

Downy Brome Control

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This NebGuide describes downy brome and its control, including cultural, mechanical and chemical methods; herbicide recommendations also are provided.

Downy brome (*Bromus tectorum* L.) is found throughout Nebraska and is one of the most serious weeds in western Nebraska. Lack of control can be costly to both crop and livestock producers. It is especially troublesome in alfalfa, winter wheat-fallow rotations, continuous winter wheat, rangeland, waste areas, roadsides, shelterbelts, fence rows, and railroad rights-of-way. It invades overgrazed pastures and rangelands and is spread when the long awns on seeds attach to cattle. Seeds also are spread by hay, combines, grain trucks, and in contaminated winter wheat seed.

Downy brome is known by a variety of names including cheatgrass, cheatgrass brome, downy brome grass, military grass, wild oats, downy chess, and cheat. Downy brome may be called cheat, but cheat (*Bromus secalinus* L.) is actually a different weed. Cheat always heads out above the wheat. Two other annual bromes often are confused with downy brome: Japanese brome (*Bromus japonicus* Thunb. ex. Murr), which is more common in western Nebraska, and hairy chess (*Bromus commutatus* Schrad), which is more common in eastern Nebraska. Both are more prevalent in pastures and waste areas but can be found in winter wheat. This discussion of downy brome also pertains to Japanese brome and hairy chess.

Damage and Impact

Downy brome is a winter annual and thrives in all soils. This weed has an extensive shallow root system and roots with many hairs that enable the plant to extract much of the soil water. A downy brome density of 50 plants per square foot can remove soil water to the permanent wilting point to a depth of about 2.5 feet. Downy brome is thus very competitive with winter wheat for soil water and nutrients. When under stress, plants only 1 to 2 inches tall can produce seed. Plants under stress from tillage or harsh environments divert more of their photosynthetic energy to seed production than undisturbed plants or plants growing in more productive environments.

At Alliance and North Platte, moderate (one to two plants per square foot) to heavy infestations of downy brome have reduced wheat yields 30-80 percent. Downy brome also can dramatically reduce first harvest alfalfa yields by competing for early season moisture. It also can severely reduce forage qual-



Figure 1. Downy brome plant, enlarged spikelet, ligule area, and seed.

ity. Overgrazed rangelands are more easily invaded by downy brome, which reduces economic returns of the grassland.

Downy brome is a palatable grass before the seed heads emerge but becomes unpalatable with maturity. Mature downy brome can injure livestock by causing infection in the eyes or mouth. Mature plants also are a serious fire hazard.

Plant Description

Downy brome usually begins growing in the fall or early spring. Reproduction is by seed and seedling plants must be vernalized to produce seed. In medium-textured soils, the optimum seed depth for downy brome emergence is less than 1 inch; however, seedlings have emerged from a 4-inch depth in western Nebraska. The plant tillers profusely, depending on time of germination. In early spring the plant continues to tiller, joints, and sets seed (see *Figure 1*). The plant grows from 6 to 24 inches tall. Height depends on available soil water, fertility, and plant competition. At emergence, leaves are about 1/32 of an inch wide and brownish-green. As the plant and seed reach maturity, leaves turn purplish-tan.

Identifying Characteristics

- *Leaves* — Leaf blades are flat and 2 to 6 inches long. Blades and sheath are hairy.
- *Ligule* — Prominent membrane with frayed margin to almost 0.10 inch long.
- *Auricle* — None
- *Roots* — Fibrous and relatively shallow.
- *Stems* — Smooth, slender, and erect, protruding from a much-branched base.
- *Panicle and seed* — Panicles are 2 to 6 inches long, slender, and drooping to one side. Spikelets are numerous, five to eight flowers with slender straight awns, 1/2 to 3/4 inch long, each attached to a hairy, buff-brown, narrow seed about 1/2 inch long. The seeds are light and fluffy — about 200,000 per pound. Initial seed germination rates usually are high. A heavy infestation can produce as much as 400 lbs or 80 million seeds per acre. Some seeds will remain viable more than two years when placed near the soil surface because of natural dormancy or unfavorable conditions for germination.

Downy Brome Control

Downy brome is best managed by integrating cultural and chemical control measures to eliminate seed sources, contain its spread, and kill existing weeds before they can compete with crops and pastures for water resources. Crop rotation is one of the most effective control measures; however, this is not a viable option in pastures or in some cropping systems in western Nebraska. The following sections describe two control options — eliminating seed sources and rotating crops — as well as strategies best suited to specific cropping systems.

