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G99-1389 Cultural Practices to Improve Weed Control in Winter Wheat

Gail A. Wicks
University of Nebraska - Lincoln

Alex Martin
University of Nebraska - Lincoln, amartin2@unl.edu

Drew J. Lyon
University of Nebraska-Lincoln, drew.lyon@wsu.edu

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Cultural Practices to Improve Weed Control in Winter Wheat

This NebGuide explains the influence of cultural practices on weeds in winter wheat.

Gail A. Wicks, Extension Weed Specialist
Alex R. Martin, Extension Weed Specialist
Drew J. Lyon, Extension Dryland Cropping Systems Specialist

- Crop Rotations
- Prewheat-fallow Weed Control
- Soil Fertility
- Clean Seed, Seeding Date, Rate, Variety, and Row Direction

Precipitation and temperature greatly influence crop and weed growth in the semiarid areas of the central Great Plains. Precipitation in Nebraska varies from 14 to 24 inches where fallow is practiced. The purpose of fallow is to control weeds and, when not cropping a field, to store water and stabilize winter wheat fields. With good prewheat-fallow techniques, sufficient soil moisture is usually available to establish winter wheat. Peak rainfall occurs in May and June during the pollination and grain-filling period of winter wheat. The latter part of June, July, and first part of August is the hottest period. High temperatures may cause stress to the wheat and weeds, reducing weed control if herbicides are applied after harvest.

Several methods of weed management are available in winter wheat production. Cultural practices that improve weed control include crop rotation, a fallow period with timely weed control, and a firm seedbed at wheat seeding. Seeding date, variety, seed quality, soil fertility, row spacing, and row direction influence wheat competitiveness.

Several crop rotation sequences are used when growing winter wheat in Nebraska. Winter wheat-fallow, winter wheat-corn or grain sorghum-fallow, winter wheat-corn-soybean, and continuous winter wheat are the most common rotations. In addition proso millet and sunflower also are used as rotational crops.

Crop Rotations

Weeds with the same life cycle as the crop tend to increase under monoculture. Winter annual weeds

tend to be the most common weeds in winter wheat. Downy brome, hairy chess, jointed goatgrass, volunteer wheat, and feral rye are particularly troublesome when winter wheat is grown continuously or every other year on the same land. Winter annual broadleaf weeds also increase but can be readily controlled in the growing winter wheat with herbicides. Rotating to a warm-season crop such as corn, grain sorghum, proso millet, soybean, or sunflower can break the life cycle of these economically important weeds. Any regionally adapted warm-season crop will suffice and serve as an important weed management tactic; however, with jointed goatgrass, a four-year rotation is encouraged.

Crop rotation is an important aspect of weed management. Rotating summer annual crops with winter annual crops aids in controlling winter annual weeds. Winter wheat helps control summer annual weeds that tend to be a problem in summer annual crops. A rotation of winter wheat-corn-fallow is excellent for weed management. For example, substituting grain sorghum for corn may decrease control of barnyardgrass and longspine sandbur in the grain sorghum crop and subsequent fallow periods (*Table I*). In west central Nebraska, eliminating the prewheat-fallow period by planting winter wheat immediately after sunflower, soybean, corn silage, or oat often results in wheat stands of reduced vigor due to limited soil moisture or planting beyond optimum planting date. The winter wheat is less competitive resulting in increased weed growth in the wheat and following harvest. This is less of a problem in eastern Nebraska where greater fall precipitation occurs and wheat can be planted later. This occurs when winter wheat is planted after soybean harvest in a winter wheat-corn-soybean rotation.

Table I. Effect of rotation on weed control when averaged over herbicides applied after winter wheat harvest in west central Nebraska.[1]

Rotation	*Barnyard-grass*	*Green foxtail*	*Witch-grass*	*Stink-grass*	*Sandbur*	*Kochia*	*Field appearance[2]*
	---------- (%) ----------						
Wheat-fallow	86	80	88	72	—	100	83
Wheat-corn-fallow	78	84	94	92	83	93	86
Wheat-sorghum-fallow	57[*3]	70	83	71	36[*]	60[*]	65[*]
Wheat-soybean, sunflower, corn silage, or oat	0[*]	51[*]	50[*]	42[*]	—	99	52[*]

[1]Adapted from Wicks et al., Weed Technology 3:244-254.
[2]High numbers indicate excellent weed control and stubble.
[3*] = different from wheat-corn-fallow rotation at the 5 percent level.

