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CEREAL RUSTS IN CANADA IN 1962 1/

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RUST DEVELOPMENT IN CANADA IN 1962

Prevalence of the Cereal Rusts

Stem Rust of Wheat

Stem rust of wheat (Puccinia graminis Pers. f. sp. tritici Erikss & Henn.) was more prevalent in Western Canada in 1962 than for many years (Figure 1). Fortunately, the widely grown varieties of common and durum wheat are resistant to race 56 which predominated and losses were insignificant. Stem rust was first found on wheat at Morden, Manitoba, on June 19, about the usual time for its appearance, and soon was widely distributed throughout Manitoba. It occurred commonly on wild barley (Hordeum jubatum L.), and by early August susceptible varieties in experimental plots and in the occasional farm field were virtually destroyed. The bread wheat varieties, Selkirk and Pembina, were free from stem rust, and only traces were found on the bread wheat variety Lee and the durum wheat variety Ramsey. Stem rust losses in barley were not large because the resistant variety Parkland is most commonly grown, but late fields of the susceptible variety Montcalm were damaged.

Smaller amounts of stem rust occurred farther west in Saskatchewan and Alberta. Losses were small in Saskatchewan because resistant varieties such as Thatcher, Canthatch, and Selkirk predominate. Losses were small in Alberta as well but, in some areas where susceptible varieties are grown, there was damage. Infections of up to 50 per cent were observed in occasional fields.

Leaf Rust of Wheat

Leaf rust of wheat (P. recondita Rob. ex Desm.) was first found at Morden and Winnipeg, Manitoba, on June 18 which is the usual time for its appearance in this area (Figure 1.). Rust developed slowly during the early part of the season but, by late July and August, heavy infections developed throughout the rust area. The cool wet weather which prevailed during this period delayed maturity of the crops and favoured rust development. Severe infections developed on the moderately resistant varieties Selkirk and Pembina and, in most fields, the leaves were killed two to three weeks before maturity. The effect of leaf destruction on yield was at least partially alleviated by the slow rate at which the crop matured. However, there was undoubtedly some loss in yield,

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1/ Issued as Report No. 18, Plant Pathology Section, Canada Department of Agriculture Research Station, Winnipeg, Manitoba.

2/ Reports on the stem rusts and epidemiology by G. J. Green, on the leaf rusts of wheat and barley by D. J. Samborski, and on crown rust of oats by G. Fleischmann.

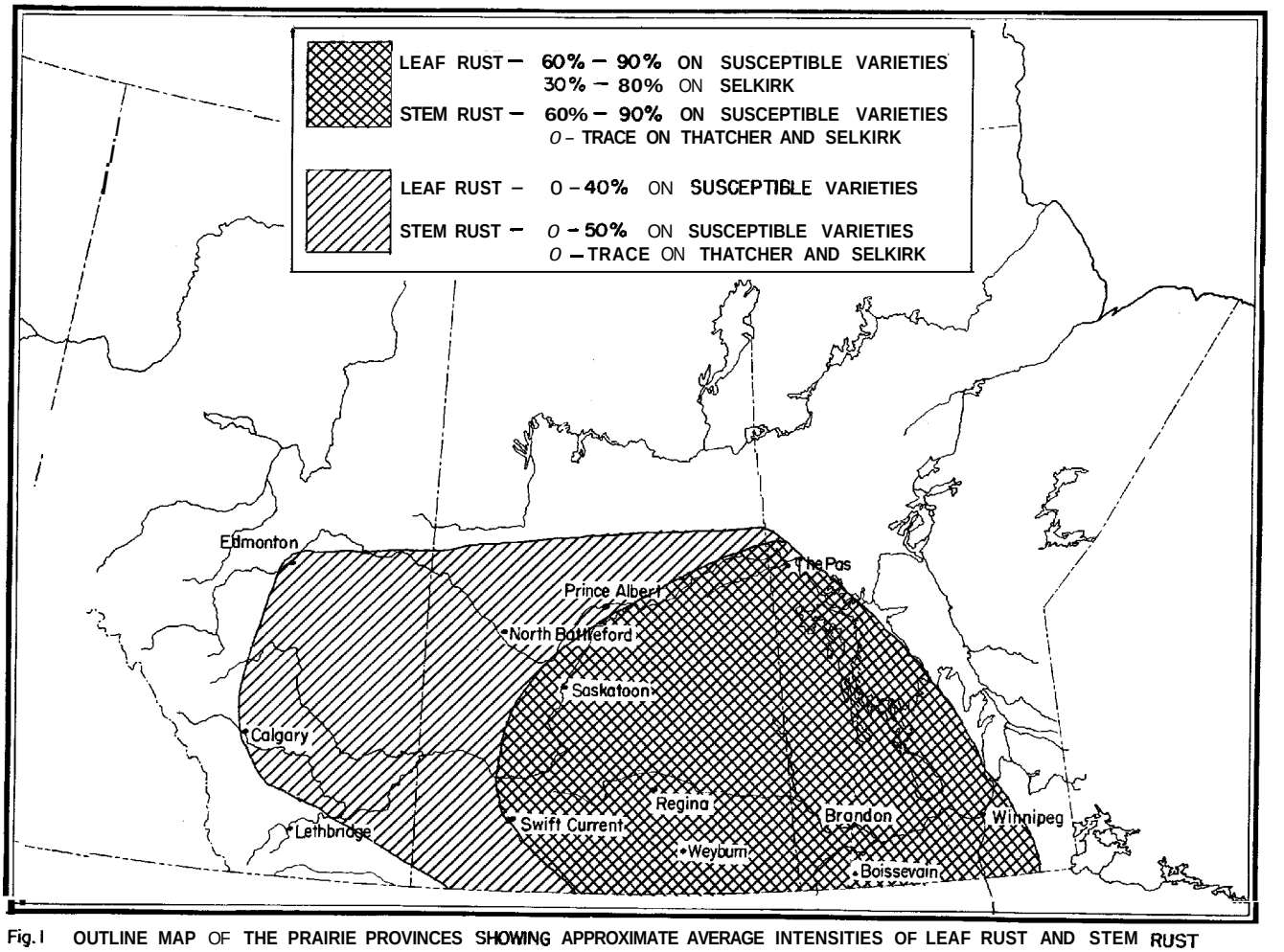
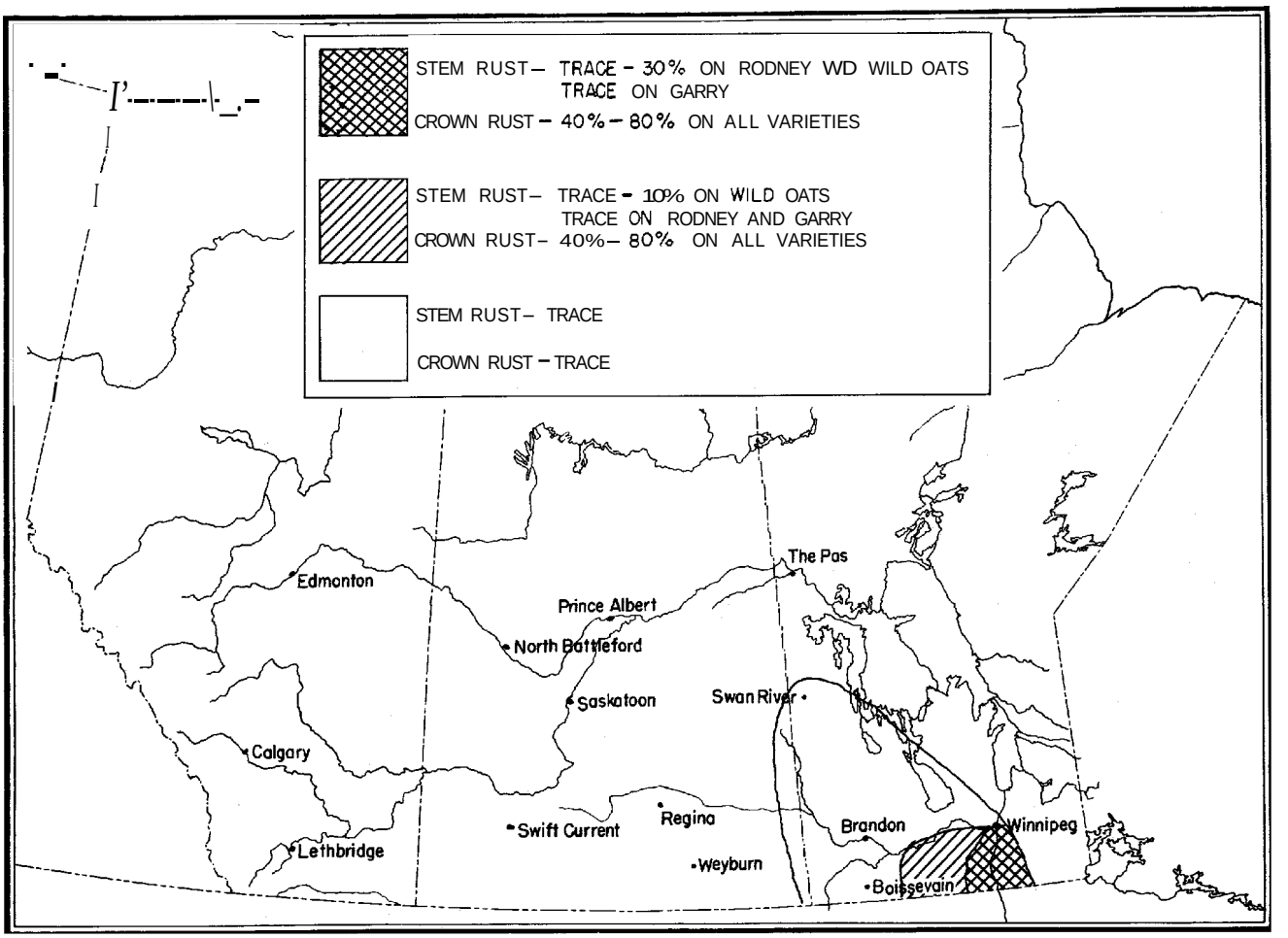


