegrass as a mulch
Ryegrass benefits

- Small ryegrass decomposes readily
- Provides mulch/weed control
- Works for most crops
- Easy to establish broadcast
- Good root mass, adds SOM, adds tilth
- Reasonable cost $0.40 to $0.65/ lb.
- Tolerates wet soil
- Stores excess nitrogen (can uptake 300-500#/a)
- Excellent livestock feed value

Residue Quality

Common index (C:N) Residue < 20 C:N decompose fast >N levels

- Young ryegrass C:N 12:1 (depends on N available)
- C:N > 30 decreases N available in soil

<table>
<thead>
<tr>
<th>Crop</th>
<th>C:N Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybeans</td>
<td>15-25:1</td>
</tr>
<tr>
<td>Corn</td>
<td>30:1</td>
</tr>
<tr>
<td>Corn stalks</td>
<td>60:1</td>
</tr>
<tr>
<td>Wheat straw</td>
<td>80:1</td>
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</tbody>
</table>

Example of picking up excess nitrogen after corn

Nitrogen Uptake

Example of holding Nitrogen

- Corn after Corn
- 200#/N/a = 215 bu/A.
- Jan7th = 3642 #/A. annual ryegrass
- 2” of water leached
- 84 #/a of available Nitrogen from ryegrass

Ryegrass Management

- Plant dates
- Seeding rates 8-25#/a
- Spring kill before grass joints for quick decomposition
  - Use tillage or plastic to smother
- Ryegrass can retilli/resprout if not killed
- Combine with grazing system
  - Will reduce rooting
  - Make plant easier to control

Ryegrass

- Seeding method
  - Broadcast after harvest
  - Drilled
  - Does best if September seeded
  - Aerial seeded early September
- Seeding rate
  - Broadcast 15-20 #/acre
  - Drilled 8 – 15 #/acre
Date of Planting

- South I-70 seed before Oct. 15th
- North of I-70 seed before Oct. 1
- Dormant seeding
  - December – March 1
- Later seeding requires addition of:
  - Manure
  - 30-50#/a of nitrogen
  - To improve stand/ survivability

Seeding annual ryegrass with rolling harrow

Date of Planting

Ryegrass September 15 seeded vs mid October ....11” vs 2” on Nov 4th

Seeded Sept 15 on Sept. 30th

Grazing value from Jan. 6th test

- 21 % Protein level
  - This level can be higher if excess nitrogen is found in soil
  - In heavy manure applications, excess nitrogen raised protein level to 28%
- Relative feed value of 191
  - Better than corn or alfalfa

Sept. 15 seeded as of Jan. 6th
12+” height and 3642# dry matter/acre
Roots to 20”
Sept. 30th seeding 20#/a 2 different varieties

Variety selection

Competition of winter annuals with ryegrass is not competitive if winter annuals present at seeding

Annual Ryegrass Control

- Tillage very effective
- Mowing after bloom/before complete seed development
  - Variable success
  - Some seed may be produced
- Plastic mulch smothered
  - Smaller easier to control
  - Has fumigant qualities on root knot nematode
- Others?

Problem with escaped ryegrass in wheat. Very competitive

Intense ryegrass pressure will injure crops, cause nitrogen deficiency

Soil pit investigation of cover crop site
Rooting Depth

- December 10th ryegrass roots 14”
- April 9th to 51”
- Corn roots on Claypan soil
  - September 4th to 75”
- Soybean roots on Claypan soil
  - September 4th to 48”

April 9 in silt loam soil

Roots April 9th at 12” depth; third year of ryegrass cover
Note soil structure and worm holes

Corn root mass in silt loam clay pan soil under vetch/ryegrass cover crop

Intensive tillage can destroy soil structure
Tilled soil with a line of compaction at 7”

Note root growth restricted to 4 1/2” in chisel disk system
Note compacted platy soil below 5”
Soil profile changes

- Noted movement down of topsoil depth and color (organic matter)
- Noted significant decrease in silt fragipan deposition layer after 3 years !!!!!
- Significant increase in subsoil root – allows for crop root expansion

