

Tall Fescue

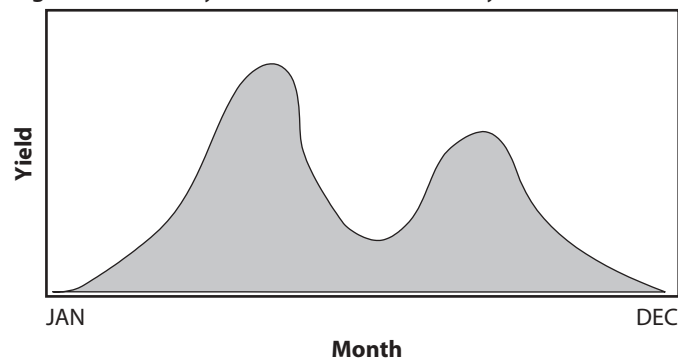
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Tall fescue (*Festuca arundinacea* Schreb.) is the most important cool-season forage grass in Kentucky, occupying approximately 5.5 million acres in the state. It is a versatile plant used for animal feed, lawns and turf, and conservation purposes (grass waterways, rights-of-way, etc.).

Tall fescue is a deep-rooted, long-lived bunchgrass with short rhizomes (underground stems). It is widely adapted and grows well on the state's many and varied soil types. Tall fescue produces a good sod that will support livestock during wet and rainy conditions.

Like other cool-season grasses, tall fescue produces the majority of its total growth during the first third of the growing season (Figure 1). Growth is slow during July and August, followed by increased production during autumn. Although the major share of fescue's total production normally occurs during the spring, autumn growth can be significant with adequate moisture and proper applications of nitrogen (N).

Figure 1. Seasonal yield distribution of Kentucky 31 tall fescue.



Total seasonal production of tall fescue is affected by weather, fertilizer (especially nitrogen), and cutting or grazing management. Yields of 2 to 4 tons of dry matter/acre are common, with the higher yields associated with proper fertilizer applications and harvest management.

Tall Fescue at a Glance

Origin	Europe
Characteristics	Perennial
	Long-lived bunchgrass
	Panicle seedhead
	Grass 2-4 feet tall
	Most older fields infected with endophyte
	Low endophyte and novel endophyte varieties available
Uses	pasture, hay, turf, erosion control
Seed	270,000 seed/lb 25 lb/bu
Seeding rate	15-20 lb/A
Seeding depth	1/4 - 1/2 in
Primary seeding date	Aug. 15-Oct. 15
Secondary seeding date	Feb. 1-April 15
First harvest	May 1-15
Yield	2-4 T/A/yr

Endophytic Fungus in Tall Fescue

Animal performance on tall fescue pastures has historically been inconsistent relative to other cool-season grasses. The cause of this inconsistent performance is attributed to an endophytic (endo = inside, phytic = the plant) fungus, *Neotyphodium coenophialum*, which is present in more than 85 percent of Kentucky's tall fescue pastures and hay fields. Endophyte-free tall fescue has been shown to provide better animal performance than endophyte-infected tall fescue (Tables 1 and 2).

Table 1. Average daily gains and gains/ac of beef steers grazing endophyte-infected and endophyte-free Kentucky 31 tall fescue.*

Endophyte level (%)	Average daily gain (lb)	Animal Gain/Acre/Year (lb)
1	2.18	463
90	1.41	371

*Represents 3-year average.
(Data adapted from Pedersen et al., 1986. Steer performance as affected by tall fescue cultivar and level of *Acremonium coenophialum* infection. N.Z.J. Exp. Agric.)

Table 2. Milk production and body weight change of dairy cows consuming endophyte-infected and endophyte-free Kentucky 31 tall fescue.*

Endophyte level (%)	Milk yield (lb/day)	Body weight change (lb/month)
0	43.0	17.2
63	34.0	-15.4

*Represents 2-year average. (Data adapted from Strahan et al., 1987. Performance of lactating dairy cows fed tall fescue forage.)

Even though the absence of the endophyte improves animal performance, elimination of the endophyte from tall fescue has been associated with decreased seeding vigor and less tolerance to drought and other stressors. However, endophyte-free varieties differ considerably in stress tolerance, and the opportunity exists for selecting more stress-tolerant plants.

