



Research Article

ASSESSMENT OF BLAST DISEASE INCIDENCE IN MAJOR RICE GROWING AREAS OF ANDHRA PRADESH STATE, INDIA

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Abstract: Rice blast incidence was assessed in nine major rice growing districts of Andhra Pradesh. Percent disease incidence was calculated as the proportion of plants showing symptoms, out of the total number of plants. Highest mean blast incidence 38.99 % was recorded in Kovvur mandal of Nellore district and the lowest incidence 15.41 % was noticed in Madugula mandal of Visakhapatnam district. When compared with the locations, blast incidence was highly varied among the cultivars. The highest mean disease incidence was observed in cultivar MTU-7029 (59.44%) followed by BPT-5204 (33.07%) whereas the lowest mean incidence was recorded in NDLR-8 (3%) followed by MTU-3626 (4.46%) and MTU-1121(5.89%).

Keywords: Rice blast, Percent disease incidence

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Introduction

Rice (*Oryza sativa* L.) is the most important human food crop in the world, directly feeding more people than any other crop. In India, rice is cultivated on an area of 42.96 million hectares with a total production and productivity of 158.75 million tonnes and 3.69 metric tonnes per hectare, respectively [1]. The major rice growing states in India are West Bengal, Uttar Pradesh, Punjab, Tamil Nadu and Andhra Pradesh. In Andhra Pradesh, it is grown in an area of 2.16 million hectares accounting for a production of 7.49 million tonnes of paddy with an average yield of 3466 kg ha⁻¹ [2]. This yield is very low and it is resulted due to several abiotic and biotic factors. Among the biotic factors, blast caused by *Piricularia oryzae* is most destructive disease [3] and results in crop losses of \$ 5 billion every year [4]. The disease results in yield loss as high as 70-80% when predisposition factors (high mean temperature values, degree of relative humidity higher than 85-89%, presence of dew, drought stress and excessive nitrogen fertilization) favor epidemic development [5]. 100 % yield loss was documented in Brazil in a newly released cultivar Calasao. The yield loss of 10 per cent is significant as it is sufficient to feed 60 million people for one year. Realizing the importance, natural resource institute of London gave first rank to rice blast disease in its study of pre-harvest disease occurring in South Asia [6]. With the evolution and wide spread cultivation of blast resistant varieties, the blast incidence in Andhra Pradesh was still severe. Hence, the present investigation was taken up in order to provide baseline information on the status of the disease in the major rice growing areas of Andhra Pradesh.

Material and Methods

Roving survey was conducted in different rice ecosystems, viz., irrigated, rainfed, tank fed, bore wells, low lying and upland ecosystems during Kharif and Rabi seasons of 2015-16 in major rice growing districts (Chittoor, Nelloore, Kurnool,

Guntur, Krishna, West Godavari, East Godavari, Visakhapatnam and Srikakulam) of Andhra Pradesh [Fig-1]. In each district, four mandals and in each mandal, four villages were selected. In each village, four fields were selected for the study. Observations were recorded in four one-meter square areas randomly in each field by walking diagonally starting from South west corner. The disease in observed fields was expressed as Per cent Disease Incidence (PDI).

$$PDI = \frac{\text{Diseased hills observed}}{\text{Total No. of hills observed}} \times 100$$

Results and Discussion

Among the nine districts, highest mean per cent disease incidence (PDI) 29.05 % was recorded in Nellore. It was followed by Krishna, Kurnool, East Godavari, Guntur and Chittoor districts, with mean PDI of 27.26 %, 27.23 % and 26.76 %, 24.30 % and 24.12 %, respectively. The lowest mean blast disease incidence 20.79% was recorded in Srikakulam district followed by West Godavari (23.85 %) and Visakhapatnam (23.99 %) districts [Table-1]. The data presented in the [Table-2] revealed that highest mean blast incidence 38.99 % was recorded in Kovvur mandal of Nellore district in a range of 20.45 % to 51.14 % followed by Bandi Atmakur mandal of Kurnool district with 38.35 % incidence in a range of 28.25 % to 50.00 %, Yelamanchili mandal (37.22 % PDI with 23.72 % to 50.28 % range) of Visakhapatnam district and Kankipadu mandal (33.66 % PDI with 21.16 % to 50.99 % range) of Krishna district. The lowest incidence 15.41 % with 10.94 % to 21.02 % range was noticed in Madugula mandal followed by Narasannapeta (16.85 % PDI with 8.10 % to 24.43 % range), Srikakulam (17.29 % PDI with 12.07 % to 22.87 % range), Palakollu (17.37 % PDI with 5.82 % to 32.67 % range) and Anakapalle (17.89 % PDI with 10.09 % to 27.27 % range). When compared with the locations, blast incidence was highly varied among the cultivars. The highest mean incidence of 59.44% with a range of 29.55 % to 95.45 % was observed in cultivar MTU-7029 (swarna).

