Other Diseases

In addition to the cereal rusts, a summary of the incidence in the rust nurseries of several other diseases is given in Table 2. Powdery mildew (Erysiphe graminis) of wheat and barley was confined largely to the nurseries in B.C., and a few of those in Eastern Canada. Speckled leaf blotch of oats (Septoria avenae) was not found west of Fort William, Ont., except at Agassiz, B.C., where a moderately heavy infection occurred. It was present in various amounts in most of the nurseries in Eastern Canada. Speckled leaf blotch of barley (S. passerinii) occurred in the nurseries in Man. and at Edmonton, Alta., but was rare in the Eastern nurseries. Disease ratings on the varieties in the test revealed that Wis. H.106 was generally more lightly infected than the others. Scald of barley (Rhynchosporium secalis) was found in the nurseries located in the northern areas of Alta. and Sask., but was observed at only one other point (Ste. Anne de la Pocatiere, Que.). Some other diseases on which no systematic notes were taken were widespread such as net blotch (Helminthosporium teres) and spot blotch (H. sativum) of barley and Septoria leaf blotch of wheat caused by Septoria avenae f. sp. triticea. Septoria nodorum, the cause of glume blotch of wheat was less common but was found in slight amounts at Edmonton, Alta., Scott, Sask., Normandin, Que., and Fredericton, N.B. Septoria tritici was found only at Lethbridge and Edmonton, Alta.

PHYSIOLOGIC RACES OF CEREAL RUSTS IN CANADA IN 1953

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In Report 6 issued by the Plant Pathology Laboratory, Winnipeg, Man., in January 1954, an account is given of cereal rust development in Western Canada in 1953 and the distribution in Canada is recorded of the physiologic races of the rusts: wheat stem rust (Puccinia graminis var. tritici), wheat leaf rust (P. triticina), oat stem rust (P. graminis var. avenae), and oat crown rust (P. coronata var. avenae). Isolations from a few collections of aecia from barberry and buckthorn in Eastern Canada are also recorded.

Cereal rust development in Western Canada has been reported elsewhere (see Rust Nurseries). Accordingly the distribution of the physiologic races of cereal rusts and the results from aecial collections of barberry and buckthorn are summarized below.

Distribution of Physiologic Races

Puccinia graminis var. *tritici*

In 1953, the stem-rust survey comprised 307 isolates. The following races were isolated (the number of isolates of each race in brackets): race 2(3); race 10(1); race 11(1); race 15B-1(246); race 15B-2(6); race 15B-3(1); race 19(1); race 29(7); race 38(2); race 48(1); race 49(1); race 56(28); race 59(1); race 59B(2); race 98(1); race 113(1); and race 139(4). It may be noted that race 15B-1 produces a 2+ or 3- type of infection on Golden Ball and flecks or 1 type on Selkirk, 15B-2 produces a 4 type on Golden Ball and flecks or 1 type on Selkirk, and 15B-3 produces a 2+ or 3- type on Golden Ball and a 4 type on Selkirk. Again, 59 produces a 2 type of infection on Marquis, 0 on Reliance and flecks on Kota, and 59B produces a 2+ type on Marquis, and a 2 type on Reliance

and Kota.

In the study of the 1953 isolates, the differential varieties Spelmar and Acme were not used except in the determination of certain isolates. Four additional varieties were used: Lee (to differentiate isolates of the race 15B type), Golden Ball (to distinguish race 15B-2 from other 15B type isolates), Selkirk (to detect isolates of the race 15B-3 type), and Kenya 338 AC.2.E.2. The latter is not a differential host but was used as an accessory variety to determine whether any of this year's rust collections were capable of attacking it severely. This variety has been resistant, thus far, to all stem-rust collections against which it has been tested.

The number of isolates studied was the same as in 1952 but 17 races, including biotypes, were identified in the 1953 survey as against 10 in 1952. Races found in 1953 but not in the preceding year are races 10, 19, 29, 49, 59, 59B, 98, and 113. Race 15B-3, recorded for the first time in the present survey, evidently was present in 1952 also, though evidence of its existence was not discovered until towards the spring of 1953, when a special study of a number of 1952 collections of race 15B revealed its presence in collection No. 264-52 from Vantage barley obtained at Regina, Sask. Most of that collection was race 15B-1 as was indicated by the fact that it produced mostly necrotic flecks and type 1 pustules on the variety McMurachy. A large pustule, however, developed on one leaf of this variety. This gave rise to a culture identical with race 15B-1 except for its ability to attack McMurachy and its derivative Selkirk rather severely.

The predominant race was 15B-1 which accounted for 80.1% of all isolates. The only other race of frequent occurrence was race 56, the predominant race for many years prior to 1950, which comprised 9.1% of the isolates. As in the preceding 3 years, race 56 was more frequently collected in Alta. than in the other two Prairie Provinces.

