Smooth Brome Production and Utilization

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Introduction

Smooth bromegrass *(Bromus inermis)* is a long-lived perennial, sod-forming grass introduced into the United States from Hungary in 1884. It is a cool-season grass that grows best during months with cooler weather, primarily March through June and September through November, and becomes semidormant during the hot, dry summer months. Most production occurs during the spring growth period, generally peaking in May through early June. The amount of fall growth depends on available moisture. Mature plants are 18-48 inches tall with erect leafy stems. Smooth brome spreads by strong, creeping rhizomes and seed dispersion.

Smooth brome is one of the more important cool-season grasses in the eastern half of Kansas and in favorable dryland locations-deep, well-drained soils receiving runoff from adjacent areas-in central and western Kansas. It is productive as far west as Rawlins County on subirrigated bottomland and is well adapted for irrigated pasture.

Smooth brome provides excellent pasture with a high carrying capacity and excellent hay when properly managed and harvested. Forage yields can be exceptional—3-4 tons per acre or more—with good management when rainfall is adequate. Smooth brome also provides excellent permanent cover for sites such as waterways, eroded areas, rocky areas, and farm lanes.

Varieties

Two distinct types of smooth brome have been identified—Northern, which is adapted to western Canada and the northern Great Plains, and Southern, which is adapted to the Corn Belt states and central Great Plains. Because of their superior drought and heat tolerance, only Southern varieties should be grown in Kansas. The following varieties are recommended for use in Kansas:

- Achenbach, a typical Southern type, is the variety commonly grown in Kansas. It is a heavy producer of both seed and forage. Achenbach was named in 1944 by the Kansas Agricultural Experiment Station. Much of the seed sold in Kansas as "common" is from this source. No certified seed is available.
- Southland is a variety from the Oklahoma Agricultural Experiment Station and was released in 1953. Southland has greater resistance to leaf diseases than most Southern strains, but its chief advantages are greater yield capacity, better seedling vigor, and better adaptation to southern conditions. Certified seed is available.
- Lincoln was developed at the Nebraska Agricultural Experiment Station. Lincoln is well adapted for conservation purposes because of good seedling vigor and ease of establishment on critical planting sites. Lincoln shows good early spring growth and fall regrowth. Certified seed is available.

Other varieties of the Southern type of smooth brome available either as certified seed or commercial seed include Baylor, Blair, and Fischer.

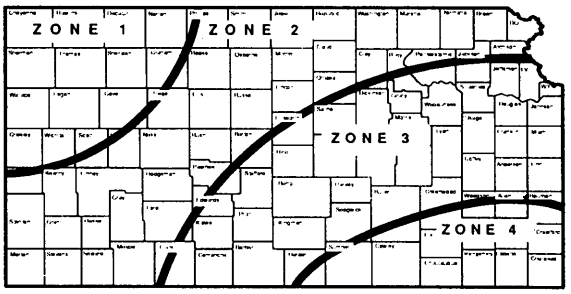
Establishing Smooth Brome

Smooth brome has been successfully established under many circumstances. Eroded and rocky areas, unproductive weed patches, bluegrass pastures, brush infested areas, and marginal cropland are all possible sites.

Time of Seeding

Smooth brome can be planted in late summer, early fall, winter or early spring (Figure 1). Winter and spring plantings are not recommended on droughty clay-pan soils because bromegrass will not survive if a hot, dry summer follows planting. Cool-season grasses are established most successfully with late summer or fall plantings. Adequate time must be allowed for summer tillage and soil moisture storage.

