
Managing Weeds in Legumes

Managing weeds in forages requires a different approach than weed management in row crops. Over 95% of the weed control in a healthy forage crop comes from the competition provided by the forage. However, to maintain a relatively weed-free forage, proper fertilization, cutting management, insect control, the use of disease-resistant varieties, and selective herbicide use are necessary to keep the forage stand competitive.

If weeds become a problem, they can compete or interfere for light, nutrients, water, and space, directly influencing yield and standability. Common chickweed infestations in alfalfa have been reported to reduce forage stand by more than 30%. Common chickweed emerges in the fall and winter and early in spring develops a thick lush mat that can compete with the first forage cutting. Once the chickweed dies in early summer, summer annual weeds such as foxtails, lambsquarters, and pigweed or perennial weeds such as dandelion can replace the dead or dying winter annual weeds and continue to reduce forage yield and quality.

Unlike most grain or fiber crops from which weeds are separated at harvest, weeds are often harvested along with the forage crop, potentially reducing quality. Reductions in quality are often in the form of lower protein content and feed digestibility. Although weeds do have some feed value, this value differs among species. Dandelions come close to equaling alfalfa in protein and total digestible nutrients (TDN). Control of dandelion may not necessarily improve the quality of hay, but it may be of some value in reducing the time necessary to dry the hay, since dandelion dries more slowly than alfalfa. Increased drying time may mean greater harvest losses due to untimely rainfall.

Grassy weed quality can be similar to that of the forage. In general, weedy grasses have about 75% of the quality of alfalfa. However, controlling quackgrass in alfalfa can increase forage protein levels 4% to 7%. Weeds with woody stems or flower stalks, such as yellow rocket, white cockle, rough fleabane, curly dock, and broadleaved dock, have lower protein levels (about 50% of the quality of alfalfa), so controlling them is even more important.

When weeds are present or persist in spite of good management, herbicides can help improve yield and quality. Weed control at establishment or in the seedling year is most critical for maintaining a healthy forage stand. When weeds are controlled the seedling year, the forage crop seldom requires additional herbicide treatments for at least the first two years of the stand.

Weed management in forages can be divided into two phases: control in the establishment or seedling year and control in an established stand.

Control before and during establishment

Managing weeds in forages begins long before crop establishment. Certain types of weeds are potentially serious problems for forages, so it is important to eliminate them in advance. In particular, perennial broadleaves and grasses such as dandelion, curly dock, Canada thistle, and quackgrass are much easier to manage prior to planting a forage crop. In addition, biennial weeds such as musk thistle, wild carrot, and burdock should be eliminated before establishing forage. If these weeds are not removed before the seeding is made, they commonly persist throughout the life of the forage. The cost of controlling weeds before or at the time of seeding should be considered an investment that will be returned for the life of the stand.

Below are some general rules for managing weeds at establishment or in the seedling year:

1. Weeds that emerge with the crop are generally more destructive.
2. Maintain the forage relatively weed-free for the first 60 days.
3. Weeds that emerge beyond 60 days will not influence that year's forage yield.
4. Later-emerging weeds may still influence forage quality.
5. Winter annual weed competition in early spring is most damaging to forages.
6. Broadleaved weeds are generally more competitive against legumes than grassy weeds.

Herbicides are needed most often during establishment, and several options exist for managing weeds in pure legume seedlings. In no-till seedings, adequately controlling the existing vegetation prior to planting is very important, especially perennials. Weed control is also very important while the forage is young and prone to competition from invading species.

Control in established alfalfa

The best weed control in an established forage stand is achieved by maintaining a dense healthy stand through proper fertilization, cutting management, and insect control. Controlling weeds in established forages is normally of greatest benefit in the first cutting. Weeds generally cause less yield loss in the second and succeeding harvests. Before using a herbicide in established stands, evaluate the forage to ensure it is worth the cost of the herbicide.

Below are some general rules to follow before using a herbicide in established forage stands:

1. Thin or irregular stands will not thicken once weeds are removed. Be sure there are sufficient desirable species to fill in the gaps. Use the following guidelines to evaluate stands.

Stems per square foot	Effect on Yield
55	Stem density not limiting yield
40-55	Some yield reduction expected
<40	Significant yield reduction

Year	Minimum number of plants/square foot
Fall of seeding year	25-30
2 nd	10-15
3 rd or older	5-6

2. Weeds tolerant of the herbicide may invade the space left by susceptible species, ultimately creating a more severe weed problem.
3. Only well-established vigorous stands should be treated with herbicides.
4. If the forage stand is at least two years old and 25% to 30% are weeds, removing them with an herbicide application is of questionable value.
5. If 50% or greater of the stand are weeds, it is time to rotate to a different crop.
6. Weed control in established stands is most effective when herbicides are applied in the fall or early spring. Application of Sencor or Velpar in winter when established alfalfa is dormant is the most effective method of broadleaf weed control.

If weeds become a problem in established forages, several herbicide options are available. Chemical control in established forage legumes is often limited to late fall or early spring applications. Also, many products have harvesting, feeding, or grazing restrictions following their use.

