



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2020; 9(8): 207-210

© 2020 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 25-05-2020

Accepted: 20-07-2020

## Chitra K

Anbil Dharmalingam  
Agricultural College and  
Research Institute, Tamil Nadu  
Agricultural University,  
Tiruchirappalli, Tamil Nadu,  
India

## Sheeba Joyce Roseleen S

Anbil Dharmalingam  
Agricultural College and  
Research Institute, Tamil Nadu  
Agricultural University,  
Tiruchirappalli, Tamil Nadu,  
India

## PT Sharavanan

Anbil Dharmalingam  
Agricultural College and  
Research Institute, Tamil Nadu  
Agricultural University,  
Tiruchirappalli, Tamil Nadu,  
India

## C Gailce Leo Justin

Anbil Dharmalingam  
Agricultural College and  
Research Institute, Tamil Nadu  
Agricultural University,  
Tiruchirappalli, Tamil Nadu,  
India

## Corresponding Author:

### Chitra K

Anbil Dharmalingam  
Agricultural College and  
Research Institute, Tamil Nadu  
Agricultural University,  
Tiruchirappalli, Tamil Nadu,  
India

## Reaction of land races and germplasm collections of paddy against major diseases under sodic soil

Chitra K, Sheeba Joyce Roseleen S, PT Sharavanan and C Gailce Leo Justin

### Abstract

The resistance breeding is one of the ways to tackle disease incidence in plants and it requires continuous efforts of enriching the resistance mechanism against the diseases. In our investigations, field experiments were conducted to find out tolerant germplasm and land races against major disease of Paddy during 2015-16 and 2017-18. It was found that from the trial, IVT 3932 and IVT 3933 found no disease symptoms in 2015-16. Whereas AVT entry 1711 recorded no major diseases in the same year. Among the 37 IVT entries the highest per cent disease incidence was noticed in the entry 3936 (4.60 %). All other entries noticed below 4.6% disease incidence. Overall incidence of disease in the IVT, AVT and MLT trials were less. The maximum incidence of BLB 3.45 per cent was noticed in the entry 1702, the entries 1703 and 1717 recorded 4.24 & 4.0 % of leaf spot incidence respectively. Among the MLT entries, 506 recorded maximum incidence of blast (5.56 %), BLB (4.59 %) and leaf spot (4.67 %). Karudan samba and Kandavali had lesser incidence of blast, sheath blight, sheath rot, bacterial blight, false smut and brown spot. The maximum incidence of blast (4.13 %) was noticed in TRY 3 and the minimum incidence 0.86 % was noticed in Karudan samba. The maximum incidence of BLB was observed in the TN 1 (5.65 %) and TRY 3 (4.33%). All other entries noted minimum incidence when compared to check and TRY 3.

**Keywords:** Paddy, Land races, germplasm, diseases, sodic soil

### Introduction

Paddy, *Oryza sativa* L. is one of the most important cereal crops in the world. There are only two species of cultivated rice in the world, *Oryza sativa* (Asian rice) and *Oryza glaberrima* (African rice). Both species are annual grasses (except in the tropics, where the plant can be perennial) belonging to the family Poaceae, which are cultivated for their grain which is considered a staple food in most parts of the world. Paddy, *Oryza sativa* L. is one of the most important cereal crops in the world. India has the largest area under rice cultivation in the world (44.6 million hectares) and ranks second in production (104.31 million tonnes in 2011-12). In India, Rice is grown under different agro ecological conditions viz., water logged, deep water, hills, high humidity, high temperatures, salinity alkalinity and flood prone areas. The cropping intensity differs from one environment to the other with a maximum of three rice growing seasons in a year in the fertile deltaic regions due to availability of continuous irrigation. Area under rice cultivation in Tamil Nadu: 21.84 million ha. Rice production in Tamil Nadu: 76.31 lakh tonne. Productivity of rice in Tamil Nadu: 3,494 kg/ha. Diseases affecting paddy crop are nearly nine diseases like Blast - *Pyricularia grisea* (*P. oryzae*), Bacterial Leaf Blight - *Xanthomonas oryzae* pv. *oryzae*, Rice tungro disease - *Rice tungro virus* (RTSV, RTBV), Brown Spot - *Helminthosporium oryzae*, Sheath Rot - *Sarocladium oryzae*, Sheath Blight - *Rhizoctonia Solani*, False Smut - *Ustilaginoidea virens*, Grain discolouration - *fungal complex* and finally Leaf streak - *Xanthomonas oryzae* pv. *oryzicola*. The percentage of disease affected rice in Tamil Nadu is as low ( $\leq 5\%$ ), low to medium (6–15%), medium (16–25%) and medium to severe ( $>25\%$ ). Disease damage to rice can greatly reduce yield. They are mainly caused by bacteria, viruses, or fungi.

