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Annual Ryegrass

(*Lolium multiflorum* Lam.)

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Annual ryegrass (*Lolium multiflorum* Lam. or *Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot, also called Italian ryegrass) is a cool-season annual bunchgrass native to southern Europe. It is closely related to perennial ryegrass (*Lolium perenne* L.). Both are widely distributed throughout the world, including North and South America, Europe, New Zealand, and Australia.

Annual ryegrass is an important short-duration grass. High palatability and digestibility make this species highly valued for forage/livestock systems. It is used in many environments when fast cover or quick feed is required.

Characteristics include:

- High yield potential
- Fast establishment
- Suitability for reduced-tillage renovation
- Use on heavy and waterlogged soils

Although an annual, in temperate climates, some types may behave as biennials, short-lived perennials, or perennials.

Short-rotation ryegrasses (intermediates) are hybrids of *L. perenne* and *L. multiflorum*. Westerwolds ryegrass (*L. multiflorum* var. *westerwoldicum*) can be regarded as a group of ecotypes of annual ryegrass. They are more truly annuals than other types. Westerwolds are high yielding but have less heat tolerance than other types of annual ryegrass.

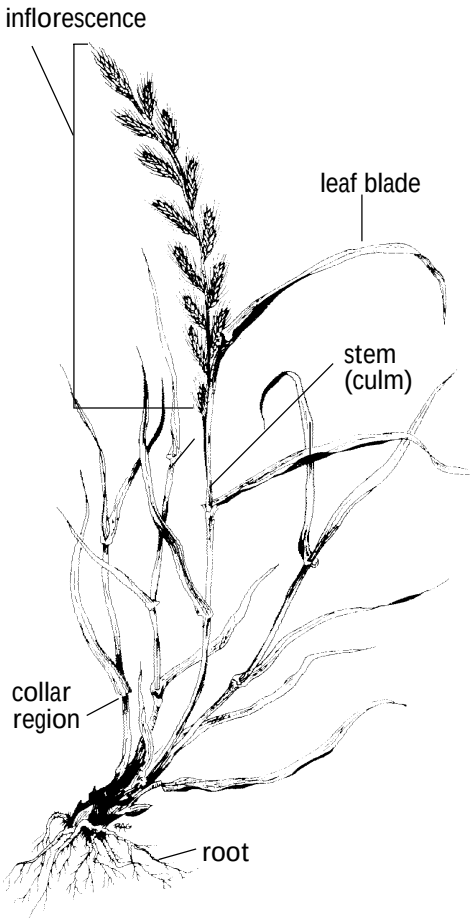

Figure 1.—Annual ryegrass plant.

Identification

Annual ryegrass, like other grasses, may be identified by floral parts (inflorescence, spikelet, and seed) or vegetative parts (leaf, stem, collar, and root). See Figures 1–8.

Inflorescence (seed head)

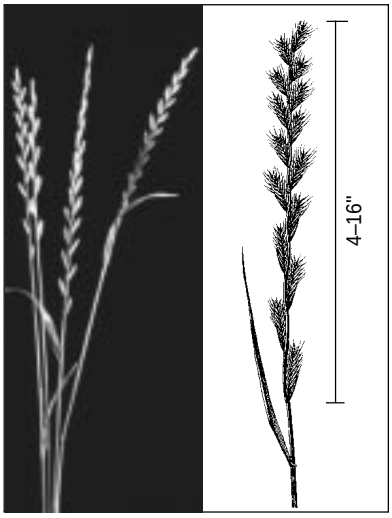

Figure 2.—Inflorescence.

The *inflorescence* terminates the stem (*culm*). In annual ryegrass it is a solitary *spike*, 4 to 16 inches (10 to 40 cm), but typically about 12 inches (30 cm). It has 5 to 38 alternately arranged *spikelets* attached edgewise directly to the central axis (*rachis*). See Figure 2.

- *Culm*—Stem of grasses comprised of nodes and internodes, each node bearing a leaf
- *Inflorescence*—Seed head terminating the stem
- *Peduncle*—Uppermost culm segment supporting the inflorescence
- *Rachis*—Central axis of the seed head
- *Spike*—Inflorescence in which spikelets are attached directly to the rachis
- *Spikelet*—Unit of the grass inflorescence, generally composed of two *glumes* and one or more flowers (*florets*), each borne between a *lemma* and *palea*

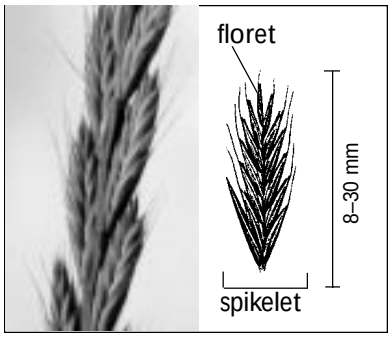

Figure 3.—Spikelets and florets.

