

**A** rrowleaf clover is a productive winter annual legume that can play a role in many livestock feeding programs. Attention to management details can greatly increase chances of success with this legume.

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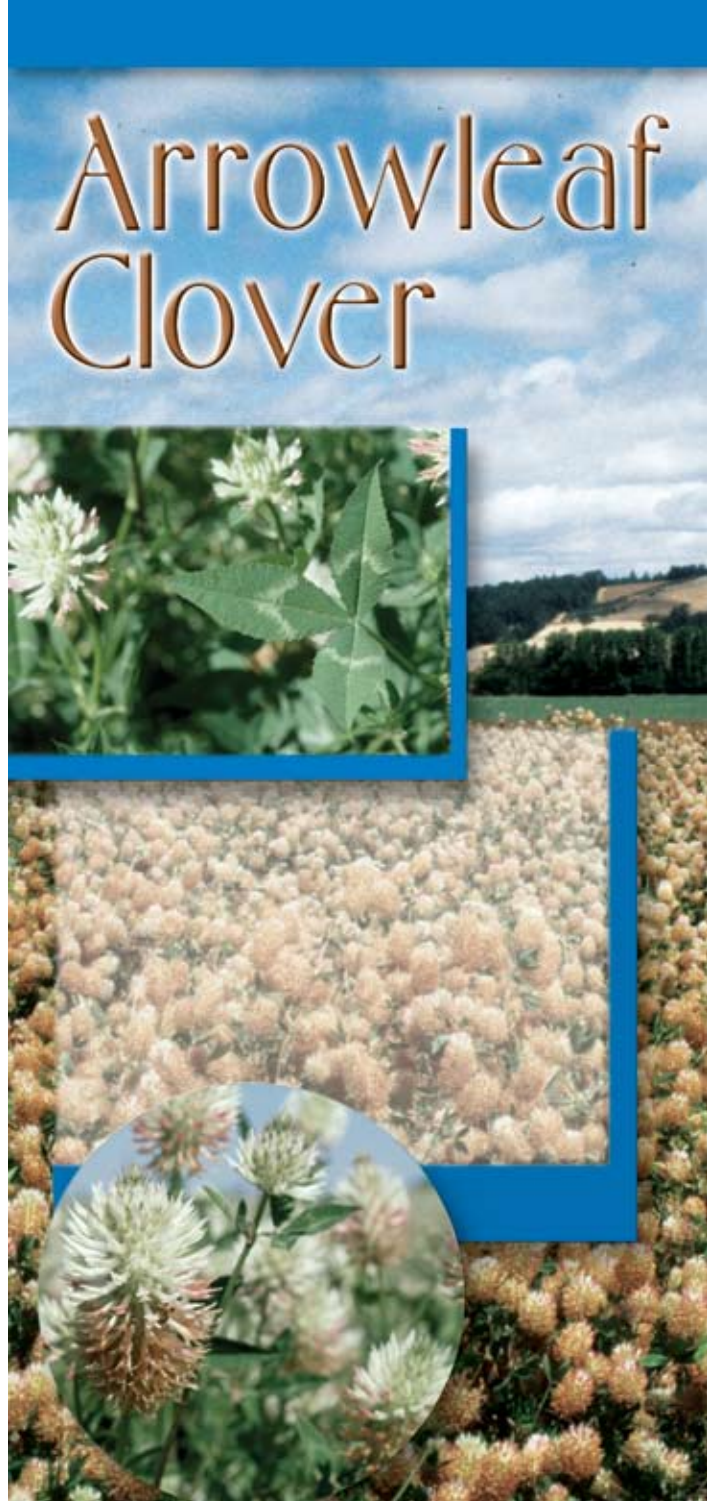
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# Arrowleaf Clover



## Arrowleaf Clover

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### DESCRIPTION

Arrowleaf clover has non-hairy, arrowhead-shaped leaves with pronounced veins. Individual leaflets sometimes reach 3 inches in length, and develop a large, white, V-shaped mark as they mature. Blooms are cylindrical in shape, often more than 2 inches long and 1 1/4 inches in diameter at maturity. Each bloom contains over 100 florets that are white initially and later turn pink or purple. The stems are hollow and often purplish, fibrous, and hard at maturity. Plants may reach a height of 4 feet or more if not grazed.

