II. DISEASES OF FORAGE AND OTHER FIELD CROPS

A. FORAGE LEGUMES

A joint report on the "Diseases of Forage Legumes in Eastern Canada" has been prepared by Mr. R.J.Baylis, Dr. W.G. Benedict and Dr. R.O. Lachance. Because these officers are located at Ottawa and Harrow, Ont., and Ste Anne de la Pocatiere, Que., respectively, the report covers observations on these crops as they occur in southwestern Ont., eastern Ont., and in the lower St. Lawrence valley of Que.

Although many of the observations in each area were made by the officer working alone in his respective area, it was possible in 1953 for the three investigators to meet together and carry out a special survey visiting each area in turn. This report covers more particularly observations made in the current year, but it includes pertinent data recorded in previous years.

Besides the pronounced climatic differences between the three areas, the type of farming practised in each is quite dissimilar. In southwestern Ont. forage legumes are grown on a large scale in pure stands and are often used as soil conditioners. Sweet clover is the principal legume used for the latter purpose. In the central and eastern parts of the province, hay mixtures and shorter rotations more generally adapted to mixed farming are to be found. In the St. Lawrence valley of Que., however, conditions for the extensive growing of legumes are considerably more limited on account of the shorter growing season and the variable nature of the soils.

Winter Conditions in 1953.- The winter of 1952-53 was unusually mild in Ont., with a light snowfall. The average mean temperature from November 1952 to February 1953 inclusive for 12 points in Eastern Canada was 5.5°F. above normal. Snowfall for this four-month period was below normal and at Ottawa only 27.3 inches were recorded for the entire winter compared with a normal annual snowfall of 87 inches. At Ste. Anne de la Pocatiere, however, snowfall amounted to 109.3 inches, a figure slightly above the normal total of 106 inches.

At many points in Eastern Canada, especially in Ont., the ground was bare or nearly bare most of the winter and soil remained unfrozen until late December. Later, frequent rains and melting snow resulted in standing water, which froze to form extensive ice sheets on fields during January and February. Although the spring weather was favourable for renewed growth, icing conditions, as anticipated, had killed extensive areas in many fields in eastern Ont. and southern Que.

Winter Injury. - A survey of the eastern counties of Ont. in May 1953 revealed severe winter injury to stands of red clover and alfalfa on most soils. Stands on well-drained and sloping land survived relatively well, but when they were examined later in the summer after exposure to a period of hot dry weather, older stands of alfalfa showed additional injury. In general, new seedlings of alfalfa survived well, whereas older stands were often greatly reduced. In legume-grass mixtures, grasses appeared to have suffered little injury from icing and the resulting hay crops, while light in legumes, were still fair in quality and yield.

Injury from icing was also general in southwestern Que., where adequate drainage is an important problem in the rich meadows of the Richelieu valley. Icing with consequent injury to forage legumes is a recurrent problem in the area, which is alternately cooled and warmed by reason of the close proximity of Lake Champlain.

In southwestern Ont., despite icing conditions occurring occasionally during the winter, no damage of any great consequence resulted.

Common Clover

Because of its hardiness under average winter conditions, red clover is of first importance as a hay and pasture crop in Eastern Canada. Most of the observations have therefore been made on red clover, but similar notes were collected on the other clovers whenever they were of common occurrence.

Crown Rot (Sclerotinia trifoliorum). - The almost complete absence of injury by crown rot was notable in 1953 after a winter and spring that were expected to favour severe outbreaks of the disease. Crown rot has occasionally been destructive, as in 1949 (P.D.S.29: 23-24) and 1950, to pure stands of red clover, Ladino and birdsfoot trefoil in eastern Ont. It also occurs to a lesser extent on alfalfa. Damage by the fungus is difficult to estimate in grass and clover mixtures and is frequently attributed to winter killing.

