CROWN RUST OF OATS IN CANADA IN 1966[1]

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Disease development and crop losses in Western Canada

In 1966 oat crown rust, Puccinia coronata Cda. f. sp. avenae Erikss., was first found in southern Manitoba on July 18th. By the end of July trace to slight amounts of the disease were general in the Red River Valley of Manitoba, mostly on wild oats. A small gradual increase in crown rust intensity on the oat crop occurred during August. Trace amounts of the pathogen also spread into fields in eastern Saskatchewan. Maximum disease intensity in commercial oat fields ranged from 10 to 25 percent in southern Manitoba at the end of the growing season. Yield losses due to crown rust were negligible in most oat fields in Western Canada in 1966. Slight to moderate losses occurred in late sown fields in which crown rust reached intensities of more than 10 percent while the oats were still at avulnerable pre-heading stage.

Disease ratings in the rust nurseries

Ratings of crown rust intensity on 10 oat varieties grown at nurseries across Canada are presented in Table 1. Omitted from this table are those nurseries in which no crown rust was found on any of the 10 oat varieties, as well as a few nurseries in which rust intensity could not be estimated because of the shrivelled or mildewed condition of the leaves.

Except for traces of rust on 'Bond', 'Clinton', and 'Rodney' oats grown at Lacombc, Alberta, no crown rust was recorded from any nurscry west of Indian Head, Saskatchewan. The heaviest infections in Western Canadawere recorded on varieties grown at Winnipeg and Glcnlea in southern Manitoba. In Eastern Canada heavy crown rust infections were once again observed in oat nurseries near dense buckthorn infestations in southeastern Ontario, and from the Guelph region. A slight amount of crown rust was seen on six varieties in the nursery at Lennoxville, Quebec, but none was dctectcd in any other nursery in Quebec and the Maritimes.

Distribution of physiologic races

The frequency of occurrence and distribution of 49 physiologic races of crown rust idcntificd from 222 isolates is presented in Table 2. In previous years a few biotypes comprised the bulk of isolates in Western Canada but no race isolated in the west in 1966 constitutedeven 10 percent of the crown rust population. Furthermore, the trend toward virulence on the differential varieties 'Landhafer' and 'Santa Fe' appears to have been reversed; less than one quarter of the western isolates attacked these

Table 1. Percent infection of crown rust on 10 oat varieties at 12 locations across Canada,

Locality	Bond	Trispernia	Landhafer	Ceirch du Bach	Saia	Exeter	Clinton	Rodney	Carry	C.I. 4023
Lacombe, Alta.	tr*	0	0	0	0	0	tr	tr	0	0
Indian Head, Sask.	5	0	0	0	0	tr	tr	2	2	tr
Brandon, Man,	0	0	0	tr	0	15	15	10	5	tr
The Pas, Man.	tr	0	0	0	0	0	tr	0	tr	tr
Morden, Man.	5	0	tr	0	0	10	10	5	5	2
Winnipeg, Man.**	5	0	1	0	0	10	10	10	10	5
Glenlea, Man.***	5	0	tr	tr	0	30	30	25	25	30
Kemptville, Ont.	15	0	0	0	0	10	10	5	5	10
Guelph, Ont.	30	tr	0	0	0	60	30	30	40	10
Ottawa, Ont.	--	0	0	0	0	5	--	10	--	5
Merrickville, Ont.	5	0	tr	0	tr	20	30	20	--	--
Lennoxville, Que.	2	0	0	0	0	tr	2	tr	tr	tr

* tr - trace infection, less than 1 percent.
** rust ratings taken on Aug. 5, 1966.
*** rust ratings taken on Aug. 22, 1966.

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Distribution of physiologic races of crown rust in Canada, 1966.