Spikelet

Annual ryegrass *spikelets* are 0.3 to 1.2 inches (8 to 30 mm) long, excluding *awns*, and contain 10 to 20 *florets*. Florets are 0.25 to 0.4 inch (6 to 10 mm) attached to the *rachilla*. See Figure 3. The terminal spikelet has two *glumes*. The inner glume is absent in the other spikelets.

- *Awn*—Slender, bristle-like projection of the lemma
- *Floret*—Lemma and palea with the enclosed flower
- *Glumes*—Bracts at the base of the spikelet cradling the enclosed florets
- *Rachilla*—Central axis of the spikelet, each segment supporting a floret

Seed

A seed is a mature ovule enclosed by a lemma and a palea. The *lemma*, the lower bract, is 0.15 to 0.3 inch (4 to 8 mm) long, with a straight, slender *awn* up to 0.6 inch (15 mm). The *rachilla* segment is somewhat wedge shaped. See Figure 4. Seeds per pound average 228,000 (502,000 per kg), with a range of 200,000 to 250,000 (440,000 to 550,000 per kg).

- *Bract*—Modified leaf, differing from foliage leaves in size, shape, color, and texture
- *Lemma*—The lower of two bracts enclosing the flower
- *Palea*—The upper of two bracts enclosing the flower
- *Rachilla segment*—Portion of the rachilla that breaks off and remains at the base of each seed

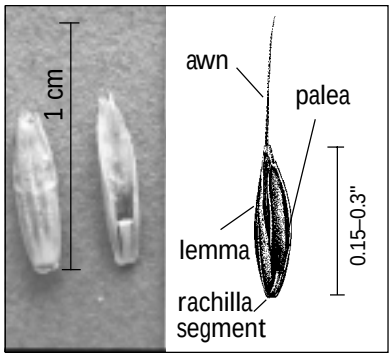

Figure 4.—Seed.

Leaf

Leaf blades of annual ryegrass are rolled in the bud (in contrast to those of perennial ryegrass, which are folded). Leaf blades are 0.15 to 0.4 inch wide (4 to 10 mm) and 2.5 to 8 inches long (6 to 20 cm). They are sharply taper-pointed and *keeled*. See Figure 5.

Blades are bright green. They are prominently ridged on the upper surface. Lower surfaces are smooth, glossy, and hairless, with a prominent midrib. Leaf margins are slightly rough to the touch. The blade is joined to the sheath at the collar, a zone of *meristematic* tissue. See Figure 6. The leaf *sheath* is split and overlapping, with no hairs.

- *Blade (lamina)*—Part of the leaf above the collar
- *Keel*—Central ridge on back or outer surface of folded leaf or seed
- *Leaf*—The main lateral appendage of a stem, usually flattened, serving as the main organ for photosynthesis
- *Meristem*—Group of actively dividing cells from which roots, shoots, leaves, and flowers are derived. See Figure 6.
- *Sheath*—Lower part of the leaf that encloses the stem internode

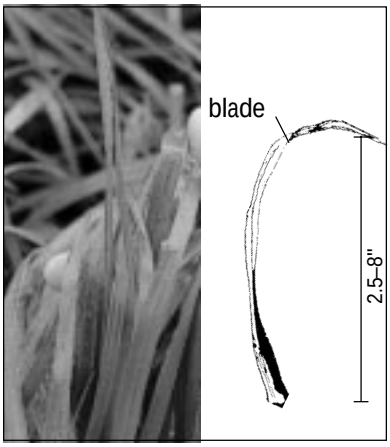

Figure 5.—Leaves.

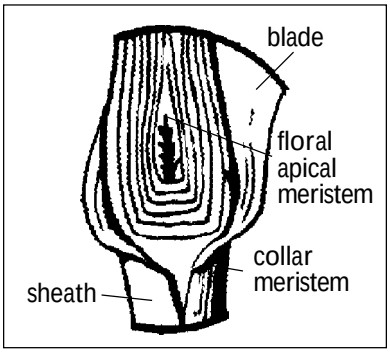

Figure 6.—Meristems.

Stem

Stems (culms) are comprised of *nodes* and *internodes*. Each node bears a leaf. The uppermost culm segment is called the peduncle, the structure that supports the inflorescence. Annual ryegrass culms are 12 to 40 inches (30 to 100 cm) tall depending on variety, moisture, and site conditions. The stem base of annual ryegrass commonly is pale green or yellowish.

- *Internode*—Region of a stem between nodes
- *Node*—Joint where the leaf attaches to the stem

Collar

The *collar* region is a narrow band of meristematic tissue accounting for increasing blade length. Once the leaf has achieved its maximum length, cells in the collar cease dividing. In annual ryegrass this region is narrow, hairless, and yellowish- to whitish-green. The 0.04- to 0.16-inch (1 to 4 mm) *ligule* is membranous. *Auricles* are narrow and hairless. See Figure 7.

