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Annual Broadleaf Weed Control in Winter Wheat

This guide discusses preventive, cultural, and chemical weed control in winter wheat. The best weed control is obtained by using a combination of these methods.

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Winter and summer annual broadleaf weeds have an important economic impact on Nebraska winter wheat. They compete with winter wheat for water, light, space, and nutrients, reducing Nebraska winter wheat yields by an estimated 10 percent each year. The dollar loss, with wheat at \$2.50 per bushel, is over \$2.1 million per year. Weeds also slow harvest and increase combine repair costs. Producers may be docked at the elevator for excessive grain moisture and/or weed seeds in wheat.

In 1982, only 11 percent of the winter wheat acres in Nebraska were sprayed with herbicides to control weeds. In 1987, 29 percent were sprayed. By 1998, however, approximately 60 percent were sprayed. Effective weed control in winter wheat can eliminate losses due to weeds and increase net returns.

Success with reduced and no-till programs is improved with weed-free winter wheat stubble after harvest. In addition, weed seeds from the current crop will survive in the soil and cause problems in future crops. These potential problems underscore the importance of broadleaf weed control in winter wheat.

An effective weed control program considers the entire cropping system. This approach involves the use of preventive, cultural, and chemical weed control methods.

Preventive Weed Control

Prevention, or stopping the advancement of weed infestations, is an important part of a total weed management program. It requires diligence from the producer, but offers low cost, effective control. Some rules of preventive weed control are:

1. Use crop seed that is weed free.
2. Clean tractors, implements, trucks, and combines before moving them from infested to clean fields.
3. Keep uncropped areas (fencelines and field borders) weed free.
4. Do not allow livestock to move directly from infested to clean areas.
5. Prevent weed seed production in all areas.

Cultural Weed Control

Cultural weed control involves manipulating the crop/weed environment so that conditions are favorable for crop plants, but unfavorable for weeds. Crop competition and crop rotation are two important cultural control practices in winter wheat production.

Crop competition involves establishing a vigorous crop which can compete more effectively than weeds for water, light, space, and nutrients. Several factors contribute to competitive crops, including proper seedbed preparation, adequate fertilizer, high quality crop seed, careful variety selection, and proper rate, date, and depth of seeding. These factors also result in high winter wheat yields.

In a properly established healthy winter wheat crop, it is difficult for summer annual weeds to survive. In addition, some winter wheat varieties are more competitive with weeds than others.

Crop rotations that include late spring seeded crops break the life cycle of problem weeds, particularly winter annual broadleaf weeds such as tansy mustard and field pennycress, and allow the use of tillage or herbicides that may not be feasible in a winter wheat monoculture. Adapted rotational grain crops include corn, grain sorghum, proso millet, soybean, and sunflower, depending on location.

Chemical Weed Control

Several herbicides provide excellent broadleaf weed control with minimal wheat injury; however, some varieties are more sensitive to herbicides than others. Injury varies with herbicide, variety, and growth stage. Research has not been conducted on the herbicide sensitivity of many of the varieties presently planted. The following are fundamentals that should be considered before selecting a herbicide treatment:

1. Identify the problem weed(s).
2. Spray when weeds are small and actively growing. Spray at the proper winter wheat growth stage for the herbicide used.

3. Use proper spray equipment that is in good condition and not contaminated with previously used herbicides.
4. Calibrate the sprayer to ensure application accuracy.
5. Read and follow directions on the herbicide label.
6. Know your rotational plans to avoid herbicide carryover problems to sensitive crops.
7. Be aware that crop disasters such as winter injury, hail, or disease occur and previously applied residual herbicides may limit the choices for recropping.

Herbicides recommended for broadleaf weed control in winter wheat are Ally (metsulfuron), Amber (triasulfuron), 2,4-D, Banvel (dicamba), Buctril (bromoxynil), Canvas (thifensulfuron + tribenuron + metsulfuron), Curtail (clopyralid + 2,4-D), Finesse (metsulfuron + chlorsulfuron), Harmony Extra (thifensulfuron + tribenuron), Peak (prosulfuron), and Tordon (picloram). Some of these products should be combined to control a wider spectrum of broadleaf weeds in winter wheat. Herbicide combinations are also recommended for management of potential herbicide resistance development by weeds. Ally, Amber, Canvas, Finesse, Harmony Extra, and Peak are sulfonylurea herbicides and are ALS-AHAS inhibitors.

