

# Annual Ryegrass Cover Crop Management for Corn and Soybean Production

## 2013 Management Recommendations

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**A**nnual ryegrass is a vigorous cool-season grass with an extensive fibrous root system. When used as a cover crop, annual ryegrass helps prevent erosion, builds soil organic matter, improves soil tilth, captures residual nitrogen and can significantly increase the rooting depth of crops including corn and soybeans. This publication covers the management practices essential to growing a successful annual ryegrass cover crop. These time-tested strategies come from more than 12 years of on-farm testing in the Midwest.

Using annual ryegrass as a cover crop requires management. It must be seeded on a timely basis and at the proper rates and it must be controlled on time so that it does not compete with corn or soybeans as a weed. By using the correct seeding date and methods in the fall and then effectively killing the ryegrass the following spring, growers can reap both economic and environmental benefits from this cover crop.

### When to Seed Annual Ryegrass

Seeding date is an extremely important factor to ensure establishment and growth of annual ryegrass before winter. Annual ryegrass establishes readily when temperatures are warm in late summer (55°F plus), but it is slower to germinate and establish than winter wheat or cereal rye when soil and air temperatures are cooler in late-September and October. If ryegrass is seeded after harvesting corn and soybeans, do so as soon as possible. From I-70 south, the best seeding dates are between September 10 to October 1, and north of I-70 the best seeding dates are late August to September 15. Ideal weather conditions may allow a later planting but it increases the risk.

### Variety Selection

Select a variety that has been tested in the Midwest and is suitable for cover crop production. Annual ryegrass varieties vary in how fast they emerge and in how winter hardy they are, but as a species annual ryegrass is less tolerant of cold weather than cereal rye and winter wheat. Even if a variety is marketed as “winter hardy,” it will not survive a severe open winter as well as cereal rye. Snow cover can aid winter survival.

Annual ryegrass varieties have not shown any allelopathic effects on corn or soybeans. Rooting depth varies some among varieties, but all have a fibrous root system that is an excellent soil builder and nitrogen scavenger. Annual ryegrass produces less above ground biomass compared to cereal rye, and is easier to establish using broadcast and aerial methods of seeding. Even if winter kill or dieback occurs, the rooting depth of annual ryegrass will still be beneficial to the soil.



Effective annual ryegrass control was achieved on this Indiana farm using a full rate of glyphosate (48 oz/a) at 12 gpa, and by waiting until the ryegrass was actively growing and weather conditions were favorable for optimum efficacy of the herbicide.

### SUMMARY

**Planting Date:** An early fall planting date is very important. Annual ryegrass is fast to emerge while the weather is still warm, but slower than cereal rye or winter wheat later in the fall as soil temperatures cool

**Seeding Rate:** 12-25 lb/acre depending on planting date and method. Use higher rates with broadcast or aerial seedings and with later planting dates.

**Variety:** Seed an annual ryegrass variety that has been tested in the Midwest and is suitable for cover crop plantings.

**Control Timing:** Apply burn-down herbicide before jointing, usually late March or early April. Thorough coverage is important.

**Herbicide:** Use an adequate rate of glyphosate (1.25-1.5 lb a.e./acre) and a medium spray pattern. Spray during favorable environmental conditions (warm temperatures) to control the annual ryegrass cover crop.

## Seeding Methods

No-till drilling provides good seed soil contact and is the most dependable method to establish an annual ryegrass cover crop. The seed should be planted at a rate of 12-15 lb/a at a depth of ¼ to ½". Another method that can be used is broadcast seeding using a greater seeding rate of 15-25 lb/a. Broadcast seeding with an airflow spreader results in a uniform spread of the seed and allows annual ryegrass to be mixed with fertilizer, typically 100 lb of 0-0-60 or 18-46-0 if nitrogen is needed. This reduces the time and expense that no-till drilling requires.

The main drawback with broadcast seeding is that annual ryegrass emergence is weather dependent and requires additional seed. Drilling the ryegrass ensures quicker germination and emergence (7-10 days) compared to broadcast methods which rely on rainfall for seed germination. Drilling also results in better root development and allows for a later planting date.

