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BIRDSFOOT TREFOIL PRODUCTION

(Revision of Factsheet "Birdsfoot Trefoil Production", March 1978)

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Birdsfoot trefoil is a leafy, fine-stemmed legume which obtained its name from its seed pod clusters, each of which resembles a bird's foot (Figure 1). It is an ideal forage legume for long-term pasture production as it has a long productive life and does not cause bloat. It can also be used for hay production in many areas not suitable for alfalfa.

Trefoil is adapted to a wide range of soil drainage conditions and will withstand some acidity. On acidic or poorly-drained soils, trefoil will produce more dry matter and survive longer than alfalfa. On well-drained soils, alfalfa will produce 40% more dry matter in the form of hay or haylage in a single season than trefoil. However, this initial yielding advantage of alfalfa is short-lived. Even under ideal alfalfa growing conditions alfalfa will only last 3 to 5 years, whereas trefoil can continue to produce, through reseeding itself, for 10 or more years. Trefoil can therefore be used as a long-term investment. It fits into programs where: (1) acid soils or soils of poor to fair drainage are encountered for silage, hay and pasture production; (2) heavy grazing and long-term pastures are needed; and (3) for renovated roughland pastures (see OMAF Factsheet Pasture Renovation, Order No. 85-112).

VARIETIES

Two distinct types of trefoil, hay and pasture, are recommended in Ontario. To maximize production, it is important to select both the appropriate type and variety of this species.

The hay types have a more erect growth, are earlier flowering and recover faster after cutting than the pasture types. Hay type varieties are intermediate between alfalfa and the pasture type of trefoil for tolerance to poor soil drainage and grazing pressure. The hay varieties have maturities similar to that of alfalfa and are less winterhardy than the pasture varieties.

Figure 1. The distinctive seed pod cluster of Birdsfoot trefoil.

The pasture types can be cut for hay but their prostrate growth habit makes them more suitable for pasturing. They have a slower growth rate than the hay varieties and may be more difficult to establish because of their lower seedling vigor. This drawback to their use should be regarded as a small one because of their superior winterhardiness and stand longevity.

Hay Type

Viking is an upright, early maturing variety of birdsfoot trefoil. It has good seedling vigor and is adapted to fair to well-drained soils.

Pasture Type

Empire is a fine-stemmed, low-growing, late maturing variety (2 to 3 weeks later than alfalfa or Viking). It has a high tolerance to grazing and is adapted to poor, fair and well-drained soils.

Leo is a semi-upright, medium maturing (10 days earlier than Empire) variety. It has greater seedling vigor, more aftermath production and will withstand similar grazing and drainage conditions as Empire.

Check with the current OMAF Publication 296, *Field Crop Recommendations* for further information on trefoil varieties.

SEED

A kilogram of trefoil seed contains approximately 935,000 seeds. Good quality trefoil seed is dark brown and shiny. A high proportion of green, dark green, shrunken, or hollowed-out seed in a seedlot indicates poor quality (low germination) and an increased number of hard seeds. Hard seeds are impermeable to water and will not germinate until later in the summer or until the following spring. Normally, 10 to 30% of the total seed consists of hard seeds.

To insure not only the quality of the seed but also the trueness to variety, pedigreed seed should be used. Of the three classes of pedigreed seed (Foundation, Registered and Certified) certified seed is recommended for use by the commercial farmer. Common seed (Canada 1, 2, 3) can only be recommended when no certified seed is available.

MIXTURES

Clovers should never be included in mixtures with trefoil. Red clover, alsike, and ladino clover are too competitive for trefoil and trefoil establishment is markedly reduced (Table 1).

Usually, a simple mixture of trefoil and one grass is recommended. Reasons for this are: (1) the grass adds to the total forage production by filling in areas where trefoil does not establish or persist; (2) the grass helps to prevent a build-up of weeds; (3) the grass reduces lodging of the trefoil; (4) the grass aids in harvesting; and (5) early and late season growing grasses lengthen the grazing season.