Prewheat-fallow Weed Control

Weed management for winter wheat begins in the ecofallow period (*Figures 1* and *2*) with weeds controlled by tillage and/or herbicides and continues during the prewheat-fallow period. During ecofallow - the period between winter wheat harvest and planting the next crop - weeds are controlled with herbicides. See University of Nebraska EC-130, *Guide for Herbicide Use in Nebraska*, for details on herbicides.

During the prewheat-fallow period, a sweep plow, tandem-disk harrow, offset disk, chisel plow, and/or herbicides may be used to kill weeds before they remove appreciable soil water. The number of tillage

operations needed depends on precipitation, the weed species present, slope, susceptibility to erosion, and how much crop residue the drill can handle. Sweep tillage does not control weeds when soil is moist; therefore, disks are often used although they destroy more residue.

A good stand of vigorously growing winter wheat will have fewer weeds than a thin stand. Poor wheat stands and lack of vigor often result from poor soil moisture management before winter wheat planting. Weed control must be timely throughout the rotation to prevent weeds from wasting soil water and nutrients and producing seeds.

Common purslane is especially hard to control with tillage. Ally, Amber, Finesse, or Glean applied during the prewheat fallow period (where labeled) will control most annual broadleaf weeds preemergence (including common purslane). Include Fallow Master, Landmaster BW, Roundup Ultra, or Touchdown 5 to improve weed control. In late May, summer annual grass species and volunteer corn, shattercane, sorghum, or proso millet should be the first weeds to emerge after applying Ally, Amber, Finesse, or Glean. At this time, Landmaster BW, Roundup Ultra, Fallow Master, or Touchdown 5 could be used. If herbicides are not used, begin tillage before soils are too dry and hard for implements to function properly.

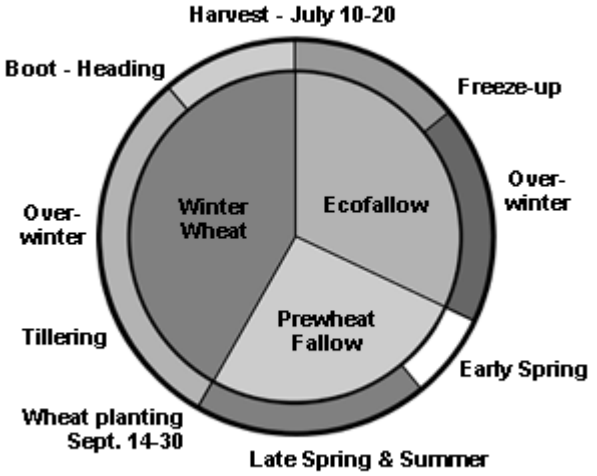

Figure 1. Winter wheat-fallow rotation.

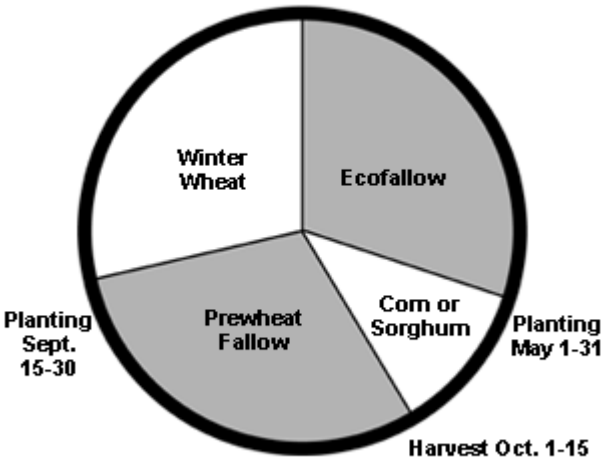

Figure 2. Winter wheat-corn or sorghum-fallow rotation.

The rodweeder should be used to control weeds during the final two to four weeks before seeding wheat. Volunteer wheat and other host weeds for the leaf-curl mite (vector of wheat streak mosaic virus and High plains disease) and Russian wheat aphid must be eliminated at least 14 days before winter wheat seeding to reduce potential yield losses. A firm seedbed enhances wheat seed germination and seedling growth. In areas where winter annual weeds are a problem, rainfall prior to wheat seeding can cause weed seeds to germinate and set the stage for control. Following rain, rodweeding and wheat seeding should be delayed at least one week to aid in controlling winter annual weeds. This delay, coupled with tillage, has controlled downy brome and prevented grain yield losses up to 69 percent; however, don't delay wheat seeding beyond the optimum planting date or yields will be reduced. Downy brome is more of a problem in early planted fields than those planted later.

