UofA UNIVERSITY OF ARKANSAS DIVISION OF AGRICULTURE
Cooperative Extension Service

Agriculture and Natural Resources

FSA2151

General Traits of Winter Annual Clovers Grown in Arkansas

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Clovers are beneficial additions to many forage programs because of improved forage growth distribution, increased forage yield, increased forage quality and reduced nitrogen fertilizer costs. These benefits lead to increased animal performance and profitability of the livestock enterprise. Winter annual clovers are considered to be better adapted to soil and environmental conditions in southern Arkansas than perennial clovers. Perennial clovers are slower to establish than annuals and are not very long-lived in the hot, humid Coastal Plains region of southern Arkansas.

Because annual clovers complete their life cycle each year, they must be re-established from seed. The clover stand can be re-established either by replanting each year or relying on natural reseeding. Reliance solely on natural reseeding increases risk of establishment failure, because the producer depends on good conditions in late spring for clover seed production as well as in the fall for seed germination and seedling development. For natural reseeding to occur, grazing and hay harvest should be managed to allow some of the clover to mature in late spring for seed production.

Many clovers produce a percentage of "hard" seeds that do not germinate immediately after planting. The seed coat of hard seed is impervious to water, which delays germination for long periods of time. Hard seed may survive passage through the digestive tracts of animals and can remain viable in soil for 30 years. Delayed germination by hard seed of annual legumes grown in harsh environments helps maintain stands from volunteer seedlings when conditions are not favorable for seed production in a particular year. Clover species that produce a high percentage of hard seed provide more dependable volunteer stands than those that produce more soft seed.

Good stand establishment and forage production depend on a variety of factors including soil fertility, moisture, pH, seed-to-soil contact and inoculation of seed with nitrogen-fixing bacteria. (Refer to FSA2035, *Forage Legume Inoculation,* for information on inoculation of legumes.)

Establishment of Annual Clovers

The first step in successful establishment of clovers is proper site selection. Factors such as soil texture and drainage should be considered when matching a clover species to a specific site. Select a site well in advance so weed management and improvements in soil fertility and pH can take place. Weeds should be suppressed using a herbicide with short residual activity such as 2,4-D or Weedmaster. Soil samples should be collected and analyzed so that any required phosphorus, potassium or lime can be added well in advance of planting. (Refer to FSA2121, *Test Your Soil for Plant Food and Lime Needs*, for information on soil sampling and analysis). Soil pH should be near neutral (> 6.0). When clovers are to be planted in acid soils, apply lime at least six months before seeding to allow time for the required chemical reactions to take place for increasing

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soil pH. Avoid nitrogen fertilization because rhizobia bacteria in clover roots tend to stop N fixation when abundant soil N is available. Nitrogen fertilization also favors grass growth in grass-legume mixtures, so N fertilization leads to excessive grass growth and causes shading out of clovers.

Clover species selection should be based on soil types and drainage, soil fertility and pH as well as intended use of the forage and the companion grasses grown with the clovers. Research at the University of Arkansas Southwest Research and Extension Center has shown that berseem clover is superior to alfalfa, white and Persian clovers when grown in a flood-prone Blackland Prairie soil. Research from Texas A&M Agricultural Research and Extension Center at Overton indicates that Persian, berseem and white clovers are superior to red, arrowleaf, crimson and rose clovers in waterlogged soil conditions.

Late-maturing clovers (red or arrowleaf) grown with perennial warm-season grasses will reduce late spring growth of the grasses, may be shaded out if grasses are allowed to outgrow clovers but may improve forage quality over grass alone. Early- (crimson) and medium-maturing (berseem and rose) clovers can allow earlier grazing of perennial warm-season grass pastures and will supply nitrogen to the grasses under proper management. Late-maturing clovers grown with cool-season grasses (tall fescue or small grains) can lengthen the grazing season, improve forage quality and reduce the toxic effect of fungal endophytes found in fescue. Low-growing or prostrate clovers are generally more grazing tolerant than upright-growing clovers. Preferred site, soils, climate and management of many common annual clovers are shown in Table 1.

Clovers can be established by broadcasting or drilling seed into a grass sod or following tillage. Establishing clovers by broadcasting following tillage increased the clover stand counts by 41 percent in southern Arkansas. Stand counts were only 50 percent for clovers broadcast onto a mixed grass sod but increased to 91 percent with tillage. Seed should be planted shallow. It can be drilled to a depth of 1/4 to 1/2 inch or broadcast. Seeding rates should be increased by 20 to 25 percent if clovers are established by broadcasting seed.

Clovers can be established in clean, tilled seedbeds between early September and November 1. When interseeding clovers into a sod, it is important to remove existing forage to a height of 3 inches or less. Seeding in warm-season grass sod should be delayed until October 15 to November 15 when cool nighttime temperatures (50 to 60 degrees F) slow grass growth and reduce competition. Because fescue grows vigorously in the fall, fescue sod must be grazed short or lightly disked to reduce competition before interseeding clovers.

