



Downy Brome

Bromus tectorum L.

P.E. Nesse and D.A. Ball

Downy brome (*Bromus tectorum* L.), also known as cheatgrass, was introduced into the North American continent from the Mediterranean area of Europe. It was identified in the eastern United States in 1861, and by 1914 this aggressive weed had spread throughout the continent.

Downy Brome is of particular importance in the northern Great Plains, intermountain west, and the inland Pacific Northwest. It is present to a lesser extent in most of the continental United States except for the extreme southeastern tier of states.

In much of the Pacific Northwest and intermountain west, downy brome provides an important source of spring forage on arid grazing lands. However, the forage quality of downy brome decreases as plants mature. Protein content drops to about 3 percent as plants mature, and long slender awns on the seed head can limit feed intake by irritating and puncturing the soft tissues inside the mouth of grazing animals.

Philip E. Nesse, Extension agent, Gilliam/Morrow counties; Daniel A. Ball, assistant professor of weed science, Columbia Basin Agricultural Research Center, Pendleton; Oregon State University.



Figure 1.—Downy brome in the vegetative growth stage.

Downy brome is a major weed problem in winter wheat, perennial grass seed, and alfalfa in much of the Pacific Northwest and Great Plains. Downy brome infestations of 10 and 50 plants per square foot can reduce winter wheat yields by 40 and 92 percent, respectively. Downy brome is especially troublesome in drier production areas where crop rotations are mostly limited to winter wheat followed by a year of summer fallow (winter wheat-summer fallow rotation).



Figure 2.—Magnified view of the collar region of a downy brome culm showing characteristic pubescence.

Identification

Downy brome is a winter-annual grass producing erect or spreading culms that are slender and 12 to 24 inches high. It produces numerous tillers and is characterized by the presence of fine hairs covering leaf sheaths and blades. The panicle (seed head) is rather dense, slender, drooping, often purple, with spikelets nodding, and 2 to 6 inches long. Seeds are narrow, $\frac{1}{4}$ to $\frac{5}{8}$ inch long and with awns up to $\frac{5}{8}$ inch long.

Ecology

Downy brome is adapted to climates with annual precipitation from 6 to 22 inches. It can colonize a wide range of soil conditions on both disturbed and undisturbed sites.

In addition to its success as a cropland weed, downy brome can inhabit salt desert shrub communities, sagebrush steppe, and ponderosa pine and Douglas-fir forest. Once established, it can become the dominant herbaceous plant species. The area dominated by downy brome in the intermountain west has been estimated at over 100 million acres.

Downy brome seed germination typically occurs in late summer or autumn shortly after fall rains when the soil temperature is about 70°F. Seeds can continue to germinate in the autumn at soil temperatures between 35 and 40°F if soil moisture is adequate. Established plants overwinter in the vegetative stage, resume growth again in the early spring, and mature in May or June, typically 4 to 6 weeks

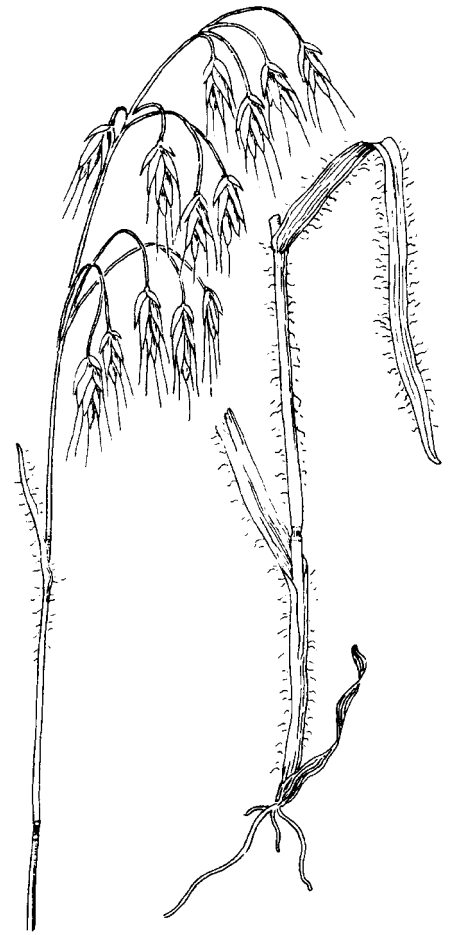
before winter wheat. Mature plants also can be produced from seeds germinating in the spring, although seed production is much more prolific from autumn germinating plants. Newly produced downy brome seed requires a short after-ripening period for best germination.