Root Rot. - An insect-fungus complex exists in red clover as a result of tunnellings made by the clover root borer, Hylastinus obscurus (Marsham), which appeared to be more active than usual in 1953 in soutwestern Ont. Infestations are somewhat sporadic throughout the province. Sufficient injury occurs each year to permit secondary organisms. predominantly species of Fusarium, to cause some rotting and premature killing.

Anthracnose. - Kabatiella caulivora is an organism of minor importance although it causes mostly trace infections each year. Much commoner in Eastern Canada are Colletotrichum graminicola and C. destructivum, the latter fungus being the more destructive to red clover.

Powdery Mildew (Erysiphe polygoni) was conspicuous this year on the current year and year-old stands of red clover. Infection became severe in southwestern Ont. in the late summer. The fungus was present to a lesser extent in eastern Ont. and was of no consequence in Que. The disease may be of considerable importance during hot dry summers.

Sooty Blotch (Cymadothea trifolii) is virtually absent on red clover but is prevalent on Ladino and White Dutch clovers late in the season. It is of no economic importance.

Leaf Spot (Stemphyllium sarcinaeforme) is very common but seldom causes appreciable injury to "double-cut" clovers.

Rust (Uromyces fallens) infection varied from a trace to quite severe on red clover according to the district. In general, rust is rather severe in southwestern Ont., but it causes only slight damage. Rust (U. trifolii) has been present each year on alsike, causing severe damage. In 1953, leafhoppers also caused severe burning of the foliage, probably resulting in more damage than that caused by rust.

Alfalfa

Alfalfa is used as a hay and pasture legume in areas suited to its production. These areas are found principally in southwestern and central Ont. and to a lesser extent further east.

Bacterial Wilt (Corynebacterium insidiosum). - The continued advance of bacterial wilt in Ont. was readily discernable in 1953, following the weakened condition of some overwintered stands. Typical symptoms of wilt and yellowing were unusually prominent in eastern Ont. in July; damage was estimated to be rather severe. Obvious symptoms of wilt are generally lacking under conditions highly favourable for the growth of alfalfa. The disease is more commonly detected, in fields two or three years old, by a progressive die-back in unproductive appearing plants.

Based on the percentage of wilt-infected plants, damage was variously estimated as slight to severe in southwestern Ont., where 14-92% of the plants in the infected fields were either dead or severely infected in May, moderate in eastern Ont., and a trace only in southwestern Que.

Recently both Verticillium ?albo-atrum and Fusarium spp. have been isolated from wilted alfalfa plants collected at Ste Anne de la Pocatiere, Que. These plants had already given a negative smear for Corynebacterium insidiosum.

Bacterial wilt is not a major disease of alfalfa in most parts of Eastern Canada as it apparently is in the West, probably because alfalfa is grown in relative short rotations and hay mixtures in the East.

Boron Deficiency. - Yellowing of alfalfa due to the lack of boron is quite common on light soils everywhere in Que. Surveys during the last 3 years have shown that it was present in 61% of the fields surveyed. The disorder has also been observed on heavy soils with an alkaline reaction and alkaline subsoil. The trouble has also been seen in red clover.

Black Stem (Ascochyta imperfecta) is seldom important in Eastern Canada. Trace to moderate, and occasionally severe, infections were observed in the areas surveyed this year. The last severe outbreak of the disease was reported in 1948 (P.D.S. 28:16).

Common Leaf Spot (Pseudopeziza medicaginis) is undoubtedly the most prevalent leaf spot of alfalfa in Eastern Canada. However, it apparently has little economic importance, the plants suffering some loss of foliage only if the second cutting is delayed. It is generally present in moderate to severe amounts on the lower half of the plant.

Yellow Leaf Blotch (Pseudopeziza jonesii) is not commonly observed in eastern Ont. and in Que. However, it appeared to be more abundant this year than usual and was present in trace to slight amounts in most sections. In southwestern Ont., the disease was very prevalent especially in alfalfa growing on sandy soils in 1953.

Other Leaf Spots (Stemphyllium botryosum, Leptosphaeria pratensis) appear only occasionally and are of no economic importance. Rust (Uromyces medicaginis) also occurs occasionally.

