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Fact Sheet

Fact Sheet 812

Adapting Annual and "Italian" Ryegrasses to Forage Systems in the Mid-Atlantic

Introduction

Ryegrass species are widely distributed providing high quality forage to livestock throughout the world. Ryegrasses are not to be confused with cereal rye (*Secale cereale* L.). Annual ryegrass (*Lolium multiflorum* Lam) is a cool season annual bunchgrass native to Europe. In Maryland, a late summer seeding of annual ryegrass (ARG) behaves like a winter annual—growing vigorously in the fall, then growing vigorously again in April and May until going to seed in June and senescing in July. "Italian" ryegrass (*Lolium perenne* L. ssp. *Multiflorum* Lam. Husnot) follows a similar growth pattern if seeded in the fall. However, after the production of seed heads in early summer, this grass returns to a vegetative growth pattern for the remainder of the summer similar to a perennial ryegrass. The "Italian" ryegrass (IRG) unlike the annual ryegrass (ARG) does not go into senescence in the first summer and may persist into a second summer. If seeded in the spring IRG maintains vegetative growth throughout the first summer. It then produces a more vigorous growth in the second spring and will produce seed heads in the second summer.

Plot work at Western Maryland Research and Education Center comparing small grains, annual and Italian rygrass varieties.

A spring seeding of ARG will result in a spring vegetative growth phase with seed head production in mid-summer followed by senescence. Both species are closely related to perennial ryegrass (*Lolium perenne* L.).

Introduced to Maryland in 1997, ARG gained acceptance in regional forage systems with sales of 450,000 pounds of seed (about 15,000 acres of seedings) by the fall of 1999. As more companies entered the ryegrass

Lactating cows grazing on annual ryegrass in November.

market, IRG seedings increased. By the fall of 2002, ARG and IRG seed sales for forage production totaled over 800,000 pounds (about 25,000 acres) in the mid-Atlantic region north of Richmond, Virginia.

The ability of these ryegrasses to be adapted to a variety of forage management systems is due to their exceptional seedling vigor, rapid fall and spring growth, and high quality forage. Both ryegrasses can be established with or without seedbed preparation, grow in a wide range of soil types, persist across a range of environmental conditions, and can tolerate abuse by both livestock and the producer.

The small plot variety work conducted at the Western Maryland Research and Education Center (WMREC) has provided total yield data, relative yield over the course of the season, heading dates, and cold hardiness information. Field days, pasture walks, and seminars held at WMREC allowed producers to observe a number of cultivars side by side and make selections based not only on yield, but also on tillering, leaf texture, and vigor. Testing of both ARG and IRG varieties and their adaptability to forage production systems will continue at WMREC.

Farm demonstrations were initiated in 1997 and expanded in 1998. Pasture walks, beginning in 1997 and continuing each year, have allowed producers to share their successes and experiences with ARG and IRG cultivars in a number of forage crop systems, primarily on dairy farms but also on beef and horse farms.

Seeding and harvest dates, yield data, and forage management details referred to in this publication were gathered from the demonstration and plot work conducted at WMREC and from the on-farm observations of producers in central Maryland and south-central Pennsylvania.

Double Crop Systems

Dairy farm managers need to produce more tons of high quality forage. A major forage system used in this effort is double-cropping a winter annual with a summer crop of corn silage. Cereal rye and other cereals are normally used in this system providing a single cutting of small grain silage in early May followed by the planting of the corn silage crop. Timing of the harvest of cereal silage is particularly critical with rye because its forage quality declines rapidly after an optimum harvest window of several days. The introduction of ARG and IRG has provided producers an alternative winter

annual forage crop that can be seeded after corn silage harvest. This September planting will provide limited forage production in the fall and significant forage production in the spring prior to corn planting. The ryegrasses also provide the flexibility to be harvested by grazing or mechanical harvest and maintain their forage quality for a much longer harvest window.

