

Managing Weeds in Alfalfa

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In New Mexico, managing weeds is a critical component of premium alfalfa production. Uncontrollable environmental factors affect production whether or not weeds are controlled. However, under New Mexico growing conditions, effective weed management will pay for itself if the market for premium alfalfa exists.

Weeds are plants that interfere with the management objectives for a particular crop or situation. In alfalfa production weeds play a major role in determining whether or not premium alfalfa is produced. Weeds hurt alfalfa production by competing for space, nutrients, sunlight, and moisture. The presence of weeds in harvested alfalfa reduces its quality.

Weeds affect alfalfa stands differently at the various stages of alfalfa production—prior to establishment, seedling, and established stands. In establishing an alfalfa field, it is critical that the field is free from perennial weeds. Weeds such as field bindweed, silverleaf nightshade, yellow nutsedge, and Johnson-grass are extremely aggressive and will out-compete 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.

During the second stage of production, the seedling stage, weeds exert their greatest impact. If competition from weeds is high enough, it can cause the entire crop to fail to establish. Light to moderate weed infestations can reduce alfalfa growth, which will delay the field getting into production. With seedling alfalfa, weed pressure varies with the timing of seeding. Fields planted in the fall in areas with mild winters will have a problem with winter annual weeds. In areas with more severe winters where fields are planted in the spring, growers will have to contend with summer annual weeds as well as any perennial weeds that may be emerging with the seedling alfalfa.

In established stands, weeds reduce the quality of alfalfa. A California study showed that alfalfa containing 80% weeds had an overall protein content as low as 9%. However, when the weeds were con-

trolled, 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 alfalfa can compete with them. Weeds can become a problem in established stands because of factors such as poor soil fertility, improper irrigation practices, disease and insect pressures, and other natural and cultural 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 the grower first be able to identify the weeds. Weeds typically found in alfalfa fields are divided into three major classes: broadleaves, grasses, and sedges. Broadleaves have a taproot system, two cotyledons (embryonic leaves), and netted veins. Grasses have a fibrous root system, a single cotyledon, and leaves with parallel veins. Sedges have stems that are triangular in cross-section.

Each of these classes also are grouped according to their life cycles. Annual weeds, either winter or summer, complete their life cycle in one year. Winter annuals germinate in the fall and complete their life cycle the following spring, while summer annuals germinate in the spring and complete their life cycle in the fall. Biennial weeds complete their life cycle 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, and tubers. Perennials are difficult to manage because any plan has

to deal with both vegetative reproduction and seed production. This class of weeds has, like the annuals, includes two different groups. Simple perennials have a simple, nonbranching root system, while creeping perennials have a root system that spreads vertically and horizontally in the soil.

Table 1 lists some of the more common weeds found in New Mexico alfalfa fields during the different stages of alfalfa production.

Table 1. Common weeds associated with the different stages of alfalfa production.

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

Russian thistle	<i>Salsola iberica</i>	Grass	SA
Shepherdspurse	<i>Capsella bursa-pastoris</i>	Broadleaf	WA
Tansymustard	<i>Descurainia pinnata</i>	Broadleaf	WA
Whorled milkweed	<i>Asclepias</i> spp.	Broadleaf	CP
Yellow foxtail	<i>Setaria glauca</i>	Grass	SA
Yellow nutsedge	<i>Cyperus esculentus</i>	Sedge	CP

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

Management Options

In developing a management program, the following strategies will provide a basis for consideration.

Preventive Weed Management

Growers can prevent weeds from getting into the field. This involves such strategies as managing weeds in the fence row or along ditches. Taking time to remove weeds from harvesting equipment when going from field to field reduces 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 gives alfalfa a fighting chance.

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 inva-

sion. 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 cutting the alfalfa as soon as possible allows the alfalfa to be more competitive. Though ideal in some ways, this is not always possible due to irrigation schedules.

Mechanical Weed Management

Though 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 seed anyway.

Chemical Weed Management

Growers may opt to use herbicides to manage weeds. Be sure to read and understand the label before using the product. Pay particular attention to information such as timing of application, rates of application, types of weeds controlled, grazing restrictions, and rotation restrictions. Many times, an herbicide's poor or nonperformance can be traced to improper use and failure to follow label directions.

