

Weed Control in Forage Crops

Weeds can be a major problem in forage crop production in Alberta. In stands used for seed production losses caused by weeds are quite obvious. Canada thistle, at a density of 20 plants per square metre, has been shown to reduce the seed yield of alfalfa by 50 per cent. Similarly, heavy infestations of wild oats and stinkweed in the year of seeding of creeping red fescue have caused up to a 75 per cent reduction in seed yields the following year.

In forages grown for livestock feed, losses caused by weeds are less obvious than in forages grown for seed. Some weeds have significant feed value and this must be considered. In a study near Lethbridge, losses were small from annual weeds that infested irrigated alfalfa during the year of seeding. Over a four-year-period weedy plots produced only 1.6 tonnes per acre less forage than under weed-free conditions. Losses occurred only in the first year. However, factors other than yield must be considered, e.g., the spread of perennial weeds and the build-up of weed seeds. A number of weeds are also poisonous to livestock.

Decisions on how to manage weed populations in forages must take into consideration factors such as the age and kind of stand, the types of weeds present, and the intended use of the forage crop.

Cultural control

The key to controlling weeds in a forage crop lies in the establishment and maintenance of a vigorous, highly competitive crop stand. Some suggestions for obtaining and maintaining such a stand are as follows:

- Seed into a clean field. Heavy weed infestations should be controlled prior to the seeding of the forage crop through either cultural or chemical means. Perennial weeds, such as Canada thistle, perennial sow-thistle and quack grass, are extremely difficult and costly to eradicate in a forage stand and should be eliminated before the stand is established. The herbicide Roundup (Laredo, Wrangler) is useful for this purpose.
- Seed into fields free of any herbicide residues. Residues of herbicides such as Glean and Tordon 202C can remain in the soil for one or more years and seriously reduce the emergence and growth of seedling grasses and/or legumes. (See section on cropping restrictions).
- Use seed that is either weed-free or free of problem weed seeds. When purchasing certified seed check the official seed testing certificate. This certificate provides information on the type and quantity of weed seeds present. Make sure that the list does not contain too many weed seeds or seeds of weeds not present where the forage crop is to be seeded. It is particularly important to avoid seed stock containing noxious or restricted weeds such as nodding thistle, diffuse knapweed, spotted knapweed, scentless chamomile, toadflax, quack grass, perennial sow-thistle, Canada thistle, leafy spurge, and field bindweed.
- Use forage crops and varieties recommended for your area and the field to be seeded.
- Seed into a firm, well prepared seedbed at the recommended rate and depth.
- Seed at a time to coincide with favorable moisture conditions. In the north, seeding of forage in the spring is most successful. In the south, the appropriate time can be in the early spring or fall.
- Use fertilizer based on soil test results and inoculate legume seed with the appropriate inoculum.
- Evaluate the option of seeding without a companion crop. Since soil type, weather, economic conditions and type of farming operation are all important factors, the choice is an individual one. In general, where soil crusting or erosion is not a problem and maximum forage production is a primary objective, seeding without a companion crop is advisable. While companion crops suppress weeds and enhance herbicide efficacy, they also suppress forage seedling development and yield in subsequent years. Less competitive companion crops such as flax should be considered. When a cereal companion crop is used, the application of modest amounts of nitrogen, decreased companion crop seeding rate and harvesting of the companion crop early as greenfeed or silage can aid in the establishment of the forage crop.
- Mowing just above the forage crop is an effective method of preventing annual weeds from smothering forage seedlings. Seed set of the

Table 1. Herbicides used in forage crops and the weeds they control - 1990

Herbicide	Grassy Weeds										Broadleaved Weeds																											
	Barnyard grass	Blue grass	Downy brome	Foxtail barley	Green foxtail	Quack grass	Timothy	Volunteer cereals	Wild oats	Annual smartweed	Bluebur	Canada thistle	Chickweed	Cleavers	Clovers	Common groundsel	Corn spurry	Cow cockle	Dandelion (established)	Flaxweed (seedling)	Hemp-nettle	Kochia	Lamb's-quarters	Narrow-leaved hawk's-beard	Night-flowering catchfly	Perennial sow-thistle	Redroot pigweed	Russian thistle	Scentless chamomile (seedling)	Shepherd's-purse (seedling)	Stinkweed (seedling)	Toadflax	Volunteer canola	Wild buckwheat	Wild mustard			
Avadex BW									●																													
Avenge									●																													
Banvel									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Banvel + 2,4-D									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Basagran									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Buctril M									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Carbyne									●																													
Edge	●								●																													
Embutox/Butyric/Cobutox	●								●																													
Eptam	●	●							●																													
Fusilade/Fusilade II	●	●							●																													
Hoe-Grass 284	●	●							●																													
Hoe-Grass II	●	●							●																													
Kerb	●		●						●																													
Lontrel									●																													
Mataven									●																													
MCPA									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Pardner									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Poast	●								●																													
Princep/Simazine	●								●																													
Rival/Treflan	●	●	●						●																													
Sencor	●	●	●						●																													
Tordon 202C									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Tropotox Plus									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
2,4-D amine									●	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

● Controlled by rates recommended for crops.

