



Dwarf Bunt of Winter Wheat

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Historically, winter wheat produced under dryland conditions in Idaho has been attacked by two smut fungi — common or stinking bunt and dwarf bunt. Common bunt has basically been eradicated by the development of resistant varieties, improved chemical seed treating materials and improved seed treating equipment. Dwarf bunt, however, continues to be a major disease problem in many of Idaho's dryland winter wheat areas.

Dwarf bunt is known to occur in these counties:

Northern Idaho - Benewah, Boundary, Clearwater, Kootenai, Latah, Lewis and Nez Perce.

Southwestern and Southcentral Idaho - Camas, Cassia, Elmore and Washington.

Eastern Idaho - Bannock, Bingham, Bonneville, Caribou, Franklin, Fremont, Madison, Oneida, Power and Teton.

Most soft white winter wheats and many hard red winter wheat varieties adaptable to Idaho growing conditions are susceptible in varying degrees to dwarf bunt. Some recently developed varieties have become susceptible because of the development of new strains or races of the fungus.

Monetary costs of the disease are difficult to assess. They can include both yield reduction and a price discount of 6 cents per bushel when grain is graded "smutty," and 3 cents per bushel when graded "light smutty."

Symptoms of the Disease

Positive symptoms become apparent only after the crop heads out. Extreme dwarfing of wheat stems is a characteristic symptom of dwarf bunt. Height reductions range from 25 to nearly 70 percent depending on the variety of wheat, the strain of the fungus and climatic conditions.

Dwarf bunt infections usually stimulate tillering. The number of tillers per infected plant often exceeds that of uninfected plants by about 50 percent. Partially infected plants tend to tiller more than totally infected plants.

Morphological changes occur in the heads of wheat plants infected with dwarf bunt fungus. Club type heads become elongate while common type heads usually are shortened. Both head types exhibit a squarrose appearance. The awns on awned varieties tend to spread, giving the head a feathered appearance. If the wheat variety is susceptible, all kernels of infected heads are replaced by roundish, light-brown smut balls filled with a dark brown spore mass. With tolerant wheat varieties, only a few spikelets of the head may be affected. Just a few florets of some of the spikelets may possess the smut balls. Even partially smutted kernels have been observed. When the smut balls are crushed, they emit a distinctive foul odor similar to rotting fish.

Cause of the Disease

Dwarf bunt is caused by the fungus *Tilletia controversa*, which survives as spores in the soil several years. The fungus is unique because the spores germinate only at low temperatures—between 32 and 41° F. The spores require about 15 weeks' exposure at 32° F before germination is initiated, 5 weeks at 41° F. Not all the spores germinate at once, even under optimum conditions. Once initiated, spore germination

may occur over a 9-week period. Thus, under optimum conditions, maximum spore germination may take 14 weeks.

The spores also require oxygen for germination. Therefore, only spores situated near the soil surface germinate in a given year. Spores buried deeper in the soil remain dormant until they are brought nearer the soil surface by cultural operations.

Dwarf bunt spores will not germinate in water maintained between 32° and 41°F. But they can be preconditioned to germinate in cold water and, when a drier environment is provided, they will germinate readily.

Dwarf bunt in the field can be severe under two conditions. Both conditions require that the soil remain unfrozen all or most of the winter months. These conditions are:

Areas with winter snow cover — If snow accumulates before the soil freezes in the fall, soil temperature beneath the snow holds at about 33°F. The soil is saturated with water. Wheat plants are dormant at that temperature. The spores will not germinate in cold water, but can be preconditioned to germinate. When the snow melts and the soil surface partially dries, the spores will germinate, the wheat will tiller and infection occurs.

Areas with intermittent winter rain and snow — Soil temperatures near the surface fluctuate from slightly below 32°F to slightly above 41°F throughout the winter months. The soil usually is wet but not always saturated. The wheat is essentially dormant and the smut spores are preconditioned to germinate. The coincidence of spore germination, wheat tillering and infection is basically the same as before. However, under these conditions it is possible that infection could occur anytime from midwinter through early spring.

If the soil freezes in the late fall and remains frozen through the winter, the incidence of dwarf bunt will be low because the soil temperature is below 32°F and the spores will not germinate. When the soil thaws in the spring, temperatures generally become too warm to allow maximum spore germination and subsequent infection.

When dwarf bunt infects a wheat plant, the fungus threads (mycelia) become established in the growing point of the stem which later develops into the wheat

head. The fungus invades the developing floral organs. As the head emerges from the boot, the individual cells of the mycelia become detached and develop into smut spores which are enclosed in the pericarp of the wheat kernel. A single floret can produce 5 to 12 million smut spores.

The spore balls are readily crushed during grain harvest, releasing the spore masses. Some smut spores adhere to the kernels, resulting in a price discount for grain graded smutty. The rest attach to harvesting equipment or are dispersed by air currents to the fields. Such dispersion reinfests fields and infests others previously free of the fungus.

Planting smut-contaminated seed also can infest fields and introduce new races of the fungus into fields.

Control

Treat seed with HCB, PCNB, PMA or Vitavax. Infection of wheat plants occurs solely from spores at or near the soil surface and not from spores adhering to the seed. Seed treatment will kill the smut spores adhering to the seed and thus is recommended to prevent spread of the fungus.

Plant resistant varieties.

Here are winter wheat varieties grown in Idaho and their reaction to dwarf bunt:

Soft White Winter Wheat Varieties

Luke - very resistant
Paha - susceptible
McDermid - susceptible
Hyslop - susceptible
Gaines - susceptible
NuGaines - susceptible
Peck - susceptible

Hard Red Winter Wheat Varieties

Tendoy - susceptible
Wanser - susceptible
McCall - susceptible
Itana 65 - susceptible
Ranger - resistant
Franklin - very resistant
Ark - moderately resistant
Bridger - moderately susceptible
Jeff - very resistant
Heglar - susceptible

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