Pacific Pests, Pathogens, Weeds & Pesticides - Online edition

Rice false smut (428)

Common Name

Rice false smut. It is not a true smut, but classified in a different division of the kingdom fungi, the Ascomycota.

Scientific Name

Ustilaginoidea virens

Distribution

Asia, Africa, North, South and Central America, the Caribbean, Europe, Oceania. It is recorded from Australia, Fiji, and Papua New Guinea.

Hosts

Rice, but also recorded from maize and wild grasses.

Symptoms & Life Cycle

A fungus that colonises rice grains and converts them into a ball of fungal growth that forms spores on the outer layers (Photos 1-3). The grains become over twice their normal size. On each panicle, only a few grains are infected. At first, the spore balls are orange; later, they become greenish-black.

The life-cycle is complex and not completely understood. The spore balls contain two types of spores: i) conidia (asexual spores), which are minute and produced by the millions on the fungal balls and give them their velvety appearance; these last in the soil for about 4 months (Photo 4); and ii) sclerotia. Sclerotia are large (up to 10 mm across), dark brown, hard with irregular shape, and survive on or in the soil for up to 12 months. They eventually produce ascospores (sexual spores) from tiny toadstool-like fruiting bodies.

Which of these two types of spores is the primary source of infection is unknown. There are several suggestions: (i) ascospores are released first that infect the ovaries of the spikelets as the panicles emerge at late booting stage (see Diagram for flower parts); later, conidia infect the spikelets near maturity; (ii) both ascospores and conidia infect at the early stage; (iii) conidia alone are the primary source at the early stage from spore balls surviving in the soil; and (iv) either ascospores or conidia infect wild grasses, which produce spores that infect rice.

The disease is favoured by high temperatures (25-30°C), high humidity, and cloudy days during the time of flowering.

Impact

Mostly considered a minor disease, but there are occasional outbreaks reported from south and southeast Asian countries, with losses up to 75% from reduced grain weight as well as lower quality because of the presence of smut balls. Graham states: "A very small amount of false smut can probably be found in any rice field in Fiji, but the disease rarely causes serious losses. It appears to be more common along the south coast of Viti Levu than in the river valleys or the dry zones"[1].

Photo 1. Spore balls of false smut, *Ustilaginoidea virens*, on rice.

Photo 2. Spore balls of false smut, *Ustilaginoidea virens*, on rice.

Photo 3. Grains of rice replaced by spore masses of *Ustilaginoidea virens*.

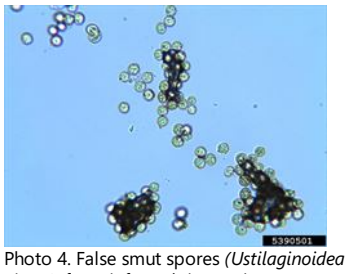

Photo 4. False smut spores *(Ustilaginoidea virens)*, from infected rice grains.

Detection & inspection

Look for the orange to greenish-black balls of fungal growth on the panicles of rice plants. If unsure whether grain is contaminated, wash and collect any spores, and check identification under a microscope

Management

BIOSECURITY

Although there is speculation that the fungus is seedborne, there is no good evidence. However, visual inspection of rice seed for spores of false smut is carried out for phytosanitary certification at IRRI. Therefore, it is advisable that certified seed is always used in transfers from regions where false smut is present.

CULTURAL CONTROL

Before planting:

- Use certified seed. If unsure, treat seed at 52°C for 10 mins.

During growth:

- If possible, remove the fungal balls as soon as seen, and preferably before they develop into the (velvet) stage when spores are shed.
- Use moderate rates of nitrogen: do not over-fertilise. Keep nitrogen levels below 180 kg/ha.
- Reduce humidity levels in the crops; if irrigating, alternate periods of flooding and drying.

After harvest:

- Collect straw and other debris after harvest and burn it with the stubble, or plough everything into the soil.

RESISTENT VARIETIES

Some varieties are said to have (low) resistance. Contact your local agriculture office for information.

CHEMICAL CONTROL

The azole fungicide, propiconazole, has been found to be effective in trials, and copper fungicides have also been used to good effect. Treatments are applied during the booting stage, but the economics of fungicide use has been questioned.

When using a pesticide, always wear protective clothing and follow the instructions on the product label, such as dosage, timing of application, and pre-harvest interval. **Recommendations will vary with the crop and system of cultivation. Expert advice on the most appropriate pesticide to use should always be sought from local agricultural authorities.**

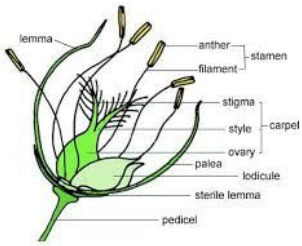

Diagram. Structure of a grass flower.

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Information from CABI (2018) Ustilaginoidea virens (false smut). Crop Protection Compendium. (https://www.cabi.org/cpc/datasheet/55958); and False smut. Rice Knowledge Bank. IRRI. (http://www.knowledgebank.irri.org/training/fact-sheets/pest-management/diseases/item/false-smut); and Graham KM (1971) *Plant diseases of Fiji*. Her Majesty's Stationery Office. London; and from *Ustilaginoidea virens*. Wikipedia (https://en.wikipedia.org/wiki/Ustilaginoidea_virens). Photo 1&2 William M. Brown Jr., Bugwood.org. Photo 3 O.P. Sharma, Bugwood.org. Photo 4 Cesar Calderon, Cesar Calderon Pathology Collection, USDA APHIS PPQ, Bugwood.org. Photo 5 Donald Groth, Louisiana State University AgCenter, Bugwood.org. Diagram David Condrey. grass flower with vestigial perianth or lodicules. (https://commons.wikimedia.org/wiki/File:Grassflower.gif).

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