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A RECESSIVE RESISTANCE GENE FOR YELLOW RUST (*Puccinia striiformis* West.) IN BREAD WHEAT (*Triticum aestivum* L.)

R. W. STUBBS¹, M. SANDERS and A. C. ZEVEN²

¹ Research Institute for Plant Protection (IPO), Wageningen, the Netherlands

² Institute of Plant Breeding (IvP), Agricultural University, Wageningen, the Netherlands

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INDEX WORDS

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SUMMARY

Three lines derived from the old 'dirty' Dutch land variety Gelderse Ris were resistant against race 66(70)EO(16) of yellow rust. It was found that this resistance was conditioned by one recessive gene provisionally coded yrGR.

INTRODUCTION

The land wheat variety Gelderse Ris developed in the area near Geldern, West Germany near the Dutch border. From there it spread to the Netherlands where it was grown extensively in the 19th century. It is not described and no herbarium material has been preserved. However, it is very likely that due to its fast spread throughout the Netherlands it was contaminated with lines not belonging to the original Gelderse Ris. Hence, lines selected from the 'dirty' Gelderse Ris may or may not have belonged to it. Such lines have been maintained by the Department of Crop Husbandry and later by the Institute of Plant Breeding, both of the Agricultural University at Wageningen. Tests by Mr J. J. Rietema (unpublished) indicated that, when tested with race 66EO(16) of yellow rust, the lines Gelderse Ris (GR), Gelderse Uitzoeking 1 (GU1) and Gelderse Uitzoeking 48 (GU48) were resistant, while Gelderse Uitzoeking 42 (GU42) was susceptible. Research of F₁'s and F₂'s would elucidate the genetics of this resistance.

MATERIAL AND METHODS

Available for testing were the four parents, two F₁'s and three F₂'s (see Tables 1 and 2). As it was not known whether minor resistance genes, being temperature (SHARP & VOLIN, 1970) or environment dependent (LEWELLEN et al., 1967), were present the testing was carried out in a growth cabinet. This cabinet had a day temperature of 25° and a night temperature of 14°C (25/14). During the 'day' of 12 hours light intensity was gradually increased to 20,000 lux and afterwards decreased to 0 (darkness).

Seeds were sown and after 13 days the seedlings were infected with spores of race

66(70)EO(16) of yellow rust. After 17 days the plants were investigated and grouped into resistant (infection types 1, 2 and 3) and susceptible (infection types 4 till 9).

RESULTS AND DISCUSSION

The results are given in Tables 1 and 2. These tables show that the three parents were – as expected – resistant. One of the parents and the F_1 's are susceptible and this may point to recessiveness of the resistance.

The F_2 (GR/GU42) and F_2 (GU42/GU1) segregated into 1 (resistant): 3 (susceptible) (both $\chi^2(1:3)$ are significant at $P = 0.05$). The χ^2 was for F_2 (GU42/GU48) not significant at $P = 0.05$ ($\chi^2 = 3.95$). Adding all F_2 data together gives 98 resistant and 270 susceptible ($\chi^2(1:3) = 0.52$, significant at $P = 0.05$).

From these data it may be concluded that the resistance of the three Gelderse Ris lines is conditioned by one recessive gene acting at a high temperature. The locus of this gene is provisionally coded YrGR/yrGR. GR stands for Gelderse Ris.

Table 1. The expression of resistance or susceptibility to race 66(70)EO(16) of four parents and two F_1 's.

	Number of plants	Resistance (R)/ Susceptibility (S)
GR	10	R
GU1	14	R
GU42	16	S
GU48	15	R
F_1 (GU42/GU1)	7	S
F_1 (GU42/GU48)	2	S

Table 2. The number of F_2 plants resistant or susceptible to race 66(70)EO(16).

	R*	S	$\chi^2(1:3)$	P = 0.05**
F_2 (GR/GU42)	29	96	0.22	+
F_2 (GU42/GU1)	29	92	0.07	+
F_2 (GU42/GU48)	40	82	3.95	—
F_2 (all)	98	270	0.52	+

*R = Resistant; S = susceptible.

**—, + non-significant and significant at $P = 0.05$.

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