Beyond this initial after-ripening period, little seed dormancy remains, and germination occurs if favorable temperature and moisture conditions exist. Seed germination often exceeds 95 percent for seeds buried within 2 inches of the soil surface. Seeds buried below 2 inches may germinate but will rarely emerge above the soil surface.

Seedling emergence also is restricted by soil compaction. Downy brome seeds are viable in the soil for 2 to 3 years, which makes a 2-year crop rotation of winter wheat with fallow or other crop ineffective, by itself, for control of downy brome.

Under ideal conditions, a dense infestation of downy brome can produce over 500 pounds of seed per acre (1 pound of seed contains approximately 250,000 seeds). Dry matter production of downy brome on rangeland sites can vary from less than 100 lb/acre on the poorest sites to more than 2000 lb/acre on the better sites.

Rainfall, or lack of it, plays a key role in determining dry matter production of downy brome, as does competing vegetation and growing season temperatures. Roots can continue to grow at soil temperatures of 37°F during the winter,



Downy brome inflorescence (left) and stem (right).

and can reach a maximum depth of 3 to 4 feet as downy brome plants mature. In a dense stand, the extensive, fibrous root system can extract all the available moisture from the upper soil profile.

Downy brome responds dramatically to nitrogen fertilization of winter wheat. Surface-applied nitrogen, either as commercial fertilizer or as manure, has been shown to triple downy brome height and yield. Research has shown that actively growing downy brome can negate the benefits to winter wheat from spring-applied, topdress nitrogen.

Control

Control of downy brome in rangeland generally consists of burning, using nonselective herbicides, and stocking rate management. Vigorously growing desirable grass and forb species compete with downy brome and help prevent the establishment of infestations. Prevention of overgrazing and management for optimum range production are effective approaches for downy brome control.

Rotation

A number of strategies have been used with some success for control of downy brome in winter wheat. The most effective control is to lengthen the period between winter wheat crops by including 2 or more years of various combinations of spring crops with or without fallow.

In the lower precipitation areas, rotations could include: winter wheat-summer fallow-spring wheat-summer fallow; winter wheat-spring barley/other crop-summer fallow; or winter wheat-spring barley/other crop-spring wheat-summer fallow.

In higher precipitation areas with annual cropping, rotations including 2 years of spring crops, such as spring barley, canola or spring peas, between winter wheat crops can effectively reduce downy brome populations. These types of rotations allow for fall and/or spring destruction of germinating downy brome over a period of 2 or more years. This can

prevent new seed production and deplete the downy brome seed reserve in the soil. Yields from spring crops can be considerably less than yield from winter wheat. However, winter wheat yield losses from downy brome need to be a part of comparisons of alternative crop options and rotations.

Mechanical and Chemical Control

Another strategy for control is to perform shallow tillage after downy brome emergence in the fall, but prior to planting winter wheat. This control requires timely rains for downy brome germination. Waiting for adequate precipitation for downy brome germination can delay wheat planting and may result in reduced grain yield.

Moldboard plowing of winter wheat stubble in the fall after harvest to deeply bury downy brome seed traditionally has been used as the primary control for downy brome in infested winter wheat crop rotations. While this control generally has been successful in limiting infestations, it can result in severe soil erosion over the winter due to elimination of crop residue on the soil surface. It also can result in reduced overwinter soil moisture compared to moisture retained by leaving wheat stubble on the surface.

A fallow management practice that helps deplete downy brome seed reserves in the soil is to allow downy brome to germinate in wheat stubble from autumn into early spring. Downy brome can then be

destroyed by using a nonselective herbicide or by tillage.

The use of nonselective herbicides in early spring followed by late spring tillage also has been effective in maximizing soil moisture storage in fallowed land. Herbicides with soil residual activity also can be used to control winter annual grasses during the winter and spring of the fallow year. This practice can reduce the necessity for early nonselective herbicide treatment in the spring.

Selective chemical control of downy brome can be obtained in alfalfa, but is more difficult in cereal crops such as winter wheat because of the relatively close botanical relationship between the weed and winter wheat. Several selective herbicides are available as preplant incorporated treatments in cereals or as postemergence treatments for downy brome in growing winter wheat.

For further, in-depth information on downy brome management in winter wheat rotations, refer to the *PNW Conservation Tillage Handbook Series* publication, "Managing Downy Brome under Conservation Tillage Systems in the Inland Northwest Crop-Fallow Region" (chapter 5, No. 15).

For current herbicide control strategies for downy brome, refer to the *PNW Weed Control Handbook*, and contact local county Extension agents and agricultural professionals. As with all crop protection chemicals, read and follow label directions and understand their proper use.



Figure 3.—Mature downy brome plant showing characteristic growth habit.



Figure 4.—Mature downy brome panicles in a field of ripening winter wheat.

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