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BEEF102

Beef Cattle Sciences

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Alfalfa for Beef Cattle [1]

Professionally Reviewed

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Introduction

Alfalfa (*Medicago sativa* L.) is well known as an excellent source of protein and energy for beef cattle. One ton of alfalfa hay contains as much protein as 2/3 ton of soybean meal and as much digestible energy as 25 bushels of corn (Balliette and Torell, 1993). A beef cow needs high energy hay to regain body weight after calving, produce milk for her calf, and rebreed in 40 to 90 days after calving.

Some high quality grass hays may be as high in digestible dry matter as alfalfa, however alfalfa tends to have faster passage rates and provide more energy because generally it is higher quality than the grass hays that are typically fed. Alfalfa hay will generally have a ruminal passage rate of around 24 to 48 hours (high to low quality) while grass hays normally have ruminal passage rates of 24 hours (high quality) to 72 hours (low quality). Good to fair grade alfalfa will be digested at a faster rate than good to fair grade grass hay. Passage rate is also influenced by the quality of other hay or feed provided as part of the overall ration.

In addition to protein and energy, alfalfa can provide most minerals and vitamins at less cost than if supplied from processed sources. Feeding one pound of alfalfa hay per 100 pounds of body-weight, will supply beef animals with their daily requirements for calcium, magnesium, potassium, sulfur, iron, cobalt, manganese and zinc. Phosphorus levels of alfalfa are more moderate, but still high enough that if fed at 1% of body weight, will supply about 2/3 of daily requirements. The high level of calcium in alfalfa is especially important for lactating cows, young developing replacement heifers, and bulls due to their higher requirements. Beef cattle fed alfalfa hay in the winter are less likely to get grass tetany (hypomagnesemia) at turn out time due to higher magnesium levels of alfalfa compared to grass hays. Vitamin A is the most common beef cow vitamin deficiency and good quality alfalfa hay is high in carotene, the precursor of Vitamin A, and can furnish all the Vitamin A needs of beef animals. In addition to the many dietary functions of Vitamin A, this vitamin also may have some therapeutic value, and be a contributing factor in preventing "shipping fever complex" and other disorders associated with animal stress. Recently harvested alfalfa is richer in Vitamin A than in hays stored over an extended time period.

Alfalfa can also be good sources of Vitamin E and selenium, depending on the soils' nutrient

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status. "White muscle disease" which sometimes causes serious losses of calves is caused by a deficiency of Vitamin E and selenium. Thus, feeding alfalfa hay that has been grown on soils with adequate levels of selenium can help decrease this problem. Sun-cured alfalfa hay also is a good source of vitamins D and K, riboflavin and niacin.

Description of Alfalfa

Alfalfa is a palatable and productive herbaceous perennial legume with worldwide distribution. It is grown in every state in the US on nearly 30 million acres. Hundreds of different varieties are available for various climate, soil, and pest conditions. Alfalfa's growth habit is upright, with crowns having 5-25 stems growing 23-35 inches in height. Regrowth occurs from crown buds or axillary stem buds. Alfalfa has a large taproot, with roots documented to 50 feet. Typically, however, 60-70 percent of the root system is concentrated in the upper 6 inches of soil, with fibrous roots predominating and bearing most of the nodules that are fixing atmospheric nitrogen. With its deep root system and rapid shoot regrowth capability, alfalfa is high yielding and high in quality, but requires high fertility and large quantities of water (5-8 inches per DM ton) for optimum productivity. It is grown primarily for hay, but can be ensiled, or used as pasture, either alone or in combination with grasses (typically orchardgrass or smooth bromegrass). Alfalfa can also be dehydrated and made into pellets, cubes, or meal.

Where Alfalfa Grows Best

A wide range of soil and climatic conditions are suitable for alfalfa, but for best production it requires a well-drained soil with nearly neutral pH and good fertility. As a species, alfalfa is grown from cold-temperate to subtropical climate zones. Cultivars (cultivated varieties) are grouped for fall dormancy from 1(very dormant) to 11 (non-dormant) and for winter hardiness with a survival index rating from 1 (superior) to 6 (non-winter hardy). The winter hardiness and fall dormancy characteristics have been determined to be located on two separate genes. This has allowed for the development of winter hardy cultivars that are quick to recover after harvest. Alfalfa can grow under many diverse environmental conditions. Temperature stress, however, limits its growth, yield, and stand longevity. Increases in winter hardiness have been achieved by hybridization of *M. sativa* and *M. falcata*. Current breeding efforts are directed at developing cultivars with increased yield, more tolerance to salt and high pH, bloat resistance, reduced lignin, duration of quality, drought stress, water use efficiency, and herbicide resistance.

