Managing Weeds in Alfalfa

Guide A-325

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Managing weeds is a critical component of alfalfa production, and under New Mexico growing conditions, effective weed management will pay for itself if the market for alfalfa exists.

Weeds are plants that interfere with the management objectives for a particular crop or situation. Weeds negatively impact alfalfa production by competing for space, nutrients, sunlight, and moisture, and also play a major role in production of premium alfalfa, because they can reduce the quality of harvested alfalfa. Weeds affect alfalfa stands differently at the various stages of alfalfa production: prior to establishment, in the seedling stage and in established stands.

In establishing an alfalfa stand, it is critical that the field be free from perennial weeds. Weeds such as field bindweed, silverleaf nightshade, yellow nutsedge, and johnsongrass are extremely aggressive and will outcompete seedling alfalfa should the field be planted prior to their control. Taking time to manage any perennial weed prior to alfalfa establishment will pay for itself in reseeding costs or excessive weed control costs in the future.

During the seedling stage, weeds exert their greatest impact. If competition from weeds is high enough, it can cause failure of crop establishment. Light to moderate weed infestations can reduce alfalfa growth, which will delay production. In seedling alfalfa, weed type/pressure varies with the timing of seeding. In areas with mild winters, winter annual weeds may cause problems in alfalfa planted in late summer or early fall. However, weed control in New Mexico and the southern high plains is generally much easier to achieve in fall-planted alfalfa than in alfalfa planted in the spring.

In established stands of alfalfa, weeds reduce the quality of forage. A California study showed that in fields with high weed infestation forage protein content was as low as 9%. However, when the weeds were controlled alfalfa protein content increased to over 20%. The vigor of an established stand depends on how well the weeds were managed during the previous stages of production. Once a healthy alfalfa stand is established, problems associated with weeds lessen because the alfalfa becomes much more competitive. Weeds can become a problem in established stands because of factors such as poor soil fertility, improper irrigation and/or harvest management, disease and insect pressures, and other practices. Aside from standard crop rotation practices, growers report that weeds are the main reason many fields are taken out of production.

PRINCIPLES OF WEED MANAGEMENT

Weed Identification

Developing a management plan requires that growers first properly indentify the weeds. Weeds typically found in alfalfa fields are divided into three major classes: broadleaves, grasses, and sedges. Broadleaves usually have a taproot system, two cotyledons (embryonic leaves), and netted veins on the leaves. Grasses usually have a fibrous root system, a single cotyledon, and leaves with parallel veins. Sedges are often confused with grasses, but unlike grasses they have stems that are triangular in cross-section.

Weeds in each of these classes are also grouped according to their life cycles. Annual weeds, either winter or summer, complete their life cycles in one

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year. Winter annuals germinate in the fall and complete their life cycles the following spring, while summer annuals germinate in the spring and complete their life cycles in the fall. Biennial weeds such as musk thistle complete their life cycles in two years. Annual and biennial weeds spread through seed production only, so the key to effective management is to not let them set seed. Perennial weeds are capable of coming back year after year because they have vegetative reproductive structures such as rhizomes, stolons, or underground roots with adventitious buds, crowns, or tubers.

Perennials are difficult to manage because, in most cases, management plans have to deal with both vegetative reproduction and seed production. There are two groups of perennials: simple perennials and creeping perennials. Simple perennials such as common mallow and dandelion spread only by seed and have no normal means of spreading vegetatively. However, if the roots of some species are cut or broken, each piece could send out roots and stems to form a new plant. Creeping perennials, such as bindweed or johnsongrass, may reproduce not only by seeds but also by creeping roots, creeping aboveground stems (stolons), or creeping underground stems (rhizomes). Some of the more common weeds found in New Mexico alfalfa fields during different stages of alfalfa production are listed in Table 1.

Management Options

Successful weed management requires an integrated approach that includes multiple strategies. There are four general weed management strategies used in alfalfa: (1) preventive, (2) mechanical, (3) cultural and (4) chemical management. Sustainable weed control requires a system that integrates these management strategies. The following will provide a basis for consideration.

Preventive weed management

The most important part of integrated weed management is preventive management. Growers can prevent weeds from getting into the field. Strategies such as managing weeds in the fencerow or along ditches, controlling weeds before they set seeds, planting certified seed, and taking time to remove weeds from harvesting equipment when going from field to field reduce the potential spread of weeds such as field bindweed, johnsongrass, sandbur, and other troublesome weeds.