■ Top growth control or suppression only.

weeds is also reduced. A flail-type mower, or one that distributes the plant material evenly over the field, is preferable to a swather.

- Harvest established crops grown for livestock feed at the appropriate time. Harvesting at the wrong time can cause crop injury. For example, alfalfa in northern and central Alberta should not be harvested in August while in southern Alberta, where a three-cut system is used, it should not be harvested in September. Harvesting during these periods can predispose alfalfa to potential winterkill and reduce its competitiveness. Such weakened stands allow weeds to become established.
- Cut hay or silage crops before weeds go to seed.
- Do not overgraze pastures.
- Fertilize older forage stands to keep them productive and to prevent the establishment of invading weeds.
- In well established stands of alfalfa (not less than one year old) cultivation to a depth of 2 to 4 cm with a narrow, stiff-toothed cultivator in the early spring will control some annual weeds and tufted

grasses. A second cultivation at right angles to the first may be necessary.

- Pull by hand or spot spray problem weeds such as Canada thistle. Roundup (Laredo, Wrangler) will control problem perennial weeds on a spot spray basis, killing the sprayed forage crop as well. Failure to control small patches of problem weeds will lead to problems in the future.
- Remove weeds from adjoining fence-lines, roadways and rights-of-way.
- Break up old, depleted or winter-killed stands where there is no longer a vigorous forage stand to compete with weeds.

Biological control

The use of living organisms, such as insects, fungi and bacteria, is a viable alternative in the control of problem weeds in forage crops. Because of the perennial nature of forage crops, the effectiveness of biological control agents is increased because they have time to build up in population, particularly on

Herbicides used in grasses and legumes grown FOR FORAGE - 1990

	Herbicide	Grasses											Legumes					Cover Crop								
		Brome grass	Creeping red fescue	Crested wheat grass	Inter. wheat grass	Kentucky blue grass	Meadow fescue	Meadow foxtail	Orchard grass	Reed canary grass	Russian wild rye grass	Slender wheat grass	Tall wheat grass	Timothy	Alfalfa	Alsike clover	Bird's-foot trefoil	Cicer milkvetch	Red clover	Sainfoin	Sweet clover	White clover	Barley	Canola	Flax	Oats
SEEDLING* STAND	Avadex BW													1	1	1		1	1	1						
	Avenge	1	1	1		1	1		1	1	1		1	1	1		1	1		1						2
	Carbyne																									
	Embutox/Butyric/Cobutox																									
	Eptam																									
	Fusilade/Fusilade II													3	3		3									
	Hoe-Grass 284																						2			
	MCPA																									
	Poast													4												
	Rival																				5					
	Treflan																		5	5						
	Tropotox Plus																									
	2,4-D amine																									
ESTABLISHED* STAND	Banvel																									
	Banvel + 2,4-D amine																									
	Carbyne																									
	Embutox/Butyric/Cobutox													6	6	6						6				
	Fusilade/Fusilade II													3	3		3									
	Kerb	7	7	7	7	7	7	7	7	7	7	7	7	7	7		7									
	MCPA																									
	Poast													4												
	Princep/Simazine													8		8										
	Sencor													9												
Tropotox Plus																										
2,4-D amine																										

■ - Herbicide is recommended for the crop.

* Seedling - within approximately 3 months of the time of seeding. Established - 3 months or more after the time of seeding.

1. Use only if forage crop is underseeded with a companion crop for which herbicide is registered.
2. Check label for varietal restrictions.
3. Do not harvest for feed or graze livestock in year of treatment.
4. Minimum interval between application and harvest is 70 days.
5. Spring application only.
6. In established legume pasture spray after grazing or cutting when regrowth is not above 7 cm. Damage to the crop is related to amount of foliage present when sprayed.

7. For foxtail barley control in established pastures (grass, grass/legumes, alfalfa, trefoil). Creeping red fescue, Kentucky blue grass and timothy are less tolerant than other grasses and may experience some yield reduction (10-15%). Brome grass, orchard grass and wheat grass are the most tolerant grasses.
8. Established at least one year. Apply in the late fall before freeze-up.
9. Irrigated alfalfa only, established at least 18 months. Apply in fall to dormant stands.

