Madras Agric. J. 80 (9) : 495 - 499 September 1993

https://doi.org/10.29321/MAJ.10.A01689

CHARACTERISTICS OF THE ISOLATES OF BLB ORGANISM

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ABSTRACT

Eighteen pathogenic isolates of **Xanthomonas campestris** pv. **oryzae** (Xco) were collected from seventeen locations in Tamil Nadu. Tetracycline exerted maximum inhibitory effect on the growth of all isolates. Isolate I_8produced the smallest lesion. Based on the leaf area blighted on the susceptible T(N) 1 rice variety, isolates, I_1, I_2 and I_3 were classified as most virulent, isolates I_4,I_5,$I_6$$I_7$,$I_9$,$I_{10}$,$I_{11}$,$I_{12}$,$I_{16}$ and I_{18} as virulent and the isolates I_3, $I_8$and I_{15}as least virulent. The reaction of the five international differential rice varieties have reacted to these 18 isolates differentially. Based upon the IRRI standard on the classification of race groups, Xco isolates. I_3,$I_8$and I_{15} are considered to belong to race group 2 and the rest of the 15 isolates belong to race group 3 of Philippines.

Key Words : *Pathogenic isolates, Bacterial blight*

INTRODUCTION

Many ruling rice cultivars including IR20 (hither to considered as resistant to BLB) are affected by bacterial blight disease caused by **Xanthomonas campestris** pv. **oryzae** (Ishiyama) (Xco) in recent years in Tamil Nadu. This interaction might have arisen possibly due to the variation in the pathotypes. It is therefore, with a view to find out the existing pathotypes of Xco in Tamil Nadu, the present investigation was carried out.

MATERIALS AND METHODS

Sensitivity To Antibiotics

The sensitivity of the isolates to six antibiotics viz., Chloramphenicol, Streptomycin, Neomycin, Streptomycin (3.6%) + Terramycin (0.4 g/40g), Streptomycin (15%) + Oxytetracycline (1.5%), tetracycline at 1000 ppm was tested by paper disc bioassay method (Smale and Keil, 1966). Two filter paper discs of 10mm diameter were immersed in the antibiotic solution, air dried and laid on to the seeded (with Xco) potato sucrose agar surface in the petriplates. The inhibition zone was measured after 24 - 48 h. The filter paper disc immersed in distilled water served as control. For each antibiotic three plates were used.

Virulence of the isolates

The Virulence of Xco isolates was studied by fresh bean pod method described by Star and Dye (1965). Uniformly matured, straight and blemish free green french bean pods were selected and washed thoroughly in distilled water. Under aspeeetic conditions, the pods were pricked with a sterilized needle dipped in the actively growing 48h old culture of the bacterial isolate to a depth

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of 2mm and incubated at 24 - 30 °C in a humid chamber for 2 - 4 days. The water soaked lesion type and size were recorded.

Reaction of the susceptible cultivar

The leaves of 45 days old TN1 plants were clipped with a paid of sterilized scissors dipped in a inoculum containing 40,000 cfu/cubic ml. After 15 days of inoculation 20 leaves at random were assessed for disease intensity for each isolate. The blighted leaf are was measured. The infected leaves were graded following Standard Evaluation System (SES) for rice (IRRI, 1988, 1989).

Grade	Per cent lesion area blighted
0	0
1	1 - 5
3	6 - 12
5	13 - 25
7	26 - 50
9	51 - 100

The percent disease Index (PDI) values were worked out by the following formula

$$\frac{\text{Sum of all grades} \times 100}{\text{No. of leaves examined per treatment} \times \text{Maximum grade value in the scale (9)}}$$

(Mickinney, 1923)

Reaction of differential rice varieties

Rice seeds of five differential varieties of Xco viz, IR20, Dv 85, Cas 209, IR 24, IR 1545-339) received from IRRI, Philippines were sown in pots containing uniform soil mixture. Ten plants of each differential variety were separately inoculated with each of the 18 isolates of Xco. Twenty leaves in each differential variety were selected at random and graded 15 days after inoculation. The blighted leaf area was measured. The reactions were classified as resistant, moderately resistant, moderately susceptible and susceptible (IRRI, 1989).