Of the other races identified, race 139 is of special interest. This race attacks McMurachy heavily but is not virulent to Thatcher or Lee or Hope - and H44- derivatives. Despite its ability to attack McMurachy it is not virulent to its derivative Selkirk. Evidently the resistance of Selkirk is due to its possessing the H44 type of resistance derived from its other parent Redman. Race 139, however, attacks the durum wheat Golden Ball heavily in the seedling stage. Another race of some interest is race 29 which also attacks Golden Ball heavily. A characteristic of race 29 and of the three isolates of race 139 from Eastern Canada is the light colour of the uredinia, which are decidedly more orange than is usual in stem rust. The Western isolate of race 139 (from Alta.) is an exception; its uredinia have the usual stem-rust colour.

It is again evident, as in former years, that race distribution in B.C. is different from that of the Prairie Provinces. Races 2 and 59B, pathogenically rather similar, appear to predominate in the Creston area, in southeastern B.C.

Puccinia graminis var. secalis on Barley

Stem rust on barley in Canada, in 1953, was predominantly wheat stem rust. Most stem rust collections from barley and Hordeum jubatum were analysed for the presence of wheat and rye stem rust. Of 23 isolates from barley grown in Eastern Canada only 6 were rye stem rust. Of 41 isolates from barley grown in Western

Canada only 5 were rye stem rust. Similarly, wheat stem rust predominated in collections from H. jubatum; of 17 isolates from this host only 2 were rye stem rust.

Puccinia triticina

The physiologic races of leaf rust of wheat were recorded according to the "Unified Numeration" (UN) of the key agreed on, in 1948, by American and Canadian investigators of this rust. In this key the races are grouped in the 24 classes they fall into if the differential hosts consist of only Malakof, Webster, Loros, Mediterranean, and Democrat. Race identification, in 1953, was made by means of these hosts with the addition of the variety Brevit, and the further addition of Renown which makes possible the separation of certain biotypes not otherwise readily distinguishable. The varieties Carina and Hussar were added occasionally when it was judged necessary to test certain isolates on the full assortment of differential hosts. The old race numbers corresponding to the UN groups are also given.

All rust collections were initially increased on the susceptible variety Little Club. Two single-pustule isolates were established from each collection and used for race determination. The remainder of each culture was inoculated to a screening set composed of the resistant varieties Exchange, Gabo, Lee, Frontana, and Selkirk. Any unusually large pustules produced on the screening varieties were used to initiate cultures for the determination of the races involved.

The 195 isolates studied were identified as follows (numbers of isolates in brackets): UN 1 = races 1(3) and 1a(2); UN 2 = races 15 (8) and 15a(48); UN 3 = races 3(1) and 58(71); UN 6 = race 126(6); UN 9 = race 9(4); UN 10 = race 11(10); UN 11 = race 93(2); UN 13 = race 35(5); and UN 14 = race 128a(2). Races with the suffix "a" as 1a and 15a, are virulent to seedlings of Renown and many other derivatives of H44 and Hope.

In most respects the race distribution in 1953 was similar to that of the preceding year. Race 58 was by a wide margin the predominant race in Eastern Canada and races 15a and 5a occurred in the Prairie Provinces almost to the exclusion of other races. It may be noted that of the 74 isolates from the Prairie Provinces 70 were virulent to Renown and presumably also to most other Hope and H44 derivatives. As in the preceding year, races 1, 1a, and 11 occurred in the eastern provinces and were common in collections from B.C. Races 9 and 128a were also found in the Creston area, B.C., as in 1952. It seems evident that there is a greater variety of physiologic races in both Eastern Canada and B.C. than in the Prairie Provinces.

The chief difference between this year's and last year's survey concerns the distribution of race 126. This year it accounted for only 3% of the total isolates. In 1952 and 1951 the figure was 12%; in 1950 and 1949 it was 22% and 25% respectively. The sharp decrease in the prevalence of this race, especially in the Prairie Provinces, represents a trend for which there is no known explanation. Another difference between this year's survey and those of several preceding years is the occurrence this year of race 35 in several rust collections from Eastern Canada.

Puccinia graminis var. avenae

Studies on 144 isolates of oat stem rust resulted in the identification of the following races (number of isolates of each race in brackets): race 1(1); race 2(11); race 3(1); race 4(1); race 5(2); race 6(7); race 7(75); race 7a(2); race 8(21); race 10(10); race 11(6); race 12(5); race 13(2). In 1952 the same races were identified except races 3 and 4 which were not collected.

The trend of increasing prevalence of race 7 was extended. This race constituted 52% of the isolates in 1953, which greatly exceeds the 33.3% of the previous year. The increase in the prevalence of race 7 was made at the expense of races 1 and 2. Race 8 was second in order of prevalence as it was in 1952.

