Advanced International Journal of Multidisciplinary Research
E-ISSN: 2584-0487
editor@aijmr.com
Volume 4, Issue 4, July-August 2026
CrossRef DOI: 10.62127/aijmr.2026.v04i04.1456

Study on Diagnosis and Management of Bacterial Disease in *Oryza sativa* L. cv. Pooja Cultivated in Cuttack District of Odisha

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Abstract:
Rice (*Oryza sativa* L.) is the principal staple food crop of India and occupies a significant position in the agricultural economy of Odisha. Among various biotic stresses affecting rice production, bacterial diseases are considered major constraints causing substantial yield losses. The present investigation was undertaken to diagnose and manage bacterial diseases affecting rice cultivar Pooja cultivated in different blocks of Cuttack district, Odisha. Field surveys were conducted during the kharif season to assess disease incidence and severity. Symptomatic leaf samples showing water-soaked lesions, yellowing, wilting and blighting were collected and subjected to laboratory analysis. Isolation and identification of the pathogen were carried out through morphological, cultural and biochemical characterization. The bacterium was identified as *Xanthomonas oryzae* pv. *oryzae* the causal organism of bacterial leaf blight (BLB). Various management practices including seed treatment, chemical bactericides and integrated disease management approaches were evaluated under field conditions. Among the treatments seed treatment with streptocycline followed by foliar spray of copper oxychloride significantly reduced disease severity and improved grain yield. Integrated disease management involving resistant cultivar maintenance, balanced fertilizer application, field sanitation and timely bactericidal spray provided the most effective disease control. The study highlights the importance of early diagnosis and integrated disease management strategies for sustainable rice production in Odisha.

Keywords: Pooja Rice, *Oryza sativa*, Bacterial Leaf Blight, Disease Management, Odisha.

Introduction-

India is one of the top producers of rice making a substantial contribution to the world's rice output. Among the states that grow rice Odisha holds a major position with rice agriculture serving as the foundation of the agricultural economy[1,3,4]. Over half of the world's population depends on rice (*Oryza sativa* L.) one of the most significant cereal crops in the world. Because of its versatility, high output potential and consumer popularity the cultivar Pooja rice is widely grown in Odisha[2,4]. However a number of illnesses brought on by bacteria, viruses, nematodes and fungi frequently impact rice output.

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One of the most damaging bacterial diseases to rice is bacterial leaf blight (BLB) which is brought on by *Xanthomonas oryzae pv. oryzae*. [5,6]

Depending on the location and cultivar susceptibility the disease can cause substantial yield losses of 10–50% in nearly every rice-growing region. Strong winds, extensive nitrogen fertilizer, high humidity and heavy rains all contribute to the disease[4,7]. Water-soaked lesions at leaf margins that develop and turn yellowish-white are typical symptoms that result in widespread blighting[3,4,6]. During the monsoon season, bacterial leaf blight outbreaks have been frequently documented in Odisha. Comprehensive data on disease incidence and control in cultivar rice Pooja under Cuttack conditions is still scarce, despite its economic importance[1,3,9]. In order to diagnose the bacterial condition and assess appropriate management techniques the current investigation was conducted[3,8,10].

Review of Literature-

Bacterial leaf blight was first identified in Japan and quickly spread throughout Asia. The disease is caused by the Gram-negative bacteria *Xanthomonas oryzae pv. oryzae*[5,7]. The disease persists in contaminated crop residues, volunteer rice plants and other hosts[10]. Several researchers have documented severe yield decreases associated with BLB. The severity of an illness is influenced by host vulnerability, pathogen virulence and climate[10,12]. High temperatures (25–34°C) relative humidity levels above 80% and continuous rainfall all contribute to the development of disease[1,2,8].

The efficacy of integrated illness management strategies has been shown in numerous research. Bactericidal sprays, seed treatment, balanced nutrient management and resistant cultivars have all been suggested[2,10]. Antibiotic formulations including streptocycline and copper-based compounds have demonstrated differing degrees of effectiveness in treating bacterial infections[11,13]. Pathogen identification and illness predicting have been enhanced by recent developments in molecular diagnosis. However, field diagnostics and traditional management techniques continue to play a major role in farming systems with limited resources[13].

Materials and Methods

Study Area

The investigation was conducted in different rice-growing villages of Cuttack district, Odisha during the kharif season[4,7,12]. The district experiences a tropical monsoon climate characterized by high rainfall, humidity, and temperatures favorable for bacterial disease development[10,13].