Adapted with modifications from the Penn State Field Crop Pest Management/Agronomy Guide.

Table 18. Weed Response to Herbicides in Alfalfa

This table compares the tolerance of forages to herbicides and the relative effectiveness of herbicides on individual weeds. Ratings are based on labeled application rate and weed size or growth stage. Performance may vary due to weather and soil conditions or other variables.

Forage crop tolerance rating:

0 = excellent tolerance; 1 = Good Tolerance; 2 = Fair Tolerance; 3 or greater = Poor Tolerance; and N = No Information.

Weed control rating:

9 = 90% to 100%; 8 = 80% to 90%; 7 = 70% to 80%; 6 = 60% to 70%; 5 = 50% to 60%; 0 = less than 50% control.

	Forage Crop Tolerance		Grasses										Broadleaf Weeds																	
	Alfalfa	Red Clover	BFT	Barnyardgrass	Crabgrass	Downy Brome	Fall Panicum	Foxtails	Orchardgrass	Quackgrass	Volunteer Grain	Yellow Nutsedge	Canada Thistle	Chickweed	Dandelion	Dock, Curly	Field Pennycress	Henbit	Lambsquarters	Mustard, Wild	Nightshade	Pigweed	Plantain	Ragweed, Common	Ragweed, Giant	Shepherd's purse	Smartweed	Wild Radish	Yellow Rocket	
Balan	1	1	1	9	9	9	9	9	5	5	8	0	0	8	0	0	0	5	9	0	0	9	0	0	0	0	0	0	0	0
Eptam	1	1	1	9	9	9	9	9	6	8	8	8	0	7	0	0	6	9	9	6	8	9	0	5	0	7	5	0	7	
Bromoxynil	2	N	N	0	0	0	0	0	0	0	0	0	6	6	0	0	8	8	9	8	9	8	0	9	8	9	9	0	7	
Butyrac	1	1	1	0	0	0	0	0	0	0	0	0	6	8	5	9	6	8	9	2	8	2	9	9	9	9	6	0	8	
Glyphosate	6	9	9	9	9	9	9	9	8	9	9	7	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	8	9	
Gramoxone	1	N	N	8	7	9	9	9	5	5	6	0	0	8	0	0	9	9	8	9	9	9	5	9	9	9	9	8	8	
Kerb	1	1	1	8	8	9	6	8	7	8	9	0	0	8	0	0	5	8	6	5	6	6	0	5	5	5	5	0	0	
Poast/Poast Plus	0	0	0	9	9	9	9	9	6	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pursuit	1	N	N	6	7	3	7	8	0	0	0	5	6	8	0	0	8	8	6	9	9	9	N	6	7	9	9	N	8	
Raptor	2	N	N	6	7	3	7	8+	0	0	0	4	6	8	0	0	8	8	8	9	9	9	N	7	8	9	8	N	8	
Select	0	0	0	9	8+	9	9	9	6	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sencor	1	N	N	6	5	9	6	6	5	5	5	0	0	9	7	6	9	9	9	9	5	9	8	8	5	9	9	9	9	
Sinbar	1	N	N	6	7	9	6	7	5	5	5	0	0	9	6	6	9	9	9	9	6	8	7	8	5	9	8	9	7	
Velpar	1	N	N	7	7	8	6	7	6	5	5	0	0	9	8	6	9	8	9	9	6	9	8	8	5	9	8	9	9	

Forages

Forages: Establishment and Seedling Year

Herbicide	Formulation	Product Rate Range
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Butyrac 200 (2,4-DB)	2L	1 - 3 qt
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- Mode of action: growth regulator.
- Controls annual broadleaf weeds in alfalfa, clovers, and birdsfoot trefoil. Do not use on sweet clover.
- Apply in spring or fall when legumes have 2 to 4 trifoliolate leaves. Annual weed seedlings should be no more than 2 to 3 inches tall. Rosettes should be no more than 2 inches across and not bolting. Weeds that emerge in the fall and overwinter in the rosette stage (mustards, field pennycress) may be more easily controlled in late fall than in spring.
- Apply 1 to 2 quarts/A when weeds are less than 1 inch tall, and 2 to 3 quarts when weeds are 1 to 3 inches tall. Use the 3-quart rate for smartweed or curly dock.
- Do not harvest or graze for 60 days following treatment.
- Butyrac 200 can be tank-mixed with Poast Plus for control of a mixed population of grass and broadleaf weeds in alfalfa only.

Herbicide	Formulation	Product Rate Range
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Buctril/Moxy	2S	1 - 1 1/2 pt
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- Mode of action: photosynthesis inhibitor.
- Apply in the spring to seedling alfalfa with 4 trifoliolate leaves when weeds have less than 4 leaves or are less than 2 inches tall, or before rosettes are 1 inch in diameter.
- Apply in a minimum spray volume of 20 gpa with a minimum spray pressure of 30 psi.
- For improved control of pigweed, tank-mix 1 pint of Buctril/Moxy with 1 quart of Butyrac 200.
- Crop leaf burn often occurs from Buctril/Moxy application and is increased by warm, humid conditions. To avoid serious crop injury, do not treat when temperatures will exceed 70 F on the day of and for 3 days following application. Injury can be more severe when tank-mixed with Butyrac 200.
- Do not apply when alfalfa is under stress from moisture, temperature, insects, or disease.
- Do not graze or harvest for 30 days following treatment.

