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Forage Clovers for Arkansas

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Introduction

Clovers and other legumes are highly desirable species in pastures and hay meadows. They serve several useful functions. First and foremost, legumes are able to obtain nitrogen from air through their symbiotic relationship with *Rhizobium* bacteria and, therefore, are not dependent on nitrogen fertilizer. The fixed nitrogen is used first to support clover growth, but it becomes available to neighboring grass plants when clover tissue dies. Under ideal conditions, clovers can add up to 200 lb actual N/acre/year to the soil, where it can be used by other forage species. This is the equivalent of 600 lb/acre/year of ammonium nitrate or 400 lb/acre/year of urea fertilizer that the farmer does not have to purchase and apply.

A second valuable role of clovers is to increase forage quality of pastures, hays or silages. Legumes are higher in crude protein and digestibility than most grasses commonly used in Arkansas. Animals usually consume diets higher in quality than grass alone when pastured on grass/legume mixtures or fed grass/legume hays. As a result, animal performance often improves when a clover is included in pastures, even though total forage yield may not increase. Adding clovers to endophyte-infected tall fescue pastures also improves performance of cattle by diluting the toxicity of the endophyte.

A third advantage is that clovers can help even out the forage supply over the grazing season by contributing peak grazing at a time when other forages are not as active.

Clovers are implicated in some health problems for livestock. Many clovers can cause bloat in grazing ruminants. Not all clovers cause bloat, and the problem is unlikely even with bloat-inducing types unless the proportion of clover in the stand is greater than 50 percent. A few clovers synthesize estrogen-like compounds called phytoestrogens that can cause reproductive problems in livestock, especially sheep. Sheep should not be grazed on these clovers during the breeding season. On rare occasions, some clovers become infected with a fungus that causes “slobbers” or excessive salivation in cattle and horses. If this occurs, animals should be removed from the offending forage.

The primary disadvantage of clover in Arkansas is that it is simply difficult to grow. Clovers in general are not well-adapted to the climate of the humid south, into which most of Arkansas fits. High rainfall, humidity and hot summers create a perfect environment for root diseases, insect pests and soil nematodes that severely curtail persistence of perennial clovers. Acid, poorly drained, infertile soils create more problems. Annual clovers may have a bit more success than perennials, but often do not reseed reliably and must be replanted every year.

Clovers are usually planted in September or October. Seed may be drilled or broadcast and can be overseeded along with winter annual

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grasses like wheat or annual ryegrass. Care should be taken not to plant clover seeds deeper than 1/4 inch. Clover seed should be inoculated with the correct species of rhizobia before planting to ensure good nitrogen fixation potential (see FSA 2035, *Forage Legume Inoculation*, for detailed information about legume inoculation).

Most clovers respond to improvements in soil fertility. Most prefer soils with pH near neutral. When a clover planting is planned for an acid site, lime should be applied at least six months before clover planting to allow time for soil reaction to neutralize acidity. Potassium is a very important nutrient for clovers, and attention should be paid to supplying adequate amounts according to soil test recommendations. Phosphorus should also be applied according to soil test. Many clover species will respond to boron fertilization at 1-2 lb/acre every one to two years, especially when grown on sandy soils.

Nitrogen fertilizer application to clovers should be avoided as much as possible. When abundant soil N is available, clovers will use that instead of fixing their own N, which reduces the benefits of using clover in the first place. Also, when N is applied to grass/clover mixtures, the grass usually responds faster than the clover, which can lead to excessive shading of clover and its loss from the stand. If N fertilizer must be applied to keep grass productive, rates should be kept to 30 lb N/acre or less at each application.

Perennial Clovers

White clover. White and ladino clover are the same species. The only difference is that ladino-type cultivars have been selected for a taller plant and higher yields. These traits make ladino more suitable for hay than is common or wild-type white clover (also called Dutch white clover). Common white clover grows very close to the ground and is perfectly adapted for use under continuous grazing systems or for livestock species that graze close to the ground, such as sheep or horses. It is difficult for animals to kill common white clover through overgrazing.

White clover is cold-tolerant throughout the state and among the most tolerant clovers for wet soil conditions. However, it will not tolerate summer heat and drought well. In northern parts of the state, plants go dormant during summer. In southern parts of the state, they likely will die in summer. However, common white clover is a prolific reseeder, so stands will probably regenerate each fall. Ladino types are poor reseeders. White clover is not shade-tolerant and can be shaded out of mixtures by taller grasses if canopy height is not carefully managed by hay cutting or grazing management. It does not generally persist well in mixtures with tightly sodded grasses like bermudagrass or bahiagrass. White clover spreads laterally via aboveground stems called stolons.

