CROWN RUST OF OATS IN CANADA IN 1973[1]

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Occurrence in western Canada

Oat crown rust caused by Puccinia coronata Cda. f. sp. avenae Eriks. was general but light throughout Manitoba and southeastern Saskatchewan. There was moderate damage in late-sown fields. Well developed crown rust pustules were found on oats adjacent to buckthorn (Rhamnus cathartica L.) thickets near Morden, Manitoba, on June 26, 2 weeks earlier than the first observation of crown rust in farm fields distant from buckthorn.

Uniform rust nurseries

Ratings of crown rust intensity on 10 oat (Avena sativa L.) cultivars in nurseries grown across Canada are given in Table 1. Locations at which no crown rust was detectable or from which leaves could not be scored are omitted from the table. There was a slight increase in virulence on R.L. 2924 (a line with gene Pc38) in 1973 as compared to other years (1, 2). The line R.L. 2925, carrying gene Pc39, has remained resistant.

The cultivar Hudson has been recently licensed for commercial production, and it is expected that Hudson will be grown mainly in Western Canada. There were significant levels of infection on Hudson at all locations, with the highest levels occurring in Eastern Canada. Some isolates of races 229, 264, 275, 284, 295, 324, 326. 330, and 333 obtained in the present survey were virulent on this cultivar. Most isolates could attack the commercial oat cultivars Harmon and Random (Table 4).

Physiologic specialization

The incidence and distribution of physiologic races of crown rust in Canada are given in Table 2. The 73 isolates from Eastern Canada comprised 22 "standard" races, giving a racelisolate ratio of 0.30. As in 1972 (2) race 210 predominated, comprising 26% of the isolates. Races 284 and 330 were also common.

In Western Canada 104 isolates comprised 18 races, for a race/isolate ratio of 0.17. As in recent years (1,2), races 295 and 326 were the most common.

All crown rust collections were tested on a series of backcross lines of Avena sativa L. cv. Pendek containing single genes for crown rust resistance derived from Avena

Table 1. Percentage infection of crown rust on 10 oat cultivars at 10 locations* in Canada in 1973

Location	Hudson	C.I. 9139	C.I. 4023	C.I. 3034	Rodney	R.L. 2924	R.L. 2925	R.L. 2926	R.L. 2970	Harmon
Brandon, Man.	40	65	80	60	65	0	0	65	65	80
Morden, Man.	20	10	20	5	20	tr†	0	40	20	30
Durban, Man.	30	10	40	65	60	0	0	40	50	60
Kemptville, Ont.	90	40	90	60	90	tr	0	90	80	80
Guelph, Ont.	50	30	50	20	60	0	0	10	20	50
La Pocatière, Qué.	5	tr	20	10	25	tr	0	10	5	15
Macdonald College, Qué.	50	0	50	80	80	0	0	50	70	20
Truro, N.S.	5	0	10	0	tr	0	0	tr	tr	tr
Kentville, N.S.	25	0	25	15	25	0	0	20	20	25
Charlottetown, P.E.I.	tr	0	10	tr	10	0	0	5	tr	5

* Crown rust was not detected or was not rated in nurseries at the following locations: Agassiz and Creston, B.C.; Edmonton, Beaverlodge, and Lacombe, Alta.; Indian Head, Scott, and Melfort, Sask.; New Liskeard, Thunder Bay, Ottawa, Appleton, Sudbury, and Vineland, Ont.; Québec City, Lennoxville, and Normandin, Qué.; Fredericton, N.B.; St. John's West, Nfld.

† tr = trace.