Field Survey

Field surveys were conducted at major rice-growing locations. Disease incidence was recorded at tillering, panicle initiation and flowering stages[12]. Five fields from each location were selected randomly. Selected random field survey- 10 fields,100 plants, Plot size = 5 × 5 m for study[11,12].

$$\text{Disease incidence (DI) (\%)} = \frac{\text{Number of infected plants}}{\text{Total plants observed}} \times 100$$

Sample Collection- Leaves exhibiting characteristic blight symptoms were collected in sterile polyethylene bags and transported to the laboratory for pathogen isolation[7,9].

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Field Experiment- Recent advances in molecular diagnosis have improved pathogen detection and disease forecasting. However, resource-limited farming systems still rely heavily on field diagnosis and conventional management practicesv[8,12].

Isolation of Pathogen- Leaf pieces were surface sterilized with 0.1% mercuric chloride and washed thoroughly with sterile distilled water[5,7,9]. The tissues were macerated and streaked onto nutrient agar medium[13]. The inoculated plates were incubated at 28 ± 2°C for 48–72 hours. Yellow mucoid colonies typical of *Xanthomonas* species were isolated and purifiedv[4,8].

Identification of Bacterium-Identification was based on:

- Colony morphology
- Gram staining
- Biochemical tests
- Pathogenicity tests

Pathogenicity Test- Healthy rice seedlings were inoculated using the leaf-clipping method[7]. Development of typical BLB symptoms confirmed pathogenicity according to Koch's postulates[5,8].

Results

Disease Symptoms- Initial symptoms appeared as water-soaked streaks along leaf margins. These lesions gradually enlarged and turned yellow[10,12]. In severe cases, complete blighting of leaves was observed. Young seedlings exhibited wilting known as the "Kresek" phase[9,13].

Figure - Some symptoms appeared as water-soaked streaks along leaf margins("Kresek" phase)

Disease Incidence-

Table no. 1- Disease incidence varied among surveyed locations.

Location	Disease Incidence (%)
Niali	18.5
Salipur	24.7
Tangi-Choudwar	31.6
Banki	39.8
Cuttack Sadar	52.3

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Table No. 2- Disease Severity Index

Block	DSI (%)
Niali	18.2
Salipur	24.6
Tangi-Choudwar	31.8
Banki	38.4
Cuttack Sadar	46.2

The highest disease incidence was recorded in Cuttack Sadar while the lowest incidence occurred in Niali.

Isolation and Identification-The pathogen produced circular, yellow, mucoid colonies on nutrient agar[7,11]. Microscopic examination revealed Gram-negative rod-shaped bacterial cells. Biochemical tests confirmed the identity of the pathogen as *Xanthomonas oryzae* pv. *oryzae*[9,12].
Pathogenicity-Artificial inoculation resulted in symptom development within 10–14 days. Re-isolation yielded the same bacterium, thereby satisfying Koch's postulates[13].

Evaluation of Management Practices
Management Trial- The following treatments were evaluated:

Table no. 3- Disease severity and grain yield were recorded

Treatment	Disease severity and grain yield
T1	Control
T2	Seed treatment with streptocycline
T3	Copper oxychloride spray
T4	Streptocycline spray
T5	Seed treatment + copper oxychloride spray
T6	Seed treatment + streptocycline spray
T7	Integrated disease management

Table no. 4- Disease severity and grain yield differed significantly among treatments.

Treatment	Disease Severity (%)	Yield (q/ha)
T1	48.6	38.4
T2	36.8	42.1
T3	31.2	44.8
T4	29.6	45.2
T5	21.4	50.8
T6	19.7	52.3
T7	14.5	56.4

Integrated disease management (T7) resulted in the lowest disease severity and highest grain yield.

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Suggestions for Integrated Disease Management -

The following actions are suggested in light of the findings:

1. Make use of certified disease-free seeds.
2. Steer clear of using too much nitrogen fertilizer.
3. Keep the ideal distance between plants.
4. Remove contaminated crop remnants after harvest.
5. When possible, rotate your crops.
6. Apply streptocycline to seedlings prior to sowing.
7. Use copper oxychloride when the illness first manifests.
8. Make sure the field drains properly.
9. Keep an eye on fields to see symptoms early.
10. Encourage the production of rice cultivars that are tolerant or resistant.