Herbicide	Formulation	Product Rate Range
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Eptam	7E 10G	3 1/2 - 4 1/2 pt 30 lb
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Balan	1.5EC	3 - 4 qt
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- Mode of action: root meristem inhibitor (Balan), shoot meristem inhibitor (Eptam).
- Control annual grasses and some broadleaf weeds in alfalfa, clovers, and birdsfoot trefoil. High rates of Eptam provide some control of yellow nutsedge and quackgrass.
- Apply to prepared seedbed shortly before seeding, and incorporate 2 to 3 inches deep immediately following application.
- Do not use when a companion crop of grain or forage grass is in the seeding mixture.
- Do not use Eptam on white Dutch clover.
- Do not use Balan on soils high in organic matter.

Herbicide	Formulation	Product Rate Range
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Forages: Establishment and Seedling Year

Gramoxone Max	3L	0.75 pt (between cuttings) 0.75 - 1.3 pts (dormant)
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- Mode of action: cell membrane disruptor.
- Controls or suppresses small emerged grass and broadleaf weeds in dormant stands or between cuttings. Weeds beyond the seedling stage may not be controlled. Gramoxone provides effective control of henbit, but control of common chickweed is variable.
- Apply with 1 pint nonionic surfactant per 100 gallons spray in a minimum spray volume of at least 10 gpa. Increase spray volume where foliage is dense.
- When using between cuttings, apply no later than 5 days after alfalfa has been removed. Injury to first-year alfalfa will be more severe than to established stands. Stand and yield may be reduced if alfalfa is allowed to regrow more than 2 inches between cutting and application. Do not make more than 2 applications during the first growing season.
- When using on dormant alfalfa, apply during winter or early spring before alfalfa starts new growth. Early-spring application is usually most effective. Do not cut or harvest within 42 days after application. Do not apply more than once during the first growing season.

Herbicide	Formulation	Product Rate Range
Kerb	50W	1 - 3 lb

- Mode of action: shoot meristem inhibitor.
- Apply to alfalfa in the fall after the soil temperature is below 60F and until the ground freezes. Alfalfa plants must have reached the first trifoliolate leaf stage.
- Use 1 to 1 1/2 pounds per acre to control volunteer grains and chickweed, and 2 to 3 pounds to control quackgrass.
- Do not graze or harvest for 120 days following application.

Herbicide	Formulation	Product Rate Range
Poast	1.5E	12 - 24 oz
Poast Plus	1E	18 - 36 oz

- Poast (sethoxydim) and Poast Plus (sethoxydim plus Dash) control annual and perennial grasses in alfalfa and clover.
- Mode of action: ACCase inhibitor.
- Apply with Dash (1 pint/A) or crop oil concentrate (2 pints/A). For best control of crabgrass, volunteer cereals, and quackgrass, also include nitrogen fertilizer solution (1/2 to 1 gallon/A) or ammonium sulfate (2 1/2 lbs/A).
- For control of volunteer wheat in summer seedings, apply 24 ounces /A of Poast or 36 ounces/A of Poast plus with Dash or crop oil concentrate plus UAN or AMS. Apply in the fall before wheat is 4 inches tall and prior to tillering.
- Apply in spray volume of 5 to 20 gpa with a pressure of 40 to 60 psi. Adjust spray pressure, spray volume, and boom height to ensure penetration of canopy and coverage of grasses.
- The rate is 16 oz/A of Poast or 24 oz/A of Poast Plus per acre for control of most annual grasses up to 8 inches tall. The rate may be reduced for control of barnyardgrass, giant and green foxtails, and fall panicum that are up to 4 inches tall and actively growing.
- Quackgrass and other perennial grasses require higher rates and often two applications. Apply 24 oz/A of Poast or 36 oz/A of Poast Plus when quackgrass is 6 to 8 inches tall, and make a second application at 2/3 the initial rate when regrowth reaches the same height.
- Oats inter-seeded with alfalfa may be killed with a rate of 16 oz/A of Poast or 24 oz/A of Poast Plus before oats exceed 10 inches in height.
- Not recommended for control of cereals planted the previous fall.
- May be tank-mixed with Butyrac 200 for control of a mixed population of grass and broadleaf weeds. Apply this tank-mix with crop oil concentrate only, and observe feeding, grazing, and harvesting restrictions for Butyrac.
- Tank-mixing Poast or Poast Plus with Pursuit often results in reduced grass control.
- Allow 1 hour between application and rainfall.
- Do not apply to grasses under stress from lack of moisture, herbicide injury, or low temperatures.
- Do not feed, graze, or harvest forage for 7 days following application. Do not feed or harvest dry hay for 14 days following application.

