Birdsfoot trefoil (Lotus corniculatus L.) is a perennial legume that produces high yields with high nutritive value forage. The plant is adapted to a wide range of environmental conditions and grows well in most parts of the United States.

This bulletin addresses some of the major factors that must be considered when establishing birdsfoot trefoil. Birdsfoot trefoil is adapted to conditions in Wyoming and performs well when grown either as a monocrop or in mixtures with compatible grasses and legumes. Although slow to establish, the plant produces high yields of high nutritive-value forage. Birdsfoot trefoil is a potential crop that can serve as an alternative to alfalfa, especially under poor acidic soil conditions and where a bloating-free forage legume is desired.

Birdsfoot trefoil contains special compounds (tannins) that make it non-bloating. Tannins also increase milk production in dairy cows fed birdsfoot trefoil. Additionally, the tannins increase protein utilization in livestock, reducing the amount of nitrogen (N) excreted by animals. This has huge environmental benefits. The plant also contains high concentrations of non-fibrous carbohydrates compared to alfalfa that is better for ruminant nutrition.

Birdsfoot trefoil can be grown in the same soils and climatic conditions required by alfalfa, nonetheless it is more tolerant to low fertility (for example, phosphorus), low pH, and poorly drained soils. It can be grown either as a monocrop or in mixtures with compatible grasses (such as meadow bromegrass) and legumes (alfalfa). Many factors should be considered...
whether grown as a monocrop or in mixtures. For example, species selection affects yields and nutritive value as well as stand persistence and economic returns. Unlike other perennial legumes such as alfalfa and sainfoin, birdsfoot trefoil has poor seedling vigor mainly due to the smaller seed size. Special management is required at the seedling stage for successful establishment.

Site selection

Birdsfoot trefoil is adapted to a wide range of conditions and can grow on soils relatively poor and/or too acidic for alfalfa. However, productive soils must be selected where available because yields could be greatly improved under good soil conditions. The soil must be well-drained. Soils with pH between 6.0-6.5 are more suitable for good establishment. However, a wide range of pH (5.5-8.5) can also be tolerated.

Field preparation

Successful stand establishment requires a clean seedbed that is firm and well worked. Existing vegetation should be killed preferably using a burndown application of non-selective post emergence herbicide such as Roundup (glyphosate) that have little to no residual activity or planting restrictions. Soil must be settled and bigger soil clumps broken to produce a fine-tilled condition for good seed-soil contact. Tilling with a disk followed by tine cultivation or harrowing produces a good seedbed (Figure 1) for germination and emergence. Where soil moisture is not adequate, no-till drill can be helpful in conserving moisture as well as keeping weed pressure down.

Selection of varieties and compatible forage species

Birdsfoot trefoil varieties can be either prostrate, erect, or semi-erect (Table 1). Prostrate types are more suitable for grazing, and erect types are adapted to haying. Semi-erect types can be grazed or hayed; however, prostrate and erect types can be hayed or grazed depending on the goal and management. Moderate to high winter hardy varieties (Table 1) are suitable for Wyoming conditions.

Figure 1. A well-prepared seedbed is necessary for successful stand establishment.
Table 1. Characteristics of selected winter hardy varieties of birdsfoot trefoil†

<table>
<thead>
<tr>
<th>Variety</th>
<th>Origin; year of release</th>
<th>Growth type/use</th>
<th>Winter hardiness</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce</td>
<td>Agriculture and Agri-Food Canada; 2007</td>
<td>Semi-erect; hay or grazing type</td>
<td>High</td>
<td>High yield, good seedling vigor; fast establishment; good regrowth following grazing</td>
</tr>
<tr>
<td>Bull</td>
<td>University of Guelph, Canada</td>
<td>Semi-erect; hay or grazing type</td>
<td>Moderate to high</td>
<td>Moderate to high yield; moderate to high grazing tolerance and persistence; drought tolerant</td>
</tr>
<tr>
<td>Carroll</td>
<td>Iowa State University; 1973</td>
<td>Semi-erect to erect; hay-type</td>
<td>High</td>
<td>Excellent seedling vigor; high yield</td>
</tr>
<tr>
<td>Dawn</td>
<td>Agricultural Research Service/USDA, University of Missouri</td>
<td>Semi-erect; hay or grazing type</td>
<td>Moderate to high</td>
<td>Average yield; good fall growth; moderate to high grazing tolerance</td>
</tr>
<tr>
<td>Empire</td>
<td>Cornell University</td>
<td>Prostrate; grazing type</td>
<td>High</td>
<td>Moderate to high grazing tolerance; relatively slow establishment</td>
</tr>
<tr>
<td>Leo</td>
<td>MacDonald College, Canada; 1964</td>
<td>Semi-erect to erect; hay-type</td>
<td>Moderate to high</td>
<td>Good seedling vigor; high yield</td>
</tr>
<tr>
<td>Mackinaw</td>
<td>Soil Conservation Service, USDA</td>
<td>Semi-erect; hay or grazing type</td>
<td>High</td>
<td>Good seedling vigor; high yield</td>
</tr>
<tr>
<td>Mairland</td>
<td>University of Guelph, Canada; 1968</td>
<td>Erect; hay type</td>
<td>Moderate to high</td>
<td>Good seedling vigor; average to low yield</td>
</tr>
<tr>
<td>Norcen</td>
<td>North Central States; 1981</td>
<td>Semi-erect; hay-type</td>
<td>High</td>
<td>High yield; great persistence; multi-cut variety</td>
</tr>
<tr>
<td>Pardee</td>
<td>Cornell University; 1999</td>
<td>Erect; hay-type</td>
<td>Moderate to high</td>
<td>High yield; earlier flowering than Norcen; fast re-growth after cutting; high tolerance to fusarium wilt</td>
</tr>
</tbody>
</table>

†Adapted and modified from Undersander et al. (1993).