Yellows (boron deficiency). Observations indicated that red clover growing about Ste. Anne de la Pocatiere, Que., is suffering from boron deficiency. This finding was confirmed experimentally; it was found that boron deficiency symptoms were visible on plants of both red and alsike clover receiving 0.25 p.p.m. of boron or less, whereas plants receiving 0.50 p.p.m. or more were healthy (R.O. Lachance).

Sweet Clover

As already mentioned, sweet clover is grown extensively in southwestern Ont. where it is important as a seed crop and a soil conditioner.

Phytophthora Root Rot (P. cactorum). which causes a soft rot of the root and crown, was prevalent again this spring in Essex County, affecting up to 60% of the plants in some stands in early May. However, the damage was light because by mid-June the thinned stands showed promise of producing a good crop. Later observations showed that seed yields were very good. Since 1947, when this disease appeared to be a distinct menace to sweet clover in the area (cf. J.T. Slykhuis. Sci. Agr. 32(1):1-18. 1952), epidemic outbreaks have occurred less frequently and damage to crop less pronounced.

Black Stem (Ascochyta meliloti) is very prevalent in second-year growth of sweet clover, especially in stands that are grazed. The disease becomes conspicuous on seed crops as they near maturity, but the damage is slight. Often the whole plant including the seed pods becomes infected.

Leaf Spot (Stagonospora meliloti). - The circular gray to tan spots bearing brown pycnidia of the fungus are found on the leaves of sweet clover throughout southwestern Ont. Loss of foliage is slight as the disease is found on maturing second season stands.

Mosaic (several viruses). - The foliage of a small percentage of plants in most sweet clover stands show symptoms of virus infection especially early in the second season. The damage caused to the plants depends on the particular virus present. Probably of more importance is the fact that sweet clover may act as an overwintering host for a number of viruses affecting annual crops.

ALFALFA

BLACK STEM (Ascochyta imperfecta) was found in all 55 fields examined in Sask. The disease was well established on June 9 in all fields at Hudson Bay. Infection was mod. in all fields in the Nipawin area by mid-July and in most fields in the Big River, Meadow Lake, and Pierceland areas by the end of the month (H.W. Mead). Infection ranged from trace to heavy in half the fields of Ontario Variegated examined in Essex Co.; damage was severe due to defoliation in one 3-year-old field left to mature seed after the first cutting (W.G. Benedict).

Foliage diseases of alfalfa caused considerable damage this year in Man., being favoured by the heavy rainfall in the spring and early summer. The following organisms, in order of their importance, were observed on alfalfa: Ascochyta imperfecta, Pseudopeziza medicaginis, Pseudopeziza jonesii, Leptosphaeria pratensis, Peronospora aestivalis and Pseudoplea trifolii (W.C. Donald).

WINTER CROWN ROT (low-temperature basidiomycete). Infection was 2-tr. 3-sl. 4-mod./12 fields examined w. of Lacombe and w. and n.w. of Edmonton, Alta. (G.B. Sanford). Infection ranged from tr. to mod. in the 25 out of 55 fields examined in Sask. In most fields it was confined to single plants or to small groups (H.W. Mead). In a recent note (Phytopath. 43(10):571-572. 1953) J.B. Lebeau and J.G. Dickson report the production of hydrogen cyanide by the pathogen. They conclude: "The greenhouse and laboratory experiments strongly suggest that disease development is directly dependent upon the production of HCN by the fungus and the confinement of the lethal agent in the close proximity of the plant parts until specific tissues or the entire crown is killed".

ANTHRACNOSE (Colletotrichum destructivum). Odd plants of Grimm alfalfa were found affected at two places in Kamouraska County, Que.; affected plants showed a girdling of the stem and reddening of the foliage (R.O. Lachance).

