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Alfalfa Management Guide

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Alfalfa is one of the highest yielding and highest quality forages. Managed properly, stands can be productive for more than five years. Timeliness of management practices is important because alfalfa is less forgiving of poor management and irregular harvest schedules than tall fescue or bermudagrass. It is a valuable forage crop and should be managed as such. This guide will outline the general management practices to maintain productive and persistent alfalfa stands. Recommendations for planting alfalfa can be found in FSA15, *Establishing Alfalfa for Forage*.

Seasonal Overview:

In Arkansas, alfalfa can usually be harvested four to five times per year. Alfalfa will begin greenup and active growth in March. It grows rapidly through April and will reach early bloom and be ready for first harvest in late April to early May. Regrowth occurs rapidly after cutting under good conditions. Alfalfa grows well through summer when soil moisture is adequate. Its deep roots gives it drought tolerance, although it may go semi-dormant during excessive drought. Growth normally recovers well following rain or after irrigation. Irrigation should be managed to avoid prolonged standing water in the field.

Alfalfa varieties are categorized by Fall Dormancy (FD) ratings which range from 1-11. Varieties best suited for Arkansas conditions are dormant in winter and are in FD classes of 2-5. Plants may retain green leaves in the crown throughout the winter even though they are not actively growing. Varieties with a FD rating of 4-5 fit well statewide; those with a FD rating of 6 are best adapted in southern locations in the state. Semi-dormant and non-dormant varieties with FD ratings of 7 or higher are not recommended because they can be severely damaged from unseasonal fall or spring freezes.

Figure 1. A well-established field of alfalfa.

Fertilization:

Alfalfa (in combination with rhizobia bacteria) fixes enough atmospheric nitrogen (N) that nitrogen fertilizer is not needed for production. Therefore, fertility management emphasis is on phosphorus (P), potassium (K), boron (B), and soil pH. Soil pH should be 6.5 - 7.0 and soil P and K levels should be medium to high before planting. Fertilizer applications should be managed to replace these nutrients removed in hay. Soil test recommendations are based on tonnage yield goals. Alfalfa will remove approximately 15 lbs

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of P2O5 and 50 lbs of K2O per ton of hay. Fertilizer recommendations factor in this nutrient removal along with additional P and K fertilizer to build soil levels of these nutrients to optimum over an 8-year period on lower fertility sites. Fertilizer can be applied in two split applications with the first application made after first cutting and the second application made after third cutting. Boron is recommended at 1-2 lbs/acre per year and can be applied with the P and K application.

Poultry litter and animal manure can be applied to alfalfa, but the N in manure is not needed. Manure application will reduce N fixation because alfalfa will use N from the manure preferentially. Litter and manure application often lead to increasing soil P levels. However, poultry litter often does not contain enough K to support hay production so supplemental K fertilizer is often required. Care should be taken if applying manure slurry to fields to avoid creating a thick layer that can smother growth.

Harvest Management:

Timing of the first cutting will range from late April to early May. The recommended stage of growth for hay harvest is when the field averages about 10 percent bloom. The date of the first cutting sets the schedule for the rest of the season. Each successive cutting will normally reach early bloom on a 30-35-day interval. This can be scheduled on a calendar to facilitate planning. In fall, alfalfa should not be cut from Sept. 15 to Nov. 1 to allow time for it to build root reserves for overwintering before going dormant. After Nov. 1, the last cutting can be taken for hay or silage or grazed as needed. This last growth can be also left in the field to serve as soil cover over the winter if the forage is not needed. A disadvantage of leaving the last growth is that more stems are available for alfalfa weevil to lays eggs and can increase weevil populations and possible damage in spring.

Hay quality can exceed 20 percent crude protein (CP) and 65 percent total digestible nutrients (TDN). Forage quality declines as the plants mature into full bloom. Plant fiber content increases with maturity and lower leaves may senesce, leading to stemmy hay. As plants mature, new shoots that make up the next cutting will begin to emerge from the crown. Significant delays in harvest can lead to these new shoots also being cut which reduces yield of the next cutting. Skipping a harvest or extended harvest delays can lead to excessive plant lodging that can smother down new shoots of the next cutting cycle. This can also lead to premature stand thinning. Plant crowns increase in size as stands thin which helps maintain yield. However, alfalfa stands do not thicken up from new seedings after plant loss as can fescue or bermuda so regular harvest management is important. Harvest delays also allows more time for insect pest populations to build, causing more damage to the crop.

Generally, alfalfa should be cut at a two- to three-inch stubble height. Regrowth occurs from new shoots from the crown and also from buds located on the lower stems. Mowing at a very short height (less than two inches) removes the stem buds and can lower yield of the following cutting.

