

Table 1. Strains of bacteriophage and *Xanthomonas oryzae* in Thailand

Bacterial strain		Thai phage					Japanese phage				Nos. of isolates
		TBP ₁	TBP ₂	TBP ₃	TBP ₄	TBP ₅	OP ₁	OP _{1h}	OP _{1h2}	OP ₂	
Thai	A	+	+	+	+	+	+	-	+	+	2
	B	+	+	+	+	-	-	+	+	+	30
	C	+	+	+	-	+	-	-	+	+	35
	D	+	+	-	+	-	-	+	+	+	3
	E	+	+	-	-	+	-	-	+	+	7
	F	+	-	+	+	-	-	-	+	+	3
	G	+	-	+	-	-	-	+	-	+	2
	H	+	-	-	+	-	-	-	-	-	9
	I	-	-	+	-	-	-	-	-	+	19
	J	-	-	-	+	-	-	-	+	-	4
	K	-	-	-	-	-	-	-	-	-	11
Japanese	A	-	-	-	-	-	+	-	+	+	
	B	+	+	+	+	-	-	+	+	+	
	C	-	-	-	-	-	-	-	-	-	
	D	-	-	-	-	-	-	-	+	+	
	E	-	-	-	-	-	-	-	-	+	

Thai bacteriophages were distinctly different from those of Japanese ones. But Thai strain B and Japanese strain B of *X. oryzae* showed similar sensitivities against all kind of Thai and Japanese bacteriophages. Therefore, it is clear that Thai strain B and Japanese strain B of *X. oryzae* belong to the same group with respect to bacteriophage reaction. This is an interesting discovery of the common phage reaction of *X. oryzae* strain among different countries.

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Infection source of the bacterial leaf blight of rice in Thailand

In Thailand, rice plants can be grown almost all year round and in some places stubbles remain alive in fields even in the off season. This phenomenon is considered to be most favorable for the survival of the causal organism from season to season. Present study was made to know the seasonal occurrence of leaf blight bacteria in irrigation water during the off season in 1973 and 1974 at Bangkhen Rice Experiment Station, Thailand. The detection of bacteria in water was made by means of the bacteriophage method. The phage method is designed to grasp indirectly the tendency of bacterial population by determining the number of phages which increase with the multiplication of bacteria.

Counting method of bacteriophage population in test water was as follows; 1 ml of irrigation water collected was mixed with 1 ml of the bacterial suspension and 5 ml of melted potato peptone sucrose agar medium at 43-45°C. Resultant mixture in Petri

dish was incubated at 20°C for about 15 hours. Phage plaques appeared on the plate indicate the bacteriophage population in every 1 ml of the test water. Bacterial strain B, dominant one in field of this station, was used as test bacteria.

Result is shown in Tables 1 and 2. Primary infection of the bacterial leaf blight of rice

in Thailand is caused by the bacteria from rice stubbles which were infected with the disease during the last season. Bacteriophage in the paddy field water appear after plowing and harrowing with water, and hold their population for about two weeks prior to seed sowing or transplanting of rice seedling. It is presumed that such a sudden

Table 1. Phage population in nursery and paddy water before transplanting
Off season, 1973 (per 1 ml water)

Sampling point	Date of sampling								
	8/1	15/1	22/1	29/1	5/2	13/2	20/2	26/2	5/3
Main channel	66	6	0	0	1	0	1	0	0
Drain channel	5	1	0	1	1	0	0	0	0
Nursery		332*	432*	0	0	0	0	0	0
Paddy a					0*	0*	0*	0	3
b					1*	2*	0*	0*	0
c						0*	98*	0*	3
d						30*	6*	0*	123
e						0*	3*	0	0

* Plowing and harrowing with water

Table 2. Phage population in nursery and paddy water before transplanting
Off season, 1974 (per 1 ml water)

Sampling point	Date of sampling												
	24/12	2/1	7/1	14/1	21/1	28/1	4/2	11/2	18/2	25/2	4/3	11/3	18/3
Main channel	0	8	1	0	0	0	0	0	0	0	0	0	0
Drain channel	0	3	0	0	0	0	0	0	0	0	0	0	0
Nursery A	42*	8*	1*	0*	0	0	0	0	0	0	0		
B					2*	7*	0*	0	0	0	0	0	0
C											0*	0*	0*
Paddy a						3*	40*	0					
b						0*	7*	0					
c						0*	0*	0					
d						0*	0*	0*	0				
e								0*	0				
f								0*	0*	0*	0		
g								0*	0*	0			
h								0*	0				
i									0*	0			
j									0*	0*	0*	0*	0
k										0*	9*	0*	0
l										0*	0*	0*	0
m												0*	0*

* Plowing and harrowing with water

increase of bacteriophage in the paddy field water is due to the bacteria which were reactivated and liberated from rice stubbles by plowing and harrowing under wet condition. In general, free bacteria in irrigation water die within 24 hours. But phage population in this study remains high for about two weeks. It is suggested that bacteria are released every day from rice stubbles until all of them are reactivated and liberated into paddy water.

Irrigation from paddy field to paddy field is usually practiced in Thailand, and the water irrigated paddy fields is used for nurseries. If a nursery is located lower than paddy fields, the nursery is apt to be suffered from the infection of the bacterial leaf blight. Therefore, attention should be paid to water management, so that irrigation

water is introduced to nurseries directly from main channel. Deep submergence on nurseries should be avoided, because it often induces "Kresek" after transplanting.

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