Herbicide	Formulation	Product Rate Range
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Forages: Establishment and Seedling Year

Pursuit	70DG	1.08 - 2.16 oz
	2S	3 - 6 oz

- Pursuit (imazethapyr) is a translocated imidazolinone herbicide that controls annual broadleaf weeds and controls or suppresses grasses. Control of ragweeds and lambsquarters is variable. Does not control ALS-resistant weeds.
- Mode of action: ALS inhibitor.
- Can be applied postemergence to seedling or established alfalfa. Apply when seedling alfalfa is in the 2nd trifoliate stage or larger. For established alfalfa, Pursuit can be applied in the fall after the last cutting, in the spring before or after alfalfa breaks dormancy, or between cuttings. Apply spring treatments before alfalfa growth exceeds 3 inches to allow adequate spray coverage on weeds.
- Pursuit application may cause a temporary yellowing or reduction in alfalfa height.
- Apply in a spray volume of at least 10 gpa with nonionic surfactant (1 qt/100 gallons) or crop oil concentrate (1 1/2 to 2 pints/A) plus nitrogen fertilizer solution (1 to 2 quarts/A) or spray grade ammonium sulfate (2 1/2 lbs/A). Control of large or drought-stressed weeds will be maximized when the higher rates of fertilizer are used in combination with a seed-oil based crop oil concentrate (Meth Oil, Priority MSO, or Sun-It II, for example).
- Can be tank-mixed with Buctril/Moxy, 2,4-DB, or Poast Plus to control additional weeds. Control of some grasses may be reduced when tank-mixed with Poast Plus.
- Apply when annual weeds are 1 to 3 inches tall. For low growing weeds such as mustards, apply before the rosette exceeds 3 inches in diameter.
- If replanting is necessary in a field treated with Pursuit, do not replant to alfalfa for 4 months following application. See label for other recrop restrictions.

Herbicide	Formulation	Product Rate Range
Raptor	1AS	4 - 6 oz

- Raptor (imazamox) is a translocated imidazolinone herbicide that controls annual broadleaf and grass weeds. Raptor generally provides better control of lambsquarters and annual grasses than Pursuit. Control of common and giant ragweeds and waterhemp is variable. Raptor provides a shorter period of residual control compared to Pursuit. Does not control ALS-resistant weeds.
- Mode of action: ALS inhibitor.
- Can be applied postemergence to seedling or established alfalfa. Apply when seedling alfalfa is in the 2nd trifoliate stage or larger, and when weeds are 1 to 3 inches tall or when rosettes are 1 to 3 inches wide.
- Raptor application may cause a temporary yellowing or reduction in alfalfa height.
- Raptor should be applied with nonionic surfactant (1 to 2 quarts/100 gallons spray) or a crop oil concentrate (1 to 2 gallons/100 gallons) plus 10-34-0 or 28 percent fertilizer solution (2.5 gallons/100 gallons) or ammonium sulfate (12 to 15 pounds/100 gallons). Ammonium sulfate is generally the preferred nitrogen source over UAN or 10-34-0. Control of large or drought- or temperature-stressed weeds will be maximized when the higher rates of fertilizer are used in combination with a seed oil-based crop oil concentrate (Meth Oil or Sun-It II, for example).
- Apply in a spray volume of 10 to 20 gpa with a pressure of 20 to 40 psi. Flat fan spray nozzles are recommended for adequate plant coverage. Allow 1 hour between application and rainfall.
- Control may be reduced when weeds are growing slowly under cold or dry conditions. If possible, wait for rain and resumption of active weed growth before applying Raptor. If air temperatures reach or stay below 50 F for 10 or more hours, delay application for 48 hours from the time temperatures increase above 50 F.
- Can be tank-mixed with one or more of the following: Buctril/Moxy, Poast/Poast Plus, Select, or 2,4-DB.

Herbicide	Formulation	Product Rate Range
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Forages: Establishment and Seedling Year

Select/Arrow

2EC

6 - 16 oz

- Select/Arrow (clethodim) controls annual and perennial grasses in alfalfa.
- Mode of action: ACCase inhibitor.
- Apply at a rate of 6 to 8 ounces per acre for control of annual grasses up to 8 inches tall. Perennial grasses will generally require higher rates and may require more than one application. Application should be delayed until perennial weeds are at least 4 to 12 inches tall for best results.
- Apply with crop oil concentrate (1% v/v) in a spray volume of 10 to 40 gpa at a pressure of 30 to 60 psi.
- May be tank-mixed with Butyrac 200 for control of a mixed population of grass and broadleaf weeds. Observe feeding, grazing, and harvesting restrictions for Butyrac.
- Allow 15 days between application and grazing, feeding, or harvesting of alfalfa.
- Allow 1 hour between application and rainfall.