Discussion-

The prevalence of Xanthomonas oryzae pv. oryzae in the Cuttack district is confirmed by the occurrence of bacterial leaf blight in cultivar Pooja rice. The survey's symptoms closely matched earlier reports of BLB in Asian rice-growing regions[1,5,7].

Poor field sanitation, excessive nitrogen fertilizer and favorable environmental circumstances may all contribute to higher disease incidence in some areas. Odisha's warm, humid climate makes it the perfect place for pathogens to proliferate and spread[10,12].

Studies on isolation and identification verified that X. oryzae pv. oryzae was the causative agent. Previous results were confirmed by the distinctive yellow mucoid colonies and positive pathogenicity tests[6,8]. Integrated techniques are better than single control measures, as management studies have shown[4]. Bactericidal sprays prevented secondary spread but seed treatment decreased the original inoculum load. The development of disease was successfully inhibited by the combination of therapeutic and preventive approaches[11,12]. Because integrated disease management improved plant health and decreased disease pressure it produced the maximum productivity[10]. These results corroborate other studies that highlighted the significance of integrating preventative, chemical and cultural activities[6,9].

Conclusion

The present study revealed that bacterial leaf blight caused by *Xanthomonas oryzae* pv. *oryzae* is a major bacterial disease affecting rice cultivar Pooja in Cuttack district of Odisha. Disease incidence varied across locations but reached economically damaging levels in several areas. Laboratory diagnosis confirmed the identity of the pathogen through morphological, biochemical and pathogenicity analyses. Among the evaluated treatments, integrated disease management proved most effective in reducing disease severity and increasing grain yield. The adoption of disease-free seeds, balanced fertilizer use timely bactericidal applications and proper field sanitation can substantially minimize disease losses. These findings provide useful information for farmers, researchers and extension workers involved in rice disease management programs in Odisha.

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REFERENCES:

1. Adhikari, T.B., Vera Cruz, C.M., Zhang, Q., Nelson, R.J., Skinner, D.Z., Mew, T.W., and Leach, J.E. (1995). Genetic diversity of *Xanthomonas oryzae* pv. *oryzae* in Asia. *Applied and Environmental Microbiology*, 61(3), 966–971.
2. Behera S., Behera S., Nayak B.S. (2024). Management of bacterial leaf blight of rice caused by *Xanthomonas oryzae* pv. *oryzae* through integrated approach in Odisha. *Journal of Cereal Research*, 16(1):37–43.
3. Mew, T.W. (1987). Current status and future prospects of research on bacterial blight of rice. *Annual Review of Phytopathology*, 25, 359–382.
4. Nino-Liu, D.O., Ronald, P.C., and Bogdanove, A.J. (2006). *Xanthomonas oryzae* pathovars: model pathogens of a model crop. *Molecular Plant Pathology*, 7(5), 303–324.
5. Pal R., Mandal D. (2024). Integrated disease management for bacterial blight of rice. *Journal of Mycopathological Research*.
6. Sharma, P., Bora, L.C., and Kataky, L. (2017). Management of bacterial leaf blight of rice through integrated approaches. *Journal of Plant Protection Research*, 57(4), 351–357.
7. Singh J. et al. (2024). Integrated disease management modules for rice bacterial leaf blight ecosystem. *International Journal of Research in Agronomy*.
8. Singh, R.A. (2000). *Plant Pathology*. Oxford and IBH Publishing Co., New Delhi.
9. Srivastava, D.N. (2012). *Modern Plant Pathology*. Oxford and IBH Publishing Co., New Delhi.
10. Swings, J., Van den Mooter, M., Vauterin, L., Hoste, B., Gillis, M., and Kersters, K. (1990). Reclassification of the causal agents of bacterial blight and bacterial leaf streak of rice. *International Journal of Systematic Bacteriology*, 40(3), 309–311.
11. Webster, R.K., and Gunnell, P.S. (1992). *Compendium of Rice Diseases*. APS Press, Minnesota.
12. Yagnasree S. et al. (2024). Scenario of bacterial leaf blight in Andhra Pradesh. *Journal of Experimental Agriculture International*.
13. Yasmin, S., Ahmed, M., and Islam, M.R. (2018). Occurrence and management of bacterial leaf blight of rice. *Bangladesh Journal of Agricultural Research*, 43(1), 65–78.