Cover crop rooting depth compared

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Rooting Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal rye</td>
<td>18.4”</td>
</tr>
<tr>
<td>Annual ryegrass</td>
<td>30.6” *</td>
</tr>
<tr>
<td>First year cover crop, planted Oct. 1</td>
<td></td>
</tr>
<tr>
<td>Roots measured April 9th</td>
<td></td>
</tr>
</tbody>
</table>

* Significant .05

Soil Density

<table>
<thead>
<tr>
<th></th>
<th>Ryegrass cover crop</th>
<th>No cover crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10”</td>
<td>1.49 g/cc</td>
<td>1.66 g/cc</td>
</tr>
<tr>
<td>16”</td>
<td>1.58</td>
<td>1.54</td>
</tr>
<tr>
<td>24”</td>
<td>1.48</td>
<td>1.65</td>
</tr>
</tbody>
</table>
Soybean Yield

<table>
<thead>
<tr>
<th></th>
<th>Bare</th>
<th>Cereal Rye</th>
<th>Ryegrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sw</td>
<td>48.2</td>
<td>52.3</td>
<td>60.6*</td>
</tr>
<tr>
<td>NW</td>
<td>51.2</td>
<td>53.8</td>
<td>55.7*</td>
</tr>
</tbody>
</table>

3 replications, each location

* Significant .05

Nematode Properties

- Research shows nematode suppression – Strawberries < root knot nematodes - MAFRA
- Incorporation reduces soybean cyst nematodes – Rigor, Welacky, Anderson

Nematode suppression

Table 2: Effect of root exudates originating from different plant species, on hatching of Heterodera glycines eggs.

<table>
<thead>
<tr>
<th>Species</th>
<th>Egg hatch (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echinochloa crusgalli</td>
<td>7.9±1.3*</td>
</tr>
<tr>
<td>Glycine max</td>
<td>31.3±3.9*</td>
</tr>
<tr>
<td>Lepidota rugulosa</td>
<td>29.9±1.4*</td>
</tr>
<tr>
<td>Leptospiella terrestris</td>
<td>45.6±3.1*</td>
</tr>
<tr>
<td>Lycosa peronana</td>
<td>16.9±1.8*</td>
</tr>
<tr>
<td>Medicago sativa</td>
<td>19.9±1.7*</td>
</tr>
<tr>
<td>Melilotus officinalis</td>
<td>18.7±1.8*</td>
</tr>
<tr>
<td>Trifolium hybridum</td>
<td>24.9±1.9*</td>
</tr>
<tr>
<td>Trifolium repens</td>
<td>37.8±2.1*</td>
</tr>
<tr>
<td>Vicia villosa</td>
<td>19.0±1.7*</td>
</tr>
<tr>
<td>Control water (plastic)</td>
<td>7.5±1.2</td>
</tr>
</tbody>
</table>

Anderson, Welacky, Rigor, Can. J. of Plant Pathology

Nematode suppression

Table 3: Effect of plant residues incorporated into soil on Heterodera glycines in soil and roots of grameneae grown

<table>
<thead>
<tr>
<th>Plant residue</th>
<th>H. glycines in soil</th>
<th>H. glycines in roots</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10.0±0.5 (ST)</td>
<td>15.0±0.5 (ST)</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>5.0±0.2 (ST)</td>
<td>10.0±0.5 (ST)</td>
</tr>
<tr>
<td>Barley</td>
<td>2.0±0.1 (ST)</td>
<td>5.0±0.2 (ST)</td>
</tr>
<tr>
<td>Corn</td>
<td>1.0±0.1 (ST)</td>
<td>2.0±0.1 (ST)</td>
</tr>
<tr>
<td>Soybean</td>
<td>0.5±0.05 (ST)</td>
<td>1.0±0.05 (ST)</td>
</tr>
</tbody>
</table>

TA plot

- Take good samples
- Keep good records of changes
- Cover crops can pull fertility from subsoil
- Sample same time and moisture content
Cover crops can move nutrients
- From subsoil to surface
- Will decrease subsoil levels
- Increased SOM will store nutrients
- Cover crop can store nitrogen for later release
- Cover crop can tie up nutrients if allowed to mature
Ryegrass
- Provides specific benefits
- Requires high level of management
- Can be highly beneficial

All cover crops are weeds in Growing Crops
- Manage accordingly