Crown rust of oats in Canada in 1976[1]

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Oat crown rust *[Puccinia coronata* f. sp. ***avenae]*** did not cause significant crop losses in western Canada in 1976. There was little increase in virulence from previous years on the cultivar Hudson. Hudson is currently the most crown rust resistant cultivar in Canada, although it is susceptible to a large number of isolates from eastern Canada. The combination of genes ***Pc 38*** and ***Pc 39*** still provides effective resistance to all crown rust isolates in Canada. Virulence combinations were determined using a set of 12 oat lines carrying substituted single genes (*Pc*) for crown rust resistance. The 280 isolates from western Canada and 94 isolates from eastern Canada comprised 37 and 22 virulence combinations respectively. There was little change from 1975 in the levels of virulence on the *Pc* genes in western Canada, but in eastern Canada there were increases in virulence on genes ***Pc 45*** and ***Pc 56.***

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En 1976, la rouille couronnee de l'avoine ***(Puccinia coronata*** f. sp. ***avenae)*** n'a pas cause de pertes de recolte significatives dans l'ouest du Canada. On n'a observe qu'un leger accroissement de virulence sur le cultivar Hudson par rapport aux annees precedentes. Hudson est généralement le cultivar le plus resistant a la maladie au Canada, bien qu'il soit sensible a un grand nombre d'isolats provenant de l'est du pays. La combinaison génique Pc **38** et Pc 39 assure encore une resistance efficace a tous les isolats de rouille couronnee au pays. On a determine les combinaisons de virulence au moyen d'une série de 12 lignees d'avoine porteuses de genes uniques substitués (Pc) de resistance a la maladie. Les 280 isolats provenant de l'ouest du pays et les 94 provenant de l'est comprenaient respectivement 37 et 22 combinaisons de virulence. On n'a observe que peu de changement par rapport a 1975 dans les taux de virulence a l'égard des genes Pc dans l'Ouest, contraitement a l'Est ou l'on a enregistre des accroissements de virulence sur les genes Pc 45 et Pc 56.

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 1976. Due to a dry spring infection of buckthorn ***(Rhamnus cathartica*** L.) was light, and general infection of oats did not occur until mid July. Continued dry weather throughout most of the growing season limited the spread of crown rust.

Physiologic specialization

All isolates of crown rust from eastern Canada were obtained from uniform rust nurseries grown at Macdonald College, Quebec City, Lennoxville, La Pocatiere, and St. Anne de Bellevue, Quebec; Sunbury, Ottawa, Guelph, Thunder Bay, and Appleton, Ontario. In western Canada the isolates were obtained from field surveys throughout Manitoba and eastern Saskatchewan.

In 1976 all crown rust isolates were assessed using a series of backcross lines of ***Avena sativa*** L. cv. Pendek carrying single genes derived from ***Avena sterilis*** L. The ***280*** isolates from western Canada and 94 isolates from eastern Canada comprised 37 and 22 virulence combinations respectively (Table 1). In western Canada there was little change from 1975 in the number of isolates avirulent on the lines with single ***Pc*** genes, but in eastern Canada a general increase in crown rust virulence was indicated by a relative decrease in the number of avirulent isolates in 1976 (Table 2). As in previous years (1, 2), virulence predominated on genes ***Pc 35*** and ***Pc 40*** in western Canada, and on gene ***Pc 35*** in eastern Canada (Table 2). In western Canada there were no large scale changes in virulence on the ***Pc*** genes. The origin of the virulence noted on genes ***Pc 39, Pc 47, Pc 48,*** and ***Pc 55*** is not certain. An isolate with the same virulence formula as the last one in Table 1 is at times used in greenhouse experiments, and contamination cannot be ruled out. In eastern Canada there were substantial increases in virulence on genes ***Pc 45*** and ***Pc 56*** (Table ***2).*** If these genes are to be used in crown rust resistance breeding, they will need to be carefully combined with complementary resistance genes.

Genes ***Pc 38*** and ***Pc 39*** are currently being combined to provide crown rust resistance in the oat breeding program at Winnipeg, and to date no crown rust isolates have been found that are virulent on this gene combination. In western and eastern Canada, respectively, **10%** and ***28%*** of isolates were virulent on Hudson, which is presently the most crown rust resistance commercial oat cultivar in Canada. This level of virulence on Hudson is relatively unchanged from previous years.

Acknowledgments

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Literature cited

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2. Harder, D.E. 1976. Crown rust of oats in Canada in 1975. Can. Plant. Dis. Survey 56:19-22.

