Cool-Season Annual Forage Grasses

Many Oklahoma producers feed livestock hay, silage, or concentrates during fall, winter, and early spring due to limited forage growth. This winter feeding program is generally expensive and reduces profitability. More cost-effective winter feeding programs generally utilize some form of cool-season pasture.

Adapted cool-season perennial forage grasses provide the least costly means of wintering livestock; however, with the exception of tall fescue in eastern Oklahoma, suitable cool-season perennial forage grasses have not been identified for all portions of Oklahoma. Thus, cool-season annual forage grasses are commonly used, not only in Oklahoma, but across much of the southern U.S.

This publication discusses those cool-season annual forage grasses that may be used for winter pasture programs in Oklahoma. A brief description of each of the grasses and the relative differences between species will be discussed. Cultural recommendations for establishment, management, and utilization are also provided.

Barley (Hordeum vulgare)

Barley, along with wheat, is thought to have originated in the Near East. This species is probably the least utilized of the cereal grains for pasture use. It is generally grown for grain used in the brewing industry. Barley is less winter hardy than wheat and rye, and winterkilling frequently becomes a problem. Barley, however, can provide good winter pasture, although other cereal grains typically provide better alternatives in Oklahoma. Of the cereal grains, barley is the most tolerant of saline and alkaline soils and, thus, may provide pasture on certain soils that may be less productive when other cereal grains are used. Barley does not grow well on sandy soils.

Oat (Avena sativa)

Oat originated as a domesticated crop in Europe and has been used as both food for humans and livestock. Oat also provides excellent cool-season pasture for livestock and is a popular planting for white-tailed deer and turkey. Oat has the least cold tolerance of the cereal grains and this limits its use in Oklahoma to the southern part of the state. Oat grows better on wet soils than the other cereal grains. At least one oat variety, ‘Okay’, has good salt tolerance. Oat is planted both during late summer/early fall and in late winter/early spring for both pasture or hay. If planted in late summer/early fall, oat is more susceptible to winter kill than with later plantings.

Rye (Secale cereale)

Rye also originated in Europe. Rye is the most winter-hardy of the cool-season annual grasses. Rye is also the most productive cool-season annual grass on soils that are low in fertility, well-drained, and sandy in texture. Rye generally produces more fall forage than spring forage and matures earlier in the spring than most wheat varieties. Because of this aspect, a mixed-planting of rye and annual ryegrass provides good seasonal distribution of forage production since ryegrass produces most of its growth in the spring.

Ryegrass (Lolium multiflorum)

Ryegrass is indigenous to southern Europe and is a popular choice for winter feeding of livestock. Ryegrass grows on a wide range of soil types and grows better on wet soils than any other cool-season annual grass. Ryegrass generally matures later, thus extending the grazing season well into spring. Ryegrass establishes readily without any seedbed preparation and tolerates a high level of grazing pressure. With adequate moisture, ryegrass can produce large quantities of forage (mostly during the spring production phase) and is generally the most productive of all the cool-season annual grasses. Production, however, decreases in northern and western Oklahoma.

Triticale (Triticum secale)

Triticale is a unique species that resulted from a cross of wheat and rye. Grain from triticale is used as a feed grain for the livestock industry. In Kansas, triticale has been shown to: produce more forage than wheat or rye, be better adapted for early planting for fall forage production, provide a longer grazing period than wheat or rye, and have superior tolerance to drought, pests, and low pH when compared with wheat. In
south-central Oklahoma trials, however, triticale generally has not produced as much fall forage as rye. Production and distribution of forage is similar to most wheat varieties. Although often overlooked, triticale could be a good choice for annual winter pasture.

Wheat (See OSU Facts No. F-2586, Wheat for Pasture)

Establishment

Cool-season annual forage grasses are well adapted to most regions of Oklahoma with soil texture generally the greatest limiting factor. The choice of species, therefore, is largely up to the producer, depending on his particular management philosophy and livestock production needs. Be aware that cool-season annual grasses can produce different levels of forage (Fig. 1). Regardless of species, it is important that cool-season annual forage grasses be established under a fairly narrow set of conditions to ensure maximum probability of success.