White clover has excellent feed quality and palatability, but it presents a high bloat risk for ruminants and should not be grazed in pure stands. White clover is occasionally implicated in cases of slobbers.

Planting rate is 2-3 lb/acre. Proven ladino varieties for Arkansas include 'Osceola', 'Louisiana S-1' and 'Regal', and there are many newer varieties that may also work well. When testing these newer, unproven varieties, producers should start by seeding a small area to check for local adaptability.

Red clover. Red clover is classified as a weak perennial, but is generally considered to act like a biennial with a useful stand life of only two years. It has excellent cold tolerance. Like white clover, it will go dormant during the summer heat, but it flowers later than white clover and so has a longer productive season. Red clover is not tolerant of frequent close grazing and is best suited to hay meadows or rotational grazing systems. Red clover is reasonably shade-tolerant and is particularly well-suited to mixtures with tall grasses like tall fescue and dallisgrass. It has the best seedling vigor of any perennial clover, which makes it a good choice for overseeding into cool-season perennial grasses. Natural reseeding is unlikely to be sufficient to maintain stands. It has excellent forage quality and contains a higher proportion of bypass protein than most other forages. As a result, cattle sometimes perform surprisingly well on this forage.

Red clover can cause bloat. It contains phytoestrogens that can impair the fertility of sheep but is not likely to cause fertility problems if grown in mixed grass/legume stands. Red clover is the clover most commonly implicated in cases of slobbers, but this is an unusual problem that should not discourage use of the clover.

Planting rate for red clover is 10-12 lb/acre. 'Cherokee', 'Kenland', 'Kenstar' and 'Redland II' are proven varieties for Arkansas. There are many others that may also work well.

Alsike clover. Alsike clover is better suited for the northern tier counties of Arkansas than for more southern ones. It has better tolerance of wet and acid soils than most clovers. Alsike clover is not tolerant of shade. It should not be used for horse pastures because it has a tendency to cause photosensitization, or sun scald, in that livestock species. Seeding rate is 4-6 lb/acre.

Sweetclover. The two sweetclover species (yellow and white) are not true clovers. These are biennial plants that reseed well to form "perennial" stands. Sweetclover is extremely tall, up to eight feet. They are winter-hardy throughout Arkansas and tolerant of drought but do not tolerate acid soils. Sweetclover contains a bitter compound called coumarin which is extremely distasteful to animals. In moldy sweetclover hay, coumarin is converted into the toxic compound dicumarol which causes sweetclover poisoning in cattle. Low-coumarin sweetclover varieties are available (white 'Polara' and yellow 'Norgold'). Planting rate is 10-15 lb/acre.

Annual Clovers

In Arkansas, all the annual clover species perform best as winter annuals, meaning that they germinate in fall, grow through the winter, flower and set seed in spring or early summer and then die. For some species, the seeds that were naturally produced will continue the cycle in the following year, while others must be replanted every year. Annual clovers can be overseeded onto dormant warm-season grasses, either alone or in combination with small grains and annual ryegrass.

Crimson clover. Crimson clover is the standard against which other annual clovers are compared in Arkansas. It has the best seedling vigor of the annual clovers. It is the earliest to mature of the commonly used annual clovers, flowering in early April in south Arkansas and about three weeks later in northern regions. This limits its usefulness as a hay crop, but it is widely used to overseed bermudagrass. Crimson clover is not tolerant of wet, poorly drained or alkaline soils, but has good tolerance to soil acidity. Bloat is usually not a severe problem but can occur. Its reseeding potential is fair if heads are allowed to ripen and if clover weevils do not destroy the seeds. Seeding rate is 10-30 lb/acre. 'Dixie' is the standard variety. 'Tibbee' is another good forage variety.

Arrowleaf clover. Arrowleaf clover is a tall clover that holds its quality well for a longer period of time than most annual clovers. It is among the latest-maturing clovers and may produce forage into June. Its late maturity makes it a good match to be grown with annual ryegrass. Arrowleaf clover will germinate at cooler temperatures than crimson clover. It is not tolerant of infertile, acid soils. Animals rarely bloat on arrowleaf clover. Periodic grazing to a height of 2 to 4 inches promotes new growth and reduces plant disease outbreaks. Purplish-red color of arrowleaf clover leaves is a symptom that the plant is stressed by something such as nutrient deficiency, insects, diseases or weather. Arrowleaf reseeds well under grazing, but much of the seed it produces is hard, which makes year-to-year stand regeneration somewhat unpredictable. Regrowth (and reseeding) should not be expected after a hay crop is harvested. Arrowleaf clover seed must be scarified to break the hard seed coat before planting. Planting rate is 5-7 lb/acre. The standard variety is 'Yuchi'.

