Common Bunt Again A Threat to Wheat

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Smut diseases of wheat have been known for centuries. Their prevalence has generally declined in recent years because of the development of chemical and cultural controls and the widespread use of resistant cultivars. However, each time control measures are relaxed the diseases have assumed new prominence. This is currently happening with common bunt of wheat in Michigan.

Bunt plagued wheat in Michigan through the first half of this century. During the 1950's it was reduced to inconsequential levels by the widespread use of low cost, volatile mercury seed treatments. However, mercury was pronounced an environmental hazard in 1970, and its use in agriculture was strictly regulated or banned. The abolition of volatile mercury coupled with new state regulations for pesticide applicators and application facilities led to virtual abandonment of all wheat seed treatments in Michigan.

In an almost predictable fashion, the first new occurrences of bunt in Michigan wheat were reported in two fields in 1975. A year later, additional identifications were made and, in 1977, bunt was confirmed from field observations and from spore residues in combines and on grain submitted to elevators in six counties in Michigan's eastern lower peninsula.

What is Wheat Bunt?

The term "bunt" has an ancient and uncertain origin. Over the years the disease in wheat has also become known as "covered smut" and "stinking smut." The name covered smut describes the intact nature of the seed coat about diseased kernels (bunt balls) in bunted heads (Figs. 1 & 2). This feature contrasts with the loose smut disease of wheat (see Loose smut of wheat spelt and barley, Mich. Coop. Ext. Bull. E-826) which totally converts kernels and glumes to loose, powdery, black spore masses. Stinking smut describes the fishy odor of the black, powdery contents of bunted kernels (Figs. 3 & 4).

Fig. 1. Typical appearance of bunted wheat heads. Note bunt balls replace normal kernels and protrude from the glumes. (Courtesy E. D. Hansing.)

Fig. 2. Close-up of bunt balls within distended glumes. (Courtesy Plant Path. Dept., Wash. St. Univ.)

Fig. 3. Sectioned immature bunt ball (right) and normal wheat kernel (left). (Courtesy R. L. Keisling.)

Wheat bunt is divided into common and dwarf types, each caused by different fungi. Infection by the dwarf bunt fungus permits wheat plants to achieve about one-fourth their normal size (Fig. 5). With common bunt, stunting of host plants is subtle or does not occur. It is common bunt that is currently reappearing in Michigan.

Common bunt reduces wheat yields by decreasing kernel numbers and by reducing seed quality. Some Michigan growers lost 50% of their crop to bunt in 1977. All seed harvested from bunt-infested fields is spore-covered. It is visibly darkened and smells fishy when spores are abundant. Such infested seed is undesirable for use in food products and, when offered for sale, is discounted in value or rejected.

An additional detriment of bunt infection is the possibility of minor explosions within harvesters. Bunt spores are combustible and, when released from bunt balls during harvest operations (Fig. 6), can be ignited by sparks from machinery.

Identification

Bunted wheat plants are best distinguished after heads emerge. Bunted heads maintain their green color longer than healthy heads and their glumes often become conspicuously spread apart. Glume spreading occurs around bunt balls which replace, and tend to be more spherical than, normal wheat kernels.

Bunt balls remain intact in the head until harvest (Fig. 1). They are dull, gray-brown and can be crushed with thumb-nail pressure. When broken, the release of black, powdery spores (Fig. 3) and a fishy odor is diagnostic. Seed lots contaminated with spores are recognized by their odor and the darkened appearance of individual kernels especially at their brush end (Fig. 4).

Cause

Two closely related fungi, *Tilletia caries* (DC) Tul. and *Tilletia foetida* (Wall.) Liro cause common bunt. A third fungus, *Tilletia controversa* Kühn causes dwarf bunt. Currently only common bunt caused by *T. foetida* has been confirmed in Michigan.

Tilletia foetida is distinguished from *T. caries* by having smooth rather than reticulate spore walls. Spores of *T. controversa* have rough walls like those of *T. caries*, but the former fungus is

Fig. 4. Healthy grain (right) and grain harvested from a bunt-infested field (left). (Courtesy R. W. Somsen.)

distinguished by its ability to dwarf host plants (Fig. 5).

Disease Cycle

All three bunt fungi have similar life cycles. Bunt spores persist on the surface of wheat seed and, in some geographic areas, in soil. Their survival in soil in Michigan is assumed insignificant but is currently under investigation.

When contaminated seed is planted, the bunt spores and seed germinate concurrently and the fungus enters the seedlings before or soon after emergence. Thereafter, the growing point of the plant and later the head are the principal sites of infection. Infected plants are not appreciably stressed and their heading and maturation is unaltered. Fungal mycelium eventually displaces all tissues of developing kernels interior to the seed coat (Fig. 3). The mycelium fragments into black, powdery spores which are released when bunt balls are broken during harvest operations (Fig. 4 & 6). The liberated spores contaminate normal seed, the harvester, soil and straw.

The dispersal of bunt spores on seed is very efficient. Elevators, mills, storage bins and other grain handling equipment become contaminated with spores from infested grain and readily contribute spores to otherwise disease-free seed. Contaminated seed often requires microscopic examination to confirm the presence of spores. Only heavily contaminated seed lots will be odoriferous and visibly darkened.

Control

Bunt is best controlled by the use of resistant wheat cultivars and clean seed. All wheat cultivars currently grown in Michigan appear susceptible to common bunt but tests to identify sources of resistance are being conducted. The best option for bunt control, thus, is to plant disease-free or chemically disinfected seed. Certified wheat seed in Michigan is produced under strict disease tolerances and grown from chemically treated seed lots. It remains bunt free.

Fig. 5. Healthy wheat plant (left) and plant with dwarf bunt (right). (Courtesy Dept. of Plant Path., Wash. St. Univ.)

Seed lots suspected to be bunt contaminated, and preferably all wheat seed to be planted, should be treated with an approved fungicide. Chemicals currently recommended for bunt control are hexachlorobenzene (HCB) and pentachloronitrobenzene (PCNB). Carboxin, thiram and maneb are slightly less effective. Among these, carboxin is the only chemical which has activity against loose smut in addition to bunt.

If seed treatment is not done conscientiously and consistently, wheat bunt could reach the epidemic levels that existed in Michigan prior to the availability of volatile mercury fungicides. Therefore, the application of a chemical fungicide to wheat seed prior to planting is encouraged. For maximum effectiveness such chemicals must be uniformly applied to each seed. In this regard, hopper box and dust formulations normally applied manually are generally less effective than liquid or slurry formulations applied using mechanical seed treaters.

Fig. 6. Cloud of dark spores released during harvest of bunt-infested wheat field. (Courtesy Dept. of Plant Path., Wash. St. Univ.)

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