Cultural weed management

The central theme of cultural weed management is giving alfalfa the competitive edge against weeds. Begin by ensuring the field is free of any major weed problems before planting. Planting certified seed and varieties suited for the area are two other ways the grower can improve chances of good establishment. Maintaining proper field fertility and managing any disease or insect problem also helps alfalfa establishment prior to weeds. When using flood irrigation, growers can give alfalfa a competitive edge by knowing when to turn the water off. By not overwatering, growers reduce ponding, which drowns alfalfa and favors weed invasion. If irrigation occurs soon after cutting alfalfa, the added moisture can favor summer annual grasses because there will not be enough regrowth from the alfalfa to shade out the competing grasses. Irrigating prior to cutting, then harvesting the alfalfa as soon as possible allows the alfalfa to be more competitive. Although ideal in some ways, this is not always possible due to irrigation schedules. Proper harvest management (particularly during the last cutting of the season) allows alfalfa plants to store root energy prior to harvesting and, therefore, helps maintain a dense and healthy alfalfa stand.

Mechanical weed management

Although quite effective in row crop production, mechanical weed management offers little help in managing weeds in alfalfa. Fields heavily infested with winter annual mustards often are cut prematurely to eliminate the mustards. However, the mustards produce lateral branches from below the cut stem, produce new flowers, and go to seed anyway.

Chemical weed management

Growers may opt to use herbicides to manage weeds. A list of currently registered herbicides for alfalfa in New Mexico and some information regarding their usage is given in Table 2. Be sure to read and understand the label before using the

Table 1. Some of the Common Weeds Associated with the Different Stages of Alfalfa Production

Common name	Scientific name	Class	Life cycle*
Prior to establishment			
Bermudagrass	*Cynodon dactylon*	Grass	CP
Field bindweed	*Convolvulus arvensis*	Broadleaf	CP
Johnsongrass	*Sorghum halepense*	Grass	CP
Purple nutsedge	*Cyperus rotundus*	Sedge	CP
Silverleaf nightshade	*Solanum elaeagnifolium*	Broadleaf	CP
Texas blueweed	*Helianthus ciliaris*	Broadleaf	CP
Yellow nutsedge	*Cyperus esculentus*	Sedge	CP
Fall-seeded seedling alfalfa			
Downy brome (cheatgrass)	*Bromus tectorum*	Grass	WA
Flixweed	*Descurainia sophia*	Broadleaf	WA
London rocket	*Sisymbrium irio*	Broadleaf	WA
Rescuegrass	*Bromus catharticus*	Grass	WA
Shepherdspurse	*Capsella bursa-pastoris*	Broadleaf	WA
Tansymustard	*Descurainia pinnata*	Broadleaf	WA
Spring-seeded seedling alfalfa			
Dodder	*Cuscuta spp.*	Broadleaf	SA
Green foxtail	*Setaria viridis*	Grass	SA
Kochia	*Kochia scoparia*	Broadleaf	SA
Pigweed species	*Amaranthus spp.*	Broadleaf	SA
Russian thistle	*Salsola iberica*	Broadleaf	SA
Sandbur (grassbur)	*Cenchrus spp.*	Grass	SA
Yellow foxtail	*Setaria glauca*	Grass	SA
Yellow nutsedge	*Cyperus esculentus*	Sedge	SA
Established alfalfa stands			
Bermudagrass	*Cynodon dactylon*	Grass	CP
Common mallow	*Malva neglecta*	Broadleaf	SP
Dandelion	*Taraxacum officinale*	Broadleaf	SP
Dodder	*Cuscuta spp.*	Broadleaf	SA
Downy brome (cheatgrass)	*Bromus tectorum*	Grass	WA
Flixweed	*Descurainia sophia*	Broadleaf	WA
Green foxtail	*Setaria viridis*	Grass	SA
Johnsongrass	*Sorghum halepense*	Grass	CP
Kochia	*Kochia scoparia*	Broadleaf	SA
London rocket	*Sisymbrium irio*	Broadleaf	WA
Pigweed species	*Amaranthus spp.*	Broadleaf	SA
Plantain	*Plantago spp.*	Broadleaf	SP
Purple nutsedge	*Cyperus rotundus*	Sedge	CP
Rescuegrass	*Bromus catharticus*	Grass	WA
Russian thistle	*Salsola iberica*	Grass	SA
Shepherdspurse	*Capsella bursa-pastoris*	Broadleaf	WA
Tansymustard	*Descurainia pinnata*	Broadleaf	WA
Whorled milkweed	*Asclepias spp.*	Broadleaf	CP
Yellow foxtail	*Setaria glauca*	Grass	SA
Yellow nutsedge	*Cyperus esculentus*	Sedge	CP