Most of the common races were widely distributed throughout the country. It is of interest that race 6 and the related race 13, which have increased in prevalence in the last two years, have been collected, with very few exceptions, in the Maritimes, Que., and Ont.

The biotype of race 7, designated 7A and first mentioned in these reports in 1952, was collected again this year. This strain is distinguished from other race 7 isolates by means of its ability to attack the variety Rodney, which was used as a differential host in 1952 and 1953. In 1952, two isolates of this biotype were collected in Man.; in 1953, one isolate was collected in Sask. and another in Que. Apparently race 7A is widely distributed, although it is not a common race at present.

Puccinia coronata var. avenae

In 1953, uredinial collections of crown rust were obtained from many localities in Eastern Canada and the Prairie Provinces.

The races present in the cultures established from these collections were identified by means of the following differential hosts: Anthony, Appler, Bond, Bondvic, Saia, Ukraine, Trispernia, Victoria, Santa Fe, and Landhafer.

The races identified are designated in accordance with the "New Method" of crown rust race numeration agreed on, in 1951, by Canadian and American workers carrying out crown rust race identifications and first used in these reports in 1952.

In all, 180 isolates were studied. From these 18 distinct physiologic races were identified, all of which had been found in Canada in previous surveys.

The designation of the races identified, with the former designations of each race, is as follows: 201=34, 202=45 & 57, 203=45a, 209=1948-1, 211=34a, 212=1946-1, 228=2a, 229=2b, 230=4a & 5a, 231=3a, 232=3b, 234=2c, 235=3c, 236=3b, 237=1 & 6, 238=4 & 5, 239=2 & 38, and 240=3.

The number of isolates of each race identified is indicated in brackets after the number of the race: 201(30), 202(61), 203(21), 209(3), 211(7), 212(1), 228(4), 229(1), 230(2), 231(8), 232(5), 234(2), 235(1), 236(2), 237(4), 238(1), 239(11), and 240(16).

Races 201, 202, and 203, all of which are capable of attacking varieties possessing the Bond type of crown rust resistance, were the predominating races in Western Canada and in Ont. and Que. They also occurred in the Maritime Provinces but were relatively less prevalent there. Race 240 was the most prevalent race in the Maritime Provinces.

No races were isolated capable of attacking the varieties Landhafer, Santa Fe, Trispernia, and Victoria. These varieties are the main ones now being used by plant breeders as a source of crown rust resistance.

Isolations from Aecia

In the early summer of 1953 a number of collections of aecia on barberry (Berberis vulgaris) and buckthorn (Rhamus cathartica) were shipped to the Plant Pathology Laboratory, Winnipeg, Man. by cooperators in Eastern Canada. For this assistance acknowledgment is due to the following: A. Payette, Ste Anne de la Pocatiere, Que., J.L. Howatt and S.R. Colpitts, Fredericton, N.B., H.A. Klinck, Macdonald College, Que., J.E. Campbell and R.B. MacLaren, Charlottetown, P.E.I., D.N. Huntley, O.A.C., Guelph, Ont., D.W. Creelman, Kentville, N.S., I.J. Bassett and I.L. Conners, Ottawa, Ont., G.C. Chamberlain, St. Catharines, Ont., T.C. Vanterpool, Saskatoon, Sask.

Aecia on Barberry

On receipt of the collections the aeciospores were inoculated to Little Club wheat, Victory oats, Rosen rye, Agrostis alba, and Poa compressa.

As in other years when similar studies were made var. secalis was the most common. It occurred in 6 of the 9 collections studied. Var. agrostidis occurred in 4 collections, var. tritici in 3 (races 1,15B and 56) and var. avenae in 2 (race 8). Var. poae was not detected in any of the collections. One collection from Fredericton, N.B. contained the 3 varieties tritici, secalis, and agrostidis. Race 15B was from aecia at Ste. Petronille, Isle d'Orleans, Que.

Aecia on Buckthorn

Aecial collections were obtained, in 1953, from both Eastern and Western Canada. The spores from each collection were transferred to oats, rye, Festuca elatior, Lolium perenne, Holcus lanatus, Alopecurus pratensis, and Calamagrostis epigeios.

Three different varieties of crown rust, Puccinia coronata var. avenae, P.c. var. secalis, and P.c. var. festucae were isolated.

The variety avenae was the most prevalent one and comprised about two thirds of all the isolates identified; the variety secalis comprised almost one third of the isolates; and the variety festucae was represented in only two of the collections.

Nine physiologic races of crown rust were isolated from the 22 cultures of the variety avenae established from the aecial collections. These were as follows: 202, 212, 228, 231, 235, 236, 237, 239, and 240.