### ADAPTATION AND USE

Arrowleaf clover is a productive and drought-tolerant winter annual legume that originated in the Mediterranean region. It is widely adapted from southern Tennessee to the Florida panhandle and from east Texas to the Carolinas. It can also be grown in humid areas in Washington, Oregon, and northern California. Forage produced by this clover is not liked by horses, but it is relished by cattle, deer, and most other grazing animals.

Seedling growth of arrowleaf clover is slow and it makes relatively little growth until mid March to early April. To extend the winter annual grazing period it is typically planted in combination with annual ryegrass, rye, wheat, and/or oats. It is sometimes planted with crimson clover for the purpose of providing legume growth over a longer period of time than either clover alone.



This legume can be used for grazing, hay, haylage, or greenchop, but it is most commonly grown for grazing. A good stand often produces 1 1/2 to over 2 tons of dry forage per acre, which is equal to or better than other annual clovers commonly grown in the United States.

With adequate soil moisture, it produces about 6 to 8 weeks longer in the spring than crimson clover. Forage quality is excellent even in late spring, so growing this clover with winter annual grasses can help improve both yield and quality of winter annual pasture in late spring. It is more drought tolerant than most winter annual legumes, and livestock bloat is rare on this clover.

### ESTABLISHMENT

**SOILS AND FERTILITY:** Arrowleaf clover does best on well-drained, but not extremely droughty, soils. It is more sensitive to soil acidity than some clovers and is best suited to soils having a pH in the range of 6.0 to 6.5 and seedling emergence is delayed if pH is below 6.0. Iron chlorosis is a growth-limiting factor if the pH is higher than 7.5. This legume is especially well-suited to sandy Coastal Plain soils, but can also be productive on well-drained clay soils. It is less tolerant of wet soils than are many other clovers.

Arrowleaf clover yields best when grown on soils having at least medium levels of phosphorus and potassium. Fertilizer should be applied as determined by a soil test. Application of about 2 pounds of boron per acre may be advisable if reseeding is desired, especially if the clover is grown on sandy soil.

**VARIETIES:** Several varieties of arrowleaf clover have been released. These varieties differ with regard to date of maturity, disease resistance, and yield. Unbiased field studies conducted by universities is the best source of variety comparison data.

**SEED QUALITY:** With any forage crop it is highly important to use good quality seed known to be free of noxious weed seed. Wild turnip and wild mustard, both of which are extremely difficult to eradicate from clover stands, are examples of weeds that are often a contaminant in low quality arrowleaf clover seed. It is advisable to purchase seed of named varieties as opposed to "common" arrowleaf clover seed.

**SEED SCARIFICATION:** Arrowleaf clover produces a high percentage of hard seed (usually exceeding 70% after combine harvest) that will not germinate for several months or years. This makes it an excellent reseeder, but results in poor germination unless the seed coat is scarified (scratched or otherwise damaged) prior to planting.

Arrowleaf clover seed sold through commercial marketing channels normally has been scarified and thus will have a high germination level. However, seed obtained through farmer-to-farmer transactions may not have been scarified. Planting unscarified seed is not recommended unless the seeding rate is at least tripled. **SEEDING RATE:** Arrowleaf clover seed are small; about 400,000 seeds/pound. The recommended seeding rate for scarified seed is 5 to 10 pounds per acre. If the clover has been allowed to reseed on the same field for several consecutive years, planting as little as 3 pounds of seed per acre should be enough to ensure a good stand.

If annual ryegrass and/or small grain are to be planted with arrowleaf clover, a seeding rate of no more than 15-20 pounds of ryegrass and 60-90 pounds of small grain should be used.

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# Arrowleaf Clover

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## ...ESTABLISHING THE CROP *continued*

**SEEDING DEPTH:** The ideal seeding depth for arrowleaf clover is 1/8 to 1/4 inch. It is preferable for the seed to be on top of the soil than for it to be planted deeper than 1/2 inch.

**SEEDING DATE:** When planted on a prepared seedbed in the South, arrowleaf clover is normally planted in September or October when night temperatures are in the low 60s. When planted on the sod of a warm season perennial grass, the planting date should be 3 to 4 weeks before the usual date of the first killing frost. Arrowleaf clover will germinate at lower temperatures than crimson clover, which may result in stands thickening during winter in years when a dry autumn has occurred.