Herbicides used in grasses and legumes grown FOR SEED - 1990

Herbicide		Grasses														Legumes						Cover Crop						
Consult the label for final detailed instructions.		Brome grass	Creeping red fescue	Crested wheat grass	Inter. wheat grass	Kentucky blue grass	Meadow fescue	Meadow foxtail	Orchard grass	Reed canary grass	Russian wild rye grass	Slender wheat grass	Tall wheat grass	Timothy	Alfalfa	Alsike clover	Bird's-foot trefoil	Cicer milkvetch	Red clover	Sainfoin	Sweet clover	White clover	Barley	Canola	Flax	Oats	Wheat	
SEEDLING* STAND	Avadex BW														1	1	1			1	1							
	Avenge	1	1	1		1	1		1	1	1		1		1		1	1	1							2		
	Banvel		3																									
	Banvel + 2,4-D amine		3																									
	Basagran																											
	Buctril M																											
	Carbyne																											
	Edge																											
	Embutox/Butyric/Cobutox																											
	Eptam																											
	Fusilade/Fusilade II																											
	Hoe-Grass 284																							2				
	Hoe-Grass II																							2				
	Lontrel																											
	Mataven																										2	
	MCPA	4	4	4	4	4	4	4	4	4	4	4	4	4														
	Pardner																											
	Poast																											
	Rival																					5						
	Tordon 202C	6													6													
Treflan																					5	5						
Tropotox Plus																												
2,4-D amine	4	4	4	4	4	4	4	4	4	4	4	4	4															
ESTABLISHED* STAND	Banvel																											
	Banvel + 2,4-D amine																											
	Carbyne																											
	Fusilade/Fusilade II																											
	Kerb														7	7												
	Lontrel													8														
	MCPA	9	9	9	9	9	9	9	9	9	9	9	9	9														
	Poast																											
	Princep/Simazine														10	10												
	Sencor														11													
	Tordon 202C	6												6														
2,4-D amine	9	9	9	9	9	9	9	9	9	9	9	9	9															

■ - Herbicide is recommended for the crop.

N.B. See page 5 for notes.

Herbicide	Forage crops which may be affected the year following use of the herbicide
Ally	Seedling legumes and grasses may be affected for 1 or more years after Ally application. On Black and Gray Wooded soils of pH 7.9 or lower, fescue may be planted 10 months after Ally application while alfalfa and red clover may be planted 22 months following application of Ally. Extend the rotational interval one year if rainfall was less than 250 mm in any year following application. On Brown and Dark Brown soils and for all other forage crops on Black and Gray Wooded soils a test strip (field bioassay) should be seeded the year before planting forages. Yield from the test strip should be compared to yield from an adjacent untreated area.
Assert	Seedling legumes and grasses may be affected for one or more years after Assert application. Conduct a field bioassay (a test strip grown to maturity) the year before planting any forage crop. The yield from the test strip should be compared to the yield from an adjacent untreated area.
Atrazine	Seedling legumes and grasses may be affected for one or more years after Atrazine application.
Banvel	Legumes and seedling grasses may be affected if high rates of Banvel were used for perennial weed control the year before.
Edge	Small seeded grasses, such as timothy, should not be grown in rotation following a crop treated with Edge. Over-application caused by overlapping, improper calibration, and non-uniform application may reduce stands of crops that follow in rotation.
Glean	Seedling legumes and grasses may be affected for two or more years after Glean application. A test strip (field bioassay) should be seeded the year before seeding a forage crop. The yield from the test strip should be compared to the yield from an adjacent untreated area. The time interval between application of the herbicide and seeding of the forage crop is increased when the pH of the soil is greater than 7.0, the organic matter content is less than 5% and/or there is less than 250 mm of rainfall in any year following application of the herbicide.
Lontrel	Legumes may be affected for one or more years after application. Do not seed to crops other than wheat, oats, barley, rye, flax, canola or forage grasses the year following treatment. For additional cropping and use information, contact Dow Elanco at 1-800-661-6436.
Princep/Simazine	All crops may be affected except established forage legumes. Soil residues may persist for two or more years.
Rival/Treflan/Triflurex Heritage, Fortress	Grasses should not be grown in rotation the year after a crop is treated with these products. Drought conditions in the year of treatment may result in higher levels of carryover into the next year.
Sencor	All crops other than potatoes should not be grown for 24 months following application on irrigated alfalfa.
Tordon 202C	Alfalfa should not be grown until at least the third growing season after the year of treatment. For additional cropping and use information, contact Dow Elanco at 1-800-661-6436.

