Diagnosing Bacterial Leaf Streak of Rice

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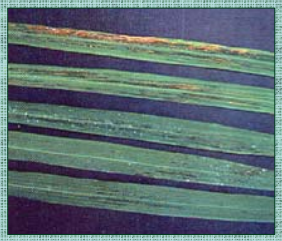


Leaves initally develop water-soaked streaks. Photo reprinted from Webster, R.K., and Gunnell, P.S., 1992, Compendium of Rice Diseases, American Phytopathological Society, St. Paul, MN.

Advanced symptoms of bacterial leaf streak showing orange appearance of streaks. At this stage, the disease is very similar in appearance to bacterial leaf blight. Photo courtesy of courtesy of IRRI and C. Vera Cruz

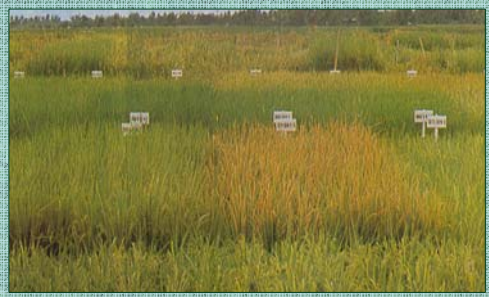
Background. Bacterial leaf streak, caused by *Xanthomonas oryzae* pv. *oryzicola* (*Xoc*) is widely distributed in tropical and subtropical Asia, including China, Thailand, Malaysia, India, Vietnam, the Philippines, and Indonesia, but is not found in temperate areas such as Japan and Korea. It also has recently become a significant problem in western Africa. The pathogen has not been reported in the United States and is currently on the national select agent list. Major concerns are that the pathogen is seed borne and, once introduced, is difficult to control. Available reports suggest that bacterial streak can cause yield losses of up to 17%, depending on the rice variety and climatic conditions.

Droplets of bacterial ooze from bacterial leaf streak lesions. Photo courtesy T.W. Mew. Reprinted from Webster, R.K., and Gunnell, P.S., 1992, Compendium of Rice Diseases, American Phytopathological Society, St. Paul, MN.

Yellowing of young rice leaves caused by bacterial leaf streak. Photo courtesy of IRRI and C. Vera Cruz

Symptoms. Bacterial streak may develop during any development stage of the rice plant. Initial symptoms include the formation of interveinal, water-soaked leaf streaks or spots. The streaks eventually turn yellow to orange. Individual plants also may develop a pronounced yellowing of the tips of new leaves if infection occurs early in the season. Bacterial ooze may exude from lesions during periods of high humidity or following rain. As the disease progresses, the leaf streaks become more diffuse and turn from orange to brown. Old bacterial streak lesions may resemble symptoms of bacterial blight caused by *X. oryzae* pv. *oryzae* (*Xoo*). Furthermore, bacterial streak symptoms will vary depending on the susceptibility of the rice cultivar. Thus, field diagnosis based on symptoms may be difficult.

Diagnosis. Biosecurity issues raise a major concern with bacterial leaf streak as we lack accurate and rapid tools for the diagnosis, tracking, and assignment of geographic origin of *Xoc*. In addition, although it is important to distinguish *Xoc* from other members of the genus *Xanthomonas*, it is particularly critical to distinguish it from the very closely related rice pathogen, *Xoo*, causal agent of bacterial blight of rice. Biochemical tests and fatty acid and metabolic profiling can distinguish strains of the pathovar, however these are relatively slow. Monoclonal antibodies that distinguish *Xoo* and *Xoc* are available, however, they do not distinguish among isolates of the pathovar. DNA probes and PCR-based assays based on insertion elements, avirulence genes, or rep-PCR were developed that could distinguish *Xoc* and *Xoo* based on the patterns generated (sizes of hybridizing- or amplified- fragments; none were specific to one or the other pathogen. The primers/probes used in these assays were based on insertion elements, repetitive sequences, or genes known to be involved in plant/pathogen interactions. Although all of these immunological and nucleic acid-based assays have been useful for various studies, NONE were performed on *Xoc* from diverse geographic areas, so their broad utility for diagnosis of *Xoc* and their ability to detect differences within the pathovar are unknown. Thus, there is need for a rapid and accurate method for identifying *Xoc*.



Symptoms of bacterial leaf streak may vary depending on cultivar. Photo courtesy S.H.

Older leaf symptoms of bacterial leafstreak showing yellowing of lesions between veins. Photo courtesy S.H.

References.

http://www.knowledgebank.irri.org/riceDoctor_MX/Fact_Sheets/Diseases/Bacterial_Leaf_Streak.htm
Ou SH (1985) Rice Diseases, Ed 2. Association Applied Biology, Surrey, England
Webster RK, Gunnell, P.S., ed (1992) Compendium of Rice Diseases. APS Press, St. Paul