Replacing endophyte-infected tall fescue pastures with new endophyte-free varieties is an option that requires careful consideration. Even though endophyte-free tall fescue will produce more animal product per acre, it requires more intensive management. Endophyte-infected tall fescue pastures have historically withstood overstocking and continued grazing. However, endophyte-free tall fescue will not withstand close, continued grazing—especially under stressful (drought) conditions—without the risk of stand damage.

Novel or Friendly (Nontoxic) Endophyte

Since the discovery of the endophyte in tall fescue, scientists were hopeful of finding a tall fescue plant with a nontoxic fungus that would give all the good agronomic characteristics of tall fescue but would not cause animal performance problems. This hope became reality when Dr. Gary Latch and his co-workers at Agriculture Research in New Zealand identified and selected the first nontoxic endophyte. In cooperation with Dr. Joe Bouton at the University of Georgia, this endophyte was inserted into endophyte-free Jesup tall fescue. This combination of the Jesup variety and novel endophyte became Max Q marketed by Pennington Seed and was the first nontoxic endophyte variety to be marketed. Research with Max Q in several states (endophyte-free Jesup + nontoxic endophyte) has shown animal performance equal to endophyte-free Jesup and agronomic performance equal to endophyte-infected Jesup. ArkPlus is also commonly available. It is a result of a novel endophyte developed in Arkansas that was inserted into a variety developed by the University of Missouri. Other varieties with novel endophyte are being developed. For more information on all varieties of tall fescue, see the most recent *Tall Fescue Report* available at each county Extension office or on the Web at: <<http://www.ca.uky.edu/agc/pubs/respubs.htm>>.

Establishment

With adequate soil moisture, the best time to seed tall fescue is late summer through early fall. Spring seedings can be successful but are more susceptible to summer drought and weed competition. To increase the chance of success with spring seeding, plant before mid-April.

- For pure stands, seed 15 to 20 pounds of seed in a prepared seedbed that has been limed and fertilized according to a soil test. No-till seeding can also be successful if competition is controlled and the seed is planted on time at consistent depth and rate.
- When seeding in mixtures with legumes, reduce the fescue seeding rate by one-third.
- When seeding in pure stands, apply nitrogen at 50 lb/A.

Many seeding methods, including no-till seeding, can be successful if they result in uniform distribution over the field, placement of seed below the soil surface ($1/4$ - to $1/2$ -inch deep), and firming of the soil around the seed for close seed-soil contact. Good seedbed preparation and seed placement are especially important for successful establishment. For more information, see Cooperative Extension publication AGR-64, *Establishing Forage Crops*.

Quality

Tall fescue quality, as measured by forage analysis, has shown a seasonal change in sugar content and digestibility. Protein content in green, leafy tall fescue leaves can be high throughout the season (Table 3). Digestibility and sugars are highest in fall, intermediate during spring, and lowest in summer. Palatability follows essentially the same trend as digestibility and sugar content (i.e., most palatable in fall, least in summer, and intermediate in spring).

Table 3. Seasonal chemical composition and digestibility of tall fescue.

	Spring	Summer	Fall
Sugars, %	9.5	8.5	19
Crude Protein, %	22	18	19
D.D.M.%*	69	66	74

*Digestible Dry Matter
University of Kentucky

Although endophyte infection in tall fescue has caused it to be viewed as a low-quality forage, laboratory quality factors have shown good quality. Its digestibility compares favorably with orchardgrass (Table 4). When the endophyte is eliminated, tall fescue is a high-quality forage in the laboratory and in the field.

Table 4. Spring and fall digestibility of Kentucky 31 (endophyte-free) tall fescue and Hallmark orchardgrass.

	% IVDMD*	
	Spring	Fall
Kentucky 31 Tall Fescue	58.1	56.2
Hallmark Orchardgrass	55.4	60.4

*IVDMD = In vitro dry matter disappearance, a measure of digestibility (Data adapted from Carlson and Umbaugh, 1988. Stain tests of cool-season perennial forage grasses—1988, Iowa State University.)

Management of Established Pure Stands

Grazing—Management during spring is of vital importance for best quality and quantity, since tall fescue produces more than two-thirds of its total dry matter during this period.