The following is a list of herbicides registered for use on alfalfa in New Mexico:

<u>Common name</u>	<u>Common trade name</u>	<u>Weed</u>		<u>Timing</u>		
		<u>G*</u>	<u>B</u>	<u>AP</u>	<u>S</u>	<u>E</u>
Benefin	Balan DF	Yes	Yes	Yes	No	No
Bromoxynil	Buctril 2EC	No	Yes	No	Yes	No
	Buctril Gel					
2,4-DB Amine	Butoxone 200	No	Yes	No	Yes	Yes
	Butoxone 1.75EC					
	Butyrac 200					
Diuron	Karmex DF	Yes	Yes	No	No	Yes
EPTC	Eptam 7E	Yes	Yes	Yes	Yes	Yes

Glyphosate	Roundup	Yes	Yes	No	No	Yes
Hexazinone	Velpar 90W, 2L	Yes	Yes	No	No	Yes
Imazethapyr	Pursuit 2S	Yes	Yes	No	Yes	Yes
	Pursuit DF					
Metribuzin	Lexone DF	Yes	Yes	No	No	Yes
	Sencor 4F, DF					
Norflurazon	Zorial Rapid 80	Yes	Yes	No	No	Yes
Paraquat	Gramoxone Extra	Yes	Yes	Yes	No	Yes
Pronamide	Kerb 50W	Yes	Yes	No	No	Yes
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					

G = Grass

AP = At planting

B = Broadleaves

S = Seedling

E = Established

Note Table 2 (pg. 8).

The following information on herbicides can help the producer develop an effective alfalfa weed management program.

<u>Common name</u>	<u>Trade name</u>	<u>Timing</u>	<u>Rates of application</u>
Benfenin	Balan DF	Incorporate preplant	2.0–2.5 lb Balan DF/acre

COMMENTS: A preplant 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.

Bromoxynil	Buctril 2EC	Postemergence	1.0–1.5 pt Buctril 2EC/acre
	Buctril Gel		0.5–0.75 pt Buctril Gel/acre

COMMENTS: Buctril 2EC and Gel are labeled only for seedling alfalfa. Make applications after the alfalfa has at least four trifoliolate leaves. Studies have shown that this herbicide is not very effective when applied alone, but when tank mixed with 2,4-DB Amine, control improves.

Clethodium	Select 2E	Postemergence	6-8 Fl oz. Select 2E/acre
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COMMENTS: May be applied to seedling and established stands of alfalfa. Always add a crop oil concentrate at 1.0% v/v 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.

2,4-DB Amine	Butoxone 200	Postemergence	4.0 pt Butoxone 200/acre
	Butoxone 1.75EC		4.33 pt Butoxone 1.75/acre
	Butyrac 200		2.0–6.0 pt Butyrac 200/acre

COMMENTS: Seedling alfalfa—Apply in spring or fall when seedling alfalfa has at least two trifoliolate leaves and weeds are less than 3" tall. Do not graze treated fields for 60 days following application. 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 work 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/Postemergence 1.5–3.0 lb Karmex 80DF/acre

COMMENTS: While there is some postemergence 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 observed all crop rotation restrictions on the label.

EPTC Eptam 7E Incorporate preplant 3.5–4.5 pt Eptam 7E/acre (seedling al
falfa)
Preemergence 2.25–3.5 pt Eptam 7E/acre (established
stands)

COMMENTS: As a preplant incorporated treatment, it is important to incorporate 3–4" deep immediately following the application. In established stands, the herbicide is usually metered into the irrigation water. The strength of this herbicide is its activity on yellow and purple nutsedge.

Glyphosate Roundup 4S Postemergence 0.25–10 pt Roundup 4S/acre

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

Hexazinone Velpar 90W Pre/Postemergence 0.5–1.5 lb Velpar 90W/acre
Velpar L 1.5–6.0 pt Velpar L/acre

COMMENTS: 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 applying this herbicide. Be sure to observe all crop rotation restrictions on the label.

Field work show 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.

Imazethapyr Pursuit 2S Postemergence 3.0–6.0 fl oz Pursuit 2S/acre

COMMENTS: Applications can be made to seedling stands when alfalfa has at least two trifoliolate leaves and when the majority of the weeds are 1–3" 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.