Assuming corn silage harvest is completed by September 10, manure can be applied to the field, or at least 50 lbs. of nitrogen (N), and the ryegrass can be seeded by September 15. Seeding may be accomplished using a no-till drill, placing the seed at a depth of 1/4 inch. Or the soil can be lightly disked so that the seed can be broadcast onto the field, then cultipacked or incorporated with a chain drag. If seed and fertilizer are broadcast in the same operation, one must remember the seed is much less dense than fertilizer. Applying the fertilizer at half rate and running the spreader at half the normal spacing will correct this problem. The standard ryegrass seeding rate is 30 lbs. per acre. This provides a good stand that has time to tiller in the fall if seeded no later than September 15. Producers striving for a higher population of grass plants in the fall, particularly graziers, have found that a 40 lb. seeding rate provides a more dense sward and more animal grazing days per acre. Seed size and germination will also determine seeding rates. Fall grazing should be initiated when the ryegrass is no taller than six inches and when the grass can be grasped between the thumb and forefinger and "grazed" without coming out by the roots. No-till or minimal tillage seedlings retain soil structure, allow grazing to be initiated sooner, and prevent animal traffic damage to the soil. Heads-up management can provide two fall grazing rotations on September-seeded ryegrasses. Or the entire fall growth can be accumulated and strip-grazed late in the fall or into winter. Accumulated fall ryegrass growth can also be mechanically harvested as silage, baleage, or greenchop.

The initial concern with attempting to adapt both ARG and IRG to this region was the question of cold hardiness. Several winters have provided temperatures near 0°F with no snow cover. The survival of all

A second cutting of annual ryegrass in May.

ARG and IRG varieties has been excellent as long as the ryegrass seedlings were over three inches tall. Fall or winter grazing to a height of three inches or less does not thin the stand. However, during one farm demonstration dairy heifers grazed the ryegrass to the ground before winter. This portion of the field recovered more slowly in the spring than the remainder of the field, but by the second cutting of haylage in early May there were no visible differences across the field.

Spring management of both ARG and IRG begins with the application of N fertilizer about four weeks prior to the expected first harvest of the crop whether it will be grazed or mechanically harvested. Ryegrass responds best to multiple applications of N fertilizer. Farm demonstrations showed that 50 lbs. of N applied at seeding, again in late March and again in early May provided dry matter (DM) yields of 3-4 tons per acre. This total of 150 lbs. of N fertilizer is in addition to any manure that is applied. But since the growth of the ryegrass is so vigorous and takes place when the soil is cool, manure N mineralization is inadequate to supply the available N that the ryegrass requires to produce to its potential.

Spring grazing can be initiated when the ryegrass is no more than six inches tall. Farm demonstrations and plot work have shown that grazing on a rotation schedule of 12-15 days provides the most production in terms of dry matter yield and quality. In a mechanical harvest system the best quality

and yield is achieved when the ryegrass is cut at a height of 15-20 inches. A spring mechanical harvest of ryegrass is limited to silage or greenchop. The cool weather and the high moisture content of the grass precludes a dry hay harvest at this time. If corn is planted in late May, producers can expect to get 3-4 grazing rotations, or 2-3 silage cuttings, or a combination of the two systems.

After the spring harvest is completed, the ryegrass needs to be killed with an application of glyphosate. Suppressing the ryegrass is not sufficient to assure a vigorous corn stand. The ryegrass root system is simply too massive to allow the corn seedlings to compete. The ryegrass must be killed for the corn to thrive. Manure can be spread on the field after the herbicide application. A corn silage hybrid with a maturity of 100–110 days should be used, allowing corn silage harvest to be completed in early September and the next seeding of either ARG or IRG to be made immediately.