*WA = Winter annual, B = Biennial, SP = Simple perennial, SA = Summer annual and CP = Creeping perennial

Table 2. List of Herbicides Registered for Use on Alfalfa in New Mexico (2008)[a] [b]

		Weed		Timing		
Common name	**Example of trade name[c]**	**Grass**	**Broadleaf**	**Prior to establishment**	**Seedling**	**Established**
Benefin	Balan DF	Yes	Yes	Yes	No	No
Bromoxynil	Buctril	No	Yes	No	Yes	No
	Buctril 4EC					
2,4-DB Amine	Butoxone 200	No	Yes	No	Yes	Yes
	Butoxone 7500					
	Butyrac 200					
Clethodim	Select 2E	Yes	No	No	Yes	Yes
Diuron	Karmex DF	Yes	Yes	No	No	Yes
EPTC	Eptam 7E	Yes	Yes	Yes	Yes	Yes
Flumioxazin	Chateau	Yes	Yes	No	No	Yes
Glyphosate	Roundup	Yes	Yes	Yes	No	No
Hexazinone	Velpar DF, L	Yes	Yes	No	No	Yes
Imazamox	Raptor	Yes	Yes	No	Yes	Yes
Imazethapyr	Pursuit 2S	Yes	Yes	No	Yes	Yes
	Pursuit DF					
Metribuzin	Lexone DF	Yes	Yes	No	No	Yes
	Sencor 4F, DF					
Metam-Potassium	K-PAM HL	Yes	Yes	Yes	No	No
Metam-Sodium	Metam CLR 42%	Yes	Yes	Yes	No	No
MCPA	MCP Amine 4	No	Yes	No	No	Yes
Norflurazon	Solicam DF	Yes	Yes	No	No	Yes
Paraquat	Gramoxone Extra	Yes	Yes	Yes	No	Yes
Pelargonic acid	Scythe	Yes	Yes	Yes	No	Yes
Pendimethalin	Prowl H2O	Yes	Yes	No	Yes	Yes
Pronamide	Kerb 50W	Yes	Yes	No	Yes	Yes
Pyraflufen-ethyl	ET Herbicide	No	Yes	Yes	No	No
Sethoxydim	Poast	Yes	No	No	Yes	Yes
	Poast Plus					
Terbacil	Sinbar	Yes	Yes	No	No	Yes
Trifluralin	Treflan 4EC, MTF	Yes	Yes	No	Yes	Yes
	Treflan 5					
	Treflan TR–10					
	Trilin 4EC, 10–G					
	TRI–4 EC, DF					

[a] Note Table 3

[b] The list is current as of December 2008; however, labels change frequently, and the herbicide's current label should be reviewed for the most recent conditions or restrictions before it is used. Read all labels carefully and comply with their site-use directions. For the very latest label information on a given herbicide, contact the manufacturer, Extension services in your area, or the company or distributor that sells the product.

[c] Other trade names of the above mentioned active ingredients alone or in combination may be available in the market. (Notice: Mention of herbicide trade names does not constitute endorsement of any material).

product. Pay particular attention to information such as timing of application, rates of application, types of weeds controlled, harvest or grazing restrictions, and rotation restrictions. Many times, an herbicide's poor performance or nonperformance can be traced to improper use and failure to follow label directions.

When using chemical control, growers need to be advised that repetitive usage of a single herbicide or of a particular herbicide family with the same site of action could select for herbicide-resistant weed biotypes. Therefore, make sure to rotate herbicides with different sites of action and do not make more than two consecutive applications of herbicides with the same site of action against the same weed. If possible, combine herbicides based on the label direction. Mixing two or more herbicides can delay/prevent the development of herbicide resistance in weeds and dramatically increase the spectrum of weed control, since no single herbicide controls all weeds commonly found in alfalfa.