Fig. 1 OUTLINE MAP OF THE PRAIRIE PROVINCES SHOWING APPROXIMATE AVERAGE INTENSITIES OF LEAF RUST AND STEM RUST OF WHEAT— *1962*



Fi.2 OUTLINE MAP OF THE PRAIRIE PROVINCES SHOWING APPROXIMATE AVERAGE INTENSITIES OF CROWN RUST AND STEM RUST OF OATS 1962

Stem Rust of Oats

Stem rust of oats (P. graminis Per ~ f. sp. avenae Erikss, & Henn.) appeared rather late in the growing season (first collected July 18 at Morden) and developed slowly at first. In Manitoba, it was scarce until after the middle of August but, by the end of the month it was widely distributed (Figure 2). Most of the oat crop was approaching maturity by that time and was not subject to rust damage. During September, moderate infections of race 7A developed in a few very late fields of the variety Rodney in the Red River Valley. Traces of oat stem rust occurred in the most easterly parts of Saskatchewan but it was not reported farther west in Saskatchewan or in Alberta.

Crown Rust of Oats

Crown rust of oats (P. coronata Corda f. sp. avenae Erikss.) was first observed in Western Canada at Christie, Manitoba, on July 4, Disease development was retarded during July, so that only a trace to two per cent of crown rust was noticeable in oat fields in the Red River Valley on August 1. By mid-August, however, the disease had increased to epiphytotic proportions, and Rodney, the predominant commercial variety in Manitoba, was heavily infected in the Red River Valley. At this time, crown rust infection was much lighter on oats in northern and western Manitoba. The crown rust epiphytotic was general in south-central and south-eastern Manitoba by the first week in September. Oats in the northern and western areas of the province escaped severe attack.

Despite the severity of crown rust infection on a large portion of the oat crop in Manitoba in 1962, losses were small. This was largely due to the slow buildup in rust intensity during July, probably resulting from a scarcity of airborne inoculum from the south. Most of the oat crop had headed before infections became severe. Late-sown fields in southern Manitoba did, however, suffer some loss due to crown rust because the disease became established while the crop was still in the boot stage. The light infections observed on oats in eastern and north-eastern Saskatchewan apparently did not damage the oat crop in those regions.

Other Cereal Rusts

Leaf rust of barley (P. hordei Otth,) was first found on July 18 at Clearwater, Manitoba and,—by the end of the month, was present in trace amounts throughout the province. The degree of infection varied considerably from field to field as the season advanced but, by mid-August, moderate infections were observed in southern Manitoba and, in September, a severe infection (70 per cent) was observed in a very late field at St. Agathe in the Red River Valley. Leaf rust of rye (P. recondita Rob. ex Desm.) was first observed at Morden, on June 19 and moderate infections developed in southern Manitoba later in the season. Rye stem rust (P. graminis Pers. f. sp, secalis Erikss, & Henn.) occurred throughout Manitoba in trace amounts,

Influence of the Weather on the Prevalence of Rust

Weather conditions in Manitoba were very favorable for rust development throughout much of the growing season in 1962 despite dry conditions early in the spring. After the dry summer of 1961 subsoil moisture supplies were only poor to fair in many districts about May 1, although surface moisture conditions were fair to good. Precipitation from April 1 to May 1 was 49 per cent below normal and by May 9, it was 54 per cent below normal. The weather then changed markedly and, by May 16, precipitation was 15 per cent above normal. The wet weather continued. Precipitation by June 6 was 65 per cent above normal and it continued above normal into September. Temperatures were generally below normal. The heavy rainfall delayed seeding especially in the Red River Valley and resulted in a late, lush crop on which rust could develop under excellent conditions for spore germination and infection, Under these favorable conditions wheat stem rust developed rapidly wherever there were! susceptible hosts. Wheat leaf rust developed more slowly than stem rust but severe infections were present about the end of July.

In Saskatchewan and Alberta conditions for rust development were generally favorable but the crop was not as late as in Manitoba.

Prevalence of Air-borne Rust Spores in Western Canada

An estimate of the relative amount of rust inoculurn in the air over Manitoba and Saskatchewan in 1962 was obtained by exposing vaseline-coated microscope slides in spore traps and counting the spores caught on each slide. The slides were exposed for 48-hour periods at Winnipeg, Morden and Brandon in Manitoba, and at Indian Head, Regina, and Saskatoon in Saskatchewan. The slides from all locations except Saskatoon were examined at Winnipeg. The Plant Pathology Section of the Canada Department of Agriculture Research Station at Saskatoon reported on the number of spores caught at Saskatoon. The numbers of leaf rust and stem rust spores caught during each exposure, expressed as the number of spores per square inch of slide, except at Saskatoon, are presented in Table 1.

Despite the widespread cultivation of rust resistant varieties there was a good supply of air-borne inoculum over Manitoba and Saskatchewan in 1962. As usual, few spores were carried into these provinces in May but rather heavy spore showers occurred in Manitoba from June 12 to 15 and from June 26 to July 1. In the latter shower smaller numbers of spores were carried into Saskatchewan as far as Saskatoon. After July 7 spores were caught in nearly every exposure with the most spores occurring at the more easterly locations. Most of these spores were probably of local origin while the spores caught in June were probably carried into the area from the south,

The total number of spores caught exceeded the number caught in 1961 when rust was scarce, and in 1960 (see Reports 16 and 17), but was much less than the number caught during great rust epidemics of past years. During the rust epidemic of 1954 over 23,000 stem rust and over 24,000 leaf rust spores per square inch of slide were caught in a three day exposure. (July 28-31) at Morden. In the same period 43,300 leaf rust spores were caught at Regina. The failure of large numbers of air-borne stem rust

spores to appear in late July and early August probably results from the limited rust development on the predominant resistant varieties. Although leaf rust spores were more abundant than stem rust spores, the moderate resistance of the predominant variety Selkirk in Manitoba greatly reduced their number by preventing early local rust development.