BACTERIAL WILT (Corynebacterium insidiosum) was general in a neglected field at Savona in the Thompson valley, B.C. (V.C. Brink, E.J. Hawn). Infection ranged from tr. to mod. in 1-3-year-old fields (in 28 out of 35 examined) in s. Alta. (E.J. Hawn). Bacterial wilt was found affecting 10-15% of the plants in a single old field in Sask.; it was the first case in the Meadow Lake area (H.W. Mead). As mentioned in the special report above, bacterial wilt was usually severe in all fields 3-4-years old of Ontario Variegated examined in Huron County. Alfalfa seed imported from France was sown extensively in 1952 and 1953 in the southern part of the county; no wilt has yet been found in these stands (W.G. Benedict). The disease affected 15% and 20% of the plants in 2 fields of Ontario Variegated in Wellington Co. Diseased specimens from which the pathogen was isolated were received from a field in Frontenac Co. (J.A. Carpenter).

STEM NEMATODE (Ditylenchus dipsaci). Localized infections found in 2 fields in the Lethbridge district, Alta. (E.J. Hawn).

DOWNY MILDEW (Peronospora aestivalis) was severe in May on trial rows of Buffalo and Ranger varieties at the Station, Saanichton, B.C. Downy mildew was general on plants of Trifolium dubium growing in the headlands adjacent to the alfalfa, but it is still to be demonstrated that only one organism is responsible (W. Jones). Although only a trace of downy mildew was reported in one of the 35 fields examined in Alta., infection in the plots was recorded as follows: Severe on scattered plants at Lethbridge (E.J. Hawn); severe and general on Grimm, Ladak and Rhizoma at Lacombe (W.P. Campbell); and severe on some Iranian varieties at Edmonton (A.W. Henry).

YELLOW LEAF BLOTCH (Pseudopeziza jonesii) appeared to be heaviest in Sask. around Loon Lake, where the infection was 12-mod. 6-sev./18 fields. Further east, infection was 8-sl. 4 mod./12 fields (H.W. Mead).

COMMON LEAF SPOT (Pseudopeziza medicaginis). Infection was 3-tr. 5-sl./35 fields examined in Alta. and sl.-mod. in the plots at Lethbridge (E.J. Hawn) and sev. in the plots at Lacombe and Vermilion (W.P. Campbell). Infection was 10-tr. 10-sl. 5-mod./30 fields examined in Sask.; along with yellow leaf blotch, the disease causes mod. defoliation in alfalfa grown as a seed crop (H.W. Mead). A sev. infection was recorded in one field in Queens Co., N.S. (D.W. Creelman). A sl. infection was observed in Queens Co., P.E.I. (J.E. Campbell).

LEAF SPOT (Stemphylium botryosum). Infection was tr. to heavy in 14 out of 23 fields examined chiefly in Essex and Huron counties, Ont., in Sept. For fuller account see U.S.D.A. Pl. Dis. Reptr. 38(1):27-29. 1954. (W.G. Benedict).

CROWN BUD ROT (Rhizoctonia solani, Fusarium spp., etc.) was observed in 34 out of 35 fields examined in s. Alta. Field and plot studies showed that the disease develops most rapidly during May to July with little increase later in the season. In irrigated fields, most plants become infected in the second year (E.J. Hawn).

RUST (Uromyces medicaginis) mod. infected a one-year-old field of Ontario Variegated at the Substation, Woodslee, Ont., in Sept. (W.G. Benedict).

WITCHES' BROOM (virus), first noticed in the Kamloops area, B.C., in 1936, is now reported from Chilcotin, Kamloops and Nicola valley areas. It also occurs as far north as Fort Fraser, but it has yet to be observed in B.C.'s Peace River area. The proliferation of the stems shows up well after second cutting and on ranches, where only partial irrigation is practised. With more data available, it appears that the disease is spreading in Interior B.C., in some fields in the Kamloops area, 80% of the plants are infected (V.C. Brink).

YELLOWING (boron deficiency) was present in 52 of the 77 fields examined on light soils in August in the lower St. Lawrence valley, Que.; some fields were mod.-sev. affected (R.O. Lachance). Yellowing was sev. in a small field in Digby Co., N.S. (K.A. Harrison) and sl. in one field in Queens Co., P.E.I. (J.E. Campbell).