Climatic tolerances

When gradually acclimated through proper fall management, and with the insulation of snow cover, alfalfa can survive very low winter temperatures (-30 to -45 °F) in north central USA and Canada. Thus, the species has great capacity to survive cold temperatures. For Pacific Northwest production systems, the key to long-lived, productive stands is choosing appropriate cultivars and managing the regrowth to ensure adequate levels of root non-structural carbohydrates. Typically this means allowing plants to regrow for 4-6 weeks prior to a killing frost (26 °F) or timing the last harvest so there is little to no regrowth. Alfalfa regrowth is dependent upon root carbohydrate reserves until it reaches a height of 6-8 inches. Carbohydrate reserves then start increasing after that height.

Alfalfa grows optimally at 86 °F average daily temperature, but can tolerate temperatures above 122 °F, and established stands are highly drought tolerant (due to deep roots extracting moisture from great depths). Nevertheless, it grows best in areas with moderate rainfall or in irrigated, dry climate regions of the western US.

Soil requirements

Alfalfa yields are best on a deep, permeable soil with good soil moisture supplying capacity or under irrigation. It is very sensitive to poor drainage and compacted soil conditions restrict root growth. Thus, alfalfa is most productive on loamy soils that are both well drained and have good moisture-holding capacity. Alfalfa does not tolerate acidic soils (pH below 5.8), especially in the seedling stage. This is partly due to nodulation requirements for calcium and partly to sensitivity to manganese and aluminum present at low pH levels. Reducing pH below 5.8 has a dramatic negative effect on the nodulation of alfalfa roots, and production levels. Liming soils to above 6.5 prior to seeding is recommended to ensure adequate pH levels throughout the stand's life. In high pH soil conditions (above 8.0), select a cultivar with high salt tolerance.

Establishment

A good seedbed for alfalfa is finely pulverized, leveled, and firmed to the seedling depth and contains soil moisture near the surface to initiate germination. A boot heel should sink no farther into the soil than 0.25 to 0.5 inch. Rolling before and after planting, either in simultaneous or separate operations will aid in establishing alfalfa through ensuring good seed-soil contact.

Seeding rate and depth

Twelve to 15 pounds of pure live seed (pls) per acre or approximately 60-75 uncoated seeds per ft^2 for irrigated fields, planted in 6-in rows (30-40 seeds in a linear 6-in row) is sufficient for a well prepared seedbed. Experimental research at the Central Oregon Agricultural Research Center at Madras and Powell Butte, Oregon showed that from 6 to 25 lb/a of pls there was no effect on yield under good planting conditions. Increasing the seeding rate, however, does increase the number of stems in the first few years of the stand (Bohle and Simmons, 2007). Alfalfa stands self-thin over time with substantial decreases starting the first year; even more so with beginning higher seeding rates. Seeds should be planted 0.25 in deep but no more than 0.5 in below the surface because seedling emergence will be reduced with deeper plantings. For dryland fields, planting 5-7 lb/a pls at 0.5 in or slightly deeper will be advantageous because soil moisture conditions will be improved for the germinating seedling.

Weed Control

There are several herbicides registered for weed control in alfalfa (Peachey et al., 2012). Pre-emergence herbicides, applied before seeding, keep weeds from competing with emerging seedlings. Post-emergence herbicides can be used to address problems not effectively addressed with pre-plant applications. Some post-emergent herbicides can be applied from the 2 to 4 trifoliate leaf seedling stage to control competition from weeds during establishment. Roundup Ready™ alfalfa offers advantages in weed control, but like all herbicide programs, rotation of herbicides is highly advised to reduce the possibility of developing herbicide resistant weed populations. Information on weed problems and control can be obtained from Extension Service publications, weed specialists, county agents, and crop consultants. Read all label instructions and follow them carefully; the label is the law.

Conclusion

Alfalfa is a palatable and productive herbaceous perennial legume with worldwide distribution. It can be grown in nearly all parts of Oregon, but for best production it requires a well-drained soil with nearly neutral pH and good fertility.

Alfalfa is an excellent source of protein and energy for beef cattle and if fed at 1% of body

weight will typically supply all needed vitamins and minerals except for phosphorus and can reduce the animal health problems of hypomagnesemia and white muscle disease when grown on soils with sufficient levels of Mg and Se. Note, however, that most of central Oregon is Se deficient so alfalfa hay grown in this region is low in Se.

Cultivar selection should be based on Extension and Experiment Station variety trial data as well as utilizing the cultivar's pest resistance and fall dormancy/winter survival index information to match field conditions. Successful establishment depends on preparing a fine, firmed seedbed and ensuring proper depth of planting (<0.5 in) of 12 to15 lb/ac pure live seed. Weed control is best accomplished by using pre-plant herbicides supplemented with post-emergence herbicides as needed.

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