If the top 2 to 4 inches of soil is dry at planting, a hoe drill is preferred over a disk drill to place the winter wheat seeds into firm moist soil. The openers must have proper tension to ensure the wheat is planted deep enough, especially in the tractor tracks. Weed density is often greater in wheel tracks because of lack of competition from the wheat due to improper seeding depth. Planting depth should be

1 inch in firm, moist, fine-textured soil and 1.5 inches in coarse-textured soils.

Residues left on the soil surface during the fallow period will help prevent wind and water from silting under the winter wheat seedlings or burying the seeds too deep. Herbicides and tillage tools that maintain the residue are preferred for weed management.

Soil Fertility

A good fertilizer program based on soil tests will increase the vigor and competitiveness of the winter wheat crop. Fertilizer placement is very important with phosphorus. Phosphorus applied as a band when wheat is seeded can increase wheat yield and reduce weed density after wheat harvest (*Table II*). Weed control was better when nitrogen was applied in the fall rather than in the spring (*Table III*). Fall fertilization improves the competitiveness of winter wheat and reduces summer annual weed growth. Spring fertilization needs timely rain to move the nitrogen into the root zone. In some years rainfall is not timely and late germinating weeds take advantage of the nitrogen. Fall-applied nitrogen is more susceptible to leaching than spring-applied nitrogen.

Table II. Influence of phosphorus on winter wheat yield, stem density, and weed density when banded in a farmer's field at winter wheat seeding time in west central Nebraska.[1]

	Phosphorus	
Item	*No*	*Yes*
Winter wheat yields, bu/A	48.0	58.0
Winter wheat stems/m^2	600.0	730.0
Witchgrass/m^2	2.0	0.0
Stinkgrass/m^2	4.3	0.3
Pigweed/m^2	2.7	0.0
Russian thistle/m^2	0.3	0.3
Common purslane/m^2	1.0	0.0
Total weeds/m^2	10.3	0.6

[1]Adapted from Wicks et al., *Weed Technology* 3:244-254.

Table III. Influence of fertilizing winter wheat on weed control in the wheat stubble treated with herbicides in west central Nebraska.[1,2]

	Weed control			
Fertilizer practice	*Barnyard-grass*	*Green foxtail*	*Witch-grass*	*Prickly lettuce*
	---------- (%) ----------			
N broadcast in spring only	46	48	60	56
N banded or broadcast in fall + P in row	76	99*[3]	98*	100*
P and/or N + P broadcast in fall	82*	92*	98*	100*
N broadcast in fall only	52	65	95*	99*

N + P in row in fall + N in spring	60	78*	60	—
N + P broadcast in fall + N in spring	89*	86*	83	100*
No fertilizer applied	68	59	96*	100*

[1]Adapted from Wicks et al., Weed Technology 3:244-254.
[2]Based on 138 fields.
[3]* = different from nitrogen applied in spring at 5 percent level.

Weeds may be larger after harvest and more difficult to control where nitrogen was applied in the spring. The excess weed growth is due to incomplete utilization of nitrogen by the wheat as a result of the late application. When nitrogen is to be applied in spring, band phosphorus at planting to stimulate crop growth, resulting in reduced weed growth.

Increasing the nitrogen rate above recommended amounts improves weed control, but may decrease wheat yield (*Table IV*). However, fields with low fertility that have not been properly fertilized generally have more weeds because of less vigorous winter wheat.

Fields should be checked for weeds four to six weeks after planting and in February through April for broadleaf weeds. Broadleaf weed problems encountered in the stubble after winter wheat harvest can be largely eliminated by a timely spring herbicide application.

Table IV. Influence of nitrogen rates on summer annual weed density in growing wheat and stubble at North Platte.[1]

	Growing wheat		*Wheat stubble*	
N rate[2]	*Waterpod*	*Green foxtail*	*Green foxtail*	*Stinkgrass*
lb/A	---------- (no./m^2) ----------			
0	7	20	23	5
30	6	26	27	4
60	4	16	21	2
90	2	15	9	1
LSD (0.05)	4	6	13	3

[1]Adapted from Valenti and Wicks, 1992. *Weed Science* 40:115-121.
[2]Applied before winter wheat planting.

