## Other Diseases

Powdery mildew (Erysiphe graminis) was relatively scarce on wheat in 1949, being found in only 6 nurseries as compared with 16 in 1948. On barley it was observed in only two nurseries, Agassiz, B.C., and Kemptville, Ont. No mildew was observed on oats in any of the nurseries.

Diseases caused by Septoria spp. were also relatively scarce possibly because of the dry, warm weather that prevailed over much of Canada from spring to midsummer. Speckled leaf blotch of oats (S. Avenae) was, however, found in light or moderate amounts in many of the rust nurseries in Eastern Canada.

## PHYSIOLOGIC RACES OF CEREAL RUSTS IN CANADA IN 1949

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This report gives the distribution in Canada, in 1949, of physiologic races of the following rusts of cereals: Puccinia graminis var. Tritici, Puccinia graminis var. Avenae, Puccinia triticina, Puccinia coronata var. Avenae, Puccinia Hordei. Included also is a brief record of studies carried out with collections of aecia made on barberry and buckthorn.

For the development of cereal rusts in Canada in 1949, the report on the Rust Nurseries may be consulted.

### Distribution of Physiologic Races of the Cereal Rusts

From the 100 isolates of wheat stem rust (Puccinia graminis var. Tritici) studied 12 physiologic races were isolated: 69 isolates of race 56, 12 of race 38, 5 of race 17, 5 of race 29, 2 of race 36, and 1 of each of races 1, 16, 19, 32, 39, 48, and 80. The chief difference between the racial distribution this year and in 1948 is that the considerable prevalence of races 17, 29, and 38 in 1948 was not repeated in 1949. These three races, which in 1948 accounted for about 50% of all isolates, comprised in 1949 only 22% of them. This year, race 56 resumed its high predominance of former years, accounting for 69% of all isolates as compared with 42% in 1948. It is rather a remarkable fact that of the 45 isolates from the Prairie Provinces 44 belonged to race 56.

In Eastern Canada race 56 was also the most common race but its predominance was much less pronounced. Race 38, as in most former years, was second in order of prevalence. The occurrence of races 16 and 36, collected at Appleton, Ont., is possibly related to the presence in that locality of numerous barberry plants.

The collections from B.C. were limited to the vicinity of Creston. The race isolations indicate a race distribution in that area considerably different from that prevailing east of the mountains and distinctly more varied (T. Johnson).

Table 3. Incidence of certain pathogenic fungi on wheat, oats and barley grown at 31 localities in Canada in 1949.

| Locality | Wheat | | | | | | Oats | | | Barley | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P. gr. Tritici | P. triticina | Erysiphe graminis | Septoria nodorum | S. Avenae f.sp. tritícea | Fusarium spp. (Scab) | P. gr. Avenae | P. coronata Avenae | Septoria Avenae | P. graminis | P. Hordei | Erysiphe graminis | Septoria Passerinii |
| Saanichton, B.C. | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Creston, B.C. | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 |
| Agassiz, B.C. | 0 | 4 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 4 | 0 |
| Beaverlodge, Alta. | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Edmonton, Alta. | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lethbridge, Alta. | 0 | 1 | - | - | - | 0 | 0 | 0 | - | 0 | 0 | - | - |
| Scott, Sask. | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Melfort, Sask. | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indian Head, Sask. | 1 | 4 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brandon, Man. | 2 | 4 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 2 |
| Winnipeg, Man | 3 | 4 | - | 0 | 2 | 0 | 2 | 3 | 0 | 2 | 3x | - | 2 |
| Morden, Man. | 2 | 4 | - | - | 1 | 0 | 2 | 0 | 0 | 1 | 0 | - | 0 |
| Ft. William, Ont. | 4 | 4 | 0 | 0 | 0 | 0 | 2 | 2 | 4 | 3 | 0 | 0 | 0 |
| Kapuskasing, Ont. | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 3 |
| Mindemoya, Ont. | 3 | 4 | 0 | 3 | 1 | 0 | 1 | 3 | 3 | 2 | 3 | 0 | 0 |
| St. Catharines, Ont. | 1 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Guelph, Ont. | 2 | 3 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 |
| Appleton, Ont. | 3 | 4 | 0 | 0 | 2 | 0 | 3 | 2 | 1 | 3 | 4 | 0 | 0 |
| Ottawa, Ont. | 3 | 4 | 3 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | 2 | 0 | 0 |
| Merrickville, Ont. | 2 | 4 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 3 | 0 | 0 |
| Kemptville, Ont. | 2 | 4 | 4 | 0 | 0 | 0 | 1 | 3 | 2 | 2 | 1 | 3 | 0 |
| Williamstown, Ont. | 2 | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Macdonald College, Que. | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 |
| L'Assomption, Que. | 2 | 4 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 | 0 | 0 |
| Lennoxville, Que. | 2 | 4 | 0 | 0 | 0 | 1 | 2 | 1 | 3 | 2 | 0 | 0 | 0 |
| Normandin, Que. | 0 | 4 | 0 | 3 | 0 | 2 | 1 | 0 | 3 | 0 | 2 | 0 | 4 |
| Ste. Anne de la Pocatière, Que. | 1 | 4 | 0 | 0 | 1 | 0 | 0 | 4 | 3 | 2 | 2 | 0 | 0 |
| Fredericton, N.B. | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 |
| Kentville, N.S. | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 0 | 0 | 0 |
| Pictou, N.S. | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Charlottetown, P.E.I. | 1 | 4 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 |