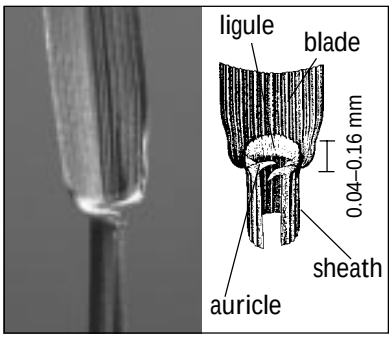

Figure 7.—Collar region.

- *Auricle*—Small claw- or ear-like outgrowths at the junction of the sheath and blade of some grasses
- *Collar*—Zone of meristematic tissue at the junction of the sheath and the blade
- *Ligule*—Outgrowth at the inner junction of the leaf sheath and blade, often membranous, sometimes a fringe of hairs

Root

The root system of annual ryegrass is highly branched and dense, with many fibrous, *adventitious* roots. See Figure 8. It has no *rhizomes* or *stolons*.

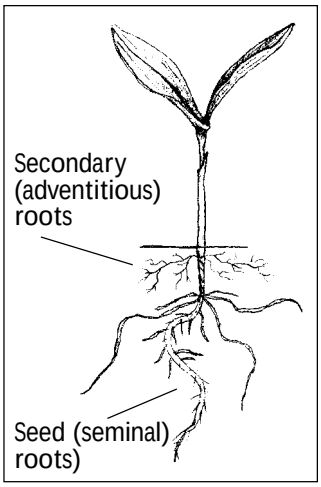

Figure 8.—Roots.

- *Adventitious*—Second root system that develops from the lower nodes of each tiller
- *Seed (seminal) roots*—First roots to develop but short lived
- *Rhizome*—Underground stem bearing scale-like leaves, rooting at the nodes
- *Stolon*—Prostrate or creeping stem, rooting at the nodes

Adaptation areas

Annual ryegrass is best adapted to cool, moist climates. Best growth occurs between 68 and 77°F (20 to 25°C). Thus, annual ryegrass grows well in early spring and fall. Although it is more tolerant of heat than perennial ryegrass, temperature stress causes summer production to suffer even if adequate water is available.

In the United States, annual ryegrass can grow nearly anywhere there is adequate available soil moisture. The largest area of annual ryegrass forage production is from eastern Texas and Oklahoma to the Atlantic Coast, and from the Gulf Coast north to the transition zone of warm- and cool-season species. In this area, it is used as a winter annual forage crop, often overseeded into bermudagrass and bahiagrass pastures. It also is an important species along the Pacific Coast where annual rainfall exceeds 20 inches (500 mm), and in the southwest, where it is grown under irrigation. See Figure 9.

In addition to use in the United States, annual ryegrass is an important forage species in Ireland, the United Kingdom, Europe, central Mexico, Australia, New Zealand, and South America. In the milder regions of its adaptation zone, annual ryegrass can survive for several years. In the more extreme environments, it behaves as an annual.

Annual ryegrass grows best on fertile, well-drained soils, but has a wide range of soil adaptability. It is grouped with forages that prefer high soil moisture conditions, being suited to well drained to poorly drained soils. Annual ryegrass is tolerant of long periods of continuous flooding—15 to 20 days when temperatures are below 81°F (27°C). It is tolerant of acidic to alkaline soils (pH 5.0 to 7.8). Below pH 5.0, aluminum toxicity may be a problem. Higher pH can cause chlorosis due to iron and manganese deficiencies. Best growth occurs when soil pH is maintained between 5.5 and 7.5.