Forages: Established Stands

Herbicide	Formulation	Product Rate Range
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Butyrac 200 (2,4-DB)	2L	1 - 3 qt
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- Mode of action: growth regulator.
- Apply to alfalfa only in spring or fall when weeds are no more than 2 to 3 inches tall, or when rosettes are no more than 2 inches across and not bolting. Weeds that emerge in the fall and overwinter in the rosette stage (mustards, field pennycress) may be more easily controlled in late fall than in spring.
- Apply 1 to 2 quarts/A when weeds are less than 1 inch tall, and 2 to 3 quarts when weeds are 1 to 3 inches tall. Use the 3-quart rate for smartweed or curly dock.
- Butyrac can be tank-mixed with Poast Plus for control of a mixed population of grass and broadleaf weeds.
- Do not harvest or graze for 30 days following application.

Herbicide	Formulation	Product Rate Range
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Gramoxone Max	3L	0.75 pt (between cuttings) 1.5 - 2 pt (dormant)
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- Mode of action: cell membrane disruptor.
- Apply with 0.125 to 0.25 percent nonionic surfactant in a spray volume of at least 10 gallons per acre. Increase spray volume to 15 to 20 gpa where foliage is dense.
- When using between alfalfa cuttings, apply immediately after alfalfa is removed. Controls annual grass and broadleaf weeds. Do not delay treatment more than 5 days after cutting. Apply only once during the season. Do not graze or harvest forage for 30 days following application.
- When using on dormant alfalfa or alfalfa-forage grass stands, apply in fall or early spring to control annual grass and broadleaf weeds. Higher rates will suppress forage grasses. Early-spring application is usually most effective. Increase spray volume for larger weeds. Gramoxone provides effective control of henbit, but control of common chickweed is variable.
- Do not graze or harvest forage for 42 days following dormant application.

Herbicide	Formulation	Product Rate Range
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Kerb	50W	1 - 3 lb
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- Mode of action: shoot meristem inhibitor.
- Can be used on alfalfa, clover, birdsfoot trefoil, and crown vetch stands that do not contain a forage grass.
- Controls many perennial grasses, volunteer grains, downy brome, and chickweed.
- Apply in the fall after soil temperature is below 60 F and until the ground freezes. Do not apply to frozen ground.
- Use 1 to 1 1/2 pounds per acre to control volunteer grains, downy brome, and chickweed. Use 2 to 3 pounds to control quack-grass.
- Do not graze or harvest forage for 120 days following application.

Herbicide	Formulation	Product Rate Range
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Forages: Established Stands

Poast	1.5E	12 - 24 oz
Poast Plus	1E	18 - 36 oz

- Poast (sethoxydim) and Poast Plus (sethoxydim plus Dash) control annual and perennial grasses in alfalfa and clover.
- Mode of action: ACCase inhibitor.
- Apply with Dash (1 pint/A) or crop oil concentrate (2 pints/A). For best control of crabgrass, volunteer cereals, and quackgrass, also include nitrogen fertilizer solution (1/2 to 1 gallon/A) or ammonium sulfate (2 1/2 lbs/A).
- For control of volunteer wheat in summer seedings, apply 24 ounces /A of Poast or 36 ounces/A of Poast plus with Dash or crop oil concentrate plus UAN or AMS. Apply in the fall before wheat is 4 inches tall and prior to tillering.
- Apply in spray volume of 5 to 20 gpa with a pressure of 40 to 60 psi. Adjust spray pressure, spray volume, and boom height to ensure penetration of canopy and coverage of grasses.
- The rate is 16 oz/A of Poast or 24 oz/A of Poast Plus per acre for control of most annual grasses up to 8 inches tall. The rate may be reduced for control of barnyardgrass, giant and green foxtails, and fall panicum that are up to 4 inches tall and actively growing.
- Quackgrass and other perennial grasses require higher rates and often two applications. Apply 24 oz/A of Poast or 36 oz/A of Poast Plus when quackgrass is 6 to 8 inches tall, and make a second application at 2/3 the initial rate when regrowth reaches the same height.
- Oats inter-seeded with alfalfa may be killed with a rate of 16 oz/A of Poast or 24 oz/A of Poast Plus before oats exceed 10 inches in height.
- Not recommended for control of cereals planted the previous fall.
- May be tank-mixed with Butyrac 200 for control of a mixed population of grass and broadleaf weeds. Apply this tank-mix with crop oil concentrate only, and observe feeding, grazing, and harvesting restrictions for Butyrac.
- Tank-mixing Poast or Poast Plus with Pursuit often results in reduced grass control.
- Allow 1 hour between application and rainfall.
- Do not apply to grasses under stress from lack of moisture, herbicide injury, or low temperatures.
- Do not feed, graze, or harvest forage for 7 days following application. Do not feed or harvest dry hay for 14 days following application.

