

PASTURES FOR HORSES

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INTRODUCTION

Properly managed pastures can provide much of the feed needed by horses, while providing the most natural and healthy environment for exercise and rest. For most classes of horse, a well-managed pasture can provide all of the nutrients needed by the animal. For horses with elevated nutrient requirements (i.e., growth, reproduction, exercise), pasture should be an important part of their nutritional program. Productive pastures can provide an inexpensive, high-quality portion of the horse diet, while a poorly managed pasture will supply limited, low-quality feed. Poorly managed pastures will be unattractive and could potentially be the cause of some health/nutritional problems.

HOW MUCH ACREAGE IS NEEDED?

The first question that needs to be answered for proper pasture management is: Is this a pasture or an exercise area? In order for a pasture to provide a majority of the diet, approximately two to three acres are needed for each mature horse (1000-1200 lbs). If the available acreage is limited, then exercise may be the primary use of the pasture. If the pasture is being used solely for exercise, management practices should be in place to prevent weed growth, manure accumulation and mud. Close grazing and trampling will occur with high stocking rates of horses, and it will be difficult to maintain a dense, weed-free grass stand in this area. Use of seed, fertilizer and herbicides is generally not cost-effective in exercise lots.

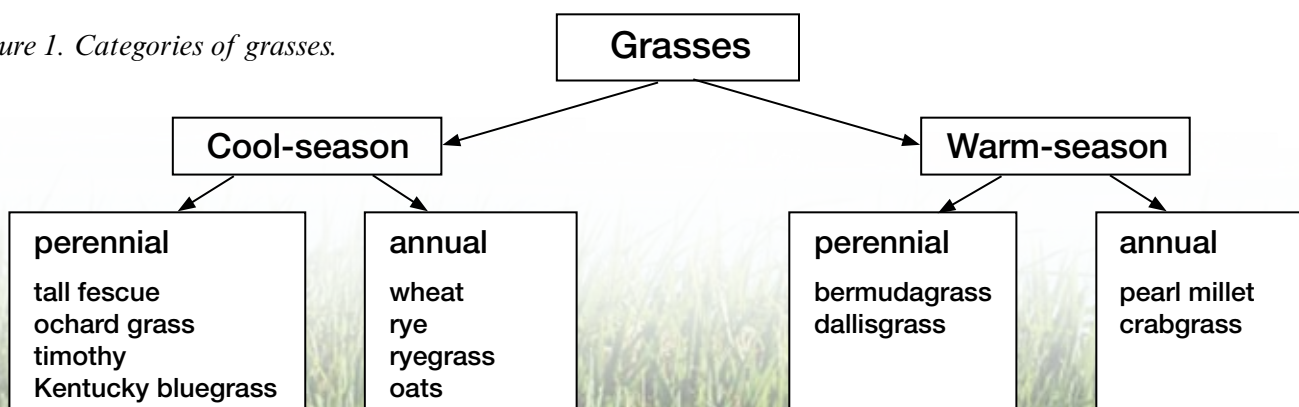
SELECTING THE PROPER FORAGE SPECIES

Several plants can be used for horse pasture in Tennessee. Grasses should be the primary forage in a pasture, because they tend to be more productive and more persistent than legumes, such as red and white clover. Grasses can be divided into categories based on their growth seasons and life cycles: cool-season grasses or warm-season grasses (Figure 1). An understanding of growth patterns is useful in determining which forage species should be selected for use in a horse pasture.

Cool-season grasses produce most of their growth during the cooler periods of the year (March to June and September to November). During the summer, cool-season plants usually become dormant or die. Warm-season grasses grow best during the warm periods of the year (June to October), since they tend to be more efficient in their water use and are therefore better adapted for growth during the hot and dry times of the year. Warm-season plants will either become dormant or die when the fall frosts begin.

Within both the cool-season and warm-season categories, a further distinction can be made to classify plants based on their life cycle: perennial and annual. A perennial plant is one that lives for more than one year. It may become dormant for part of the year, but it survives the dormancy period and regrows from roots and crowns to be productive again. Annual plants

Figure 1. Categories of grasses.



