Kernel Smut of Rice

Background

Kernel smut was fist found in California in the mid 1980s. Since then, the disease has been present in rice fields across the Sacramento Valley without causing problems. However, starting in the mid 2010s, growers and pest control advisers started noticing an increase in the incidence of the disease. In 2018, many fields were severely affected, especially in the northern part of the Valley.

Kernel smut can affect rice production in several ways. Anecdotal evidence suggests severely affected fields can suffer yield reductions. Because the fungus affects the kernels directly, milling and head rice yield are affected, with reductions of up to 15% observed in California. Additionally, during the milling process smutted kernels contaminate other kernels, resulting in off-colored milled rice. When grain is severely affected, spores may be visible when the milled rice is cooked. While *T. horrida* is not toxic if ingested, this may cause health risks concerns among consumers.

The Pathogen

Kernel smut is caused by the fungus *Tilletia horrida*. This pathogen has a rather complicated cycle that is poorly understood. During grain maturity, infected rice kernels are partially or completely replaced by a black mass of spores called teliospores (Fig. 1).

During harvest, teliospores disperse and can cover equipment, grain, and soil. In the spring, spores present in the field float to the surface and germinate, forming primary sporidia, a type of dispersing spore. These sporidia germinate, grow and later form secondary sporidia. Secondary sporidia are discharged into the air and infect ovaries of open rice flowers. The pathogen then develops inside the flower and forms the black mass of spores evident as the grain matures (Fig. 2). Smutted kernels are more noticeable early in the morning because they swell with the morning dew.

Figure. 1. Panicle showing smutted kernels. Smutted kernels are more noticeable early in the morning.

Management

Seed

Infected seed can be a source of the disease. A 2019 survey showed that most seed sources in the Sacramento Valley have various levels of kernel smut. At this time, it is not known if the sodium hypochlorite seed treatment commonly used for bakanae disease reduces the viability of spores in seed. Make sure to use certified seed and continue to treat with sodium hypochlorite when possible.

Varieties

Long grains are more susceptible than medium and short grains, with some differences among varieties (Fig. 3). Of the medium grains, M-209 seems to be the most susceptible.

Fertility

Excess nitrogen increases the susceptibility of plants to the disease. Apply nitrogen to maximize yield and asses the need of a mid-season nitrogen application.

Figure. 2. Smutted kernels break during the milling process, resulting in lower milling and head rice yield. Also, spores contaminate other kernels, producing off-colored milled rice.

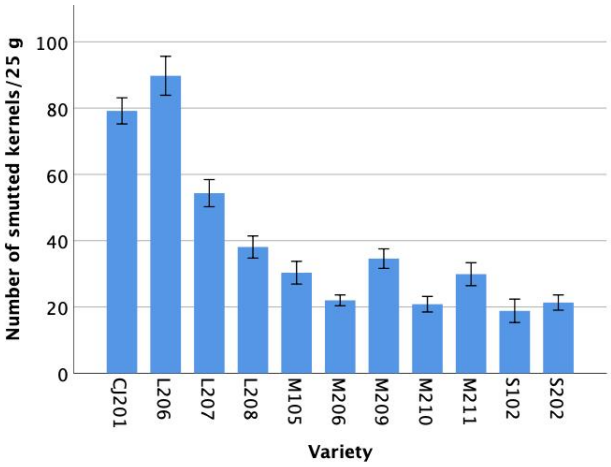

Figure. 3. Number of smutted kernels in 25 g of seed in a variety trail conducted in 2018 in Butte County.

Fungicides

It is challenging to monitor for this disease because smutted kernels are not noticed until harvest. The decision to use a fungicide should be based on the history of the field. Trials have shown that the fungicide propiconazole (the active ingredient in Tilt) can reduce the severity of the disease. Applications should be made at the mid boot stage, before panicles emerge from the boot.

For more on this topic:

- ✓ Integrated Pest Management for Rice, Third Edition. UC Agriculture and Natural Resources.
- ✓ UC IPM for Rice: ipm.ucanr.edu
- ✓ Agronomy Research and Information Center-Rice: rice.ucanr.edu

Agronomy Research and Information Center

http://agric.ucdavis.edu/

UC CE University of California Cooperative Extension

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2020