If you have been relying on one particular herbicide for several years and notice that some weed species that were effectively controlled in past seasons are now abundant, or that some species are now present that you have not dealt with before, this could be an indication that a herbicide-resistant biotype or a shift in weed species has developed.

The following information on herbicides can help producers develop an effective alfalfa weed management program. Most chemical labels can be accessed at either http://www.greenbook.net or http://cdms.net.

Herbicide Common Name	Example of Trade name	Timing	Rates of application
Benefin	Balan DF	Incorporate pre-plant	2.0–2.5 lb Balan DF/acre
Comments: A pre-plant herbicide that must be incorporated within 4 hours following application if the soil is moist, and within 8 hours under dry soil conditions. This herbicide will not control mustard species but can be effective on small-seeded broadleaf weeds and annual grasses.			
Bromoxynil	Buctril Buctril 4EC	Post-emergence	1.0–1.5 pt Buctril/acre 0.5–0.75 pt Buctril 4EC/acre
Comments: Buctril and Buctril 4EC are labeled only for seedling alfalfa. Make applications after the alfalfa has at least four trifoliate leaves. Applications made when temperature is expected to exceed 80°F at and 3 days following application can result in unacceptable crop injury. Be sure to read the label for harvest and crop rotation restrictions. Studies have shown that this herbicide is not very effective when applied alone, but control is improved when it is tank-mixed with 2,4–DB Amine.			
Clethodim	Select 2E	Post-emergence	6-8 Fl oz. Select 2E/acre
Comments: Clethodim is a grass herbicide with no activity on broadleaf weeds that may be applied to seedling and established stands of alfalfa. Always add a crop oil concentrate at 1.0% v/v to final spray solution. Do not apply within 15 days of grazing, feeding, or harvesting alfalfa for forage or hay. Select offers control of several winter annual Bromus species as well as sandbur and the summer annual foxtails.			

Herbicide Common Name	Example of Trade name	Timing	Rates of application
2,4–DB Amine	Butoxone 200 Butoxone 7500 Butyrac 200	Post-emergence	4.0-6.0 pt Butoxone 200/acre 1.33- 2.0 pt Butoxone 7500/acre 2.0–6.0 pt Butyrac 200/acre

Comments: 2,4-DB Amine is a "Restricted Use Pesticide," so the applicator is required to be certified. Some broadleaf crops such as cotton are as sensitive to 2,4-DB Amine as many weeds, and only a trace of the chemical as spray drift, vapor drift or contaminant in soil or water may cause serious damage. Thus, follow label precautions carefully to minimize the possible unwanted crop injuries.

In seedling alfalfa: Apply in spring or fall when seedling alfalfa has at least two trifoliate leaves and weeds are less than 3 inches tall. Do not graze treated fields for 60 days following application.

In established stands: Certain winter annual mustards are better controlled using a late fall/early winter treatment. The grazing restriction for treated fields is 30 days.

Do not apply this herbicide if daytime temperature is expected to exceed 90°F or drop below 40°F within the 2 or 3 days following application. Field research in New Mexico showed this to be an inconsistent treatment; sometimes it works and other times it doesn't appear to provide any control. In seedling stands, the addition of bromoxynil has improved 2,4DB Amine's efficiency, but erratic results still are observed.

Diuron	Karmex 80DF	Pre/Post-emergence	1.5–3.0 lb Karmex 80DF/acre

Comments: While there is some post-emergence activity with this herbicide, uptake from the soil by susceptible plants is the main mechanism for activity. Uptake requires some form of incorporation, usually irrigation or rainfall, within 2 weeks of application. Studies have shown that if the incorporation occurs sooner than 2 weeks post-application, control improves. The strength of this herbicide is its mustard control, for which applications must be made following the **alfalfa's fall dormancy and before regrowth occurs in the spring**. Do not make applications to frozen ground. Be sure to read all crop rotation restrictions on the label.

EPTC	Eptam 7E	Incorporate pre-plant	3.5–4.5 pt Eptam 7E/acre (seedling alfalfa)
		Pre-emergence	2.25–3.5 pt Eptam 7E/acre (established stands)

Comments: As a pre-plant-incorporated treatment, it is important to incorporate 3–4 inches deep immediately following the application. In established stands, the herbicide is usually applied by chemigation. The strength of this herbicide is its activity on yellow and purple nutsedge.

