

CHICORY: An Alternative Livestock Forage

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History

Chicory (*Cichorium intybus* L.) is an herbaceous perennial plant that has historically been used in other countries as a coffee substitute, as a leafy vegetable, and as pasture forage for over 300 years. Although chicory originated in central Europe, breeding for improved forage varieties has been conducted in New Zealand for many years. In the United States, use of chicory as pasture forage is a relatively new concept. Forage chicory is a potentially valuable pasture component because it is a drought-tolerant, high-yielding plant that can improve seasonal distribution of high-quality herbage.

Growth Habit and Varieties

Forage chicory is a winter-dormant, herbaceous plant that has a rosette growth habit and a large taproot that allows for some tolerance to drought conditions. Forage chicory varieties, which tend to have much larger leaves, can be confused with wild chicory (also *Cichorium intybus* L.) and looks very similar to dandelion in the rosette growth stage. Spring growth of chicory consists of many leaves developing from the crown of the plant, but as temperatures warm in early summer, flower stems develop and may grow as tall as 5 to 6 feet. The most common varieties of forage chicory available in Kentucky are Grasslands Puna, Brow Tyne, Six Point, and Oasis. Although originally developed in New Zealand, Grasslands Puna has performed well under Pennsylvania and Kentucky growing conditions. Several other varieties exist but are not available for use in the United States.

Forage chicory can provide excellent spring and summer forage for grazing livestock in Kentucky. As with other forage species, nutritive quality declines as the plant matures and reaches the reproductive growth stage in late summer.

Site Selection and Establishment

Forage chicory can grow well in a variety of soil types, if compaction is not a problem. Well-drained to moderately well-drained soils with moderate to high fertility will provide suitable conditions for optimal growth. Both spring (March 15 through May 15) and early fall (Aug. 15 through Sept. 15) seedings have been successful under Kentucky growing conditions. Chicory should not be planted too late in the fall, because the shortened day length and lower temperatures impede establishment. Weeds are a potential problem for establishment of chicory. Herbicide options are not available to control problem weeds during the seedling stage or after establishment of chicory as a forage crop. Mowing or grazing at proper intervals will help stimulate dense chicory regrowth, thus suppressing potential weed problems.

Tilled Seedbed Establishment

Forage chicory may be planted alone or with legumes or grasses in a tilled seedbed.

A finely-textured and firm seedbed is required for successful establishment. Both drilling and broadcasting of seed are acceptable planting methods and successful establishment can be ac-

complished with either. However, drilling is the preferred method as greater uniformity of depth can be achieved. Chicory seeds should be planted to a depth of 0.25 to 0.50 inch. If a broadcast method of planting is used, soil should be prepared by rototilling or discing existing sod and cultipacking, before and after seeding, to ensure adequate seed to soil contact.

Existing Pasture Establishment

Forage chicory may also be planted into existing pastures by broadcasting or drilling. If broadcasting is to be done, do so in late winter or early spring (Feb. 15 through March 15) when the soil surface freezes at night and thaws in the day. Plantings later in spring can also be accomplished by disturbing existing sod (i.e., light discing) and broadcast seeding. No-tillage methods of establishment may also be used; however, suppression of existing vegetation is critical to successful establishment of chicory.

Seeding Rates

In establishing pure stands of chicory, a seeding rate of 3 to 4 pounds per acre will be adequate. However, many factors, such as seeding method, seed quality and seedbed condition, can necessitate adjustments in rate. When seeding chicory in a mixture it is often a good idea to include a legume, because legumes have nitrogen-fixing ability from which chicory will greatly benefit. Refer to Table 1 for seeding rates when planting chicory in a mixture.

Fertility

Prior to establishment, a soil test should be conducted to determine the fertility status of the desired planting area. Forage chicory will grow best at a pH of approximately 7.0, although diminished production may be realized at pH levels as low as 5.5. In pure stands, apply 35 pounds of nitrogen per acre at planting to promote good establishment. If you are planning to seed a legume with chicory, do not apply nitrogen. Added nitrogen stimulates chicory growth, which will increase competition with any companion legume.

