Crown rust of oats in Canada in 1975'

D. E. Harder

Oat crown rust [***Puccinia coronata*** f. sp. ***avenae]*** did not cause significant crop losses in western Canada in 1975. There was no increase from 1974 in virulence on the currently most resistant commercial oat ***(Avena sativa)*** cultivar Hudson and on the important resistance genes ***Pc38*** and ***Pc39***. The Occurrence of standard races of crown rust across Canada was determined. In western Canada races 295 and 326 predominated, while in eastern Canada race 210 predominated. Virulence combinations in the crown rust population were also determined using a set of 12 oat lines carrying single substituted genes ***(Pc)*** for crown rust resistance. The 333 isolates from western Canada and 56 isolates from eastern Canada comprised 18 and 40 virulence combinations respectively. There was little change from 1974 in the levels of virulence on the ***Pc*** genes except for some increase in virulence on lines with genes ***Pc50*** and ***Pc56***.

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En 1975, la rouille couronnee de l'avoine ***[Puccinia cofonata*** f. sp. ***avenae]*** n'a pas cause de pertes importantes de recoltes dans l'ouest du Canada. Par rapport a 1974, on n'a constate aucun accroissement de virulence sur le cultivar Hudson normalement le plus resistant de l'avoine commerciale ***(Avena sativa)*** ni sur les principaux genes de resistance, soit Pc38 et Pc39. La frequence des races courantes de rouille couronnee au pays a ete determinee. Dans l'Ouest, les races 295 et 326 ont dominé, comparativement a la race 210 dans l'Est. Certaines combinaisons de virulence chez les populations de rouille couronnee ont egalement ete determinees au moyen d'une serie de 12 lignees d'avoine porteuses d'un seul gene substitue different (*Pc*) de resistance a la rouille. Les 333 isolats provenant de l'Ouest et les 56 de l'Est cornprenaient respectivement 18 et 40 combinaisons de virulence. On a constate peu de changement, par rapport a 1974, du degre de virulence sur les lignees possedant le gene Pc, sauf un leger accroissement sur celles possedant les genes Pc50 et Pc56.

Occurrence in western Canada

Oat crown rust caused by *Puccinia* coronata Cda. f. sp. avenae Eriks. did not cause significant losses in oat crops in most localities in 1975. Buckthorn (*Rhamnus* cathartics L.) infection was light in the spring of 1975, and general infection of oats did not occur until mid July. Although the early season weather was favorable for rust development, much of July and August was very warm and dry, limiting rust spread. In a few localities isolated showers occurred which allowed crown rust to attain moderately severe levels in some late sown fields.

Physiologic Specialization

All isolates of crown rust from eastern Canada were obtained from uniform rust nurseries grown at Lennoxville, La Pocatiere, L'Assomption, and Macdonald College, Quebec; and Elphin, Appleton, Brantford, Vineland, Guelph, and Ottawa, Ontario. In western Canada the isolates were obtained from field surveys throughout Manitoba and in eastern Saskatchewan.

In 1975 all crown rust collections were assessed using the "standard" differential oat varieties to monitor evolutionary changes in virulence (Table 1). The 40 isolates obtained from eastern Canada comprised 17 "standard" races, giving a race/isolate ratio of 0.425. As in the last report (2) race 210 predominated in eastern Canada, and increased to 42.5% of isolates as compared to 26% in 1973. Insufficient collections were obtained from eastern Canada to reliably assess the occurrence of the less common races.

In western Canada 282 isolates comprised 23 races giving a race/isolate ratio of 0.085. The difference in race/isolate ratios between eastern and western Canada may be a reflection of the difference in numbers of isolates, but the widespread occurrence of R. *cathartica* in parts of eastern Canada may also be a factor. As in 1973 (2) race 295 predominated, but decreased slightly to 35.5% of isolates. Race 326 increased from 21% in 1973 to 32.6% in 1975. Race 335 increased in prevalence from 2.9% in 1973 to 8.5% in 1975.

