UNIVERSITY OF ILLINOIS EXTENSION
College of Agricultural, Consumer and Environmental Sciences

Annual Ryegrass Variety Report

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June 2008

Background

The use of annual ryegrass (Lolium multiflorum) as a winter cover crop began in the early 1990s. As no-till gained in popularity, researchers, crop advisors and Midwest corn and soybean farmers wanted to experiment with annual ryegrass, comparing its characteristics and management needs with other familiar cover crops.

University of Illinois Extension was part of those early field trials, using successively larger plots in a wider geographic area, often comparing results (anecdotally) between acreage conventionally tilled with other adjacent acreage planted with annual ryegrass. Thus, much practical information was gained from working cooperatively each year with farmers in southern Illinois and Indiana. But the practice also raised many questions, among them: Which varieties perform the best and which are the easiest to manage?

In the fall of 2005, the University of Illinois initiated a three-year variety trial to ascertain how different varieties of annual ryegrass reacted against the Midwest winter climate. Likewise, the trials also included herbicide trials, determining optimal methods for effectively eliminating annual ryegrass in the spring. Throughout, management practices were evaluated and developed to insure the highest level of success under Midwest conditions.

This report is being made available to the ryegrass industry and to Midwest producers in order to help farmers and seed growers with their decisions about using annual ryegrass as a cover crop.

Variety Trial Program Description

The annual ryegrass variety trial was initiated in 2005 to investigate winter hardiness of different annual ryegrass (Lolium multiflorum) varieties. Varieties were selected based on an open invitation to all seed companies, breeders and producers. The initial request was for 10 varieties. With a strong interest, 16 varieties were entered in 2006, with 3 more varieties added by the farmers in 2007.

The first variety trial was located at the Ralph Upton farm, 10 miles south of Interstate 64 and about 20 miles from the Indiana border. This site was chosen because the soil is representative of large areas of Missouri, Southern Illinois, Indiana, and Ohio. The soil type (*Bluford silt loam, fine, smectitic, mesic Aeric Fragic Epiaqualfs*) is a moderate claypan soil, low in organic matter with acid subsoil. Further, the land is typically eroded and exhibits poor internal drainage, restricted crop rooting and is often highly variable in yields. The Upton site was classified as a C3 with 6 to 8 inches of top soil over highly acidic subsoil; it had been no-tilled for 9 years.

The second location was at the Terry Taylor Farm, located 15 miles north of Interstate 64. This site was chosen due to its uniform soil, a type representative of much of the southern corn belt—poorly drained with little slope and high in fertility. Specifically, the soil type is a *Cisne gray prairie claypan silt loam, fine, smectitic, mesic Mollic Albaqualfs*. This site had little erosion and had been no-tilled for more than 15 years.

Similar research was conducted at Ohio State University by Jim Hoorman. Because of variances between those trials and those in Illinois, data reported herein does not include that of Ohio.

Materials and Methods

These annual ryegrass variety trials were blind by design, using a randomized complete block of land with three replications at each site. The only identification used on the varieties in the plots was a number representing each variety. The plots were also flagged with numbers and data was collected by numbers so that no bias was introduced.

Planting was done with a no-till drill at all locations. The use of a no-till drill ensures that the correct seeding rate is applied to each plot and that seed is placed at the proper depth. A CrustBuster 15-foot drill was used at the Upton farm, and a John Deere 20-foot drill was used at the Taylor farm. Seeding rate was 20 pounds per acre at a depth of ½ inch.

Planting took place following crop harvest at Locations 1 & 2, to ensure that the data would conform to farming practices in the area. Each year, the annual ryegrass was planted between September 28 and September 30 at both Illinois locations.

Plots at the Upton farm were located at the same site every year and measured 7.5 feet wide by 100 feet long. At the Taylor farm, plots were 10 feet wide and 120 feet long. Over the three years, plots were located in three different fields.