Eliminate Seed Sources

1. Till and crop roadside ditches when possible or seed to a perennial grass.
2. Seed perennial, cool-season grasses such as crested wheatgrass or smooth brome in waste areas and field borders. Vigorous stands of grasses or grass-legume combinations are highly competitive with downy brome and other annual weeds. See section on *Reestablishing Desirable Grasses in Waste Areas* for additional information.
3. Sometimes mowing can be effective in reducing seed production, but it will not eliminate downy brome. Mowing must be timely and close to the ground. More than one mowing may be necessary to prevent tillers from producing seed. Mowing is useful for small infestations in pastures, roadsides, and waste areas where cultivation or herbicides are not feasible. Mowing also may reduce competition so that desirable perennial grass may reestablish.
4. On cultivated fields, destroy weeds before they produce seed.
5. Plant clean seed. Downy brome seeds often are found in small grain and grass seed.
6. Use herbicides that do not kill established perennial grasses around field borders.
7. Control small patches or area infestations before they spread.

Rotate Crops

Crop rotation is the most effective control method. Crops planted in late spring such as corn, grain sorghum, proso millet, and sunflower are much more effective than crops planted

Caution

Herbicide residue in the soil and water, crop safety, herbicide costs, and Environmental Protection Agency regulations must be considered before a chemical is used for any weed control operation. Always read and follow the herbicide label. Keep chemicals out of reach of children.

earlier in the spring such as pea, oat, spring barley, and spring wheat. Crops that must be planted early for optimum yield will allow some downy brome enough time to germinate and produce seed. The key to control is having fall rains to germinate downy brome seeds and then killing these plants before seeding early spring crops. A glyphosate application followed by tillage 7 to 15 days later or glyphosate followed by no-tillage are effective control methods.

With crops planted in late spring, tillage and/or herbicides can be used to control downy brome before planting. It will not be able to germinate and set seeds after a late spring control program. Also, atrazine can be used after winter wheat harvest to effectively reduce downy brome density before planting corn or grain sorghum. Corn and grain sorghum yields have been better when the crop is planted no-till into the treated winter wheat stubble (ecofarming). The one disadvantage of planting no-till corn or grain sorghum is that some of the downy brome seeds may not be in contact with moist soil long enough to germinate until the spring or fall after corn or grain sorghum is planted. Seedlings from these seeds can be a problem even in rotations. In the spring following corn or grain sorghum harvest, the volunteer winter wheat and downy brome seedlings must be controlled in the three-year rotations (winter wheat-summer crop-fallow). Tillage or glyphosate must be applied in April before downy brome heads to ensure that seeds are not produced. Two herbicide applications are necessary to control downy brome in heavy corn or grain sorghum residues as the residue will shield some plants. Thus, it is important to make the second application in the opposite direction. Most importantly, do not allow downy brome to produce seed during fallow periods.

Crop rotations with two years of a late spring planted crop provide almost 100 percent downy brome control if plants are kept from producing seed during the fallow periods. Consider this option before returning to a winter wheat-fallow or continuous winter wheat rotation. If staying with the three-year rotation, there will be little need for a second year of a late-planted spring crop unless downy brome was not killed before it produced seeds.

Control in Winter Wheat-Fallow Rotation

For some western Nebraska winter wheat producers, crop rotation is not an attractive option; therefore, they must improve downy brome control during the fallow period. When selecting treatments, consider the farm program, farm program residue requirements, soil erosion from wind and water, and equipment availability.

In the winter wheat-fallow rotation, effective control measures must include getting good seed-to-soil contact and germination of downy brome seeds. Conservation tillage, which maintains crop residues, usually is not as effective in controlling downy brome. This creates a problem when trying to maintain crop residues to prevent soil erosion from wind and water or complying with government programs. Following is a suggested program for downy brome control in winter wheat-fallow rotation.

1. Sweep-till immediately after harvest to plant downy brome seeds for optimum germination and easier control.
2. Sweep-till in late August or early September and spray atrazine. Tillage kills emerged downy brome and atrazine controls new flushes over the winter.
3. Till twice in April or apply glyphosate before downy brome heads. Herbicides are more effective than tillage in moist spring soils and do not destroy additional residue.
4. Use tillage such as sweep and rodweeding during summer to control weeds and prepare a seedbed.
5. Delay seeding winter wheat if possible for 7 to 10 days after rain. This allows downy brome to germinate and be killed by tillage before planting winter wheat. By delaying planting for one week after a fall rain then tilling and planting, winter wheat yields may be increased by as much as 69 percent in some years. Most downy brome can be killed with this tillage operation. Do not delay seeding more than 10 to 14 days beyond the optimum seeding date for winter wheat for the area. Timely operations are important to this program's success.