Herbicide	Formulation	Product Rate Range
Pursuit	70DG	1.08 - 2.16 oz
	2S	3 - 6 oz

- Pursuit (imazethapyr) is a translocated imidazolinone herbicide that controls annual broadleaf weeds and controls or suppresses grasses. Control of ragweeds and lambsquarters is variable. Does not control ALS-resistant weeds.
- Mode of action: ALS inhibitor.
- Can be applied in the fall after the last cutting, in the spring before or after alfalfa breaks dormancy, or between cuttings. Apply spring treatments before alfalfa growth exceeds 3 inches to allow adequate spray coverage on weeds.
- Pursuit application may cause a temporary yellowing or reduction in alfalfa height.
- Apply in a spray volume of at least 10 gpa with nonionic surfactant (1 qt/100 gallons) or crop oil concentrate (1 1/2 to 2 pints/A) plus nitrogen fertilizer solution (1 to 2 quarts/A). Control of large or drought-stressed weeds will be maximized when the higher rates of fertilizer are used in combination with a seed-oil based crop oil concentrate (Meth Oil, Priority MSO, or Sun-It II, for example).
- Can be tank-mixed with Buctril/Moxy, 2,4-DB, or Poast Plus to control additional weeds. Control of some grasses may be reduced when tank-mixed with Poast Plus.
- Apply when annual weeds are 1 to 3 inches tall. For low growing weeds such as mustards, apply before the rosette exceeds 3 inches in diameter.
- If replanting is necessary in a field treated with Pursuit, do not replant to alfalfa for 4 months following application. See label for other recrop restrictions.

Herbicide	Formulation	Product Rate Range
Raptor	1AS	4 - 6 oz

Forages: Established Stands

- Raptor (imazamox) is a translocated imidazolinone herbicide that controls annual broadleaf and grass weeds. Raptor generally provides better control of lambsquarters and annual grasses than Pursuit. Control of common and giant ragweeds and waterhemp is variable. Raptor provides a shorter period of residual control compared to Pursuit. Does not control ALS-resistant weeds.
- Mode of action: ALS inhibitor.
- Can be applied postemergence to established alfalfa at the following times: 1) in early spring when alfalfa is dormant and winter annual weeds are emerging; 2) before the first cutting; 3) between cuttings; or 4) in the fall after the last cutting. Apply before alfalfa growth exceeds 3 inches to allow adequate spray coverage on weeds. Weeds should be no more than 1 to 3 inches tall or 1 to 3 inches wide (for rosettes) at the time of application.
- Raptor application may cause a temporary yellowing or reduction in alfalfa height.
- Raptor should be applied with nonionic surfactant (1 to 2 quarts/100 gallons spray) or a crop oil concentrate (1 to 2 gallons/100 gallons) plus 10-34-0 or 28 percent fertilizer solution (2.5 gallons/100 gallons) or ammonium sulfate (12 to 15 pounds/100 gallons). Ammonium sulfate is generally the preferred nitrogen source over UAN or 10-34-0. Control of large or drought- or temperature-stressed weeds will be maximized when the higher rates of fertilizer are used in combination with a seed oil-based crop oil concentrate (Meth Oil or Sun-It II, for example).
- Apply in a spray volume of 10 to 20 gpa with a pressure of 20 to 40 psi. Flat fan spray nozzles are recommended for adequate plant coverage. Allow 1 hour between application and rainfall.
- Control may be reduced when weeds are growing slowly under cold or dry conditions. If possible, wait for rain and resumption of active weed growth before applying Raptor. If air temperatures reach or stay below 50 F for 10 or more hours, delay application for 48 hours from the time temperatures increase above 50 F.
- Can be tank-mixed with one or more of the following: Buctril/Moxy, Poast/Poast Plus, Select, or 2,4-DB.

Herbicide	Formulation	Product Rate Range
Glyphosate	Various	2% v/v solution

- Table 22 contains a list of currently available glyphosate products. See labels for more information on this type of application.
- Mode of action: EPSP synthase inhibitor.
- Apply as a spot treatment to problem weeds that cannot be controlled by any other means.
- Apply to actively growing, susceptible weeds.
- To avoid crop injury, avoid contact with desirable, nontarget vegetation (forage).
- For maximum effectiveness on target vegetation, refer to label for recommended timing of application.
- Treat no more than 1/10 of an acre at one time. Further applications may be made to the same area at 30-day intervals.
- Do not graze or harvest for 14 days following application.

Herbicide	Formulation	Product Rate Range
Select/Arrow	2EC	6 - 16 oz

- Select/Arrow (clethodim) controls annual and perennial grasses in alfalfa.
- Mode of action: ACCase inhibitor.
- Apply at a rate of 8 ounces per acre for control of annual grasses up to 8 inches tall. Perennial grasses will generally require higher rates and may require more than one application. Application should be delayed until perennial weeds are at least 4 to 12 inches tall for best results.
- Apply with crop oil concentrate (1% v/v) in a spray volume of 10 to 40 gpa at a pressure of 30 to 60 psi..
- May be tank-mixed with Butyrac 200 for control of a mixed population of grass and broadleaf weeds. Observe feeding, grazing, and harvesting restrictions for Butyrac.
- Allow 15 days between application and grazing, feeding, or harvesting of alfalfa.
- Allow 1 hour between application and rainfall.