It is best to cut alfalfa with a mower/conditioner to facilitate drying. The cut forage should be laid out in wide swaths to allow as much sunlight exposure as possible to speed drying. Raking should begin before the forage is dry enough to bale, usually at approximately 30 percent moisture, and allow it to finish drying in the windrow. Raking alfalfa that is too dry can cause leaf shattering which greatly reduces hay quality. Moisture content should be 20 percent or less for small square bales and should be less than 18 percent for large bales. Hay preservative applicators can be mounted on the baler to apply preservatives made of buffered acids that prevent heating and molding of hay baled up to 25 percent moisture. Hay preservatives can be applied as needed during humid conditions and can be turned off during good drying weather.

Grazing:

Alfalfa makes excellent pasture. Grazing should be managed to mimic hay cutting, in that it should be rotationally grazed to remove the forage in a week or less. This requires relatively high stock densities, or staging grazing of strips or paddocks early in the season to create a staggered grazing schedule across paddocks. Staging can be accomplished by beginning grazing the first paddock in spring at a height of eight to 10 inches then rotating to the next paddock. If well-timed, successive grazings for each paddock will occur at approximately the correct forage maturity. If growth in some alfalfa paddocks gets ahead of the herd, those paddocks can be cut for hay to reset them in the grazing rotation.

Common Insect Pests:

Many beneficial insects are found in alfalfa including ladybugs, lacewings, parasitic wasps, spiders, and many others. Regular scouting with a sweep net and careful field observation will help confirm presence of beneficials or pests when making IPM control decisions. Regular harvest management is an important part of an IPM program. Extended harvest delays allow pest populations to build, causing more damage to alfalfa stands. When pest populations are high, and not controlled before harvest, regrowth after cutting may be delayed from pests feeding on the new shoots.

Alfalfa weevil is the major insect pest of alfalfa, but damage occurs only on first cutting in spring. This insect can cause serious yield and stand damage if not controlled. Scouting for alfalfa weevil should start in March and continue until first cutting.

Figure 2. Severe (left) and light (right) alfalfa weevil damage. Photo by Phil Sloderbeck, Kansas State University, Bugwood.org.

Weevil larvae cause the majority of the feeding damage to the alfalfa. Adults also feed on the plants, but their impact is minimal compared to larval feeding. Feeding damage first appears as small holes in the leaves. As damage progresses, the leaves will become severely skeletonized from larva feeding. When the larvae reach full size, they migrate to the base of the plant where they spin a thin gauze-like cocoon and pupate.

Emerging adults go into dormancy during summer. They may return to fields to lay eggs in fall. Adults also lay eggs in spring so there are two peaks of larvae hatching in spring. Insecticide application should be timed to attempt to control larvae from both hatches. Insecticides for weevil should be applied when one or more larvae are present per stem and 30 percent of growing tips show feeding damage with some signs of leaf skeletonization. Generally, one well-timed insecticide application will give adequate control. Spraying too early at the first sign of damage can lead to the need for a second insecticide application. If the insecticide application is timed correctly, pyrethroids such as lambda-cyhalothrin give effective control.

A fungal pathogen and certain parasitic wasps (*Bathyplectes*, spp.) are established in Arkansas that can help reduce weevil populations enough that insecticide treatment is not needed in some years. However, the population cycles of natural enemies and weevils don't always match, so regular scouting during March and April are important. Early cutting or grazing can sometimes be effective in controlling low to moderate weevil infestations. Stubble should be scouted frequently if early harvest is used as a control measure since larvae can drop down into the stubble and feed on new shoots preventing normal "greenup" of the field. Grazing off forage in fall after Nov. 1 can remove fall-laid eggs potentially reducing spring larvae numbers.

Potato leafhopper can infest fields during summer. This insect overwinters along the Gulf Coast and is carried into Arkansas and up through the Midwest by spring storm fronts. Populations build and damage may occur from second cutting through late summer under the right conditions. Potato leafhoppers having piercing-sucking mouthparts. Damage is caused as the pest sucks sap from the leaves. During feeding, the insect injects a toxin which stunts the plant reducing yield. Visible symptoms show up as yellowing leaves. Yellowing starts at the leaf tip and extends up the midrib of the leaf in a "V" shape. The yellowed areas become necrotic and the leaf drops, further reducing yield. Scouting for leaf hoppers should be done by using a sweep net. Take several series of 20 sweeps in a pendulum motion across the field. The treatment threshold for potato leafhoppers depends upon plant height.