A variation of the airflow broadcast seeding method is the use of a fertilizer buggy to spread the annual ryegrass seed and fertilizer mix. Annual ryegrass weighs only 26 lb/bu and will not spread as far as heavier seeds. Fan spreaders require that everything be double spread to ensure that the ryegrass seed is uniformly distributed due to the difference in weight between the fertilizer and the seed.

Annual ryegrass has been seeded into standing corn and soybeans with excellent results using high clearance seeders (e.g. modified "Hi-Boy" sprayer retrofitted to be a seeder). Seeding just before rain generally results in a very good stand using these types of seeders, as it does with other broadcast and aerial methods.

## Aerial Seeding

Aerial seeding is one way to get seeding done and the ryegrass established earlier in the growing season. Use the broadcast seeding rate of 18-25 lb/a when aerial seeding. In standing corn, aerial seeding should be done when the corn is starting to turn yellow or brown. There needs to be approximately 50% of the sunlight passing through the corn canopy to the ground so the annual ryegrass will germinate (although ryegrass has been successfully established while the corn is still green). Make sure the pilot has calibrated his plane so the width of the spread pattern does not leave streaks or gaps.

Aerial seeding into standing corn is a standard practice north of I-70 to ensure timely emergence and increased winter survival. Although aerial seeding does not provide the good seed-to-soil contact obtained with a drill, planting the ryegrass 4-6 weeks before corn harvest (typically mid-August to mid-September) may provide more total fall growth and better root development. However, too long of a time between germination and corn harvest may cause loss of the stand. Seeding in August is as early as one should consider planting annual ryegrass in the Midwest Corn Belt. Earlier plantings may go to seed before cold weather arrives.

In soybeans, aerial seeding needs to be done in the standing crop when the soybeans have turned yellow and the first leaves are falling off the plants. Aerial seeding into soybeans has been somewhat more inconsistent than in standing corn. Seeding into soybeans seems to



Photo: Matt van Tilberg

High-clearance seeder

work better if the seed hits bare soil and the soybean leaves then fall and act as a mulch on top of the seed. However, too heavy a layer of leaves may suppress the emerging seedlings. Rainfall and other factors interact to affect establishment as well. Bottom line – aerial seeding into soybeans works most of the time but not always.

## Frost Seeding

Dormant or frost seeding is also an option. Generally, annual ryegrass will not germinate until the soil temperature warms in the spring. To obtain the desired root growth, the ryegrass will need to grow for a longer period of time in the spring compared to a fall seeding. This delay in ryegrass development means soybeans – not corn – will probably be the best crop to plant following a dormant seeding.

## Nitrogen Needs are Field Specific

Annual ryegrass is a very good nitrogen scavenger. However, there needs to be sufficient nitrogen available in the top 6" of soil for good fall growth. To increase plant growth and winter survival, use 30 lb/a of nitrogen fertilizer or a manure application at planting. Nitrogen may not be needed if the field is relatively high in organic matter, has had a cover crop the previous year, has been in continuous no-till for several years or has had manure applied in the past 2-3 years. Fertilizer nitrogen is especially needed if the cover crop is to be used as forage, and an additional 30 lb/a of spring nitrogen will increase production.

The uptake of residual nitrogen in the soil by annual ryegrass depends on how much biomass or growth occurs, and on how much nitrogen is in the soil. Uptake of nitrogen varies based on how much residual nitrogen is available. An early seeded and well-established annual ryegrass cover crop, planted on soil with a manure application, may take up in excess of 100 lb/a of nitrogen. This is nitrogen protected from leaching and runoff losses, and becomes available to crops as the annual ryegrass residue breaks down.

In the drought conditions of 2012, significant fertilizer remained in the soil profile in many fields. A well-established annual ryegrass cover crop can capture a significant portion of the residual underused nitrogen, as well as other nutrients, for use in the coming crop year.