Herbicide	Formulation	Product Rate Range
Sencor	4F	1/2 - 2 pt

Forages: Established Stands

75DF

1/3 - 1 1/3 lb

- Mode of action: photosynthesis inhibitor.
- Apply once in the fall or spring to dormant alfalfa (before new growth starts).
- Application rate varies with target weed, and soil texture and organic matter content.
- Controls downy brome and most winter annual weeds, including chickweed, henbit, mustards, and yellow rocket. High rates will suppress dandelion, curly dock, and quackgrass. The 1/3 lb/A rate is for control of chickweed only.
- Do not use on sandy soils or soils with pH greater than 7.5.
- Do not graze or harvest for 28 days following application.

Herbicide	Formulation	Product Rate Range
Sinbar	80W	1/2 - 1 1/2 lb

- Mode of action: photosynthesis inhibitor.
- Apply once in the fall or spring to dormant alfalfa (before new growth starts).
- Application rate varies with soil type. Use lower rates for coarser soils. Do not use on soils with less than 1 percent organic matter.
- Do not apply to snow-covered or frozen ground.
- Controls chickweed, henbit, mustards, and yellow rocket. Suppresses dandelion and quackgrass.
- Do not plant any other crop for 2 years after Sinbar application.

Herbicide	Formulation	Product Rate Range
Treflan/Trifluralin	TR-10/10G	20 lb

- Mode of action: root meristem inhibitor.
- Controls annual grasses in established alfalfa.
- Apply in the spring before weed emergence.
- A single rainfall or overhead irrigation of 1/2 inches or more within 3 days of application is required for this treatment to be effective.
- The year following Treflan application, plant only crops for which Treflan may be applied as a preplant incorporated treatment or injury may result.

Herbicide	Formulation	Product Rate Range
Velpar	2L	1 - 3 qt

- Mode of action: photosynthesis inhibitor.
- Apply in the fall or spring when alfalfa is dormant or before new growth exceeds 2 inches in height. Can also be applied to stubble after hay crop removal, but before regrowth exceeds 2 inches.
Application rate varies with soil type.
- For best results, apply when weeds are less than 2 inches tall and rosettes are less than 2 inches across.
- Controls most winter annual broadleaf weeds, including chickweed, mustards, and yellow rocket. Controls dandelion and downy brome.
- Do not plant any crop except corn within 2 years of treatment. Corn may be planted 12 months after treatment where deep tillage is used.
- Do not graze or harvest for 30 days following treatment.

Alfalfa: Preharvest Glyphosate Application

Herbicide	Formulation	Product Rate Range
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Roundup WeatherMax	4.5S	22-44 oz
Glyphomax, Glyphomax Plus	3S	1 qt
Touchdown	3S	1 qt

- Touchdown, and Roundup and Glyphomax products can be used in declining alfalfa stands where crop destruction is desirable or acceptable. Other glyphosate products may also be approved for this use. Table 22 contains a list of currently available glyphosate products.
- A preharvest application will control annual and perennial weeds, and greatly improve control of alfalfa and perennial grasses compared to application after harvest.
- Apply in a spray volume of 3 to 10 gpa just prior to alfalfa harvest in spring or fall.
- Allow a minimum of 36 hours between application and harvest. Optimum harvest time is 3 to 7 days after application to maintain hay quality and maximize perennial control.
- The treated alfalfa can be fed to any livestock including lactating animals.
- If the field is planted to corn following alfalfa harvest, including atrazine in the preplant/preemergence herbicide program will aid in control of perennial grasses. Postemergence application of dicamba or dicamba + 2,4-D may be required for complete control of alfalfa in the corn.

Mixed Grass-Legume Forages: Established Stands Only

Herbicide	Formulation	Product Rate Range
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Glyphosate	Various	2% solution (spot treatment)
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- Table 22 contains a list of currently available glyphosate products. See labels for more information on this type of application.
- Apply as a spot treatment to problem weeds not controlled by any other means.
- Apply to actively growing, susceptible weeds.
- To avoid crop injury, avoid contact with desirable, nontarget vegetation (forage).
- For maximum effectiveness on target vegetation, refer to label for recommended adjuvants and timing of application.
- Treat no more than 1/10 of an acre at one time. Further applications may be made to the same area at 30-day intervals.
- Do not graze or harvest for 14 days following application.

Herbicide	Formulation	Product Rate Range
Sencor	4F	3/4 - 1 1/2 pt
	75DF	1/2 - 1 lb

- Can be used in alfalfa-grass mixtures.
- Apply once in the fall or spring when plants are dormant (before new growth starts).
- Application rate varies with soil texture and organic matter content.
- Higher rates may injure grass component.
- Do not use on sandy soils or soils with pH greater than 7.5.
- Do not graze or harvest for 28 days following application.

Table 19. Weed Response to Herbicides in Grass Pastures

This table compares the relative effectiveness of herbicides on individual weeds. Ratings are based on labeled application rate and weed size or growth stage. Control of perennial weeds may require more than one application. Performance may be better or worse than indicated in the table, due to weather or soil conditions, or other variables.