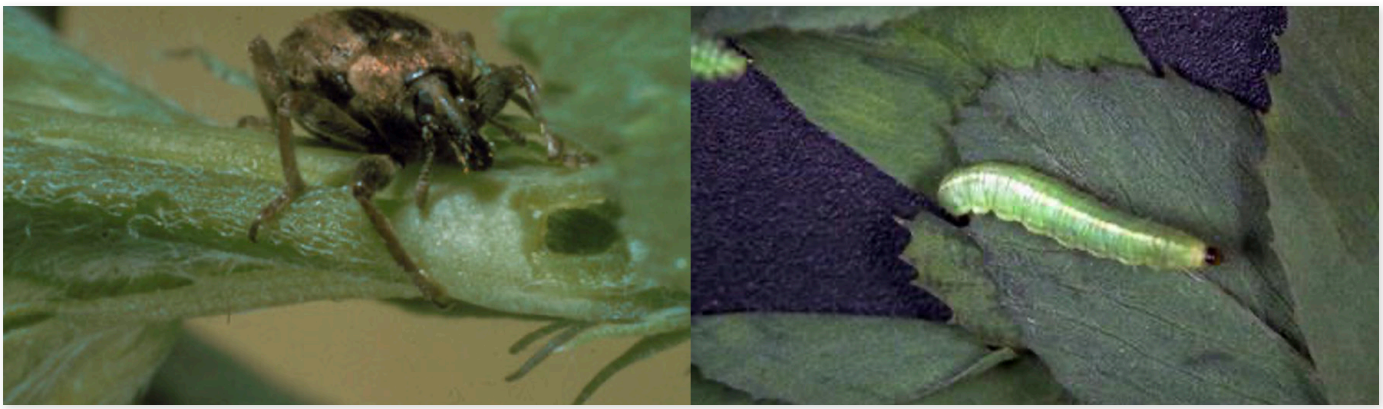

Figure 3. Adult (left) and larval (right) alfalfa weevil. Adult photo by University of Georgia, Bugwood.org and larva by Frank Peairs, Colorado State University, Bugwood.org.

Figure 4. Typical yellowing of alfalfa leaves caused by potato leafhopper.

For alfalfa three inches tall the threshold is 4 per 20 sweeps: for six inch alfalfa it is 10 per 20 sweeps and for twelve inch or greater it is 40 per 20 sweeps. Several products are labeled to control potato leafhoppers on alfalfa including pyrethoid insecticides (lambda-cyhalothrin and others), carbamates (carbaryl), organophosphates (chlorpyrifos and dimethoate) and combinations such as chlorantraniliprole/lambda-cyhalothrin.

Three-cornered alfalfa hoppers can be serious pests especially in southern Arkansas and in areas where soybeans are grown, since they are a pest of that crop as well. Damage occurs in summer and not on first cutting in spring. Three-cornered alfalfa hoppers damage plants by girdling alfalfa stems near the crown. Damage can be severe on new stands. Symptoms include leaves turning yellow, red, purple or bronze. Symptoms are often confused with boron deficiency. Girdled stems do not recover and often break off. Scouting is done with a sweep net to confirm presence of adults and nymphs and by looking for the telltale girdling near the base of affected stems. Treatment is warranted when 10 percent of stems show damage. Pyrethoid insecticides (lambda-cyhalothrin and others), carbamates (carbaryl), organophosphates (chlorpyrifos) and combinations such as chlorantraniliprole/lambda-cyhalothrin are labeled against three-cornered alfalfa hoppers on alfalfa.

Figure 5. Three-cornered alfalfa hopper adult and stem girdling.

Figure 6. Yellow and red alfalfa leaves indicating feeding damage from three-cornered alfalfa hopper. Symptoms are often confused with boron deficiency.

Aphids are common in alfalfa, but are normally kept in check by beneficial insects. Occasionally, populations can build to damaging levels. Pea aphids are the most common species. Other species of aphids have been found in Arkansas that can cause significant plant damage. For seedling alfalfa the treatment threshold is five pea aphids per plant. Chlorpyrifos or dimethoate are used to control various aphid species on alfalfa.

Figure 7. Pea aphids on alfalfa.

Foliage feeding caterpillars are occasional pests of alfalfa but are rarely a significant problem in an established crop. Examples include earworms, webworms, cloverworms, armyworms and cutworms. New alfalfa stands can be decimated by the army cutworm in early spring and variegated cutworms can cause damage during regrowth following the first harvest. Fall armyworms can also destroy newly planted alfalfa in the fall and on occasion cause defoliation in established alfalfa. Two species of webworms are known to attack alfalfa are the garden and alfalfa webworms. Garden webworms are not a common pest, but do occasionally damage alfalfa during summer. Pigweeds are a preferred host and larvae may be forced into alfalfa following a herbicide application. The larvae spin webs binding the top

Figure 8. Garden webworm larvae. *Note the 3 black dots on sides of each body segment. Large striped larva in photo is fall armyworm.*

Figure 9. Webbing and leaf skeletonization by garden webworm. *Note the larva feeding within the webbed leaves.*

leaves of plants together where they feed inside. Leaves become skeletonized.