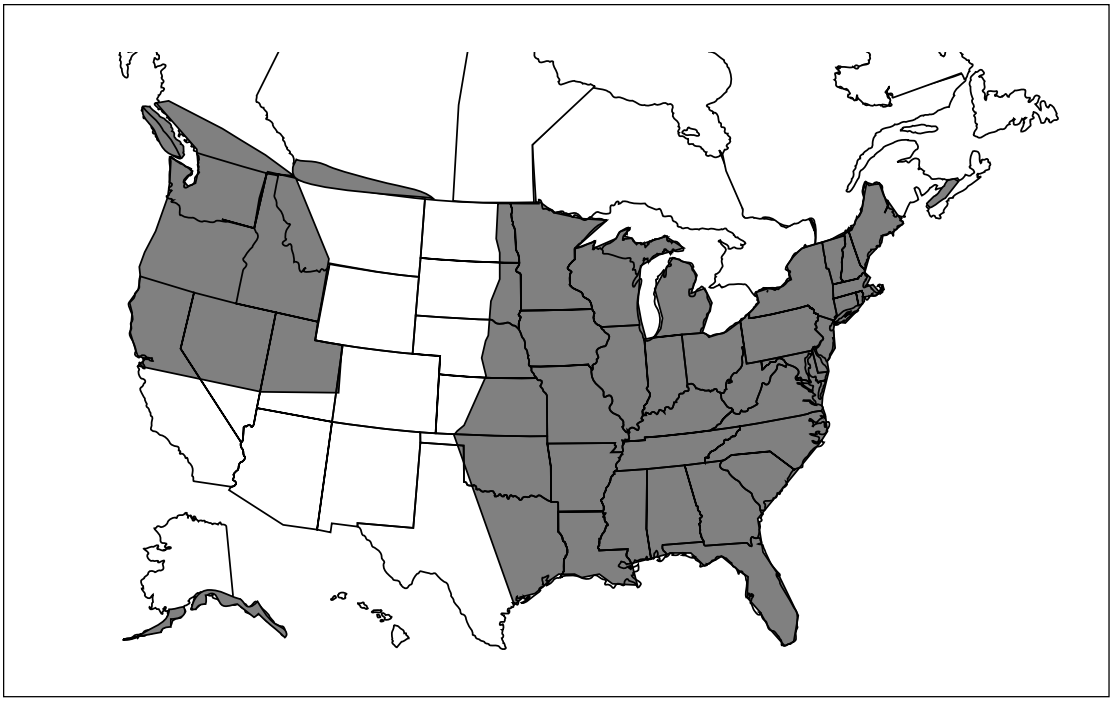

Figure 9.—Areas of adaptation of annual ryegrass in North America.

Uses

There are nearly 3 million acres of annual ryegrass in the United States, with about 90 percent used for winter pasture in the southeast. About 80 percent of this ryegrass pasture is established by over-seeding into warm-season perennial grasses to extend the grazing season. Annual ryegrass also is grown for silage and hay on poorly drained soils where small grains are not adapted.

In the northeast and Pacific Northwest, annual ryegrass is used to interseed corn and other row crops to absorb excess N, reduce erosion after row crop harvest, and provide winter feed.

In the northern United States and Canada, it is grown as a summer annual, typically as a quick cover lawn grass. Often it serves as a "nurse" crop for the slower-germinating and establishing lawn grass species.

Smaller amounts are used for roadside stabilization, as a cover crop for reducing soil erosion, and as a green manure crop to provide organic matter for improved soil structure.

Interestingly, annual ryegrass also is used for fish feed in China. Grass-eating species of carp are fed hand-harvested annual ryegrass.

Because annual ryegrass is less winter-hardy than orchardgrass or tall fescue, its use in the Pacific Northwest is limited to areas west of the Cascade Mountains. There are reports, however, of winter survival in the north-central states in areas where snow cover provides insulation from cold.

Pasture

Annual ryegrass produces some of the highest quality pasture that can be grown in the southeastern United States. Annual ryegrass pastures are used for stocker cattle, replacement heifers, and lactating dairy cows.

Its strong seedling vigor, high yield, and high quality also make it valued for temporary pastures in the coastal Northwest.

Although annual ryegrass grows quickly and is highly productive, its short-lived and aggressive nature make it less desirable in permanent pasture mixes.

Silage and hay

Annual ryegrass often is harvested for silage. The high production capacity of this grass makes it popular for additional feed when short hay supplies are expected.

As with all forage species, silage quality is influenced greatly by maturity stage at harvest. For the optimal compromise between quality and quantity, cut annual ryegrass in the boot to early-heading stage. See the “Cutting and grazing management” section.

Harvesting annual ryegrass for hay is not recommended in high rainfall/humidity areas such as the coastal Pacific Northwest. Good hay-curing weather typically occurs too late in this region for producing high-quality ryegrass hay.

Manure and biosolids application

As a high-yielding grass with high growth rates, annual ryegrass is able to absorb large amounts of nitrogen (N) from manure and biosolids application. Efficient utilization of this N, however, requires that rates and timing be appropriate for the climatic conditions. Research has shown that 400 lb (448 kg) of N can be accounted for in harvested forage. Care should be used in determining application rates of manure or biosolids, because only 30 to 40 percent of their N is available the first year. About 50 percent of the remaining organic nitrogen becomes available in each subsequent year. If subsequent applications are not reduced, excessive amounts of nutrients may be available to forage crops, leading to animal health problems. See the “Fertility and pH relationships” section.

Soil conservation

Annual ryegrass is well suited to soil conservation uses. Its extensive, shallow, fibrous root system makes it effective for reducing soil erosion. It can be used alone for temporary cover or as a small (5 percent of the total weight), fast-starting component in mixtures, where it provides rapid cover and allows longer-lived or more winter-hardy species to become established.