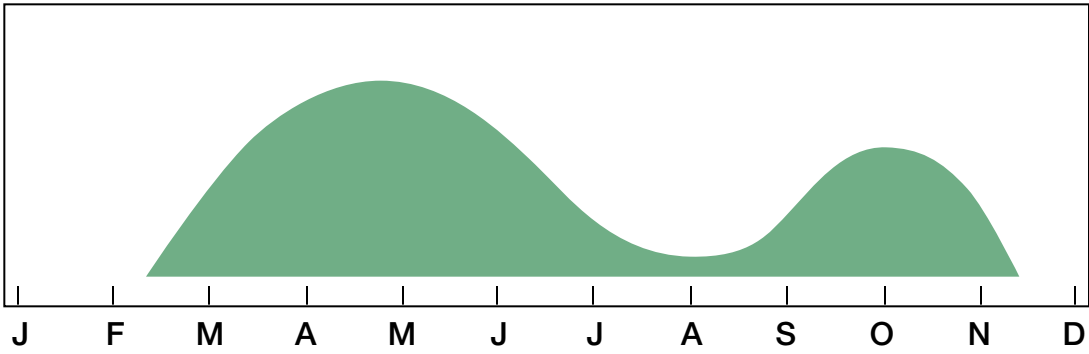


Figure 2.
Yield distribution of cool-season grasses.

Figure 3.
Yield distribution of warm-season grasses.

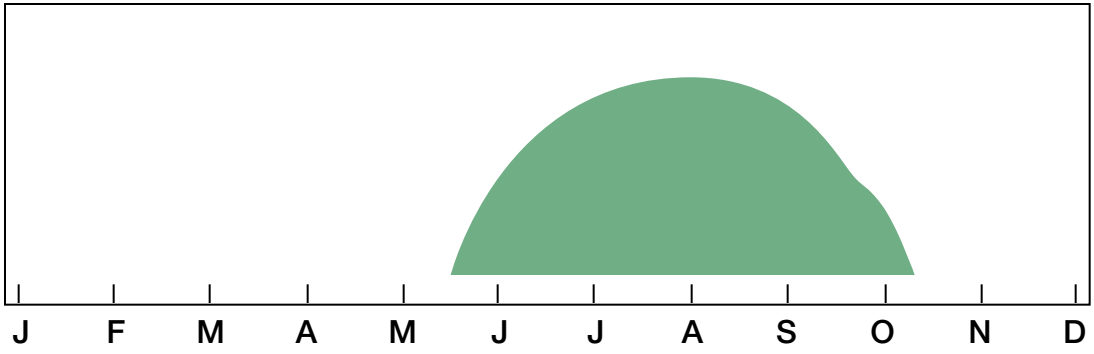


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are those that germinate from seed, grow, produce seed and then die within one year. None of the plant survives from year to year. The only way an annual plant survives is to produce seed, and then that seed germinates to produce new growth the following year.

When trying to determine which grass species is the best to use for pasture, several factors need to be considered. The length of the growing season is one of the most important factors in species selection for pastures. Most pastures in Tennessee should use cool-season plants, because they have a much longer growing season than do the warm-season plants. It is also preferable to use perennial plants instead of annuals, due to the expense and weather risks. Annuals will have to be seeded each year, and a drought during stand establishment will risk complete loss of grazing for that season (a risk that occurs each year). Once perennial plants are established, the risk of drought killing the stands is reduced significantly. Drought during the early part of the growing season may reduce yield and delay grazing, but it will not typically eliminate the stand.

WHAT ABOUT TALL FESCUE AND TOXICITY IN HORSES?