Measurements of each variety were taken at two weeks after planting, again at four weeks, and then monthly, weather permitting, and at the final evaluation date. Plants were measured for height, stand, and winter hardiness (condition) in the spring. In the spring, the last measurement included rooting depth, which was measured in every variety and replication. Rooting depth was taken using a 3″ x 48″ soil probe.

Results and Discussion

The winter weather patterns in the Midwest were highly variable during the three years of the trial. In the first year, 2005-2006, weather was fairly typical with some cold conditions.

The second year, 2006-07, had wide temperature fluctuations, with temperatures varying more than 60 degrees Fahrenheit over 2- to 3-day periods. These fluctuations occurred five times, resulting in severe plant desiccation and dieback. Frequent regrowth and freezing depleted the plants' nutrient reserves.

The 2007-08 growing season was similar to the average temperature, but had 300 percent greater rainfall than normal, resulting in plant stress and freeze damage.

The Upton farm site, a continuous no-till corn field, had many problems during the study. In the first year, the site had limited rainfall for establishment of annual ryegrass, resulting in reduced

stands and reduced winter hardiness. In year two, the ryegrass was planted on September 30, but it did not receive any rainfall for almost three weeks, thus delaying emergence until November. The resulting stand was poor and, when combined with the extreme weather conditions, the entire plot died over winter (winterkill). In year three, the plot was planted on September 7 in moist soil conditions (from a .3-inch rain, the first rain in 45 days). The area had experienced a severe drought that year, with less than 3 inches of rainfall in the growing season and extended high temperatures. Plants emerged but did not receive any additional rainfall until Oct 10. All the varieties had sprouted and then died due to the lack of moisture. The trial was replanted on November 1 in cold, wet conditions. The planting was not established when cold winter conditions arrived, and the majority of the varieties did not survive the winter. Consequently, only one year of data from the Upton trials was included in the summary results. One significant note is that of the three replications, the one replication that was located on a higher organic matter soil had a significant increase in survival. The variety trials at the Taylor farm were located in a different field each of the three years. The soil type was the same in each field, and all the fields were located within ½ mile of each other. All the fields had organic matter greater than 2 percent and high levels of fertility. Planting dates were September 28, September 30, and September 21 for the 3 years. All varieties achieved good stands going into winter all three years.

The following Table 1 lists the performance of all varieties, based on when they normally would be killed in the spring for a Midwest farming operation. This varied from March 15 in 2006 to April 16 in 2007 and April 23 in 2008. The data shows significant differences between varieties as evidenced by stands. The “means” column numbers indicate the percentage of the stand thriving at the date it was killed.

Table 1 is a composite of both Illinois locations for the three-year trial. Individual tables, by year, are available allowing further comparison of the impact of the weather for each year. As mentioned before, each calendar year’s data represents the mean of the three replicated trials done at each location. Table 2 lists root depths achieved by variety.

Table 1. Summary of Annual Ryegrass Varieties' Winter Hardiness

	2006 stand means	**2007 stand** means	**2008 stand** means	**3 year mean**
A055-30r	72.7	17.3	34.3	41.4
Angus 1	65.0	5.7	36.0	35.6
Bartissimo	82.o	21.7	45.0	49.6
Bounty	82.3	81.7	65.7	76.6
Commission blend	90.7	38.3	45.0	58.0
Fantastic*		28.3		28.3
Florina	41.0	50.0	53.3	48.1
Flx2002	29.3	38.3	63.3	43.7
Flying a	70.0	17.7	36.7	41.4
Gulf	88.3	2.0	40.0	43.4
Jackson**		63.3	67.7	65.5
King	81.3	71.7	83.3	78.8
Marshal	77.3	60.0	65.0	67.4
Passerel +**		58.3	60.0	59.2
Ribeye	74.3	48.3	41.7	54.8
Saddle butte	59.0	66.7	61.7	62.4
Saddle pro	74.3	66.7	61.7	67.5
Soil builder	86.0	59.3	49.0	64.8
Tam90	57.7	36.7	58.3	50.9
LSD 0.05	12.8	13.5	13.0	21.7
LSD 0.10	10.6	11.3	10.8	18.0