Flumioxazin	Chateau	Pre/Post-emergence	0.25–10 oz. Chateau/acre

Comments: While there is some post-emergence activity with this herbicide, weeds mainly are controlled by residual activity of Chateau. Applications should be made as soon as possible after cutting and removing alfalfa to minimize injury to alfalfa regrowth. Chateau may be applied to established alfalfa with a maximum amount of regrowth of 6 inches or less for the pre-emergence control of the weeds. Application to alfalfa with greater than 6 inches of regrowth may result in unacceptable crop injury.

Herbicide Common Name	Example of Trade name	Timing	Rates of application
Glyphosate	Roundup 4S	Post-emergence	4 pt Roundup 4S/acre

Comments: In conventional alfalfa, this herbicide is for site preparation and spot treatment only. Glyphosate is a nonselective herbicide, so any alfalfa that comes in contact with it will be killed or severely damaged. Application rates depend on the weed species. Adding a surfactant and nitrogen fertilizer improves efficacy, as does reducing the total sprayer output volume to about 10 gal/acre of total spray solution.

In Roundup Ready alfalfa, glyphosate can be applied at any stage of alfalfa production based on the label direction. However, in order to prevent or delay the occurrence of herbicide-resistant weed species, and control the glyphosate tolerant weed species, it is recommended to apply glyphosate in a mixture with other registered alfalfa herbicides, such as Pursuit, based on the label direction.

Hexazinone	Velpar DF	Pre/Post-emergence	1/3–2.0 lb Velpar DF/acre
	Velpar L		1.0–6.0 pt Velpar L/acre

Comments: Application rates are based on soil type and organic matter content. Make applications to well-established stands in the fall after the onset of dormancy and before the field begins regrowth in the spring. Do not make applications to frozen ground. Moisture is necessary within 2 weeks after application to activate the herbicide in the soil. Do not graze for 28 days after application. Be sure to observe all crop rotation restrictions on the label.

Field studies have shown that at low application rates, this herbicide will not only control winter annual mustards, but also provides partial to complete control of winter annual grasses. At higher rates, residual control of some weed species may continue into summer and fall. Hexazinone is also available in mixture with Diuron (e.g., VELPAR ALFAMAX).

Imazamox	Raptor	Post-emergence	4.0–6.0 fl oz Raptor/acre

Comments: Apply Raptor when the majority of weeds are 1–3 inches tall. In seedling alfalfa Raptor should be applied when seedling alfalfa is in the second (2nd) trifoliate stage or larger. In established stands, raptor can be applied in the fall, winter or spring to dormant or semi-dormant alfalfa or between cuttings. Any application should be made before significant alfalfa growth or regrowth (3 inches) to allow Raptor to reach the target weeds.

Do not make sequential application of Pursuit herbicide followed by Raptor (or Raptor followed by Pursuit) within a 60-day timeframe due to increased potential alfalfa crop response.

Imazethapyr	Pursuit 2S	Post-emergence	3.0–6.0 fl oz Pursuit 2S/acre

Comments: The key to obtaining good weed control with Pursuit is applying the product to small weeds. Applications can be made to seedling stands when alfalfa has at least two trifoliate leaves and when the majority of the weeds are 1–3 inches tall. With established stands, applications need to be made in accordance to the weed size. The standard rate of 4 fl oz/acre has shown outstanding control of winter annual mustards. This product also can provide extended control of annual grasses and mixes well with clethodim and sethoxydim.

When using Pursuit, remember:

- It is critical that an adjuvant, either a surfactant or a crop oil concentrate, be added to the spray mixture according to the label directions.
- Studies have shown that adding a liquid fertilizer solution (such as 28% N, 32%N or 10-34-0) improves the product's performance. Apply 1–2 qt/acre.
- The following cropping rotations apply to the use of Pursuit:

Peanuts	Anytime	Wheat	4 months	Field corn	8.5 months
Cotton	18 months	Lettuce	8 months	Chile	40 months

These rotation restrictions frequently change, so be sure to check the most current label for any adjustments.

Herbicide Common Name	Example of Trade name	Timing	Rates of application
Metribuzin	Lexone 75DF Sencor 4F Sencor 75DF	Pre/Post-emergence	0.5–1.33 lb Lexone 75DF/acre 0.75–2.0 pt Sencor 4F/acre 0.5–1.3 lb Sencor 75DF/acre

Comments: Make a single application in the fall to well-established alfalfa stands following the beginning of dormancy and before regrowth begins in the spring. To become activated, the herbicide requires moisture within 2 weeks after application. Do not use on soils with a pH greater than 7.5. The labeled grazing restriction is 28 days.

