STEM RUST OF OATS IN CANADA IN 1966[1]

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Disease development and crop losses in Western Canada

Stem rust of oats (Puccinia graminis Pers. f. sp. avenae Eriksss. & Henn.) caused little or no yield reduction in Western Canada in 1966. Stem rust was first found in Manitoba on July 28 and its subsequent development was relatively slow. However, some losses occurred in a few late fields that had moderately severe infections by the end of August.

Uniform rust nurseries

Rust nurseries consisting of ten oat varieties (Table 2) were grown at 36 locations across Canada. The nurseries were planted, cared for and harvested by cooperating University and Canada Department of Agriculture personnel and then sent to Winnipeg for disease rating. No rust was found in nurseries in Alberta and only trace to slight infections were observed in single nurseries in British Columbia and Saskatchewan. Rust infections in Manitoba nurseries were also light, excepting those at Winnipeg and Glenlea which had moderate infections, mainly because they were late. In Eastern Canada only the nurseries at Appleton and Ottawa, Ontario, and La Pocatikre, Quebec, carried moderate to heavy infections.

Physiologic race identification and distribution

Physiologic races were identified by inoculating seedlings of the varieties 'Richland' (gene A), 'Rodney' (gene B), 'Minrus' (gene D), 'Jostrain' (gene E), 'Eagle[2] x C. I. 4023' (gene F), and 'C. I. 5844-1' (gene H). The race designations given (Table 1) follow the system of nomenclature now in use in Canada (1, 2).

A supplementary set of differential hosts composed of the varieties 'Rosen's Mutant', 'Saia' and 'C.I. 3034' was also used. In addition, headed plants of all the above varieties, with the exception of 'Saia', were inoculated with representative races from the survey. The seedling rust reactions of 'Rosen's Mutant' were usually similar to those of 'C. I. 5844-1' but slightly more resistant. 'Saia' was resistant to all field isolates excepting a culture of race C6 from Plaissance, Quebec. 'C. I. 3034' seedling reactions were similar to those of 'Minrus'. The adult plant reactions were similar to seedling reactions with the exception of 'C. I. 3034'. This variety was moderately resistant to all races tested, including races C3, C5, C9, C10, and c20.

Table 1. Virulence formulas and numbers for races of oat stem rust identified in Canada from 1963-1966.

Formula No.	Formula (Effective/Ineffective Host Genes)	Race
C1	ABDEF/H	1
c2	ABDF/EH	2
c3	AF/BDEH	7A-12A
c4	BDFH/AE	8
c5	BH/ADEF	6F
C6	DF/ABEH	8A-10A
c7	D/ABEFH	8AF
C8	EF/ABDH	4A
c9	F/ABDEH	6A-13A
C10	H/ABDEF	6AF
C11	DF/ABE	8A
c12	DH/ABEF	8AF
C13	BF/ADEH	6
C14	FH/ABDE	6A
C15	ABF/DEH	8
C16	BDF/AEH	7
C17	DEF/ABH	11A
C18	ABFH/DE	7
C19	ABDFH/E	2
C20	/ABDEFH	6AFH
c21	DFH/ABE	8A
c22	DEFH/AB	11A

Race C10 has become the predominant race of oat stem rust in Western Canada (Table 3). Since its first appearance in 1963 it has increased to 80% of all isolates collected from Manitoba and Saskatchewan in 1966. Race C20, a polyvirulent race that can attack varieties carrying all of the six identified resistance genes, was found for the first time in Canada. Two isolates of this race were obtained from field collections made in Manitoba and Saskatchewan. A third isolate was obtained from experimental material collected at Ottawa, Ontario. In Ontario and Quebec, 66% of the isolates were race C9 with races C8 and C6 accounting for most of the balance. The race distribution in Eastern Canada has changed relatively little since 1958 when race C9 and closely related races first became predominant.

The separation of isolates according to the susceptibility or resistance of the host from which they were collected does not greatly affect the race distribution pattern for 1966.

The predominant races, C9 and C10, for Eastern and Western Canada, respectively, are capable of attacking all commercial oat varieties, Since there is little or no effective resistance in the Canadian oat population, and since no resistant varieties are immediately available, serious economic

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Table 2. Percent infections of stem rust of oats (Puccinia graminis f. sp. avenae) on 10 varieties of oats in 16[a] uniform rust nurseries in Canada in 1966.

Locality	Bond	Tri-spernia	Land-hafer	Ceirch du Bach	Saia	Exeter	Clinton	Rodney	Garry	C. I. 4023
Saanichton, B. C.	1	tr[b]	1	2	tr	0	0	0	0	0
Melfort, Sask.	tr	0	0	0	0	0	0	0	0	0
Brandon, Man.	tr	0	tr	0	0	0	tr	tr	0	0
Glenlea, Man.	20	1	1	5	0	5	10	3	1	1
Morden, Man.	1	tr	tr	tr	0	tr	tr	tr	tr	tr
Winnipeg, Man.	40	10	10	5	tr	40	30	20	10	10
Appleton, Ont.	70	80	60	60	5	60	70	70	50	10
Ft. William, Ont.	tr	0	0	tr	0	0	0	0	0	0
Guelph, Ont.	20	3	1	1	0	3	3	1	tr	tr
Kemptville, Ont.	5	tr	tr	0	0	3	5	10	5	10
Merrickville, Ont.	1	0	tr	0	0	1	5	1	tr	tr
Ottawa, Ont.	30	tr	5	0	0	20	30	20	10	0
L'Assomption, P. Q.	tr	0	0	0	0	tr	tr	1	3	0
Lennoxville, P. Q.	1	1	tr		0	1	2	tr	tr	0
Normandin, P. Q.	0	0	0	1	0	0	0	0	0	0
La Pocatière, P. Q.	50	-	-	-	tr	40	50	40	30	5

[a] No rust was observed in 20 other nurseries located at Agassiz and Creston, B. C., Edmonton, Beaverlodge, Lacombe, and Lethbridge, Alta., Indian Head and Scott, Sask., The Pas, Man., Alfred, Douglas, Kapuskasing, St. Catherines, Verner, and Williamstown, Ont., Kentville, N. S., Fredericton, N. B., Charlottetown, P. E. I., Doyles and St. John's, Nfld.

[b] tr = trace

Table 3. Distribution by provinces of physiologic races of Puccinia graminis f. sp. avenae 1963-1966.

Fc Nc	Sa				N. B	N. S		% is
c2	1	0	0	0	0	0	1	0.7
c3	4	6	0	0	0	0	1 0	7.0
c5	2	7	0	0	0	0	9	6.4
C6	0	0	0	4	0	0	4	2.8
C8	0	0	2	1	0	1	4	2.8
c9	0	0	10	6	2	0	18	12.8
C10	32	59	0	0	0	0	91	64.6
C14	0	0	0	1	0	0	1	.7
C19	1	0	0	0	0	0	1	.7
C20	1	1	0	0	0	0	2	1.4
Total	41	73	12	12	2	1	141	99.9

losses are possible in the immediate future. However, in Western Canada, epidemics of oat stem rust are not expected to occur as frequently as those of wheat stem rust, partly because the relatively small oat acreage in the central great plains of the United States restricts the production of inoculum. Western Canadian oat growers can keep losses at a minimum by planting early to escape the rust. The continued eradication of barberry in Eastern Canada will reduce the amount of primary inoculum in that region.

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Literature cited

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