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Table 2. Distribution of physiologic races of crown rust in Canada in 1973

Physiologic race	East		West	
	No. of isolates	% of isolates	No. of isolates	% of isolates
203	2	2.7	4	3.8
210	19	26.0		
211	1	1.4		
212	1	1.4		
216			1	1.0
226	1	1.4		
228	6	8.2		
229	2	2.7		
230	2	2.7		
231	1	1.4		
239	2	2.7		
241	1	1.4		
275	3	4.1		
283	2	2.7		
284	10	13.7	6	5.8
290	2	2.7	2	1.9
295			50	48.0
299	2	2.7		
320			1	1.0
322	1	1.4		
324			1	1.0
326			22	21.0
330	8	10.9	1	1.0
333			2	1.9
335			3	2.9
336			1	1.0
337			2	1.9
341	3	4.1	1	1.0
350			1	1.0
360			1	1.0
367			1	1.0
409	1	1.4		
416	2	2.7		
427	1	1.4	4	3.9

sterilis L. There was limited virulence on the single gene lines (Table 3). There were only 10 virulence combinations in 1973 as compared to 21 in 1972 (2). About 48% of the isolates were avirulent on the single gene lines, and, as in 1972, virulence on lines with genes Pc35 and Pc50 predominated (Table 4). The virulence combination/isolate ratios for Eastern and Western Canada were 0.11 and 0.042 respectively, following a pattern similar to the standard race/isolate ratios.

crown rust isolates were also obtained from plots at Glenlea and Greenacres (Winnipeg), Manitoba. These plots contain a wide range of genetic material, and plots at Greenacres were artificially inoculated with a mixture of crown rust races. Races isolated in addition to those found in the general survey were 264, 281, 285, 293, and 392. Also, single isolates were found with virulence combinations 39, 40. 45, 46, 47, 48, 50/35, 38, and 35, 38, 39, 45, 46, 47, 48/40, 50. Genes Pc38 and Pc39 are expected to constitute the major resistance to crown rust in Western Canada in the near future. The resistance provided by these genes in combination has remained effective.

At present there is little being done in Canada to control buckthorn, the alternate host of crown rust. In Manitoba, there are several areas with fairly extensive growths of buckthorn, while in Eastern Canada the shrub is common. The higher crown rust race/isolate ratio in Eastern Canada may be a reflection of this. The presence of buckthorn in oat growing areas is a matter of concern because of the acceleration given to epiphytotics in such areas and because the opportunity for sexual recombination in *P. coronata* increases the probability of a race appearing that is capable of attacking cultivars in which the resistance genes Pc38 and Pc39 are combined.

Table 3. Virulence combinations of *Puccinia coronata* on backcross lines containing single (*Pc*) genes for resistance to crown rust

Virulence formula (effective/ineffective host genes)	East		West	
	NO. of isolates	% of isolates	NO. of isolates	% of isolates
35,38,39,40,45,46,47,48,50/	37	43.5	88	52.7
38,39,40,45,46,47,48,50/35	35	41.2	40	23.9
35,39,40,45,46,47,48,50/38	1	1.2	2	1.2
35,38,39,45,46,47,48,50/40	1	1.2	4	2.4
35,38,39,40,46,47,48,50/45	3	3.5		
35,38,39,40,45,46,47,48/50	4	4.7	25	14.9
38,39,45,46,47,48,50/35,40			3	1.9
38,39,40,46,47,48,50/35,45	2	2.4		
38,39,40,45,46,47,48/35,50	1	1.2	5	3.0
39,45,46,47,48,50/35,38,40	1	1.2		

Table 4. Distribution of virulence of isolates of *Puccinia coronata* in 1973 on the standard differential cultivars, on backcross lines carrying single crown rust resistant genes, and on several commercial. oat varieties

Cultivar or resistance gene	Eastern Canada		Western Canada	
	No. of virulent isolates	% of isolates	No. of virulent isolates	% of isolates
Anthony	25	34.2	97	93.3
Victoria	7	9.6	28	26.9
Appler	15	20.5	85	81.7
Bond	51	69.9	95	91.3
Landhafer	7	9.6	81	77.9
Santa Fe	5	6.8	76	73.1
Ukraine	67	91.8	96	92.3
Trispernia				
Bondvic				
Saia	14	19.2	4	3.8
Pc35	38	44.7	48	28.7
Pc38	2	2.4	3	1.2
Pc39				
Pc40	1	1.2	7	4.2
Pc45	5	5.9		
Pc46				
Pc47				
Pc48				
Pc50	5	5.9	30	18.0
Hudson	11	12.9	11	6.6
Harmon	83	97.6	166	99.4
Random	49	57.6	157	94.0

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Literature cited

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