STEM RUST OF OATS IN CANADA IN 1971[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. & E. Henn. was first found in southern Manitoba in late July. The disease developed slowly and caused little or no crop loss except in a few late fields. Although light infections of stem rust were found throughout Manitoba and in eastern Saskatchewan, weather conditions permitting early planting in the Red River Valley, and adverse epidemiological conditions during the growing season combined to prevent the serious losses sustained in 1970 (2).

Uniform rust nurseries

Oat stem rust infections were light in rust nurseries grown at 32 locations across Canada (Table 1). Rust was observed in only 6 of the nurseries, and infections of more than 5% occurred only at Lennoxville, Quebec, and Glenlea, Manitoba. Virulence on the recently discovered stem rust resistance gene, pg 13, was not found in any of the nurseries.

Identification and distribution of physiologic races

Physiologic races were identified by the methods used in previous years (1). In addition to the 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 224 isolates were avirulent on Kyto and Saia; only one culture from Manitoba, an apparently new race, C24, combining virulence on Pg 3, 4, 9, and 13 attacked 'R.L. 2926'. Physiologic race C10 continued to predominate (74% of all isolates) in Western Canada (Table 2). Race C23, a race avirulent on all commercial varieties, increased from 11% in 1970 to 25% in 1971, while race C20, avirulent only on pg 13, decreased from 17% in 1970 to 2% in 1971. Races C3 and C5, once dominant, have almost disappeared. In Eastern Canada, race C9 continued to predominate but races C8 and C10 were also common. Segregating the rust isolates by origin (from hosts with stem rust resistance vs. those without) had no effect on race distribution, except with C23 which was isolated only from wild oats. The evolution of race C24 presents no immediate problems to the development of resistant varieties since sources of resistance effective against it have been used in conjunction with genes Pg 9 and 13, conferring resistance to races C10 and C20.

The virulence range of the rust population has been maintained at a very high level (Table 3). Only genes pg 8 and 13 in Eastern Canada and pg 9 and 13 in Western Canada confer effective resistance to the predominant races in the respective areas. Since Pg 2 and Pg 4 are the only types of resistance present in Commercial oat varieties, the crop remains vulnerable to serious losses in 1972.

Table 1. Percentage infection by Puccinia *graminis* f. sp. avenae on 12 oat cultivars in uniform rust nurseries* at 6 locations in Canada in 1971

Location	Bond	Trispernia	Landhafer	C.I. 4023	Saia	Rodney ABDH	C.I. 3034	Rodney	Harmon	R.L. 2924	R.L. 2925	R.L. 2926
Lennoxville, Qué.	5	tr**	tr	0	0	25	0	tr	0	25	tr	0
New Liskeard, Ont.	5	0	0	tr	0	0	0	tr	tr	0	5	0
Thunder Bay, Ont.	tr	0	0	0	0	0	0	tr	0	0	0	0
Apple Hill, Ont.	tr	0	0	0	0	0	0	tr	0	0	0	0
Guelph, Ont.	3	tr	0	0	0	3	0	1	tr	0	0	0
Glenlea, Man.	25	0	0	0	0	tr	0	5	tr	0	tr	0

* No rust was observed in 26 other nurseries located at St. John's West, Nfld.; Charlottetown, P.E.I.; Fredericton, N.B.; Kentville and Truro, N.S.; Macdonald College, Normandin, Québec, and La Pocatière, Qué.; Appleton, Kapuskasing, Kemptville, Ottawa, Vineland, and Williamstown, Ont.; Brandon, Durban, and Morden, 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 1971

Race formula no.	Virulence formula (effective/ineffective *Pq* host genes)	No. of isolates from				Total isolates	Percentage of total isolates
		Qué.	Ont.	Man.	Sask.		
c3	2, 8/1, 3, 4, 9		1			1	0.4
c5	4, 9/1, 2, 3, 8			1		1	0.4
C6	1, 8/2, 3, 4, 9		1			1	0.4
C8	3, 8/1, 2, 4, 9	2	3			5	2.2
C9	8/1, 2, 3, 4, 9	4	8			12	5.3
C10	9/1, 2, 3, 4, 8	1	3	120	23	147	65.6
C14	8, 9/1, 2, 3, 4	1	1			2	0.9
c20	/1, 2, 3, 4, 8, 9			4		4	1.8
C23	2, 4, 9/1, 3, 8		1	33	16	50	22.3
C24	1, 2, 8/3, 4, 9			1		1	0.4
Total		8	18	159	39	224	

Table 3. Frequency of virulence in the oat stem rust population on various types of resistance in Canada in 1971

Geographic area	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*	*pq-8*	pq-9	*pq-13*		
Eastern Canada	96.1	92.3	80.7	96.1	19.2	73.0	0.0	26	4.57
Western Canada	99.5	74.8	100.0	74.8	99.5	2.5	0.5	198	4.51

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

Acknowledgments

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Literature cited

1. **Martens, J. W. 1968. Stem rust of oats in Canada in 1967. Can. Plant Dis. Surv. 48:17-19.**

2. **Martens, J. W. 1971. Stem rust of oats in Canada in 1970. Can. Plant Dis. Surv. 51:11-13.**