Good weed control is essential. Germinating weeds encouraged by summer tillage can be destroyed by light discing or other tillage operations. Tillage should be done no later than mid-August for a late August or early September planting. When moisture is available, several tillage operations maybe needed to control weed growth and thus conserve soil moisture. Excess tillage may increase moisture loss. No-till seeding of brome has emerged as a viable planting method. With no-till seeding, existing weeds are controlled by use of nonselective or



	Zone 1	Zone 2	Zone 3	Zone 4
Fall	Aug 10-Sep 15	Aug 15-Sep 20	Aug 15-Sep 20	Aug 15-Oct 1
Winter	Nov 1-Mar 1	Nov 15-Feb 15	Dec 1-Feb 15 *	
Spring	Marl-Apr 1	Feb 15-Apr 1	Feb 15-Apr 1 *	

*Not Recommended

Figure 1. Optimum seeding dates for smooth brome.

nonresidual herbicides. Land subject to wind or water erosion should be protected by terracing or other appropriate soil conservation measures.

Seedbed Preparation

Proper seedbed preparation is essential for a good stand. The ideal seedbed is firm, moist, free of weeds, and adequately fertilized and limed. Such a seedbed can be obtained by planning and using good techniques.

Seedbed preparation on land suited for cultivation is relatively simple. For best results, minimize weed competition, obtain uniform seed distribution, plant shallow and evenly cover seed with soil. Many smooth brome pastures have been established on sites that cannot be adequately tilled because soil is too shallow and/or slopes are too steep. On these areas, little seedbed preparation is possible.

Lime. Soil testing is essential to determine lime needs. Smooth brome will grow on moderately acid soils, but does best on near neutral pH soils. Because smooth brome stands can remain productive for 20 years or longer, correcting soil pH prior to seeding is essential. Needed lime should be added and thoroughly mixed to a soil depth of six inches as far ahead of planting as possible.

Nitrogen. Table 1 shows nitrogen recommendations for new seedings of smooth brome. Applying 30-40 pounds of nitrogen before seeding will help ensure vigorous establishment of brome. Nitrogen could be applied with needed phosphorous and potassium and incorporated prior to seeding or broadcast after planting.

Phosphorous and Potassium. Soils in Kansas vary in levels of phosphorous and potassium present. A soil test is essential to determine requirements for these nutrients. Based on the soil test, addition of phosphorus and potassium will help establish smooth brome stands and ensure subsequent growth. Tables 2 and 3 list phosphorus and potassium recommendations for establishing new stands

Table 1. Nitrogen recommendations for smooth bromegrass.

Type	Area of State	lb/a N[1]
New Seeding	Entire	30-40
Established Stands:		
Nonirrigated	Eastern	80–1 20
Nonirrigated	Central	40–80
Irrigated	Entire	125–200

[1] In established stands, the lower recommended N rates are for hay management only. The higher rates are for grazing or grazing and haying management.

of smooth bromegrass. Broadcasting and incorporating recommended rates of phosphorus and potassium during seedbed preparation is the most desirable practice. Phosphorus and potassium also may be applied with the drill at seeding. Avoid placing more than 20 pounds per acre of nitrogen plus potash in direct contact with the seed at planting.

Seed Source and Rate

High-quality seed of known germination and purity is important. Seeding rate depends on seed quality and method of seeding. When planting in a well prepared seedbed, 10–15 pounds of pure live seed (PLS) is adequate. PLS refers to the amount of live seed of the desired species in a bulk lot. As an example, 100 pounds of bulk smooth brome seed that has a germination of 90 percent and a purity of 95 percent contains 85.5 pounds of pure live seed (100 x .90 x .95= 85.5).

If a poor seedbed exists, seeding rates as high as 20 pounds PLS per acre may be required to obtain satisfactory stands. Higher seeding rates should be used when brome is broadcast on the surface and covered.

Method of Seeding

Drilling smooth brome seed is the preferred method of seeding. Drilling ensures uniform seed distribution, accurate seeding rates, and uniform depth of coverage. For best results, smooth brome should be seeded ¼ to ½ inch deep.

Broadcasting brome on the surface with shallow incorporation can result in good stands of brome. Wheat can be used as a cover crop in establishing a stand of smooth brome. Start by broadcasting 20 pounds PLS of brome seed on the surface of soil prior to wheat seeding. As the wheat is drilled, the brome seed is covered. After the wheat is taken for hay or grain, the brome is usually established, provided sufficient moisture is available for both crops. This is a slow establishment method, but it is desirable on soils subject to erosion or to obtain a return from the field the first year.