PHOSPHORUS DEFICIENCY. An examination was made in May of extensive fertilizer experiments being carried out on the Walker Farms, Windsor, Ont. In one-year-old stands the average stand of plants per sq. yard was 17, the plants being weak and stunted, where little or no phosphate was applied but N and K were adequate; 42 where no N was supplied, but P and K adequate; and 25 where complete fertilizer was added. The yield of hay and pasture followed the same pattern (W.G. Benedict).

WHITE SPOT. A white spotting of the leaves of alfalfa was very prevalent in June in Man.; it is thought that the disorder was caused by the excessive rainfall at that time (W.C. McDonald).

WINTER INJURY caused tr.-sl. damage in 2 fields west of Edmonton, Alta. (G.B. Sanford). Damage was 5-tr. 17-sl./55 fields examined in Sask.; mostly individual plants were affected (H.W. Mead).

COMMON CLOVER

SOOTY BLOTCH (Cymadothea trifolii). Infection was tr.-sl. in 2 out of 3 fields examined in the Brooks area, Alta. (E.J. Hawn). The disease was general on alsike throughout N.S.; it caused mod. damage to a field at Broad River (D.W. Creelman).

POWDERY MILDEW (Erysiphe polygoni). Infection was sl. on red clover in the plots at Brooks, Hays, and Lethbridge, Alta., and tr. on alsike at Lethbridge (M.W. Cormack). The disease was general throughout southwestern

Que. (L. Cinq-Mars, R. Crete). Powdery mildew was widespread on red clover in N.S., but caused little apparent damage (D.W. Creelman).

ANTHRACNOSE (Kabatiella caulivora). Infection was sl. on Lasalle at Hays, Alta. (M.W. Cormack) and mod.-sev. in the red clover plots at Lacombe (W.P.C.).

LEAF SPOT (Pseudopezia trifolii) was general on the lower leaves of red clover in the plots at the Station, Saanichton, B.C. (W. Jones). Sl. infection noted at La Trappe, Que., in 1952 (Fr. M. Claude).

CROWN ROT (Sclerotinia trifoliorum) caused considerable damage to the wild Trifolium dubium in one area in North Saanich, B.C. (W. Jones).

LEAF SPOT (Stemphylium sarcinaeforme) lightly infected a field of red clover in Queens Co., P.E.I. (J.E. Campbell).

RUST (Uromyces fallens) was light in a field of red clover in Queens Co., P.E.I., on 31 Aug. (J.E. Campbell). Traces were noted at La Trappe, Que., in 1952 (Fr. M. Claude). U. minor was prevalent on Trifolium dubium in some areas along roadsides in N. Saanich, B.C. (W. Jones).

WITCHES' BROOM (virus). Up to 25% of the plants were infected in a 3-year-old planting of alsike clover at the Substation, Prince George, B.C. (H.N.W. Toms). About 30% of the plants were affected in a plot of Ladino white clover in a plot at the Farm, Agassiz; affected plants show much stem proliferation and the complete lack of stolons (H.N.W. Toms).

BORON DEFICIENCY. Affected plants were received from the Substation, Whitehorse, Yukon (G.B. Sanford).

WINTER INJURY affected 50-75% of the plants of Lasalle red clover in a planting at Grand Forks, B.C. They had been grown in rows that were ridged for furrow irrigation. No injury was present in two other plantings; the plants were grown in rows and under irrigation, but they had not been ridged (G.E. Woolliams). Winter injury caused severe damage to Lasalle and Lethbridge, but not to this variety at Hays, Alta. (M.W. Cormack).

SWEET CLOVER

BLACK STEM (Ascochyta meliloti). Infection was mod. in a roadside stand near Medicine Hat, Alta. (M.W. Cormack) and sl. in the plots at Lacombe (W.P.C.). Black stem caused sl. damage in 10 out of 18 fields examined in Sask. It was causing distortion of stems and spotting of leaves in heavy stands of yellow sweet clover in the Tisdale area early in July (H.W. Mead).