Wildlife

Annual ryegrass is an excellent wildlife feed. Forage provides high-quality grazing and a quick source of energy for geese, coots, widgeons and other ducks, wild turkeys, rabbits, deer, and elk.

Varieties

"Gulf" was the first variety released in the United States. The United States Department of Agriculture and the Texas Agricultural Experiment Station released it in 1958. It had crown rust resistance and higher yields than common annual ryegrass.

Since then, there have been numerous releases with improved cold tolerance and higher yields. Both diploid (two sets of chromosomes) and tetraploid (four sets of chromosomes) varieties are available. Tetraploids have wider leaves but are not necessarily higher yielding.

Winterhardiness varies among varieties. In the coastal region of the Pacific Northwest, annual ryegrass can survive 2 to 4 years with good management, which includes not allowing plants to produce seed. Westerwold types, however, are shorter lived.

Many annual ryegrass varieties are listed in *Grass Varieties of the U.S.* (Alderson and Sharp, 1995). Information on varieties also is available from the Oregon Ryegrass Growers Seed Commission and through the Germplasm Resources Information Network (GRIN). See the "World Wide Web" section.

Annual ryegrass varieties are grouped into three maturity categories: early, intermediate, and late. These groupings are somewhat helpful, but there is substantial overlap among them.

Recommendations

Field trials are conducted in various research and Extension centers. These trials evaluate varieties (including yield and/or quality) based on local situations. Consult your county extension office for specific recommendations for endophyte-free varieties that have performed well in your area. Always use certified seed to assure a high germination percentage and freedom from noxious weeds. Request "endophyte free" varieties.

Establishment

Annual ryegrass is probably the fastest emerging forage grass anywhere in the United States. It germinates well (in 6 to 10 days) when daytime temperatures range from 50 to 87°F (10 to 30°C). West of the Cascade Mountains in the Pacific Northwest, you can seed annual ryegrass from late August to early October. Late August seedings may require irrigation to get seedlings started before the fall rains. Spring-seed in February, March, or April.

Seeding depth should be between 0.25 and 0.5 inch (0.6 to 1.3 cm). Recommended seeding rates and companion species are shown in Table 1.

For overseeding warm-season grasses in the Southeast, seeding rates are 30 to 35 lb/a (34 to 39 kg/ha) when seeded alone and 20 to 25 lb/a (22 to 28 kg/ha) when mixed with small grains.

With poor seedbed preparation, increase seeding rates by 50–100 percent. For renovation, the existing sod should be mowed or grazed short to reduce competition.

Table 1.—Recommended mixtures and seeding rates.*

Use	Precipitation (inches)	Annual ryegrass seeding rate (lb/a)	Companion species	Companion species seeding rate (lb/a)
Overseeding warm- or cool-season pastures	>30	30–35	None	—
		20–25	Small grains (e.g., oats, rye, wheat)	70
			or annual clovers (e.g., crimson, arrowleaf)	15–20
Temporary pasture or green manure	>30 or irrigated	30–35	None	—
		20–25	Red clover	5
			and white clover	2–3
			or small grains	70
			or annual clovers	15–20
Temporary dairy pasture	30–60 or irrigated	20–25	Kale or other *Brassicas*	5
			and/or red clover	5
			and white clover	2–3
Temporary cover crop for erosion control	>30	45–55	None	—
			or white clover if longer than overwinter	2–3
		60	None; winter erosion control	—
Perennial cover crop	>30	5	Tall fescue	10
			Orchardgrass	10
			Creeping red fescue	10
			White clover	2–3
	20–30	5	Tall fescue	15–20
			or orchardgrass	8–10
			or creeping red fescue	6–8
			Subclover (mild winters)	6–8
			and/or white clover	2–3

*Increase rates by 50–100 percent if seeding into a poorly prepared seedbed.

Mixtures

For temporary pastures, you can mix annual ryegrass with red clover, white clover, oats, or a *Brassica* species, such as kale.

For cover crop and erosion control, mix with tall fescue, orchardgrass, or creeping red fescue in areas where precipitation is greater than 30 inches (720 mm) per year. For areas with 20 to 30 inches (480 to 720 mm) of annual precipitation, use tall fescue and subterranean (sub) clover.

Fertilization and pH relationships

Annual ryegrass responds to high soil nutrient levels. It tolerates a soil pH range of 5.0 to 7.8. Below pH 5.0, aluminum toxicity may be a problem. Higher pH can cause chlorosis due to iron and manganese deficiencies.

Meeting but not exceeding soil, plant, and animal needs is a continual adjustment process. You must balance fertility requirements and harvest/grazing management to accommodate the sometimes-competing objectives of:

- High yields
- High-quality forage
- Optimum N_2 fixation by forage legumes
- Maximum recycling of animal manures and municipal biosolids

Fertilization should be based on a soil test. Consult your county extension office for specific fertilization and liming rates.

