w. half of Sask., where stem rust occurred in trace amounts only and where leaf rust was quite light, Thatcher yielded 1.3% less than Selkirk. Lee yielded 6.2% and 3.6% less than Selkirk in Man. and e. Sask., respectively. These two varieties were equal in yield in w. Sask. When the acreages of various wheat varieties grown in the three areas mentioned above and the differences in yield between them and Selkirk the most rust resistant variety grown are taken into account, it is estimated that yield losses due to leaf and stem rust amounted to 1 1/2 million bushels in Man., 6 million bushels in e. Sask. and 2 million bushels in w. Sask., a total of 9 1/2 million bushels for Man. and Sask., or 2.8% of the total crop for these two provinces. Wheat did not suffer any appreciable rust damage in Alta.

The areas, in the Prairie Provinces chiefly affected by stem rust and leaf rusts of wheat are indicated on the accompanying map (Fig. 1).

RUST NURSERIES IN CANADA IN 1955

B. Peturson, G. J. Green, T. Johnson and A. M. Brown

The introductory sections, Cereal Rusts in Western Canada in 1955 and Damage Caused by Wheat Rusts in Western Canada in 1955, of Report 12, issued by the Plant Pathology Laboratory in December 1955, have been reproduced as separate reports under their respective authors in the preceding pages. Here will be given the sections on Cereal Rusts in the Rust Nurseries and Diseases Other than Rusts with the last of the 5 tables as Table 2.

Cereal Rusts in the Rust Nurseries

The following varieties were used in the rust nurseries in 1955: Wheat: McMurachy, Lee, Kenya Farmer, Little Club, Marquis, Mindum, Thatcher, Selkirk, Redman, Exchange, and Frontana. Oats: Bond, Trispernia, Exeter, Garry, Clinton, Landhafer, and Rodney. Barley: Montcalm, Black Hulless, Vantage, and Feebar. Rye: Prolific.

Wheat Stem Rust

Heavy, or even mod., stem rust infection was largely confined to the central part of Canada, roughly from Fort William, Ont. to e. Sask. E. of Mindemoya, Ont., stem rust infection was generally light. The mod. to heavy infection which occurred on Lee, Mindum, Thatcher and Redman in the nurseries in the central part of the country is an indication of the predominance of race 15B in the area. This race, though present throughout Canada, was less prevalent in the far east and the far west. For example, the data from Kentville, N.S., where the above-mentioned varieties bore no more than a trace of rust while Little Club and Marquis bore 50 and 30 per cent, respectively, show that races other than 15B were principally present. From this station

biotypes of races 29 and 48 were isolated. The heavy infection (50%) on McMurachy at Kapuskasing, Ont., also indicated the presence of races other than 15B. Race identifications showed that in addition to race 15B there were present race 56, two biotypes of race 29 and one of race 48. The heavy infection on McMurachy was evidently caused by races 29 and 48. At Creston, B.C., race 15B was less important than other races, as is made evident by the fact that Little Club and Marquis bore 40 and 30% infection, while Lee, Thatcher and Redman carried only traces of infection.

The heaviest infection shown by Selkirk was 40% at Morden, Man. As it is known from race identification studies that 15B-3 occurred on Selkirk at that station it is possible that the presence of this biotype had something to do with the heavy infection. But as the ordinary type of race 15B was also isolated from Selkirk, it is likely enough that the heavy infection was due principally to a breakdown of resistance as a consequence of the hot weather in the latter part of July and early August.

Wheat Leaf Rust

Leaf rust infection was mod. to heavy in the nurseries from Melfort, Sask., eastwards except for those at Lower South River, N.S., and St. John's, Nfld. In the Prairie Provinces, w. of Melfort and Indian Head, infection was light except at Lacombe, Alta.

Frontana was uniformly resistant. Infection was not visible or a mere trace except in one nursery where it reached about 1%. The amount of infection on Selkirk ranged widely from trace to 60%, but was everywhere of a resistant to semi-resistant type. Lee showed two distinct types of reaction at 3 nurseries in Western Canada and at 2 in Eastern Canada. About half the plants were resistant with a low percentage of infection, while the remainder were susceptible with a much higher percentage. Although this has been observed in Eastern Canada in previous years, it was noted this year for the first time in Western Canada. This year, races 5a, 15a and 126a all showed evidence of containing strains capable of attacking some plants of Lee more heavily than did the usual run of these races. Kenya Farmer was rather highly resistant in most nurseries. The maximum infection was 20% (at Dauphin, Man.). It was, however, evident from the reaction of Kenya Farmer in several nurseries that it is not uniform in leaf rust reaction. At Winnipeg, infection ranged from trace on some plants to 20% on others, and at St. Catharines, Ont., from 5 to 20%. At Fort William, Ont., some plants had 10% infection, others 80%. Redman, though now generally susceptible, showed resistance at certain places in Eastern Canada, notably Pictou and Nappan, N.S.