Weed control rating:

9 = 90% to 100% control

8 = 80% to 90% control

7 = 70% to 80% control

6 = 60% to 70% control

NR = not recommended or less than 50% control.

- = insufficient information

Weed control rating of 5 or less is rarely significant.

	Ally/Cimarron	2,4-D	Dicamba	Crossbow	Stinger	Glyphosate	Cimarron Max	Curtail
Winter annual								
Chamomile, mayweed	9	7	8	7	9	9	9	9
Chickweed, common	9	NR	9	8	6	9	9	6
Cockle, corn	-	7	9	8	NR	9	9	7
Cockle, cow	-	7	9	8	NR	9	9	7
Horseweed (maretail)	9	9	9	9	9	9	9	9
Mustard spp.	9	9	7	9	6	9	9	9
Pennycress, field	9	9	8	9	6	9	9	9
Pepper weed spp.	9	9	7	9	6	9	9	9
Shepherd's purse	9	8	7	9	6	9	9	8
Summer annual								
Cocklebur, common	9	8	9	9	9	9	9	9
Lambsquarters, common	9	8	9	9	NR	9	9	8
Nightshade, black	7	7	8	8	NR	8	8	7
Pigweed spp.	9	8	9	8	NR	9	9	8
Ragweed, common	NR	9	9	9	9	9	9	9
Ragweed, giant	NR	9	9	9	9	9	9	9
Velvetleaf	8	8	9	8	NR	8	9	8
Biennial								
Burdock, common	9	9	7	9	8	9	9	8
Evening primrose, common	-	8	7	9	-	9	8	7
Hemlock, poison	NR	7	8	9	NR	8	8	8
Lettuce, wild	9	9	8	8	9	8	9	9
Parsnip, wild	8	8	8	9	NR	8	8	8
Teasel	9	7	8	8	8	8	9	9
Thistle, bull	9	8	9	9	9	9	9	9
Thistle, musk	9	9	9	9	9	9	9	9
Yellow rocket	9	8	8	9	NR	8	9	8

Table 19. Weed Response to Herbicides in Grass Pastures (continued)

	Ally/Cimarron	2,4-D	Dicamba	Crossbow	Stinger	Glyphosate	Cimarron Max	Curtail
Herbaceous perennials								
Aster spp.	6	8	8	8	9	8	8	9
Bedstraw spp.	NR	6	NR	9	7	8	6	7
Bindweed, field	NR	7	8	8	NR	8	7	7
Bindweed, hedge	NR	8	8	8	NR	8	8	8
Buttercup spp.	9	8	7	9	-	8	9	8
Carrot, wild	9	8	7	9	6	8	9	8
Chickweed, mouseear	9	6	7	8	6	8	9	1
Chicory	9	8	7	8	8	8	9	8
Clover spp.	9	6	8	8	9	8	9	9
Cockle, white	-	6	8	8	8	9	6	8
Daisy, oxeye	NR	8	9	9	9	8	8	9
Dandelion	9	9	8	9	8	7	9	9
Dock spp.	8	7	7	8	8	8	8	8
Dogbane, hemp	7	8	7	6	NR	8	8	8
Garlic or onion, wild	9	7	6	7	NR	8	9	7
Goldenrod spp.	7	8	9	7	7	9	8	8
Groundcherry spp.	-	6	6	7	NR	7	6	6
Hemlock, spotted water	NR	7	7	9	NR	8	7	7
Horsenettle	9	6	7	8	NR	7	9	6
Ironweed	NR	7	7	9	NR	9	7	7
Knotweed, Japanese	-	6	7	6	7	7	6	7
Milkweed, common	NR	6	7	7	NR	8	6	6
Nightshade, bitter	-	6	6	-	7	8	6	6
Nettle, stinging	NR	7	7	8	NR	8	7	7
Plantain spp.	7	9	7	9	6	8	9	6
Pokeweed, common	-	6	NR	8	NR	8	6	9
Snakeroot, white	NR	7	8	8	7	8	7	7
Sorrel, red	9	NR	8	9	7	8	9	7
Sowthistle, perenniel	8	7	8	9	7	8	8	7
Thistle, Canada	7	7	8	7	9	9	7	9
Yarrow, common	-	6	8	-	7	8	6	7
Woody Perennials								
Blackberry spp.	8	6	6	7	6	7	8	6
Dewberry spp.	8	6	6	7	6	6	8	6
Grape, wild	7	7	7	8	NR	7	7	7
Honeysuckle spp.	9	6	NR	8	NR	7	9	6
Locust, black	6	6	7	7	NR	7	6	6
Multiflora rose	9	6	6	8	NR	9	9	6
Olive, autumn	-	6	7	7	NR	7	6	6
Poison ivy, oak	6	6	7	8	NR	7	6	6
Sumac spp.	NR	6	7	8	6	7	6	6
Trumpet creeper	NR	6	6	7	NR	6	6	6
Virginia creeper	6	6	7	8	NR	7	6	6