Bacterial Blight of Rice
Xanthomonas oryzae pv. *oryzae*

Hosts: Rice (*Oryza sativa*) and related rice species (*Oryza australiensis*, *Oryza coarctata*, *Oryza jeyporensis*, *Oryza malampuzhaensis*), *Oryza officinalis*, *Oryza perennis*, and *Oryza rufipogon*); wild rice (*Zizania aquatica* and *Zizania latifolia*); various weed species in the family Gramineae, including rice sedge (*Cyperus difformis*), purple nut sedge (*Cyperus rotundus*), cut grass (*Leersia oryzoides*, *Leersia oryzoides* var. *japonica*, and *Leersia sayanuka*), sprangletop (*Leptochloa chinensis*, *Leptochloa filiformis*, and *Leptochloa panicea*), Guinea grass (*Panicum maximum*), para grass (*Brachiaria mutica*), buffel grass (*Cenchrus ciliaris*), Bermuda grass (*Cynodon dactylon*), barnyard grass (*Echinochloa crus-galli*), and kodo millet (*Paspalum scrobiculatum*).

Disease common name: Bacterial blight of rice or bacterial leaf blight of rice.

Pathogen: *Xanthomonas oryzae* pv. *oryzae*; syn.: *Xanthomonas campestris* pv. *oryzae*.

Disease Cycle

Inoculum: Inoculum can be present in rice stubble and weed hosts. The pathogen may be present for a short time on infected seed and in soil, but these are not considered important inoculum sources.

Transmission: The bacterium spreads by irrigation water, rain, plant-to-plant contact, and tools used for transplanting seedlings. Typhoons are associated with rapid spread of the disease.

Infection: The bacterium enters leaf tissues through natural openings such as hydathodes and stomata on leaf blades, growth cracks caused by the emergence of new roots at the base of the leaf sheath, and wounds on leaves and roots. When there is sufficient bacterial multiplication, some bacteria invade the vascular system and may ooze from hydathodes.

Symptoms and signs: There are two main sets of disease symptoms, leaf blight and wilt; the latter is commonly referred to as kresek. Leaf blight, the more common symptom, generally occurs from the maximum tillering stage onward. Symptoms begin as water-soaked lesions and stripes on leaf blades (Fig. 1). Drops of bacterial ooze may be observed on young lesions. The stripes increase in length and width, become yellow (Fig. 2), and later become whitish with wavy margins (Fig. 3). They may coalesce to cover the entire leaf blade. Lesions on older infected leaves often appear grayish to white (Fig. 4) in contrast to the lighter brown lesions caused by *Xanthomonas oryzae* pv. *oryzicola*. Both pathogens may infect the same plant (Fig. 5). Small, round lesions with water-soaked margins may also form on severely infected glumes. Infected plants produce fewer and lighter grains, and the grain is of poor quality. A third, less common symptom associated with bacterial blight is called “yellow leaf” or “pale yellow”. The youngest leaf of the plant becomes uniformly pale yellow or has a broad chlorotic stripe. With yellow leaf, the bacteria are not present in the leaf itself but can be found in the internodes and crowns of affected stems. The wilt or kresek symptom is the most destructive manifestation of the disease (Fig. 6). It occurs in the tropics from the seedling to early tillering stages. Leaves of infected plants wilt and roll up, turning grayish green (Fig. 7). The leaves then turn yellow to straw-colored and wither, and the entire plant generally dies. Plants that survive are stunted and yellowish. Total crop failure is not uncommon with kresek.

Survival: Weeds, rice stubble, and ratoons (shoots arising from base of plants) of infected plants sustain survival of the pathogen. In Australia, the bacterium survives on wild *Oryza* species, *Oryza rufipogon*, and *Oryza australiensis*. The pathogen survives for short periods

on infected seed and in soil, but these have not been shown to be important sources of inoculum.

Disease Management

The disease is effectively controlled with resistant cultivars. Their use is dependent on monitoring the pathogenic specialization of strains of the pathogen in a given area. Cultural control recommendations include avoiding excessive nitrogen fertilization, maintaining shallow water in nursery beds, providing good drainage during severe flooding, plowing under rice stubble and straw following harvest, and removing alternate hosts. Seed treatment has been practiced using bleaching powder and zinc sulfate.

References

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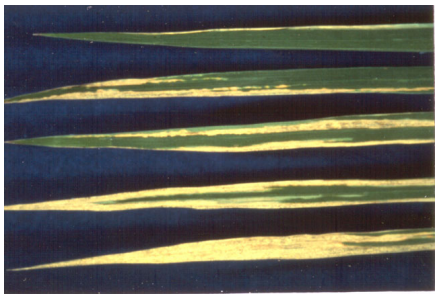

Figure 1. Gradation in symptom development (top to bottom) on leaves with water-soaked streaks that widen, lengthen, and turn yellow. (Courtesy T. Mew)

Figure 2. Leaf with large yellow stripe. (Courtesy A. Alvarez)

Figure 3. Leaves with grayish white lesions with wavy margins. (Courtesy M. Goto)

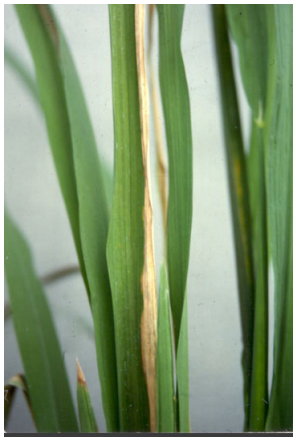

Figure 4. Leaf with elongated gray lesion, typical of blight disease. (Courtesy T. Mew)

Figure 5. Leaf with grayish white lesion on right caused by *Xanthomonas oryzae* pv. *oryzicola* and water-soaked streaks with bacterial ooze on left caused by *X. oryzae* pv. *oryzae*.(Courtesy T. Mew)

Figure 6. Rice with white leaves and dead seedlings, kresek stage of disease. (Courtesy T. Mew)

Figure 7. Rice leaves with rolled tips. (Courtesy M. Goto)