Armyworms are more often a pest of bermudagrass in summer, but occasionally can damage alfalfa. New stands planted in spring or fall can be vulnerable. Watch emerging alfalfa seedlings carefully. Damage may show up before seedlings are well developed. Watch for skips or thin spots in alfalfa drill rows amid otherwise healthy plants. This is an early sign of feeding damage. The larvae may not be actively feeding in the daytime so probe in leaf litter on the soil surface for presence of larvae.

Because seedling alfalfa is so vulnerable, treatment should be made when you see two worms per square foot. Pyrethoid insecticides (lambda-cyhalothrin and others), carbamates (carbaryl), insect growth regulators (methoxyfenozide) and combinations such as chlorantraniliprole/lambda-cyhalothrin are labeled to control caterpillars in alfalfa. Treatment is more effective when caterpillars are small.

Blister beetles feed on alfalfa and damage can sometimes be severe enough to cause yield losses. But the greatest concern from this pest is its toxicity to horses that consume hay containing beetles killed during hay harvest. Blister beetles contain cantharidin, a compound that causes blistering when it comes in contact with the eyes, skin, mouth and digestive tract. This compound remains stable in the beetle for a long period of time following the beetle's death.

Several species such as the ash, gray, black, margined, and striped blister beetles occur in Arkansas and contain varying levels of cantharidin. Of those species, the striped blister beetle contains the highest cantharidin content and tends to congregate in large clusters in the field. The most common one found in alfalfa is the striped blister beetle, but any species can occur in fields. When the hay is mowed, especially with a mower/conditioner, the beetles may be crushed by the conditioner rollers. The beetles then can get baled up and can cause poisoning to horses consuming the hay.

Blister beetles are attracted to blooms. Harvest interval can be managed to minimize flowering alfalfa. In addition, maintain good broadleaf weed management and straddle swaths to avoid crushing beetles with tires. Insecticides such as carbaryl and lambda-cyhalothrin are labeled for control of blister beetles in hay. Complete elimination of blister beetles from alfalfa fields is very difficult, but specific harvesting and management options can help reduce the risk.

Weed Management:

Weed control is very important during alfalfa establishment. Either standard or glyphosate-tolerant alfalfa varieties are available so weed species of concern and herbicide availability must be considered before variety selection is made. For fall-planted alfalfa typical weeds of concern are henbit, chickweed, buttercup and annual ryegrass. Others may be troublesome especially when no-till planting into grass sod.

Figure 10. Armyworm damage to emerging alfalfa seedlings. *Note the alfalfa seedlings missing leaflets.*

For spring-planted alfalfa, common broadleaf weeds of concern are ragweed, pigweed and others. Johnsongrass, foxtail and crabgrass can become problems during summer. Weed control management should start well before planting and continue until the stand is well-developed. Well-established alfalfa stands are very competitive after the first year and may need little weed control. As stands thin over time, older stands may need weed control to maintain productivity.

Figure 11. Striped blister beetles on fresh-cut alfalfa.

Table 1. Typical Alfalfa Management Schedule

Month	Management Items
January-February	• Take soil samples. • Scout for winter weeds. • Check with ag suppliers for availability of herbicide, fertilizer, other inputs. • Repair and service harvesting machinery.
March-April	• Start scouting for alfalfa weevil and spray if threshold is reached. • Spray for winter weeds if needed. • Can apply first half of fertilizer or wait till after first cutting. • Prepare hay harvest equipment. • First hay harvest may occur in late April in south Arkansas.
May	• First hay harvest generally occurs within first two weeks of May for north Arkansas. • Fertilize after first cutting if not done in March. Include boron. • Second harvest will be about 30-35 days after first cut.
June	• Second cutting will be 30-35 days after first cut. • Scout for potato leafhopper and three-cornered alfalfa hopper and weeds.
July	• Third cutting should still be on the 30-35 day schedule. • Scout for summer insects, and weeds. • Apply second half of fertilizer after third cutting.
August	• Fourth cutting should still be on track unless drought reduces growth. • Scout for summer insects and weeds.
September	• Fourth cutting will be harvested if not done in August. • Do not cut or graze fields after Sept. 15 to allow plants to build root reserves for winter. Final harvest can occur after Nov. 1. • Test hay from each cutting and formulate winter livestock feeding plans.
October	• Do not graze or cut fields.
November	• Final grazing or hay harvest can occur after Nov. 1. Growth can be left unharvested if forage is not needed.
December	• Scout for winter weeds. • Formulate winter hay feeding plan using alfalfa hay/baleage. • Makes plans for next season.

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