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THE BACTERIAL PATHOTYPE GROUP WHICH ATTACKS THE IR 20 GROUP VARIETY *)

Suparyono**), Hartini Ramlan Hifni***) and Osamu Horino ****)

Abstract

Bacterial Leaf Blight, caused by *Xanthomonas campestris* pv. *oryzae* (former name, *Xanthomonas oryzae* (U & I) Dowson) is one of the most important rice diseases in Indonesia.

To study the pathotype changes of this pathogen, forty six isolates were evaluated for their virulence on ten differential varieties. These ten varieties were Kinmaze (no gene for resistance), Kogyoku (Xa-1, Xa-kg), Tetep (Xa-1, Xa-2), Wase Aikoku 3(Xa-3), Java 14 (Xa-1, Xa-3, Xa - kg), IR8 (?), IR. 20 (Xa-4), IR 1545 (xa-5), DV85 (xa-5, Xa-7) and Cas 209 (?). The well developed leaf blade of each tiller was inoculated in the central portion by the needle prick method. Lesion development were scored at two to three weeks after inoculation, and the isolates were graded into group of virulence in accordance to standard proposed by Ezuka and Horino.

Results indicated that 80 percent of the isolates collected in 1980 belong to group III. This group of isolates predominantly infected IR20. The IR36 belongs to this group of variety.

Ringkasan

Penyakit bakteri busuk daun padi, yang disebabkan oleh *Xanthomonas campestris* pv. *oryzae* (nama sebelumnya *Xanthomonas oryzae* (U & I) Dowson) merupakan salah satu penyakit yang sangat penting di Indonesia.

Untuk mengetahui perubahan-perubahan patotipe penyebab penyakit ini, 46 isolat *X. campestris* pv. *oryzae* telah diuji virulensinya pada sepuluh varietas differensial.

Varietas-varietas tersebut adalah Kinmaze (tanpa gentahan), Kogyoku (Xa-1, Xa-kg), Tetep (Xa-1, Xa-2), Wase Aikoku 3(Xa-3), Java 14(Xa-1, Xa-3, Xa-Kg) IR8 (?), IR20 (Xa-4), IR1545 (xa-5), DV85 (xa-5, Xa-7), dan Cas 209 (?). Daun-daun yang telah berkembang baik diinokulasi dengan metode *needle prick*. Perkembangan penyakit diamati pada dua sampai tiga minggu setelah inokulasi. Klasifikasi grup bakteri berdasar virulensinya dilakukan menurut standard Ezuka dan Horino.

Introduction

Bacterial Leaf Blight (BLB) of rice caused by *Xanthomonas campestris* pv *oryzae* (former name *Xanthomonas oryzae* (U. & I.) Dowson) is one or the important rice diseases in Indonesia.

Since 1978 the disease has been increasingly important because some previous resistant varieties which are also known as to be resistant to the brown planthopper (*Nilaparvata lugens* Stal) were found being severely damaged by the bacterium (Table 1). Evidently the disease was widely distributed throughout Java, especially West Java.

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**) Assistant Plant Pathologist at The Sukamandi Research Institute For Food Crops, Sukamandi, Indonesia.

***) Associate Plant Pathologist at The Bogor Research Institute For Food Crops, Bogor, Indonesia.

****) Plant Pathologist, Hokuriku National Agricultural Station, Japan.



Control of the disease by chemicals was proved to be neither effective nor economically feasible (Anonymous, 1979). Breeding program were initiated at IRRI, and nationally at Sukamandi Research Institute for Food Crops to counter the disease. The two resistant varieties developed at IRRI, i.e. IR30 and IR36, possess one dominant gene controlling resistance to BLB. The source of gene for resistant of some brown planthopper resistant varieties is shown in table 2. IR 30 and IR 36 received their resistance from TKM6 and IR1561-228, respectively.

For the purpose of the breeding program, a study to gather informations of *X. campestris* pv. *oryzae* regarding the pathotype group and the appropriate isolate to inoculate breeding materials was initiated.

Material and Methods.

The bacterium isolates used

Forty six isolates of *X. campestris* pv. *oryzae* were collected from various parts of Java in 1980. These isolates were cultured on Wakimoto medium and incubated at 25 - 28°C.