Rust Losses

The only cereal rust that caused significant losses in Western Canada was leaf rust of wheat. As discussed above, severe leaf rust infections developed in Manitoba and eastern Saskatchewan on the predominant bread wheat variety Selkirk and also on Pembina. These severe infections were developing about the end of July when much of the late crop in the rust area was flowering. The crop matured slowly despite the leaf rust attack and there may have been some compensation for the loss resulting from the destruction of the leaf blades. In any event, the epidemic caused only small losses. It was estimated, on the basis of field observations, that the loss from leaf rust averaged 2 bushels per acre for the 3 million acres of common wheat in Manitoba.

Table 1. Numbers of urediospores of stem rust and leaf rust caught on vaseline-coated slides exposed for about 48 hours at three locations in Manitoba and three locations in Saskatchewan from May 1 to August 30, 1962.

Date	Winnipeg 1/		Morden 1/		Brandon 1/		Indian Head 1/		Regina 1/		Saskatoon 2/	
	Stem Rust	Leaf Rust	Stem Rust	Leaf Rust	Stem Rust	Leaf Rust	Stem Rust	Leaf Rust	Stem Rust	Leaf Rust	Stem Rust	Leaf Rust
May total	0	0	0	0	0	0	0	13/	0	0	0	0
May 31 - June 1	0	0	0	0	1	0	0	0	0	0	0	0
June 2-3	0	0	0	1	0	0	1	0	0	0	-	-
4-5	0	0	0	0	0	0	0	1	0	0	0	0
6-7	0	0	0	0	0	0	0	0	0	0	0	0
8-9	0	0	0	0	0	0	0	0	1	0	0	0
10-11	0	0	0	1	0	1	0	0	0	0	0	0
12-13	0	1	64	17	7	1	0	0	0	0	0	0
14-15	30	6	105	45	0	0	0	0	0	0	0	0
16-17	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	1	0	0	0	0
20-21	0	1	0	0	0	0	0	1	0	0	0	0
22-23	0	0	0	1	0	0	0	1	0	0	0	0
24-25	0	0	0	0	0	0	0	6	0	3	0	4
26-27	152	106	91	65	22	43	8	3	0	1	0	1
28-29	34	23	2	5	120	87	0	0	7	4	0	0
June Total	216	137	262	135	150	132	9	13	8	8	0	5
June 30 - July 1	2	3	1	3	2	3	9	11	0	3	0	0
July 2-3	0	2	0	0	0	0	0	0	0	0	0	0
4-5	0	0	0	0	0	0	0	0	0	0	0	0
6-7	0	0	)	)	0	0	0	0	0	7	0	1
8-9	14	4	91)	48)	13	4	0	0	0	3	0	0
10-11	0	0	1	0	3	5	0	0	0	0	0	0
12-13	0	5	0	7	2	21	1	4	0	0	0	4
14-15	0	0	12	35	0	8	0	3	0	0	0	0
16-17	0	3	0	3	5	12	0	14	0	0	1	22
18-19	0	0	2	4	6	48	3	39	2	26	4	30
20-21	0	1	0	3	5	28	1	3	0	13	0	4
22-23	0	0	1	10	12	25	0	26	0	0	0	30
24-25	0	0	7	94	12	85	18	18	8	86	0	7
26-27	1	20	237	609	16	195	11	54	3	70	3	106
28-29	0	0	78	742	6	115	3	42	2	87	0	26
30-31	9	75	48	510	8	77	2	52	0	0	0	26
July Total	26	113	478	2068	90	626	48	266	15	295	8	256
Aug. 1-2	4	34	62	302	108	552	23	154	13	289	1	239
3-4	1	12	2	7	0	0	13	43	10	244	5	202
5-6	5	15	66	245	17	66	6	31	7	105	1	40
7-8	16	105	18	58	71	16	85	215	1344	451	29	439
9-10	25	20	171	205	89	208	20	155	40	461	11	364
11-12	1	1	14	71	37	44	31	248	722	343	70	371
13-14	29	33	153	665	190	157	58	83	492	1074	14	303
15-16	26	64	10	104	131	227	45	253	46	217	59	279
17-18	89	106	225	233	144	231	109	121	146	692	---	---
19-20	0	12	44	551	96	178	35	59	16	75	---	---
21-22	75	227	163	368	259	275	99	91	37	170	---	---
23-24	15	85	287	531	64	61	69	70	53	265	---	---
25-26	13	57	120	479	44	43	64	41	4	7	---	---
27-28	204	504	66	226	131	103	37	22	24	101	---	---
29-30	37	38	95	34	19	53	38	8	23	43	---	---
Aug. Total	540	1313	1496	4079	1400	2214	732	1594	2977	4537	190	2237
Total	782	1563	2236	6282	1640	2972	789	1874	3000	4840	198	2498

1/ Number of spores per square inch of slide.
2/ Number of spores per slide.
3/ Caught on May 3-4.

CEREAL RUSTS AND OTHER DISEASES IN THE RUST NURSERIES IN 1962

Uniform rust nurseries were grown at 40 locations across Canada in 1962. The nurseries outside of Manitoba were planted and cared for by co-operators whose assistance makes this project possible, When the plants were approaching maturity each co-operator cut a small sheaf from each row in the nursery and sent it to Winnipeg where disease ratings were assessed, These ratings appear in Tables 2-7.

The varieties grown in the nurseries are: Wheat: McMurachy, R. L. 1313; Lee, R. L, 2477; Kenya Farmer, R. L. 2768; Red Bobs; Marquis, R.L. 84; Mindum, R. L. 1344; Thatcher, R. L. 1945; Selkirk, R. L. 2769; Thatcher6 x Transfer; Exchange, R. L. 1803; Frontana; R. L. 2336; Ramsey, Ld. 369. Oats: Bond, R. L. 1130; Trispernia, R. L. 3; Exeter, R. L. 53; Garry, R. L. 1692.27; Clinton, R. L. 66; Landhafer, R. L. 91; Rodney, R. L. 2123; C. I. 4023; Ceirch dubach, R. L. 269. Barley: Montcalm, C. A. N. 1135; Vantage, Br. 1356; Parkland, Br. 3833. Rye: Prolific. Flax: Bison, Dakota, and Raja.

Stem Rust of Wheat

The high percentages of stem rust infection in the rust nurseries on the susceptible varieties Red Bobs, Marquis, and Exchange demonstrate the widespread prevalence of wheat stern rust in 1962 (Table 2). The most severe infections occurred in nurseries in Manitoba, Ontario, and Quebec as is usual in years when stem rust is severe. The low percentages of infection in the Saskatchewan nurseries probably resulted from harvesting the nurseries before rust had a chance to reach maximum intensity.

The scarcity of rust on the varieties Lee, Mindum, and Thatcher shows that race 15B, to which they are susceptible, was not common. The near absence of rust on the variety Selkirk which predominates in the rust area of Western Canada is encouraging. Although races have been found that can attack Selkirk there is still no evidence that their prevalence is increasing. The variety Kenya Farmer has been grown in the rust nurseries since 1954, and, as in past years, it was virtually free from rust. It is evident from the severe infections on Marquis and Red Bobs and the scarcity of rust on Lee, Thatcher, and Mindum (Table 2) that race 56 predominated in most regions of Canada in 1962.

