

University of Missouri Extension

G4640, Reviewed October 1993

Birdsfoot Trefoil

Donald E. Null and Howell N. Wheaton
Department of Agronomy

Birdsfoot trefoil is a long-lived perennial legume ideally suited for many grass-legume pastures in Missouri. It grows and produces forage during July and August when most cool-season grasses are semi-dormant. Trefoil does not cause bloat, as do many other commonly used legumes.

A combination of trefoil and bluegrass or other cool-season grasses will produce three times as much feed as unimproved grass. Even heavily fertilized grass will produce one-third less beef per acre than a trefoil-bluegrass combination.

Other benefits from introducing trefoil into grass pastures include 30 percent higher daily gains by the grazing animals and more uniform distribution of forage production. Trefoil makes 60 percent of its production during June, July and August.

Table 1

Forage produced in critical summer period (May 17 to Aug. 18)

Grass plus nitrogen

- 340 pounds dry matter per acre

Grass plus trefoil

- 3,545 pounds dry matter per acre

Table 2

Daily gain of steers on pasture, data from Iowa State University, Albia Research Station

Unimproved pasture

- 1.18 pounds gain

Grass plus nitrogen

- 1.20 pounds gain

Grass plus trefoil

- 1.70 pounds gain

Region of adaptation

Birdsfoot trefoil will grow anywhere in Missouri, but it is more persistent in the northern and central regions. It produces exceptionally well on Shelby-Grundy and similar soil types. It has been least successful on level soils with poor internal drainage, such as Putnam and Mexico soil types. In poorly drained soils, diseases such as root rot become more severe and careful grazing management is necessary to maintain stands. It is not as sensitive to acid soils and soils with low fertility as most other legumes except lespedeza.

Use

In Missouri, birdsfoot trefoil should be used primarily as a pasture legume. It should not be expected to replace alfalfa or other forages as a hay crop for several reasons. It doesn't have the yielding ability of most legumes when managed as a hay crop, and in some cases it has been damaged when cut for hay.

Establishment

Trefoil is no more difficult to establish than other forages, but it requires a different technique. During the seedling period (first 60 to 90 days of life), it is less aggressive than most plants, so competition from other plants must be controlled.

Trefoil may be seeded in late winter, early spring or fall. Usually, late winter or early spring (February or early March) is ideal. For seedlings delayed to late April or early May, chemicals should be used for weed control.

Fall seeds have the advantage of less competition from weeds, but seedling failure is possible due to inadequate moisture, increased insect numbers, winter kill and heaving. Fall seedings should be before Sept. 1.

Suggested trefoil seeding rates are four to five pounds per acre. One pound of trefoil seed per acre is equivalent to 10 seeds per square foot. A seeding rate of five pounds in the spring should allow for around 15 plants per square foot the first fall and from five to 10 plants the following June. A full stand is considered to be around five plants per square foot.

Control competition to seedlings

The competition produces shade and also competes for available moisture. For control, consider the following:

- Use a pre-emergent herbicide at seeding time if there is a great possibility of competition from weedy grasses. Seeding cost may increase, but establishment probability greatly increases.
- If no herbicide is used, a small-grain nurse crop, kept clipped and grazed to prevent competition, can be used. By using a crop readily accepted by animals, the type of competition is controlled. However, such a nurse crop can compete as weeds if not managed.
- Band seed trefoil in a fairly rough seedbed. A phosphate starter (50 to 100 pounds P_2O_4) placed under the seed band offers an ideal seedbed of high fertility and discourages weeds between the seeded rows. The trefoil seedling will start and grow faster than weeds, reducing the competition.
- Avoid planting more vigorous legumes with the trefoil. Alfalfa and red clover compete vigorously as most common weeds.
- Nitrogen may increase competition. Avoid fertilizer containing nitrogen when establishing trefoil.

Trefoil is not as sensitive to low pH or acid soils as are alfalfa and clover. However, it will not produce its best under low pH conditions. A soil pH above 5.5 is recommended.

Trefoil will grow on low-fertility soils; however, as on low pH soils, it will not do its best. Extremely low phosphate and potash levels should be raised before seeding if possible. Also a topdressing program should be

initiated after establishment (fertilization needs).

Inoculation is extremely important for new seedings

Trefoil requires a specific rhizobium bacteria for inoculation. The inoculum should be stored in a cool place until ready for use and then applied to the seed. To help the inoculum stick to the seed, mix small quantities of sugar water, soda pop or condensed milk with the seed before mixing in the inoculum.