Physiologic race	West Number isolates	West % of all isolates	East Number isolates	East % of all isolates	W & E Total isolates
201	2	1.2	-	-	2
202	3	1.8	-	-	3
203	13	7.7	1	1.9	14
209	2	1.2	1	1.9	3
210	7	4.1	10	18.7	17
211	7	4.1	2	3.8	9
212	1	0.6	2	3.8	3
213	5	3.0	-	-	5
216	14	8.3	2	3.8	16
226	2	1.2	1	1.9	3
228	4	2.4	4	7.5	8
230	1	0.6	-	-	1
231	6	3.6	-	-	6
237	1	0.6	-	-	1
240	-	-	2	3.8	2
241	1	0.6	-	-	1
258	1	0.6	-	-	1
259	5	3.0	-	-	5
264	1	0.6	-	-	1
265	1	0.6	-	-	1
274	6	3.6	2	3.8	8
276	1	0.6	-	-	1
279	4	2.4	-	-	4
281	1	0.6	1	1.9	2
283	1	0.6	2	3.8	3
284	6	3.6	-	-	6
290	3	1.8	-	-	3
293	2	1.2	-	-	2
294	1	0.6	2	3.8	3
295	4	2.4	1	1.9	5
297	1	0.6	2	3.8	3
299	6	3.6	-	-	6
320	12	7.1	2	3.8	14
324	-	-	2	3.8	2
326	9	5.3	1	1.9	10
327	2	1.2	-	-	2
330	-	-	1	1.9	1
332	2	1.2	-	-	2
337	2	1.2	-	-	2
338	5	3.0	1	1.9	6
339	1	0.6	-	-	1
341	12	7.1	7	13.1	19
342	2	1.2	1	1.9	3
362	1	0.6	-	-	1
392	1	0.6	-	-	1
421	1	0.6	-	-	1
422	1	0.6	-	-	1
423	1	0.6	1	1.9	2
427	1	0.6	-	-	1
428	-	-	1	1.9	1
New races	3*	1.8	1	1.9	4
Races-Total	49		25		54
Isolates-Total	169		53		222

*Each of these 3 biotypes represents a different new race.

Table 3. Virulence of Canadian crown rust biotypes, 1966, on the differential oat varieties.

	Anthony	Victoria	Appler	Bond	Landhafer	Santa Fe	Ukraine	Trispernia	Bondvic	Saia
Western Canada:										
from wild oats	48*(69)**	36(51)	46(66)	54(77)	19(27)	18(26)	51(73)	3(4)	3(4)	5(7)
from cultivated oats	61(62)	60(61)	57(58)	82(83)	21(21)	21(21)	87(88)	1(1)	1(1)	2(2)
from all isolates	109(66)	96(58)	103(62)	136(82)	40(24)	39(23)	138(83)	4(2)	4(2)	7(4)
Eastern Canada:										
from all isolates	27(51)	24(45)	16(30)	41(77)	5(9)	5(9)	45(85)	0(0)	0(0)	5(9)
From all Canadian isolates:	136(61)	120(54)	119(53)	177(80)	45(20)	44(20)	183(82)	4(2)	4(2)	12(6)

*Number of virulent isolates. **Percent of virulent isolates in brackets.

two differential varieties in 1966 whereas over half the cultures from the west were virulent on 'Landhafer' and 'Santa Fe' in previous years (1, 2). Perhaps these phenomena both result from the crown rust population developing in the absence of selection pressure from host varieties with effective crown rust resistance.

The virulence of the crown rust cultures isolated in 1966 on the differential oat varieties is presented in Table 3. Only 'Trispernia', 'Bondvic' and 'Saia' appear to have effective crown rust resistance genes against the 1966 physiologic race population. The lower virulence of the isolates from Eastern Canada, relative to those from the west, is also indicated in Table 3. Crown rust cultures from the east were less virulent on all except the most susceptible differential, 'Ukraine'.

Three new races, with previously undescribed virulence combinations on the crown rust differential oat varieties, were isolated in 1966. Their resistance formulae are: race 445 - 1, 2, 3, 4, 7, 8, 9, 10; race 446 - 1, 3, 8, 9, 10; and race 447 - 3, 8, 9, 10.

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literature cited

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