Leaf Rust of Wheat

Severe infections of leaf rust occurred at all Manitoba nurseries and at many eastern nurseries' (Table 3). Selkirk was severely attacked in Manitoba with an incidence of 70 to 80 per cent. The severe infections on Selkirk were largely the result of unusual weather conditions which favoured rust development on this moderately resistant variety. Although cultures with increased virulence on Selkirk were isolated in 1962, the results of the race survey showed that most of the rust on Selkirk was identical to the rust isolated in previous years,

Exchange and Frontana were highly resistant to leaf rust at ail nurseries. These varieties have adult plant resistance to leaf rust and are being used in current breeding programs.

Table 2. Per cent infection of stem rust of wheat (Puccinia graminis triciti) on 12 wheat varieties in 39 uniform rust nurseries, in Canada in 1962.

Locality	McMurachy	Lee	Kenya Farmer	Red Bobs	Marquis	Mindum	Thatcher	Selkirk	Thatcher 6 x Transfer	Exchange	Frontana	Ramsey
Saanichton, B.C.	0	-	0	0	0	0	0	0	0	0	0	0
Agassiz, B.C.	0	0	0	0	0	0	0	0	0	0	0	0
Creston, B.C.	0	0	0	10	t	0	t	0	0	t	0	0
Beaverlodge, Alta.	0	0	0	0	0	0	0	0	0	0	0	0
Edmonton, Alta.	0	0	0	0	0	0	0	0	0	0	0	0
Lacombe, Alta.	0	0	0	0	0	0	0	0	0	0	0	0
Scott, Sask.	0	0	0	10	5	0	t	0	0	t	0	0
Melfort, Sask.	0	0	0	0	0	0	0	0	0	0	0	0
Indian Head, Sask.	0	0	0	1	1	0	0	0	0	t	0	0
Brandon, Man.	0	5	t	80	80	60	30	t	50	90	10	t
The Pas, Man.	0	0	0	80	60	0	0	0	t	1	0	0
Christie, Man.	0	t	0	90	80	0	0	0	0	1 0	0	0
Glenlea, Man.	0	t	t	90	90	t	3	t	3	7 0	t	t
Winnipeg, Man.	t	t	t	80	80	t	t	t	10	70	t	t
Fort William, Ont.	t	t	0	80	80	t	t	0	0	5	0	0
Kapuskasing, Ont.	0	0	0	0?	t	0	0	0	0	0	0	0
St. Catharines, Ont.	0	0	0	t	t	0	0	0	0	0	0	0
Guelph, Ont.	0	0	0	30	20	0	0	0	0	g	0	0
Verner, Ont.	0	0	0	50	50	0	0	0	0	50	0	-
Douglas, Ont.	0	0	0	90	90	5	t	0	20	90	20	5
Kemptville, Ont.	2	0	0	0	70	70	t	0	0	0	40	t	0
Merrickville, Ont.	0	0	0	0	0	0	0	-	-	0	-	-
Appleton, Ont.	0	0	0	70	50	0	0	0	0	1	0	0
Ottawa, Ont.	0	t	0	90	80	t	t	t	t	1	0	t
Alfred, Ont.	0	0	0	70	70	t	t	t	t	50	t	t
Williamstown, Ont.	0	t	0	90	80	5	0	0	1	50	t	0
Macdonald College, Que.	0	0	0	60	80	5	0	0	t	40	0	0
Lennoxville, Que.	0	0	0	15	t	0	0	0	0	0	0	0
La Pocatière, Que.	t	1	0	80	70	t	10	0	10	70	20	0
Normandin, Que.	0	0	0	30	20	0	0	0	0	1	0	0
L'Assomption, Que.	0	0	0	40	40	t	0	0	0	5	0	0
Fredericton, N.B.	0	0	0	0	0	0	0	0	0	0	0	0
Kentville, N.S.	0	0	0	t	0	0	0	0	0	0	0	0
Nappan, N.S.	0	0	0	0	0	0	0	0	0	0	0	0
Brule, N.S.	0	0	0	1	5	0	0	0	0	0	0	0
Bras-d'Or, N.S.	0	0	0	0	0	0	0	0	0	0	0	0
Charlottetown, P.E.I.	0	0	0	0	0	0	0	0	0	0	0	0
Doyles, Nfld.	0	0	0	0	0	0	0	0	0	0	0	0
St. John's West, Nfld.	0	0	0	0	0	0	0	0	0	0	0	0

Locality	McMurachy	Lee	Kenya Farmer	Red Bobs	Marquis	Mindum	Thatcher	Selkirk	Thatcher 6 x Transfer	Exchange	Frontana	Ramsey
Saanichton, B.C.	10	-	5	5	5	t	10	0	0	t	o	t
Agassiz, B.C.	10	2	t	10	10	0	10	0	0	0	0	0
Creston, B.C.	65	10	5	70	70	20	70	30	0	t	0	0
Scott, Sask.	10	5	t	10	5	0	10	5	0	0	t	t
Indian Head, Sask.	5	t	t	5	2	t	5	t	0	t	0	0
Brandon, Man.	80	70	70	-	-	5	80	70	0	t	t	t
Winnipeg, Man.	90	60	60	90	80	4	90	70	0	0	0	0
Christie, Man.	80	40	30	-	70	t	80	50	t	t	0	t
The Pas, Man.	80	60	5	go	40	t	90	80	0	0	0	0
Fort William, Ont.	80	10	10	80	70	t	80	15	0	0	0	0
St. Catharines, Ont.	5	0	0	5	5	0	5	0	0	0	0	0
Guelph, Ont.	65	15	20	00	80	5	80	15	0	t	t	5
Kemptville, Ont.	70	30	30	80	70	t	70	10	0	0	0	0
Ottawa, Ont.	50	15	15	50	50	0	50	t	0	0	0	0
Merrickville, Ont.	5	t	t	5	5	0	5	2	0	0	0	t
Douglas, Ont.	60	20	20	60	60	3	60	t	0	0	0	0
Alfred, Ont.	80	25	20	80	70	20	80	20	0	0	0	t
Appleton, Ont.	70	25	30	65	60	10	60	t	0	0	0	0
Verner, Ont.	60	5	5	60	50	t	60	3	0	0	0	0
Williamstown, Ont.	50	3	3	50	50	t	50	t	0	0	0	0
Macdonald College, Que.	60	5	5	60	50	5	60	5	0	0	0	0
Lennoxville, Que.	35	5	10	40	30	0	40	t	0	0	0	t
La Pocatière, Que.	80	40	35	75	70	30	80	30	0	0	0	0
Normandin, Que.	40	3	3	40	30	t	30	t	0	0	0	0
L'Assomption, Que.	60	5	5	60	60	0	60	1	0	0	0	0
Fredericton, N.B.	20	t	t	20	20	0	20	t	0	0	0	0
Kentville, N.S.	1	0	0	1	1	0	1	0	0	0	0	0
Nappan, N.S.	75	15	30	60	50	0	74	10	0	0	0	0
Charlottetown, P.E.I.	60	10	10	60	60	5	6 0	t	6	0	0	0

1/ Wheat leaf rust was not found in 4 nurseries. A trace of leaf rust was present on McMurachy at Lacombe, Alta., Kapuskasing, Ont., and St. John's West, Nfld.