Managing Smooth Brome

New Stands

New stands of brome should be protected from grazing until the grass is well established. With proper management, fall seeded smooth brome usually can be grazed the next year. Light grazing with haying at the bloom stage should be considered the first spring. Spring seedings should not be grazed until the following spring.

Established Stands

Brome requires annual fertilization for optimum production. Soil test bromegrass pastures and meadows during July. This will provide an accurate picture of the nutrients available. Particular attention must be paid to pH, phosphorus, and potassium. Phosphorus and potassium rates for established stands of smooth bromegrass are listed in Tables 2 and 3, respectively.

Balanced fertility is essential. For example, if phosphorus is low, added nitrogen will not produce optimum yields. Soils low in phosphate limit plant and root growth. Phosphate and/or potassium should be applied by broadcasting in the fall or before spring growth begins.

Nitrogen Source. Nitrogen management is critical for optimum smooth brome production. Several nitrogen sources are available—liquid nitrogen solutions, urea, ammonium nitrate, and anhydrous ammonia. Anhydrous ammonia is not extensively used on permanent pastures because application is difficult. Nitrogen source research generally has shown little difference among sources under most conditions. When urea fertilizers—including liquid nitrogen—are applied to moist soils covered with grass residue, an enzyme called urease can break down the urea to ammonia which is lost to the air. This can occur fairly rapidly when moist conditions followed by warm temperatures and rapid drying occur without rain to move the urea into the soil. If urea is applied from November through February, volatilization loss should be minimal.

Application Timing. When brome is grazed in the fall, the yearly nitrogen application should be split. If adequate soil moisture is available for good growth in late August and early September, apply all phosphorus and potassium indicated by a soil test plus 30-40 pounds of nitrogen per acre. Before the soil freezes in November or December, apply the remainder of the nitrogen recommended for haying or grazing. Split or late fall applications generally initiate earlier green up in the spring.

If soil moisture is limited, apply all nitrogen, phosphorus and potassium before the soil freezes in November or December. **Do not apply fertilizer to frozen soil.**

Spring applications as soon as the soil thaws are acceptable for spring-only grazing. Timely application is often delayed because of wet soils.

Nitrogen Rate. Nitrogen rate recommendations for established stands of smooth bromegrass are shown in Table 1. When brome is to be utilized for hay production, excessive nitrogen may cause lodging and reduce the amount of harvestable hay. In Table 1, the lower values in the rate range are for hay production. Nitrogen rate should be selected based on factors such as fertilizer cost,

Table 2. Phosphorus recommendations for smooth bromegrass.

Type	Soil Test Level (ppm P)				
	Very Low (0-5)	Low (6-1 2)	Medium (13-25)	High (26-50)	Very High (51 or more)
	lb/a P_2O_5				
New Seeding	60–80	40–60	20–40	None	None
Established Stands					
Nonirrigated	30-50	20–40	0–30	None	None
Irrigated	50–60	40–50	20–40	1 0–20	None

Table 3. Potassium recommendations for smooth bromegrass.

Type	Soil Test Level (ppm K)				
	Very Low (0-40)	Low (41 -80)	Medium (81-120)	High (121-160)	Very High (161 or more)
	lb/a K_2O				
New Seeding	80-100	60–80	30–60	0-30	None
Established Stands					
Nonirrigated	30–50	20-40	0–30	None	None
Irrigated	50–60	40–50	20–40	0-20	None