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Table 1. Virulence combinations of *Puccinia coronata* on backcross lines of *Avena sativa* cv. Pendek containing single *(Pc)* genes for crown rust resistence

Virulence formula effectivetineffective 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/	17	18.1	60	21.4
38,39,40,45,46,47,48,50,54,55,56/35	9	9.6	32	11.4
35,39,40,45,46,47,48,50,54,55,56/38	0	0	7	2.6
35,38,39,45,46,47,48,50,54,55,56/40	3	3.2	59	21.1.
35,38,39,40,46,47,48,50,54,55,56/45	13	13.8	1	0.4
35,38,39,40,45,47,48,50,54,55,56/46	3	3.2	10	3.6
35,38,39,40,45,46,47,48,54,55,56/50	1	1.1	3	1.1
35,38,39,40,45,46,47,48,50,55,56/54	0	0.0	6	2.1
35,38,39,40,45,46,47,48,50,54,55/56	13	13.8	6	2.1
39,40,45,46,47,48,50,54,55,56/35,38	0	0.0	1	0.4
38,39,45,46,47,48,50,54,55,56/35,40	0	0.0	26	8.9
38,39,40,46,47,48,50,54,55,56/35,45	1	1.1	1	0.4
38,39,40,45,47,48,50,54,55,56/35,46	2	2.1	2	0.7
38,39,40,45,46,47,50,54,55,56/35,48	0	0.0	2	0.7
38,39,40,45,46,47,48,54,55,56/35,50	2	2.1	3	1.1
38,39,40,45,46,47,48,50,55,56/35,54	0	0.0	5	1.8
38,39,40,45,46,47,48,50,54,55/35,56	17	18.1	2	0.7
35,38,39,46,47,48,50,54,55,56/40,45	0	0.0	2	0.7
35,38,39,45,47,48,50,54,55,56/40,46	0	0.0	8	2.9
35,38,39,45,46,47,48,54,55,56/40,50	0	0.0	6	2.1
35,38,39,45,46,47,48,50,55,56/40,54	0	0.0	10	3.6
35,38,39,45,46,47,48,50,54,55/40,56	1	1.1	3	1.1
35,38,39,40,47,48,50,54,55,56/45,46	1	1.1	0	0.0
35,38,39,40,46,47,48,54,55,56/45,50	1	1.1	0	0.0
35,38,39,40,46,47,48,50,55,56/45,54	1	1.1	0	0.0
35,38,39,40,45,47,48,54,55,56/46,50	0	0.0	1	0.4
35,38,39,40,45,47,48,50,55,56/46,54	0	0.0	1	0.4
35,38,39,40,45,47,48,50,54,55/46,56	1	1.1	0	*0.0*
35,38,39,40,45,46,47,48,54,55/50,56	1	1.1	1	0.4
39,45,46,47,48,50,54,55,56/35,38,50	0	0.0	2	0.7
38,39,46,47,48,50,54,55,56/35,40,45	0	0.0	1	0.4
38,39,45,47,48,50,54,55,56/35,40,46	0	0.0	2	0.7
38,39,45,46,47,48,54,55,56/35,40,50	0	0.0	4	2.1
38,39,45,46,47,48,50,55,56/35,40,54	0	0.0	2	0.7
38,39,45,46,47,48,50,54,55/35,40,56	1	1.1	1	0.4
38,39,40,46,47,48,54,55,56/35,45,50	1	1.1	0	0.0
38,39,40,46,47,48,50,54,55/35,45,56	2	2.1	0	*0.0*
38,39,40,45,47,48,54,55,56/35,46,50	0	0.0	1	0.4
38,39,40,45,47,48,50,54,55/35,46,56	1	1.1	0	*0.0*
38,39,40,45,46,47,48,55,56/35,50,54	0	0.0	2	0.7
38,39,40,45,46,47,48,54,55/35,50,56	2	2.1	0	0.0
35,38,39,45,46,47,48,54,55/40,50,56	0	0.0	1	0.4
35,38,39,45,46,47,48,50,55/40,54,56	0	0.0	2	0.7
35,38,39,47,48,54,55,56/40,45,46,50	0	0.0	1	0.4
35,38,50,56/39,40,45,46,47,48,54,55	*0*	*0.0*	1	0.4
Total	94		280	

Table 2. Distribution of virulence of isolates of *Puccinia coronata* in 1976 on backcross lines carrying single crown rust resistance genes

Resistance genes	Eastern Canada		Western Canada	
	No. of virulent isolates	% of isolates	No. of virulent isolates	% of isolates
Pc 35	38	40.4	90	32.1
Pc 38	0	*0.0*	10	3.6
Pc 39	0	*0.0*	2	0.7
Pc 40	5	5.3	133	47.5
Pc 45	20	21.3	8	2.6
Pc 46	8	8.5	28	10.0
Pc 47	0	*0.0*	2	0.7
Pc 48	0	*0.0*	4	1.4
Pc 50	8	8.5	25	8.9
Pc 54	1	1.1	30	10.7
Pc 55	0	*0.0*	2	0.7
Pc 56	39	41.5	15	5.4