Stem Rust of Oats

Oat stem rust was widely distributed in the rust nurseries in 1962 (Table 4) but severe infections occurred only at Appleton, Ontario. In Western Canada traces of rust occurred in the nursery at Saanichton, B. C. and moderate infections occurred in the nurseries in eastern Manitoba. Oat stem rust was late in reaching the Prairie Provinces from the south and, although it became established in Manitoba, there was insufficient time for it to spread westward into Saskatchewan and Alberta. The infections that developed in the nurseries in Ontario and Quebec, especially the severe infection at Appleton, Ontario, probably originated locally on barberry. This is evident from the amount of rust on the varieties Garry and Rodney which, in Canada, are attacked by stem rust only in areas where races such as 6A and 8A originate locally on barberry. The variety C.I. 4023 continued to show high resistance in all regions including the barberry areas,

Crown Rust of Oats

Manitoba rust nurseries were severely infected with crown rust in 1962, whereas, infection in the provinces farther west was very light (Table 5). Races 294 and 295 were isolated from collections made on Landhafer in Manitoba nurseries. These virulent races are reported for the first time in Western Canada. The incidence of crown rust in Eastern Canada was much the same as in previous years, being light to moderate in nurseries in southern Ontario and Quebec.

The Rusts of Barley and Rye

Stem rust on the susceptible barley variety Montcalm (Table 6) was coextensive with stem rust on susceptible varieties of wheat. The infections were more severe than in most years although they were not as severe as infections on wheat because barley matures earlier than wheat and often escapes severe damage. Evidently most of the rust on Montcalm was race 56 of wheat stem rust. The scarcity of rust on the varieties Parkland and Vantage was not anticipated because, although these varieties are resistant to wheat stem rust, they have been attacked in past years by rye stem rust. It is somewhat surprising, therefore, that at locations such as Guelph, Ontario, where rye was severely infected (Table 6), there were only traces of rust on the barley varieties.

Moderately severe infections of leaf rust of barley occurred in the nurseries located in Manitoba but infection was light or absent in other parts of Canada.

Small amounts of stem rust of rye occurred in occasional nurseries in Western Canada and the Maritime Provinces but, in Ontario and Quebec where barberry occurs, infections were light to severe. Evidently, these infections were of local origin because rye stern rust is the most common form of stem rust on barberry in these areas.

Leaf rust of rye (Table 6) was common in nurseries in all parts of Canada.

Table 4. Per cent infection af stem rust of oats (Puccinia graminis avenae) in 1962 on 9 oat varieties in 30 uniform rust nurseries in Canada 1/

Locality	Bond	Trispermia	Exeter	Garry	Clinton	Landhafer	Rodney	C.I. 4023	Ceirch du Bach
Saanichton, B.C.	0	t	0	0	0	t	0	0	0
Agassiz, B.C.	0	0	a	d	0	0	0	0	0
Creston, B.C.	0	0	0	0	0	0	0	0	0
Brandon, Man.	t	-	t	0	t	-	0	0	-
The Pas, Man.	-	0	0	0	0	0	0	0	0
Christie, Man.	t	0	0	0	0	0	0	0	0
Glenlea, Man.	50	-	20	2	30	-	10	t	20
Winnipeg, Man.	20	20	30	2	10	-	20	t	t
Fort William, Ont.	0	0	0	0	0	0	0	0	0
Kapuskasing, Ont.	0	0	0	0	0	0	0	0	0
St. Catharines, Ont.	0	0	0	0	0	0	0		
Guelph, Ont.	0	0	0	0	0	0	0	0	0
Verner, Ont.	0	1	0	0	0	t	0	0	0
Douglas, Ont.	10	5	10	5	20	5	20	t	1
Kemptville, Ont.	20	5	10	10	5	5	10	t	t
Merrickville, Ont.	10	-	t	1	30	-	30	0	-
Appleton, Ont.	60	30	30	50	80	-	70	1	30
Ottawa, Ont.	t	5	t	t	t	t	t	0	t
Alfred, Ont.	1	t	1	1	2	t	2	0	1
Williamstown, Ont.	0	t	0	0	0	t	0	0	1
Macdonald College, Que.	t	t	0	0	t	t	0	0	t
Lennoxville, Que.	10	5	1	t	1	1	10	0	5
La Pocatière, Que.	1	5	5	5	t	20	10	t	1
Normandin, Que.	0	0	0	0	0	0	0	0	t
L'Assomption, Que.	1	0	t	1	1	-	3	t	-
Fredericton, N.B.	0	0	0	0	0	0	0	0	0
Kentville, N.S.	0	0	0	0	0	0	t	0	0
Nappan, N.S.	0	0	0	0	0	0	0	0	0
Brule, N.S.	0	0	0	0	0	0	0	0	t
Bras-d'Or, N.S.	0	0	0	0	0	0	0	0	0

1/ No rust was observed in the nurseries in Alberta, Saskatchewan, Prince Edward Island, or Newfoundland.

Flax Rust

Flax rust (Melampsora lini (Ehrenb.) Lev.) was not observed in any nursery.

Diseases other than Rusts

A summary of the incidence of the rusts and certain other diseases in the nurseries is presented in Table 7. Conditions for the development of the leaf spotting diseases of wheat and barley in the Prairie Provinces seemed favorable in **1962** but these diseases were not prevalent. Apparently, the severe drought of **1961** which persisted into May of **1962** reduced the amount of primary inoculum below the level required to produce epidemics. Although most leaf spotting diseases of cereals were not common in 1962, a light infection of speckled leaf blotch of oats (Septoria avenae Frank f. sp. avenae) occurred in the Winnipeg nursery. This disease was not observed in the nurseries in Western Canada in **1961** but in **1962** it was easily found in late oat fields in southern Manitoba. As usual, moderate or severe infections occurred in most nurseries in Eastern Canada.

Scald of barley (Rhynchosporium secalis (Oud.) J. J. Davis), not shown in Table 7, was present only in nurseries at Beaverlodge (light), Edmonton (moderate), and Melfort (trace).

Table 5. Per cent infection of crown rust of oats (Puccinia coronata avenae) in 1962 on 9 oat varieties at 18 locations across Canada 1/

Locality	Bord	Trispermia	Exeter	Garry	Clinton	Landhafer	odney	I. 4023	eirch ubach
Brandon, Man.	10	t	**20**	5	30	t	**10**	**20**	t
Christie, Man.	80	0	**90**	50	**60**	5M	50	**40**	t
Glenlea, **Man.**	80	0	**60**	30	**70**	5M	**20**	**30**	1
Winnipeg, Man.	70	20R	80	**60**	**70**	20M	**60**	**70**	30R
Fort William, Ont.	**60**	0	**1**	**1**	5	t	**2**	**1**	**0**
Douglas, Ont.	**5**	**0**	t	t	**1**	**0**	1	t	0
Verner, Ont.	t	o	0	t	t	o	t	o	0
St. Catharines, Ont.	t	0	t	o	t	o	0	0	0
Guelph, Ont.	**25**	t	5	t	t	1	t	t	0
Williamstown, Ont.	t	o	t	0	t	0	t	t	0
Alfred, Ont.	40	0	**30**	**20**	**10**	t	**10**	**5**	0
Appleton, **Ont,**	**30**	t	30	**30**	20	t	15	10	0
Kemptville, Ont.	t	o	**10**	**10**	5	0	**5**	10	t
Merrickville, Ont.	50	t	30	**10**	**20**	1	**10**	**10**	t
Macdonald College, Que,	40	0	20	**10**	**20**	t	**10**	**20**	0
L'Assomption, Que.	10	0	10	**10**	5	0	**10**	**5**	**0**
Kentville, N. S.	5	0	1	0	0	0	0	0	0
Charlottetown, P. E. I.	10	0	5	t	t	o	0	0	0

1/ No crown rust occurred at the other locations. See Table 2 for a complete list of rust nursery locations.

Table 6. Per cent infection in 1962 of stem rust (Puccinia graminis) and leaf rust (P. hordei) on 3 barley varieties and of stem rust and leaf rust (P. recondita) on Prolific rye in uniform rust nurseries at 39 locations in Canada.