Ball clover. Ball clover is another low-growing clover with excellent tolerance of close grazing. It also has good tolerance of wet, clay or loam soils. Ball clover tolerates lower soil acidity than crimson clover. Ball clover has poor cold tolerance and is best suited to southern Arkansas. Bloat is a serious concern with this clover, and it should not be used in pure stands. Reseeding capability under grazing is excellent because flowers are produced close to the ground. Much of the seed is hard. Seeding rate is 2-3 lb/acre. Improved varieties are not available.

Berseem clover. Berseem clover is a relatively new addition to the list of clovers that can be grown in Arkansas. Older varieties lacked enough cold tolerance for even southern tier counties. The newer variety 'Bigbee' has enough cold tolerance to be worth risking in the southern half of the state, although it will likely winterkill in a severe winter. It is not suitable for northern Arkansas. Bigbee berseem clover has excellent tolerance of wet soils and poor drainage. It does not tolerate acid soils well, doing better on near-neutral and slightly alkaline soils. Berseem clover requires good soil fertility and will respond to boron fertilizer. It matures about a month later than crimson clover. Bloat is very unusual on berseem clover pasture. Berseem performs well under grazing if not grazed closer than 3-4 inches. Bigbee has potential to reseed itself, but is likely to be undependable. Planting rates are 10-20 lb/acre.

Hop clover. There are two species of hop clover, large hop clover and small hop clover. Hop clovers are actually medics, not true clovers, and are closely related to alfalfa. Both hop clovers are naturalized throughout Arkansas and are most often found on infertile, acid, unproductive ground. Hop clovers do not compete well with other forages when fertility is good. Dry matter production is low, maturity is very early and plants do not regrow well after being grazed. As a result, hop clover is rarely planted instead of other clovers, but it can contribute grazing and nitrogen to pastures where it is already present. Natural reseeding capability is excellent. Planting rate is 3-4 lb/acre. Improved varieties are not available.

Persian clover. Persian clover is one of the best clovers for wet, poorly drained soils. It does not tolerate acid soils, and cold tolerance is poor. It is best suited for southern Arkansas. Persian clover is one of the most dangerous clovers for causing bloat and should never be grazed if stands are more than

50 percent clover unless a bloat preventative is being fed. It tolerates close grazing well and has excellent seed production, but a high proportion of hard seeds can make stand regeneration unpredictable from year to year. Seeding rate is 3-5 lb/acre. 'Nitro' is an available improved variety.

Rose clover. Rose clover is a drought-tolerant species that has been widely used in California for years. A new variety, 'Overton' (also often referred to as R18), was developed by Texas A&M and has better adaptation to the rainfall and humidity conditions in Arkansas than do other available varieties. Rose clover is tolerant of poor soil fertility and alkaline soils, but does not like acid or wet soils. Overton rose clover is a late-maturing clover with good reseeding ability if heads are allowed to mature. It makes a high proportion of hard seeds. In Hope, Arkansas, it appears to be resistant to clover weevils. Rose clover tolerates grazing well. Bloat is not usually a problem when grazing rose clover. Seeding rate is 15-20 lb/acre.

Subterranean clover. This clover is so named because it buries its seed pods underground. This trait results in excellent reseeding potential. Subclover is a low-growing clover with excellent tolerance to close grazing and continuous stocking management. It has poor cold tolerance and is best suited to use in the southern half of Arkansas. Subclover has a relatively high rate of N fixation under ideal conditions. It is too short in stature to contribute yield to hay crops but can be used to fix N for hay crops. It is a mainstay of the Australian grazing industry, and most available varieties were developed there. A limiting factor to its usefulness in Arkansas is that light August rains often trigger seeds to germinate too early, before adequate moisture is available for growth. As a result, seedlings die. Harder-seeded varieties are being introduced into this country in an attempt to address this problem. This is the most shade-tolerant of the clovers and tolerates some wetness and soil acidity. Subclover can cause bloat. It is the clover most likely to be implicated in phytoestrogen fertility problems in sheep. However, most newer varieties have been bred for lower phytoestrogen content in order to reduce this problem. Planting rates are 10-20 lb/acre. Varieties with proven track records for Arkansas are 'Mt. Barker' and 'Denmark', and new varieties are continually being introduced from Australia.

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