ROOT ROT (Phytophthora cactorum) was usually prevalent and destructive in s. Alta. Infection was 1-tr. 3-sl. and 2-mod. to sev./6 fields examined(E.J.H., M.W.C.).

LEAF SPOT (Stagonospora meliloti). Tr.-sl. infections in the plots at Lethbridge, Alta. (M.W. Cormack). Foliage diseases of sweet clover caused considerable damage this year in Man,; the chief pathogen was S. meliloti (W.C. McDonald).

MOSAIC (virus) was common on sweet clover in all parts of the Okanagan Valley, B.C. (G.E. Woolliams). Mosaic was noted on sweet clover at the Farm, Brandon, Man.; the leaves were typically mottled and the size of the plant reduced. (J.E. Machacek).

B. OIL-SEED CROPS

FLAX

Dr. W.E. Sackston has prepared a special account on "Flax Diseases" in Manitoba in 1953".

Flax was sown late in most areas in Man. in 1953 because of drought in April and May followed by rains, which continued past the middle of June. Above-normal rainfall in July, warm weather in July and August, and a long frost-free season allowed all but the latest sown fields to mature. The average yield for the province was estimated at 9.4 bu. per acre. Altogether 74 fields of flax were examined, 66 during a survey made in Man. and eastern Sask. 17-21 August, and 8 in the area south of Winnipeg 11 August. Most of the fields seen during the survey were in the green boll stage or turning colour although some were still in bloom and a few were ripe. Loss from disease was of no importance in most fields.

RUST (Melampsora lini). There was no rust found in 59 fields, while traces were seen in 7 fields, and from 5 to 10% in 8 fields. The decline in the occurrence of rust is largely attributable to the increasing use of rust-resistant varieties of flax. The growing of such varieties seems also to have reduced the amount of rust inoculum in the area. Several fields of the susceptible variety Dakota had only trace to light infections of rust.

PASMO (Septoria linicola). Traces of pasmo infection were seen in 13 fields (1 in s.e. Sask.), 5 to 10% in 9, 15% in 1 (in s.e.Sask.), 50% in 1, and 75% in 1. Pasmo infections were erratic in 1953. Infection was patchy and light in inoculated plots at Winnipeg, while relatively heavy natural infection occurred on some of the same varieties in uninoculated plots in the same field. Pasmo was scarce in a field of Viking, and extremely susceptible variety, in southwestern Man., although another field of a less susceptible variety a mile away, had 5% of the stem area lesioned.

YELLOWS (?aster yellows virus). A floral deformity, first observed in the University plots at Winnipeg in July, 1952, was found in the experimental plots at Crookston, Morris, and St. Paul, Minn., Brookings, S.D., and Fargo, N.D., early in July, and in 71 of 74 farm fields examined in August. Flax was ripe in the 3 fields where the deformity was not found. The symptoms are difficult to recognize on ripe plants, so failure to find the condition is no proof of its absence. About 5% of the plants were affected in a field of certified Marine flax early in August; fewer plants were diseased in certified Redwood flax on the same farm. In most of the other farm fields only a few diseased plants were found.

The symptoms were most striking on the flowers, (Plate 1(2)) although there was also some yellowing of the apical leaves which progressed downward along the stem of affected plants. The petals were greenish yellow to purple

PLATE I

(1) Flax inflorescence with some flowers affected supposedly by aster yellows virus.

(2) Flax flowers showing effects of infection supposedly by aster yellows virus.

(3) Yellows on stinkweed (Thlaspi arvense) from a flax field lightly infected with yellows. All shoots diseased except one on the right. Oct. 1953, Saskatoon, Sask.

(4) Sunflower head showing florets on a sector of the head affected supposedly by aster yellows virus.

(5) Sunflower head and stem showing sector of stem affected supposedly by aster yellows virus.