A traditional management practice has been to use light stocking during spring to ensure a summer feed supply. However, this practice results in much of the spring plant growth becoming stemmy and overly mature. Since cattle usually prefer not to eat overly mature plants and tramp a lot of them into the soil, much of the plant growth is wasted. Spring growth can be more efficiently utilized if animals are restricted to small fields (rotational grazing) that can be kept grazed to a 3- to 4-inch height during April, May, and June. This restriction may require the temporary use of electric fences in large fields, or it may require closing gates to confine animals to small fields. Intake and quality will be higher when animals graze plants kept in a young, leafy stage of growth. Fields not used for grazing during spring should be harvested as hay or balage.

Since tall fescue grows slowly in July, August, and September, animals need larger areas to graze during this period to avoid overgrazing. Having larger areas is especially important when endophyte-free varieties are used; they may not survive summer droughts as well if they are severely stressed by overgrazing. Ideally, a stubble height of 3 to 4 inches should be maintained throughout the summer. For more information, see Cooperative Extension publication ID-143, *Rotational Grazing*.

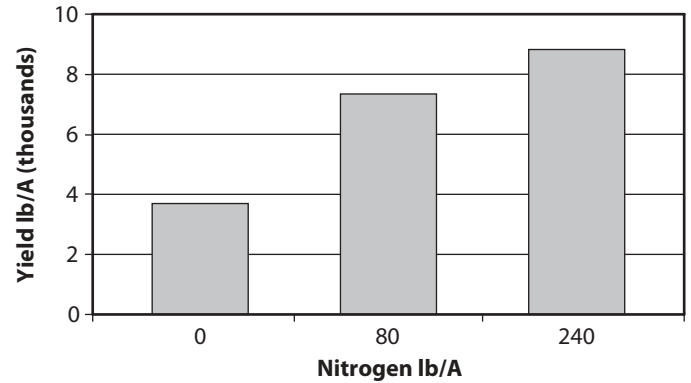
Hay—For highest yields of acceptable quality hay, make the first harvest when the plants' seed heads are in the boot to early heading stage of growth. Subsequent cuts can be made depending on rainfall and growth. Early cut hay will be leafier and more digestible, and it will be consumed in larger amounts than late cut hay. The amount of forage consumed is important in determining animal productivity. For more information see Cooperative Extension publication AGR-62, *Quality Hay Production*.

Balage—An increased use of round bale silage (balage) has permitted the storage of high-quality feed since less is lost during curing and storage. Early harvest, storage at 45% to 65% moisture, and wrapping soon after baling are important in making quality balage. For more information, see Cooperative Extension publication AGR-173, *Baling Forage Crops for Silage*.

Fertilizers—Fertilizers, especially nitrogen, are necessary for good fescue production. Figure 2 shows dry matter yields of tall fescue with different rates of nitrogen. Yields increased with each increase in the rate of nitrogen. In these studies, half the nitrogen was applied in March and the rest in August.

Test soil periodically to monitor pH, phosphorus (P), and potassium (K) levels and to determine if lime and fertilizer topdressings are needed.

Figure 2. Tall fescue dry matter yields at three levels of N fertilization (three location avg., split application in March and August).



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Manage to Maximize Grazing

Feed is usually the most important cost involved in producing livestock. Forage accounts for the majority of nutrients for ruminant animals. Stored feed (hay, haylage) is usually the single biggest cost item when analyzing budgets for livestock production. In several studies, the amount (cost) of hay fed during winter was the single best indication of profitability in beef cattle production. Tall fescue has played an important role in reducing the amount of hay required by providing pasture over a long grazing season.

To reduce the amount of stored feed, it is important to start grazing early in the spring and to continue grazing as late as possible in the fall to early winter. One of tall fescue's many attributes is that it has a longer growing season than most other cool-season grasses. As a result, grazing can begin early and provide feed later in the season. Nitrogen and adequate moisture play a key role in determining how long a grazing season tall fescue will provide.

Early spring grazing—Adding a light application of nitrogen when tall fescue begins growth in spring will usually permit grazing one to two weeks earlier than nonfertilized fescue. This practice should be evaluated with reference to pasture needs, hay supply, nitrogen cost, and management decisions.

Fall and winter (stockpiled)—Many cattlemen can take advantage of the late summer to fall growing conditions to obtain high-quality fescue pasture for fall and winter. This practice is called stockpiling. Tall fescue is an excellent grass for stockpiling because it grows at lower temperatures than many grasses, retains its green color and forage quality later, and can form a dense sod.