Location	Stem Rust			Leaf Rust			Stem Rust	Leaf Rust
	Montcalm	Parkland	Vantage	Montcalm	Parkland	Vantage	Prolific Rye	
Saanichton, B.C.	*0*	0	0	0	0	0	*0*	t
Agassiz, B.C.	0	0	0	0	0	0	0	50
Creston, B.C.	3	t	0	0	0	0	10	10
Beaverlodge, Alta.	0	0	0	0	0	0	0	0
Edmonton, Alta.	0	0	0	0	0	0	0	1
Lacombe, Alta.	0	0	0	0	0	0	0	0
Scott, Sask.	0	0	0	0	0	0	0	0
Melfort, Sask.	0	0	0	0	0	0	0	0
Indian Head, Sask.	0	0	0	0	0	0	*0*	0
Brandon, Man.	60	20	5	20	50	50	5	70
The Pas, Man.	5	0	0	t	0	5	t	5
Christie, Man.	t	t	t	-	-	-	t	-
Glenlea, Man.	50	t	t	40	40	40	1	30
Winnipeg, Man.	40	t	t	40	40	40	10	30
Fort William, Ont.	1	0	0	t	t	t	0	10
Kapuskasing, Ont.	0	0	0	0	0	0	*0*	t
St. Catharines, Ont.	0	0	0	-	-	-	0	-
Guelph, Ont.	t	t	t	t	t	t	*60*	70
Verner, Ont.	1	0	0	5	10	10	0	30
Douglas, Ont.	80	t	t	0	0	0	40	50
Kemptville, Ont.	1	t	t	0	0	0	10	30
Merrickville, Ont.	t	0	-	t	0	1	0	20
Appleton, Ont.	5	5	5	1	0	t	50	45
Ottawa, Ont.	t	0	0	3	3	3	10	10
Alfred, Ont.	5	t	t	3	3	3	40	-
Williamstown, Ont.	1	0	0	0	0	0	10	-
Macdonald College, Que.	0	0	0	0	0	0	20	5
Lennoxville, Que.	0	0	0	5	5	5	t	50
La Pocatière, Que.	20	t	0	-	-	-	20	-
Normandin, Que.	0	0	0	0	0	0	*0*	5
L'Assomption, Que.	t	0	t	1	1	1	0	40
Fredericton, N.B.	0	0	0	0	0	-	*0*	0
Kentville, N.S.	0	0	0	0	0	0	5	50
Nappan, N.S.	0	0	0	t	t	t	*0*	40
Brule, N.S.	0	0	0	-	-	-	0	-
Bras-d'Or, N.S.	*0*	0	0	0	0	0	*0*	0
Charlottetown, P.E.I.	0	0	0	0	0	0	*0*	0
Doyles, Nfld.	*0*	0	0	0	0	0	*0*	0
St. John's West, Nfld.	0	0	0	0	0	0	-	0

Table 7, Incidence 1/ of certain pathogenic fungi on wheat, oats, barley and rye at 39 locations in Canada in 1962.

Locality	Wheat				Oats			Barley						Rye	
	P. gr. tritici	P. recondita	Erysiphe graminis	Septoria spp.	P. gr. avenae	P. cor. avenae	Septoria avenae	P. graminis	P. hordei	E. graminis	S. passerinii	P. teres	B. sorokiniana	P. gr. secalis	P. recondita
Saanichton, B.C.	0	2	2	0	1	0	2	0	0	2	0	0	-	0	1
Agassiz, B.C.	0	2	1	1	0	0	2	0	0	0	0	3?	0	0	3
Creston, B.C.	2	4	0	0	0	0	-	2	0	0	0	0	3	2	2
Beaverlodge, Alta.	0	0	0	2	0	0	0	0	0	0	0	-	-	0	0
Edmonton, Alta.	0	0	0	0	0	0	0	0	0	0	0	-	-	0	1
Lacombe, Alta.	0	1	0	-	0	0	0	0	0	0	0	0	0	0	0
Scott, Sask.	2	2	0	0	0	0	0	0	0	0	0	1	1	0	0
Melfort, Sask.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Indian Head, Sask.	1	2	-	-	0	0	0	0	0	0	0	0	0	0	0
Brandon, Man.	4	4	0	0	1	3	0	4	3	0	0	2	2	2	4
The Pas, Man.	4	4	0	0	0	0	0	2	2	0	0	3	0	1	2
Christie, Man.	4	4	0	-	1	4	-	1	-	-	-	-	-	1	-
Glenlea, Man.	4	4	-	-	3	4	0	3	3	-	3	-	1	1	3
Winnipeg, Man.	4	4	0	-	3	4	2	3	3	3	0	0	3	2	3
Fort William, Ont.	4	4	0	0	0	4	3	1	1	0	0	0	2	0	2
Kapuskasing, Ont.	1	1	0	-	0	0	0	0	0	0	0	0	0	0	1
St. Catharines, Ont.	1	2	4	-	0	1	0	0	-	0	0	0	1	0	-
Guelph, Ont.	3	4	3	-	0	3	2	1	1	3	0	-	1	4	4
Verner, Ont.	3	4	0	0	1	1	0	1	2	0	0	0	0	0	3
Douglas, Ont.	4	4	0	2	2	2	3	4	0	0	0	0	1	3	3
Kemptville, Ont.	4	4	3	-	2	2	3	1	0	-	-	-	-	2	3
Merrickville, Ont.	0	2	-	-	3	3	-	1	1	-	-	-	-	0	2
Appleton, Ont.	4	4	2	-	4	3	0?	2	1	-	-	-	-	3	3
Ottawa, Ont.	4	3	0	-	2	0	4	1	2	1	-	-	-	2	2
Alfred, Ont.	4	4	0	-	2	3	3	2	2	2	-	-	-	3	-
Williamstown, Ont.	4	3	0	3	1	1	4	1	0	-	-	-	-	2	-
Macdonald College, Que.	4	4	2	-	1	3	3	0	0	3	0	0	0	2	2
Lennoxville, Que.	2	3	2	0	2	0	4	0	2	0	1	0	0	1	3
La Pocatière, Que.	4	4	0	1	2	0	4	2	-	3	0	0	2	2	-
Normandin, Que.	3	3	0	2	1	0	4	0	0	0	0	4	4?	0	2
L'Assomption, Que.	3	4	0	0	2	2	2	1	1	0	0	0	3	0	3
Fredericton, N.B.	0	2	0	0	0	0	2	0	0	-	-	-	-	0	0
Kentville, N.S.	1	1	0	0	1	2	3	0	0	0	0	0	2	2	3
Nappan, N.S.	0	4	0	4	0	0	4	0	1	0	3	0	0	0	3
Brule, N.S.	2	-	0	3	1	0	4	0	-	0	1	0	2	0	-
Bras-d'Or, N.S.	0	0	0	4	0	0	4	0	0	0	0	0	2	0	0
Charlottetown, P.E.I.	0	4	0	2	0	2	4	0	0	0	2	0	1	0	0
Doyles, Nfld.	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
St. John's West, Nfld.	0	1	0	0	0	0	0	0	0	0	0	0	2	-	0

1/ 1 = trace, 2 = light, 3 = moderate, 4 = heavy
For the rusts 1 = trace - 1%, 2 = 2 - 20%, 3 = 21 - 50%, 4 = over 50%

DISTRIBUTION OF PHYSIOLOGIC RACES

Puccinia graminis Pers. f. sp. tritici Erikss. & Henn.

