

GENETIC CONTROL OF LEAF RUST IN BARLEY

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By

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ABSTRACT

Chicaiza, Oswaldo, Ph.D., Department of Plant Sciences, College of Agriculture, North Dakota State University, July 1996. Genetic Control of Leaf Rust in Barley. Major Professor: Dr. Jerome D. Franckowiak.

Twelve genes (*Rph1* to *Rph12*) have been reported to control the resistance to *Puccinia hordei* Otth in barley (*Hordeum vulgare* L.). This study was conducted to (1) develop 'Bowman' backcross-derived lines differing in the *Rph* genes, (2) identify new *Rph* genes, and (3) map the new *Rph* genes in barley chromosomes using morphological markers. Twelve differential cultivars (possessing *Rph1* to *Rph12*), Tunisia 17 (Tu17), and seven *H. vulgare* subsp. *spontaneum* accessions (PI 354937, PI 355447, PI 391024, PI 391069, PI 391089, PI 466245, and PI 466324) were crossed and backcrossed to the susceptible cultivar Bowman. Isolates ND8702 and AUS220 of *P. hordei* were used to evaluate the parents, F₂, and F₃ progenies during the development of the derived lines. Isolate ND8702 is avirulent to all *Rph* genes except *Rph1*, *Rph4*, *Rph10*, and *Rph11* which were selected for using isolate AUS220. The infection phenotypes to 12 isolates of *P. hordei* were similar for the original source of the *Rph* genes and the backcross-derived lines.

Two genes were identified in lines from cross to Tu17 based on the reaction to isolates ND8702 and AUS220. The lines homozygous for different *Rph* genes were designated as Tu17a and Tu17b. Allelism tests indicated that one of the lines carries an *Rph* gene which is a new allele at the *Rph7*

locus. The *Rph* genes in Tu17a and in the derived line from PI 466324 are different from each other and from those isolated from the other six *H. vulgare* subsp. *spontaneum* accessions. The *Rph* gene from PI 355447 was different and not allelic to the 14 previously reported resistance genes. The symbol *Rph15* is suggested for the resistance gene from PI 355447. The *Rph* genes from PI 354937, PI 391024, PI 391069, PI 391089, and PI 466245 are alleles at the *Rph15* locus. The *Rph15* gene is linked to the *v1* ($p=32.3\pm 2.7\%$) and *rb* ($p=38.8\pm 2.9\%$) genes in the long arm of chromosome 2. The gene from PI 466324 was shown to be a new allele at the *Rph3* locus.