Table 2. Summary Table of Annual Ryegrass Root Growth

Variety	3 year mean of root growth in inches	
A055-30r		19.7
Angus 1		18.9
Bartissimo		21.1
Bounty		24.1
Commission Exp		22.7
Fantastic*		11.0
Florina		22.8
Flx2002		25.2
Flying a		21.4
Gulf		16.9
Jackson**		19.1
King		23.7
Marshal		24.1
Passerel +**		20.4
Ribeye		23.4
Saddle butte		26.4
Saddle pro		24.4
Soil builder		24.1
Tam90		19.2
* one year data	**LSD 0.05**	**6.6**
** two years data	**LSD 0.1**	**5.5**

Winter Hardiness

With three widely different growing seasons and highly variable weather, the three-year summary is a good indicator of the potential usefulness of each of the varieties in the Midwest. The main concern for producers is whether they can establish a stand that will survive every winter, while providing a maximum amount of root and top growth every year.

Variety selection is just one criterion in utilizing annual ryegrass in a Midwestern cropping system. Early planting will influence winter hardiness as will fertility levels. If varieties are planted early, some will establish quicker which means they may get too tall by winter. This may also cause loss of the stand, but the large root development will still provide many of the benefits, even though the plant was winter killed. Some varieties developed 14 to 20 inches of root development by the first week of December when planted the last week of September. Many of the varieties that showed good winter hardiness also were able to quickly establish and develop a good crown for the winter. Jackson was one of the quickest to establish in late plantings. Bartissimo did well being planted in early September, but it did not survive well when planted in late September or October.

There is a key to the success with planting annual ryegrass in the Midwest: There is an optimum window of opportunity for planting which may not coincide with corn and soybean harvest. Later plantings are not always successful. Planting in September is suggested in the northern Corn Belt and by mid-October in southern Corn Belt.

Summary

A key to the success of annual ryegrass as a cover crop in the Midwest is timely planting which may conflict with corn and soybean harvest. Later plantings are not always successful. Planting in September is suggested in the northern Corn Belt and by mid-October in the southern Corn Belt.

Variety selection is just one criterion in utilizing annual ryegrass in a Midwestern cropping system. In addition, early planting, planting method, and fertility levels will influence winter hardiness. These Southern Illinois results should be taken as a guide, but results may be different as one moves further north in the Corn Belt.

Planting annual ryegrass too late or broadcasting the seed in dry soil conditions 2 to 3 weeks before a rain may result is a small plant when freezing temperatures arrive and result in winterkill. Snow cover throughout the winter appears to dramatically reduce winterkill potential.

If varieties are planted early, some will establish quicker which means they may get too tall by winter unless grazed or cut for haylage. Freeze damage may or may not cause loss of the stand, but the large root development will still provide many of the benefits, even though the plant was winter killed. Root development of 14 to 20 inches was documented by some varieties by the first week of December when planted the last week of September. However, more research is needed to document the benefits or loss of benefits if winter kill does occur. Many of the varieties that showed good winter hardiness also were able to quickly establish and develop a good crown for the winter.

Applying nitrogen, 30 to 40 pounds of N/ac or manure, will increase annual ryegrass fall growth and decrease the potential of winterkill.

Annual ryegrass is not hard to kill in the spring but may require more than one burndown application because glyphosate does not translocate well with cold temperatures. The burndown effectiveness varies somewhat among annual ryegrass varieties, but timing, rate and temperature have more of an influence. A full rate of glyphosate should always be applied; always check the label to confirm the rate needed with the formulation used. Adding residual herbicides such as atrazine with the glyphosate will causes antagonism and greatly reduces annual ryegrass control. Although adding Basis did not improve burndown effectiveness, it does provide residual control.

Annual ryegrass as a cover crop will enhance several soil properties and improve nutrient cycling, which may increase yields. However, management, especially timing, is important for success. Soils with a restricted layer, natural or man made, which limits rooting depth and soil moisture availability have the most to gain from using annual ryegrass as a cover crop, especially in a dry year.