

Chapter 5. Other fungal diseases

In addition to the pathogens described in the previous chapters, several other groups of pathogens or opportunistic pathogens attack rice grains. They can be grouped under the "grain discoloration or dirty panicle" syndrome. Individually, they do not cause alarming damage to rice and there are no distinct and characteristic symptoms caused by individual agents. However, they proliferate under favorable circumstances created when panicles are exposed to a sudden rainstorm or heavy rainfall. When crop lodging occurs at the mature stage prior to harvest, panicles come in contact with the ground. The fungi usually detected on rice seeds consist mostly of these pathogens. Those listed here are described in Ou (1985) and also appear in many Japanese literature citations on grain diseases.

1. Black kernel

This disease, caused by *Curvularia* spp., belongs to the group of facultative pathogens and produces grain discoloration. More than 10 species are reported to infect rice but the most common ones are *C. lunata* (Wakker) Boedijn (teleomorph: *Cochliobolus lunatus* (R.R. Nelson & Haasis) and *C. geniculata* (Tracy & Earle) Boedijn (teleomorph: *C. geniculatus* (R.R. Nelson).

Morphological features of *C. lunata* follows. Colonies appear brown to black color, hairy, velvety, or woolly texture, loosely arranged and rapidly grow on potato dextrose agar medium. Microscopically, there is great variety in the arrangement of the septate conidiophores, which are isolated or in groups, straight or bent, showing a simple or geniculate growth pattern and varied in color ranging from pale to dark brown measuring up to 650 µm in length and 5-9 µm wide, with swollen bases ranging from 10-15 µm in diameter. Conidia develop at the tips and sides of the spores and have a smooth texture.

Conidia of *Curvularia* spp. can be confused with those of *Bipolaris* or *Drechslera* spp. The curved conidia of *Curvularia* are distoseptate (septa from edge to edge of the conidia wall). Black kernel can be mistaken for kernel smut, which invades the grain and the fungal mass replaces it. Black kernel attacks from outside and molds the grain completely covering it.

2. Minute leaf and grain spot

This disease, caused by *Nigrospora* spp., is often found on old or dead parts of rice plants, including glumes, culms, or leaves. *Nigrospora oryzae* (Berk. & Broome) Petch is a saprotroph colonizing debris of different plant species and a weak parasite producing grain spots of rice, sorghum, and corn (Neergaard 1977). The teleomorphic state is *Khuskia oryzae* H. Hudson. Four species are reported in rice. *Nigrospora oryzae* and *N. sphaerica* are most commonly isolated from rice, whereas *N. panici* and *N. padwickii* are less frequent.

The morphology of *N. oryzae* follows. Conidiophores are short, mostly simple, rarely slightly branched, inflated near the tip, with a small pore at the tip, from which a single, terminal conidium develops. Conidia are shiny, pale yellow to orange yellow when young, olive brown to black when mature, single-celled, up to 15 µm diameter or ellipsoid, 11-16 x 9.5-12 µm.

3. Red blotch of grains

This disease, caused by *Epicoccum* spp., is often found on seeds when rice plants fall on the ground before or after maturity. Three species of *Epicoccum* are reported in rice. *Epicoccum oryzae* S. Ito & Iwaware and *E. neglectum* are reported to infect rice glumes, whereas *E. purpurascens* is found only on dead rice leaves.

The conidiophores of *Epicoccum* are short, undistinguished, and grouped in clusters. Spores are dark brown, globose, and muriform (septa in both directions, like a soccer ball). Spores are often observed in colonies growing on culture as little black dots.

4. Speckled blotch

This disease, caused by *Septoria* spp. (Teleomorph: *Mycosphaerella* Johanson), appears on leaves, leaf sheaths, and glumes. Three species of *Septoria* are reported: *S. oryzae* Catt. and *S. miyekei* infect glumes, and *S. poae* infects leaves.

The fungal morphology of *S. oryzae* is as follows. Pycnidia are numerous and black, with stomata, 80-120 microns. Spores are cylindrical, direct or curved, with 3-4 septa, 15-23 (50) x 2-3.5 microns. Pycnidia overwinter on infected residues and seeds. During the vegetation period the infection is carried by spores.

5. Seed rot

This disease, caused by *Pinatubo oryzae* gen. et sp. nov. Manandhar & Mew (1996), formerly known as *Verticillium cinnabarrimum*, produces gray lesions on the plumules. The fungus is a rice grain pathogen and frequently is detected in rice seeds grown in different rice-growing countries. The fungus is weakly parasitic to germinating rice seedlings, showing chlorotic grey lesions on plumules.

P. oryzae produces two kinds of hyaline, oboviform to pyriform sympodio-conidia, 1-septate, dry, 6.7-10.2 x 2.2-3.3 µm (av. 8.2 x 2.5 µm) conidia from solitary conidiophores and 0-septate, wet, 5.6-8.4 x 1.8-2.6 µm (av. 6.7 x 2.1 µm) conidia from sporodochial conidiophores on the same niche. In the sporodochium, the first conidium initiates on a minute denticle near the tip of a conidiophore; the second conidium initiates similarly by elongating the axis just below the first conidial attachment displacing it to one side and so on forming a heap of conidia.

References

- Manandhar, J.B., Mew, T.W. 1996. *Pinatubo oryzae* gen. et sp. nov. and its identity during routine tests of rice seed. Mycotaxon. 60:201-212.
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- Ou, S. H. 1985. Rice diseases. 2nd ed. Kew, Surrey (England): Commonwealth Mycological Institute, CABI. 380 p.