Cover Crops and Weed Science Bill Johnson

Cover Crop Weed Science Research Areas at Purdue

- Spring termination
 - Timing and impact on efficacy and crop yield
 - Herbicide programs
- Cover crops and weed control in corn and soybean
 - Winter annual weed control (marestail, henbit, deadnettle, chickweed, shepherdspurse, pennycress, cressleaf groundsel, etc)
 - Summer annual weed control (giant ragweed, waterhemp, palmer amaranth)
 - Can they be used in buffer areas in Xtend and Enlist soybeans
- How do cover crops and residual herbicides work together in an integrated system
 - Impact on establishment from previous year
 - Impact of cover crop residue on residual herbicide activity
 - Impact of cover crop "biology" on residual herbicide persistence

Spring Termination with Herbicides

- Many factors to consider when applying herbicides in the spring
 - Weather
 - Cover crop species
 - Other weeds present



Cover Crop Termination – General Comments

- Build your termination plan for the toughest to control species (cover crop or weed)
 - See extension guides, weed control guides for best herbicide choices
- From a weed science standpoint, early termination is always best (before planting or crop emergence)
 - Cover crops are easier to control when small and gives the user time to retreat if necessary
 - Residual herbicides need to hit soil to work
 - High residue amounts can tie up some residual herbicides (those with low water solubility)

PURDUE

PURDUE EXTENSION TERMINATING COVER CROPS Successful Cover Crop **Termination with Herbicides**

Authors: Travis Legleiter Bill Johnson Tom Jordan Kevin Gibson



Cover crops have become a major topic for producers who want to capitalize on government conservation payments and incorporate sustainable agriculture practices into crop production acres. Cover crops can decrease soil erosion, enhance soil quality and nutritive value, and help improve air and water quality. Cover crops are unique in that most are planted primarily for these benefits and are not harvested for their seed, fruit, or forage (some are partially grazed or used as forage). Instead, cover crops are terminated before planting production crops.

Those who would like to use cover crops in their production systems have many factors to consider including how the cover crop will be terminated. If not terminated properly, cover crops have the potential to become weeds in the production crop and can slow soil drying and warming in the spring. Many cover crop species have characteristics that make them both desirable as cover crops and troublesome weed species. Weedy cover crop escapes not only affect the current production crop, but also can produce seeds and establish a seed bank that will produce future weed problems.

This publication describes how producers can effectively terminate cover crops with herbicides to prevent them from becoming weeds in production crops.

Termination Methods

The four common methods of terminating cover crops are: winterkilling, tilling, mowing, and applying herbicides.



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Oats can be an effective cover crop.

Each method has its disadvantages and limits. For example, winterkill (the cover crop is terminated by a hard freeze) is only applicable to certain crops and climate regions; mowing is limited to certain cover crops and crop growth stages. Tillage can be expensive and can negate the benefits of the cover crops, as well as the benefits of minimum/no-till production systems. Many factors also limit herbicides - and they may be completely prohibited in organic cropping systems. When selecting an herbicide program for termination of a cover crop, consider:

- · The cover crop species.
- · The cover crop growth stage.
- · Other weed species present.
- · The production crop to be planted.
- The weather conditions at application.
- · The type of herbicide used.



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TERMINATING COVER CROPS Successful Annual Ryegrass **Termination with Herbicides**

Annual ryegrass has become a popular cover crop choice for growers in Indiana and many other states. Annual ryegrass has many attributes that make it a favorable cover crop including quick establishment across a wide range of environments, the ability to survive Midwest winters, a vigorous and aggressive vegetative growth habit, and a high biomass potential both above and below the soil line. Annual ryegrass is also valued for its ability to sequester and release nitrogen for corn production. Unfortunately, its adaptability, quick establishment, and aggressive growth are also considered to be characteristics of a weed. The annual ryegrass we know as a cover crop is the same species (Lolium multiflorum) as Italian ryegrass, which has become a major pest in both the southern

> Mississippi Delta and Pacific Northwest. Italian ryegrass is not only tough to control, it also has been confirmed resistant to four herbicide sites of action in the United States: ACCase inhibitors (Group 1), ALS inhibitors (Group 2), glyphosate (Group 9), and glufosinate (Group 10).

> This species' aggressive growth aspects and its ability to adapt to herbicides has made many weed scientists cautious about recommending it as a cover crop. While annual ryegrass has shown to be an excellent cover crop it is also the most difficult grass cover crop to terminate, so should only be grown by experienced cover crop users.

