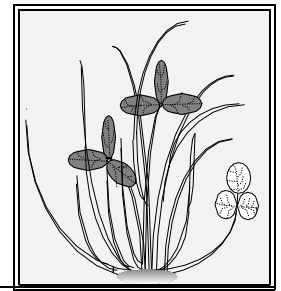


# ARROWLEAF CLOVER

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FORAGE CROPS --- PRODUCTION TECHNOLOGY

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**ARROWLEAF CLOVER** (*Trifolium vesiculosum*), one of the most popular forage legumes in eastern Oklahoma, is generally used with bermudagrass, tall fescue, and small grains for pastures and hay. This clover produces abundant growth during spring, resulting in high-quality forage for stockers and cow-calf operations.

**DESCRIPTION:** Arrowleaf clover is a cool-season annual. Seedlings are somewhat slow-growing, delicate, and drought-sensitive. Each leaf, as is typical for clovers, has three leaflets. Each leaflet is normally arrow-shaped with a large white "V" mark. Leaves and stems are generally smooth although sparse short hairs are sometimes noticeable. Seeds are about half the size of alfalfa seed and twice the size of white clover seeds.

Arrowleaf clover normally remains fairly leafy if grazed or hayed. The hollow stems can attain lengths of 4 feet or more, usually falling over and becoming intertwined, if not grazed. In late spring, clusters of white flowers with a pink or light purple tinge begin to develop and become over 3 inches long. Growth slows in June, and plants begin to die by mid July. Arrowleaf clover is most productive in eastern Oklahoma but can contribute to pasture yield and quality throughout the state.

**HISTORY AND ORIGIN:** Arrowleaf clover was introduced from Italy and became popular in the southeastern U.S. during the 1960's. Like most forages from Mediterranean environments (no summer rainfall, mild winter temperatures, and abundant winter rainfall), arrowleaf clover has its major growth period in spring and prepares for hot summers by producing seed as soils begin to dry. As a survival mechanism during dry periods, a high percentage of the seed is dormant because of an impermeable seed coat. Few seeds germinate during the first fall, and most seeds germinate during the second, third, and fourth falls following seed production.

**ESTABLISHMENT:** This should be viewed as a "several-year undertaking". Care should be exercised during the first fall to optimize the seed germination and emergence. Grazing should be deferred during early fall and during seed production the following summer. This approach enables plants to develop strong root systems during the fall and to produce an abundant supply of seed in the soil for subsequent years.

Arrowleaf clover grows well on a wide variety of soils (from sands to clay loams) and can be successfully established in many different ways. It should be sown in late September or

early October, with seedlings emerging as soon as soil temperatures begin to cool. As little as 3-5 lb/acre of seed can be broadcast on sod, but it is more reliable to drill 5-10 lb/acre with a planter that places seed in contact with soil at a depth of 1/4-1/2 inch

Seeds normally germinate in 5-15 days after sowing in cool, moist soil. Seed-soil contact is important; therefore, dense thatch should be removed by heavy grazing or haying. Disking is useful to develop a better seedbed and reduce grass competition during germination and emergence.

**Soil fertility and pH** are critical for successful establishment. Arrowleaf clover can be productive if the soil pH is 6-6.5. Agricultural lime should be applied several months before planting if soil pH is lower than 5.8.

Soils should be sampled and tested to determine the pH as well as the level of phosphorus and potassium. Proper fertilizer should be applied if either of these elements is deficient. Nitrogen levels as low as 15 lb/acre are adequate for rapid seedling development. High levels of nitrogen (more than 30 lb/acre) may stimulate grass growth which competes with clover seedlings.

**Grazing should be deferred** for several weeks after sowing. That promotes good seedling development and avoids trampling by animals.

**Inoculation** of seed with the correct *Rhizobium* bacteria (strain O) is essential in areas where arrowleaf clover has not been grown. The *Rhizobium* strain for arrowleaf is different from many other common clovers. Normally 3-4 oz. of inoculant is adequate for 50 lb. of arrowleaf clover seed. Although it is not essential, a sticker (commercial products, sugar water, cola, or milk) on seeds avoids wasting inoculant and ensures quick bacterial action.