(6) Sunflower head with almost all the florets affected by aster yellows virus.

and were not shed normally. They were reduced in size, often markedly resembling sepals. The sepals were also greenish yellow, often with a purplish tinge. Affected flowers remained sterile and the sepals spread to expose the undeveloped ovary. On some plants only one or two branches of the inflorescence showed the symptoms (Palte 1 (1)), while in others the whole inflorescence was involved. The pedicels remained short, causing affected inflorescences to be fairly compact and making many of the diseased plants several inches shorter than adjacent normal plants. Diseased plants were readily identified by the colour of the inflorescence when normal plants were in bloom or in the green boll stage. As the affected tissues dried and turned brown in later stages of the disease, they were more difficult to distinguish from normal plants, which were by then turning colour or were ripe.

The symptoms observed resemble those described for flax plants experimentally infected with aster yellows virus in California (Phytopathology 35: 602-606. 1945). The probability that the condition was caused by aster yellows or a similar virus is supported by the widespread occurrence of aster yellows on known hosts in 1953, and by the unusually heavy populations of leafhoppers observed on various crops.

MISCELLANEOUS. Traces of Wilt (Fusarium oxysporum f. lini) were found in 3 fields, and pure cultures of the pathogen were isolated from specimens submitted from Altona. Root Rot was found in patches in one field, and specimens were submitted from several points. Fusarium acuminatum, Rhizoctonia solani, Alternaria tenuis, miscellaneous fungi, bacteria, and nematodes were isolated from many of the affected roots. Heat Canker (physiological) killed about 10% of the plants in a field southeast of Winnipeg in June. Specimens were submitted from other points following a hot spell in mid-June, and damage to 10% or more of the plants in a number of fields was reported from southwestern Man. Boll Blight (cause unknown) affected a few plants in 8 fields, 5 to 10% in 12, and 20 to 30% of the bolls in 23. The flax was not sufficiently mature in many of the fields examined for boll blight to be apparent. Traces of Top Discoloration (cause unknown) were seen in 4 fields, 5 to 10% in 2 fields (where there was considerable telial rust infection on the stems), and 35% in 2 fields that were damaged by drought. Severe hail damage was seen in 1 field, patches were killed by flooding in 3 fields, and alkali damage was found in 1 field.

Prof. T.C. Vanterpool, University of Saskatchewan, Saskatoon, also contributed a special report on "Flax Diseases in Saskatchewan in 1953".

The growing season was favourable for flax and cereals with yields well above average though slighly below those of 1952. The average yield of flax was 10.5 bu. per acre, or 3,600,000 bu. on 342,000 acres. The crops were able to make optimum use of an average rainfall because of low evaporation throughout the summer, and below average sunshine and temperature during the first half of the growing season.

The common flax diseases were not conspicuous. Here and there, fields were encountered with a moderate or occasionally with a heavy rust infection but these fields were sown with susceptible varieties. Rust-resistant varieties free from rust comprised by far the majority of fields. The notable disease development this season was the finding of flax yellows, a potentially serious disease, in fields about 100 miles east of Saskatoon with 10% of the plants

infected in one field and 20% in another. Around Saskatoon, several fields were found with trace to slight infections but none above 0.5%. None was found in the large flax area southwest of Rosetown. Field observations pointed strongly to a correlation between weed infestation and the amount of flax yellows.

RUST (Melampsora lini) was virtually absent on rust-resistant varieties across central Sask., but it was generally moderate, or occasionally severe, on susceptible varieties. As there were 4-5 fields in resistant varieties to one susceptible, the overall reduction in yield from rust was slight. In general, the season was favourable to rust development, especially during the latter part. It is highly probable, therefore, that had rust-resistant varieties not been grown so extensively, 1953 would have been another rust year. Last year's recommendations of the Cereal Variety Committee were fully justified.

