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report on
PLANT
DISEASE

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BLAST OF OATS

Blast of oats – also called blight, blindness, or white ear – is a term applied to a type of sterility resulting from the inability of certain spikelets to develop completely. Its prevalence and severity in Illinois oat fields vary from year to year. Since 1945, however, blast of oats has been on the increase.

Over a 30-year period, the proportion of oat panicles with some blasted spikelets has varied from 38 to 99 percent. The average is 76 percent. Some 16 percent of the spikelets have been blasted. Blast causes a direct reduction in yield. The extent of the lower yield is often difficult to determine.

Figure 1. Oat blast. Healthy panicle on left.

CAUSE

Any factor that interferes with the normal development of the oat plant, especially during the time of panicle differentiation and development, may produce blast. Tillers are affected more often than the main stems (culms). Late seeding, lack of moisture, high temperatures, nutrient deficiencies or imbalances, overplanting or crowding, disease or insect attacks, or a combination of two or more of these factors may cause blast. A major cause of blasting is infection by the barley yellow dwarf virus. A restricted development of the oat plant (from moisture stresses, high temperatures, and the like) about six weeks after seeding or during panicle development and pollination commonly results in blast.

The maximum, average daily temperature at which oats will grow is 86°F (30°C). Temperatures in Illinois fields from mid to late June often exceed that. Kernels formed at higher temperatures are light in weight. Early planting permits the oat plant to take full advantage of the cool, moist, spring weather–thus reaching an advanced stage of growth before damage by drought and heat can occur. Early planting also helps the plant escape severe attacks by diseases and insects. Late seeding and tillering tend to increase the amount of blast.

SYMPTOMS

Spikelets affected by blast fail to develop. The white, empty spikelets can be recognized as soon as the head emerges from the boot (Figure 1). Blast is most common at the base of the panicle. Occasionally, half of the head is sterile. On rare occasions, the entire head becomes sterile. Some blasted spikelets are

so small that they are not noticed at maturity. Others are of nearly normal size and are recognizable chiefly by their pale yellow-to-white, paper-like chaff.

DEVELOPMENT OF THE OAT PANICLE

A knowledge of panicle development helps explain why blast is normally most prevalent at the base of the head. An oat panicle is composed of numerous branches, each ending in a many-flowered spikelet in which only two flowers normally produce seed. The number of spikelet-bearing branches increases from the tip of the panicle downward.

Dr. O.T. Bonnett, from the University of Illinois, studied the development of the oat panicle in great detail. Here are some of his findings.

The oat panicle starts to develop with the tip spikelet and proceeds to the base. The first structure developing from the main axis of the panicle is a branch primordium (a first-order branch). This is the beginning of a system of branches of different orders formed at each node of the panicle. From the first-order branches, second-order branches are formed; from the second order, third-order branches are formed; and so on. At the nodes, especially of the basal group, branches of the fifth and sixth orders may be found. At any node, development begins with the first-order branches, followed by the second, then the third, and so on. Therefore, the oat panicle is the oldest at the tip and youngest at the base. At any node, the first-order branches are the oldest and the fifth- or sixth-order branches are youngest

In central Illinois, an oat panicle requires 15 to 18 days to develop fully. Heading occurs about 15 to 18 days later.

Any factor that disturbs the normal metabolism and places restrictions on the growth of the oat plant during the critical period of panicle development, especially the first half, affects the youngest parts more than the oldest ones. (The youngest parts are more susceptible, being farther from producing seed). More blast usually occurs in the basal groups of branches because the largest number of high-order branches (third, fourth, fifth, and sixth) are found there.

CONTROL

No completely effective control measures have been developed for blast of oats. The following practices, though, will help to reduce the stresses on the oat plant that encourage blast.

1. **Plant spring oats as early as is practical in a fertile, well-prepared seedbed** using the recommended seeding rate. Sow seed treated with a recommended fungicide.

2. **Grow only recommended, high-yielding oat varieties that are adapted to your area**. Usually, these varieties are relatively free of blast. A listing of oat varieties recommended for Illinois with resistance to barley yellow dwarf, stem rust, crown rust, smuts, and Septoria disease is given in Extension Circular, Illinois Agricultural Pest Management Guide for Field Crops. This circular is revised annually.

3. **Before sowing, have a soil test made to determine plant food requirements. Follow the suggestions in the report**. The major plant nutrients–nitrogen, phosphorus, and potassium (potash)–should be present in adequate and balanced amounts.