

CROWN RUST OF OATS IN CANADA IN 1969¹G. Fleischmann²Disease 1 and p losses in Western

Oat crown rust caused by *Puccinia coronata* Cda. f. sp. *avenae* Eriks. was first found near Plum Coulee, Manitoba, on July 24th. Despite the late date of initial occurrence, crown rust was generally present on oats in the province during the first week in August and increased in intensity in the Red River Valley and in southwestern Manitoba during the remainder of the summer. Crown rust was observed and collected from oat fields as far west and north as Canora, Saskatchewan, during the first week in September.

Yield reductions from oat crown rust in experimental plots at Glenlea, Manitoba, were 34% and 28% for the varieties 'Eagle' and 'Kelsey', respectively. Crown rust damage to the crop was anticipated in 38 of 49 late sown farm fields examined during the first week in August. In these fields disease development was evident on flag leaves by the early milk stage, and, in accordance with previous findings (1), losses were to be

expected. The yield loss estimates were calculated separately for each of the 11 crop districts in Manitoba in which oats are grown in substantial quantity. Only late-sown fields that were in the milk stage or at an earlier stage of development were taken into consideration in arriving at yield losses. Thus, the acreage affected was determined by multiplying the fraction of fields inspected that were late in their development by the total oat acreage in the district. The yield in each district in bushels per acre was based on Manitoba Department of Agriculture figures for 1969. It was estimated that in excess of 3.5 million bushels of oats in late sown fields would be lost due to crown rust. At prices of 50 cents per bushel, this loss is in the order of \$1,750,000 from yield reduction alone. Qualitative losses reflected by groats, % hull, and bushel weight were not taken into consideration. Losses to individual late fields ranged from 5% to 30%, but on average were 10% to 20%, considerably less than the losses demonstrated in the experimental plots. The estimate of about two million dollars loss due to crown rust in Manitoba is, for the

Table 1. Percentage infection of crown rust on 11 oat varieties at 15 locations in Canada

Location	Bond	Trispernia	Landhafer	CI 4023	Saia	Rodney ABDH	CI 3034	Rodney	Garry	RL 2895	RL 2896
Melfort, Sask.	tr*	0	0	tr	0	0	0	0	0	0	0
The Pas, Man.	tr	0	0	tr	0	0	0	0	tr	0	0
Morden, Man.	90	30	50	70	20	50	70	90	90		
Winnipeg, Man.	80	10	30	50	10	40	50	50	60	40	50
Williamstown, Ont.	30	0	0	20	tr	40	20	40	30	10	tr
Alfred, Ont.	20	0	0	30	0	20	20	30	20	0	tr
Kemptville, Ont.	40	0	0	40	0	20	10	50	50	tr	tr
Fort William, Ont.	20	0	0	10	0	tr	tr	10	10	tr	0
Ottawa, Ont.	30	0	0	20	0	10	10	20	20	1	1
Appleton, Ont.	30	0	0	20	0	20	20	30	30	5	5
Morewood, Ont.	60	tr	10	40	1	50	40	60	60	20	10
Vineland, Ont.	30	tr	5	30	5	30	30	30	30	10	30
La Pocatière, Que.	30	0	tr	20	tr	10	10	20	20	tr	tr
L'Assomption, Que.	20	0	0	10	0	5	10	20	10	0	0
Normandin, Que.	20	0	0	5	0	10	5	20	20	0	0

* tr = trace infection, less than 1%

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above reasons, considered to be very conservative. Detailed results are presented in another paper (3).

Rating of crown rust intensity on 11 oat varieties grown at nurseries in Saskatchewan, Manitoba, Ontario, and Quebec are presented in Table 1. Omitted from this table are nurseries in which no crown rust was found on any of the 11 oat varieties, as well as nurseries from which rust intensity could not be estimated because of the mildewed or shrivelled condition of the leaves.

The intensity of crown rust infection from the Manitoba nurseries at Morden and Winnipeg reflects conditions prevailing just prior to maturity in mid-August. The reading for Ontario and Quebec nurseries were taken fairly early in the growing season and crown rust severity probably increased considerably on the commonly grown susceptible varieties. The highest intensity of infection in Ontario occurred in the vicinity of dense buckthorn infestations, i.e. the Kemptville, Morewood, Williamstown and Appleton nurseries.