**SEED INOCULATION:** Unless seed are pre-inoculated, arrowleaf clover should be inoculated just prior to planting. It is important to use fresh inoculum (check expiration date) and to make certain the inoculum specifically states on the package that it is for arrowleaf clover. This species requires a highly specific type of bacteria in order for good nodulation and nitrogen fixation. Directions for inoculation are provided on inoculum packages.

### SEEDING METHODS:

**Prepared Seedbed** - When planted on a prepared seedbed it is important to prepare a firm seedbed. This can be done by using a cultipacker-seeder or by cultipacking the soil, broadcasting arrowleaf clover seed (and, if desired, annual ryegrass seed), then cultipacking again. This will ensure good seed/soil contact and increase the likelihood of obtaining a stand.

Another approach is to allow the soil to be settled by rain after tillage, then to broadcast arrowleaf clover seed followed by use of a cultipacker. If small grains, which have a larger seed, are to be in the mixture, the best approach is to plant small grain seed with a grain drill about 3/4 inches deep prior to planting small-seeded species. Arrowleaf clover seed broadcast on a prepared seedbed should not be covered by disking, because to do so will likely result in covering it too deeply.

**Overseeded On Summer Grass** - Arrowleaf clover is often planted into a warm season perennial grass sod, especially bahiagrass or bermudagrass. Most of the grass foliage should be removed by grazing, burning, or mowing prior to planting so that no more than 1 or 2 inches of summer grass stubble is present at seeding. Light disking may be necessary to ensure good seed/soil contact on thick, tight sods, especially in the case of bahiagrass. Seed can then be broadcast over the soil surface or shallowly drilled. If the seed are broadcast, either subsequent heavy stocking of the area with livestock or light disking may enhance establishment.

**PEST CONTROL:** The striped field cricket can defoliate seedlings when they first emerge, thus seriously hurting stands when arrowleaf clover is planted into a sod. It is advisable to carefully inspect a field before overseeding to make certain this insect is not present in large numbers. If it is, an insecticide should be applied to eliminate the problem. After a hard freeze, crickets should not be a problem.

Soil insect pests can also sometimes be a problem during establishment, especially when clover is sod-seeded. Newly-planted fields should be monitored for pests. If problems arise, identification of the pest and timely implementation of a suitable control strategy are critically important. Whenever pesticides are used, it is important to read and follow all label instructions.

A disease complex can cause death of arrowleaf clover seedlings resulting in poor stands. Unfortunately, since this problem is soil-borne, it can be a problem year after year, especially on clay soils or on wet-natured sandy soils. Planting in a different field or treating seed with a labeled fungicide are ways to avoid or reduce this problem. Most pre-inoculated arrowleaf clover seed has been fungicide-treated to reduce the likelihood of this potential problem.

Virus diseases can also be a problem. Plants affected by virus will be chlorotic, have crinkled leaves, and display a mosaic pattern. Leaves of arrowleaf clover may turn red due to any of several types of stress including disease, severe cold, or other climatic factors.



## MANAGEMENT

Once established, arrowleaf clover needs to receive appropriate management in order to realize its potential productivity. Some important considerations are as follows.

**FERTILITY:** Arrowleaf clover is less tolerant than some clovers to low fertility and soil acidity. Phosphorus, potassium, and lime applications made in autumn according to soil test recommendations should be adequate to take arrowleaf clover or an arrowleaf clover/winter annual grass mixture through the spring growth period. Boron should be applied at the rate of 2 pounds per acre in areas that are to be managed for reseeding.

Pure arrowleaf clover stands require no nitrogen fertilizer if seed were properly inoculated. Mixed stands of arrowleaf clover and winter annual grasses should receive about 60 pounds of N/acre at or near seeding if planted in early autumn but only 20 to 30 lb/acre if planted near frost. An additional application of about 60 pounds of N/acre is often made to arrowleaf clover/grass mixtures in late winter.

### PEST CONTROL:

**Insects** - Several species of insects may damage the foliage of arrowleaf clover and require either treatment with an insecticide or a quick graze down. However, foliage-damaging insects are usually not a problem.

**Diseases** - An aphid-transmitted disease named bean yellow mosaic virus can attack established arrowleaf clover plants. Leaves become wrinkled and turn yellow or sometimes red when attacked by this disease. (Arrowleaf clover leaves often turn red or purple in response to stress, whether caused by disease, nutritional imbalances, pest damage, or climatic conditions.)