xArtificially created epidemic.

Note: 1 = trace; 2 = light; 3 = moderate; 4 = heavy.

The identification of races of Puccinia triticina was carried out by the use of the reduced set of differential hosts agreed on at a meeting of Canadian and American investigators of leaf rust in St. Paul, Minn., in February, 1948. The dropping of the differential hosts, Carina, Brevit and Hussar and the use of a dichotomous key reduces the number of races from 130 to 24. Little difficulty was experienced in relating the races of the new key to those of the old and such doubts as arose were resolved by checking with the three discarded hosts.

The procedure followed in race determination differed in one respect from that of preceding years. Each rust collection, after increase on the susceptible host, Little Club, was inoculated to a "screening set" of accessory hosts comprising the varieties Exchange, Hope x Timstein, Gabo, and R.L. 2520 (Frontena x (R.L. 2265 x Redman$^2$)), all of which have a high degree of leaf rust resistance. Any large pustules observed on these varieties were used for study of the race or races involved. The screening set served the purpose of calling the investigator's attention to any races that might be a threat to the new sources of leaf rust resistance now used by plant breeders. It is not necessarily intended that the screening set should be the same from year to year but rather that it should contain varieties currently used as sources of leaf rust resistance.

The physiologic race distribution in 1949 did not differ greatly from that of the previous year. The races have been numbered according to the "Unified Numeration" of a new key, but the old number corresponding to each of these new numbers is also given.

The 361 isolates studied were identified as follows (number of isolates in brackets): UN 1= races 1 and 1a (25); UN 2= races 15 and 15a (71); UN 3= races 3 and 58 (43); UN 5= race 5a (92); UN 6= races 126 and 126a (91); UN 9= race 9 (9); UN 10= race 11 (17); UN 11= race 93 (1); UN 14= race 128a (4); UN 16= race 33 (8). The letter "a" is used to designate isolates virulent to Hope and H-44 derivatives.

UN 3 (race 58) was the predominant race in Eastern Canada. In Man. and Sask. UN 2 (race 15a), UN 5 (race 5a) and UN 6 (race 126a), which are virulent to wheats of Hope or H-44 derivation, were present almost to the exclusion of other races. In southern Alta. and B.C. these races were present also (though it may be noted that the isolates of UN 2 from B.C. corresponded to race 15 rather than 15a) but the predominant races were UN 1 (race 1), UN 10 (race 11), and UN 16 (race 33). It seems clear that much of the leaf rust in this area does not come from the same source as the rust found in the eastern prairie region. This source is probably the Palouse area of Washington and Idaho. It is worth noting that the screening sets clearly differentiated the rust collections made in southern Alta. and around Creston, B.C. from other collections. Collections from this area attacked the varieties Gabo and Hope x Timstein more or less heavily, whereas other Canadian collections did not (T. Johnson, A.M. Brown).

No significant change has occurred in the past year in the distribution of the physiologic races of oat stem rust (Puccinia graminis var. Avenae). From the 79 isolates studied 10 physiologic races were isolated: 24 of race 10, 18 of race 8, 15 of race 2, 7 of race 11, 6 of race 5, 4 of race 1, 2 of race 6 and 1 each of races 4, 7 and 13. In terms of the isolates identified it might appear as if the race group 8, 10, 11 had gained a considerable predominance over the race group 1, 2, 5, the

common races of former years. However, by considering only those collections made on varieties that exercise no selective action it appears that the two race groups are present in almost equal concentration. The isolates of races 4, 6 and 13 came from areas in which barberry occurs and may, consequently, have originated on this host (T. Johnson).