Use *Table I* to select herbicide treatments to control your weed problem. Specific use rates for selected herbicides are found in *Table II*.

Table I. Broadleaf weed response to herbicides used in winter wheat. ¹																		
		2,4-D ester		2,4-D + Banvel		Buctril		2,4-D + Buctril		2,4-D + Ally		Amber		Curtail	2,4-D + Tordon	2,4-D + Amber	Harmony Extra	2,4-D + Finesse
Weed species	Inches	<3	6-12	<3	6-12	<3	6-12	<3	6-12	<3	6-12	<3	6-12	<3	<3	<3	<3	<3
Winter Annuals																		
lettuce, prickly		9	6	8	7	7	4	9	6	10	9	10	7	10	9	10	9	10
mustard, blue		9	4	6	5	7	4	8	4	10	8	10	7	9	8	10	9	10
mustard, tansy		9	7	10	5	9	4	9	7	10	9	10	7	10	10	10	9	10
pennycress, field		9	7	10	5	9	6	10	6	10	9	10	7	10	10	10	10	10
Shepherdspurse		9	7	10	5	9	7	9	7	10	9	10	7	9	10	10	10	10
vetch, hairy		7	5	8	7	5	3	7	6	6	5	7	5	9	8	6	5	6
Early Summer Annuals																		
Horseweed		5	4	6	4	8	6	7	4	9	6	8	6	9	5	6	7	6
Kochia		6	5	10	6	7	5	7	5	10	8	10	8	8	6	9	7	9
knotweed, tall		6	4	8	6	9	6	9	7	7	7	6	4	9	6	6	6	6
lambsquarters, common		9	8	9	8	8	6	9	6	10	10	10	8	10	10	10	9	10
lambsquarters, slimleaf		9	8	9	9	9	7	9	7	10	10	10	8	10	10	10	10	10
ragweed,		9	9	10	9	9	7	9	8	8	6	8	6	9	9	9	8	9

common																	
sunflower, common	9	9	10	8	9	8	9	7	10	10	8	7	10	9	9	8	9
thistle, Russian	8	7	9	8	8	6	9	7	10	8	9	8	8	8	8	8	8
Waterpod	10	10	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10
Late Summer Annuals²																	
buckwheat, wild	4	2	8	6	9	6	7	5	7	6	6	5	9	9	7	8	7
pigweed, prostrate	9	9	10	9	7	5	9	7	10	10	10	8	10	10	10	9	10
pigweed, redroot	9	8	10	8	8	5	9	7	10	10	9	8	10	10	10	9	10
pigweed, tumble	9	9	10	9	8	5	9	7	10	10	10	8	10	10	10	9	10
sage, lanceleaf	9	7	9	7	8	5	8	6	10	10	10	9	10	10	10	9	10
smartweed, Pennsylvania	8	6	10	8	8	4	9	7	6	5	5	4	10	8	6	8	6
Velvetleaf	9	5	8	7	9	5	9	8	8	8	7	5	10	9	8	8	8

¹Expected control when herbicides are applied to weeds at these heights in inches. Control ratings: 10 = 96-100%, 9 = 90-95%, 8 = 85-90%, 7 = 80-84%, 6 = 70-79%, 5 = 60-69%, 4-2 = less than 60%, and 1 = 0.

²Control of late summer annual broadleaf weeds may be reduced because of canopy protection provided by other weeds and winter wheat.