Table-1 Rice blast incidence in major rice growing districts of Andhra Pradesh

District	Range of Percent Disease Incidence	Mean Percent Disease Incidence
Chittoor	21.20-27.70	24.12
Nellore	21.66-38.99	29.05
Kurnool	22.16-38.35	27.23
Krishna	23.69-33.66	27.26
Guntur	20.70-25.92	24.30
West Godavari	17.37-28.09	23.85
East Godavari	20.24-32.99	26.76
Visakhapatnam	15.41-37.22	23.99
Srikakulam	16.85-24.75	20.79

Table-2 Rice blast incidence in different mandals of Andhra Pradesh

SN	Mandal	Range of Percent Disease Incidence	Mean Percent Disease Incidence
	Chittoor		
1	Srikalahasti	10.09-34.52	21.20
2	Chinnagottigallu	9.66-49.29	27.70
3	Pakala	19.03-29.40	24.25
4	Nagari	14.63-36.36	23.33
	Nellore		
5	Kovvur	20.45-51.14	38.99
6	Kavali	7.53-39.77	23.86
7	Chillakur	21.16-50.99	31.68
8	Tada	15.06-30.54	21.66
	Kurnool		
9	Pamulapadu	11.51-33.66	22.62
10	Bandiatmakuru	25.28-50.00	38.35
11	Owk	10.51-34.23	22.16
12	Sirivella	11.08-41.19	25.78
	Guntur		
13	Chebrolu	6.96-41.19	25.89
14	Battiprolu	12.22-42.19	25.92
15	Bapatla	16.19-25.00	20.70
16	Narsaraopeta	16.48-36.36	24.68
	Krishna		
17	Mudinepalli	22.87-36.08	27.59
18	Gannavaram	17.90-34.38	24.11
19	Kankipadu	17.47-44.60	33.66
20	Ibrahimpatnam	11.22-33.81	23.69
	West Godavari		
21	Palakollu	5.82-32.67	17.37
22	Bhimadole	5.97-43.18	26.63
23	Attili	18.75-35.94	28.09
24	Nidadavole	8.66-35.80	23.30
	East Godavari		
25	Khadiyam	17.76-49.72	32.99
26	Ramachandrapuram	9.80-27.13	20.24
27	Ainavilli	14.63-36.79	27.49
28	Biccavolu	0.71-40.77	26.31
	Visakhapatnam		
29	Anakapalle	10.09-27.27	17.89
30	Achyutapuram	10.80-44.03	25.46
31	Yelamanchili	23.72-50.28	37.22
32	Madugula	10.94-21.02	15.41
	Srikakulam		
33	Srikakulam	12.07-22.87	17.29
34	Gara	16.62-32.39	24.75
35	Narsannapeta	8.10-24.43	16.85
36	Ranastalam	8.95-37.64	24.25

Table-3 Mean percent blast incidence among rice cultivars in Andhra Pradesh

Variety	Range of percent disease incidence	Mean percent disease incidence
ADT-37	0.00-51.14	23.81
BPT-5204	0.00-92.05	33.07
MTU-1001	2.84-38.07	19.74
MTU1010	0.00-93.75	25.06
MTU-1061	4.55-66.48	16.83
MTU-1121	0.00-27.27	5.89
MTU-7029	29.55-95.45	59.44
NDLR-8	0.00-9.09	3.00
NLR-145	22.15-28.97	25.55
NLR-34449	0.00-83.52	11.09
RGL-2537	0.00-80.05	12.86
MTU-3626	0.00-28.98	4.46



Fig-1 Map showing the districts and mandals surveyed in Andhra Pradesh

It was ascertained that favourable and unfavourable climate conditions, farmer's practices viz., prior application of fungicides, high amount of nitrogen applications, improper irrigation might have affected survival and spread of inoculum and that ultimately led to highly aggregated distribution in each cultivar among the fields. The present results on the incidence of blast disease in different agro climatic zones of Andhra Pradesh are in accordance with Hossain and Kulakarni [7], who conducted survey for rice blast during Kharif, 1999 in different villages of Dharwad, Belgaum and Uttara Kannada districts of Karnataka and reported maximum disease incidence in Haliyal (61.66%) and Mundagod (54.00%) talukas of North Karnataka. In the same way, Ali *et al.* [8] surveyed temperate districts of Kashmir for the severity of rice blast and reported that the leaf blast severity ranged from 3.7 to 41.3% whereas highest nodal blast was found in Kulgam (7.3%) followed by Khudwani (5.4%) and Larnoo (3.8%) zones of Anantanag district. The most destructive phase of neck blast severity was found in every district with an average range of 0.3-4.9%.

Conclusion

In the present study, it was concluded that the disease incidence was highly varied among the cultivars rather than the locations. Based on the weather, farmer's practices and cultivar adaptation, the observed disease was in the range of no incidence (0.00%) to 95.45%.

Application of research: This research is applicable to rice farmers and researchers to know the status of rice blast among the adopted cultivars in major rice growing areas of Andhra Pradesh.

Research Category: Plant Pathology, Rice blast disease survey

This was followed by BPT-5204 (Samba Mahsuri) with mean incidence of 33.07 % in a range of no incidence to 92.05% PDI. The cultivar MTU-1010 (*Cottodora sannalu*) was recorded with 25.06 % PDI in a range of no incidence to 93.75 %. The lowest mean incidence was recorded in NDLR-8 (3%) followed by MTU-3626 (4.46%) and MTU-1121 (5.89%). The ascending order of the remaining cultivars regarding the mean disease incidence was recorded as NLR-34449 (11.09 %) < RGL-2537 (12.86 %) < MTU-1061 (16.83 %) < MTU-1001 (19.74 %) < ADT-37 (23.81 %) and NLR-145 (25.56 %) [Table-3]. Presence and absence of R genes to corresponding virulent races of *P. oryzae* might be the reason for high and low range of incidences in cultivars.

Abbreviations: PDI - Percent Disease Incidence

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