Burning or Plowing to Control Downy Brome

Generally, these programs are discouraged because of residue requirements and the possibility of soil erosion. If soil erosion and conservation compliance are not problems, the moldboard plow may be used on a small percentage of your acreage each year to control downy brome. Using the moldboard plow to bury seeds at least 4 inches deep can provide 95 percent downy brome control. Subsequent plowing should be avoided for at least four years to prevent viable seed from returning to the soil surface. Burning, even in small areas, usually disqualifies producers from the farm program.

The success of all treatments involves keeping the plant from producing seeds in the fallow period. If downy brome needs to be controlled in March or April, use tillage if the soil and weather conditions allow. Remember, the soil must be dry enough for downy brome to wilt within 30 minutes for good control. Use herbicides containing glyphosate when the soil or weather conditions limit control with tillage (*Table I*).

Table I. Effect of downy brome treatment on wheat yields.

Treatment ¹	bu/A
Roundup® or paraquat	40.4
Without Roundup or paraquat	26.2

¹Treatments applied in May of fallow year.

Chemical Control

Nine herbicides — Amber®, Beyond™, Far-Go®, Finesse®, Hoelon®, Maverick®, Olympus™ 70WDG, PowerFlex™, and Treflan® — are registered for selective downy brome control in winter wheat.

Maverick, Olympus 70WDG, and PowerFlex are sulfonylurea herbicides (ALS-inhibitors) similar to other common wheat herbicides such as Ally® and Amber, except that they provide excellent control of grasses in the *Bromus* genus such as downy brome, Japanese brome, and cheat. Olympus 70WDG and PowerFlex may provide better late postemergence control than Maverick.

Maverick and Olympus 70WDG have long persistence in the soil. Recrop options for up to one year after Maverick use include wheat (anytime); millet, imidazolinone-resistant (IR) corn, or sulfonyl-tolerant soybeans (STS) (three months);

and conventional soybean (12 months). Recrop options for up to one year following Olympus use include wheat (anytime); proso millet or STS soybean (four months); and grain sorghum, sunflower, or conventional soybean (12 months). PowerFlex has less persistence in the soil, with most major crops having a nine-month rotational interval and no rotation interval being longer than 12 months. Always check the label for details on recropping.

Maverick should be applied at a rate of 2/3 ounce in 5 to 20 gallons of water per acre per cropping season. It may be applied preemergence or postemergence in winter wheat. A non-ionic surfactant should be added to postemergence treatments at 0.5 percent (1/2 gallon per 100 gallons of spray solution) on a volume basis.

Olympus 70WDG should be applied at a rate of 9/10 ounce in at least 5 gallons of water per acre at early postemergence in the fall. A non-ionic surfactant should be added at 0.5 percent (1/2 gallon per 100 gallons of spray solution) on a volume basis.

PowerFlex should be applied at a rate of 3.5 ounces in more than 5 gallons of spray solution per acre. A spray volume of more than 10 gallons per acre is preferred. A non-ionic surfactant (0.25 percent to 0.5 percent) or crop oil concentrate (0.8 percent) is required. Liquid nitrogen may be added to the spray solution, but not at more than 50 percent concentration and not exceeding 30 pounds of nitrogen per acre.

In testing by the University of Nebraska–Lincoln, Maverick and Olympus 70WDG have performed best on downy brome in wheat when applied early postemergence, shortly after the downy brome has emerged in the fall. Control at this time ranged from 80 to 100 percent when sufficient rainfall was received by late October to improve soil activation and root uptake of the herbicide. Fall application should be made when downy brome is in the two- to three-leaf stage. Without appropriate fall precipitation, downy brome control declines.

Herbicide applications after Nov. 1 have provided less control, probably due to reduced precipitation and slower plant growth. In University tests Olympus 70WDG provided better control than Maverick in late fall applications. Spring applications have been inconsistent, with an occasional control rating as high as 85 percent, but with more typical ratings of 35-70 percent. These plants usually are significantly stunted, but can produce seeds. Again, precipitation following application appears to be important for improved herbicide activity. Best control is obtained if downy brome has fewer than five tillers and plants are green. Research in Colorado and Kansas suggests that PowerFlex provides similar downy brome control to Maverick and Olympus 70 DWG when applied in the fall, and may provide slightly better control than Maverick when applied in spring.

Downy brome may develop resistance to Maverick, Olympus 70 WDG, PowerFlex, and herbicides with the same mode of action when these herbicides are used repeatedly. Herbicide-resistant plants may be present naturally in a weed population at extremely low numbers. Repeatedly using the same herbicide, or herbicide mode of action, allows the resistant weeds to multiply while the susceptible weeds are controlled. Over time the weed population shifts to primarily herbicide-resistant weeds and weed control failures can occur. Resistant weeds cannot be controlled by increasing the herbicide rate.