Metam-Potassium	K-PAM HL	Incorporate pre-plant	30–60 gallons/acre
Metam-Sodium	Metam CLR 42%	Incorporate pre-plant	15–74.5 gallons/acre

Comments: K-PAM HL and Metam CLR 42% are soil fumigants for control of several weed species, soilborn fungi, nematodes and insects. These products are applied following harvest of the previous crop and 14 to 21 days before alfalfa is planted. In some locations, fall application is preferred as the products will dissipate over the winter, which allows planting in favorable springtime conditions. These products will suppress or control pests that are in the fumigated zone at time of treatment; however, application rates will vary depending on the soil texture and the depth of treatments.

MCPA	MCP AMINE 4	Post-emergence	1 pt MCP AMINE 4/acre

Comments: MCPA is registered for broadleaf weed control in alfalfa and should be applied in late fall following frosts **when alfalfa is dormant.**

Norflurazon	Solicam DF	Pre-emergence	1.25-2.5 lb. Solicam DF/acre

Comments: Rates of application are based on soil texture. Do not apply to alfalfa less than 5 months old. On young alfalfa, apply no more than 1.25 lb of product the first time, with a second application of 1.25 lb later in the year if needed. Incorporation is necessary to activate this pre-emergence herbicide, either through rainfall, irrigation, or tillage. Rotation restriction: Only cotton, soybeans, peanuts, and asparagus may be planted in fields previously treated with Solicam DF, with peanuts showing a greater sensitivity to the herbicide. Solicam DF may be tank-mixed with several of the registered alfalfa herbicides.

Paraquat	Gramoxone Extra	Post-emergence	Application-dependent rates

Comments: Paraquat is a "Restricted Use Pesticide," so the applicator is required to be certified. Paraquat can be used at two times:

1- Before planting or emergence of alfalfa, but after weeds emerge: Apply after weeds have emerged, but before seedling alfalfa has emerged. This herbicide will kill any emerged alfalfa. Application rates of 2.0–3.0 pt of Gramoxone Extra plus surfactant must be applied in 20 gal of water per acre. If applied by air, reduce the spray solution to 3 gal/acre of total spray mix. This application will control emerged annual weeds and burn off emerged perennial weeds. Do not allow grazing on treated areas.

2- Between cuttings: Apply 12.8 fl oz of Gramoxone Extra plus surfactant in 20 gal of water per acre. Applications must be made within 5 days following alfalfa cutting. If seedling stands are allowed to regrow more than 2 inches before application, the application will injure the stand but will not likely kill the plants. In first-year alfalfa, make no more than two applications; established stands can tolerate up to three applications in one year. Do not apply by air. A harvesting restriction of 30 days is associated with the use of this herbicide.

Herbicide Common Name	Example of Trade name	Timing	Rates of application
Pelargonic acid	Scythe	Post-emergence	Application-dependent rates 3–10%

Comments: Pelargonic acid is a contact, non-selective, broad-spectrum herbicide that can be used for burndown before planting or emergence of alfalfa, but after weeds emerge, and between cuttings but before regrowth. This herbicide will damage emerged or green alfalfa.

For best control or burndown use the indicated rate of this product in 75 to 200 gallons of spray solution per acre through boom, hand-held or high volume equipment. Use 3–5% solution for annual weeds and vegetation, 5–7% solution for perennial herbaceous and late stage annuals, and 7–10% for maximum vegetation burndown.

Pendimethalin	Prowl H_2O	Pre-emergence	1.0–4.0 qt Prowl H_2O/acre

Comments: Apply to established alfalfa grown for forage/hay. For seedling alfalfa, Pendimethalin can be applied at 1 to 2 pints per acre, once alfalfa has reached the 2nd trifoliate stage of development, but prior to reaching 6 inches in growth. In established alfalfa, pendimethalin can be applied: 1) in the fall after the last cutting, 2) during the winter dormancy, 3) in the spring or between cuttings, but before the alfalfa reaches 6 inches in regrowth. Application made after the alfalfa exceeds 6 inches in height may result in poor weed control. Do not apply this product less than 50 days prior to harvest for forage or hay.