Planting a resistant variety is the simplest and, often, the most cost effective management for diseases. Rice (*Oryza sativa* L.) is one of the most important cereal crops in the world, serving as staple food for (Deepti *et al.*, 2013) [4] about 90% of rice in the world is grown and consumed by the population of Asian countries. In India, rice crop is grown under wide range of agro-climatic conditions and is being cultivated over an area of 44.40 million hectares with total production of 104.32 million tonnes during 2011-12 (Anonymous 2013) [2].

Rice occupied almost 53% of the total agricultural crop areas of the state of West Bengal during 2007-08. The area and production under food grain during 2007-08 were 63.70 lakh hectare and 160.61 lakh metric tonnes respectively (Anonymous, 2010) [1]. Rice suffers from many diseases caused by fungi, bacteria and viruses. Among the fungal diseases, sheath blight, sheath rot, bacterial blight, brown spot, blast and false smut are the most prevalent ones. To ensure the global food security for increasing population growth, it is vital to control the various insect pests and diseases that damage rice (Normile, 2008) [8]. The resistant varieties reduce the cost of production by reducing the investment on pesticide (Chouhan *et al.*, 2000) [3]. Keeping in the view its economic importance, the present investigation was undertaken to find out the resistant /tolerant cultivars against the major diseases under sodic soil condition.

### Materials and methods

A total of 38 IVT line, 20 AVT line and 10 entries of each MLT and local land races were collected from Department of Plant Breeding and Genetics, Anbil Dharmalingam Agricultural College and Research Institute, Trichirapalli, Tamil Nadu and used for screening against various diseases under sodic soil condition. The germplasm was sown in Sep and Oct, 2016 and 2018 at Farm, Anbil Dharmalingam Agricultural College and Research Institute, Trichirapalli, Tamil Nadu. After 15 days, the well grown seedlings were transplanted in main field with sodic pH of 8.3.

The crop is monitored regularly and the diseases like blast, brown spot and bacterial leaf blight were recorded using scale 0 to 9 and where as diseases like sheath blight, sheath rot were recorded as number of plants affected by the disease.

Scale	Description
0	No visible symptoms
1	< 1 % leaf area affected
3	1-10 % leaf area affected
5	11-25 % leaf area affected
7	26-50 % leaf area affected
9	>50 % leaf area affected

The per cent disease index is worked out using following formula:

$$\text{Per cent Disease Index (PDI)} = \frac{\text{Sum of individual ratings}}{\text{Total no. of plants/leaves observed}} \times \frac{100}{\text{Maximum Grade}}$$

In case of neck blast, per cent disease incidence was worked out from number of infected plants to total number of plants.

### Result and discussion

A total of 63 germplasm entries including IVT, AVT and MLT were screened for their resistance against major pests and diseases of rice under field conditions during Sep to Jan, 2015-16 and 2017-18.