- * Seedling - within approximately 3 months of the time of seeding.
- Established - 3 months or more after the time of seeding.

1. Use only if forage crop is underseeded with a companion crop for which herbicide is registered.
2. Check label for varietal restrictions.
3. Apply when crop is 5 cm tall. If mixed with 2,4-D, do not apply in the fall of the year of seeding if forage grass is seeded without a companion crop.
4. Do not apply to timothy or fescue (beyond 4 leaf stage of crop) in the fall of the year of seeding when a seed crop is expected the following year. 2,4-D or MCPA may be applied to fescue in the fall of the year of seeding if a companion crop is used since a seed crop is not normally expected the following year. The effect of applying 2,4-D or MCPA in the fall of the year of seeding on other grasses is not known at this time, although in preliminary tests, brome grass appears to have some tolerance. Do not exceed 0.45 L/ac of 2,4-D or MCPA (500 g/L formulation) except for narrow-leaved hawk's-beard, on creeping red fescue only (0.90 L/ac). Rates above 0.45 L/ac may cause seed yield losses.

5. Spring application only.
6. Apply prior to shot-blade stage of the crop. Applications should not be made after August 1 in the year of seeding. Treatments after that date may result in significant yield reductions in the year following treatment.
7. Fall application only on trefoil, fall or spring application on alfalfa.
8. Apply in the fall after harvest or in early spring. Weeds must be actively growing.
9. May be applied prior to shot-blade in the seed production year or in the fall after a seed crop has been removed. Applications made during flower development and during pollination will reduce seed yield. Apply 2,4-D in the fall for narrow-leaved hawk's-beard. Limited information is available on the effect of MCPA on seed production. Although most crops usually are more tolerant of MCPA than 2,4-D, it would be prudent to follow the guidelines outlined for 2,4-D until more data are available.
10. Established at least one year. Apply in the late fall before freeze-up.
11. Irrigated alfalfa only, established at least 18 months. Apply in fall to dormant stands.

GRAZING AND FEEDING RESTRICTIONS FOR HERBICIDES USED IN FORAGE CROPS

Herbicide	Restriction
Avadex BW	Do not harvest treated underseeded legumes for greenfeed, silage or hay in year of seeding.
Avenge	Do not graze or harvest underseeded forages for feed during the year of seeding.
Banvel	Dairy Cattle - Up to 500 ml/ac - 0 days between treatment and grazing or cutting; 501-930 ml/ac - 7 days; 931 ml/ac - 1.86 L/ac - 14 days; 1.87 - 2.87 L/ac - 30 days. Beef Cattle and other meat animals - If treated vegetation has been consumed by meat animals within 30 days of Banvel application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Banvel application without restrictions on slaughter.
Basagran	Do not graze or harvest for livestock feed in year of treatment.
Buctril M	Do not graze or harvest for greenfeed until 56 days after treatment (registered for use on forage crops grown for seed production only).
Carbyne	Do not graze or feed crop for 5 weeks after treatment.
Edge	Do not graze or harvest for livestock feed in year of establishment.
Embutox/Butyric/Cobutox	Do not graze or harvest for livestock feed in year of treatment.
Eptam	Do not graze or feed forage from treated fields to livestock.
Fusilade/Fusilade II	Do not graze livestock or harvest for feed in the year of treatment.
Hoe-Grass 284	Do not graze or harvest forage crops for livestock feed in the year of treatment.
Hoe-Grass II	Do not graze or harvest forage crops for livestock feed in the year of treatment.
Kerb	Do not harvest or graze within 90 days of applying 1.3 kg/ac or 60 days after applying lower rates.
Lontrel	Do not graze or cut for greenfeed until 7 days after treatment (registered for use on forage crops grown for seed production only).
Mataven	Do not graze or harvest for forage in the year of treatment.
MCPA	Do not graze or cut for greenfeed until 7 days after spraying.
Pardner	Do not graze or harvest for greenfeed until 56 days after treatment (registered for use on forage crops grown for seed production only).
Poast	Alfalfa - Do not harvest until 70 days after treatment. Other forage crops - Do not graze or harvest for livestock feed in year of treatment.
Princep/Simazine	Do not graze for 30 days or cut for hay within 60 days of application.
Rival/Treflan	Do not graze or harvest for livestock feed in year of establishment.
Roundup/Laredo/Wrangler	Do not graze or harvest treated areas in forages until treated plants have turned brown and started to deteriorate (registered for spot treatment only in forage crops).
Sencor	Do not graze or feed treated crop to livestock within 30 days of green-up in spring.
Tordon 202C	Do not permit meat animals being finished for slaughter or dairy animals to forage or graze treated fields within 2 weeks of treatment. If straw from treated crops (non-toxic to livestock) is used for bedding or animal feed, return the manure to fields to be planted to grain crops, flax, rapeseed or perennial grasses (registered for use on forage crops grown for seed production only).
Tropotox Plus	Do not graze or harvest for livestock feed in year of treatment.
2,4-D amine	Do not graze for 24 hours after treatment.