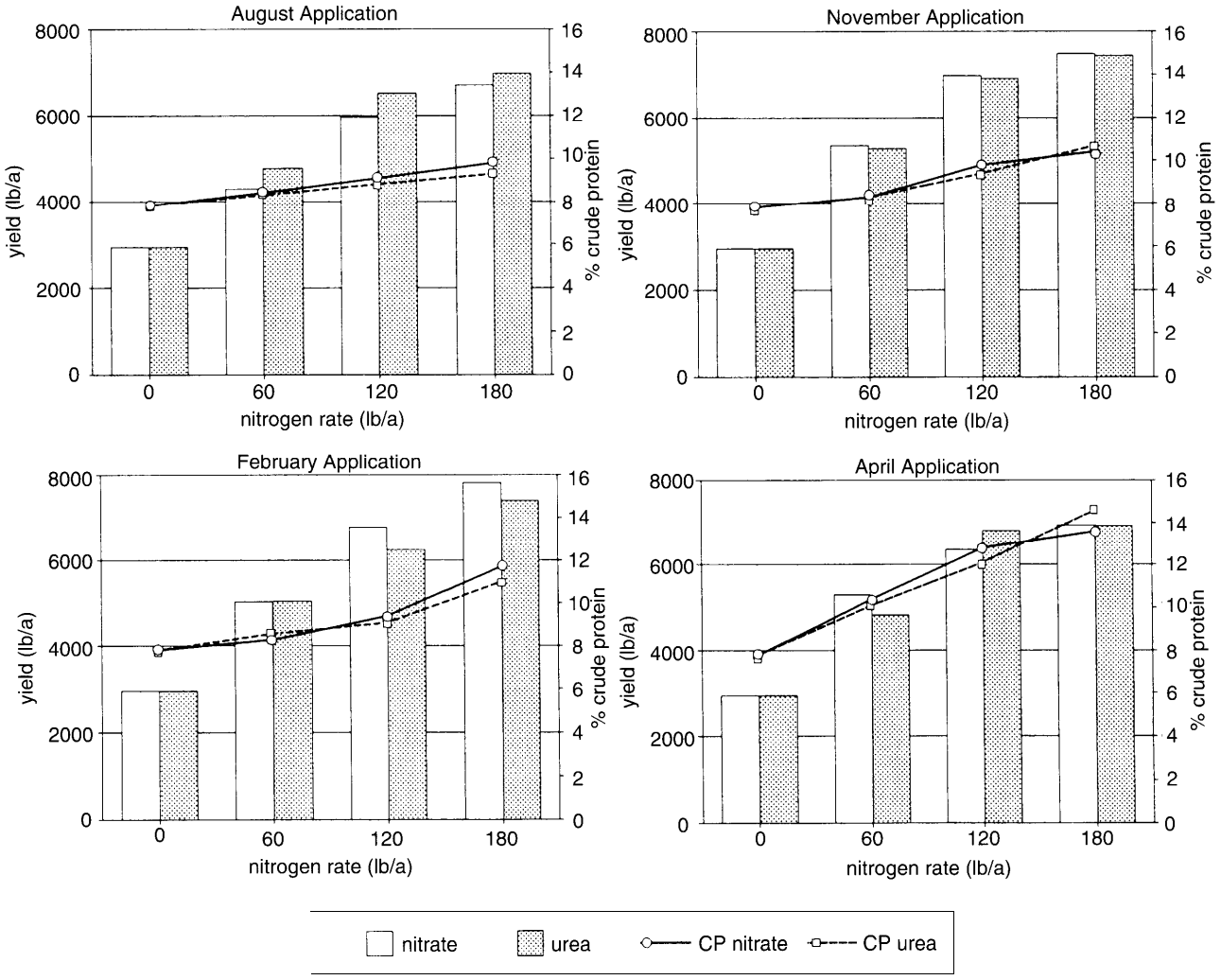


Figure 2. Production and crude protein content as influenced by timing of nitrogen application and nitrogen source based on eight years of data.

hay price, and/or grazing pressure. For brome seed production, nitrogen should be applied in November through early December. Figure 2 summarizes effects of N rates (O, 60, 120, 180 lb N/a), sources (ammonium nitrate and urea), and application timing on brome forage yields and crude protein levels.

Lime. Brome forage production response to lime is hard to document, unless the pH drops below 5.5. However, keeping the pH at or above this level can improve stand longevity. When lime is recommended, surface apply no more than 2,000 pounds effective calcium carbonate (ECC) per acre at one time.