#### Reactions of IVT entries against major pests of rice

Thirty seven IVT entries and TN1 were screened for their reactions to major diseases like blast (neck blast), bacterial leaf blight (BLB) and leaf spot and the results were presented in Table 1. IVT entries viz., IVT 3901, IVT 3904, IVT 3905, IVT 3906, IVT 3907, IVT 3910, IVT 3913, IVT 3921, IVT 3922, IVT 3923, IVT 3932, IVT 3933 and IVT 3934 recorded no neck blast symptoms and IVT 3909, IVT 3915, IVT 3919, IVT 3921, IVT 3922, IVT 3926, IVT 3931, IVT 3932, IVT

3933, IVT3934 and IVT 3936 recorded no bacterial leaf symptoms. Whereas IVT 3907, IVT 3908, IVT 3909, IVT 3912, IVT 3926, IVT 3932, IVT 3933, IVT 3935 recorded no brown spot symptoms. In the trial, IVT 3932 and IVT 3933 found no disease symptoms in 2015-16. All the entries recorded below 5.0 % PDI of neck blast, bacterial leaf blight and brown spot.

Among the 37 IVT entries the highest per cent disease incidence was noticed in the entry 3936 (4.60 %). All other entries noticed below 4.6% disease incidence. Overall incidence of disease in the IVT, AVT and MLT trials were less. The maximum incidence of BLB 3.45 per cent was noticed in the entry 1702, the entries 1703 and 1717 recorded 4.24 & 4.0 % of leaf spot incidence respectively. Among the MLT entries, 506 recorded maximum incidence of blast (5.56 %), BLB (4.59 %) and leaf spot (4.67 %).

Among the entries screened in three samba seasons from 2015-17 ten land races showed consistent results with regard to the pest incidence. The highest damage was noticed in the entry 3924(8.39 %). The maximum disease incidence was noticed in the entry 3924 (8.39%). The overall incidence of diseases in the field trials was less. Minimum incidences were noticed in the entries Thengapoo samba, Karudan samba and Kandavali land races.

The maximum incidence of blast (4.13 %) was noticed in TRY 3 and the minimum incidence 0.86 % was noticed in Karudan samba. The maximum incidence of BLB was observed in the TN 1 (5.65 %) and TRY 3 (4.33%). All other entries noted minimum incidence when compared to check and TRY 3.

#### Reactions of AVT rice germplasm entries to major diseases during Sep to Jan, 2015-16 under field condition

Twenty entries under AVT were evaluated for their resistance to major diseases of rice under field conditions (Table 2). Overall incidence of disease in the AVT trial was less. There was no blast incidence in the entries 1711,1714,1701,1718 and 1709. While the other entries recorded minimum incidence of 1.0 to 4.0 %. The highest incidence of BLB 3.45 per cent was noticed in the entry 1702. The entries 1703 and 1717 recorded 3.45 & 4.24 % of leaf spot incidence. The higher incidence of blast was (4.34%) noticed in the entry 1704.

Among the MLT entries, the highest incidence of blast 5.56 per cent was recorded in the entry 506 followed by 4.32, 3.54 and 3.32 per cent in 505, 510 and 503, respectively. The other entries recorded below 5 per cent incidence. The entry 502 recorded the minimum incidence of blast which was 0.76 % (Table 3).

The BLB caused by *Xanthamonas campestris* pv. *oryzae* was less than 5.0 % in all the entries, the maximum incidence of 4.59 % was recorded in 506 and the minimum of 0.76 % in 502. The maximum incidence was recorded in 506 with the incidence of 4.67 %. All the other entries recorded less than 5.0 % incidence.

#### Reactions of rice germplasm entries to major insect pests during samba 2017-18 under field conditions

The overall incidence of diseases was low during Rabi, 2017-18 in all the land races as well as the susceptible check tested. The maximum blast incidence was noticed in the Kanba samba recorded (2.62 %), sheath blight was noticed in the Kaiveera samba of 2.75 per cent, sheath rot and BLB incidence of (2.54 and 3.44 %) respectively in

Kuzhiyadichan, brown spot was (3.47 %) noticed in Manakathai. The Minimum incidence of blast was recorded in Manakathai (1.16%), sheath blight in Kuruvikkar (0.86%), sheath rot in Seeraga samba (1.12%), BLB and in Kuruvikkar

(1.87%). The overall disease incidence minimum in all the entries tested. Thengapoo samba, Karudan samba and Kandaalai were recorded minimum incidence of all diseases.

