

Relation between Disease Incidence of Bacterial Grain Rot of Rice and Weather Conditions

Tae-Hwan Noh¹⁾, Hyung-Moo kim^{2)*}, Wan-Yeob Song²⁾, Du-Ku Lee¹⁾,
Mi-Hyung Kang¹⁾, and Hyeong-Kwon Shim¹⁾

¹⁾National Honam Agricultural Experiment Station, Iksan 570-080, Korea

²⁾Department of Agricultural Biology, Chonbuk National University, Chonju 560-756, Korea

ABSTRACT

Bacterial grain rot of rice caused by *Burkholderia glumae* was examined between weather condition and disease incidence. From 1998 to 2000, average disease incidence was 3.0 % without difference in survey regions. However, it was related closely to amount of rainfall that disease incidence higher in 1998 and 2000 to 3.0 % and 3.6 % respectively than 2.3 in 1999 relatively small volum of rainfall season.

Key words : *Burkholderia glumae*, bacterial grain rot, weather condition, disease incidence

INTRODUCTION

Bacterial grain rot of rice has been identified the occurrence in several Asian countries especially since first repoted in Japan (Goto and Ohtta, 1956; Zeigler and Alvarez, 1988). This disease was the one of the major pathogenic agents in rice in korea scince the first reported in 1987 (茂木 and 金). The infection and occurrence field area has been increase yearly, especially from 5,435 ha in 1998 to 16,609 ha in 2000, and damage in yield and rice quality by rice grain injury (농진청, 1998, 1999, 2000). Bacterial grain rot of rice caused by *Burkholderia glumae* related closely to weather conditions around heading stage, so this study was investigated the relation between disease incidence and climatic factors.

MATERIALS AND METHODS

Disease incidence and weather condition was investigated in several rice fields of Chonbuk province to confirm the relationship both. The examination was carried out for 3 years from 1998 to 2000 in several Chonbuk regions as Jeongup, Namwon, Kimje, Kunsan and Iksan known as important rice production area in Korea. Disease incidence was examined by natural occurrence of kernel symptoms around heading stage with 2,500 plants on 25 spots totally as by 5 spots each region.

Weather conditions around heading stage related disease occurrence was examined in 5 regions where same site of disease incidence investigation and the data of weather was examined to average temperature, days of rainfall, amount of rainfall and relative humidity and those weather information from National Honam

*Corresponding author : Hyung Moo Kim, E-mail : mc1258@chonbuk.ac.kr

Relation between Disease Incidence of Bacterial Grain Rot of Rice and Weather Conditions

Agricultural Experiment Station for Iksan and other 4 regions from monthly weather report of Korea Meteorological Administration.

RESULTS AND DISCUSSION

Disease occurrence rate of bacterial grain rot of rice

caused by *Burkholderia glumae* was examined 5 regions for 3 years from 1998 through 2000. In the results, the disease incidence rate was 3.6% in 2000 which was higher than other examinations as 2.3% and 3.0% in 1998 and 1999 respectively (Table 1). There was significant difference between investigated years but not regions by Duncan's multiple range test

Table 1. Occurrence of rice bacterial grain rot at paddy fields in Chonbuk province.

Year	Area surveyed					Mean
	Iksan	Kimje	Jeongup	Kunsan	Namwon	
1998	3.3 ^a	2.8	3.2	2.7	3.1	3.0a ^b
1999	2.5	2.3	2.5	2.1	2.2	2.3b
2000	3.2	5.3	2.3	3.5	3.6	3.6a
Mean	3.0a	3.46	2.66	2.76	2.96	2.96

^a Average % of infected panicles.

^b Means with the same letter are not significantly different according to Duncan's multiple range test (p=0.01%).



Fig. 1. *Burkholderia glumae* symptoms on bacterial grain rot.

Table 2. Temperature conditions during August in 1998, 1999 and 2000.

