STEM RUST OF OATS IN CANADA IN 1972[1]

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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 at St-Joseph, Emerson and Horndean in southern Manitoba on July 31. Light infections occurred throughout most of Manitoba and eastern Saskatchewan, but the disease developed too late in the season to cause crop losses, except in the case of a few late fields in western Manitoba and northeastern Saskatchewan, where infections of up to 30% were observed.

Uniform rust nurseries

Oat stem rust infections were light or absent in rust nurseries grown at 27 locations across Canada (Table 1). Rust was observed in only five nurseries and more than trace infections occurred only at Morden, Manitoba. These readings are indicative of the very low levels of rust incidence throughout most of the country.

Identification and distribution of physiologic races

Physiologic races were identified by the methods used in previous years (1). In addition to the oat (Avena sativa L.) varieties with the genes listed in Table 2, a supplementary set consisting of 'Kyto' (pg 12). 'Saia' and R.L. 2926 (pg 13) was used. All 150 cultures identified were avirulent on the supplemental set. The race distribution in Western Canada (Table 2) has developed into the simplest since 1942, when two races comprised 97% of the population. In 1972, two races, C10 and C23, comprised 99% of all isolates from this area. The rapid increase of race C23 since it first appeared in 1969 to 10%, 22%, and 46% of all isolates in Canada in 1970 (2), 1971 (3) and 1972, respectively, is surprising. This race is avirulent on both Pg 2 and Pg 4 resistance which are present, singly or in combination, in most of the oat cultivars grown in Canada. If only collections from hosts with no resistance are considered, it comprised 68% of the population in 1972; this race is obviously highly successful in competition with race C10. The once dominant races C3 and C5 have disappeared, apparently not because of resistance in the host population, but for other reasons.

The frequency of virulence in the oat stem rust population on resistance conferred by genes Pg 2, pg 9 and pg 13 has declined significantly (Table 3) for the first time in 4 years. The almost complete absence of virulence on genes pg 9 and pg 13 is encouraging since these gepes are the main components of the current multi-gene-resistance cultivar breeding program.

Table 1. Percentage infection of oat stem rust on 12 cultivars in the uniform rust nurseries* at 5 locations in Canada in 1972

Location	Bond	Trispernia	C.I. 4023	Saia	Rodney ABDH	C.I. 3034	Rodney	Harmon	R.L. 2924	R.L. 2925	R.L. 2926	R.L. 2970
New Liskeard, Ont.	0	tr**	0	0	tr	0	tr	0	0	0	tr	tr
Ottawa, Ont.	0	0	0	0	0	0	tr	0	tr	0	0	0
Durban, Man.	0	0	0	0	tr	0	0	0	0	0	0	0
Morden, Man.	10	tr	15	0	tr	0	40	15	20	10	0	30
Lacombe, Alta.	0	0	0	0	0	0	0	tr	0	0	0	0

* No rust was observed in 22 other nurseries grown at St. John's West, Nfld.; Charlottetown, P.E.I.; Fredericton, N.B.; Kentville and Truro, N.S.; Macdonald College, Normandin, Quebec, and Ste-Anne de la Pocatière, Qué.; Appleton, Guelph, Kemptville, and Thunder Bay, Ont.; Brandon, Man.; Indian Head, Melfort and Scott, Sask.; Beaverlodge, Edmonton, and Lethbridge, Alta.; and Agassiz and Creston, B.C.

** tr = trace infection.

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Table 2. Distribution of physiologic races of oat stem rust in Canada in 1972

Race no.	Virulence formula (effective/ineffective Pg host genes)	No. of isolates from: Ont.	Man.	Sask.	Total isolates	Percentage of total isolates
	A. Combined isolates *from* all hosts					
C 9	8/1,2,3,4,9	1			1	0.7
C 10	9/1,2,3,4,8		54	25	79	52.7
C 20	/1,2,3,4,8,9		1		1	0.7
C 23	2,4,9/1,3,8	1	20	48	69	46.0
Total		2	75	73	150	
	B. Isolates *from* cultivated oats with stem rust resistance					
C 9		1			1	2.0
C 10			35	12	47	96.0
C 20			1		1	2.0
C 23						
Total		1	36	12	49	
	C. Isolates *from* wild oats and cultivars with no stem rust resistance					
C 9						
C 10			19	13	32	31.7
C 20						
C 23		1	20	48	69	68.3
Total		1	39	61	101	

Table 3. Frequency of virulence in the oat stem rust population on various types of resistance in western Canada in 1972

Percentage of isolates virulent on cultivars with with 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	54.0	100.0	54.0	100.0	0.7	0.0	143	4.09

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

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Literature cited

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