**YIELD POTENTIAL:** Arrowleaf clover can produce tremendous yields of high quality forage in favorable environments. Yields of 5 ton/acre are frequently recorded, and 6-8 ton/acre are attainable. Pure arrowleaf clover is generally difficult to cure for hay. In pure clover stands, protein can be in excess of 20%; however, it is more realistic to expect 11-15% protein-hay in mixed stands of arrowleaf clover and bermudagrass or fescue without nitrogen fertilizer. Stocker gains of 2 lb/day or more for 60 days is reasonable from well-managed grass/clover pastures.

**MANAGEMENT:** Maintaining adequate levels of phosphorus and potassium with a soil pH of 6-6.5 is essential to successful arrowleaf clover production. When these fertilizer elements are low or the soils are excessively acid, clover stands are unproductive and unreliable. Following recommendations based on soil tests is the only way to know what soil amendments are necessary. Soil pH, phosphorus, and potassium can be built up to acceptable levels over 3-5 years with annual surface applications. It is more efficient; however, from the stand point of building up the soil's production capacity, to apply and incorporate lime and phosphorus well before sowing.

**Irrigation:** Arrowleaf clover would rarely benefit from irrigation in eastern Oklahoma. Irrigation could increase yields in middle and western parts of the state, and at the same time, it would lessen some of the boom and bust cycles.

**Renovation:** Once established and productive, arrowleaf clover pastures seldom need special renovation practices. Practices to encouragement reseeding are necessary, however. These include allowing good seed production and removal of thick thatch by grazing and/or haying in September.

Few herbicides are needed in well-managed arrowleaf clover pastures. The combination of good soil fertility and very competitive legume and grass species, grazed or hayed in a timely fashion, reduces the need for special weed control practices.

**Harvesting:** Grazing arrowleaf clover pastures between seedling emergence and early December can be detrimental to the clover. Arrowleaf clover is normally ready to be grazed in March or April, depending upon growing conditions during fall and late winter. While there is no ideal harvesting height, light grazing should begin when plants are 6-10 inches tall. Arrowleaf clover should be grazed heavily if plant heights reach 12-18 inches. A problem associated with initiating grazing late is that arrowleaf clover grows rapidly, and animals do not like to graze it when rank. In addition, the clover shades associated grasses and delays their production.

**Nitrogen fixation:** The nitrogen fixing potential of well-managed arrowleaf clover minimizes the need for nitrogen fertilizer. Arrowleaf clover can produce 5 ton/acre of hay, containing 18% protein (1800 lb/acre protein), requiring fixation of more than 200 lb/acre nitrogen. This nitrogen is first available for animal feed, much of which is recycled through urine and manure.

As roots, stems, and leaves of arrowleaf clover decay after plant death, some of the nitrogen becomes available to associated grasses. This illustrates the importance of effective inoculation.

**Grazing:** Continuous stocking of arrowleaf clover can be profitable, but requires frequent adjustments in number of animals per acre. Rotational stocking provides assurance of efficiently utilizing forage and maintaining good stands year after year.

Ideally, arrowleaf clover should be grazed for 7-10 days early in the growing season, followed by 2-3 weeks of regrowth and regrazing for 2-3 weeks with enough animals to remove all but 3 to 4 inches of growth. This pattern should be followed until the clover begins to flower. At that time animals should be removed for about a month to allow seed to set and mature. Few flowers develop for good seed production if grazing is continuous and heavy. Pastures can be cut or grazed after that, shattering much of the seed onto the soil.

**VARIETIES:** There are presently only three varieties of arrowleaf clover, 'Amclo', 'Yuchi', and 'Meechee'. All were released in the 1960's as introductions from Italy. Generally, Yuchi seems to be preferred for most Oklahoma conditions. Other varieties may be released from southeast states. Seed produced in Oklahoma after many years of natural selection may be preferred, for production in the western areas of adaptation.

**BLOAT:** Arrowleaf clover rarely causes bloat. This is probably because tannin in leaves prevents formation of foam in the rumen. Care should be exercised to avoid turning hungry animals into lush pastures. Occasionally, bloat occurs on lush small grains or ryegrass pastures.

**FORAGE QUALITY:** Young arrowleaf clover has excellent nutritive value from the stand point of protein, minerals, and digestibility. As plants become mature and rank, animals avoid grazing it, but they will perform well on hay from fairly mature arrowleaf clover.

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