A very definite change is taking place in the relative prevalence, in Canada, of the various physiologic races of crown rust (Puccinia coronata var. Avenae). The races isolated in 1949 with the number of isolates of each in curves were as follows: Race 1 (4 isolates), race 2 (24), race 3 (13), race 4 (4), race 5 (1), race 6 (2), race 34 (29), race 38 (1), race 45 (8), and race 57 (8). Prior to 1947 the races that attack Bond and Clinton (races 34, 45, 57) were quite rare. In some years they were not collected at all and they never comprised more than a small fraction of the isolates identified. The first increase in the prevalence of these races occurred in 1947 when they comprised 4% of all isolates. In 1948 they comprised about 20% of all isolates and in 1949 they increased still further, constituting about half of all isolates identified. The increase in these races is no doubt due to the increased acreage in the United States devoted to varieties derived from Bond. The Bond derivatives are, as a rule, immune to the common crown rust races but susceptible to races 34, 45 and 57, and, therefore, tend to favour the increase of these races and to suppress the increase of the common races.

In all, 10 distinct physiologic races of crown rust were isolated by use of the standard differential oat varieties. However, by using R.L. No. 2065, Saia C.I. 4629, and Ukraine C.I. 2359 as additional hosts, it was possible to distinguish four biotypes of race 2, four biotypes of race 3, two biotypes of race 4, two biotypes of race 38, and four biotypes of race 34. This expanded differential host set showed the presence of 21 races and biotypes in the cultures studied (B. Peturson).

Barley leaf rust (Puccinia Hordei), although not severe in 1949, was present on barley in Que., Ont., Man. and B.C. Several collections were made in each of these provinces, all of them from the variety Vantage. It is of particular interest that most of the physiologic races isolated from Vantage were races that are not recorded in the International Register, recently compiled by M.N. Levine and W.J. Cherewick. Races 44 and 49 occurred in Que., while in Ont. race 4 only occurred. A new race was isolated from a collection made in Que. and the races occurring in Man. and B.C. were also races not hitherto encountered.

To a new race collected at Winnipeg, the varieties Campana, Newal, Frontier, Gem, Montcalm, Plush, Rex, Byng, Wisconsin 38, Velvon, Feebar, Tregal, Vantage and Titan, all were susceptible, but to race 44, collected in Que., Frontier, Gem and Feebar were resistant, while all of the other varieties just mentioned were susceptible (A.M. Brown).

The Relative Prevalence of Varieties Tritici and Secalis of P. graminis on Barley.

In view of the fact that barley is attacked not only by P. graminis var. Tritici (wheat stem rust) but also by P. graminis var. Secalis (rye stem rust) it was thought advisable to test stem rust collections made on

barley for the presence of both rusts. In a total of 37 collections on barley, var. Tritici alone occurred in 23 collections, var. Secalis alone in 6 collections, and both varieties together in 8 collections. The isolates of var. Secalis occurred in collections from B.C., Alta., Man., Ont., Que., and N.B. In one locality only, Fredericton, N.B., was there evidence that barley was severely rusted by var. Secalis. Although var. Secalis is widely distributed in Canada it is definitely of importance secondary to that of var. Tritici (T. Johnson).

Infection Studies with Aecia from Berberis and Rhamnus in 1949

Isolations from Aecia on Berberis

Isolations from 15 collections of aecia from Eastern Canada produced only varieties Secalis and Agrostidis of Puccinia graminis. Only var. Agrostidis occurred in the 7 collections from the Maritime Provinces, and this variety was present also in 2 of the collections from Ont. and in 1 from Que. In these two provinces, however, var. Secalis, which occurred in 6 of the 8 collections, was the predominant one (T. Johnson).

Isolations from Aecia on Rhamnus species

Aecial collections were obtained on Rhamnus cathartica from P.E.I., N.B., Que., Ont., and Man., on R. saxatilis and R. tinctoria in Man. and on R. Frangula in N.B. From the 17 collections on R. cathartica, Puccinia coronata var. Festucae was isolated from 2 collections, var. Avenae from 11 collections, and a variety tentatively designated as Bromi (Muehleth.)[x] from 7 collections. Var. Bromi was isolated also from collections made on R. saxatilis and R. tinctoria. Puccinia coronata var. Agrostis was the only variety of crown rust isolated from R. Frangula.

The following physiologic races of the variety Avenae were isolated from the 11 above mentioned collections of that variety: race 2 (3 isolates), race 3 (7), race 6 (3), race 38 (2), and race 4 (1).

Two of the isolates of var. Bromi, one from R. saxatilis at Morden, Man., the other from R. cathartica at Kemptville, Ont., were tested for pathogenicity to several varieties of cereals. The results demonstrate the existence of physiologic races within var. Bromi (B. Peturson).

[x]Owing to the ability of this strain to attack rye, barley, and even wheat, as well as certain species of Bromus, its proper nomenclature must be left for future decision.