The spring growth curve of late summer-seeded IRG is not as steep as that of ARG and continues into the summer. This may not allow the maximum dry matter production of IRG by the time the corn silage crop needs to be seeded. The recent development of sorghum hybrids with reduced lignin content offers a high dry matter (DM) producing summer annual alternative to corn silage. Sorghum hybrids designed for either a single-cut or multiple-cut summer harvest can be seeded into late June and still produce 6-7 tons of DM in 100 days. This crop system allows IRG to be seeded in early to mid-September, providing a fall harvest. The late June seeding date of the sorghum hybrid provides three months of spring growing season to maximize the IRG spring production season. Like the corn silage crop, the sorghum hybrids require the elimination of competition in order to produce to their potential. The IRG must be killed with an application of glyphosate prior to seeding the sorghum. Producers have attempted to simply suppress the IRG before seeding the sorghum; however, the ryegrass recovered in every case, reducing the vigor and yield of the sorghum crop. And the surviving ryegrass did not produce well in the fall. In multiple-cut sorghum systems producers are successfully seeding either ARG or IRG into the stubble of a late August or early September cutting, then allowing the sorghum to continue growing through the month of September. By the time the sorghum is cut or grazed in early October, the ryegrass is well established and can be cut or grazed later in the fall. This method allows producers to extend the growing season of the sorghum and seed the ryegrass several weeks earlier, which increases its yield in the fall.

Both of these doublecrop systems are important on dairy farms where nutrient management regulations will require farm managers to utilize cropping systems that remove the maximum pounds of N and P from the field. By harvesting the entire plant, more total nutrients are removed from the field than when harvested as a grain crop. Double crop systems not only produce maximum yields of high quality forage, they also remove the maximum amounts of N and P from the field. The N and P removal by several forage crops are compared in the chart on page 5.

Seeding Ryegrasses in Alfalfa

Over the past decade, producers have seeded a small grain, usually wheat or triticale, into older alfalfa stands in the fall. The small grains tiller in the fall filling the spaces between the alfalfa plants, suppressing winter annual weeds, and effectively increasing the yield of the following year's first cutting. The introduction of ARG and IRG has provided an alternative to small grains that can be seeded into alfalfa in September, producing a vigorous spring growth with the regrowth potential to allow several cuttings of an alfalfa-grass mixture. An alfalfa-grass mixture can improve ruminant nutrition and can improve haylage fermentation.

After a late August or early September cutting of alfalfa, the ARG or IRG can be notilled into the stubble at a seeding rate of 30-40 lbs. per acre. The tops of this new grass will be clipped with the October alfalfa haylage cutting. In the spring the producer

CROP NUTRIENT REMOVAL					
CROP	YIELD	% CP	N LBS/A	% P	P LBS/A
Alfalfa[2]	5T DM	19	285	.29	29
Corn Silage[2]	7T DM	8.8	185	.23	32
Cereal Rye[1]	2.1T DM	26	167	.47	17
ARG[1]	3.7T DM	22	276	.44	31
IRG[1]	2.9T DM	28	253	.44	25
Corn Grain[2]	150 Bu/A	10	106	.31	22

[1] Multiple vegetative cuttings, Washington County data.
[2] *Dairy Reference Manual*, NRAES-63.

has the option of allowing the ryegrass to grow from whatever N it can glean from the alfalfa or a winter application of manure. Maximum spring ryegrass growth will be provided by an application of N fertilizer four weeks before the expected date of the first harvest. The first harvest date should be determined by the height of the ryegrass and not the maturity of the alfalfa. Taking the first cutting when the alfalfa is completely vegetative is not detrimental to the summer growth and survival of an alfalfa stand. Alfalfa should be established for one full year before incorporating ryegrass into the system. Forage management intensity will determine if the second and perhaps third cutting will be made based upon the height of the grass. With N fertilization, from the first cutting date, the second and third cuttings can be made at 20-25 day intervals. After June 1 the ryegrass growth will slow and the remainder of the year's cuttings will be made based on the maturity of the alfalfa. A late summer seeding of ARG will have a more rapid spring growth curve and may allow only two cuttings based on the ryegrass. A late summer seeding of IRG will have a slower but more persistent growth curve allowing more ryegrass to be harvested with the alfalfa into the summer.

A spring seeding of IRG made into alfalfa will provide a gradual vegetative growth throughout the first summer. In the second year the IRG will provide a vigorous spring growth, then decline to a vegetative growth pattern through the summer. A spring seeding of ARG does not perform well at this latitude—it is just becoming well established when summer weather conditions will suppress its growth.