Trefoil may be established in rough or finely prepared soils; however, it is essential that the immediate seedbed for the seed be very firm. This may be accomplished by using a packer behind the drill or by using a brilliant seeder. More satisfactory results are usually obtained with a drill or brilliant seeder than by broadcasting and packing the soil.

Trefoil may also be seeded into existing bluegrass sod.

Varieties

Consider varieties carefully. In northern Missouri, Empire may do as well as Dawn, but moving southward, Dawn should be more beneficial. Dawn was developed at MU on the basis of its increased resistance to diseases and can usually withstand more abuse than Empire.

Carroll, a variety developed by Iowa State University, may be of particular interest to northern Missouri producers. Carroll is a large-seed trefoil with more seedling vigor than Dawn or Empire.

Companion grasses

Bluegrass, where adapted, is the favored grass to grow with trefoil. Bunch grasses, such as timothy and orchardgrass, may also be used to good advantage with trefoil. Vigorous, sod-forming grasses such as brome grass and fescue are sometimes used, but are more apt to crowd trefoil out of the stand in four or five years.

Seeding mixtures and rates

Keep the seeding mixture simple when using trefoil. Including two tall grasses in the mixture can bring uneven grazing and excessive competition in spots. Also, adjust seeding rates to suit the soil and climate of the area.

Suggested mixtures — five pounds Birdsfoot trefoil along with:

- Timothy (two pounds) and Kentucky Bluegrass (one pound), or Orchardgrass (three pounds) and Kentucky Bluegrass (one pound). Omit the bluegrass if the seeding is to be made in old bluegrass sod or if Kentucky Bluegrass is not adapted to the area.
- Tall fescue, (five to eight pounds). Heavier seeding rates may be harder to manage growth that can over-compete with the trefoil.
- Bromegrass, (five to six pounds), where brome is adapted in the state. Like fescue, brome will have to be managed to prevent its taking over the trefoil. Don't use other legumes in the mixture.

Fertility

Birdsfoot trefoil yields highest on soils properly limed and fertilized. Good stands may be established under rather low pH and fertility conditions, but must be topdressed to obtain good yields. Although good stands

have been established where the salt pH was as low as 4.8, lime should be applied and worked into the soil before seeding. The salt pH level should be corrected so that it is in the range of 5.5 to 6.0. Trefoil responds well to phosphate; a good practice is to use some super phosphate at seeding time. On soils that test low in phosphorus, use at least 100 pounds of phosphate. Placing it in a band beneath the seed is especially effective. Potash is best applied broadcast and worked into the soil. It is helpful if this can be broadcast some months before seeding. Nitrogen is of little benefit to new trefoil seedlings and in some cases is actually harmful. Research has shown that in many situations, nitrogen stimulates competitive grasses and weeds more than trefoil.

Trefoil or trefoil-grass should be topdressed each year with a 0-30-60 or 0-30-90 to maintain production. No nitrogen should be applied to trefoil or trefoil grass mixtures.

Grazing management

Trefoil is better suited to controlled continuous grazing than alfalfa or many other legumes. It is basically different in the way it assimilates stored energy or root reserves.

Trefoil and alfalfa initiate their first spring growth from stored energy in their root systems. After the growth is removed, alfalfa will replenish its root reserve in about 35 to 45 days throughout the growing season. Trefoil is noticeably different; it does not replenish its root reserves until fall and must depend upon photosynthesis from its leaves to supply energy for all of its regrowth during the late spring and summer. After about the first of September, trefoil once again will attempt to build up its root reserves that have been depleted since the first spring growth.

This basic difference from many other legumes explains why trefoil must be managed differently and why failure to do so has usually resulted in depleted stands and disappointment to growers.

Controlled continuous grazing that never completely removes all the trefoil leaves from the plants gives better results than complete defoliation followed by a rest period.

Trefoil's different way of storing root reserves explains why summer stockpiling of large amounts of growth usually results in stand depletion following the removal of this growth by heavy grazing. It also explains why using it as a hay crop sometimes results in loss of stand.

Tall fescue is the poorest choice of all the grasses to grow with trefoil. Not only is fescue extremely competitive with trefoil, but fescue palatability is extremely low during the summer months, and animals will overgraze the trefoil allowing the ungrazed fescue to soon **smother** out the grazed off trefoil.

If fescue is used, no more than 5 to 8 pounds of fescue seed per acre should be used. It's harder to manage the growth of heavier seeding rates of fescue because it can overrun trefoil.

If trefoil is seeded into existing stands of fescue (i.e. renovating grass sods with legumes) it is extremely important to manage the early grass growth so that it is removed early in the growing season.

Maintaining trefoil stands

- Allow trefoil stands to reseed.
- Always keep the plant in a thrifty condition.
- Avoid stockpiling or deferred grazing.