All crown rust collections were also tested on a series of backcross lines of Avena *sativa* L. cv. Pendek containing single genes for crown rust resistance derived from Avena *sterilis* L. (Table 2). In 1975 there were a total of 44 virulence combinations, 18 from eastern Canada (race/isolate ratio of 0.32), and 40 from western Canada (race/isolate ratio of 0.12). In 1975 there was relatively little change in the number of isolates from both eastern and western Canada that were avirulent on the single Pc-gene lines. As in 1974 (1) virulence predominated on genes Pc35 and 40, either singly or in combinations, in western Canada, and on Pc35 in eastern Canada (Table 3). There was increased virulence on gene *Pc50* and on the newly isolated gene Pc56 in eastern and western Canada, but the levels of virulence

[1] ***Contribution*** No. ***715, Research Station, Agriculture Canada, Winnipeg. Manitoba R3T 2M9***

Table 1. Distribution of physiologic races of crown rust in Canada in 1975

Physiologic race	Eastern Canada		Western Canada	
	No. of isolates	% of isolates	No. of isolates	% of isolates
203	0	0.0	10	3.6
209	0	0.0	2	0.7
210	17	42.5	1	0.4
211	1	2.5	0	0.0
212	0	0.0	1	0.4
216	0	0.0	5	1.8
226	1	2.5	3	1.1
228	3	7.5	0	0.0
231	3	7.5	2	0.7
232	1	2.5	0	0.0
237	0	0.0	2	0.7
259	1	2.5	0	0.0
263	0	0.0	3	1.1
264	0	0.0	12	4.3
281	1	2.5	0	0.0
284	1	2.5	8	2.8
294	1	2.5	2	0.7
295	0	0.0	100	35.5
297	1	2.5	0	0.0
299	1	2.5	1	0.4
320	2	5.0	5	1.8
322	1	2.5	1	0.4
325	0	0.0	3	1.1
326	2	5.0	92	32.6
330	2	5.0	1	0.4
335	0	0.0	24	8.5
345	0	0.0	1	0.4
410	0	0.0	1	0.4
427	1	2.5	2	0.7
Total	40		282	

Table 2. Virulence combinations of *Puccinia coronata* on backcross lines containing single (*Pc*) genes for resistance

Virulence formula effective/ineffective *Pc* genes	Eastern Canada		Western Canada	
	No. of isolates	% of isolates	No. of isolates	% of isolates
35,38,39,40,45,46,47,48,50,54,55,56/	20	35.6	70	21.0
38,39,40,45,46,47,48,50,54,55,56/35	7	12.4	35	10.5
35,39,40,45,46,47,48,50,54,55,56/38	0	0.0	3	0.9
35,38,39,45,46,47,48,50,54,55,56/40	1	1.0	62	18.5
35,38,39,40,46,47,48,50,54,55,56/45	1	1.8	0	0.0
35,38,39,40,45,47,48,50,54,55,56/46	1	1.0	6	1.8
35,38,39,40,45,46,47,48,54,55,56/50	0	0.0	17	5.1
35,38,39,40,45,46,47,48,50,55,56/54	0	0.0	9	2.7
35,38,39,40,45,46,47,48,50,54,55/56	7	12.4	4	1.2
	0	0.0	1	0.3
38,39,45,46,47,48,50,54,55,56/35,40	0	0.0	26	7.8
38,39,40,46,47,48,50,54,55,56/35,45	2	3.6	4	1.2
38,39,40,45,47,48,50,54,55,56/35,46	1	1.8	5	1.5
38,39,40,45,46,47,48,54,55,56/35,50	2	3.6	14	4.2
38,39,40,45,46,47,48,50,55,56/35,54	1	1.8	8	2.4
38,39,40,45,46,47,48,50,54,55/35,56	3	5.4	3	0.9
35,39,40,46,47,48,50,54,55,56/38,45	0	0.0	1	0.3
35,38,39,46,47,48,50,54,55,56/40,45	0	0.0	1	0.3

Table 2. (Cont.)