Tall fescue is the predominant grass used in Tennessee pastures. It is a persistent, good-quality forage for horses. It also has the longest growing season of any of the forages that can be grown. The most common variety of tall fescue is “Kentucky 31” (KY-31) tall fescue. In the late 1970s, it was discovered that KY-31 tall fescue contained a fungal endophyte called *Neotyphodium coenophialum*. This endophyte grows between the cells inside the plant, and cannot be seen externally. The endophyte fungus causes problems in pregnant mares, including extended gestation periods, difficult birth and poor milk production. Endophyte-infected tall fescue can be used for mares 9-10 months of the year, but two months prior to foaling, the mares need to be moved to another type of pasture, or stall-fed something other than endophyte-infected tall fescue hay. If a mare has been allowed to graze endophyte-infected tall fescue within two months of foaling, a veterinarian should be consulted to consider various treatment alternatives that will prevent complications during foaling.

If you have tall fescue pastures but are unsure if they are infected with the endophyte, the University of Tennessee Soil, Plant and Pest Laboratory can test to determine the endophyte infestation level. There is no way to determine if a tall fescue plant is infected simply by looking at it in the field. The test involves taking tiller samples from plants in the field and having them microscopically examined for the presence of the endophyte. Contact your local Extension office for more information regarding this test.

TALL FESCUE OPTIONS

Endophyte-free tall fescue – There are several tall fescue varieties that are not infected with the endophyte. Since tall fescue toxicity is caused by the endophyte, there is no toxicity problem with endophyte-free tall fescue. The biggest issue with endophyte-free tall fescue is its lack of persistence. While the endophyte causes toxicity problems in animals, it also helps the tall fescue plant tolerate drought, insects and disease. An endophyte-free stand will not have as long of a stand life as KY-31 infected tall fescue. Proper management, in particular grazing management, will help lengthen the stand life. Most producers should expect a stand of endophyte-free tall fescue to last 3-5 years.

Tall fescue with a non-toxic endophyte – Over the last several years, new technology has been developed allowing the advantage of the improved persistence of tall fescue that is infected, without having the toxicity problem. Non-toxic endophyte strains have been found and inserted into tall fescue varieties. The non-toxic (also called novel) endophyte provides the improved drought and pest resistance without the risk of foaling problems in mares. Research has shown these varieties persist similar to KY-31 if grazing management is similar.

If a novel endophyte variety is going to be used, it is important to kill all of the old tall fescue in the field the spring prior to planting. This will make sure all of the toxic tall fescue is gone, and no seed from the toxic tall fescue will be in the soil for germination in the fall.

MAINTAINING ENDOPHYTE-FREE OR NON-TOXIC ENDOPHYTE STANDS OF TALL FESCUE

If an endophyte-free or non-toxic tall fescue variety is going to be used, it is important to take steps to minimize the number of infected tall fescue plants that may encroach into the field. The endophyte does not move from plant to plant, so there is no concern of a non-infected plant becoming infected. The primary method of endophyte movement is through seed. An infected plant will produce seed that contains the endophyte. When this seed is moved (via wind, machinery, etc.) then there is the potential for new infected plants to become established in the field. Take care to minimize the amount of seed that may be transmitted into an endophyte-free or non-toxic tall fescue field. If there is a toxic KY-31 tall fescue field near, clip the field in mid-spring to eliminate seed production. If you use machinery in a field that has



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produced seedheads, be sure to clean the machinery prior to using it in one of the new fields.

SHOULD YOU TOTALLY AVOID KY-31 TALL FESCUE?

Many horse owners are completely opposed to having any tall fescue on their farm. It is important to understand that pregnant mares are the only class of horse that has any problems related to the endophyte in KY-31 tall fescue. All other horses other than late-gestation mares have shown no production problems when grazing infected tall fescue. Even with pregnant mares, remember that removing them from infected tall fescue two months prior to their expected foaling date will eliminate any problem.

OTHER COOL-SEASON GRASS OPTIONS

There are several other options for cool-season grasses other than tall fescue (Fig 1). Orchardgrass, timothy and Kentucky bluegrass can be used as perennial grasses for pasture. The biggest limitation for each of these is their persistence, particularly when overgrazed. For most areas of Tennessee, orchardgrass will be the best option for cool-season pasture if trying to avoid tall fescue.