Preparation of differential varieties

Ten differential varieties consisting of five Japanese and five IRRI varieties were used. They were Kinmaze (no gene for resistance), Kogyoku (Xa-1, Xa-kg), Tetep (Xa-1, Xa-2), Wase Aikoku 3 (Xa-3), Java 14 (Xa-1, Xa-3, Xa-kg), IR8 (?), IR20 (Xa-4), IR1545 (xa-5), DV85 (xa-5, Xa-7) and Cas 209 (?). The experiment was conducted in the green house. Seeds were soaked in water for 48 hours, and were seeded in the seed box. Fourteen days old seedlings were transplanted into pots of 17 cm in diameter containing field soils, three hills per pot. They were supplied with an excess amount of urea (67 g per pot).

Inoculations

Inoculations were conducted using the two days old cultures of *X. campestris* pv. *oryzae*. The cultures were suspended in distilled water with a concentration of 10^8 — 10^9 cells/ml and inoculated on the central portion of the well-developed leaf blade by pin prick methods. Five to seven leaves from each tillers were inoculated when the plants were approximately two months old. Lesion developments were scored at two three weeks after inoculations, and the isolates were graded into group of virulence in accordance to standard proposed by Ezuka and Horino (personal communication).

Result and discussion

The reaction of the IRRI differential varieties varied greatly, therefore classification of the isolates into group of virulence was based on their reaction to

Japanese differential varieties. The data of this experiment were summarized in table 3. It appears that 80 percent of the isolates isolated in 1980 belong to group III (Fig. 2). This group of isolates predominantly infected IR20 which has one dominant gene for resistance, Xa-4, derived from TKM6. The IR36 also belong to this group.

Field observation conducted in the 1979/1980 wet season crop by Dr. T.W. Mew (Plant Pathologist, IRRI., P.O. Box 933 Manila, Philippines), Dr. Osamu Horino (Plant Pathologist, Hokuriku National Agricultural Experiment Station, Japan) and Suparyono (Assistant Plant Pathologist, Sukamandi Research Institute for Food Crop, Sukamandi, Indonesia) and in the 1980/1981 wet season crop by Dr. O. Horino and Suparyono in some parts of West Java, revealed that IR36 was the most common varieties planted by farmers and that it was severely infected by this bacterium (Table 3 and 4). On the other hand Pelita I-1, Cisadane and GH147 showed field resistant to this pathogen. In the green house DV85, IR1545, Java 14 and Wase Aikoku 3 were resistant to most of the isolates tested. These evidence indicated that in the near future those varieties mentioned above can be incorporated as resistance sources in breeding for resistance to BLB.

Conclusion

1. Eighty percent isolates of *X. campestris* pv. *oryzae* isolated in 1980 belong to group III. This group infected IR36 which is belong to the IR20 group of variety.
2. In order to develop varieties resistant to this pathogen some sources of resistance, i.e. Pelita I-1, Cisadane, GH147, DV85, IR1545, Java14 and Wase Aikoku can be incorporated in the breeding program.
3. Further studies are needed to prevent BLB incidence through :
 - a. Collection and identification of pathotype of *X. Campestris* pv. *oryzae* that are dominant in a particular season and location.
 - b. Identification of sources of resistance of Pelita I-1, Cisadane and GH147 and from germplasm collection
 - c. Incorporation of several resistant genes (may be recessive and dominant) into one variety in order to develop field resistant varieties to BLB.

Literature cited

1. Anonymous (1979) *Rice diseases in North and Eastern India, Nepal and Bangladesh (with focus on bacterial leaf blight)* A Report of an IRTP Monitoring Tour. IRRI, Manila.
2. Suparyono; Ardi Suardi and Taryat Cubaryat (1978) *Rice bacterial leaf blight (Xanthomonas oryzae) in Java.* Paper presented at Kongres Nasional ke V Perhimpunan Fitopatologi Indonesia (PFI), Malang, 1979.

Table 1. Bacterial leaf blight on some Brown Landraces Resistant Varieties in Java, March, 1978.