Nitrogen fertilization

Yield responses to N fertilization are greatest if the N is applied and available at the time the crop makes its most rapid growth. For annual ryegrass, that period usually is late spring (April and May in the Pacific Northwest). Annual ryegrass yields generally have increased with N application rates to as high as 400 lb N per acre (448 kg N/ha), when applied in multiple applications of 75 to 100 lb N/a (84 to 112 kg N/ha) following each harvest.

Manure and biosolids

Most dairies can supply all the nitrogen, phosphorus, potassium, and other nutrients needed for forage production by applying manure to forage crops. In fact, the annual value of nutrients in manure from 100 lactating cows exceeds $10,000.

Applying too much manure, however, results in excess plant uptake of nutrients such as potassium and can lead to animal health problems—especially in dry cows. Excess manure application also contributes to nutrients and microorganisms in runoff water and potential nutrient leaching to groundwater.

Thus, analyzing the nutrient value of manure and applying the correct amount is essential for efficient use, optimum plant growth, and proper stewardship of our natural resources. See EM 8585, *Manure Application Rates for Forage Production,* for an example of how to calculate the proper amount of manure to apply on perennial ryegrass. Use similar application rates on annual ryegrass.

Legume nitrogen fixation

The amount of atmospheric nitrogen (N_2) fixed by legumes growing in combination with grasses depends on the legume species and the soil environment. If nitrate nitrogen is present, legumes fix less N_2. Nitrates also increase grass growth. The resulting competition will suppress legume N_2 fixation. Thus, to maximize the nitrogen-fixing contribution of legumes, apply only moderate amounts of fertilizer N or manure (no more than 50 lb N/a/yr; 56 kg N/ha/yr) during cool season growth.

Boron (B) and molybdenum (Mo) are important nutrients for nitrogen-fixing legumes. Monitor legumes for deficiency symptoms, particularly west of the Cascades in the Pacific Northwest. Deficiency symptoms include discoloration, streaking, or shriveling.

If you suspect micronutrient deficiencies, submit leaf samples to a certified laboratory for analysis. Your local extension agent can assist with sampling and interpretation.

Cutting and grazing management

Whether by mechanical clipping or grazing, defoliation management greatly influences forage quality, productivity, and persistence. Quality is most affected by maturity stage at harvest. To obtain high-quality preserved forage (silage or hay), harvest annual ryegrass at the boot stage. See Figure 10. For silage, let plants wilt prior to ensiling. Lower moisture content will reduce effluent losses from silage.

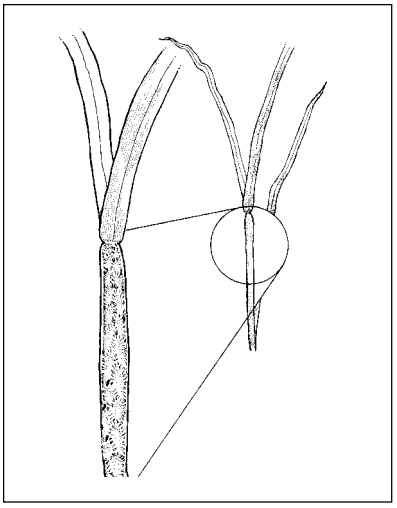

Figure 10.—Boot stage. The inflorescence is contained in the sheath of the flag (uppermost) leaf.

In the Pacific Northwest, four to six harvests are possible. With a five-cutting system, typical yield distribution is 40 percent in the first harvest, 15 to 20 percent in the second, and 10 to 15 percent in subsequent harvests.

Later-maturing varieties may be 10 to 14 days later in development, but this seldom is enough to avoid the damage caused by rain at this time of year or the poor quality, over-ripe hay that results from delaying harvest until after the rainy

season. More consistently high-quality forage is obtained by grazing, green chopping, or ensiling early spring growth. To stimulate recovery growth, fertilize with N immediately following the initial harvest.

Growth and regrowth characteristics

Although somewhat less tolerant of severe and frequent defoliation than perennial ryegrass, annual ryegrass is relatively tolerant of defoliation as long as at least 2 to 3 inches (5 to 7 cm) of stubble remains after harvest, and regrowth periods are at least 3 weeks long. This suggests a range of appropriate defoliation management schemes, typically including a rest period provided by rotational grazing, or hay/silage harvesting. Management to promote rapid recovery following defoliation should focus on harvesting prior to heading. This will ensure high-quality forage and trigger retillering at a somewhat earlier date.