RESULTS AND DISCUSSION

Tetracycline exerted the maximum inhibitory effect on the growth of Xco isolates followed by chloramphenicol, streptomycin (3.6%) + terramycin (0.4 g/40g) (Plantomycin), Streptomycin (15%) + oxytetracycline (1.5%) (Pasuhamycin), neomycin and streptomycin at 1000 ppm concentration (Table - 1). Balaraman and Soumini (1978) also reported that the antibiotic tetracycline Hcl recorded the highest inhibition zone. Several workers (Kauffman and Kannaiyan, 1987; Chandrasekaran and Vidhyasekaran, 1988 and Seetharaman, 1989) reported that chloramphenicol was effective against the pathogen. While Seetharaman (1989) reported that streptomycin was the least inhibitory.

The lesion produced on green bean pod by the isolate I_1 was the largest while that produced by the I_8 was the smallest indicating that isolate I_1 is the more virulent and I_8 is less virulent. The reaction of TN1 rice variety to the isolates of the pathogen also varied as seen by the percent leaf area blighted. Isolate I_1 produced the maximum per cent leaf area blighted (69.86) while I_8 produced the minimum (20.03). Valluvaparidasan (1980) and Seetharaman (1989) also recorded similar relationship between virulence and leaf area blighted. Based on the virulence the isolates were grouped under three categories viz.

i. The most virulent - I_1, I_2 and I_{13} (per cent leaf area blighted 51 - 100)

Table 1. Sensitivity of Xco isolates to antibiotics (Inhibition dia in mm) 1000 ppm

Isolate No.	A	B	C	D	E	F
I_1	31.5	11.5	29.5	19.0	24.5	20.0
I_2	30.5	10.0	28.5	17.5	22.0	19.5
I_3	19.5	7.5	18.5	10.0	15.5	12.0
I_5	27.5	10.0	26.0	14.5	19.0	18.5
I_6	21.0	7.5	21.5	10.0	16.0	12.5
I_7	22.0	8.0	18.0	9.5	15.5	13.5
I_8	13.5	7.0	14.0	8.5	12.0	10.5
I_9	15.5	7.5	14.5	10.5	12.5	11.5
I_{10}	25.5	9.0	23.5	13.0	17.0	16.5
I_{11}	24.5	8.5	22.5	12.5	16.0	15.0
I_{12}	22.5	8.5	12.5	11.5	16.5	12.5
I_{13}	29.5	10.5	26.0	14.5	20.0	19.0
I_{14}	23.5	9.5	21.0	18.0	15.0	14.0
I_{15}	19.0	8.0	19.5	10.0	14.5	11.0
I_{16}	28.5	10.5	27.5	16.5	21.5	19.0
I_{17}	20.0	10.0	18.0	11.5	15.0	13.0
I_{18}	24.5	11.0	23.5	15.5	18.5	15.5

A : Tetracycline: B : Streptomycin; C : Chloramphenicol ; D : Neomycin: E : Streptomycin 3.6% + Terramycin 0.4 g/40g;
F : Streptomycin 15% + Oxytetracycline 1.5%.

Table 2. Infection of BLB Isolates on rice differetials, beanpod and TN_1

Isolate Number	Differential Rice Varieties*					Lesion Diameter on French bean pod (mm)	Percent leaf area blighted (TN_1) PDI
	IR24	IR20	IR 1545-339	Cas209	DV85		
I_1	68.2(S)	60.9(S)	5.0(R)	68.8(S)	3.0(R)	6.1	69.86 (56.7)
I_2	53.0(S)	51.0(S)	4.9(R)	67.9(S)	2.8(R)	5.7	55.64 (48.2)
I_3	34.3(S)	34.5(S)	9.4(R)	2.4(R)	2.6(R)	2.4	21.84 (27.8)
I_4	49.2(S)	42.8(S)	3.6(R)	40.6(S)	2.7(R)	4.0	36.2 (36.9)
I_5	51.8(S)	55.9(S)	3.1(R)	49.2(S)	1.4(R)	4.9	43.12 (41.0)
I_6	49.9(S)	45.3(S)	4.6(R)	42.4(S)	2.3(R)	4.1	33.61 (35.4)
I_7	44.4(S)	44.4(S)	4.8(R)	48.8(S)	3.0(R)	4.3	38.98 (38.6)
I_8	34.5(S)	32.8(S)	9.5(R)	2.3(R)	2.4(R)	2.2	20.03 (26.5)
I_9	42.5(S)	49.9(S)	3.4(R)	40.6(S)	2.4(R)	4.3	39.48 (38.9)
I_{10}	44.5(S)	49.2(S)	4.8(S)	40.3(S)	2.5(R)	4.2	39.97 (39.2)
I_{11}	40.6(S)	40.6(S)	3.3(R)	47.4(S)	2.3(R)	3.8	38.88 (38.5)
I_{12}	42.8(S)	42.8(S)	3.2(R)	42.5(S)	2.4(R)	4.5	42.13 (40.4)
I_{13}	44.7(S)	40.6(S)	4.7(R)	65.2(S)	2.5(R)	5.8	54.02 (47.2)
I_{14}	53.8(S)	53.1(S)	3.6(R)	42.8(S)	2.3(R)	4.2	37.84 (37.9)
I_{15}	32.8(S)	34.3(S)	8.7(R)	1.4(R)	2.7(R)	3.5	23.54 (29.0)
I_{16}	42.5(S)	49.1(S)	4.5(R)	45.3(S)	2.4(R)	4.4	45.25 (42.2)
I_{17}	42.8(S)	42.5(S)	4.8(R)	46.0(S)	1.7(R)	4.3	40.83 (39.7)
I_{18}	62.0(S)	53.1(S)	3.0(R)	56.9(S)	2.7(R)	3.9	38.59 (38.4)