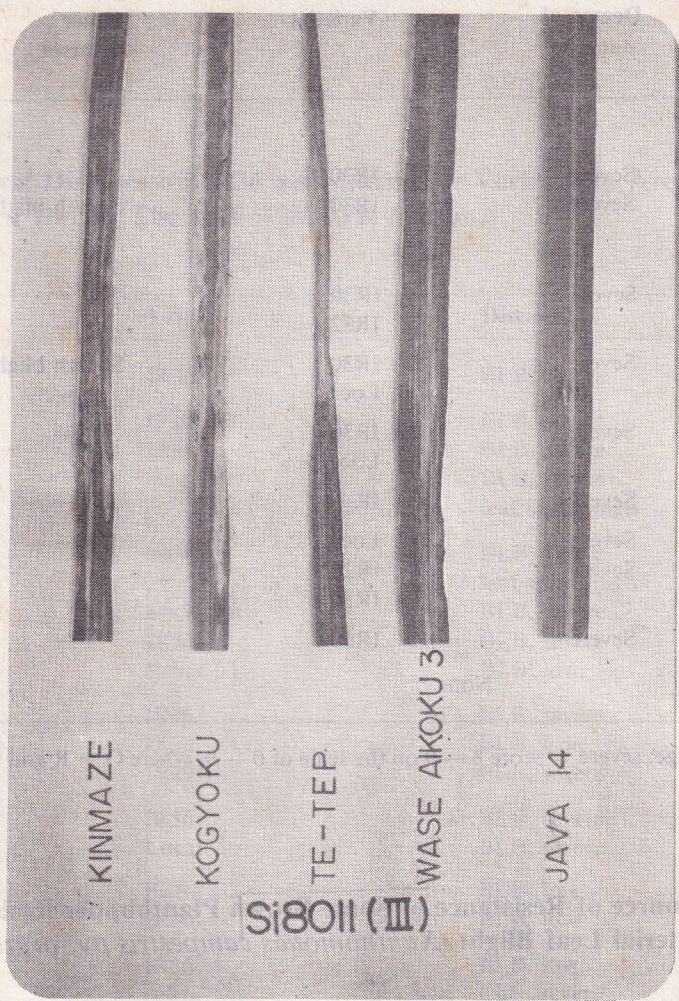


Figure 2. The reactions of Bacterial Group III to five differential rice varieties.

Variety	Reaction
KINMAZE	Resistant
KOGYOKU	Susceptible
TE-TEP	Susceptible
WASE AIKOKU 3	Susceptible
JAVA 14	Susceptible



Table 1. Bacterial Leaf Blight on Some Brown Planthopper Resistant Varieties in Java, March, 1978.

Location Province/K ReGENCY	Degree of damage ¹⁾	Varieties	Other diseases
West Java			
Sukamandi	Severe	IR30	
Cirebon	Severe	IR30	Sheath blight
Central Java			
Tegal	Severe	IR30 IR32	—
Purwokerto	Severe	IR30 Local	Sheath blight —
Pekalongan	Severe	IR30 Local	— —
Prupuk	Severe	IR.34	—
Magelang	Severe	Local	—
Boyolali	Severe	IR26 IR30	— —
Sragen	Severe	IR30	—
East Java	None		

¹⁾Degree of damage; severe = score 8 — 9 on the scale of 0 — 9, where 0 = R and 9 = susceptible.

Table 2. Gene Source of Resistance of Some Brown Planthopper Resistant Varieties To Bacterial Leaf Blight (*Xanthomonas campestris* pv. *oryzae*)

Variety	Crosses	Gene source
IR26	IR24/TKM6	TKM6
IR28	Peta ³ /TN-I/ /Gampai 14/4/IR8/Tadukan// TKM ² /TN-I/ /IR24/O.nivara	TKM6
IR30	IR24/TKM6///IR20 ⁴ /O. nivara	TKM6, IR20
IR32	IR20 ² /O.nivara//CR94 - 13	IR20
IR34	IR833-6///IR1561 - 149/IR24 ² /O. nivara	IR1561
IR36	IR1561 - 228 - 1 - 2//IR24 ⁴ /O.nivara///CR94-13	IR1561
IR38	IR20/O. nivara//CR94-13	IR20
Pelita I-1	PB5/Syntha	Syntha

Source : Breeding Department
in Suparyono *et al.*, 1978.

Table 3. General Diseases on IR36 and other Rice Varieties in Areas of West Java Visited During The 1979/1980 Wet Season.

Locality	Variety	Diseases
Bekasi	IR36	BLB, severe
Sukamandi	IR36	BLB, severe
	IR38	BLB, severe
	Semeru	BLB, severe leaf scald, high
Pusakanegara	IR38	BLB, severe leaf scald, high
	Local var.	BLB, severe
	IR36	BLB, severe
	Pelita I-1	BLB, low
Cirebon	IR36	BLB, severe
	IR39	BLB, Low
	IR29	BLB, severe
Kuningan areas	IR36	BLB, severe
	Local var.	BLB, severe
Ciamis areas	Pelita I-1	BLB, low
	IR36	BLB, low
Cianjur	IR36	BLB, low CLS, severe
	Local var.	BLB, severe

Severe = score 8 — 9 on the scale of 0 — 9, where 0 = R and 9 = susceptible.