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Integrated Management of Bacterial Leaf Blight of Rice

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Rice is most important staple food crop grown worldwide and most widely cultivated crop particularly in Asian countries with nearly 90% of total global production and consumption contributing immensely to food and nutritional security urging essentiality for sustainable rice production globally. Numerous biotic stresses emerged as major constraints for rice cultivation, among them bacterial blight (BLB) of rice is most destructive disease of rice caused by Xanthomonas oryzae pv. oryzae, which can cause severe yield loss of up to 50% depending on the rice variety, growth stage, the geographic location and environmental conditions. The losses may be even 80–100% in case of bacterial infection occurring at the tillering stage of the crop. BLB affects photosynthetic areas and drastically reduces the yield, producing partially filled grain and low-quality fodder yield. In India, this disease is prevalent in almost all paddy growing regions and states and is a major problem in the Kharif season crop.

Pathogen and Disease Symptoms

Bacterial blight is one of the oldest recorded rice diseases, which was first found by a farmer in the Fukuoka area of southern Japan in 1884 (Nino-Liu et al. 2006). Since then, it was observed in other regions of Japan and gradually spread to all the rice-growing areas of this country. Damage caused by this disease was significantly increased due to the widespread cultivation of semi-dwarf and hybrid rice varieties, as well as massive input of nitrogen fertilizer. It was prevalent in other Asian countries during this period, including India, Philippines, Nepal, Indonesia and Sri Lanka. After that, its incidence was reported in Australia, America and West Africa. To date, rice BB is widely distributed in almost all the rice-growing countries in the world.

Bacterial blight is caused by Xanthomonas oryzae pv. oryzae, is a gram-negative, non-spore forming bacterium and devoid of capsule that belong to the family Xanthomonadaceae subclass Gammaproteobacteri. It is a rod shaped, measures 1.2 x 0.3-0.5 µm. They are single, occasionally in pairs but not in chains. On nutrient agar are produces pale yellow colonies with circular, and smooth with an entire margin.

Xanthomonas oryzae pv. oryzae produces two distinct phases of the disease: (i) the leaf blight phase affecting mature plants in which bacteria enter through hydathodes present in the leaf tip and leaf margin or through wounds, multiply in the intercellular spaces of the underlying epitheme, and propagate to reach the xylem vessels. Then migrate to the xylem vessels, cause infection, and result in yellow to tannish-gray to white lesions along the veins with irregular wavy margins; and (ii) the Kresek phase is systemic infection during seedling stage and results in desiccation of leaves and death of young transplanted plants. Kresek symptom may occur from 1 or 2 weeks after transplanting.

Disease Cycle

1. Alternate hosts, infected seeds and left over plants infected by bacterial blight pathogens after harvest acts as s primary source of inoculum as well as a crucial source of inoculum.
2. Spread of the disease from infected plant to healthy plant by irrigation water or storms acts as a secondary source of inoculum.

Favourable Factors for Disease Development

1. Presence of weeds, rice stubbles and ratoons of infected plants
2. Warm temperature (25-30° C) coupled with high humidity, rain and cloudy weather accelerate the disease development.
3. Over usage of chemical fertilisers especially nitrogen
4. Clipping of tip of the paddy seedling at the time of transplanting and closer.

Management of Bacterial Leaf Blight

1. Use of healthy seeds
2. Removal of diseased stubbles, straw and weeds from the field, by keeping the nursery beds above from the water level.
3. Avoid clipping of seedlings during transplanting. 4. Avoid excess application of chemical fertilisers
5. Proper spacing
6. Soaking of rice seeds by twelve hours in 0.025% solution of agrimycin and hot water treatment at 54ºC for a time of 30 minutes.
7. Treatment of seeds with bleaching powder @ 100 g L-1 .
8. Foliar application of streptomycin sulphate + tetracycline combination 300 g + copper oxychloride 1.25 kg ha-1 .
9. Foliar spray with copper fungicides alternatively with streptocyclin (250 ppm).