For optimum dodder control the highest labeled rate should be used. Be sure to read the label for harvest and crop rotation restrictions.

Pronamide	Kerb 50W	Pre/Post-emergence	1.0–4.0 lb Kerb 50–W/acre

Comments: Pronamide is a "Restricted Use Pesticide," so the applicator is required to be certified. Application rates depend on the weed species to be controlled and whether there is furrow or overhead irrigation. Apply during the fall or winter months before the soil freezes. Optimum herbicidal activity is achieved when applications are made at air temperatures 55°F or lower and are followed by water incorporation. In seedling alfalfa, do not apply this product before the trifoliate leaf stage. Field studies conducted in the state have not shown this option to be very effective or consistent. Be sure to observe all restrictions on the label.

Pyraflufen-ethyl	ET Herbicide	Pre-Plant burndown	0.5–2.0 fl oz ET Herbicide/acre

Comments: Pyraflufen-ethyl must be applied at least 30 days prior to planting for contact (burndown) broadleaf weed control. For best results use this product for control of annual or perennial herbaceous broadleaf weeds less than 4 inches in height, or rosettes less than 3 inches in diameter. Addition of a crop oil concentrate or nonionic surfactant is recommended for optimum control.

Sethoxydim	Poast 1.5 E Poast Plus 1.0 E	Post-emergence	1.5–2.5 pt Poast/acre 1.5–3.75 pt Poast Plus/acre

Comments: Sethoxydim controls only grass weeds. Application rates are based upon the grass species to be controlled and the county and state in which you live. The addition of a crop oil concentrate is critical. The addition of UAN solution or ammonium sulfate also improves control. Ground applications must be made with equipment calibrated to deliver at the rate of 10 gal/acre of total spray solution. Applications are most effective to young, actively growing weeds, so growers may need to irrigate before making the application.

Herbicide Common Name	Example of Trade name	Timing	Rates of application
Terbacil	Sinbar 80W	Pre/Post-emergence	0.5–1.5 lb Sinbar/acre

Comments: Apply to well-established stands in the fall after the beginning of dormancy and before the field begins regrowth in the spring. Do not make applications to frozen ground. To become active, the herbicide requires moisture within 2 weeks after application. There is no grazing restriction with the use of this herbicide. Be sure to observe all crop rotation restrictions on the label.

Low application rates have proven effective when applied to young, actively growing winter annual mustards.

Trifluralin	Treflan 4EC, MTF	Pre-emergence	1.5–4.0 pt Treflan 4EC/acre
	Treflan 5		1.2–3.2 pt Treflan 5/acre
	Treflan TR-10		20 lb Treflan TR-10/acre
	Trilin 4EC		1.5–2.0 pt Trilin 4EC/acre
	Trilin 10-G		20 lb Trilin 10-G/acre
	TRI-4 EC		1.5–2.0 pt TRI-4 EC/acre
	TRI-4 DF		1.4–1.66 lb TRI-4 DF/acre

Comments: When considering the use of trifluralin, be sure to read the label: certain formulations can be water incorporated, while others must be incorporated using "incorporation equipment that will ensure thorough soil mixing with a minimum of damage to established alfalfa." Use of the granular formulations, Treflan TR-10 and Trilin 10-G, requires specific application equipment and an incorporation requirement of 3 days following application. Use of Treflan 4EC, MTF, and Treflan 5 includes an option for "surface application which is activated by rainfall or irrigation," in which higher rates can be applied in the fall for control of winter annual grasses. Such applications must be made between August 1 and October 1. Observe a 21-day grazing restriction.

According to its label, two applications of Treflan TR-10 at the rate of 20 lb Treflan TR-10/acre can be used to control dodder. The first application must be made in the spring prior to weed germination. The second application should be made 60 days following the first, or after at least two cutting cycles. Applications can be made both with ground and aerial application equipment. Incorporate within 3 days after application.

When considering the use of an herbicide, nothing can take the place of reading the label and making applications according to label directions. Pay attention to label information on controlled weed species, timing of application, rates of application, and methods of incorporation. Also note other directions such as worker protection standards, requirements for personal protective equipment (PPE), restricted entry interval (REI), storage and disposal and sprayer cleanup.

Table 3. Weed Susceptibility to Herbicides Labeled for Use on Alfalfa in New Mexico[†‡].

