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REQUIREMENTS FOR SUCCESSFUL ALFALFA ESTABLISHMENT ON ACID SOILS

V. A. Haby, F. M. Rouquette, Jr., and A. T. Leonard

Background. Sustainable production of alfalfa on East Texas acid soils has been relatively unsuccessful in the past. Recently, requirements for sustainable alfalfa production on acid soils have been determined through research by TAES scientists at Overton. Field scale alfalfa-production demonstrations have been successfully conducted with farm and ranch cooperators. Steps critical for successful establishment and production of alfalfa follow.

Research Findings. Planning, site selection, soil evaluation, liming and fertilization, site preparation and seeding, weed control, insect control, and harvesting are important considerations for alfalfa production on acid soils of eastern Texas.

1. Planning includes determining the market potential for alfalfa. Economic projections for hay production are quite favorable. Grazing with livestock having high weight-gain potential or milk-production requirement may be necessary to remove first-growth alfalfa during inclement hay drying weather. Will liming the soil to pH 6.8 to 7.0 be economically offset by not having to fertilizer alfalfa with nitrogen? Is the right type of soil available? Is there sufficient acreage for alfalfa without needing those acres for grazing cool-season annuals in mid-late winter?

2. Site selection is the most important consideration. Alfalfa needs a soil with excellent drainage, good aeration, high fertility, and low subsoil acidity. Alfalfa cannot tolerate extended wet soil conditions. A pH above 5.5 in the subsoil to 4 ft deep will allow greater root development and water use. Below pH 5.5, aluminum (Al) can become toxic to root growth.

3. Soil sampling and analysis for alfalfa should be done one year in advance of seeding. Fall is the best time to sample acid, sandy soils intended for alfalfa production. Collect a representative sample from the surface 6-in depth for standard analysis and for boron. Collect a representative sample of the 0.5-1, 1-2, 2-3, and 3-4-ft. depths for pH. If pH is below 5.5, test for Al soluble in 0.01 molar calcium chloride. Concentrations greater than 1.0 ppm soluble Al can inhibit root growth and limit alfalfa yield. High Al in the 3-4-ft. depth will have less effect on alfalfa yield than if the same level of Al were in the upper subsoil depths. An Al level above 1.0 ppm in the 0.5 - 1 and 1 - 2 ft depth is justification for rejection of that site for alfalfa production.

4. Liming and fertilization need timely consideration. The finest particle-size limestone available should be applied at a rate sufficient to raise soil pH to 6.8 - 7.0 the winter before planting alfalfa in the fall. Limestone should be disked 6-inches deep in early spring. Disking should be done even in an established stand of hybrid bermudagrass. Pack the freshly disked soil with a roller to retain soil water. Leaving limestone on the soil surface limits alfalfa growth.

Soils that test low in phosphorus (P) require 120 lb of P_2O_5 /acre the seedling year. The P benefits alfalfa more when it is disked into the soil rather than leaving it on the surface. In succeeding years, P rates can be reduced to 80 lb of P_2O_5 /acre. Alfalfa contains 50 lb of potassium (K)/ton (60 lb K_2O) of hay. Yields can be four to five tons/acre the seedling year. Alfalfa needs about 400 lb of K from the soil or fertilizer in succeeding years. Magnesium and sulfur are important inputs for alfalfa particularly on deeper sands soils. Research showed that 3.75 lb of B/acre annually are needed for alfalfa production on Coastal Plain soils limed to pH approximating 7.0.

5. Site preparation and seeding are best accomplished by preparing a level and firm, weed-free seedbed. The seedbed for alfalfa planting should be sufficiently firm that the heel of an adult's boot leaves an imprint no deeper than $\frac{1}{4}$ inch. Early October is the optimum planting time for alfalfa when sufficient soil moisture is available for seedling survival. Planting in early December has been successful when followed by several weeks of mild temperatures, but this is risky. Seeding rate varies between 15 - 20 lb of seed/acre. Plant the seed within the top $\frac{1}{4}$ inch in clay soils and $\frac{1}{2}$ inch in sandy soils using a disk drill and firm the soil over the seed. Alfalfa seed planted without press wheels on the drill can be covered successfully with a rolling packer.

6. Weed control is important. Grass and broadleaf weeds can be successfully controlled using preplant or post-emergent herbicides. Most post-emergent weed control measures must be delayed until after the second true leaf stage has been attained on alfalfa and before the broadleaf weeds are taller than 2 inches. Annual ryegrass must be controlled or it can shade and kill alfalfa seedlings. In a new seeding of alfalfa, ryegrass should be sprayed before it exceeds 6-inches tall.

7. Insect control begins in mid-February, and earlier in milder winters, with monitoring alfalfa for chewing damage by weevil larvae on the terminal bud leaves. New larvae are about $\frac{1}{16}$ to $\frac{3}{32}$ -inch long, white to very light green, and have a black head. Shot-holed terminal leaves indicate that larvae are present. Chemical controls should be initiated when 30 to 40% of stems show chewing damage on new terminal bud leaves. Low mammalian toxicity insecticides are available for weevil control. Lady beetle and larvae will control aphids and late-hatch weevil larvae. Three-cornered alfalfa hopper girdles stems near the base and may need chemical control.

8. Harvesting alfalfa may be accomplished by haying, grazing, greenchopping, ensiling, or baleage. Crimping at cutting, followed by tedding speed drying. Slight dew helps prevent leaf loss from alfalfa during the haying operation. Grazing alfalfa is a science by itself. Publications are available that describe the precautions and methodologies for successfully grazing alfalfa.

Application. Successful alfalfa production on limed acid soils is possible by following these guidelines. More detailed information on alfalfa production and alfalfa production-related sites is on the Internet Web sites "<http://soils.tamu.edu>" and "<http://overton.tamu.edu/soils>".