Maximum fall forage production is generally a function of moisture, planting date, and fertility. Adequate stored soil moisture can be critical to maximizing forage production; therefore, many producers leave cool-season annual pastures fallow during the warm months of the year to conserve soil moisture.

Where moisture is generally not limited, such as in eastern Oklahoma, the cool-season annual forages may be successfully sod-seeded into warm-season perennial grass swards. This practice is used to increase forage nutritive value and extend the grazing season. The warm-season grass, however, should be grazed or mowed short prior to establishment of cool-season annual grasses. The warm-season grass should also be near the onset of dormancy to minimize competition for sunlight, moisture, and other nutrients of emerging cool-season annual grass seedlings.

A soil sample should be obtained well before the time to establish the cool-season pasture. Adequate P and K (65 and 250, respectively, based on OSU Soil, Water, and Forage Analytical Laboratory results) should be present and soil pH should be 5.5 or higher. If planting into a clean-tilled seedbed, necessary P, K, and lime should be incorporated into soil well ahead of planting. Phosphorus can also be applied at planting in the seed furrow as 16-46-0. If sod-seeding into warm-season grass sod, P, K, and lime can be surface-applied with good results, and again, 18-46-0 can be applied in the seed furrow.

Nitrogen is second only to moisture as a limiting factor in plant production. Nitrogen fertilizer may be applied as anhydrous ammonia pre-plant in clean-tilled seedbeds, or as a topdress using dry forms of inorganic nitrogen fertilizer, such as ammonium nitrate or urea. Liquid formulations of nitrogen, such as Solution 28, may also be used to topdress. Nitrogen applications may be made at planting, or after germination and at levels designed to provide the quantity of forage desired.

Nitrogen application rates will vary with region of the state. In the eastern portion of Oklahoma, 100 to 150 lbs of actual nitrogen per acre may be utilized by the cool-season annual grass. As fields are planted farther west in the state, less nitrogen is applied due to reduced moisture availability. Planting for fall pasture should begin as early as possible to allow maximum forage production prior to winter dormancy. Where possible, late-summer plantings (i.e., late August, early September) can capitalize on the bimodal precipitation pattern experienced in Oklahoma and provide pasture for grazing by late October or early November. Semi-dwarf wheat, however, may exhibit poor emergence due to higher soil temperatures experienced during late summer plantings. If forage is the only concern, taller, later maturing varieties may be a better choice for the livestock producer.

Seeding rate and planting depth can be critical elements in stand establishment. Tall varieties of wheat may be planted as deep as 2" in late August and produce good stands. This can be important during late summer plantings where producers attempt to plant to soil moisture. Semi-dwarf wheat, on the other hand, suffers from poor emergence if planted deeper than 1" due to a shorter coleoptile length. Rye should not be planted any deeper than 3/4". Ryegrass is generally not planted, but simply broadcast over a field, generally as part of a fertilizer application for a mixed-planting with rye or wheat. More information regarding seeding rate and planting depth for the various cool-season annual forages are contained in Table 1.

Table 1. Planting information for cool-season annual grasses.

<table>
<thead>
<tr>
<th>Species</th>
<th>Planting Date</th>
<th>Seeding Rate (lbs/ac)</th>
<th>Planting Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley</td>
<td>Late Aug-Sept</td>
<td>90-120</td>
<td>1.2&quot;</td>
</tr>
<tr>
<td>Oat</td>
<td>Late Aug-Sept</td>
<td>60-90</td>
<td>1.2&quot;</td>
</tr>
<tr>
<td>Rye</td>
<td>Late Aug-Sept</td>
<td>90-120</td>
<td>1.2&quot;</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>Late Sept, Jan</td>
<td>20-30</td>
<td>1/4-1/2&quot;</td>
</tr>
<tr>
<td>Triticale</td>
<td>Late Aug-Sept</td>
<td>90-120</td>
<td>3/4-1&quot;</td>
</tr>
</tbody>
</table>