Weed Control

Invasion by weedy plants can occur. Often, a well managed smooth bromegrass pasture will have weeds in areas such as corners, around water, mineral sources, and other areas where cattle concentrate. These disturbed areas may become weedy, but controlling the weeds is rarely profitable.

When smooth bromegrass plants lose their ability to compete, weedy plants invade. This can result from a fertility imbalance, low fertility—particularly nitrogen and/or phosphorus—unfavorable weather, repeated heavy summer grazing, and numerous other factors. In the past, chemical control was often used because herbicides were relatively inexpensive. With increased herbicide costs and changes in labels, improved production and grazing management must be combined with herbicides to be profitable. Adequate fertility and proper grazing management will minimize most weedy plant invasions. For the latest chemical control recommendations, see your county Extension agent and ask for “Chemical Weed Control for Field Crops, Pastures, Rangeland & Noncropland,” a publication issued annually.

Smooth Brome Utilization

Grazing Management

The carrying capacity of smooth brome pasture is determined by several production factors previously discussed. If smooth brome is to be grazed the entire season, stocking rates must be adjusted so that enough forage remains for grazing during summer months when production is low.

Smooth brome should not be grazed below a stubble height of four inches. If warm-season native grass, bermudagrass or a summer annual pasture is available, an alternative is to heavily stock brome pastures during the spring, utilize the warm-season grass in summer, and then move back to the brome with moderate stocking in the fall. This management technique is preferred because cool- and warm-season forages are grazed when quality is best.

If brome is to be grazed during the dry summer months, it is necessary to stock moderately during the early part of the grazing season so more forage will be available during summer months. Mineral supplementation to meet local deficiencies should be provided with any grazing management program.

Rotational Grazing. In recent years, some producers have been rotating their cattle on two or more pastures to increase the carrying capacity and/or better utilize the forage. Rotational grazing does not increase forage production. Concentrating animals from several pastures into a single pasture for a shorter grazing period ensures that more forage is harvested. Once livestock are moved, regrowth is quicker and more uniform. This will help to maintain an adequate nutrition level for the animals. Use of rotational grazing should be considered for the summer months. By alternating grazing and resting, regrowth in rested pastures can be used to the best advantage.

When using rotational grazing, animals are grazed in one pasture for a selected time and then moved to another. The grazing interval is determined by forage availability, length of time needed for regrowth, and animal nutrition requirements. Grazing should be long enough to harvest all of the required quality forage, to allow rapid regrowth, and to allow harvest when needed.

Hay Production

Production of high-quality brome hay requires adequate fertility and timely cutting. Smooth brome hay can bean extremely high-quality forage if harvested at the bloom stage. Producing quality hay, however, eliminates producing a seed crop. Brome hay should be cut between early heading and full bloom—usually mid-May to June l—to optimize quantity and quality. Smooth brome should never be cut before the early heading stage or below a stubble height of four inches as stand reduction or loss can occur, particularly during dry soil conditions.

Hay Quality. As grass plants mature, forage quality drops rapidly. Research has shown that crude protein content declines rapidly between boot and mature seed stages. Crude protein levels in well fertilized hay harvested at early heading range from 10–1 8 percent, but drop rapidly after heading (see Figure 3). Decreases in crude protein levels by as much as one-half percent per day after heading have been recorded.

Two of the most important factors affecting nutritive value of a forage are its digestibility and dry matter intake. Forage digestibility and intake both decrease with maturity. Digestibility of smooth brome declines rapidly after heading (Figure 4). When cut at or past the dough stage, brome hay often is not adequate to meet the energy requirements of a mature beef cow. Unlike protein and digestibility, fiber concentrations of smooth brome increase with advancing maturity. The fiber content of a forage-commonly estimated by the neutral detergent fiber or NDF concentration—is a measure of components that contribute to "fill" in ruminant animals. Therefore, NDF is inversely related to animal intake potential—a low NDF value would indicate high intake potential. For the data in Figure 4, brome hay harvested at the dough stage of maturity had an NDF content five percentage units higher than brome hay harvested at early heading. Although seemingly small, this increase in fiber content would result in significant reductions in the intake of brome hay.