Clean Seed, Seeding Date, Rate, Variety, and Row Direction

Planting crop seeds containing weed seeds has been the most common method of spreadingf weeds for centuries. Recent drill box surveys in Kansas and Nebraska have shown that many wheat seed lots contain unacceptable levels of weed seeds. Farmers should have their seed cleaned at certified seed conditioners. Trashy wheat will reduce the planting rate of actual wheat seed.

It is important to plant winter wheat during the optimum planting time (*Figure 3*). For example, at North Platte optimum seeding period is September 15 to 25. Planting wheat earlier may result in lower winter wheat yield (*Table V*). Earlier plantings are subject to crown and root rot which reduce winter wheat yields. In addition more weeds are present in the wheat and the following grain sorghum crop when

wheat was planted before September 1. Late planted wheat may not tiller enough to suppress weeds in the spring and yield may be reduced.

Table V. Effect of winter wheat planting date on density of summer annual grasses.[1]			
		Summer annual grasses	
Planting date	*Winter wheat grain*	*In wheat*	*In sorghum*
	bu/A	---------- (no./m^2) ----------	
September 1	18	14	270
September 15	37	7	140
September 25	39	8	100
LSD (0.05)	5	5	120
[1]Adapted from Wicks et al., 1995. *Weed Science* 43:434-444.			

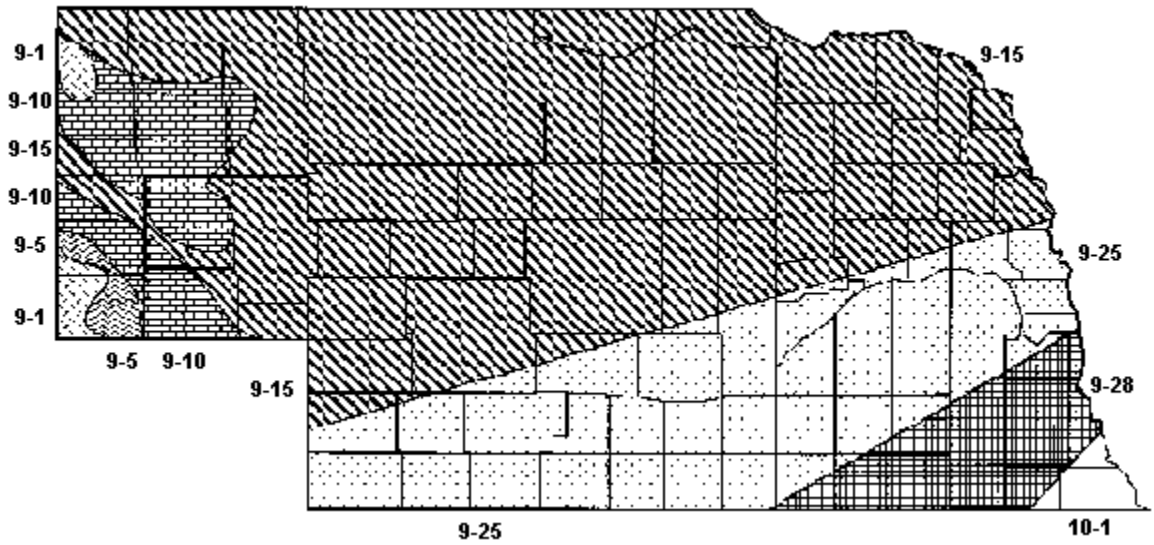

Figure 3. Guide for optimum planting date for winter wheat in Nebraska. Adapted from EC98-103, *Nebraska Fall-Sown Small Grain Variety Tests.* Window ends about 10 days after the optimum date.

Selecting adapted competitive winter wheat varieties is important. Research and field surveys have shown a large difference in weed suppression characteristics of winter wheat varieties (*Table VI*). Tall wheats competed with weeds better than short varieties in two out of three years. Other factors affecting competitiveness include leafiness, leaf angle, tillering, early growth, and winter injury.

Seeding rates can be adjusted to improve weed control. Generally seeding rates need to be increased for later seeding dates to compensate for reduced tillering. Seed treatments should be considered to control seedling diseases. In Nebraska, winter wheat is planted at 45 to 120 lb/A depending on location and planting date. The 45 lb/A rate is more common in western Nebraska while 60 to 75 lb/A is more common in the eastern two-thirds of the state. Higher seeding rates are used when winter wheat is planted after soybean harvest. When winter wheat is planted at the optimum time, the appropriate

seeding rate is 18 seeds per foot. This is about 60 lb/A with average seed size. Planting fewer seeds may result in increased weed growth (*Table VII*).