Ryegrasses in Sacrifice Areas

Almost every livestock farm has a sacrifice area by either accident or design. A perennial grass will not have the opportunity to persist in this high traffic area. A dirt lot near the barn can be seeded to a ryegrass either in the spring or the fall. This will depend upon the use of the lot and when it can be left idle for two months or more, so that a ryegrass seeding can cover the soil, establish a significant root mass, and absorb excess nutrients. An ARG will perform better in this role due to its seedling vigor and rapid growth curve. Seeding can be accomplished with a drill. But in most small lots a broadcast application of ARG seed is adequate. If the broadcast seed is lightly

Italian ryegrass regrowth after a second cutting of alfalfa.

incorporated with a pasture drag, or tractor tire chains or the like, the seeding will establish more thoroughly and more rapidly. If the lot is not needed for animal feeding or management for several months, the ARG can be grazed periodically.

Maintaining Annual or "Italian" Ryegrass as a Perennial Crop

Both ARG and IRG reseed readily. Producers have found that either ryegrass can be grazed or mechanically harvested into early summer then allowed to regrow, produce seeds, and senesce. The seeds are mature when the seed heads are turning a tan color. At that time livestock can be turned back onto the field and allowed to graze down the ryegrass and any summer weed growth. The activity of livestock effectively shatters ryegrass seed onto the field and partially incorporates the seed. A mechanical harvest of the mature ryegrass "hay," or more properly, straw, will shatter the seed over the field also. Since the ryegrass seed will not germinate until temperatures begin to cool in late August or early September, the summer grazing or hay harvest should take place in early to mid-August to minimize the time for weed regrowth to compete with the germination of the new grass. Some producers have utilized this ryegrass system to clean up weedy fields before seeding permanent grasses. Once the ryegrass is completely mature and weeds such as johnsongrass or Canada thistle are actively growing, then an application of glyphosate can be made to the field. The field can then be grazed or hayed after a suitable interval, or simply bushhogged to scatter the seed.

This system may be adaptable to lower intensity livestock operations because it does not maximize the forage DM yield of the field. However, a modification of this system where a stand of IRG is boosted with an additional 10-20 lbs. of seed each September is being considered by a number of dairy and beef stocker graziers. These producers measure the efficiency of a forage system by the profitability of milk or meat production per acre and not merely by forage DM production.

Summary

The introduction of annual and "Italian" ryegrass cultivars to the Mid-Atlantic provides producers an alternative source of high quality forage. The ability of these grasses to be seeded in late summer and in the spring, across a variety of cropping systems, soil types and by a number of seeding methods and still produce high quality forage, allows producers the opportunity to find a place for these grasses in their specific production systems. The increase in seed sales of these grasses over the past several years indicates that producers are adapting ARG and IRG into both grazing and mechanical harvest systems.

Both ARG and IRG are particularly adaptable to high producing forage double-crop systems. In corn silage and forage sorghum double-crop systems these ryegrasses can provide up to four tons of high quality forage dry matter under a multiple harvest system, and remove more N and P than a single harvest of a cereal grain.

Seeding ryegrass, particularly IRG, into a mature alfalfa stand in early September allows producers to increase alfalfa crop dry matter production and decrease winter weed competition. An alfalfa-grass mixture can improve ruminant nutrition and can improve the silage fermentation process. Annual ryegrass has a role in providing a quick cover with a massive root system to stabilize bare dirt lots, capture excess nutrients, and provide extra grazing.

Annual and IRG can be managed to persist as if they were perennial grasses. Both grasses reseed readily. ARG produces seed as it matures each summer. IRG can be left to mature but might be best maintained by adding at least 10-20 lbs. of seed to the stand each September.

Forage systems across the Mid-Atlantic are as diverse as the farms on which they are grown, the livestock they feed, and the producers who manage them. Annual and "Italian" ryegrasses provide a forage alternative that each producer will need to assess to determine if and how they might fit into the forage production system on each specific farm.

Small plot variety trials will continue to test ARG and IRG cultivars at Western Maryland Research and Education Center. Additional SARE-funded applied research will test these grasses in double-crop systems to determine dry matter yields, forage quality, nutrient removal, and the economic efficiency of producing milk on these cropping systems.

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