## Seed Into Weed-Free Fields

Fields need to be free of established weeds when annual ryegrass is seeded. During the fall, winter annuals are becoming established and are very difficult to detect. Henbit, purple deadnettle, chickweed, cheat, downy brome and winter barley can become very competitive with the germinating annual ryegrass. If the field has a history of winter annuals, a burndown herbicide application before planting will ensure a clean field and quick start for the annual ryegrass when not seeding into standing corn or soybeans crops. Herbicides may be used before seeding to provide good winter annual weed control.

## Growth and Development

Annual ryegrass may not develop more than 2 or 3 leaves after a late seeding prior to cold conditions in winter. The stand may look thin and poor, but will develop roots during warm periods over the winter and will grow rapidly in the spring. Annual ryegrass with only 2 leaves by December has had measured root development 10-14" deep in fragipan soils and deeper in less restrictive soils.

By mid-April and sometimes earlier, most of the annual ryegrass root growth in depth has occurred. Rooting in first year no-till fields has been 28-31" for fragipan and claypan soils and 48-50" in better soils. After three years of no-till crops and ryegrass cover crops each year, the rooting depth of the crop and ryegrass has been increased to 45-60" deep. Annual ryegrass top growth is normally 8-12" in height when these rooting depths have been measured.

## Annual Ryegrass Cover Crop Control

Control of the annual ryegrass cover crop is best done when the plant is small, 8" in height, and before the first node has developed. Typically, this has corresponded to late March to early April, or mid-April in the northern Corn Belt. Annual ryegrass is more difficult to control after the first node has developed. Thorough spray coverage using medium spray droplet sizes and moderate spray pressures is critical to achieving control. The use of air induction spray systems that produce coarse droplets should be avoided. Reduce spray application volume to 10 gallons per acre (with glyphosate products, the minimum spray volume needed to achieve good coverage facilitates control).

While one burn-down herbicide application may provide control of the annual ryegrass, growers should plan for two applications



*Annual Ryegrass drilled into a corn field*



*Mike Plumer measuring root depth*

(preferable using an herbicide with a different mode of action). Even when annual ryegrass is small it requires full rates of herbicides to achieve control. Low rates will often stress the plant making it more difficult to control at a later date. In the spring, annual ryegrass has been established 7-8 months and has an extensive root system. It should be treated as if it were an established forage like tall fescue or smooth brome grass, not like a two week old giant foxtail seedling. It is important to not let the ryegrass go to seed or it may create additional weed management problems in the future. If annual ryegrass is allowed to reach the flowering stage, the control of the plant is easier, but some viable seed may develop.

## Glyphosate Burn-Down Applications

Achieving good control of annual ryegrass with glyphosate herbicides before planting corn or soybeans depends on timing, application rate and weather conditions. Apply glyphosate at 1.25-1.50 lb a.e./a (48-64 oz/a of a 41% glyphosate product) with ammonium sulfate and surfactant in late March to early April. Follow label directions carefully with respect to pH and mixing order. It is important when adding ammonium sulfate, other glyphosate additives or citric acid that they be added to the full spray tank of water and agitated for 3-5 minutes before adding the glyphosate. This is to ensure that the calcium, magnesium, iron and other dissolved minerals in the water do not interfere with the glyphosate activity. Weather conditions can affect how well glyphosate controls annual ryegrass:

- Spray during daylight hours, at temperatures above 60° F, and when the annual ryegrass is actively growing for best results;
- If night temperatures drop below 38°F, wait three days before spraying;
- Soil temperatures should be above 45°F;
- Spray at least 4 hours prior to sunset to allow for maximum translocation of the glyphosate within the plant.



Early termination of the annual ryegrass cover crop makes control easier and reduces the amount of residue to plant corn or soybeans into. Early control also facilitates soil dry down and allows for significant decomposition of the ryegrass residue and the release of nitrogen or other nutrients prior to uptake by the crop.

