

Physiologic Races of *Puccinia graminis* f. *tritici* in Korea

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韓國에 分布한 麥類 줄기 녹병균(*Puccinia graminis* f. sp. *tritici*)의 生理的 品種

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摘 要

1. 맥류 줄기 녹병균에(*P. graminis* f. sp. *tritici*) 대한 저항성 품종 육종에 기초자료물인고자 1971~1972년 2개년 간에 한국에 분포한 생리적 품종을 조사하였다.
2. 2개년간 총 55개의 균주를 채집하여 Stakman씨 방법에 따라 집중한 결과 27개 균주가 동정 되었는데 그 성적은 다음과 같다. Race 11이 2균주, Race 17과 21은 각각 8균주 Race 34의 4균주 그리고 Race 37과 56이 각각 한 균주였다. 그나머지 3균주는 Stakman씨의 색인표와 부합치 않으므로 가칭 K₃K₄ 및 K₅라고 명명 하였다.
3. 그러므로 맥류줄기 녹병균에 대한 생리적 품종의 조사는 저항성 품종 육종과 병행하여 계속 실시 되어야 할것이다.

Abstract

1. In order to investigate physiologic races of *Puccinia graminis* f. sp. *tritici* as basic materials for the breeding of resistant varieties to stem rust of wheat, this experiment was carried out during 1971 and 1972.
2. Twenty seven isolates of the fungus were identified as follows: two isolates of race 11, eight isolates of race 17, and 21, four isolates of race 34, one each of race 37 and 56, respectively. The remaining three isolates identified were not identical with the key issued by Stakman, et al in 1962. Therefore, the three new races were tentatively numbered K₃, K₄ and K₅, in addition to K₁ and K₂ described in 1961.
3. Therefore, attempts to produce resistant varieties to stem rust of wheat should be accompanied by intensive investigation of physiologic races of *P. graminis* f. sp. *tritici* in the future.

Introduction

The wheat stem rust incited by *Puccinia graminis*

f. sp. *tritici* that occurs late in the growing season is known to be a limiting factor of wheat production in Korea, because of the serious losses in the yield and quality of the crops. From observations made thus

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far, there are no susceptible species of barberry of any importance in Korea (1).

Control by the eradication of the alternate host, therefore, is out of the question. Although dusting with sulfur and applications of systemic fungicides have been demonstrated experimentally to control stem rust in other countries, it is not feasible as a practical control measure in Korea. Apparently the only possible practical control measure will be growing resistant varieties. Consequently, investigations of the physiologic races of *Puccinia graminis* f. sp. *tritici* occurring in Korea is important as basic information for the stem rust breeding of resistant varieties to stem rust because more virulent races are continuously produced through various genetic mechanisms including heterocaryosis and parasexual cycle in nature.

Occurrence of physiologic races of the fungus have been reported from all over the world (3), however,

only one report was available from this country until the present time (2).

The purpose of the present study is to investigate the physiologic races of *Puccinia graminis* f. sp. *tritici* occurring in Korea to provide basic information for the development of stem rust resistant varieties.

The experiment was undertaken between May and September during the two years of 1971 and 1972. Fifty five collections of uredial samples were obtained from various localities in Southern Korea. The differential varieties used and infection types of uredial pustules classified were according to Stakman's methods (3). The results obtained are summarized in Table I & II. It will be noted from the data presented the stem rust fungus consisted of many physiologic races in Korea.

In 1971, of twenty two isolates of the fungus, twenty were classified into five races, namely, 11, 17,

Table I. Reaction of Differential Varieties of Wheat to Physiologic Races of *Puccinia graminis* f. sp. *tritici* Collected from Southern Korea in 1971.

Differentials	Race					Unidentified race	
	11	17	21	34	37	K ₃	K ₄
L.C.	4-	4	4	4	4	3+	4
Ma.	4=	4-	4	4	4	3	4-
Rel.	3+	0;	0	4-	0	X	2+ or X
Ko.	3+	3+	3+	4=	3+	3+	3+
Arn.	4+	4+	4-	4	4=	2+	2-
Mnd.	4	4=	4-	4=	4	3+	3+
Spm.	4	4=	4-	4	4	X	0
Kub.	3+	3+	4=	4+	X	3-	3
A.C.	3	3+	3+	3+	3+	3-	0
Enk.	3-	3	1=	1=	3	1+	3+
Ver.	1=	1	0;	0;	1=	2-	0;
Kpl.	1=	1	1=	1+	1	2-	0
Places of Collection	Haenam Anjung	Sungju Milyan Onyang Chunwon Suwon Pyungtak	Bosung Boeun Yongdong Chungju Chinchun Eichun Hwasong Goyang	Najoo Chinchun Ahsan	Wonsung	Kimje	Yongin
Percent Identified	9.0	27.2	36.3	13.6	4.5	4.5	4.5

Table II. Reaction of Differential Varieties of wheat to Physiologic Races of *Puccinia graminis* f. sp. *tritici* Collected from Southern Korea in 1972.