WARM-SEASON GRASSES

A warm-season grass like bermudagrass can be used in the warmer areas of the state. Bermudagrass tends to form a thicker sod than most other grass species, so it holds up the best under heavy traffic. Due to the long dormancy period of bermudagrass, a cool-season annual grass like wheat or ryegrass should be seeded into the bermudagrass each year in early to mid-October. This will provide grazing during the late winter and spring, when the bermudagrass is dormant. However, care should be taken when grazing horses on cool-season annuals, because they tend to be high in nonstructural carbohydrates (NSC), which can cause digestive and metabolic disorders. Warm-season annual grasses related to sorghum (johnsongrass, sorghum x sudangrass hybrid) should not be used for horses, due to a medical condition known as cystitis syndrome. Warm-season annuals such as crabgrass and pearl millet can be used for grazing, but since they have to be planted each year, they tend to be more expensive than most other perennial forage crops. Just as with

bermudagrass, no forage will be produced after frost, so these areas will need to be overseeded with some type of cool-season annual plant if forage is expected during fall and spring. It will take six to eight weeks for these seedings to be available for grazing, so other areas needed to be provided for grazing during this establishment period.

YEAR-ROUND FORAGE PRODUCTION

The discussion so far has been about individual grasses for pasture. Remember that every acre does not need to have the same forage species growing on it. The best forage producers want to provide grazing for their horses as much of the year as possible. The best way to do this is to use both cool- and warm-season plants. As previously discussed, the majority of acres should be seeded to a cool-season perennial grass, most likely endophyte-infected tall fescue (unless it is a breeding farm that houses pregnant mares). The cool-season grasses are less productive during the summer (see Figures 2 & 3). Planting a few acres of a warm-season grass will provide grazing during the dormant season for the acres planted to cool-season grasses. This is the first step in developing a forage system.

After the base grasses are planted, legumes should be added to the pastures. Due to their nitrogen-fixing capability, ladino white clover (cool-season) and annual lespedeza (warm-season) can be added to most cool-season pastures to improve the quality of the forage, while adding nitrogen to the soil and decreasing the need for fertilizer. Both red and white clover can be used successfully in horse pastures; however, the late-spring growth of these clovers can have a mold on the leaves that causes excessive salivation or slobbering. This is not fatal to the animal, but it is unsightly. Red clover has also been associated with secondary photosensitization (sensitivity to sun) in some horses. Ladino white clover should be seeded at 2 lb per acre. If red clover is included, add 4 lb per acre. On droughty hillsides, 8 lb of kobe annual lespedeza can be seeded to help summer grazing. These seeds can be mixed together and broadcast in pastures from February 15 to March 1. After March 1, these seed should be drilled into the pasture no more than 1/4 inch deep. Do not seed clovers after March 31. This should be done about every three years to maintain an adequate stand of clover. One good approach is to overseed one-third of the acres each year.

PREPARING FOR NEW SEEDINGS

The first step in successful pasture management is to have a good stand of grass. If the stand is thin, management will be much more difficult, due to decreased forage production and increased weed pressure. Since having a thick stand of grass is so important, establishment of a new stand is a critical part of pasture management. The first few months after seeding will determine the type of stand the pasture will start with. If attention is paid to a few details, a lot of time and money can be saved and considerable frustration avoided.

CONVENTIONAL VERSUS NO-TILL SEEDING

There are two basic ways to plant a new stand of forage. One is conventional seeding, which involves preparing a seedbed by plowing and disking a field. This will mechanically kill all the plants that could cause competition for new seedlings. Once a smooth seedbed is prepared, seed can be drilled or broadcast onto the seedbed, and then cultipacked to ensure good soil-to-seed contact.

No-till seeding uses chemical means to remove all plant competition. With this method, a chemical such as glyphosate or paraquat used prior to seeding will kill all existing vegetation. Specially designed no-till drills are used to place the seed in contact with the soil. These drills have disk coulters that slice through the soil to create a furrow. The seed is placed in this furrow, and then press wheels follow behind to press the soil back over the seed.