- *Tiller*—Grass shoot arising from a bud in crown tissue, rhizomes, or stolons, which may become induced to flower when exposed to certain essential climatic conditions

New seedlings

Make sure newly seeded pastures are well established and approximately 10 to 12 inches (25 to 30 cm) tall before grazing. This can occur in as little as 45 days after seeding. Plants are established when they have three to four leaves and are not easily pulled out of the ground. Test this by pulling on plants. If they resist pulling, they will be able to withstand grazing.

Established stands

Proper management precautions should ensure maximum yield of high-quality forage, rapid regrowth, and increased stand persistence. These objectives can be achieved by safeguarding the regrowth mechanisms as described for each developmental stage.

Vegetative stage

In early spring, annual ryegrass shoots are vegetative. During this stage, the apical meristem (which generates new leaves) is safely below defoliation height (at approximately 0.5 inch; 1 cm above ground level).

Vegetative shoots show no sign of stem (culm) development; they are composed only of leaves.

In the vegetative stage, allow shoots to grown to 8 to 12 inches, graze to 2 to 6 inches, and provide 3 to 5 weeks for recovery.

For hay or silage, delay harvest and allow plants to reach the boot stage before mechanical harvest.

Transition stage

In the transition stage, the apical meristem is converted from a vegetative bud to a floral bud. Progress toward seed head development is easily monitored by splitting a shoot lengthwise with a sharp blade. Plants are in

the early transition stage when internodes at the base of the shoot have elongated and raised the *meristematic* growing point (the potential seed head) to a vulnerable height. See Figure 11.

During the early transition stage, control defoliation intensity by shifting livestock to adjacent paddocks before they have defoliated plants below the growing point. Leaving 2–3 inches of growth above the growing point will ensure further development of the shoot and associated crown buds for rapid growth.

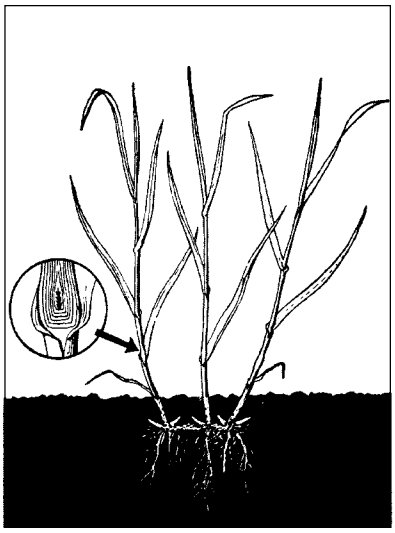

Figure 11.—Elevated apical meristem of the early transition stage.

Boot stage

Deferred grazing until late transition or early boot stage will ensure rapid regrowth from crown buds and provide a compromise between highest quality (early harvest) and highest yield (late harvest). At the boot stage, graze for maximum consumption. Clip to remove any seed heads not grazed by livestock.

Apply additional N (50–75 lb N/a; 56–84 kg N/ha) after each grazing or mechanical harvest cycle.

Summary

Defoliate annual ryegrass plants while they are in the vegetative stage or late boot to early heading stage. Avoid defoliation when they are in the early to medium transition stages.

Persistence

Cutting and grazing management affect stand persistence. Because annual ryegrass produces regrowth tillers that develop culms with elevated meristems, when mismanaged, annual ryegrass can be lost from pastures more quickly than perennial ryegrass, orchardgrass, or tall fescue.

In addition to the issue of the location of regrowth meristems, repeated harvesting without allowing replenishment of stored carbohydrates reduces stand persistence and regrowth. However, when annual ryegrass is used as a temporary forage plant, repeated close harvest may best fit the forage/livestock system. Frequent defoliation can delay or prevent culm development.

Frosted forage

Annual ryegrass may be damaged if utilized in freezing weather or when frosted. Avoid livestock and human traffic on frosted or frozen plants.

Forage quality

Annual ryegrass is noted for high nutritional qualities: high palatability, digestible energy, protein, and minerals. Ryegrasses accumulate high levels of total usable carbohydrate in spring and fall.

Forage quality depends largely on maturity stage at harvest and fertility. Thus, in order to balance rations, analyze forage samples for protein, energy (fiber), calcium, and phosphorus. "Book values" are available for annual ryegrass from the "Nutrient Requirements of Domestic Animals" series of publications from the National Research Council (Table 2).

Table 2.—Nutritional composition of annual ryegrass.

Feed description	TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NEm (Mcal/kg)	NEg (Mcal/kg)	CP (%)	Ca (%)	P (%)
Fresh, vegetative	60	2.65	2.17	1.31	0.74	15.0	0.65	0.41
Fresh, mature	58	2.56	2.10	1.24	0.68	5.8	—	—
Hay, early vegetative	60	2.65	2.17	1.31	0.74	15.2	0.62	0.34
Hay, early bloom	57	2.51	2.06	1.21	0.64	12.9	—	—
Hay, full bloom	55	2.43	1.99	1.14	0.58	6.6	—	—

All values expressed on a dry matter basis. TDN=Total Digestible Nutrients; DE=Digestible Energy; ME=Metabolizable Energy; NEm=Net Energy for Maintenance; NEg=Net Energy for Gain; CP=Crude Protein; Ca=Calcium; P=Phosphorus.
TDN values are listed for ruminants. Values for horses generally are lower.