R = Resistant; S = Susceptible

CD = 0.05
Bean Pods : 0.12
Blighted leaf area : 0.50
(Values in parenthesis are transformed values)

* Per cent leaf area blighted.

ii. Virulent - I_{16}, I_5, I_{12}, I_{17}, I_{10}, I_9, I_{11}, I_{18}, I_{14}, I_7, I_4 and I_6 (26-50)

iii. The least virulent - I_{15}, I_3 and I_8 (13-25).

The virulence of the isolates on rice leaves and bean pods followed the same trend.

The reaction of the differential varieties of Xco isolates are furnished in Table - 2. From the results, it is evident that the rice cultures IR 1545-339 and Dv 85 were resistant to all the isolates, while the varieties IR 24, IR 20 were susceptible. The rice culture Cas 209 was resistant to the isolates I_3, I_8 and I_{15} and it was susceptible to all other isolates. With these characters grouping of isolates was done as per the standard suggested by IRRI 1989. The isolates I_3, I_8 and I_{15} of Tamil Nadu appear to belong to race 2, since it is similar to the standard scale described by IRRI based on the reaction to differential rice varieties (IR20 and IR24 - susceptible, Cas 209, IR 1545-339 and DV 85 resistant). The rest of the 15 isolates (I_1, I_2, I_4, I_5, I_6, I_7, I_9, I_{10}, I_{11}, I_{12}, I_{13}, I_{14}, I_{16}, I_{17} and I_{18}) exhibited a reaction pattern on the differential varieties which are similar to the race group 3 of Philippines. The present study indicate that the pathotypes of Xco existing in Tamil Nadu belong to race 2 and 3 of Philippines.

REFERENCES

BALARAMAN, K and C.K. SOUMINI RAJAGOPALAN, 1978. Control of bacterial leaf blight of rice assay of chemicals **Madras Agric. J. 65** (7) : 463-469.

CHANDRASEKARAN, A. and P.VIDHYASEKARAN, 1988. Screening antibiotics for their control of bacterial blight (BB) **Int. Rice Res. Newsl., 13**(3) : 30.

IRRI - International Rice Research Institute, Manila, Philippines, 1988. Standard Evaluation System for rice (Revised) 3rd edition.

IRRI - International Rice Research Institute. 1989. Bacterial blight of rice P.O. Box. 933, Manila, Philippines.

KAUFFMAN, H.E. and S. KANNAIYAN, 1987. Bacterial blight of rice In : **Advances in Rice Pathology** edition S.KANNAIYAN, TNAU, Coimbatore, India. 484 p.

MCKINNEY, H.H. 1923. A new system of grading plant diseases. **J. Agric. Res.** 26 : 195-218.

SEETHARAMAN,K 1989. Studies on bacterial blight of rice (**Oryzea Sativa L**) caused by **Xanthomonas campestris** pv. **oryzae** (Ishiyama) Dye 1978. Ph.D. Thesis, TNAU, Coimbatore, India 209. p.

SMALE, B.C. and H.C.KEIL,1966. A biological study of the intervarietal resistance of **Pyrus Communis** to fire blight **Phytochemistry,** 5 : 1113-1120

STARR, M.P. and D.W.DYE. 1965. Scoring virulence of phytopathogenic bacteria. **Newzealand J. Sci., 8** : 93-105.

VALLUVAPARIDASAN, V. 1980. Studies on bacterial leaf blight of rice (**Oryza Sativa Linn**) caused by **Xanthomonas oryzae** (Uyade et Ishiyama) Dowson. M.Sc. (Ag.) Thesis, TNAU, Coimbatore, India 105 p.