Stockpiling procedure—Late July to early August is a good time to begin the stockpiling process. Remove cattle, apply 40 to 80 pounds of nitrogen, and allow grass to accumulate growth until November or December. Kentucky research has shown that when moisture is adequate, each pound of nitrogen applied in mid-August results in 25 pounds of dry matter by Dec. 1. To make the most efficient use of high-quality stockpiled pastures, use a temporary electric fence restricting animals to a

small area that cattle will consume in a few days. Then move the fence to a new section of the field. A method similar to this was used in Missouri. It showed that stockpiled tall fescue reduced hay feeding days from 120 to 60. Cost per cow day was \$1.23 for feeding tall fescue hay and 43 cents for feeding stockpiled tall fescue. Wintering cost per cow was reduced \$117 by grazing stockpiled tall fescue. For more information, see Cooperative Extension publication AGR-162, *Stockpiling for Fall & Winter Pastures*.

Seed production—Acres devoted to fescue seed harvest in Kentucky have drastically declined throughout the years. In the early 1950s, nearly 60,000 acres were harvested as certified seed. This acreage has been reduced to less than 300 acres. Acreage harvested as uncertified seed varies from year to year and with anticipated demand.

Two key management practices of vital importance in tall fescue seed production are: (1) clipping to remove excessive growth immediately after the seed crop is harvested and during the fall to promote tillering; and (2) applying nitrogen fertilizer during the late fall or winter months.

For fescue seed production to be economical, it usually must be incorporated into a total forage-livestock operation. If desired, this system usually involves using part of the fescue acreage for seed harvest in the spring, followed by stockpiling for fall and winter pastures. These two systems are quite compatible. The remaining fescue acreage is renovated with an adapted legume and used as pasture, hay, or balage during the spring and summer.

Tall Fescue–Legume Mixtures

Several legume species, such as clovers, trefoil, lespedeza, and alfalfa, can be grown in mixtures with tall fescue. Legumes usually improve summer production and total production over non-nitrogen-fertilized tall fescue. Feed quality and animal performance are better on legume-grass mixtures than on pure stands of tall fescue. Introducing legumes to endophyte-infected tall fescue pastures has also been shown to help offset the effects of fescue toxicity. In addition, legumes eliminate the need for applied nitrogen fertilizers since they are able to convert atmospheric nitrogen to a form that the plants can use.

Management decisions with tall fescue-legume mixtures should be made to benefit the legume component of the mixture to maintain the legumes in the stand as long as possible. For more information on managing legumes, see the following Cooperative Extension publications: AGR-33, *Growing Red Clover in Kentucky*; AGR-76, *Alfalfa—The Queen of Forage Crops*; AGR-93, *Growing White Clover in Kentucky*; and AGR-86, *Growing Lespedeza in Kentucky*.

Applying lime, phosphorus, and potassium helps ensure legume persistence and yield. Base the application rates on a soil test and the amount of hay or balage removed.

Tall Fescue Management at a Glance

Management

1. Restrict cattle to small fields (through rotational grazing) in the spring until they are grazed to 3 to 4 inches to ensure maximum utilization of the forage. Harvest ungrazed forage as hay or balage.
2. Rotationally graze in the summer and autumn to avoid overgrazing. Strip-graze stockpiled growth in late fall and winter.
3. To maintain fertility, test soil periodically and fertilize accordingly. Base nitrogen fertilization rates on management needs.
4. Include legumes in the pasture to improve forage quality and productivity and for nitrogen fixation.
5. Avoid overgrazing.
6. Stockpile tall fescue to extend grazing season and minimize harvested feeding time.
7. Be knowledgeable of fescue-related disorders and manage properly to minimize their vegetation efforts. See Cooperative Extension publication ASC-57, *Forage-Related Cattle Disorders*.

Establishment

1. Select a variety based on management needs. Use high-quality seed regardless of variety.
2. Soil test, lime, and fertilize to recommendations. Apply nitrogen before seeding for pure stands.
3. Seed in late summer or early fall. Use 15 to 20 lb of seed per acre and place seed $\frac{1}{4}$ - to $\frac{1}{2}$ -inch deep, maintaining good seed-soil contact.
4. Avoid excessive grazing of newly established tall fescue pastures.
5. Control weeds and other pests as needed.

Most legumes do not persist over extended periods in mixtures with cool-season grasses such as tall fescue. When the legumes go out of the stand they may be re-established into tall fescue by using pasture renovation techniques. For more information on renovation, see Cooperative Extension publication AGR-26, *Renovating Grass Fields*.

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