Oat Stem Rust

Infection was rather light in Que. and the Maritime Provinces. The generally higher infection on Clinton than on Exeter is probably an indication of a high prevalence of race 7, to which Clinton is very susceptible. The Maritime Provinces and e. Que. formed an exception in this respect, as there

these two varieties were rusted to about the same extent, whereas Bond, Trispernia and Landhafer, which are susceptible to all oat stem rust races, were the most severely rusted.

A notable feature of this year's oat stem rust epidemic was the rather heavy infection of the new varieties Garry and Rodney in the Prairie Provinces. Garry is resistant to all known races, and the survey for physiologic races does not show the presence of much race 7A, the only race known to attack Rodney severely. Possibly the heavy infection was the result of a partial breakdown of resistance due to unusually high temperatures.

Crown Rust of Oats

Where crown rust occurred in appreciable amounts it was much heavier on Bond, Exeter and Clinton than on Rodney and Garry. Only trace amounts occurred on Landhafer and very little rust developed on Trispernia except at Brandon, Man., and Merrickville, Ont., where rust infection on it averaged 20% and 30% respectively.

Rusts on Barley

Stem rust caused heavy infection only in Man. and at Creston, B.C. Vantage showed no more than a trace of rust at any point. The rust on barley was principally wheat stem rust, as the reactions of Prolific rye indicate that rye stem rust was abundant only at Winnipeg and Macdonald College, Que. Infection by leaf rust was heavy in 3 of the 4 nurseries in N.S. and in several others, particularly Lennoxville, Que., Guelph and Fort William, Ont., and Agassiz, B.C.

Flax Rust

Three flax varieties, Rocket, Dakota and Bison, were included in each rust nursery. Flax rust occurred in 7 of the nurseries: Beaverlodge and Lacombe, Alta., Scott, Sask., and Winnipeg, Morden, Brandon and Dauphin, Man. In the nurseries where rust was found it occurred in trace amounts on Bison and Dakota except at Lacombe, Alta., where the infection averaged 5% on Bison, and at Brandon, Man., where it averaged 5% on Dakota. No rust was found on Rocket at any of the stations.

Diseases Other Than Rusts

A summary of the incidence of the diseases observed is to be found in Table 2.

On wheat, powdery mildew was most sev. in the nurseries in B.C. A mod. infection was observed in 3 nurseries in N.S. and light infection in 2 nurseries in Ont. On barley, powdery mildew was found chiefly in B.C., where infection was sev., and in Ont.

Rust Nurseries

Diseases caused by species of Septoria were rather widely distributed and were conspicuous in some nurseries. Speckled leaf blotch of oats was found in all Eastern nurseries examined for its presence and occurred also in B.C. The fact that it was not found in nurseries in the Prairie Provinces should not be taken to indicate that it does not occur in that region, as it was found occasionally, in small amounts, in farmers' fields. Speckled leaf blotch of barley (S. passerinii) occurred in all the nurseries in Man. and e. Sask. and was found also in 2 of the 4 nurseries in Alta. Septoria avenae f.sp. triticea caused sev. infection of leaves and sheaths of wheat in the nurseries in Man. and e. Sask. This organism occurred generally throughout this area and probably caused a mod. yield reduction in Man. S. nodorum occurred also in some of the Western nurseries and was present at a number of points in Eastern Canada. S. tritici was found only in nurseries located in areas in which some winter wheat is grown.

Scald of barley (Rhynchosporium secalis) was found in only 2 nurseries in Alta., 2 in Sask., and in 2 nurseries in Que. Infection was heavy only at Edmonton, Alta. Light infection was recorded at Lacombe, Alta., and Scott and Melfort, Sask. In Que. mod. infection occurred at Lennoxville, and a mere trace at Ste. Anne de la Pocatiere.

Infection caused by Helminthosporium sativum and H. teres occurred on barley in many nurseries, but as it is difficult to distinguish between the symptoms caused by these fungi without making cultural studies, it was decided not to include in this report such observations as were made.

PHYSIOLOGIC RACES OF CEREAL RUSTS IN CANADA IN 1955

T. Johnson, B. Peturson, G.J. Green and A.M. Brown

Only that part of Report No. 11, issued by the Plant Pathology Laboratory, Winnipeg, Man., February 1956, on the distribution of physiologic races of cereal rusts in Canada will be reported here.

Distribution of Physiologic Races

Puccinia graminis var. tritici

In the 1955 physiologic race survey 17 races, including several biotypes, of wheat stem rust were identified from 306 isolates obtained from the various cereal producing regions of Canada. The races (number of isolates in brackets) were: race 1 (1); race 11-1 (18); race 15B, 3 biotypes (202); race 29, 4 biotypes (20); race 34 (2); race 39 (1); race 48A (16); race 36, 2 biotypes (43); race 87-1 (1); race 139 (1); and race 179 (1). The biotypes were: 15B (187), 15B-3 (10), 15B-4 (5); 29-1 (15); 29-2 (3), 29-3 (1); 29-4 (1); and 56 (41); 56A (2).

Several varieties not used previously as differential or accessory hosts were employed in 1955. These are: Thatcher, Mayo 54, Kenya 117A,