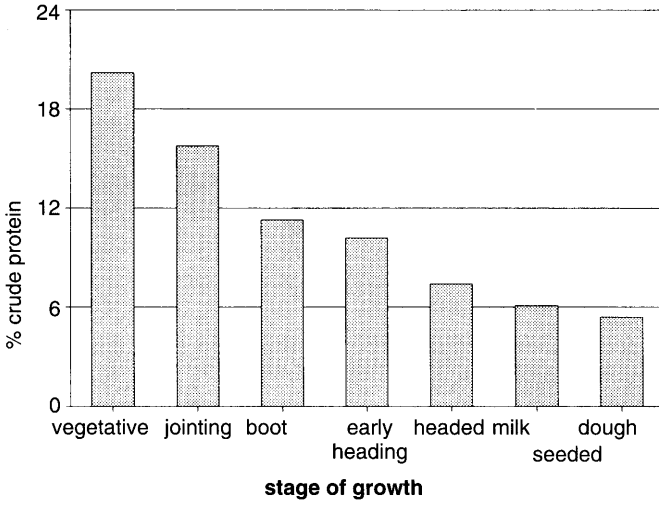


Figure 3. The crude protein content of smooth bromegrass as influenced by stage of growth.

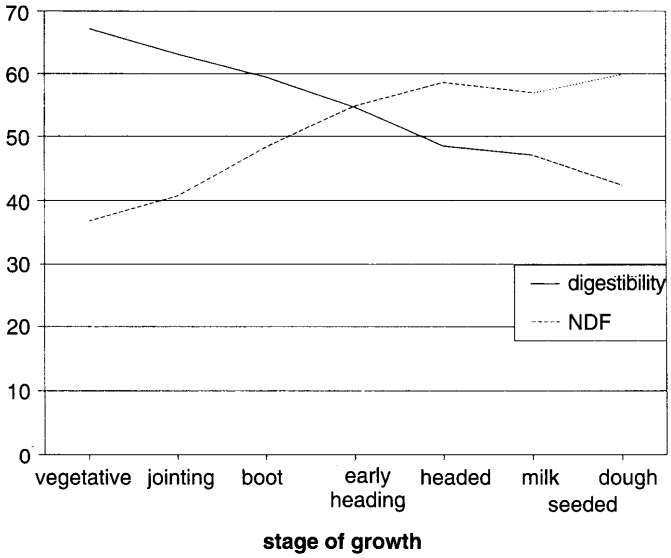


Figure 4. The relationship between digestibility and NDF (a measure of intake) is greatly influenced by growth stage at hay harvest.

Seed Production

Smooth brome seed production can be a profitable enterprise when used in combination with hay production and/or livestock grazing.

Seed is harvested when the stem just below the head has matured. Freshly harvested seed can contain enough moisture to cause the seed to heat when piled, which can reduce seed germination. Brome seed should be harvested on days when the relative humidity is below 50 percent, and harvested seed should be turned and stirred daily to ensure that heating does not occur. After the seed is harvested, the stubble and regrowth can be used for hay or grazing, but the quality will be much lower than for early harvested hay. Nitrogen rates for seed production in eastern Kansas are 80–100 pounds per acre applied in November or early December. Apply needed phosphorus and potassium at the same time. Excessive nitrogen can cause lodging. Seed yields of well managed brome range from 300–1 ,000 pounds per acre.

Noxious weed seed in smooth brome seed renders the seed unsalable. Controlling noxious weeds such as musk thistle, quackgrass, and Johnsongrass is required to meet the seed laws of Kansas.

Other publications

Seed Production and Management for Bromegrass and Tall Fescue (MF-394)

Chemical Weed Control for Field Crops, Pastures, Rangeland & Noncropland (Report of Progress issued annually)

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