Adapted from:

National Research Council. *United States-Canadian Tables of Feed Composition*, 3rd revision (National Academy Press, Washington, DC, 1982).

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Forage antiquality issues

Annual ryegrass toxicosis

Annual ryegrass toxicosis is a disease of livestock caused by a group of highly toxic compounds called corynetoxins. They are produced only when annual ryegrass is infected with a specific nematode (*Anguina agrostis*), and only when that nematode is infected by a bacteria (*Clavibacter toxicus*), and only when the bacteria is infected by a bacteriophage. Infection can be recognized as a yellow slime on annual ryegrass seed heads.

The toxins produced by this complex combination of infections affect the nervous system, and their effects become most obvious when animals are stressed or excited. Symptoms include neurological disturbances, a high-stepping gait, incoordination, and convulsions. The condition can cause extensive brain damage or death.

Annual ryegrass toxicity has been a problem mainly in Australia and South Africa. Although the disease was reported many years ago (1961) in Oregon, it has not been observed recently because of the widespread use of open field burning to dispose of grass straw and stubble.

Control of annual ryegrass toxicosis involves preventing nematode infection of the grass. Crop rotation, field burning, clipping immature seed heads, and fallowing are methods of reducing nematodes.

Perennial ryegrass staggers

Perennial ryegrass staggers is a disorder of animals grazing *perennial* ryegrass pastures. The causative agents are compounds called tremorgens, the most important of which is the alkaloid lolitrem B produced by the endophytic fungus *Neotyphodium lolii* (previously known as *Acremonium lolii* Latch). This fungus has been found in some annual ryegrass varieties. **No significant animal health problems, however, have been associated with the use of annual ryegrass as forage in the United States.** Nevertheless, endophyte-free seed is recommended for forage uses. Endophyte-free seed is available for many varieties. Check the seed tag to ensure the variety you plant is endophyte-free.

If you find the need to graze endophyte-infected varieties, animal management to avoid close grazing will minimize staggers incidence. Because lolitrem B concentrations in endophyte-infected ryegrass plants are highest in the leaf sheaths and lowest in leaf blades, the staggers syndrome is seen most often in closely grazed pastures.

Pest control

Weeds

Prevention of weed invasion is one of the most effective weed control methods. Preventive measures include use of certified seed (to minimize introduction of weed seeds at planting) and pregermination of weed seeds prior to final seedbed preparation.

Proper harvest and fertility management encourages vigorous growth of forage species and minimizes weed invasion. Early detection and removal of invasive weeds with a shovel or spot spraying with an appropriate herbicide further reduces costs and helps maintain a weed-free forage stand.

Figure 12.—Tansy ragwort, a common pasture weed.

Stands of annual ryegrass are more "open" than those of perennial ryegrass, due to the more upright plant architecture of annual ryegrass. Older stands become even more open as some plants die due to the short-lived nature of annual ryegrass. In the coastal regions of the Pacific Northwest, particular attention is needed in September when annual weeds germinate. Reseeding open areas can help. Using a mixture of annual ryegrass with longer-lived pasture and hay grasses provides better weed control by maintaining dense, vigorous stands.

Monitoring stands on a yearly basis is helpful in early detection of weed problems. Monitoring is best done after stands have been grazed or mechanically harvested because excessive forage growth prevents adequate monitoring. To assist in identifying weeds, color photos of many common weeds are found in the book *Weeds of the West.*

Diseases

Leaf diseases reduce forage quality and overall nutritive value of the forage. Most recent varieties of annual ryegrass are resistant to crown rust, once the major disease problem. Leaf spot, barley yellow dwarf virus, and blast cause minor problems.

Although rust is not toxic to livestock, it can affect palatability. For horses especially, the spores from rusts and smuts can cause significant respiratory problems. High fertility and harvesting the accumulated forage reduce rust problems.

For turf and grass seed production, chemical control measures are available. Most, however, are not registered for forage use.

Insects

No insect problems are unique to annual ryegrass. Grass grub is an important pest of ryegrass in most areas. In the southeastern United States, annual ryegrass seedlings are attacked by mole crickets and fall armyworms.

The European cranefly (*Tipula paludosa* Meigen) is important in some parts of the Pacific Northwest. Chemical control measures are available, but seldom economical. Typically, pastures are renovated and reseeded when stands are lost to the European cranefly.

For more information

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World Wide Web

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Oregon Ryegrass Growers Seed Commission:

http://ryegrass.com/

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