The last point is important if one wants to maximize the number of days livestock are kept on pasture. Trefoil is not able to produce herbage for grazing in the early spring nor in the fall. The addition of a grass species can result in adequate herbage in early May and provide fall stockpiled pasture.

Table 1. Reduction of trefoil establishment by other legumes

MIXTURE	TREFOIL PLANTS / SQ. M.
Trefoil + Timothy	64 - 107
Trefoil + Alfalfa + Timothy	32 - 75
Trefoil + Red Clover + Timothy	less than 10
Trefoil + Alsike + Timothy	less than 10
Trefoil + Ladino + Timothy	less than 10

Table 2. Distribution of production from trefoil / grass mixtures in early spring, for late hay and fall pasture (kg / ha)

TREFOIL IN MIXTURES WITH	NO. OF YEARS TESTED	SPRING (LATE MAY)	SUMMER (EARLY-MID JULY)	FALL (EARLY OCTOBER)
Bromegrass	5	2960	2600	1410
Timothy	5	2540	3100	1360
Tall Fescue	5	2880	2810	1850
Meadow Foxtail	2	2980	2580	1610
Orchardgrass	5	2510	2370	1350
Red Fescue	3	2210	3280	1575

Several grass species have been evaluated by the University of Guelph and found to be useful in combination with trefoil. Table 2 shows average yields of trefoil / grass mixtures that were harvested for several years at the Elora Research Station. Results from other areas in the province are similar to those obtained at Elora.

Bromegrass

The bromegrass-trefoil mixture is recommended for use as a source of early pasture, hay, and stockpiled or fall (Oct.) pasture. Bromegrass grows best on well-drained, fertile soils. It forms a dense sod by the spreading of short rhizomes. It is very competitive and therefore, the early spring growth of bromegrass must be grazed in order to permit the trefoil to grow.

Mixture: trefoil 9 kg / ha + bromegrass 5 kg / ha.

Timothy

Timothy is a grass that is easy to establish and which tolerates a wide range of conditions. It is a tall-growing bunch grass that produces most of its seasonal yield in the spring. Timothy is not very competitive and can be used with all varieties of trefoil. In fields where timothy has been harvested for seed there may be many timothy seeds in the soil. In such cases, the seeding rate of timothy can be kept low (2 kg / ha). In fields where there is no timothy seed in the soil, the seeding rate of timothy can be increased to 4 kg / ha. Trefoil / timothy mixtures are recommended for hay, silage or pasture situations.

Mixture: trefoil 9 kg / ha + timothy 2 kg / ha.

Tall Fescue

Tall fescue is a perennial, sod-forming grass adapted to a wide range of soil and climatic conditions. It grows well under both alkaline and acid soil conditions as well as on poorly to well-drained soils. It is tolerant of continuous close-grazing and makes excellent growth under cool temperature regimes. It is therefore useful for extending the grazing season into early spring and late fall. It retains its leaves under cold temperatures and after being frozen so that stockpiled fall growth provides high quality herbage for grazing.

Palatability and digestibility problems have been associated with tall fescue during the warm summer months. Evidence now links the presence of an endophyte (a fungus living within the plant) to some of those problems. Fungus-free varieties of tall fescue will be available in the near future.

Mixture: trefoil 8 kg / ha + tall fescue 10 kg / ha.

Figure 2. Often mistaken for timothy, meadow foxtail can mature two to three weeks earlier than its look-alike.

Meadow Foxtail

Often mistaken for timothy, because of their similar inflorescences, meadow foxtail is a promising early season pasture grass (Figure 2). It is a long-lived species whose early growth provides high dry matter yields in the spring and grazing by mid-May. Meadow foxtail / trefoil mixtures also provide good grazing in the fall, usually out yielding trefoil / bromegrass mixtures. Meadow foxtail can be difficult to seed because of small seed size. The use of coated seed is recommended.

Mixture: trefoil 9 kg / ha + meadow foxtail (coated seed) 10 kg / ha.