Figure 2. Well-established birdsfoot trefoil (5 lbs per acre) and meadow bromegrass (10 lbs per acre) mixture at Sheridan Research and Extension Center in 2014.
Birdsfoot trefoil can be grown in mixtures with compatible grasses such as meadow bromegrass and timothy. Fast growing grasses such as orchardgrass, smooth bromegrass, and tall fescue may also be suitable if the appropriate seeding ratio is used. Studies in Wyoming have shown a seeding rate of 10 lbs per acre is recommended for pure stands. In mixtures with less aggressive grasses such as meadow bromegrass, seeding rates of 5 lbs birdsfoot trefoil plus 10 lbs meadow bromegrass (Figure 2) or 3 lbs birdsfoot trefoil plus 14 lbs meadow bromegrass can be used. Three species mixtures of birdsfoot trefoil, alfalfa, and meadow bromegrass also performed well in Wyoming (Figure 3).

**Seeding**

Birdsfoot trefoil has small seeds. Seeding at a depth of 0.25 inches produces good stands and ensures faster establishment (Figure 4). August-September seeding gives seedlings a competitive advantage against weeds.

**Fertilization**

Birdsfoot trefoil nodulates and fixes nitrogen. Inoculating with appropriate bacteria (birdsfoot trefoil specific) is essential for nitrogen fixation if the land has not been previously planted with birdsfoot trefoil. Application of about 30 lbs nitrogen (N) per acre during establishment is beneficial in soils containing low N and less organic matter (<2 percent). Once well-established, N fertilizer application is not necessary. Moderate application of phosphorus and sulfur at planting would enhance establishment and growth. Residual soil phosphorus and potassium of 30 and 180 lbs per acre, respectively, is adequate for average forage yields of 4,000 to 6,000 lbs per acre.

**Weed management**

Weed competition is one of the major problems with birdsfoot trefoil establishment. Seedlings are slow to establish and not as vigorous as alfalfa, partly due to smaller seed size. Planting a smother crop such as Siberian millet (Figure 5) or wheat during the spring of the seeding year and planting birdsfoot trefoil in the fall just after harvesting the smother crop helps reduce
weed pressure. Companion crops such as oats can be planted with birdsfoot trefoil to reduce weed pressure. Pre-plant incorporation (2-3 inches depth) of Eptam (EPTC) or Balan (Benefin) is effective for controlling most annual grasses and broadleaf weeds. These herbicides should not be used if birdsfoot trefoil is planted in mixtures with grasses. Post emergence application of Butyrac (2,4-DB) is effective to control many annual broadleaf weeds. However, only small seedlings (3 inches tall) are controlled by this herbicide. In pure stands of birdsfoot trefoil, post emergence application of Poast Plus (Sethoxydim) is effective in controlling many annual grasses. Poast Plus can be used to kill companion crops such as oats and barley once birdsfoot trefoil is established. In both monocultures and mixtures, mowing is an effective measure in controlling annual weeds, especially when birdsfoot trefoil is small or at seedling stage (Figures 6 and 7). In fall seeded (September) birdsfoot trefoil, mowing once in late spring (May) was effective at controlling weeds in Wyoming (Figure 7).

**Irrigation**

Birdsfoot trefoil does not require any special irrigation management. At the time of establishment, especially for the first two weeks after planting, light and periodic irrigation is necessary to keep the soil surface moist. This will help reduce soil crusting and improve emergence if the soils are heavier and clay textured. After establishment, any watering regime suitable for alfalfa should be sufficient for birdsfoot trefoil. However, observe plants for signs of moisture stress (wilting) and irrigate as necessary. In general, birdsfoot trefoil can grow well in areas receiving 20 inches or more of precipitation.

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**Figure 5.** Siberian millet planted as a smother crop at Sheridan Research and Extension Center in 2013.
Grazing and haying management

Birdsfoot trefoil regrows from buds in the leaf axils after haying or grazing. Cutting or grazing too close to the ground removes most of the buds and reduces stand life. Leaving at least a 4-inch stubble during cutting or grazing is recommended. Birdsfoot trefoil has slow spring growth, and grazing should commence when plants are at least 8 inches tall to ensure a prolonged stand life. Cutting birdsfoot trefoil twice in a year with the last cut in late August or early September is recommended. This allows enough frost-free growing days for accumulation of carbohydrates, which are essential for early spring growth and stand persistence. Birdsfoot trefoil has a large proportion of hard seeds, and stand persistence is greatly influenced by natural re-seeding. Allowing stands to grow to maturity and seed once in every three years enables reseeding and prolonged stand life.
Figure 7. Well-established birdsfoot trefoil after one-time mowing in late spring (May) to control weeds at Sheridan Research and Extension Center illustrating effectiveness of mowing to control weeds.

References