Occasionally a trefoil stand should be allowed to set seed and shatter to ensure a source of hard seed in the

soil. As soon as most of the pods have matured and turned to brown or black color, grazing may be resumed.

Trefoil kept in a thrifty condition is not as subject to disease problems as plants in a rundown condition. The plants should never be completely defoliated since rapidity of growth is determined by the number of leaves allowed to remain on the stem. Complete defoliation results in a very slowly growing, stressed plant that is more subject to disease attack.

Allowing trefoil to stockpile generally weakens the plant. Lush growth that is allowed to stockpile is subject to stem diseases and insect infestations that may kill the plant. Another danger in stockpiling material is creating a situation where rapid defoliation, such as clipping, would stress the plant, allowing root disease to completely kill the stand.

Fall management is especially important; avoid grazing between September and the middle of October. After this period, the growth may be used, but avoid extremely close grazing.

Controlling weeds while establishing trefoil or in established stands is extremely important. Grazing will control some grassy weeds, and broadleaf weeds can be mowed. Don't overlook herbicides for controlling weeds, especially when making new trefoil seedings.

Because federal regulations relating to herbicide use change frequently, no recommendations are given in this publication.

Diseases affecting trefoil

Because diseases play such an important role in maintenance and producing ability of trefoil, a brief discussion on their characteristics is important. Trefoil diseases may be divided into two large groupings, those that attack the plant above the soil surface and those attacking it below the soil surface. Those attacking the plant from below the soil surface are the more devastating of the two groups.

Diseases are caused by parasitic bacteria, fungi and viruses. Annual disease losses are difficult to assess because they are usually cumulative. Foliar blights and root rots take their toll of plants and affect productivity of crops as long as the stand is retained. Infections by crown and root rot, fungi and viruses are not always immediately fatal. These pathogens frequently weaken plants so that they are unable to withstand adverse weather conditions such as drought or low winter temperatures.

Several practices may be employed against disease. They become more important as trefoil is moved from north to south in the state. They are:

- Use a disease-resistant variety. Dawn trefoil was developed to be more disease resistant than Empire and common.
- Avoid rapid and complete defoliation. Always leave some leafy stems for rapid regrowth of the plant.
- Allow the plant to seed. Dying plants will be replaced by young seedlings if seed is present.
- Avoid stockpiling old growth past early bloom stage.
- Avoid excessive shading by companion grasses.
- Allow the plant to rest in the fall (September to mid-October) to build root energy reserves for winter survival.

Trefoil seed production

Harvesting birdsfoot trefoil seed is profitable in many years despite the fact that Missouri's climate is not the best for high seed yields. Good seed yields in Missouri are around 100 pounds per acre, but may range from

40 to 120 pounds. Seed production is highest in the northern part of the state.

Good seed years are usually characterized by many sunny days, cool nights and dry weather from May 15 to July. Combining seed directly from the field is recommended for harvesting small acreages. Newly harvested seed should be immediately cleaned and dried. Harvesting should be done when the majority of the seed pods are ripe and turning brown. Dry weather at harvest time causes serious shattering; therefore, harvesting time is critical. One or two days delay in harvesting may make the difference between high success and failure.

Birdsfoot trefoil generally requires honey bees and bumblebees for pollination. Wind and small insects are generally ineffective. Bees prefer trefoil to many other flowering plants and tend to congregate in flowering trefoil fields. However, for high seed yields, it is desirable to locate colonies of honey bees in or near the fields. Some bee keepers prefer trefoil to most other legumes as a source of nectar for honey.

Producing seed may lead to stand depletion in Missouri because of the stockpiling and rapid defoliation factors that usually accompany harvest. Grazing trefoil in May usually will cut seed yield, but it also usually cuts down on the damage done by harvesting practices.

To estimate seed yields, determine the number of unshattered seed-containing pods per square foot in several locations throughout the field. One pod per square foot is equal to 1 pound per acre of seed before harvesting.

The authors wish to thank Joe D. Baldrige for his guidance and contribution in preparing the manuscript for this publication.

G4640, reviewed October 1993

Related MU Extension publications

- G4511, Orchardgrass
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4511>
- G4610, The Bluegrasses
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4610>
- G4642, Establishing Birdsfoot Trefoil in Bluegrass Sod
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4642>
- G4651, Renovating Grass Sodds With Legumes
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4651>

Order publications online at <http://extension.missouri.edu/explore/shop/> or call toll-free 800-292-0969.



■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211
■ an equal opportunity/ADA institution ■ 573-882-7216 ■ extension.missouri.edu