1 Assumes planting primarily for forage
2 Annual ryegrass does not require seedbed preparation.

Figure 1. Three-year (1993-1996) dry matter production of various cool-season annual grasses at Ardmore, OK. NOBLE Foundation, 1996.
Early weed control is generally not necessary for most cool-season annual forage grasses if they are planted in clean-tilled seedbeds that have had good weed control in the past. Typically, good growth of cool-season annual grasses prevent most weeds from becoming established. If weed problems develop, they are easily controlled by applying grazing pressure or with an inexpensive application of 2,4-D.

**Management**

Other than attention to basic establishment fundamentals, proper grazing management is the key element for a profitable production from cool-season annual grass pastures. Although not widely practiced in Oklahoma, rotational stocking of cool-season pastures can increase total beef production per acre, thus providing increased income for the same level of input costs compared to continuously stocked pastures.

Stocking rate is the most important aspect to grazing management regardless of the grazing system employed. Many cool-season pastures are stocked at extremely high rates. In many pastures it is easy to identify individual plants, and bare soil is readily apparent to even the casual observer. Under these stocking rates, maximum net return is not realized.

Maximum net return, not maximum number of calves in the pasture, should dictate the stocking rate. Maximum net return is generally realized at some moderate level of stocking rate (Fig. 2). A moderate stocking rate provides a good compromise between forage plant and animal performance and yields the highest net return per acre. Figure 2 illustrates that lighter stocking rates may improve overall individual animal performance, and higher stocking rates may increase total pounds of beef gain produced per acre, but the highest net return will not be realized at either extreme. Based on data from wheat pasture studies, we believe that a minimum of 1200 lbs of dry matter in the pasture is necessary to keep from reducing animal performance. This equates roughly to 4" of forage residue. For additional information on stocking rate decisions, see **OSU Extension Facts, F-2871, Stocking Rate: The Key to Successful Livestock Production**.

Although annual establishment costs increase the price per ton of forage produced relative to perennial species, cool-season annual grasses may provide a cost-effective winter feeding program when compared to feeding hay or protein/energy supplements. This is especially true for cow-calf production systems when cool-season annual pasture is limit grazed. With limit grazing, the cows are allowed access to the cool-season pasture only two or three times a week. This stretches the available forage supply and requires less acreage be planted for the winter pasture program. A creep gate into the cool-season pasture can mean good performance for calves, while restricting entry for grown animals with the lower nutrient requirement. For more information on grazing systems, see **OSU Extension Facts, F-2567, Grazing Systems for Pastures**.

**Summary**

Cool-season annual forages have a long history of use in Oklahoma, especially hard red winter wheat. Other cool-season annual forages are available, and because of different growth habits, may provide reasonable alternatives to wheat, especially when planted in combination with annual ryegrass. With the exception of annual ryegrass, annual establishment costs may reduce the attractiveness of cool-season annual forage grasses when compared to cool-season perennial grasses that only require yearly maintenance fertility inputs.

**NOTE**: In Oklahoma, rye, ryegrass, and possibly triticale can be serious weed problems if the field in which they are planted is ever converted back to wheat production. Be aware of this fact prior to establishing these species in potential wheat fields.
The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; home economics; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

• The federal, state, and local governments cooperatively share in its financial support and program direction.

• It is administered by the land-grant university as designated by the state legislature through an Extension director.

• Extension programs are nonpolitical, objective, and based on factual information.

• It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.

• It utilizes research from university, government, and other sources to help people make their own decisions.

• More than a million volunteers help multiply the impact of the Extension professional staff.

• It dispenses no funds to the public.

• It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.

• Local programs are developed and carried out in full recognition of national problems and goals.

• The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.

• Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.