Diseases Caused by Fungi and Fungus-Like Organisms

Nigrospora oryzae Causing Panicle Branch Rot Disease on *Oryza sativa* (Rice)

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The panicle branch, which is the key node for transport of photosynthesis products from source to sink, is vulnerable to many diseases caused by fungal pathogens, such as *Magnaporthe oryzae* and *Cochliobolus miyabeanus*. Among these diseases, rice blast is the most important one, which causes devastating losses in many regions. In 2019 and 2020, panicle branch rot of rice with a symptom that could be mistaken with rice blast was observed in a paddy field, where it is not a traditional epidemic region of rice blast, in Fuyang, Zhejiang province. In 2020, a similar symptom was also observed in Hubei and Anhui provinces. In a paddy field in Fuyang, the symptom appeared on more than 30% of investigated panicles. Diseased panicles exhibited brown to black lesions on primary or secondary branches as well as pedicels; however, the grain and the neck of the spike could not be infected, which was the most obvious difference with rice blast. Obviously, the disease can not destroy the entire function of the branch, and blank grain was rarely observed, so its damage is not comparable with neck blast. Normally, it caused incomplete grain filling commonly leading to 5 to 25% grain weight loss. During the booting stage of rice, local solar irradiation time and temperature were less and lower than typical years, which may be responsible for losses caused by this disease. After surface sterilization, lesion parts cut from infected branches from 25 panicle samples were cultured on 2% water agar at 28°C for 24 to 28 h, and fungi were isolated and purified by mycelial tip transferring. Among 31 isolates, 26 showed similar cultural characters.

The wool-like mycelia were luxuriant and grew rapidly on PDA, spreading over the whole 9-cm Petri dish in less than a week at 28°C. The mycelia were white to ashen at beginning and gradually turned black from the center of the plate after 5 days of culture at 28°C. Hyphae were smooth, branched, septate, and hyaline or pale brown. Conidia were single-celled, black, spherical to subspherical, and 10.2 to 14.6 × 12.2 to 15.7 μm ($n = 50$) in dimension and borne on the tip of hyaline and ampulliform conidiophores. The fungus showed similar morphological characteristics with *Nigrospora oryzae* (Zhai et al. 2013). ITS sequences of six representative strains of the fungus were amplified, sequenced with primer pair ITS1/ITS4 (White et al. 1990), and submitted into GenBank with accession number MW228165. Phylogenetic analysis was conducted with sequences of reference strains (Hao et al. 2020). The result showed that the fungus obtained in this study fell into the same group with *N. oryzae*. In view of the above morphological and molecular analysis, the strains were finally identified as *N. oryzae*. Pathogenicity tests were conducted in triplicate with rice panicles in the initial heading stage. Fifty panicles were wounded on branches with needles and inoculated by spreading the conidial suspension (10 μl, 1×10^6 conidia/ml) on the wounds. The panicles used as a control were treated in the same way with 10 μl of sterile water. The inoculated and control plants were kept in the dark at 25°C and relative humidity of more than 85% for 24 h in a culture chamber. Symptoms appeared on 44 of 50 inoculated panicles, which were basically similar to those observed in the paddy field, whereas negative controls remained symptomless. The fungi reisolated from inoculated panicles were also confirmed as *N. oryzae* by both morphological and molecular analysis. To the best of our knowledge, this is the first report of *N. oryzae* causing panicle branch rot disease on *Oryza sativa* (rice). This disease not only causes yield losses and lower milling quality but could also be mistaken for rice blast, incurring unnecessary fungicide spraying.

References:

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