**Table 1:** Reactions of IVT rice germplasm entries to diseases during rabi 2015-16 under field conditions

S. No	Entry No.	Blast (% Neck blast)	BLB (PDI)	Leaf spot (PDI)
1	IVT 3901	0.00	4.00	1.00
2	IVT 3902	2.32	1.26	1.33
3	IVT 3903	1.17	0.69	3.45
4	IVT 3904	0.00	1.55	3.45
5	IVT 3905	0.00	0.55	2.66
6	IVT 3906	0.00	0.55	1.50
7	IVT 3907	0.00	1.55	0.00
8	IVT 3908	2.26	2.57	0.00
9	IVT 3909	1.50	0.00	0.00
10	IVT 3910	0.00	1.00	0.69
11	IVT 3911	2.25	4.19	0.55
12	IVT 3912	2.00	1.50	0.00
13	IVT 3913	0.00	0.86	4.84
14	IVT 3914	0.50	1.30	2.39
15	IVT 3915	1.00	0.00	0.86
16	IVT 3916	2.00	0.69	0.64
17	IVT 3917	2.00	2.25	1.50
18	IVT 3918	0.55	1.20	1.12
19	IVT 3919	1.00	0.00	0.55
20	IVT 3920	1.00	2.25	2.66
21	IVT 3921	0.00	0.00	0.69
22	IVT 3922	0.00	0.00	1.50
23	IVT 3923	0.00	2.10	0.85
24	IVT 3924	0.33	1.30	1.64
25	IVT 3925	1.32	0.89	2.33
26	IVT 3926	1.50	0.00	0.00
27	IVT 3927	2.25	0.69	1.25
28	IVT 3928	2.00	1.60	0.86
29	IVT 3929	1.20	3.50	1.50
30	IVT 3930	2.25	0.69	0.86
31	IVT 3931	1.00	0.00	1.50
32	IVT 3932	0.00	0.00	0.00
33	IVT 3933	0.00	0.00	0.00
34	IVT 3934	0.00	0.00	4.01
35	IVT 3935	2.25	1.20	0.00
36	IVT 3936	4.60	0.00	0.55
37	IVT 3937	2.25	1.55	0.86
38	TN 1	2.62	1.86	1.66

**Table 2:** Reactions of AVT rice germplasm entries to major diseases during samba 2015-16 under field conditions

S. No	Entry No.	Blast (% Neck blast)	BLB (PDI)	Leaf spot (PDI)
1	1701	0.00	0.00	3.45
2	1702	1.17	3.45	0.69
3	1703	1.17	0.00	4.0
4	1704	4.34	1.55	2.26
5	1705	2.39	1.20	0.86
6	1706	0.33	0.00	0.00
7	1707	2.26	1.20	1.12
8	1708	2.25	0.00	2.25
9	1709	0.00	1.55	2.00
10	1710	1.65	2.25	1.0
11	1711	0.00	0.00	0.00
12	1712	1.20	3.50	0.55
13	1713	1.20	2.26	0.55
14	1714	1.23	1.55	1.20
15	1715	1.20	0.00	1.50
16	1716	1.35	2.00	1.56
17	1717	2.23	2.89	4.24
18	1718	0.00	1.00	0.00
19	1719	0.55	1.00	0.00
20	1720	0.00	1.30	1.34

**Table 3:** Reaction of MLT entries to diseases during samba 2015-16 under field conditions

S. No	Accession No	Blast (% Neck blast)	BLB (PDI)	Leaf spot (PDI)
1	501	1.20	0.85	3.55
2	502	0.76	0.73	2.69
3	503	3.32	0.55	0.85
4	504	2.34	0.69	0.55
5	505	4.32	4.59	1.50
6	506	5.56	5.35	4.67
7	507	2.12	0.86	2.25
8	508	2.45	0.33	3.50
9	509	1.42	2.25	3.00
10	510	3.54	0.83	2.59

