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Ryegrass

Ryegrasses are the most widely grown cool-season grasses in the world. They have numerous desirable agronomic qualities. They establish rapidly, have a long growing season, are high yielding under favorable environments when supplied with adequate nutrients, possess high nutrient contents, and can be grazed and used for hay or silage. Ryegrasses grow best on fertile, well-drained soils but can be grown on soils where it is too wet at certain times of the year for satisfactory growth of other grasses (Table 1). Ryegrasses are heavy users of water and their performance is less than optimum during a drought or periods of extended low or high temperatures. They are indigenous to Europe, Asia, and North Africa, but are grown worldwide. The ryegrasses are considered to be high-quality forage and their high digestibility makes them suitable for all types of ruminants.

TYPES OF RYEGRASSES

The two most important ryegrass species are Italian ryegrass (*Lolium multiflorum* Lam.) and perennial ryegrass (*Lolium perenne* L.). Traditionally, Italian ryegrass would not survive for more than a single growing season in northern climates. However, new experimental varieties from Switzerland have shown no stand loss after three production years in Pennsylvania. Italian ryegrass has a bunch-type growth (lacks rhizomes) and flowers in day lengths greater than 11 hours. There is no winter or cold weather requirement for Italian ryegrass to flower and, therefore, it flowers throughout the summer. Italian ryegrass is not widely recommended as a forage crop in Pennsylvania because available varieties do not survive Pennsylvania winters.

Perennial ryegrass is also a bunch-type grass, but it generally survives for several growing seasons in Pennsylvania. Unlike Italian ryegrass, perennial ryegrass requires a dormancy period of cool temperatures before the photoperiod can induce flowering, and therefore it normally produces seedheads only once per year, during the late spring. However, researchers at Penn State have observed seedhead production by perennial ryegrass during mid-summer regrowths. Perennial ryegrass can withstand considerable grazing mismanagement and remain productive. Unfortunately, perennial ryegrass has proved to be slightly less persistent in the Pennsylvania climate than other cool-season grasses such as orchardgrass, tall fescue, and timothy.

There are two basic groups within the Italian and perennial ryegrass species, the diploids and tetraploids. The distinction between the two groups is based on the number of chromosomes within each plant cell. In the diploid ryegrass cells, each chromosome is present twice; however, in tetraploid ryegrass cells, each chromosome is doubled and present four times. Of the two groups, tetraploid perennial ryegrasses have larger leaves, fewer but larger tillers, pro-

Table 1. Characteristics of perennial cool-season grasses in Pennsylvania.

		TOLERANCE TO SOIL LIMITATIONS					
Grass	Seedling vigor[a]	Droughty	Wet	Low pH[b]	Persistence	Tolerance to frequent harvest	Relative maturity[c]
Kentucky bluegrass	M	L	M	M	H	H	Early
Orchardgrass	H	M	M	M	M	H	Early-medium
Perennial ryegrass	H	L	M	M	L	H	Early-medium
Reed canarygrass	L	H	H	H	H	H	Medium-late
Smooth bromegrass	H	H	M	M	H	L	Medium-late
Tall fescue	H	M	M	H	M	H	Medium-late
Timothy	M	L	L	M	H	L	Late

[a] L = low, M = moderate, H = high.
[b] pH of 6.0.
[c] Maturity characteristic refers to relative time of seedhead appearance in the spring. This will depend not only on the species but also on the variety.

duce a more open growth (less groundcover), and are more suited for production in a legume mixture. Tetraploids have a higher percentage of sugars in their forage than are found in diploids, which explains their higher digestibility and why animals graze them in preference over diploids. Both the seed and seedlings of tetraploid varieties are larger, but the growth following emergence and persistence is often greater for diploid varieties.

Numerous tetraploid perennial ryegrasses have been tested in Pennsylvania variety trials, including Grimalda, Bastion, Reveille, Citadel, Nestor, and Taptoe. Grimalda matures 10 to 14 days earlier than Bastion, Reveille, or Nestor. Citadel and Taptoe mature later than these varieties.

Grimalda was one of the first ryegrass varieties marketed in Pennsylvania. Unfortunately, it matured earlier than most alfalfa varieties with which it was seeded and reduced the forage quality when the harvest date was based on alfalfa maturity. The experience with this early maturing variety resulted in producers concluding that all ryegrasses were not adapted to their system, a conclusion from which perennial ryegrass is now starting to recover.

Natural hybridization between the Italian and perennial species has occurred frequently. Because their persistence is intermediate between the parents, hybridized ryegrasses are frequently referred to as "short-rotation ryegrasses," relative to perennial ryegrasses. In addition, flowering of the hybridized ryegrasses is similar to that of the Italian species because there is no dormancy requirement for flowering and tillers will continue to flower sporadically throughout the growing season. Bison, a hybridized ryegrass tested in Pennsylvania, matures in the spring about 10 days after Grimalda.

ESTABLISHMENT

Normal winter temperatures in Pennsylvania are mild enough to allow ryegrass seeding in either the spring (April or May) or late summer (before August 15 in northern Pennsylvania and before August 25 in southern Pennsylvania). Ryegrass may be seeded alone; however, to improve hay yields when growing ryegrass, a mixture with a legume is recommended. Legumes such as alfalfa or white clover in the mixture will also provide some nitrogen to the ryegrass and can improve the quality of forage produced. Ryegrass seedings have been successful both in clean, tilled seedbeds and existing grass sods. However, to reduce competition when seeding by no-till methods, the existing grass sod should be mowed or grazed very short, or desiccated with a chemical prior to seeding. Ryegrass should be band seeded 0.25 to 0.5 inch deep. If the seedbed is dry and press wheels are not used, cultipack before and after seeding for additional stand insurance.