	Area	Year			Mean
		1998	1999	2000	
Mean temperature (°C)	Iksan	25.6	25.7	26.4	25.9
	Kimje	25.3	25.1	25.6	25.3
	Jeongup	25.6	25.0	25.8	25.47
	Kunsan	25.8	25.7	25.7	25.7
	Namwon	25.1	25.2	25.5	25.3
	Mean	25.5	25.3	25.8	25.5

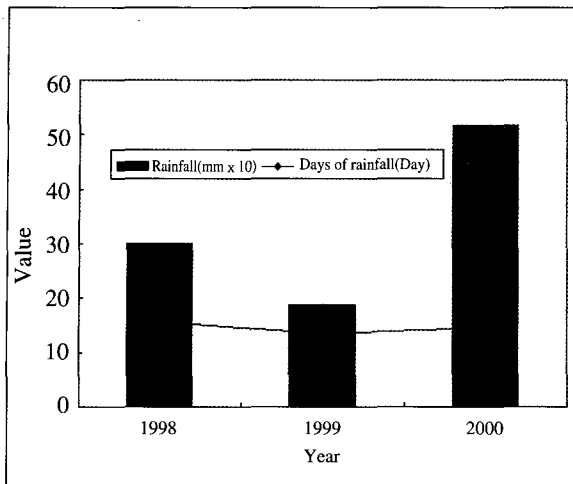


Fig. 2. Weather conditions during August in 1998, 1999 and 2000.

($p=0.01\%$). Among the examined regions, Kimje region recorded highest disease incidence as 3.5% in 3 years average rate in compare of other 4 regions. In the yearly examination result, the disease incidence was related to amount of rainfall as the rate was higher in case of more precipitation in 2000 than examined other seasons which suggest that the bacterial infection was established around heading date, and this could lead the different disease incidences(對馬 and 內藤, 1988; Tsushima et al, 1995).

Climatic factors in October including heading time have wide variation yearly (Table 2 and Fig. 2). In 1998 and 2000, showed higher disease incidence than 1999, the average temperature was higher 1.2°C and have more 199.5mm and 540.4mm of rainfall than those of 1998 season. Number of rainfall date of comparative 2 seasons was more 2.2 and 1.2 days than 1999. In these results, the higher temperature, amount of rainfall and number of precipitation date were closely related to disease occurrence, and which suggest that the climatic conditions with humid, higher temperature and long-term rainfall were major factors to disease occurrence and spread (차 등, 1994; 차, 1995).

REFERENCES

- Goto, K. and Ohatta, K. 1956. New bacterial disease of rice (brown stripe and grain rot). *Ann. Phytophthol. Soc. Jpn.* 21:46-47.
- Lee, J. C. and Yokoyama, T. 1988. Studies on control and environmental conditions of *Pseudomonas glumae* on rice bacterial grain rot. *Res. Rept. RDA(C. P) 30(2)* : 51-56.
- Tabei, H., Azegami, K., Fukuda, T. and Goto, T. 1989. Stomatal infection of rice grain with *Pseudomonas glumae*, the causal agent of the bacterial grain rot of rice. *Ann. Phytopathol. Soc. Jpn.* 55 : 224-228.
- Tsushima, S., Natio, H. and Koitashi, M. 1995. Change in panicle susceptibility associated with flowering rate of spikelets in bacterial grain rot of rice caused by *Pseudomonas glumae*. *Ann. Phytopathol. Soc. Jpn.* 61 : 109-113.
- Zeigler, R. S. and Alvarez, E. 1988. *Pseudomonas* spp. causing grain and sheath rot of rice in Latin America. *Proceedings of the 5th Int. Congress of Plant Pathology, Kyoto, Jpn., August 20-27, Poster section XII 1-16* : 411.
- 차광홍, 김영옥, 박인진. 1994. 세균성 벼알마름병의 발병환경과 방제연구. *식물보호연구* 8 : 23-31.
- 차광홍. 1995. 세균성 벼알마름병의 발병요인과 방제대책. *식물병과 농업* 1 : 14-18.
- 茂木靖夫, 金章圭. 1987. 韓國にあけるイネもみ枯細菌病の發生分布. *日植病報* 53 : 402.
- 對馬誠也, 內藤秀樹. 1988. イネもみ枯細菌に對する穂および群落單位での感染適期間の推定と本田での發病推移. *日植病報* 54 : 383.
- 농촌진흥청. 1992-2000. 농작물 병해충 예찰방제 보고서.

(Received Feb. 5, 2004)

(Accepted Mar. 15, 2004)