Differentials	Races			Unidentified
	17	34	56	K ₅
L.C.	4	4+	4	4
Ma.	4-	4-	3+	4
Rel.	0:	4-	3+	0
Ko.	3+	4=	3+	4
Arn.	4=	4	1=	4
Mnd.	4=	4=	1=	0
Spm.	4=	4	1=	4
Kub.	3+	4±	3+	4
Ac.	3+	3±	3+	4
Enk.	3	1=	1=	1+
Ver.	1=	0:	1=	1-
Kpl.	1=	1±	1-	1-

Places of Collection	Kwangjoo Ansung	WonSung	Yongdong	HwaSung

21, 34, and 37. The percentage of each race was 36.3% of race 21, 27.2% of race 17, 13.6% of race 34, 9% of race 11 and 4.5% of race 37. The remaining two isolates out of 22 isolates were not identical with the keys of Stakman et al (3). Therefore, these two isolates were tentatively named K₃ and K₄ in addition to the previously named isolates.

Although the Pyungtak isolate was identified as race 17, the isolate showed slightly weak reactions on Mindum and Einkorn in comparison with other isolates identified. Likewise Goyang isolate was also showed weak reactions on Acme and Khapli.

According to the 1972 survey result, of five isolates of the fungus, one was classified as race 56, one as race 34 and two as race 34 and two as race 17. The remaining one was not identical with the key of Stakman et al. Therefore, it was tentatively named new race K₅.

Distribution of 6 physiologic races and 3 new isolates of the fungus are presented in Fig. 1.

The two year survey indicated that major races of the fungus are 11, 17, 21, 34, 37, and 56. The three isolates were not described by Stakman, et al (3) and

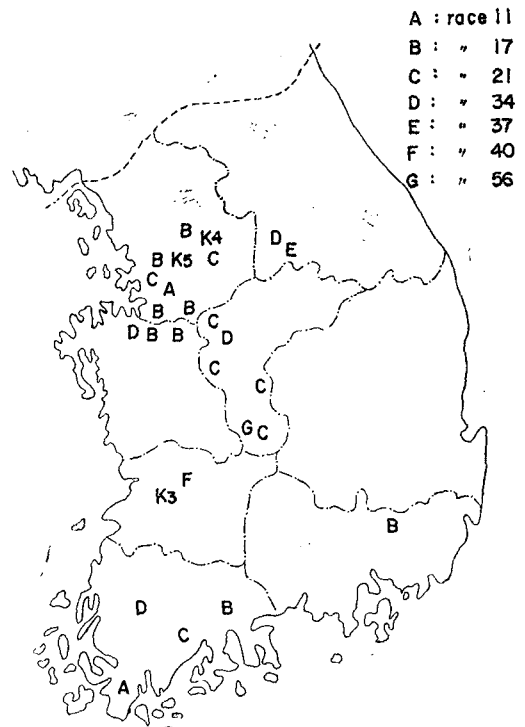


Fig. 1. Distribution of physiologic races of *P. graminis* f. sp. *tritici* obtained in Korea during the two years of 1971 and 1972

the remaining 3 isolates may be considered new races. Thus, when more virulent races or biotypes of *P. graminis* f. sp. *tritici* occur in nature, existing resistant varieties might become susceptible. Therefore, attempts to produce varieties resistant to the stem rust of wheat should be accompanied by data on the prevalence and distribution of physiologic races of *P. graminis* f. sp. *tritici* in Korea.

It was concluded that 6 physiologic races and 3 new races of *P. graminis* f. sp. *tritici* were detected in the present study. Further investigations should be continued in the future as a basis for the resistant varieties to stem rust of wheat in Korea.

Literature Cited

1. Chung, H.S. 1960 Epidemiology and control of cereal rusts. *New Agriculture* 371-374 (in Korean) Hyang Moon Sa Co. Seoul, Korea
2. Chung H.S. and B.K. Chung 1961 Physiologic races of *Puccinia graminis* f. sp. *tritici* in Southern Korea. *Plant Di Rptr*: 45(9):680
3. Stakman, E.C., D.M. Stewart and W.Q. Loegering 1962 Identification of Physiologic races of *Puccinia graminis* f. sp. *tritici* U.S.D.A. Bur. Ent. and Plant Quar. E617(revised 1962)