Table 2. Distribution of physiologic races of crown rust in Canada in 1969

Physiologic race	West		East		W & E totals	
	No. of isolates	% of all isolates	No. of isolates	% of all isolates	No. of isolates	% of all isolates
202	1	0.5	0	0.0	1	0.5
203	7	3.8	4	13.2	11	5.2
210	1	0.5	7	23.1	8	3.7
216	14	7.7	3	9.9	17	8.0
226	1	0.5	1	3.3	2	1.0
228	0	0.0	1	3.3	1	0.5
237	1	0.5	0	0.0	1	0.5
241	1	0.5	1	3.3	2	1.0
263	2	1.1	0	0.0	2	1.0
264	31	17.0	1	3.3	32	15.0
276	7	3.8	0	0.0	7	3.3
290	2	1.1	0	0.0	2	1.0
295	40	22.0	2	6.6	42	19.1
325	9	5.0	1	3.3	10	4.7
326	34	18.7	0	0.0	34	16.0
327	4	2.2	0	0.0	4	1.9
332	1	0.5	1	3.3	2	1.0
333	2	1.1	0	0.0	2	1.0
338	1	0.5	0	0.0	1	0.5
341	3	1.6	4	13.2	7	3.3
342	0	0.0	1	3.3	1	0.5
360	0	0.0	1	3.3	1	0.5
368	1	0.5	0	0.0	1	0.5
419	1	0.5	0	0.0	1	0.5
421	1	0.5	0	0.0	1	0.5
427	3	1.6	0	0.0	3	1.4
444	1	0.5	0	0.0	1	1.0
446	3	1.6	2	6.6	5	2.3
453	1	0.5	0	0.0	1	0.5
1, 3, 7, 10	2	1.1	0	0.0	2	1.0
1, 3, 4, 8, 9, 10	1	0.5	0	0.0	1	0.5
2, 4, 8, 9	1	0.5	0	0.0	1	0.5
4, 8, 9, 10	2	1.1	0	0.0	2	1.0
4, 8, 9	1	0.5	0	0.0	1	0.5
Total races	31		14		34	
Total isolates	180		30		210	
Race:isolate ratio	1:6		1:2			

Some degree of crown rust resistance appeared in the 'Rodney ABDH' backcross line containing additional stem rust resistance genes. As in the previous report (2), this was reflected by a lower intensity of crown rust on it than on ordinary 'Rodney' at nearly all of the rust nurseries where crown rust occurred.

Distribution of physiologic races

The frequency of occurrence and distribution of 34 physiologic races of crown rust identified from 210 Canadian isolates is presented in Table 3. Although 31 physiologic races were identified in the west, three of these, 264, 295, and 326, comprised nearly 60% of the isolates. These races, as well as most of the others isolated attacked the differential varieties 'Landhafer' and 'Santa Fe'.

Only 30 isolates were obtained from Eastern Canada, but 14 physiologic races were identified in this small sample. The 'Victoria'-virulent races 203, 210, 216, and 341 comprised 56% of the population. In contrast to Western Canada, there were very

few races isolated in the east which attacked the varieties 'Landhafer' and 'Santa Fe'.

Five races with previously undescribed combinations of virulence on the differential varieties were discovered in the west during the 1969 survey. Their resistance formulae are presented in Table 2. All of them were virulent on 'Landhafer' and 'Santa Fe', but only one (resistance formula 1,3,7,10) attacked 'Trispermia' and 'Bondvic'.

Virulence on the differential varieties

The percentage of crown rust isolates virulent on each differential variety is shown in Table 3. The situation in Eastern Canada indicates increased incidence of crown rust virulent on 'Landhafer' and 'Santa Fe' and decreasing incidence of virulence on 'Anthony' and 'Appler', when compared to 1968.

In Western Canada the percent of cultures attacking 'Landhafer' and 'Santa Fe' continued at the very high level recorded last year. Those virulent on 'Trispermia' and 'Bondvic' increased and were present in

Table 3. Percentage of Canadian crown rust isolates virulent on differential host varieties, 1966 to 1969

Location and year											
		Landhafer					Santa Fe				
Western Canada											
1969	92	62	93	94	82	82	87	30	30	5	
1968	90	48	90	95	82	81	95	10	10	3	
1967	72	59	72	89	68	68	80	24	31	13	
1966	66	58	62	82	24	23	83	2	2	4	
Eastern Canada											
1969	50	44	50	93	21	24	97	7	7	10	
1968	79	40	83	87	8	9	96	2	2	7	
1967	47	54	50	86	10	11	95	2	1	13	
1966	51	45	30	77	9	9	85	0	0	9	

about one third of western crown rust isolates. The contrast between the low level of virulence of the eastern crown rust population on 'Landhafer' and 'Santa Fe' and the high level of virulence of western isolates on these varieties is striking.

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