Both methods of seeding can be successful if done correctly. No-till seedings have the advantage of requiring less machinery time and better soil conservation. The basic principles of both seeding methods are the same, however. All weed competition is removed, either with a disk or herbicide, and seed is placed in contact with the soil. For both methods, pay attention to the following points:

(1) Fertilize according to soil test. Conditions in the field should be manipulated to favor the forage to be seeded. The first step in creating a favorable environment is to provide the nutrients needed for seed germination and seedling growth. An optimum pH, plus adequate nitrogen, potash and phosphate are required by the plant. The more acid the soil (i.e., the lower the pH value), the less these nutrients

are available and the more conditions favor weeds over forage. Lime and fertilizer applications should be based on soil test results. With no-till seedings, pH will not be increased as quickly with lime application as in conventional seedings. When lime is applied to the soil surface, it takes longer to move through the soil profile and decrease acidity; whereas in conventional seeding, the lime is worked into the soil and mixed thoroughly with disking, and reacts more quickly to correct pH problems. For no-till seeding, if the soil pH is below 5.5, apply lime at least six months prior to seeding to ensure adequate time for pH improvement, or conventionally establish the field, which will allow the lime to be mixed with the soil during disking.

Taking a soil test – The University of Tennessee Soil, Plant and Pest Center in Nashville can analyze soil samples and provide fertilizer and lime recommendations. Soil samples should be taken 6 inches deep from approximately 20 places in a field. Mix the samples together in a bucket, and submit a composite sample for testing. A shovel can be used to take samples, but most Extension offices have soil probes available for use. A soil sample submitted to the lab should represent no more than a 10-acre field. If a pasture is larger than 10 acres, or has changes in topography, soil type, fertilization history or forage species, split the field into smaller sub-areas and submit a composite sample from each of these sub-areas. The results from a soil test will only be as accurate as the soil sample submitted. Contact your local Extension office to learn more about soil sampling and testing, or to receive soil test submission boxes and forms.

(2) Plant at the proper time. Seeding date is very important for successful establishment of forages. All forages have specific environmental conditions that result in their peak production. For instance, tall fescue is the most productive during the spring and fall, when temperatures are relatively cool and moisture is plentiful. Hot, dry conditions during the summer cause a somewhat dormant period for tall fescue. The response of a plant to environmental conditions will be even more dramatic when it is a seedling. Plants need to be seeded when temperature, day length and moisture favor the young seedlings. Recommended seeding dates for several forage crops are listed in Table 1.

Table 1. Recommended planting rates and dates for several forage crops.

crop	seeding rate (lb/acre)	seeding date
tall fescue	15	Aug. 15 - Oct. 1* Feb. 20 - April 1
orchardgrass	15	Aug. 15 - Oct. 1* Feb. 20 - April 1
timothy	9	Aug. 15 - Oct. 1* Feb. 20 - April 1
wheat	90	Sept. 1 - Nov. 10
rye	120	Aug. 15 - Oct. 15
annual ryegrass	20	Aug. 15 - Oct. 15
bermudagrass	6 - 10 (seeded) 25 bu (sprigged)	April 15 - July 1
pearl millet	10 - 15	May 1 - July 15
red clover	8	Feb 15 - April 1
white clover	2	Feb 15 - April 1
annual lespedeza	25 - 40	Feb 15 - April 1

* Fall planting is usually the most successful for tall fescue, orchardgrass and timothy.

(3) Plant the proper amount of seed. The maximum production from a hay field or pasture can only be achieved if enough forage plants are present to provide the yield. If only half a stand of grass is present, no amount of fertilizer can be added to produce the maximum yield. It is important to plant enough seed to ensure a full stand. Take a few minutes before planting and check the seed flow rate through the seeder. With both broadcast seeders and no-till drills, mistakes can be made by planting too little seed, resulting in a poor stand due to a lack of seed, or planting too much seed and having to buy more seed to finish the remainder of a field, resulting in wasted time and money. Calibrating the drill or seeder ensures that the proper amount of seed is placed in the field. Do not always depend on the seeding charts shown in the owner's manuals of drills, whether it is a rented or owned drill. As seeders get used, seed flow rates

may change. It is useful to determine the seed put out over an acre, and then adjust the seed flow rate to meet the seeding recommendations. Contact your local Extension agent for more information concerning seeder calibration. Table 1 lists the recommended seeding rate for several forage crops. The University of Tennessee conducts forage variety trials to compare the yield potential of many forage species. Data from these trials can be viewed at <http://forages.tennessee.edu>, or contact your local Extension office to learn more about the recommended varieties of the crop you wish to plant.