Eleven races and subraces of wheat stem rust were identified in Canada in 1962 (Table 8). This is a surprisingly small number of races in view of the large number of isolates identified and appears to result from the overwhelming predominance of race 56. This race comprised over 60 per cent of the 1962 isolates from all varieties but it comprised nearly 80 per cent of the isolates from susceptible varieties (Table 9). The decline in the prevalence of the subraces of 15B was arrested in 1962. Subraces 15B-1L (Can,) and 15B-4 (Can.) declined to about 11 per cent of the isolates in 1961 but in 1962 they comprised 14 per cent of the isolates from susceptible varieties (Table 9) and over 28 per cent of the isolates from all varieties many of which are selective for these races (Table 8). Race 15B-1 (Can.), regarded as the original race 15B, was not identified for the second consecutive year. The remaining eight races occurred rarely and appear to have little practical significance in Western Canada. Race 29-1 (Can.) can attack seedlings and adult plants of Selkirk in the greenhouse but it does not appear to threaten this variety in the field. Its prevalence has declined markedly over the past five years.

The reactions of the varieties Lee, Golden Ball, Yuma, and lines of Marquis carrying single substituted genes for resistance to the races identified in 1962 appear in Table 10. The three named varieties have been useful in differentiating 'subraces but the Marquis lines and Lee, which carries Srll, separate most of the subraces and make possible further separations in races 11 and 15B-1L (Can.). Reactions of the Marquis lines to isolates of race 11 have varied widely over the years. No attempt has been made to name these variants excepting race 11-1 (Can.) which attacks Golden Ball, and race 11-2 (Can.) which attacks Golden Ball, Selkirk, and the Marquis line carrying Sr6. In 1962, about one-third of the isolates of race 15B-1L (Can.) were more virulent than the other isolates on the lines of Marquis carrying Sr7 and Srl0.

Following the practice of past years all isolates were bulked in lots of about twenty and the bulk inoculum used to infect a group of highly resistant varieties (D. T. 164, C.I. 8155, St 464, D. T. 161, Ramsey, C, T. 263, Pembina, Selkirk, C. T, 244, Mayo 54, Justin, Mida-McMurachy-Exchange II-47-26, and Frontama-K58-Newthatch II-50-17). Isolations were made from susceptible type infections that developed on these varieties but no new races were detected.

Puccinia recondita Rob. ex. Desm. f. sp. tritici

Nine races of wheat leaf rust were isolated in the 1962 race survey (Table 11). Race 15 was the most prevalent race in Canada and was markedly predominant in the Prairie Provinces. Race 9 was isolated from the earliest collections made in Manitoba; these collections came from highly susceptible varieties at Morden. However, it was not isolated from subsequent collections, most of which were obtained from commercial fields of Selkirk wheat. This variety is highly resistant to race 9 and moderately resistant to most isolates of races 5 and 15.

Table 8. Distribution by provinces of physiologic races of Puccinia graminis f. sp. tritici collected on wheat, barley and grasses in 1962.

Race	Province							Total Isolates	Per cent of total Isolates
	N.S.	Que.	Ont.	Man.	Sask.	Alta.	B.C.		
11	-	-	-	1	1	-	2	4	1.1
11-1 (Can.)	-	-	-	2	-	-	-	2	0.5
15B-1L (Can.) 1/	-	1	3	70	17	-	-	91 2/	24.7
15B-4 (Can.) 1/	1	2	-	10	1	-	-	14	3.8
17	-	-	8	6	-	-	-	14	3.8
18	-	-	-	-	1	-	-	1	0.3
29-1 (Can.)	-	1	-	3	-	-	-	4	1.1
38	-	-	3	-	-	-	-	3	0.8
48A	-	-	1	1	-	-	-	2	0.5
56	2	16	33	120	54	6	-	231	62.8
59	-	-	-	-	-	-	-	2	0.5
Total No. of Isolates	3	20	48	213	74	6	4	368	

1/ Race 15B-1L (Can.) and race 15B-4 (Can.) appear to be equivalent to races 15B-2 and 15B-3, respectively, of the Cooperative Rust Laboratory, St. Paul, Minnesota.

2/ Includes 35 isolates virulent on the Marquis line carrying Sr10 and moderately virulent on the line carrying Sr7.

Table 9. Distribution by provinces of physiologic races of Puccinia graminis f. sp. tritici collected on barley, wild barley and susceptible varieties of wheat in 1962.

Race	Province							Total Isolates	Per cent of total Isolates
	N.S.	Que.	Ont.	Man.	Sask.	Alta.	B.C.		
11	-	-	-	2	-	-	2	4	1.8
15B-1L (Can.)	-	1	2	22	3	-	-	28	12.5
15B-4 (Can.)	1	2	-	-	1	-	-	4	1.8
17	-	-	4	2	-	-	-	6	2.7
18	-	-	-	-	1	-	-	1	0.4
29-1 (Can.)	-	-	-	1	-	-	-	1	0.4
38	-	-	2	-	-	-	-	2	0.9
56	2	13	30	97	28	6	-	176	78.6
59	-	-	-	-	-	-	2	2	0.9
Total No, of Isolates	3	16	38	124	33	6	4	224	

Table 10. Infection types produced on supplemental hosts and other wheat varieties by physiologic races of stem rust identified in 1962.

Race	Lee	Golden Ball	Yuma	Marquis Sr 6	Marquis Sr 7	Marquis Sr 8	Marquis Sr 9	Marquis Sr 10
11 [1]	1	2	,	,	23CN	3	1+	;1
11 [2]	1		,	,	4C	2	2	4
11-1 (Can.)	1	4	,	,	23CN	4	2	X-
15B-1L(Can.)	3+or4	2	3C		23CN	2	1+	X
15B-1L(Can.)	3+or4	2	3C or3	,	3+ or 4	2	2-	3 t o r 4
15B-4 (Can.)	2t	4	;1	,	23CN	2	4	4
17	1	4	,	,	23CN	4	2	X-
18	1	2	;	;	4	2	1+	4
29-1 (Can.)	1	4	,	3t	4	4	1+	4-
38	1	2	,	,	23CN	2-	2	1+
48A	1	4	;	2	4-	2	2	2
56	1	2	;	,	4	2	2	2
59	1	2	,	,	3C	2-	2	2

1/ Race 11 isolated from collections made in Manitoba and Saskatchewan.
2/ Race 11 isolated from collections made in British Columbia,

Table 11. Distribution by geographic areas of physiologic races of Puccinia recondita isolated in Canada in 1962.

Race		Geographic area							Total Isolates	Per cent of total Isolates
UN		Mar. Prov.	Que	Ont.	Man.	Sask.	Alta.	B.C.		
1	1	-	-	-	-	-	-	2	2	0.6
2	15	1	5	17	141	84	10	2	260	72.3
3	3	1	-	-	-	-	-	4	5	1.4
	58	7	7	22	1	1	-	-	38	10.6
5	5	-	-	2	17	9	-	-	28	7.6
6	105	-	1	1	-	-	-	-	2	0.6
9	9	-	-	-	7	5	-	-	12	3.3
10	11	-	1	3	-	-	-	6	10	2.8
13	35	-	-	3	-	-	-	-	3	0.8
Total Isolates		9	14	48	166	99	10	14	360	100.0

The outstanding feature of the 1962 leaf rust race survey was the appearance in the rust population of strains virulent on Selkirk. This is the first year that cultures virulent on this variety have been isolated in Canada. The Occurrence of virulent cultures is of considerable practical importance since Selkirk is the principal wheat variety grown in the rust area. These cultures, which comprised 18 per cent of the Manitoba isolates and 9 per cent of the Saskatchewan isolates, ranged in virulence from 2++ to 3+, whereas the typical reaction on Selkirk is 1+ to 2. Cultures virulent on Selkirk will undoubtedly increase in prevalence since they have a considerable selective advantage on this host. All cultures virulent on Selkirk were variants of the well adapted races 5 and 15.

The appearance of new virulent types within established leaf rust races is now well recognized and supplementary differentials are used to characterize these cultures. All 1962 isolates were studied on the NA 61 set of supplementary differentials and 80 per cent of the 360 isolates were identified as MA 61-14 which attacks three of the four supplementary differential varieties (Table 12).

