CROWN RUST OF OATS IN CANADA IN 1972[1]

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Disease development and crop losses in Western Canada

Oat crown rust caused by Puccinia coronata Cda. f. sp. avenae Eriks. was first found in Manitoba on July 6. By the end of August, a light infection of crown rust was present throughout Manitoba and southeastern Saskatchewan, but damage to the crop was negligible.

Uniform rust nurseries

Ratings of crown rust intensity on 12 oat (Avena sativa L.) varieties grown in nurseries across Canada are presented in Table 1. Crown rust was noted, or could be estimated, in only 8 of the nurseries and infections were generally light. The lines containing crown rust resistance genes Pc 38 (R.L. 2924) and Pc 39 (R.L. 2925) were not attacked by crown rust at any of the locations. However, other larger plots of these two lines showed trace infections at Glenlea, Manitoba, on R.L. 2924 but not on R.L. 2925.

Physiologic specialization

The frequency of occurrence and distribution of 24 physiologic races of crown rust identified from 133 Canadian isolates is presented in Table 2. In 1972, as in 1971, race 295 was predominant in Western Canada (1). Only 12 isolates were established from collections in Eastern Canada but these isolates comprised 9 physiologic races.

Table 2. Distribution of physiologic races of crown rust in Canada in 1972

Physiologic race	West		East	
	No. of isolates	% of all isolates	No. of isolates	% of all isolates
203	16	13.2	0	0.0
209	0	0.0	1	8.3
210	2	1.6	3	25.0
216	11	9.0	0	0.0
226	1	0.8	0	0.0
241	2	1.6	0	0.0
259	1	0.8	0	0.0
276	1	0.8	2	16.7
295	56	46.2	1	8.3
320	1	0.8	0	0.0
326	13	10.7	0	0.0
327	1	0.8	0	0.0
333	2	1.6	0	0.0
335	2	1.6	0	0.0
341	0	0.0	1	8.3
345	2	1.6	0	0.0
360	2	1.6	0	0.0
367	1	0.8	0	0.0
409	0	0.0	1	8.3
415	4	3.3	1	8.3
427	1	0.8	0	0.0
446	1	0.8	0	0.0
1,2,3,10	1	0.8	1	8.3
1,2,3,6,8,9,10	0	0.0	1	8.3

Table 1. Percentage infection of crown rust on 12 oat varieties at 8 localties in 1972

Location	OT 187	Trispernia	C.I. 4023	Saia	Rodney ABDH	C.I. 3034	Rodney	Harmon	R.L. 2924	R.L. 2925	R.L. 2926	R.L. 2970
Glenlea, Man.	0	0	0	0	0	tr	tr	0	0	0	0	0
Morden, Man.	5	0	20	0	20	5	10	20	0	0	10	10
Brandon, Man.	20	0	55	0	70	5	80	65	0	0	20	25
Kemptville, Ont.	25	20	30	0	30	25	70	30	0	0	0	30
Guelph, Ont.	0	0	0	0	5	0	5	5	0	0	0	0
Ottawa, Ont.	25	5	40	0	20	25	50	20	0	0	0	0
La Pocatière, Que.	tr*	0	5	0	0	0	10	5	0	0	tr	tr
Kentville, N.S.	10	tr	15	0	0	tr	30	25	0	0	0	20

* tr = trace.

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Table 3. Virulence of isolates of Puccinia coronata on backcross lines containing single genes for resistance to crown rust in Canada in 1972

Resistance genes	Total no. of virulent isolates	% total isolates
Pc 35	32	24.0
Pc 38	1	0.8
Pc 39	0	0.0
Pc 40	13	9.9
Pc 45	5	3.8
Pc 46	2	1.5
Pc 47	5	3.8
Pc 48	0	0.0
Pc 49	22	16.6
Pc 50	28	21.1

In 1972, all isolates of crown rust were tested on a new set of crown rust differentials based on single resistance genes from Avena sterilis L. backcrossed into 'Pendek' (2). The distribution of virulence on the individual single-gene lines is shown in Table 3. Crown rust in 1972 had a low frequency of virulence on the majority of the new resistance genes.

The single-gene lines were used to classify cultures into virulence formulas. Twenty-one virulence combinations were obtained in 1972 (Table 4). Seventy-seven percent of the isolates were either avirulent on all 10 differentials or virulent on only one, and only 8.0% of the isolates were virulent on more than two of the new differentials.

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Table 4. Virulence combinations of Puccinia coronata isolates on backcross lines containing single genes for resistance to crown rust in Canada in 1972

Virulence formula (effective/ineffective host genes)	No. of isolates	% total isolates
35,38,39,40,45,46,47,48,49,50/	62	46.6
38,39,40,45,46,47,48,49,50/35	14	10.5
35,39,40,45,46,47,48,49,50/38	1	0.8
35,38,39,40,46,47,48,49,50/45	1	0.8
35,38,39,40,45,47,48,49,50/46	2	1.5
35,38,39,40,45,46,48,49,50/47	5	3.8
35,38,39,40,45,46,47,48,50/49	2	1.5
35,38,39,40,45,46,47,48,49/50	16	12.0
38,39,40,46,47,48,49,50/35,45	1	0.8
38,39,40,45,46,48,49,50/35,47	1	0.8
38,39,40,45,46,47,48,50/35,49	3	2.3
38,39,40,45,46,47,48,49/35,50	6	4.5
35,38,39,45,46,47,48,50/40,49	6	4.5
35,38,39,40,45,46,47,48/49,50	1	0.8
38,39,40,46,47,48,49/35,45,50	1	0.8
38,39,40,45,46,47,48/35,49,50	4	3.0
35,38,39,46,47,48,50/40,45,49	1	0.8
35,38,39,45,46,48,50/40,47,49	1	0.8
35,38,39,45,46,48,49/40,47,50	1	0.8
38,39,45,46,48,50/35,40,47,49	2	1.5
35,38,39,46,47,48/40,45,49,50	1	0.8

Literature cited

1. Fleischmann, G. 1972. Crown rust of oats in Canada in 1971. Can. Plant Dis. Surv. 52:15-16.

2. Fleischmann, G., and R. J. Baker. 1971. Oat crown rust race differentiation: replacement of the standard differential varieties with a new set of single resistance gene lines derived from Avena sterilis. Can. J. Bot. 49:1433-1437.