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Occurrence of bacterial leaf blight of rice in different districts of Andhra Pradesh

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ABSTRACT

Bacterial leaf blight of rice, caused by *Xanthomonas oryzae* pv. *oryzae*, has emerged as a significant challenge to intensive rice production in recent years. The yield losses due to the disease can range between 20.00 to 50.00 percent depending on the severity of infection. A roving survey was conducted during *kharif* 2024 across major rice-growing ecosystems of Bapatla, Guntur and Nellore districts of Andhra Pradesh to assess the disease severity of bacterial leaf blight. Among the surveyed areas Perali village recorded the highest percent disease index (57.40) at flowering stage of the variety BPT-5204 in Bapatla district, followed by T.P Gudur with 52.38 per cent disease index in BPT-5204 variety at flowering stage in Nellore district. The lowest disease severity was noted in the village Allure (21.69 %) at tillering stage in BPT-2782 variety. Among the cultivated varieties, BPT- 5204 was identified as highly susceptible to bacterial blight and the disease was more severe during flowering stage of the crop.

Keywords: *Bacterial leaf blight, Disease severity, Rice, Rice ecosystem*

Rice, (*Oryza sativa*) is the edible starchy cereal belonging to the family Poaceae. Rice is the world's largest food crop, providing the caloric needs of millions of people daily. It is cultivated over 162 M ha covering approximately 11 per cent of global cultivable land that produces approximately 758 million MT of rice per annum (Jat *et al*., 2022). Roughly, half of the world population, including virtually all of East and Southeast Asia, is wholly dependent upon rice as a staple food.

Asia is the major producer and consumer of rice followed by Africa. Asia accounts for about 60 per cent of global population, about 92 per cent of world's rice production and 90 per cent of world's rice consumption. The top ten rice producing countries are in Asia which include China, India, Bangladesh, Indonesia, Vietnam, Thailand, Myanmar, Philippines, Cambodia and Pakistan. In India, the state West Bengal is the leading producer of rice with an average annual production of 15.75 MT. Among the Indian states Andhra Pradesh ranks fifth in rice production with an area of 2.16 M ha and an average annual production of 7.49 MT (Department of Agriculture, 2023).

Like any other crop, rice is prone to many biotic stresses which hamper the yields considerably.

Among the diseases, Bacterial leaf blight (BLB) of rice caused by *Xanthomonas oryzae* pv. *oryzae* is an important vascular disease in irrigated rice which causes 20 to 40 per cent yield reduction when affected at tillering stage while infection at early stage causes severe yield loss of about 50 per cent (Chukwu *et al.,* 2019). Bacterial leaf blight is one of the major biotic constraints of rice cultivation in many areas of Andhra Pradesh. The disease constrains the photosynthetic area of the crop thereby causing partial grain filling (Pradhan *et al.,* 2015). This disease was first observed in 1884–85 in Kyushu, Japan. Bacterial leaf blight affects rice plant at different growth stages. The main disease symptoms are leaf blight and induces wilting of young plants, known as kresek. Wounds or water pores are mainly the medium for *X. oryzae* pv. *oryzae* to easily invade the rice plant. Water soaked lesions with wavy edges commence from the leaf tip and margins. These lesions coalesce and enlarge in size, turn yellow and then ultimately lead to dying of the plant (Nino-Liu *et al*., 2006).

MATERIAL AND METHODS

A roving survey was conducted during *kharif*, 2024-2025 to assess the severity of bacterial leaf blight disease in Bapatla, Guntur and Nellore districts

of Andhra Pradesh. In each district three mandals were surveyed and in each mandal two villages were covered. Information on name of the variety, stage of the crop and GPS location was recorded at surveyed locations. The disease severity was assessed by adopting 1-9 scale (IRRI,2013) (Table 1). Per cent disease index (PDI) was calculated by using the formula (McKinney,1923).