uncut pasture land. For example, the root and leaf-feeding flea beetle *Aphthona nigricutis* is available for release on undisturbed leafy spurge. When it was first imported from Hungary, the flea beetle was screened to ensure that it would not harm any crops or other non-target plants. A few biological control agents for weeds have already been put to use in Alberta, and research is continuing in this area.

Chemical control

Herbicides should be used only when needed and to supplement, not replace, good cultural management of weeds in forage crops. There are fewer herbicides available for use on forages than cereal crops. Herbicide selection depends upon:

- The weeds present and the effectiveness of the herbicide on these weeds. Table 1 summarizes which herbicides control the main problem weeds in forage crops. For other weeds check with the local district agriculturist or agricultural fieldman.
- The forage crop(s) grown and the tolerance to the herbicides registered for this use. When mixed stands of grasses and legumes are grown, herbicide choice is especially limited. For grass-legume mixes, use of herbicides for broadleaf weed control will be most limited by the legume, for grassy weed control herbicide choice will be most restricted by the presence of forage grasses. Consult the selector charts to determine herbicides that can be used in mixed grass-legume stands. The herbicide must be registered on all crops present in the stand.
- The companion crop, if used, and its tolerance.
- The stage of growth of both crop and weeds. See the herbicide label for the recommended stage of application.
- The age of the stand i.e., seedling (within approximately 3 months of the time of seeding) or established (3 months or more after seeding).
- The purpose or use for which the stand is being grown, i.e., pasture, hay or seed production.
- The cost of the herbicide. Is the herbicide application economical in the short term and/or in the long term?

When a herbicide is selected for use in a forage crop, several points should be kept in mind:

- Follow label directions closely, particularly as they relate to stage of crop and weed development, water volume, and grazing or feeding restrictions.
- Spray at the appropriate stage. In the year of seeding, spray post-emergent herbicides as early as label direction will permit. Young weeds, i.e., in the 2-4 leaf stage, are easier to kill than those in the more advanced stages. Early removal of weeds

will enhance forage seedling vigor. Forage seedlings tend to be weak and unable to effectively compete with faster growing weeds. Seedling legumes are most resistant to herbicides for broad-leaved weed control from the first to the third trifoliate leaf stage. They should not be sprayed after reaching 10 cm in height.

- Check label instructions closely when applying herbicides for grassy weed control to seedling forage grasses. Tolerance is specific for each herbicide i.e., Hoe-Grass can be used on brome grass but will completely kill timothy.
- Do not seed or underseed a grass as a first crop following use of soil-applied herbicides such as Avadex BW, Treflan, Rival, Triflurex, Fortress or Edge.
- Use extra precautions when applying herbicides to stands that are being grown for seed. Research has shown that applications of 2,4-D in the fall of the year of seeding can drastically reduce seed yields of creeping red fescue and timothy the following year. Spring application should be made prior to the shot blade stage. Do not exceed 0.45 L/ac of 2,4-D (500 g/L formulation) on grass stands grown for seed.
- Consider other options than 2,4-D or MCPA on forage legume crops. The use of 2,4-D and MCPA, while registered for use on certain seedling legumes, is not recommended because serious damage to the legume may result.
- Calibrate the sprayer for uniform application of the correct amount of herbicide.
- Avoid drift onto sensitive crops growing in nearby areas.
- Spray according to environmental conditions. If conditions are very dry, consider delaying spraying until a few days after a substantial rain. The performance of most herbicides is reduced under dry conditions.
- Do not use herbicides with long lasting residues on stands that may be worked under in 1 or 2 years. Injury will occur to crops seeded in soil containing these residues.
- Consult the *Guide to Crop Protection in Alberta, Part I - Chemical*. Agdex 606-1 or the label on herbicide container for further information on each herbicide listed in the selector charts.

There are a number of options for dealing with weed problems in forage crops. It may pay to spray and it always pays to use good agronomic practices.

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