(4) Plant when moisture is available. Water is the most critical nutrient for plant survival. Without nitrogen, potash or phosphate, a plant might not be very productive, but it should still be able to survive. A lack of water will result in the plant's death. When using a no-till drill to plant a forage,

you must have adequate soil moisture. You are depending on the drill to slice open a furrow in the soil, drop the seed and then press the soil together for good soil-to-seed contact. If the soil is dry, it may be too hard for the disc openers to get into the soil, and soil-to-seed contact will be poor. A poor stand may result because seed was dropped on top of the ground instead of being placed in the ground.

A second reason adequate moisture is needed for successful stand establishment is because seeds need moisture to germinate. If the soil is dry, the seed will not germinate until rain comes. Often there is just enough moisture for the seed to germinate and begin to grow, but before the root system can get established, the seedling dies from moisture stress. Don't be lulled into thinking that just because you are able to drill or disk a field, all problems are solved. Without adequate moisture, seedlings have no hope of getting established.

(5) Plant at the proper depth. The first few weeks of a seedling's life are the most difficult. When a seed germinates, it must push its way through the soil to the surface so it can receive sunlight. Once in the sun, it can produce its own energy. Until that happens, it must depend on energy stored in the seed to grow. The deeper a seed is planted, the more energy required for it to emerge from the soil. Some seeds are relatively large and should be planted deep. Other seeds are small, and have very little energy stored. These seed should be planted very shallow. Table 2 gives recommended seeding depths for many forage crops.

Planting too deep is a problem with no-till plantings more often than with conventional plantings. No-till drills vary in the method used to control coulter seeding depth. Coulter depth on some drills can be adjusted by adding or removing weights to the drill. Some drills have a hydraulic mechanism that can be raised or lowered to adjust coulter depth. A variety of mechanisms are used to adjust disk opener depth. When you calibrate the drill for seeding rate, check several furrows to determine the depth the coulter is cutting into the ground and the depth of seed placement.

MANAGING AN EXISTING PASTURE

Once the stand is established, several procedures should be routinely followed to ensure a productive life of the stand. Both newly established pastures and those that have been around for several years should be managed to maintain forage quality and production, as well as minimize weed pressure and stand loss.

(1) Evaluate the pasture for grass/clover stand and weed pressure. All pastures should be evaluated every year or two to determine the density of forage plants and the amount and type of weeds present in the field. Evaluating the stand will help determine if more grass or legume plants need to be added. Even with the best management, a severe summer drought can result in stand losses. If clovers need to be added, seed can be broadcast in late February or drilled in March. If the stand has few grass plants remaining, follow the procedures for establishing a new stand. If the stand is slightly weak and only a few grass plants need to be added, this can be done by grazing or clipping the pasture in mid-September

Table 2. Recommended planting depth for forage crops.

crop	depth (inches)
clovers	1/4 to 1/2
bermudagrass - seeded sprigged	1/4 to 1/2 1 to 3
tall fescue, orchardgrass, timothy, annual ryegrass, small grains	1/4 to 1/2
pearl millet	1/4 to 1/2

to remove all top growth. Seed can be drilled in mid to late September. Use the full seeding rate for the appropriate grass.

(2) Fertilize according to soil test results. Like new seedings, proper fertility levels in the soil are needed to ensure maintenance of adequate forage production. Low pH, phosphate or potash levels can increase weed pressure and decrease grass and clover growth. A soil test is the only way to know the fertility level of your soil, and the amount of lime and fertilizer required. See the section titled “Taking a soil test” in the “Preparing for new seedings” section in this publication.