After establishment, nitrogen should be applied at 100 to 150 pounds per acre in split applications if chicory is grown without a legume. Apply 50 pounds of nitrogen per acre in the spring when chicory starts to green up, in early summer, and again in early fall. Chicory studies in Kentucky have shown yield responses when nitrogen was applied at rates of up to approximately 180 pounds of nitrogen per acre. If chicory is planted with a legume, restrict annual nitrogen applications to prevent reduction in nitrogen fixation by the legume and to reduce competition. Increases in applied nitrogen will promote bolting (stem elongation). Because chicory stems are less digestible than leaves, a producer must weigh desirability of yield increases from nitrogen applications against the ability to graze at sufficient rates to reduce bolting.

Management

In order to achieve maximum life (five to seven years) of the chicory stand, proper grazing management must be considered. Spring-seeded chicory may be grazed after approximately 90 days depending on growing conditions, but care must be taken to prevent overgrazing. A stubble height of

Table 1. Seeding rates for chicory alone or in mixtures.

Seeding rates (lb/ac)	Seeding mixture		
	Chicory	Legume	Grass
Chicory alone	4 to 5		
<i>Chicory in a mixture with:</i>			
Red clover	4 to 5	6 to 8	
White clover	4 to 5	3 to 4	
Red clover and orchardgrass	2 to 3	3 to 4	4 to 6
White clover and orchardgrass	2 to 3	1 to 2	4 to 6
Red clover and tall fescue	2 to 3	3 to 4	8 to 10
White clover and tall fescue	2 to 3	1 to 2	8 to 10

*Adapted from Penn State publication Agronomy Facts Publication No. 45, *Forage Chicory*

1.5 to 2 inches must remain after grazing for optimal productivity. Rotational grazing management is the ideal way to optimize forage chicory persistence and quality. Generally, 25 to 30 days of rest between grazing events is recommended. Care must also be taken to prevent overgrazing and excessive hoof traffic, because exposed taproots are susceptible to freezing and frost-heaving. U.S. Department of Agriculture researchers in Pennsylvania have recorded Grasslands Puna yields of more than 3 tons per acre during the establishment year. Similarly, one Kentucky study reported dry matter yields of approximately 3.5 tons per acre.

Feed Quality

Established forage chicory stands have quality and quantity potentials similar to many other Kentucky forage crops. Depending on plant maturity, protein levels may range from 10 to 32 percent, and digestibility of chicory leaves is generally between 90 and 95 percent. Not surprisingly, these digestibility and mineral content values are greater than those of alfalfa. New Zealand studies have reported animal gains of 0.6 pound per day for lambs and 2 pounds per day for Friesian bulls. Chicory contains relatively high levels of minerals (potassium, calcium, magnesium, sulfur, zinc, and sodium) which are essential for proper animal nutrition.

Chicory also contains sesquiterpene lactones and small quantities of condensed tannins. Limited research indicates that these compounds may contribute to gastrointestinal parasite control in small ruminants (e.g., goats and sheep). These compounds may also have a negative affect on palatability and digestibility.

Summary

Forage chicory is a deep-rooted perennial plant which is drought tolerant and grows well on fertile, well-drained soils. Grasslands Puna, most commonly used in Kentucky, has produced dry matter yields of approximately 3.5 tons per acre in Kentucky. A rotational grazing management system favors forage chicory quantity, quality, and persistence. Bolting must be kept to a minimum for optimal forage production and quality. Forage chicory may be useful as a companion forage with cool-season grasses or legumes and is a high-yielding plant that may improve seasonal distribution of high-quality herbage.

NOTE: The information included in several sections of this publication was obtained from Penn State Agronomy Facts Publication No. 45 titled *Forage Chicory*, written by Marvin Hall and Gerald Jung.