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 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	18 months
Sorghum	18 months
Chile	40 months

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

Metribuzin	Lexone 75DF	Pre/Postemergence	0.5–1.33 lb Lexone 75DF/acre
	Sencor 4F		0.75–2.0 pt Sencor 4F/acre
	Sencor 75DF		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 active, 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.

Norflurazon	Zorial Rapid 80	Preemergence	1.25-2.5 lb. Zorial Rapid 80/acre
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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 preemergence herbicide, either through rainfall, irrigation, or tillage. Rotation restriction: Only cotton, soybeans, peanuts, and asparagus may be planted in fields treated with Zorial Rapid 80, with peanuts showing a greater sensitivity to the herbicide. Zorial Rapid 80 may be tank mixed with several of the registered alfalfa herbicides.

Paraquat	Gramoxone Extra	Postemergence	Application-dependent rates
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COMMENTS: Paraquat is a “Restricted Use Pesticide,” so the applicator is required to be certified. Paraquat can be used at two times:

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.

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” before application, the application will injure the stand. 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.

Pronamide	Kerb 50W	Pre/Postemergence	1.0–4.0 lb Kerb 50–W/acre
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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. Field work conducted in the state have not found this option very effective or consistent.

Sethoxydim	Poast 1.5 E	Postemergence	1.5–2.5 pt Poast/acre
	Poast Plus 1.0 E		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.

Terbacil	Sinbar 80W	Pre/Postemergence	0.5–1.5 lb Sinbar/acre
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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	Preemergence	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 because 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) and restricted entry interval (REI), storage and disposal, and sprayer cleanup.

Table 2. Weed susceptibility to herbicides labeled for use on typical weeds in New Mexico alfalfa fields.*

Weed species	Benflin	Bromoxynil	Clethodim	2,4DB Amine	Diuron	EPTC	Glypho- sate	Hexazi- none	Imaze- thapyr	Metribuzin	Norflu- razon	Paraquat	Pronamide	Sethoxy- dim	Terbacil	Trifluralin
Bermudagrass	N	N	C	N	N	N	C	N	N	N	N-P	N-P	N	C	N	N
Common mallow	N	N	N	N-P	N	N	C	P-C	C	P-C	N	N-P	N	N	N	N
Dandelion	N	N	N	P	N	N	P	N	N	N	N	N-P	N	N	N	N
Dodder	N	N	N	N	N	N	N	N	N	N	N	P-C	C	N	N	C
Downy brome	P	N	P-C	N	P	N	C	P-C	N	P-C	C	N-P	N	P-C	P-C	C
Flixweed	N	N-P	N	N-P	P-C	N	P-C	C	C	C	N	N-P	N	N	P-C	N
Green foxtail	P-C	N	C	N	N	C	C	N	P-C	N	C	N-P	C	C	P-C	C
Johnsongrass:																
Seedling	P	N	C	N	N	C	C	N	N	N	C	N-P	N	C	N	N
Rhizome	N	N	C	N	N	N	C	N	N	N	N	N	N	P-C	N	N
Kochia	N	N	N	N-P	P	N	C	N	C	N	P	N-P	N	N	N	C
London rocket	N	N-P	N	P-C	P-C	N	C	P-C	C	P-C	N	N-P	N	N	P-C	N
Pigweed species	P	N	N	P	P	C	C	N	C	N	C	N-P	N	N	N-P	C
Plantain	N	N	N	N	N	N	P	N	N	N	N	N	N	N	N	N
Purple nutsedge	N	N	N	N	N	C	P	N	N	N	P-C	N	N	N	N	N
Rescuegrass	P	N	P-C	N	N-P	C	P-C	P-C	N	P-C	C	N-P	P-C	P-C	P-C	C
Russian thistle	N	N	N	P	N	N	C	N	C	N	N	N-P	N	N	N	C
Sandbur	P-C	N	C	N	N	C	C	N	N	N	C	N-P	N	C	N-P	C
Shepherdspurse	N	N-P	N	N-P	P-C	N	P-C	P-C	C	P-C	N	N-P	C	N	C	N
Tansymustard	N	N-P	N	N-P	P-C	N	P-C	P-C	C	P-C	N	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
Yellow foxtail	P-C	N	C	N	N	C	C	N	P-C	N	C	N-P	C	C	P	C

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