Virulence formula effective/ineffective *Pc* genes	Eastern Canada No. of isolates	Eastern Canada % of isolates	Western Canada No. of isolates	Western Canada % of isolates
35,38,39,45,47,48,50,54,55,56/40,46	0	0.0	2	0.6
35,38,39,45,46,47,50,54,55,56/40,48	0	0.0	1	0.3
35,38,39,45,46,47,48,54,55,56/40,50	0	0.0	11	3.3
35,38,39,45,46,47,48,50,55,56/40,54	0	0.0	11	3.3
35,38,39,45,46,47,48,50,54,55/40,56	1	1.8	6	1.8
35,38,39,40,47,48,50,54,55,56/45,46	2	3.6	0	0.0
35,38,39,40,46,47,48,50,55,56/45,54	2	3.6	0	0.0
35,38,39,40,45,47,48,54,55,56/46,50	0	0.0	1	0.3
35,38,39,40,45,46,47,48,55,56/50,54	0	0.0	2	0.6
35,38,39,40,45,46,47,48,54,55/50,56	0	0.0	1	0.3
38,39,46,47,48,50,54,55,56/35,40,45	0	0.0	1	0.3
38,39,45,47,48,50,54,55,56/35,40,46	2	3.6	1	0.3
38,39,45,46,47,48,54,55,56/35,40,50	1	1.8	7	2.1
38,39,45,46,47,48,50,55,56/35,40,54	0		3	0.9
38,39,40,46,47,48,50,54,55/35,45,56	1	1.8	3	0.9
38,39,40,45,47,48,50,54,55/35,46,56	1	1.8	0	0.0
38,39,40,45,46,47,48,55,56/35,50,54	0	0.0	2	0.6
35,38,39,46,47,48,54,55,56/40,45,50	0	0.0	1	0.3
35,38,39,46,47,48,50,55,56/40,45,54	0	0.0	2	0.6
35,38,39,45,46,47,48,55,56/40,50,54	0	0.0	2	0.6
35,38,39,40,47,48,50,55,56/45,46,54	0	0.0	2	0.6
35,38,39,40,46,47,48,55,56/45,50,54	0	0.0	1	0.3
38,39,47,48,50,54,55,56/35,40,45,46	0	0.0	1	0.3
38,39,46,47,48,50,55,56/35,40,45,54	0	0.0	1	0.3
38,39,45,47,48,54,55,56/35,40,46,50	0	0.0	1	0.3
38,39,45,46,47,48,55,56/35,40,50,54	0	0.0	1	0.3
Total	56	100.0	333	100.0

Table 3. Distribution of virulence of isolates of *Puccinia coronata* in 1975 on the standard differential varieties and on backcross lines carrying single crown rust resistance genes

Variety or resistance gene	Eastern Canada No. of virulent isolates	Eastern Canada % of isolates	Western Canada No. of virulent isolates	Western Canada % of isolates
Anthony	15	37.5	274	97.2
Victoria	6	15.0	108	38.3
Appler	7	17.5	259	91.8
Bond	29	72.5	270	95.7
Landhafer	5	12.5	240	85.1
Santa Fe	4	10.0	215	76.2
Ukraine	40	100.0	270	95.7
Trispernia	0	0.0	16	5.7
Bondvic	0	0.0	16	5.7
Saia	3	7.5	2	0.7
Pc35	19	33.9	104	31.2
Pc38	0	0.0	5	1.5
Pc39	0	0.0	0	0.0
Pc40	4	7.1	136	40.8

Table 3. (Cont.)

Variety or resistance gene	Eastern Canada		Western Canada	
	No. of virulent isolates	% of isolates	No. of virulent isolates	% of isolates
Pc45	5	8.9	15	4.5
Pc46	6	10.7	20	6.0
Pc47	0	0.0	0	0.0
Pc48	0	0.0	1	0.3
Pc50	4	7.1	61	18.3
Pc54	3	5.4	43	12.9
Pc55	0	0.0	0	0.0
Pc56	13	23.2	11	3.3

on the other genes remained relatively constant across Canada. Gene ***Pc55,*** another recently isolated gene, provided resistance against all crown rust isolates in Canada in 1975. There was no change in virulence on lines with genes ***Pc38*** and ***Pc39,*** which are presently being used to provide crown rust resistance in the oat breeding program at Winnipeg, thus these genes continue to be effective resistance sources. There was also no increase in virulence on the presently most resistant commercial cultivar, Hudson.

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