Beyond herbicide, which was introduced in the fall of 2002, must be used with winter wheat cultivars that contain the gene that confers tolerance to Beyond as part of the Clearfield® Production System for Wheat. Tolerance means that the winter wheat variety with the gene is able to withstand a recommended rate of Beyond with minimal risk of crop injury. Varieties that

do not contain this gene are either killed or seriously injured by Beyond.

In field studies conducted in western Nebraska and throughout the western winter wheat belt, Beyond provided excellent control of downy brome and jointed goatgrass when weeds were treated with 4 ounces of product per acre in the fall or early spring. The biggest concern with the Clearfield System is the development of herbicide-resistant weeds. Beyond herbicide, like Maverick, Olympus 70 DWG, and PowerFlex, belongs to the class of herbicides known as ALS-inhibitors. Other herbicides in this class, such as Glean® and Pursuit®, have a history of quickly selecting for resistance in weed populations. Examples of weed biotypes that have become ALS-resistant include kochia, prickly lettuce, Russian thistle, and some pigweed species. Without adequate safeguards, weeds resistant to ALS-inhibitor herbicides can increase in density.

In order to delay the onset of herbicide resistance, fields treated with Beyond herbicide should not be treated with another ALS-inhibitor such as Ally® or Peak®. If additional weed control is needed to control warm-season broadleaf weeds like kochia or pigweeds, use a herbicide with a different mode of action. Herbicide mixtures containing 2,4-D or dicamba would be good choices for additional weed control in the spring.

Growers wanting to plant Clearfield wheat varieties must agree to and sign the BASF Clearfield Stewardship Grower Agreement. The BASF Clearfield stewardship program for wheat requires using only certified seed; growers will not be allowed to save back any seed. Growers should not use Beyond more than twice in six years. This allows Beyond to be used every time winter wheat is grown in a three-year rotation containing a late-spring seeded crop and summer fallow. Growers in a winter wheat-fallow rotation are advised not to use the system in more than two consecutive wheat crops.

Control with the other labeled herbicides usually has ranged from 0 to 50 percent, depending on rainfall, incorporation, and wheat seeding methods. Apply Amber preplant, preplant shallow-incorporated, or preemergence to wheat at the enhanced rate (0.56 oz per acre) for suppression of light to moderate downy brome populations that have not emerged.

Finesse can be used preemergence at 0.5 ounce per acre for suppressing downy brome in winter wheat. Check rotational restrictions. Far-Go 10G may be applied preplant without incorporation at 15 lbs of product per acre. Apply Treflan, which must be incorporated within 24 hours, from three weeks before to immediately before planting at a rate of 0.8 to 1.2 pints per acre.

Control On Non-Cropland

Arsenal®, Hyvar®-X, Krovar® I, Karmex®, Princep® and Spike® should be applied at the recommended rate of active ingredient in enough water to give good coverage. Make preemergence or early postemergence applications in the fall or early spring. Make spring application before April 10 or before the plants are 2 inches tall. Excellent preemergence control generally results when at least 1 to 2 inches of rain falls soon after application. Glyphosate also can be used, but it does not provide residual control.

Caution: With the exception of glyphosate, these herbicides carry over in the soil for several years.

Control In Alfalfa

Downy brome can be controlled in alfalfa by using cultural practices, herbicides or a combination of both practices. A healthy alfalfa stand can be very competitive with downy brome. Good water management, timely phosphorus treatments, and downy brome control near field margins can help keep this weed from becoming a problem in the field. In new seedings of alfalfa, herbicides such as Select® will effectively control annual grasses and not injure alfalfa. Remember to treat downy brome when it is small and before heading. In established stands of alfalfa, Velpar® and Sencor® applied in the fall or winter before alfalfa breaks winter dormancy will provide effective control.

Control In Rangeland and Pasture

Use good rangeland management practices. Harvest half the forage and leave the rest. Practice rotational grazing. Downy brome cannot be controlled in rangeland and pastures until good management practices are employed.

Reestablishing Desirable Grasses in Waste Areas

It is often suggested to seed desirable grass to reduce downy brome competition. This cannot be done until the downy brome is eliminated. Planting sudan or forage sorghum for a couple years, combined with tillage, is the best approach to establishing desirable grasses in abandoned fields or waste areas. Once downy brome and other weed seed has been diminished, the chances of establishing a desirable perennial grass are improved. Growers have had limited success spraying paraquat or glyphosate to kill the existing weeds and planting into the field either in the spring or fall. Weeds growing before or after treatment can use too much water, as weed seed near the soil surface can germinate with the grass and provide early season competition.

Control in Windbreaks

See the latest *Guide for Weed Management in Nebraska*, EC130, for rates and recommendations.

This publication has been peer reviewed.

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