In addition, some arrowleaf clover plants contain a gene that the virus stimulates to cause a condition called lethal wilt, an irreversible wilting of plants followed by death. However, advances in plant breeding have resulted in development of a variety that is resistant to the virus and that does not contain the gene that causes lethal wilting.

**Weeds** - Some weed pests can be controlled with herbicides or with clipping. However, the best weed control is provided by a thick, vigorous stand of forage plants.

## GRAZING MANAGEMENT

Seedlings of arrowleaf clover are small and grow slowly, so it is important to prevent excessive grass growth from shading out the clover plants, especially in autumn and early winter. Increasing the stocking rate or allowing animals access to a pasture earlier than had been planned may be necessary to accomplish this.

Ideally, arrowleaf clover should not be grazed until the plants are at least 5 inches tall. Turning livestock into a pasture when plants are small and the soil is moist can result in damage to the stand by hoof action, especially on a prepared seedbed. Arrowleaf clover should not be grazed closer than about 3 inches.

Arrowleaf clover is quite sensitive to shade. Bud development at the bases of plants will be poor if plants are not defoliated periodically. Thus, it is important to keep pastures containing arrowleaf clover to a height of no more than about 6 inches if good forage production is desired in late spring. Given the potential problems associated with either undergrazing or overgrazing, careful grazing management can maintain good production over a long grazing season.

## MANAGEMENT FOR HAY

Arrowleaf clover can be grazed until around early April and still be expected to produce a good hay crop in May. Use of a mower/conditioner is advisable to hasten drying. Once plants have been allowed to grow to hay harvest height, little regrowth can be expected after hay is harvested, especially with harvests made in May or later.

## MANAGEMENT FOR RESEEDING:

Due to the high percentage of hard seed it produces, arrowleaf clover has excellent potential for reseeding. Grazing until about early April often results in more seed production than not grazing at all because heavy, dense growth may result in lodged plants, matted forage, and reduced numbers of blooms. Once a stand has made a good seed crop, planting only 3 pounds of scarified seed per acre, together with tilling the soil in autumn will normally result in a good reseeded stand.

Reseeding requires that livestock be removed, or that the stocking rate be greatly reduced, during the seed production period. If reseeding is desired, grazing pressure should be reduced or eliminated about the time the clover begins to bloom (usually around late April), but it needs to be high enough to keep the clover from excessively shading the summer grass. Some seed for reseeding will be produced even if livestock are allowed to continue to graze at a low stocking rate.

During the 4- to 7-week flowering period, seed mature in the bottoms of seedheads first, and some mature seed should be present by early June. Though probably not essential, placing colonies of bees near a seed field will help ensure good seed set in areas in which wild bee populations are low.

Managing arrowleaf clover for reseeding works best in fields that are tilled on an annual basis. Reducing grazing pressure enough to allow arrowleaf clover to make seed when it has been overseeded on a summer perennial grass sod involves some penalty or even risk, because this clover is so vigorous in late spring that a thick stand may shade out warm season perennial grass, greatly reducing production and possibly even hurting the grass stand.

Thus, in sod-seeding situations an argument can be made for stocking arrowleaf clover heavily enough to utilize all the forage and there

fore not striving for reseeding. The clover, which requires only a low seeding rate, can then be replanted the next autumn. It is easier to get reseeding of annual clovers on bermudagrass than on bahiagrass.



## MECHANICAL HARVESTING:

Mixtures of arrowleaf clover and winter annual grasses can make excellent quality hay or silage. Unfortunately, spring weather conditions in the Southeast often make hay harvest difficult at this time. Consequently, forage of winter annuals, including arrowleaf clover, is most frequently harvested as pasture or silage.

Winter annual mixtures containing arrowleaf clover planted on a prepared seedbed in early autumn can often be grazed until early to mid-April and still produce a hay or silage harvest. Clover harvest should be made at the early bloom stage. Since regrowth from arrowleaf clover after mechanical harvesting is usually poor, only one harvest can be expected to contain significant quantities of clover.

## ANIMAL DISORDERS

Bloat of animals grazing arrowleaf clover is rare because tannins greatly reduce this hazard as compared to other forage legumes. Ways to further reduce the risk of bloat are to plant grasses with clover, avoid turning hungry animals into a lush pasture, providing dry hay to animals during periods of lush growth, and providing anti-bloat materials. Some animals are chronic bloaters and should be removed from a pasture if bloat symptoms become repeatedly evident.