Weed Species	Benefin	Bromoxynil	Clethodin	2, 4DB Amine	Diuron	EPTC	Flumioxazin	Glyphosate	Hexazinone	Imazamox	Imazethaphyr	Metribuzin	Metam-Potassium	Metam-Sodium	MCPA	Norflurazon	Paraquat*	Pelargonic acid*	Pendimethalin	Pronamide	Pyraflufen-ethyl	Sethoxydim	Terbacil	Trifluralin
Bermudagrass	N	N	C	N	N	N	N	C	N	?	N	N	C	C	N	N-P	N-P	N-P	N	N	N	C	N	N
Common mallow	N	N	N	N-P	N	N	?	C	P-C	C	C	P-C	C	C	N-P	N	N-P	N-P	?	N	C	N	N	N
Dandelion	N	N	N	P	N	N	C	P	N	P	N	N	C	C	P-C	N	N-P	N-P	N	N	C	N	N	N
Dodder	N	N	N	N	N	N	?	N	N	N-P	N	N	N	N	N	N	P-C	?	P-C	C	?	N	N	C
Downy brome	P	N	P-C	N	P	N	?	C	P-C	?	N	P-C	?	?	N	C	N-P	N-P	P-C	N	N	P-C	P-C	C
Flixweed	N	N-P	N	N-P	P-C	N	?	P-C	C	C	C	C	?	?	?	N	N-P	N-P	?	N	?	N	P-C	N
Green foxtail	P-C	N	C	N	N	C	N	C	N	C	P-C	N	?	?	N	C	N-P	N-P	C	C	N	C	P-C	C
Johnsongrass:																								
Seedling	P	N	C	N	N	C	?	C	N	C	N	N	C	C	N	C	N-P	N-P	C	N	N	C	N	N
Rhizome	N	N	C	N	N	N	N	C	N	P	N	N	?	?	N	N	N	N	N	N	N	P-C	N	N
Kochia	N	N-P	N	N-P	P	N	C	C	N	C	C	N	?	?	P-C	P	N-P	N-P	P-C	N	C	N	N	P-C
London rocket	N	N-P	N	P-C	P-C	N	?	C	P-C	C	C	P-C	?	C	C	N	N-P	N-P	P-C	N	?	N	P-C	N
Pigweed species	P	N-P	N	P	P-C	C	C	C	P	C	C	N-P	C	C	P-C	C	N-P	N-P	C	N	C	N	N-P	C
Plantain	N	N	N	N	N	N	N	P	N	?	N	N	?	?	C	N	N	N	?	N	?	N	N	N
Purple nutsedge	N	N	N	N	N	P-C	N	P	N	P	N	N	C	C	N	P-C	N	N	N	N	N	N	N	N
Rescuegrass	P	N	P-C	N	N-P	C	?	P-C	P-C	?	N	P-C	?	?	N	C	N-P	N-P	?	P-C	N	P-C	P-C	C
Russian thistle	N	N	N	P	N-P	N	C	C	P	C	C	N-P	?	?	P-C	N	N-P	N-P	N-P	N	C	N	N	P-C
Sandbur	P-C	N	C	N	N	C	?	C	N	?	N	N	?	?	N	C	N-P	N-P	C	N	N	C	N-P	C
Shepherdspurse	N	N-P	N	N-P	P-C	N	C	P-C	P-C	P	C	P-C	C	C	C	N	N-P	N-P	P-C	C	C	N	C	N
Transymustard	N	N-P	N	N-P	P-C	N	?	P-C	P-C	C	C	P-C	?	?	?	N	N-P	N-P	?	C	?	N	P-C	N
Whorled milkweed	N	N	N	N	N	N	?	P	N	?	N	N	?	?	?	N	N	N	?	N	?	N	N	N
Yellow foxtail	P-C	N	C	N	N	C	N	C	N	C	P-C	N	?	?	N	C	N-P	N-P	C	C	N	C	P	C

[†] N = no control, N-P = Non to partial control, P = partial control, P-C = partial to acceptable control, C = acceptable control, ? = insufficient information available to make a rating.

[‡] Values for the table are based upon label information and results of field work in the state.

* The ratings are based on applications in between cuttings, however, when these herbicides are applied before planting (site preparation) or emergence of alfalfa, but after weeds emerge and are actively growing, they provide acceptable control of most annual broadleaf and grass weeds.

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