Orchardgrass

Orchardgrass is a bunch type grass that grows very vigorously early in the grazing season. It must be grazed to prevent the formation of unpalatable clumps and to reduce competition to the birdsfoot trefoil. As orchardgrass is very competitive, management is critical in maintaining the trefoil in continuous grazing. Since orchardgrass requires good drainage for winter survival, it should not be used in trefoil mixtures seeded on poorly-drained soils.

Mixture: trefoil 8 kg/ha + orchardgrass 4 kg/ha.

Creeping Red Fescue

Creeping red fescue is a low-growing species that is tolerant of close grazing. Due to its low growth habit it is usually not grazed heavily during the summer if there are taller species available. Red fescue makes its largest contribution to yield in the fall as it will grow vigorously from late summer until hit by frost. In addition to good yields, its quality does not deteriorate as quickly as with other grasses. Red fescue maintains a high protein content after freezing has occurred, thereby providing good quality feed late in the grazing season. One drawback to using red fescue is that it cannot be harvested as hay due to its low growth habit.

Mixture: trefoil 8 kg/ha + red fescue 6 kg/ha.

ESTABLISHMENT

Birdsfoot trefoil generally has low seedling vigor and this factor is often the cause of establishment failures. Conventional seedbed preparation and planting are the best means of establishing trefoil. The seedlings will not emerge if seed placement is too deep. Trefoil seeds should not be placed at a depth greater than 10 cm. Early spring seedings are the most likely to succeed, as moisture then is usually non-limiting. With later plantings, the crop is more susceptible to dry weather as the upper zone of the soil dries out. At all times surface packing improves seed: soil contact and will maintain soil moisture in the seed zone to improve germination. **Seedling vigor can also be improved by banding phosphorus below the seed.** This encourages rapid root and top growth (refer to the Factsheet, *Fertilizer Use in Forage Establishment*, Agdex 120/530).

Inoculation

Trefoil seed must be inoculated with a fresh source of trefoil inoculent just before planting. Use of fresh rhizobia bacteria will ensure that the relationship between the plant and the nitrogen fixing bacteria is quickly established.

Direct Seeding Versus A Companion Crop

It is better not to use a companion crop with trefoil. Trefoil's slow growth makes it uncompetitive with faster growing species. Yet, if a companion crop is used, seed oats or barley at half the normal rate or seed in 14 inch drill runs to reduce competition. Oats are less competitive to trefoil seedlings than barley. The companion crop should be removed at heading for silage, hay or green chop. Alternatively, it could be grazed down after it reaches 30 cm to a stubble height of 7 to 12 cm. Do not graze when fields are wet as this could damage the trefoil seedlings.

Weed Control

In the absence of a companion crop, weeds will need to be controlled either chemically or by clipping. For chemical weed control recommendations refer to Publication 75, *Guide to Chemical Weed Control*. If a serious weed problem develops, cut the crop to a height of 5 to 7 cm when the weeds are 20 to 25 cm tall.

MANAGEMENT OF ESTABLISHED STANDS

It is necessary to maintain a good fertility program in order to keep a birdsfoot trefoil stand productive. A soil test is the best guide for determining the crop requirements. If a soil test is not available, use the fertilizer rates that are proposed in Publication 296, *Field Crop Recommendations*.

Pastures

For maximum production, birdsfoot trefoil pastures should be rotationally grazed. Grazing should start when the birdsfoot trefoil is 15 to 20 cm tall and stopped when the stubble height is 8 to 10 cm. A 5 to 6 week interval, for recovery and regrowth, is needed after the grazing period.

Grazing can start in the spring or be delayed until mid-June. By deferring grazing, the trefoil will be available for use in the mid-summer months, a time during which it is often difficult to get good production from pastures. When trefoil is used in combination with other pasture mixtures, good quality forage is supplied throughout the grazing season.

Stored Feed

The first cutting of established stands for stored feed should be made at early bloom and later cuttings at one half to full bloom. The cutting height should be above 8 cm in order to assure high yields and good stand persistence.

Birdsfoot trefoil stands should not be cut nor grazed during the critical fall harvesting period. See the current Publication on 296, *Field Crop Recommendations*, for more information.