Table II. Herbicides recommended for broadleaf weed control in winter wheat.				
<i>Herbicides</i>	<i>Product rate/A</i>	<i>Winter wheat growth stage</i>	<i>Remarks and 1995 costs</i>	<i>Recropping interval in months</i>
Ally + 2,4-D LV ester ¹	0.10 oz + 0.5 pt	4 tillers to joint ²	Apply in spring. Add surfactant at 1 qt per 100 gal of spray solution. Cost: \$3.16	1-34
Amber + 2,4-D amine ¹	0.28-0.47 oz 0.25-0.50 pt	4 tillers to joint ²	Apply in spring. Add surfactant at 1-2 qt per 100 gal. Cost: \$3.06-\$5.26.	1-36
Banvel + 2,4-D amine ¹	2-4 oz + 0.75 pt-1 pt	4 tillers to joint ²	Controls most troublesome broadleaf weeds. Do not apply with fertilizer. Cost: \$2.49-\$4.26.	1-2
Buctril 2EC + 2,4-D amine ¹	1-1.5 pt + 0.5 pt	4 tillers to joint ²	Broadleaf weeds must be in the 2-4 leaf stage or mustards in early rosette and before canopy covers weeds. Cost: \$8.08-\$11.76.	1
Curtail	2 pt	4-leaf to boot ³	Cost: \$9.68	1-18
Harmony Extra	0.3-0.4 oz	2-leaf to boot ³	Broadleaf weeds less than 4 inches. Add surfactant at 1 qt per 100 gal. Cost: \$4.25-\$5.67.	2
Peak + 2,4-D LV ester	0.25-0.5 oz + 0.75-1 pt	4 tillers to joint	Broadleaf weeds less than 4 inches. Add surfactant at 1-2 qt per 100 gal. Cost: \$4.12-\$7.34.	1-24
2,4-D amine ¹ + 2,4-D LV ester ¹	1-1.5 pt + 0.5-1 pt	4 tillers to joint ²	Spray broadleaf weeds as soon as good growing conditions occur. Cost: \$2.35-\$3.96.	1
			Use only on fields in continuous cereal or	

2,4-D amine or LV ester ¹ + Tordon 22K	0.5-0.75 pt + 1-1.5 oz	4 tillers to joint ²	feed grain during the spring after resumption of active growth. Cost: \$1.40-\$2.35.	1.5-36
¹ 2,4-D acid equivalent is 4 lb/gal. ² Zadok's Scale 24-34 or Feeke's Scale 2.5-6. ³ Zadok's Scale 14-39 or Feeke's Scale 1.5-9.				

Many broadleaf weeds commonly found in Nebraska winter wheat fields can be controlled at a modest price with amine or low volatile ester formulations of 2,4-D. Generally, ester formulations of 2,4-D provide better broadleaf weed control than amine formulations because they are oil soluble and readily penetrate plant foliage. Amine formulations are water soluble and do not penetrate foliage as easily, resulting in reduced control of weeds such as kochia and Russian thistle.

Winter wheat must be between four tillers and joint stage when 2,4-D is applied. In Nebraska, winter wheat generally is in the proper growth stage for 2,4-D application in March to early May, depending on planting date, the season, and location. Winter wheat planted September 10 should be ready to spray by March 1, but wheat planted October 1 may not be adequately developed until April 1 or later.

Winter wheat is considered fully tillered when it has six to nine tillers; however, the number of tillers depends on the seeding rate. Wheat injury and yield loss can be significant if 2,4-D or other herbicides are misapplied.

Table III. Winter wheat yield reduction in response to herbicides applied at four growth stages in absence of weeds.					
			<i>Growth stage at application</i>		
<i>Treatment</i>	<i>Rate</i>	<i>Fall</i>	<i>Tillering</i>	<i>Boot</i>	<i>Headed</i>
	lb/A	---- % yield reduction ----			
2,4-D amine	0.50	14	10	12	5
2,4-D amine	0.75	24	16	22	20
2,4-D ester	0.25	13	13	7	4
2,4-D ester	0.50	30	15	23	22
Buctril	0.25	3	1	2	8
Buctril	0.50	0	1	14	12
Dicamba	0.125	0	0	14	7
Dicamba	0.25	3	3	50	3
Dicamba + 2,4-D amine	0.09 + 0.5	4	3	28	7
Buctril + MCPA	0.25 + 0.25	0	0	4	6
Adapted from Robinson and Fenster, 1973. Agron. J. 65:749-751.					

Winter wheat yields were reduced more than 20 percent when 2,4-D was applied in the fall to winter wheat with two to four leaves (*Table III*). Winter wheat yields also were reduced with spring applications. To reduce injury with 2,4-D use low rates and apply in early spring to fully tillered wheat.

