Cover Crops: Getting started and N management

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Cereal rye, SE Indiana
Rationale for cover crops

- A living, growing plant at times of year when we normally have nothing growing.
- Capture sunlight, feed soil organisms, sequester carbon, trap and recycle nutrients, improve soil health
- Make better use of the resources and time available!
7 Month “Brown Gap” for soybean and corn, fallow period

Cover crop grows and takes up N during some of that normally fallow season. This would shrink the “brown gap” and keep the land green for longer time.

Tile drain studies in Midwest consistently show reduction in nitrate leaching with cover crops. This scavenged N goes into YOUR soil N bank account!
Three main categories of cover crops have different effects

- Grasses
- Brassicas
- Legumes
Cover crops and N cycling

- Legumes—biological N fixation
  How much N \textit{fixed}? and released? and when?

- Non-legumes—How much N \textit{trapped}? and released? and when?
N-scavenging crops

- Amount of biomass produced is key to nutrient uptake—good stand, rapid growth
- Age/stage of plant when killed, determines N%, C:N, plant composition, and therefore decomposition rate (along with weather!) Huge challenge!
- Cereal rye, annual ryegrass, wheat, oats, barley, triticale
Residue Addition and N Availability

High carbon residues added

Avail. Soil N

Immobilization (tie-up)

Time

Mineralization (release of N)
Residue Addition and N Availability

- Low carbon residues added
- No Immobilization (tie-up)
- Mineralization (release of N)
C:N ratios of common organic residues

<table>
<thead>
<tr>
<th>Organic material</th>
<th>C:N ratio</th>
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</thead>
<tbody>
<tr>
<td>Newspaper</td>
<td>120:1</td>
</tr>
<tr>
<td>Wheat straw</td>
<td>80:1</td>
</tr>
<tr>
<td>Corn stover</td>
<td>57:1</td>
</tr>
<tr>
<td>Rye cover crop, anthesis</td>
<td>37:1</td>
</tr>
<tr>
<td>Rye cover crop, vegetative</td>
<td>26:1</td>
</tr>
<tr>
<td>Hairy vetch cover crop</td>
<td>11:1</td>
</tr>
<tr>
<td>Soil microbes (average)</td>
<td>8:1</td>
</tr>
</tbody>
</table>

C:N ratios wider than 25:1 cause N immobilization for some time period. If utilizing covers with wide C:N ratios, then should either:
- allow time for decomposition before high N-using crop (corn)
- apply extra starter N
- don’t choose high C:N covers before corn
How to get started?

- Many farmers and crop advisors are interested in using cover crops.
- Many reasons, incl. soil health, N scavenging, erosion control, weed suppression.
- But how to start? Many options, for species and management. Sometimes overwhelming.
- These “recipes” are aimed at new cover crop users, to learn basic mgmt., get experience, w/ relatively low risk. Then many other options possible after learning basics.
Cover Crop “Recipes”

Publication numbers:
CROP 3158 (and MCCC-103)
CROP 3159 (and MCCC-104)
Available from Iowa State Extension

And www.mccc.msu.edu, go to “getting started” tab

Recipes now also available for most other states in Midwest
Cereal rye (Secale cereale L.) often chosen because most winter-hardy and widely adaptable across northern regions.
A Two-year Plan for Corn-Soybean Rotation

- **Step 1: Plant Cereal Rye into Corn Stalks**
  - drill
  - VT w/ air-seeder

Cereal rye can be planted late, and is the most winter-hardy of covers

Seeding rates, and dates, available by county for Midwest states—see MCCC Decision Tool. Or “Recipes” for your state.
Step 2—Terminate in spring

- Preferred option
  - Spray 2 weeks before planting, or when cereal rye is 6-12 inches tall
    - Herbicide works effectively on undamaged cereal rye plants
    - Cover is dead before planting
    - Less residue to plant through
Step 2—Terminate in spring

- Preferred option
  - Spray 2 weeks before planting, or when cereal rye is 6-12 inches tall

- Alternatives under very wet conditions
  - Spray 1-2 days BEFORE planting
  - Spray AFTER planting (same day or within 1-2 days)

- Advantages and risks with each option (see Table 1 in AY-353-W)
Step 3: No-till Plant Soybean into Cereal Rye

Consider short-season variety, earlier planting, to provide more time in fall for next cover. (plant your earliest beans early, on fields going to cover)
Step 4: Plant Cover Crops that Winter-kill

Oats/daikon radish.

Low C:N ratio.

Winter-kill, so no termination timing issues before corn.
Step 5: No-till Plant Corn into Dead Cover

(alternatives of fall strip till; or shallow vertical till in spring)

Starter (2x2) fertilizer, 30-50 lbs actual N per acre, should also be considered (helps with any N tieup possible from the dead oats; gives a faster start)
Resources

2nd Edition now available!

Purdue Extension Education Store
edustore.purdue.edu

Phone app now available!

www.mccc.msu.edu
Cover Crop Selector Tools
(link on top menu bars)

Check out the “recipes” under Getting Started tab!
Including video/webinar of Indiana recipes
explained in detail!

www.ccsin.org

Also Google North Central SARE, for many resources on
cover crops, sustainable ag
Residual herbicides, weed suppression, & pest management

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Outline

• Making residual herbicides work with cover crops

• Can cover crops replace herbicides?

• Pest management watch-outs
Do residual herbicides reach the soil surface?

- Residual herbicides must reach soil surface to kill germinating weeds
  - Do they reach the soil when they are applied to living covers?
  - If they are caught on living tissue, are they later released to the soil?
Do residual herbicides reach the soil surface?

• Amount of herbicide reaching soil surface is inversely related to biomass accumulation

![Graph showing sulfentrazone soil concentration](chart.png)
Should we change herbicide programs for big cover crops?

Effect of residual application timing on waterhemp control

Tips to manage residual herbicides

• Residual herbicide likely necessary with termination application if:
  – Cover crop is small (< 12-18”) at termination timing
  – Stand is uneven and would allow weeds through
  – Large-seeded weeds like giant ragweed and velvetleaf are problems

• Alternative options:
  – Early residual before cover crop canopy closure (extra pass)
  – Late residual with early POST
Can rye contribute to weed suppression?

• Yes, with:
  – Even stand of cover crop
  – High biomass accumulation
  – Late planting of crop (?)

• Real potential in soybean!
  – May be field-specific or specific to parts of fields
In Iowa: cover crop planting matters

Rye terminated on May 5. Feeke’s Stage 8-9 (flag leaf)
Does the cover crop alone control weeds?

- winter wheat
- oat
- winter vetch
- cereal rye/winter vetch mix
- cereal rye
- Austrian winter pea
- Italian ryegrass
- No tillage
- Tillage

% Control

- Waterhemp control
- Overall weed control

Effect of rye cover crop on waterhemp emergence patterns

Control

Sept. Planting

Time to 50% emergence delayed two weeks by rye
Pest management watch-outs!

• Terminate 10-14 days before planting corn
  – Reduce potential disease issues
  – Reduce food sources for insect pests

• Timing less important for soybeans
  – At or before planting to minimize issues
Pest management watch-outs!

• Scout after planting to determine whether insect management is necessary
  – Attractive to true armyworm, black cutworm, and some other early spring pests
Summary

• Cover crops can complement herbicides in a weed management program.
  – Improve overall weed control, reduce pressure on herbicides

• Cover crops can suppress weeds!

• Managing pests with cover crops can be simple, but preparation is key!
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