Stem rust of oats in Canada in 1974[1]

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Stem rust *(fucciniagraminis* f. sp. *avenae)* was first found on oats *(Avena sativa)* in Manitoba in late July. Light infections developed throughout most of Manitoba and eastern Saskatchewan causing little crop damage except in southeastern and southcentral Manitoba where infections of up to 60% caused moderate crop losses. Only two rust races, C10 and C23 were isolated from field collections in western Canada. Race C9 continued to predominate in eastern Canada. The most significant physiologic race change in 1974 was the appearance of virulence on resistance genepg *13* in field culturesof race C9 from Ontario.

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Au Manitoba on a releve la presence de la rouille de la tige *Puccinia graminis* f. sp. *avenae* sur l'avoine *Avena sativa* pour la premiere fois en fin de juillet. De legeres infestations se sont etendues a l'ensemble du Manitoba eta l'est de la Saskatchewan causant peu de dégâts aux cultures, sauf dans le sud-est et dans le centre-sud du Manitoba ou jusqu'à 60% des cultures ont ete atteintes entrainant des pertes moyennes. Deux races seulement, C10 et C23, ont pu être isolées des echantillons preleves dans les champs de l'ouest du Canada. La souche C9 reste la race dominante dans l'est du Canada. La mutation physiologique la plus importante en 1974 a ete l'apparition de virulence envers le gene de resistance *pg 13* chez des isolats de race C9 preleves au champ en Ontario.

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 in late July. Light infections developed throughout most of Manitoba and eastern Saskatchewan causing little or no crop damage except in southeastern and southcentral Manitoba where rust infections covering up to 60% of the stem area of the plants caused moderate crop losses in late fields which were numerous because of a late, wet spring.

Uniform rust nurseries

Rust nurseries comprising the oat *(Avena sativa* L.) cultivars Fraser, Hudson, Rodney, C.I. 4023, C.I. 9139, R.L. 2924, R.L. 2925, R.L. 2926, and R.L. 2970 were grown at 28 locations across Canada. Rust was observed in light to moderate amounts at Ottawa, Sunbury, and Thunder Bay, Ontario, and at Brandon, Durban, and Morden, Manitoba. No rust was observed in nurseries grown at St. John's West, Nfld.; Charlottetown, P.E.I.; Fredericton, N.B.; Kentville and Truro, N.S.; MacDonald College, Normandin, and La Pocatiere, Que.; Appleton, Guelph, Kemptville, New Liskeard, 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 'Rodney O' single-gene lines as indicated in Table 1. A suppiementary set comprising the cultivars C.I. 9139 (unknown genotype) and R.L. 2926 (*pg 13)* was used. All 204 field cultures were avirulent on C.I. 9139 resistance but *6* of 35 cultures of race C9 from Ontario were virulent on *pg 13* resistance. While all field cultures from western Canada were avirulent on *pg 13,* a number of isolates of C1 *(Pg* 1,2,3,4,8/9) and C24 *(Pg* 1,2,8/3,4,9,13), both virulent on *pg 13* were obtained from *pg 13* single gene line increase plots at Glenlea, Manitoba. The race distribution in western Canada (Table 1) remained relatively unchanged from 1973, with only two races, C10 and C23, being isolated from the field population; however, race C23 decreased sharply from 33% in 1973 to 7% in 1974, the second consecutive decline (1). If the present race distribution is maintained the cultivar Hudson, which combines resistance genes *Pg* 2, *Pg 4* and *Pg 9,* should provide adequate protection. This cultivar performed well under heavy field epidemic conditions in 1974.

Changes in the distribution of virulence on the lines carrying single resistance genes (Table 2) reflect the shift from race C23 to race C10 in western Canada. The most significant change is the appearance of field virulence on *pg 13* in eastern Canada. Very high levels of virulence on lines with *Pg 1, Pg 3,* and *pg* 8, and in eastern Canada *pg 9,* continue to persist even though these genes do not occur in the host population.

In an effort to detect the evolution of any new virulence combinations a large number of isolates, mostly small, "resistant' type pustules, were taken from breeding material in a naturally rust infected breeding nursery at Glenlea, Manitoba. Of the 150 isolates successfully cultured, 35 were identified as race C1, 90 as C10, 18 as C23, and 7 as C24.

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Table 1. Distribution of physiologic races of oat stem rust in Canada in 1974

Race no.	Virulence formula (effective/ineffective *Pg* host genes)	No. of isolates from: Ont.	Man.	Sask.	Total isolates	Percentage of total isolates
C 6	1,8/2,3,4,9	1			1	0.5
C 8	3,8/1,2,4,9	2			2	1.0
C 9	8/1,2,3,4,9	35			35	17.2
C10	9/1,2,3,4,8	7	115	33	155	76.0
C23	2,4,9,13/1,3,8		10	1	11	5.4
Total		45	125	34	204	

Table 2. Frequency of virulence in the oat stem rust population on various types of resistance in eastern and western Canada in 1974

Source of isolates	Percentage of isolates virulent on cultivars with the following genes for resistance: *Pg 1*	*Pg 2*	*Pg 3*	*Pg 4*	*Pg 8*	*Pg 9*	*Pg 13*	Total no. isolates	Mean virulence capability*
East	97.8	100.0	95.6	100.0	15.5	84.5	13.3	45	5.93
West	100.0	92.1	100.0	92.1	100.0	0.0	0.0		4.82

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

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Literature cited

1. Martens. J. W. 1974. Stem rust of oats in Canada in 1973. Can Plant Dis. Surv. 54:19-20.