## Corn Production

Never tank mix atrazine or Callisto (mesotrione) with glyphosate or annual ryegrass control can be reduced as much as 40%. If planting corn, adding 1 lb a.i./a Princep (simazine) improves weed control, but may be a concern on sandy soils. Adding Princep, Balance Pro (isoflutole), Prowl H<sub>2</sub>O (pendimethalin), Resolve (rimsulfuron) or Basis (rimsulfuron + thifensulfuron), 2,4-D or Axiom (flufenacet + metribuzin) at full label rates has shown good activity for general weed control and efficacy trials have not shown any antagonisms when applied with the glyphosate burn-down on control of ryegrass. Full rates of Ignite or Liberty (glufosinate-ammonium) and Gramoxone (paraquat) have provided 70-85% control of ryegrass before nodes are formed and less control after the 1-2 node growth stage. Two applications of these products 3 weeks apart (allowing for regrowth and retiling) have provided much better control. After the crop emerges, escapes can be controlled in corn with labeled rates of Accent (nicosulfuron) or Option (foramsulfuron), but best control is obtained with these products when temperatures are above 70 degrees. Glyphosate can be used in Roundup Ready crops.

## Soybean Production

The use of Roundup Ready soybeans makes controlling an annual ryegrass cover crop much easier. However, in conventional soybean production or after the soybean crop emerges, escapes can also be controlled with additional modes of action by applying full rates of SelectMax (clethodim), Poast Plus (sethoxydim) or Fusilade DX (fluzifop) making sure to use fertilizer and surfactant or crop oil concentrate as per label instructions. These products have shown some problems if applied in cold temperatures.

## Wheat Production

Select a field that will not have winter wheat in the crop rotation. Annual ryegrass can be difficult to control in winter wheat unless a grower is committed to using a burn-down or residual herbicide followed by one or more selective post-emergence grass herbicides.

## Management Summary

The use of annual ryegrass as a cover crop requires fine-tuned and timely management, but can result in some significant benefits to the corn and soybean grower. Poor management of this cover crop increases the potential for reduction in subsoil moisture, negative effects on crop yields or increased costs. Potential benefits of utilizing annual ryegrass as a cover crop are significant positive changes in soil properties including improvement in soil tilth and water infiltration. A well-managed annual ryegrass cover crop allows for greater crop rooting depth, improved soil aggregation, scavenged nitrogen, reduced erosion and increased moisture holding capacity. Annual ryegrass helps maintain or increase soil organic matter. The effect on yields of corn and soybeans depends on the soil type and year, but over time has been positive, especially in years of low summer rainfall.



*Annual ryegrass is also an excellent forage crop. On this farm, annual ryegrass was drilled following corn harvest, green chopped in the spring, and successfully replanted to corn. The growth stage however is later than most Midwest growers should apply burn-down herbicide, as control is easier before jointing occurs.*

## AUTHOR BIOGRAPHIES

**Mike Plumer.** As an Illinois based agronomist, Mike has worked with no-till production and cover crops for over 30 years as an educator with the University of Illinois. Mike grew up on a farm in Illinois, and currently does consulting work for a variety of organizations to help Midwest farmers. Mike has conducted more than 15 years of on-farm testing of annual ryegrass and other cover crops, including variety evaluations, control and planting methods.

**Mark Mellbye.** As an Extension field crops agent with Oregon State University, Mark has worked with annual ryegrass in the seed production region of Oregon for 25 years. He has cooperated with Mike Plumer on cover crop research in the Midwest the past 15 years.

**Dan Towery.** Currently the Conservation Cropping Systems Initiative (CCSI) Coordinator based in Indiana, Dan has extensive experience in conservation farming practices in the Midwest. Dan is the incoming president of the *Soil and Water Conservation Society*.

**Andy Hulting.** Dr. Hulting is the Extension Weed Management Specialist and an associate professor of weed science with Oregon State University. Andy grew up on a corn and soybean farm in Illinois. His research includes work on weed management in annual ryegrass seed production systems coupled with ryegrass control in wheat in Oregon. Currently, Dr. Hulting is helping evaluate control options for annual ryegrass control in corn and soybeans.



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