Bulked collections of leaf rust urediospores from each area were used to inoculate a group of highly resistant wheat varieties which included Agrus, Transfer, Klein Lucero, Aniversario, Africa 43, Klein Titan and Maria Escobar. A few type 4 pustules were observed on Klein Titan and Maria Escobar and cultures virulent on these varieties were obtained. The other varieties were resistant to all collections of leaf rust.

Puccinia hordei Otth.

Fourteen collections of barley leaf rust were studied in 1962. Race 4 (3 collections) and race 44 (11 collections) were the only races identified. The commercial variety Parkland was heterogeneous for leaf rust resistance and preliminary tests indicate that resistance in this variety was derived from OAC 21.

Table 12. Distribution by geographic areas of NA 61 races of Puccinia recondita isolated in Canada in 1962.

Geographic area	Number of Isolates of Indicated NA 61 Races							
	1	3	4	5	7	10	12	14
B. C.	-	-	-	-	-	4	4	6
Alta.	-	-	-	-	-	-	-	10
Sask.	-	3	-	5	-	-	4	a7
Man.	-	2	-	8	-	-	13	143
Ontario	3	6	3	-	14	-	2	20
Quebec	-	1	-	-	-	-	1	12
Maritimes	-	1	-	-	-	-	-	8
Total Isolates	3	13	3	13	14	4	24	286

Table 13. Distribution by provinces of physiologic races of Puccinia graminis f. sp. avenae identified in Canada in 1962.

Race	Provinces						Total Isolates	Per cent of total Isolates
	N. S.	Que.	Ont.	Man.	Sask.	B. C.		
1	--	--	--	2	--	--	2	1.2
2	--	--	--	5	--	1	6	3.6
4A	--	1	2	--	--	--	3	1.8
6A	1	5	14	--	--	--	20	11.8
6F	--	--	3	57	5	--	65	38.5
7	--	--	1	--	--	--	1	0.6
7A	--	--	2	58	2	1	63	37.3
8A	--	--	5	--	--	--	5	2.9
11A	--	--	2	--	--	--	2	1.2
13A	--		2	--	--	--	2	1.2
Total No. of Isolates	1	6	31	122	7	2	169	

Table 14, Distribution by province8 of physiologic races of Puccinia graminis f. sp. avenae collected on susceptible varieties of cultivated oats and wild oats in Canada in 1962.

Race	Province						Total Isolates	Per cent of total Isolates
	N. S.	Que.	Ont.	Man,	Sask.	B. C.		
1	--	--	--	2	--	--	2	2.7
2	--	--	--	5	--	1	6	8.1
4A	--	--	1	--	--	--	1	1.4
6A	1	1	5	--	--	--	7	9.5
6F	--	--	--	38	3	--	41	55.4
7	--	--	1	--	--	--	1	1.4
7A	--	--	--	12	2	1	15	20,3
11A	--	--	1	--	--	--	I	1.4
Total No. of Isolates	1	1	8	57	5	2	74	

Puccinia graminis Pers. f. sp. avense Erikss. and Henn.

The distribution of races of oat stem rust in Western Canada in 1962 (Tables 13 and 14) was markedly different than in earlier years. A new type of race 6 that can attack varieties carrying gene F is now predominant in the rust area. This race, tentatively called 6F, had not been found previously in Canada except for a few cultures in 1961. It was isolated commonly from rust collected on susceptible wild oats (Avena fatua L.) and rarely from the variety Rodney which predominates in Manitoba. Concern was felt when the first cultures of this race were encountered in the greenhouse because infections ranging from type 1 to type 4 developed on the varieties Garry and Rodney, Many single pustule isolates from both infection types also produced infection types 1 to 4 on these varieties indicating that they are mesothetic in reaction to race 6F. The scarcity of 6F on Rodney and Garry in the field indicated that these varieties are resistant in the adult plant stage and this was confirmed in greenhouse trials with adult plants. Race 7A was isolated frequently from rust collected in Manitoba in late fields of the variety Rodney which is resistant to the other races found in Western Canada.

Dangerous races such as 6A and 8A predominated in the barberry areas in Eastern Canada as they have for the past four years. In former years these races had not been found west of the Kingston area in Ontario, but in 1962 they occurred at Guelph and Vineland.

Puccinia coronata Cda. f. sp. avenae Erikss.

Thirty-six physiologic races of crown rust were identified from a total of 233 isolates made in Canada in 1962 (Table 15). Races 216 and 274, virulent on Victoria, are on the increase representing more than 40 per cent of the isolates in Western Canada and 28 per cent of the isolates in Eastern Canada. Races 294 and 295, virulent on Landhafer and Santa Fe, which had previously been obtained only in the east, were isolated this year in the west. Most isolates, regardless of race, were able to attack the prevailing commercial varieties Garry and Rodney. In Eastern Canada the racial population remained much the same as in previous years.

Several new physiologic races of crown rust were discovered during the 1962 ,survey. The most important of these, race 332 (race number assigned by Marr. D. Simons, U.S. D.A. Agricultural Research Station, Ames, Iowa), is one of the few crown rust races capable of attacking both the differential varieties Victoria and Saia. This new race attacks all oat varieties in the differential set with the exception of Trispernia, Bondvic, Landhafer, and Santa Fe. The evolution of race 332, contrary to that of most races of crown rust, cannot be explained in terms of selection pressure exerted by the prevailing host varieties. A close relationship exists between this new race and race 216, from which race 332 may have arisen by mutation. Four additional new races, 1962-2 to 1962-5 (Table 15), were also found in Western Canada in 1962. These have not been assigned race numbers pending further investigation.

Table 15. Distribution by geographic areas of physiologic races of Puccinia coronata avenae collected on oats in Canada in 1962.

Physio-logic race	Geographic areas						
	Que. and Maritime Provinces	Ontario	Total Isolates East	% of Total Isolates East	Prairie Provinces	% of Total Isolates West	Total Isolates East & West
201	0	0	0	000	1	0.7	1
202	1	0	1	1.2	1	0.7	2
203	1	4	5	5.8	32	21 64	37
205	0	1	1	1.2	0	0.0	1
209	1	2	3	35	0	0.0	3
210	3	7	10	11.7	1	0.7	11
211	0	2	2	2.3	12	8.0	34
212	2	2	4	47	1	0.7	5
216	9	6	15	17.5	47	31.5	62
226	0	3	3	35	3	2.0	6
228	1	1	2	2.3	0	0.0	2
229	0	1	1	12	0	0.0	1
231	0	1	1	12	1	0.7	2
235	1	0	1	1.2	0	0.0	1
237	0	1	1	1*2	0	000	1
239	0	1	1	12	1	0.7	2
240	0	1	1	12	1	0.7	2
241	0	0	0	0.0	5	3.3	5
263	0	1	1	102	0	0.0	1
264	0	1	1	12	1	0.7	2
274	7	2	9	10.5	15	100	24
275	1	0	1	1.2	2	13	3
276	0	0	0	000	1	0.7	1
279	0	0	0	00	1	0.7	1
281	0	2	2	2.3	0	0.0	2
284	1	9	10	21.7	0	0.0	10
285	0	1	1	1u2	0	0.0	1
293	0	1	1	12	1	0.7	2
294	0	2	2	2e3	7	4.7	9
295	0	3	3	3.5	6	4.0	9
299	0	0	0	0.0	1	0.7	1
332	1	1	2	2.3	3	2.0	5
1962-2	0	0	0	0.0	1	0.7	1
1962-3	0	0	0	0.0	1	0.7	1
1962-4	0	0	0	0.0	1	0.7	1
1962-5	0	0	0	0.0	1	0.7	1
Total No. of Isolates	29	56	85	100.0	148	100.0	233

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