Table 1. General Characteristics of Winter Annual Clover Species Common in Arkansas

	Plant Characteristics							Preferred Soil Characteristics		
Clover[a]	Common Uses	Seeding Rate[b] (lbs/A)	Reseeding Ability	Cold Tolerance	Relative Maturity	Arkansas Adaptation	Flowering Date	pH	Texture	Drainage
Arrowleaf	Hay/ Grazing	8-10	High	Good	Late	Statewide	Early June	5.8-7.0	Sandy Loam	Good
Ball	Grazing	2-3	High	Good	Medium	Southern	Early May	> 6.0	Sand, Loam or Clay	Fair
Berseem	Grazing	12-15	Low	Poor	Medium	Southern	Mid May	6.5-8.0	Loam or Clay Loam	Poor
Crimson	Grazing	15-20	Low	Medium	Early	Statewide	Early April	6.0-7.0	Sand or Loam	Good
Persian	Grazing	3-5	Medium	Fair	Medium	Southern	Early May	6.0-8.0	Loam or Clay Loam	Poor
Red	Hay/ Grazing	10-12	Low	Good	Late	Statewide	Early June	6.0-8.0	Loam or Clay Loam	Good
Rose	Grazing	15-20	High	Good	Medium	Statewide	Late April	6.0-8.0	Sand, Loam or Clay	Good
Subterranean	Grazing	12-15	Medium	Fair	Medium	Southern	Mid April	6.0-7.0	Loam or Clay Loam	Fair

[a]Clovers should be planted between September 1 and November 1 in prepared seedbeds or between October 15 and November 15 when seeded in sod.

[b]Recommended drilled seeding rate. Increase seeding rate by 20 to 25 percent when broadcasting seed.

Figure 1. Arrowleaf clover (*Photo from University of Arkansas*)

Figure 2. Ball clover (*Photo from Oklahoma State University*)

Arrowleaf clover is a late-maturing, tall, upright clover that produces most of its growth in late spring and can maintain productivity through June. It does not tolerate poorly drained or acid soils. Arrowleaf produces a high percentage of hard seed, which favors reseeding. Arrowleaf is commonly grown in pastures, but its late maturity also allows its use as a hay crop. Yuchi is the standard variety with which all other arrowleaf varieties are compared, but poor disease resistance has reduced its use. Apache, a new release by Texas A&M University, has shown promise in improved disease resistance and improved forage production.

Ball clover is a low-growing clover that is tolerant of close grazing. It can tolerate wet, poorly drained soils and low soil pH better than crimson. Because it produces a high percentage of hard seed and much of its seed is produced close to the ground, it is an excellent reseeder. There are no improved varieties, and seed availability is limited.

Berseem clover is tolerant of wet, poorly drained soils but is intolerant of low soil pH. Berseem is not cold tolerant and, until the release of the Bigbee variety, could not be grown even in southern Arkansas. Bigbee berseem performs well under grazing but must not be grazed below 3 inches. Berseem clover produces a large amount of seed but very little hard seed, so natural reseeding may be undependable.

Crimson clover has the best seedling vigor of the annual clovers. Crimson is very cold tolerant and produces more forage in the fall and winter than other clovers. It is the earliest maturing of the commonly grown clovers and flowers in early April. Crimson is tolerant of slightly acid soils but will not tolerate wet, poorly drained soils. Dixie and Tibbee are good forage varieties that have been tested in Arkansas.

Persian clover is one of the best clovers for wet, poorly drained soils. It does not tolerate soil acidity and is not cold tolerant, so it is best suited for southern Arkansas. Persian clover is very bloat provocative, so care must be used when grazing stands greater than 50 percent clover. Persian clover tolerates close grazing well and produces a high percentage of hard seed favoring reseeding.

Figure 3. Berseem clover *(Photo from Oklahoma State University)*

Figure 4. Crimson clover (*Photo from University of Arkansas*)

Figure 5. Persian clover (*Photo from Oklahoma State University*).

Figure 6. Red clover (*Photo from University of Arkansas*)

Figure 7. Rose clover (*Photo from University of Arkansas*)

Figure 8. Subterranean clover (*Photo from University of Arkansas*)

Red clover is a weak perennial or biennial clover species in northern Arkansas but is commonly grown as an annual in southern Arkansas. It has excellent cold tolerance and grows well in mixtures with grass because of its upright growth characteristics. The upright growth makes red clover best used for hay, but it can be used for grazing with proper management. Red clover does not tolerate wet, poorly drained or acid soils. Cherokee, Kenland, Kenstar and Redland II are proven varieties for Arkansas.

Rose clover is drought tolerant, can tolerate low soil fertility and alkaline soils but will not tolerate acid soils. Overton (a Texas A&M release) is better adapted than other rose clover varieties to the rainfall, humidity and disease conditions found in Arkansas. Overton is late maturing, tolerates grazing well and can be a dependable reseeding variety because it produces a large amount of hard seed.

Subterranean clover is a dense, low-growing annual with poor cold tolerance. It is best adapted to southern Arkansas. Subterranean does not produce as much forage as other clovers. Due to its growth habit, subterranean can tolerate frequent close grazing and shading by grasses better than other clovers. Subterranean can also tolerate applications of 2,4-D herbicide with little injury. It has excellent reseeding potential because it buries its seed pods underground. Subterranean clover has a relatively high rate of N fixation and can tolerate wet soils and low soil pH. The variety Denmark has been successfully used in Arkansas. New varieties are frequently released from Australia.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

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FSA2151-PD-4-06N