Table 1. Disease rating scale

Score	Affected lesion area (%)
1	1-5%
3	6-12%
5	13-25%
7	26-50%
9	51-100%

*PDI= (Sum of all disease ratings/ Total number of ratings x maximum disease grade) ×100

RESULTS AND DISCUSSION

Among all locations the highest per cent disease index of bacterial leaf blight (57.40 %) was recorded on BPT 5204 at flowering stage in Perali village of Karlapalem mandal, Bapatla district, followed by BPT 5204 at flowering stage in T.P Gudur (52.38 %), T.P Gudur mandal, SPSR Nellore district. Lowest per cent disease index (21.69 %) was recorded on tillering stage of BPT 2782 in Allur village (21.69 %) of Pittalavanipalem mandal, Bapatla district followed by KNM 1638 (22.22 %) in Indukur peta mandal at tillering stage of SPSR Nellore district. The Per cent disease index recorded at tillering stage varied between 21.69 - 51.11 per cent, during the heading stage it was in the range of 37.60 – 52.35 per cent and at the flowering stage it was in the range 32.40 - 57.40 per cent. The per cent disease index recorded in the surveyed districts was, Bapatla from 21. 69 to 57. 40, Guntur from 27. 40 to 51. 11 per cent and in SPSR Nellore it ranged from 22. 22 to 52. 38 per cent (Table 2, Fig 1 and Plate 1).

Highest disease severity was recorded at flowering stage because rice plants have more exposed hydathodes and stomata activity at flowering stage which serve as entry points for the pathogen. Among the varieties BPT 5204 is highly susceptible.

Plate 1. Bacterial leaf blight symptoms of rice in surveyed areas

Table 2. Occurrence and distribution of bacterial leaf blight of rice in Bapatla, Guntur and SPSR Nellore districts of Andhra Pradesh

S. No.	Name of the District	Name of the Mandal	Name of the village	Latitude (Degrees)	Longitude (Degrees)	Rice variety	Crop stage	Per cent disease index (%)
1	Bapatla	Bapatla	Bapatla	15.94628	80.50059	BPT 5204	Heading	38.46
			Hyderpeta	15.92284	80.51751	BPT 2782	Heading	51.85
		Karlapalem	Karlapalem	15.93049	80.53501	BPT 2782	Heading	52.35
			Perali	15.9238	80.51652	BPT 5204	Flowering	57.4
		Pittalavanipalem	Pittalavanipalem	16.00048	80.61653	BPT 5204	Tillering	29.62
			Allur	15.93707	80.63595	BPT 2782	Tillering	21.69
2	Guntur	Chebrolu	Chebrolu	16.2442	80.49909	BPT 5204	Tillering	51.11
			Garuvupalem	16.23972	80.57166	MTU 1224	Heading	37.6
		Tenali	Tenali	16.20796	80.66582	BPT 5204	Tillering	27.4
			Angalakuduru	16.25844	80.61038	BPT 5204	Tillering	37.03
		Vatticherukuru	Vatticherukuru	16.18067	80.42478	BPT 2782	Tillering	28.2
			Vinjanampadu	16.22966	80.42747	BPT 5204	Tillering	40.74
3	Nellore	T.P Gudur	T.P Gudur	14.40841	80.08163	BPT 5204	Flowering	52.38
			Pedur	14.44238	80.06836	NLR 34449	Flowering	42.11
		Indukuripeta	Lebur	14.48717	80.09764	BPT 5204	Flowering	38.38
			Motthalu	14.49522	80.1184	KNM 1638	Tillering	22.22
		Kodavaluru	Kodavaluru	14.56997	80.00227	BPT 5204	Flowering	32.4
			Rajupalem	14.57001	80.00223	NLR 34449	Flowering	37.96

