STEM RUST OF OATS IN CANADA IN 1973[1]

J.W. Martens

Prevalence and crop losses in Western Canada

Stem rust of oats caused by *Puccinia graminis* Pers. f. sp. *avenae* Eriks. and E. Henn. was first found in southern Manitoba on August 7. Light infections developed throughout most of Manitoba and eastern Saskatchewan as far west as Regina, but the disease caused almost no crop losses.

Uniform rust nurseries

Rust nurseries comprising the cultivars Harmon, Hudson, and Rodney, and the lines CI 3034, CI 4023, CI 9139, RL 2924, RL 2925, RL 2926, and RL 2970 were grown at 28 locations across Canada. Rust was observed in trace amounts at only six locations, Charlottetown, P.E.I., Kentville, N.S., and Brandon, Durban, Glenlea, and Morden, Man. No rust was observed in nurseries grown at St. John's West, Nfld.: Fredericton, N.B.: Truro, N.S.; Normandin, Quebec, and La Pocatière, Qué.; Appleton, Guelph, Kemptville, New Liskeard, Ottawa, Sudbury, Thunder Bay, and Vineland, Ont.; Indian Head, Melfort, and Scott, sask.: Beaverlodge, Edmonton, Lacombe, and Lethbridge, Alta.: and Agassiz and Creston, B.C.

Identification and distribution of physiologic races

Physiologic races were identified by the infection types produced on seedlings of the cultivars Richland (rust resistance gene Pg 2), Rodney (Pg 4), Minrus (Pg 1), Jostrain (Pg 3). Eagle² x C.I. 4023 (pg 8), and C.I. 5844-1 (pg 9). Adequate stocks of single gene lines in the 'Rodney 0' background have now been produced and it is anticipated that these will be used for race identification in the future. A supplementary set comprising the cultivars C.I. 9139 (unknown genotype) and R.L. 2926 (pg 13), (2) was used. All 153 cultures were avirulent on the supplementary set. The race distribution in Western Canada (Table 1) has remained almost unchanged from 1972 with two races, C10 and C23, comprising over. 98% of the population; however the

Table 1. Distribution of physiologic races of oat stem rust in Canada in 1973

Race no.	Virulence formula (effective/ineffective Pg host genes)	No. of isolates from: N.S. & Qué.	Ont.	Man.	Sask.	Total isolates	Percentage of total isolates
	A. Combined isolates from all hosts						
C 5	4,9/1,2,3,8			2		2	1.3
C 9	8/1,2,3,4,9	2	3			5	3.3
C 10	9/1,2,3,4,8		2	58	37	97	63.4
C 23	2,4,9/1,3,8			20	29	49	32.0
Total						153	
	B. Isolates from cultivars with some stem rust resistance						
C 5				2		2	3.2
C 9			3			3	4.8
C 10			2	38	14	54	85.7
C 23				4		4	6.3
Total						63	
	C. Isolates from wild oats and cultivars with no stem rust resistance						
C 9		2				2	2.2
C 10				20	23	43	47.8
C 23				16	29	45	50.0
Total						90	

[1] Contribution No. 598, Research Station, Agriculture Canada, Winnipeg, Manitoba, R3T 2M9.

Table 2. Frequency of virulence in the oat stem rust population on various types of resistance in western Canada in 1973

Percentage of isolates virulent on cultivars with the following genes for resistance							Total no. isolates	Mean virulence capability*
Pg 1	*Pg 2*	*Pg 3*	*Pg 4*	*pg 8*	*pg 9*	*pg 13*		
100.0	66.4	100.0	65.1	100.0	1.4	0.0	146	4.32

* Mean virulence capability = no. of isolates virulent on *Pg 1* + ... *pg 13*/ total no. of isolates.

prevalence of C23 decreased slightly in 1973, the first such decrease since 1969 (1). Since race C23 is avirulent on most commercial cultivars (most have Pg 2 and Pg 4) the collections from host plants with no known resistance (Table 1, C) most accurately reflect field populations, If the present race distribution is maintained, the newly licensed cultivar Hudson, which combines resistance genes Pg 2, Pg 4 and pg 9, should provide adequate protection. The distribution of virulence on the lines carrying single resistance genes (Table 2) has not changed significantly from that of 1972. Very high levels of virulence on lines with Pg 1, Pg 3, and pg 8 resistance are being maintained even though these genes do not occur in the host population of Western Canada.

In an effort to detect new virulence combinations on breeding material a large number of small pustules were isolated from resistant lines in the breeding nursery near Winnipeg. Races C1 (1,2,3,4,8/9), C2 (1,2,4,8/3,9), and C24 (1,2,8/3,4,9), all with virulence on pg 13, were isolated. A new avirulent race (1,2,3,4,8,9,13/) was also found.

Another new virulence combination (1,8,9,13/2,3,4) was isolated by Dr. G. J. Green from barberry (Berberis vulgaris L.) infected by means of teliospores from Hordeum jubatum L. collected near Altamont, Manitoba. We do not know of any previous record of P. graminis avenae being isolated from H. jubatum. Greenhouse contamination seems unlikely because it is a new virulence combination. However, the urediospores of this culture did not reinfect H. jubatum in two attempts in the greenhouse.

Acknowledgments

The assistance of cooperators who cared for rust nurseries and submitted rust samples from various parts of Canada is gratefully acknowledged. Peter K. Anema performed the technical operations necessary for the identification of physiologic races.

Literature cited

1. Martens, J. W. 1972. Stem rust of Oats in Canada in 1972. Can. Plant Dis. Surv. 52: 171-172.

2. McKenzie, R. I. H., J. W. Martens, and T. Rajhathy. 1970. Inheritance of oat stem rust resistance in a Tunesian strain of Avena sterilis. Can. J. Genet. Cytol. 12: 501-505.