**Table 4:** Reaction of rice germplasm entries to major diseases field conditions (Samba 2017-18)

S. No	Name of the entries	Disease incidence (PDI)						
		Blast	Sheath blight	Sheath rot	Bacterial leaf blight	False smut	Brown spot	Grain discoloration
1.	Kuruvikkar	2.48	0.86	1.84	1.87	0	1.57	0
2.	Kudavalai	2.24	1.23	1.64	2.33	0	2.33	0
3.	Thengapoo samba	0.59	0.12	0.77	0.95	0	0.39	0
4.	Kanba samba	2.62	1.24	1.40	2.54	0	2.49	0
5.	Seeraga samba	2.46	2.31	1.12	3.22	0	2.35	0
6.	Karudan samba	0.36	0.67	0.73	0.93	0	0.66	0
7.	Kuzhiyadichan	2.35	2.44	2.54	3.44	0	2.39	0
8.	Manakatthai	1.16	1.29	2.34	2.56	0	3.47	0
9.	Kandavali	0.23	0.12	0.00	0.88	0	0.51	0
10.	Kaiveera samba	1.19	2.75	0.00	2.44	0	1.57	0
11	TN 1	6.56	5.83	4.18	5.65	0	4.88	0
12	Check TNAU RICE TRY 3	4.13	3.28	3.04	4.33	0	3.87	0

## References

- Anonymous. Status Paper on Rice in West Bengal, Directorate of Rice Research, Rajendranagar, Hyderabad 500030, 2010, 8.
- Anonymous. World rice production in metric tonnes. Food and Agriculture Organization of the United Nations, 2013. [www.geohive.com/charts/ag\\_rice.aspx](http://www.geohive.com/charts/ag_rice.aspx).
- Chauhan JS, Variar M, Shukla VD, Maiti D, Bhattacharya NVS, Lodh SB. Screening rice genetic resources for major diseases of replants and quality fruits of resistant donors. *Indian Phytopath.* 2000; 53(1):80-82.
- Deepti D, Sasisharan N, Macwana S, Chakraborty S, Trivedi R, Ravikiran Shah G. Molecular characterization of rice (*Oryza sativa* L.) genotype for salt tolerance using microsatellite markers. *The Bioscan.* 2013; 8:499-502.
- Hajano J, Pathan MA, Rajput QA, Lodhi MA. Rice blast-mycoflora, symptomatology and pathogenicity. *International Journal for Agro Veterinary and Medical Sciences.* 2011; 5:53-63.
- IRRI. Standard Evaluation System for rice. INGER Genetic Resource Centre, 1996.
- Normile D. Reinventing rice to feed the world. *Science.* 2008; 321:330-333.
- Singh KD, Borah P. Screening of local upland rice cultivars of Assam against sheath blight. *Ann. Biol.* 2000; 16:161-2.
- Toppo R, Dubey SC. Evaluation of rice cultivars against banded blight in plateau region. *J of Research. Birsa Agri. Univ.* 1997; 9(2):203-4.
- Wheeler BEJ. An introduction to plant diseases. John Wiley and Sons Ltd., London, 1969.
- Fischer T, Byerlee D, Edmeades G. Crop Yields and Global Food Security; Will Yield Increase Continue to Feed the World? Australian Centre for International Agricultural Research, Canberra, Australia, 2014.
- Virmani S. Heterosis and Hybrid Rice Breeding, Springer Science & Business Media, Berlin, Germany, 1994, 22.
- IRRI. Hybrid Rice Breeding Manual, International Rice Research Institute, Los Banos, Laguna, Philippines, 1997.
- Acquaah G. Principles of Plant Genetics and Breeding, Blackwell Publishing, London, UK, 2<sup>nd</sup> edition, 2009.
- Payne R, Murray DA, Harding SA, Baird DB, Soutar DM. Genstat for Windows (12<sup>th</sup> Edition) Introduction, VSN International, Hemel Hempstead, UK, 2009.
- IRRI. Standard Evaluation System (SES) for Rice, International Rice Research Institute, Los Banos, Philippines, 5<sup>th</sup> edition, 2013.
- Bahadur Magar. Kathmandu, Screening of rice varieties against brown leaf spot disease at Jyotinagar, chitwan, Nepal P.B. Magar *Int J Appl Sci Biotechnol*, 2015; 3(1):56-60. DOI: 10.3126/ijasbt.v3i1.12014