Banvel and 2,4-D are combined to control a wider spectrum of broadleaf weeds, including wild buckwheat (which is not controlled by 2,4-D alone). Banvel plus 2,4-D must be applied to well tillered wheat and before jointing to avoid crop injury.

Buctril (bromoxynil) controls many broadleaf weeds in wheat with excellent crop safety. It can be applied to winter wheat from the two-leaf to the boot stage of growth without crop injury; however, at later growth stages weeds may be protected from the spray by the crop canopy or weeds may be too large for effective control.

Buctril is a contact herbicide; it is not translocated through the plant and has little soil activity. Weeds must be small (two- to four-leaf stage or 1 inch or less in diameter) at application for optimum control. Good coverage with the spray solution is needed.

Buctril can be tank mixed with 2,4-D amine or ester to improve performance on larger weeds and to broaden the spectrum of weeds controlled.

The sulfonylurea herbicides, Curtail and Tordon, have soil persistence and will control germinating broadleaf weeds for about four weeks after application. A surfactant (at 0.25 percent v/v) unless combined with liquid fertilizer should be added to the spray solution whenever the sulfonylurea herbicides are used. Adding 2,4-D improves activity on weeds and helps prevent buildup of resistant weeds. Amber alone (without 2,4-D) can be applied in the fall to control winter annual broadleaf weeds.

Among the weeds that may or have become resistant to the sulfonylurea herbicides are kochia, Russian thistle, and prickly lettuce. The use of 2,4-D (4 lb/gal) at 1/2 pt per acre applied with Ally, Amber, Finesse, or Harmony Extra and a surfactant improves weed control and helps prevent resistant weed development. Higher rates of 2,4-D and surfactant may injure the wheat.

The sulfonylurea herbicides have rotational restrictions of one to 36 months that limit their use in areas where susceptible crops are grown in rotation with wheat. This is especially important when the crop is lost to hail or other crop failures.

The degradation of sulfonylurea herbicides in soil is slowed by high soil pH. They should not be applied to soils with a pH greater than 7.9 to avoid the risk of rotational crop injury. Producers should follow label directions carefully and determine rotational plans before using these products.

Wild buckwheat has become an increasing problem. The most effective control is obtained when herbicides are applied before wild buckwheat produces vines. Herbicides with short residuals applied before wild buckwheat germinates will not provide adequate control.

Liquid Nitrogen Fertilizers and Herbicides

Producers have combined liquid nitrogen fertilizers (UAN - 28 and 32 percent) and herbicides to control weeds and fertilize the crop with one application. Do not add surfactant to the liquid fertilizer-herbicide mixture. In some situations the winter wheat showed evidence of crop injury when sprayed with these mixtures. When wheat is under stress spraying herbicides with UAN may cause yield reduction regardless of the crop stage. Adding sulfur increases crop injury.

An alternative to this program may be to strip band (20 inches) nitrogen fertilizer, as needed, as soon as field conditions permit in the spring and apply the herbicide later. The advantages of strip banding over broadcast for nitrogen fertilizer application are probably great enough to pay for the second application.

Harvest Aids

Ally, Roundup Ultra (glyphosate), Landmaster BW (glyphosate + 2,4-D), Ally + 2,4-D, and 2,4-D ester are registered for spraying winter wheat prior to harvest (check labels for rates and timing). Not all brands of 2,4-D are labeled for this use.

Winter wheat must be in the hard dough stage and treated at least seven days before harvest. Wheat sprayed with 2,4-D while the wheat nodes are green, may result in stem breakage.

In 1989, thousands of acres were sprayed with 2,4-D prior to harvest. Many treated fields had unsatisfactory desiccation of the weeds, plus many complaints were received on drift to susceptible crops including corn. Most of these fields should have been sprayed during the tillering stage. Growers should examine fields early and treat where weed densities justify.

Summary

Weeds cause yield and quality losses in Nebraska's winter wheat. Producers can implement weed management systems that include preventive, cultural, and chemical control methods to prevent these costly losses. Herbicide treatments are available to control broadleaf weeds in winter wheat at reasonable costs. Producers should read and follow directions on the herbicide label to ensure the safe and effective use of herbicides.

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