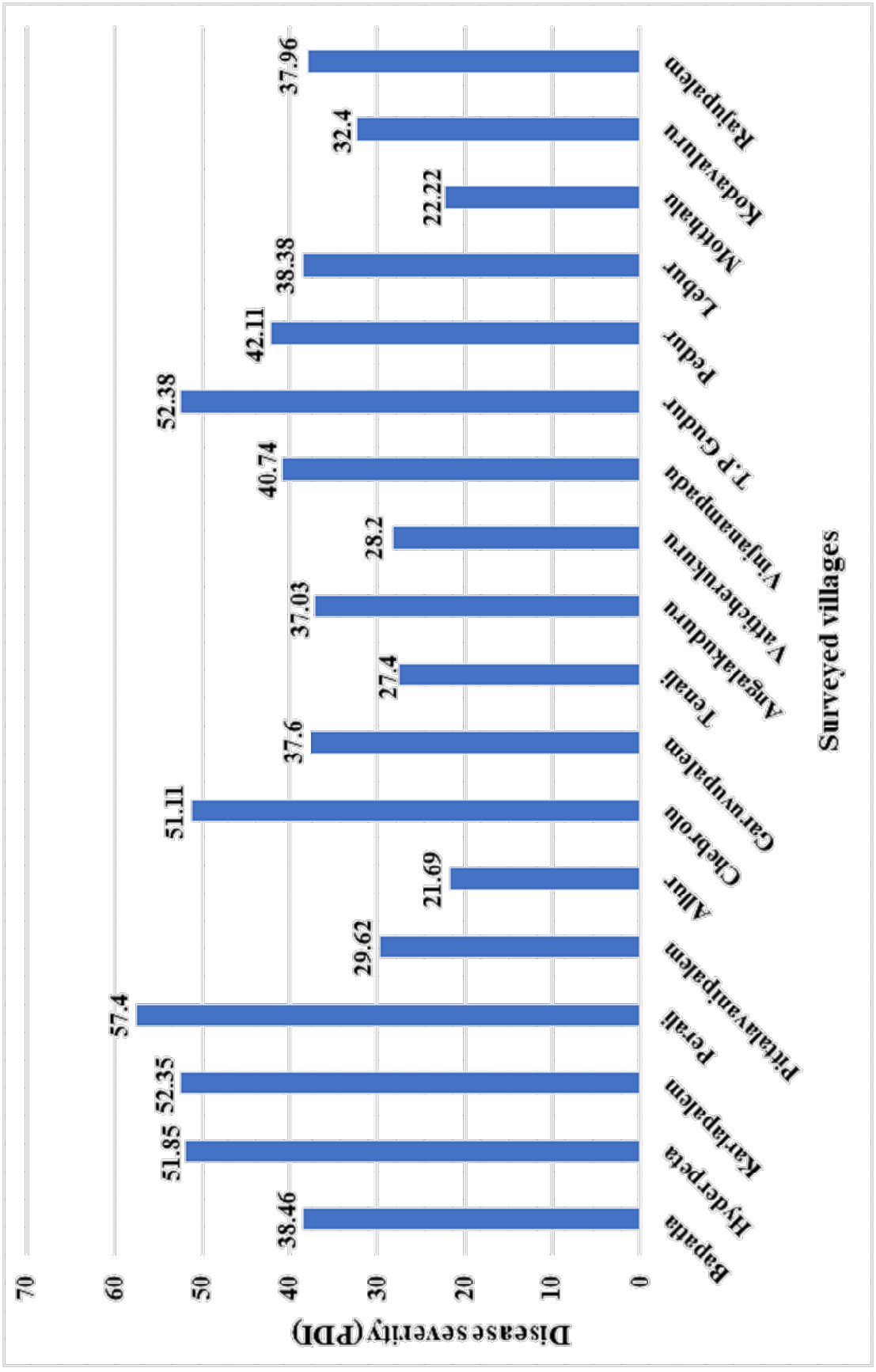

Figure 1. Disease severity of bacterial leaf blight in Bapatla, Guntur and SPSR Nellore districts of Andhra Pradesh

The primary factors contributing to the prevalence of bacterial leaf blight in Andhra Pradesh are monocropping, the cultivation of susceptible rice varieties, excessive use of nitrogen fertilizers and favorable environmental conditions such as high humidity and rainfall. These factors collectively facilitate the spread of the pathogen to nearby areas, often leading to moderate to severe disease epidemics (Obradovic *et al.*, 2004; Kumar *et al.*, 2020).

These results are in accordance with Raghunandana *et al.* (2023) who conducted random survey in rice growing ecosystem districts of Karnataka during *kharif* 2019. Among all the surveyed ecosystems, the highest mean per cent disease index of 52.60 was observed in the Bhadra ecosystem and the lowest PDI of 31.08 were observed under the Kaveri ecosystem. Laha *et al.* (2024) who reported the occurrence of 70 per cent incidence of bacterial leaf blight in Guntur district in BPT-5204 variety during 2013.

CONCLUSION

This study demonstrated the substantial impact of bacterial leaf blight on rice cultivation in Andhra Pradesh. BLB severity ranged from 21.69 to 57.40 per cent. The highest disease severity was observed in Bapatla district and the severity of the disease was more during flowering stage of the crop. The variation in disease severity at different locations is due to variation in level resistance/susceptibility of variety, crop stage, inoculum load as well as prevalence of favorable conditions.

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