Ryegrass seeding rates depend on the intended use and the condition of seedbeds. When seeding into a well-prepared seedbed, a rate of 15 to 20 pounds per acre is recommended. When seeding ryegrass with a compatible or adapted legume (alfalfa, birdsfoot trefoil, and white or red clover), a rate of 4 to 8 pounds per acre is recommended. In a USDA-ARS Pasture Research Laboratory study in Pennsylvania, alfalfa yield was not affected by ryegrass seeding rate (6 to 18 pounds per acre) in late summer seedings of alfalfa-ryegrass mixtures. In the same study, alfalfa became the dominant species within one year, even when seeding rates heavily favored ryegrass establishment.

HARVEST MANAGEMENT

Seeding-year harvest management of perennial ryegrass is dependent on the time and method of seeding, fertility, growing conditions, and other factors that affect rate of establishment. However, with favorable establishment and growing conditions, one or more harvests are possible in the seeding year. First-time harvest or grazing on newly established ryegrass should be delayed until the plants are 10 to 12 inches tall.

When grown as a hay crop, ryegrass yields may be relatively low unless considerable time is allowed for forage accumulation before the fall harvest (Table 2). Ryegrass plants contain less dry matter than other cool-season grass plants and, therefore, require a longer curing time before baling. In addition, ryegrass plants are more difficult to mow with a sickle bar mower.

Established ryegrass pastures can be initially grazed when spring growth reaches 2 to 3 inches in height and the grazing does not cause excessive pasture damage due to wet soil conditions. Established ryegrass may be continuously grazed, but yield and plant persistence are compromised if it is continually grazed below 1.5 inches in height. Greater yields are possible when ryegrass is rotationally grazed. Allowing 7 to 10 inches of regrowth between grazings will benefit grass yield as well as persistence. Animals should be removed from pastures when the ryegrass stubble is 1.5 to 2 inches in height. When grazed, perennial ryegrass-alfalfa mixtures are superior to orchardgrass-alfalfa mixtures in their production of crude protein, digestible dry matter, and in alfalfa persistence.

Table 2. Perennial ryegrass yield relative to smooth bromegrass and orchardgrass when harvested as hay.

ENTRY	5TH HARVEST YEAR[a]	FALL HARVEST 5TH YEAR[a]	5-YEAR AVERAGE[b]
	LB PER ACRE		
P. ryegrass, 'Reveille'	6,038	1,425	6,492
P. ryegrass, 'Barvestra'	5,728	1,375	6,346
S. bromegrass, 'Saratoga'	7,044	550	6,783
Orchardgrass, 'Penmead'	7,741	1,250	7,294

Source: Jung and Berg, 1982. *USDA-Penn State perennial ryegrass studies in Pennsylvania.*

[a] The fifth harvest year was 1974.

[b] The five-year average includes growing seasons from 1970 through 1974.

FERTILITY

Soil pH for optimum ryegrass production is between 6.0 and 7.0; however, ryegrass has been grown at a pH of 5.0. Determine fertility and lime needs by soil testing, but in the absence of a soil test on soil with a medium-fertility level, plow down 0-45-135 pounds per acre and apply 20-20-20 pounds per acre at seeding (banded if possible) when seeding without a legume. When seeding ryegrass with a legume, apply none or less than 20 pounds per acre of nitrogen at seeding. Nitrogen application in excess of 20 pounds per acre will stimulate ryegrass development and inhibit legume establishment. On well-adapted soils, ryegrass is very competitive with other grasses, legumes, or weeds.

A soil test is the best guide for proper fertilization of established ryegrass. Do not apply fertilizers in excess of soil test recommendations because nutrient imbalances may occur in animals consuming the ryegrass. Ryegrass responds very well to nitrogen fertilization, which is very important for economical production. Profitable returns over investment usually can be obtained with applications of 150 pounds of nitrogen per acre per year. This amount should be split into applications of 50 to 60 pounds per acre in the spring and the remaining amount evenly divided and applied after each grazing or cutting. Seeding a mixture containing ryegrass and a legume reduces the need for nitrogen fertilizer. Applying high rates of nitrogen (in the form of manure) to alfalfa-ryegrass mixtures will cause ryegrass to dominate; however, ryegrass is less suppressive than orchardgrass in alfalfa mixtures where manure is added to the soil.

SUMMARY

Ryegrasses have numerous desirable agronomic characteristics. They establish rapidly, have long growing seasons, are relatively high yielding in suitable environments, have high nutritive value, and can be used for grazing, hay, or silage. However, the lower persistence of perennial ryegrass relative to other cool-season grasses and the increased drying time of ryegrasses should be considered prior to their use. The use of ryegrass as a part of a forage production system should be carefully evaluated. Ryegrass does not fit into every farming operation, but it should be considered as a viable option on many Pennsylvania farms, especially those that include grazing as a harvesting method.

Prepared by Marvin H. Hall, professor of forage management.

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