Many farmers without previous cover crop experience have failed to terminate annual

ryegrass and allowed the intended beneficial cover crop become a major weed in their cash grain crop. Once the annual ryegrass escapes management all the way to reproduction, the seed can remain viable, yet dormant, in the soil for several years - another weedy characteristic that you would not associate with cultivated crops.

This publication provides general guidelines for successful termination of annual ryegrass with herbicides using data acquired at Purdue University. We also will consider seed varieties, termination timing, and herbicide adjuvants.

Things to Consider **Before Planting**

There are a few things you should consider before planting annual ryegrass as a cover crop. First, as with any cover crop you should remember that it is still a "crop" and it requires management. Anybody who has the mentality of "I'll throw some seed out there and collect the government check," is likely going to have a bad experience with any cover crop, especially when using annual ryegrass.

The ease with which you are able to terminate annual ryegrass begins when you buy the seed. There are limited seed quality regulations for cover crops, so be careful about what genetics you are buying and planting.

You can buy certified "Blue Tag" seed that is certified by the Oregon Seed Certification Service. This ensures you are buying a pure ryegrass variety, although it can be tough to find this certification on

WS-52-W

Influence of Residual Herbicides on Cover Crop Establishment

- Many cover crops not listed on herbicide labels for plant back restrictions
- Herbicide label plant back restrictions for harvested or grazed crops
- Very little knowledge of herbicide residue carryover on cover crop establishment



Influence of Residual Herbicides on Cover Crop Establishment

- This type of research consumers huge amounts of space and no one funds it!
 - XX herbicides * YY cover crop species/varieties/mixtures * 4 reps * ZZ soil types == acres and acres and acres......
- Herbicide carryover is difficult to tie a hard number to with one herbicide and specie because if environmental variability and variability in specie sensitivity.



General guidelines

- Herbicide half-Life information can be very helpful
- Corn herbicides
 - Pyroxasulfone (Zidua) and metolachlor (Dual, etc) can hinder ryegrass establishment, but not cereal rye
 - Atrazine or simazine at < 1 lb/A can allow cereal grain establishment
 - < 0.75 lb/A may allow for most legume cover crops, mustards, annual ryegrass, and cereal rye.
 - Atrazine > 1 lb will be problematic for legumes and mustards unless lots of rain
 - Mesotrione (Callisto, Lumax, Lexar etc.) and clopyralid (Stinger, Hornet, SureStart) is problematic for legumes and mustards like canola and forage radish.
- Soybean herbicides
 - Chlorimuron (Classic, Canopy, Cloak, etc.), imazethapyr (Pursuit), and fomesafen (Reflex etc.) could be a problem for fall seeded legume or mustard covers - cereal grains OK.
 - Fomesafen (Flexstar, etc) and imazethapyr could be problematic for tillage radish.
- If in doubt, conduct a bioassay!

Cover Crops and Weed Control

- Overall - results are variable from year to year

- Even in long-term experiments (we have data for 4 and 5 years from different studies)
- Some years 20-70% reductions are observed (marestail suppression is fairly reliable)
- Some years winter weed populations increase (henbit, deadnettle, chickweed)!
- Control of summer annual weeds depends on emergence characteristics of the weed
- High biomass production by the CC is the key to weed suppression, but can cause problems with residual herbicide use – where is the sweet spot?
- Cereal rye has the best potential for suppressing weeds
- Seed contamination has been a real concern, but may be less so now with the new seed law

Weed Control with Herbicides and Cover Crops

- What is the goal of growing the cover crop?
- Weed suppression is not "universal" over all weed species
 - Hopefully it helps with most species, but be alert for "new" species to become more prevalent
- Assess "weediness" of the field
 - Do you have problems with one (or more) of the "big four"?
 - Marestail, Waterhemp, Palmer, Giant ragweed
 - Cover crops can help maintain low weed pressure, but will NOT be much help in heavy weed pressure, unless you are following the specific recipe for a single specie
- Can you terminate in a timely manner?
 - High residue cover crops and residual herbicides are NOT a good combo!

Where Do We Go From Here?

- Still a need unbiased, scientific information from 3rd party sources due to rapid expansion of land infested with herbicide resistant weeds and stable use of cover crops
- More information is needed on cover crop mixtures
 - Weed suppressiveness in both corn and soybean (The Big 4, plus lambsquarters, morningglories, grasses, etc)
 - Interactions with residual herbicides
 - Interactions with new soy herbicide resistance traits (dicamba, 2,4-D, mesotrione, isoxaflutole)
- Integrate information with Midwest Cover Crops Council (MCCC) website
- Secure funding to continue this work

Thank You! Happy Holidays!