Table VI. Effect of winter wheat varieties on summer annual weed density.[1]

Variety stature[2]	1983	1985	1985
	---------- (no.m^2) ----------		
Medium tall	40	58	10
Medium	44	55	12
Medium short	438	111	14
Short	483	122	5
LSD (0.05)	160	45	ns

[1]Adapted from *Weed Science* 42:27-34.

[2]Stature for varieties were as follows: medium-tall, Buckskin and Siouxland; medium, Brule, Centurk 78, and Lancota; medium-short, Eagle and Homestead; and short, Colt, TAM101, and Vona.

Table VII. Effect of winter wheat seeding rates on annual grass panicle production after wheat harvest at North Platte.[1]

Seeding rate	*Barnyardgrass*	*Green foxtail*	*Stinkgrass*	*Witchgrass*
lb/A	---------- (panicles/30 m^2) ----------			
30	6	6	21	133
60	1	2	5	34
90	0	0	4	52
LSD (0.05)	8	8	14	15

[1]Adapted from *Agronomy Journal* 75:507-511.

Winter wheat is planted in row widths from 6 to 14 inches in Nebraska. Generally row spacings are wider in west central and western Nebraska. Wide rows are advantageous when soil moisture is limited because hoe openers can move dry soil to the interrow without excessive seed coverage. The wheat seeds then are placed into firm moist soil. Often this is an advantage in weed control because wheat germination and seedling vigor is greater. Also there is less danger of winter kill. Short coleoptile wheats must be planted at a shallow depth to obtain uniform emergence. However, when moisture is not a limiting factor, narrow rows and increased crop density offer advantages for weed control (*Figure 4*). Also, the wider row spacing, fewer problems occur with crop residue clearance. The ground is shaded sooner in narrow rows and weed development is suppressed. Barnyardgrass is more difficult to kill with Gramoxone

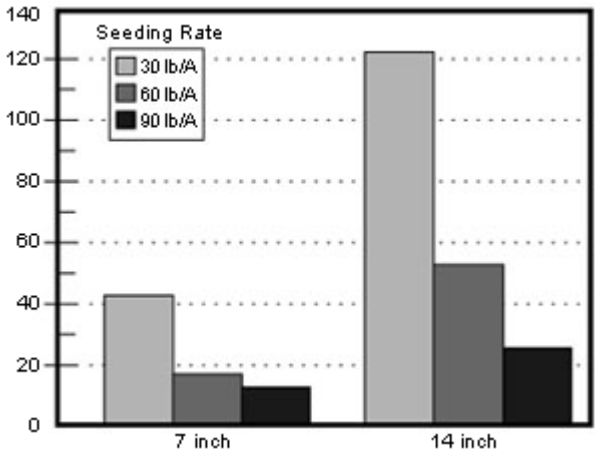

Figure 4. Summer annual weed density five days after winter wheat harvest as affected by row spacing and wheat seeding rate. Adapted from *Agronomy Journal* 75:507-

Extra or Roundup Ultra after wheat harvest in the rows that are wider than the drill rows because the weeds are large. **511.**

Row direction also can influence weed densities, but is less important than row spacing (*Table VIII*). This effect has been observed in farmers' fields after wheat harvest when Gramoxone Extra plus atrazine has been applied. Weed control was better in north and south rows than east and west rows. Apparently, the north-south rows shade the ground better than east-west rows. Where erosion control is not a concern, north-south rows are preferred.

Weed control in winter wheat requires an integrated system that relies on numerous management decisions related to maximizing crop growth and minimizing weed growth. Timely field scouting is essential in good weed management.

Table VIII. Effect of drill spacing and row direction on weed control in Arapahoe winter wheat (seeded at 18 seeds/ft) after wheat harvest at North Platte in 1994.

Winter wheat row		*Weeds after harvest*		
Spacing	*Direction*	*Lambsquarters*	*Pigweed*	*Grasses*
Inches		---------- (no./10 m^2) ----------		
14	E - W	33	17	33
14	N - S	10	1	1
7	E - W	1	0	1
7	N - S	0	0	0

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