Spring fertilization – lime, potash and phosphate can be applied any time of the year, usually either the spring or fall, whichever is convenient. Nitrogen should be applied to the grass when it is actively growing, just prior to when the forage is needed. For cool-season grasses, mid-March is the best time to fertilize. If a pasture has a 30 percent stand of clover, do not apply spring nitrogen. The nitrogen will stimulate grass growth too early, which will shade the clovers and result in their death. Adding the nitrogen will not increase the spring yield, since clovers produce nitrogen. The difference is that the nitrogen produced by the clover is available over a longer period of the spring, so growth is spread over a longer period.

Fall fertilization – if tall fescue is used, a fall application of nitrogen will increase fall growth and the available grazing days during fall and winter. Orchardgrass and timothy do not produce as much fall growth, so nitrogen fertilization in the fall is usually not profitable for these grasses. For tall fescue pastures, apply 60 pounds of nitrogen per acre (180 lb ammonium nitrate) after the fall rains begin in September. Remember to graze or clip the pasture prior to fertilization, which will remove all of the old summer growth from the field.

(3) Control weeds. Often, a thin stand and high weed pressure are found together. Weeds will fill in areas that are not covered with a forage plant. Broadleaf weeds can reduce forage yield and quality, as well as decrease stand life. Several herbicides can be used to control broadleaf weeds. The best type and amount of herbicide will depend on the forage to be sprayed, and the weeds present. Be sure to read the label on the herbicide and follow all label recommendations. Several herbicides will kill any clovers present and may prevent the germination of seed, so be careful to understand any restrictions on using herbicides. Contact your local Extension office to determine the weed species present in your field the best herbicide recommendations for your situation.

(4) Use proper grazing management. Overgrazing, particularly during the summer, will many times result in loss of forage stands in pastures. When the leaves of a forage plant are removed, it must use carbohydrates stored in the roots and crown of the plant for regrowth. As leaves develop, the plant is then able to capture sunlight and produce energy for growth through photosynthesis. If the plant is constantly overgrazed, it has to continue to use its energy reserves to grow new leaves, without the opportunity to replace those reserves with excess energy made from the photosynthesis. The overgrazing reduces carbohydrate reserves until the plant is stressed to the point that it dies.

Proper grazing management allows the plant to be grazed by the horse, but prevents constant overgrazing. The best way to minimize overgrazing is to reduce pasture size and implement rotational grazing. In a rotational grazing scheme, horses should be moved from one pasture to another, allowing a three- to four-week rest period for each pasture between grazing. Cool-season grasses such as tall fescue, orchardgrass, wheat and ryegrass should be grazed when they reach 8 inches tall, and animals should be removed when the forage is grazed down to 3 inches. Bermudagrass can be grazed down to 1-2 inches, because it has more leaves lower on the plant and does not require as much energy from root reserves for regrowth.

CONCLUSION

Pasture management is an essential component of horse care. Properly managed pastures produce forages that are the foundation of the diet for all classes of horses. Successful pasture management for horses can be simplified into three basic steps:

- (1) Select the right forage(s).
- (2) Start with a good stand.
- (3) Manage the pasture properly to keep a good stand.

For most horse owners in Tennessee, an endophyte-infected tall fescue pasture overseeded with ladino white clover will provide the longest growing season with good persistence. For pregnant mares, another type of grass can be planted on a small acreage or another type of hay can be fed for two months prior to the expected foaling date.

The farther south and west a farm is located in the state, the greater the potential for using warm-season grasses, such as bermudagrass, as forage. A bermudagrass pasture overseeded with wheat or ryegrass can provide a good-quality diet to the horse; however, caution should be used with these cool-season annuals because of their high nonstructural carbohydrate (sugar) content. If these species are used, fall droughts can cause problems with establishment of the wheat or ryegrass.

Regardless of the forage selected, a solid fertility and weed control program, combined with appropriate grazing management practices, are essential to maintain pasture longevity. If the production and quality of a pasture is poor, a failure in one or more of these areas is usually the cause. Remember that successful pasture management is nothing more than creating and maintaining conditions in the pasture that favor forage plants over weeds.