In co-operation with Dr. Peturson, an experiment to test the effect of Ceresan treatment on the germination of flax rust on bits of rusted straw contained in a seed sample, was carried out under controlled conditions in the greehhouse. Dr. Peturson had found last year that this fungicide was effective in preventing the germination of the telia on treated material. He obtained similar results this year. My experiments corroborated his.

SEEDLING BLIGHT (Rhizoctonia solani). No general spring survey was made. In fields at Saskatoon, seedling blight was again troublesome on flax following fallow, with up to 5% of the plants destroyed in many scattered areas throughout fallow fields. When the crop sequence was checked it was found that the pre-fallow crop, whether a cereal or flax, made no difference on the blight on the flax crop following the fallow. Many of the Rhizoctonia strains from flax have proven pathogenic to cereals, and vice versa. Blight of affected flax plants continued to develop until well into mid-season. Isolations show that this fungus causes more than a seedling blight and is actually one of the contributing causes of late root rot, which shows up as prematurely ripened plants with shrivelled seed.

WILT (Fusarium oxysporum f. lini). An isolation test on blighted plants from the wilt nursery gave predominantly F. oxysporum f. lini, with traces of Pythium ultimum, Rhizoctonia solani, etc. At the same date, isolations from blighted flax seedlings of recommended wilt-resistant varieties from the fallow crop gave R. solani, with traces of F. equiseti.

A sample of Royal flax was brought in by a grower from Elrose from a field showing scattered areas of wilted plants. This field had not been in flax for several years. Isolations gave eight isolates of F. oxysporum f. lini, one of P. ultimum and one of R. solani. The Elrose district is one of the old flax areas in the province and evidence on hand indicates that many fields became heavily infested with the wilt fungus when susceptible varieties, such as Crown, from which Royal was selected, were grown. A case such as the foregoing has not been encountered in a farmer's field for many years.

HEAT CANKER. Five samples of heat canker were received from widely separated areas, which fact suggests that it was commoner than the below-normal temperature and sunshine of early summer would indicate. It is possible that the damage occurred on late-sown seedlings during the moderately hot spell of 11-13 June when the afternoon temperatures ranged from 82 to 91°F., and the sunshine varied from 13.9 to 15.3 hours per day. The seedlings were probably tender because of the preceding cool, dull weather.

PHOSPHATE-FERTILIZER INJURY. In a test in the Field Husbandry Department plots on varietal response to phosphate fertilizer, injury was conspicuous in the rows treated at 60 lb. per acre of 11-48-0. The injury first showed up about mid-June as a dwarfing of the central shoot and a spreading and slightly enhanced growth of the side shoots, compared with the unfertilized rows. Fertilized rows of all varieties could readily be detected, with no apparent varietal differences. Towards maturity the difference between fertilized and unfertilized rows diminished and final yields were not affected one way or the other.

YELLOWS (aster-yellows virus). In late July scattered flax plants affected with a disease, later identified as yellows, began to appear in the experimental and 'increase' plots at the University. By harvest, the amount in one increase plot of Victory was about 0.5 per cent. In fields around Saskatoon only traces were seen. On 12-13 August a survey trip was made east of Saskatoon around the Quill Lakes.

From information supplied by Mr. L.M. Stalwick, Agricultural Representative at Watson, it seemed advisable to visit a certain field at Dafoe on this trip. This 110-acre field of Rocket showed 20% of the plants affected by yellows and not over 5% boll damage by hail. The field was heavily poluted with wild buckwheat. In the same district a 1/10 acre plot of flax contained about 5% of yellows. On the same day a large field of Victory with 10% yellows was seen east of Lanigan also in the park belt. The field was weedy. During a trip on 1 Sept. southeast of Saskatoon to the Elrose and Plato districts, no yellows was found. The fields are on the open prairie and were virtually free of weeds. As many of the common weeds in the Prairie Provinces are potential carriers of yellows, a look-out was kept for the disease in weeds in affected flax fields. Yellows was found to be present on wild buckwheat (Polygonum convolvulus) and stink weed (Thlaspi arvense)(Plate 1 (3)) in such fields. N.W. Frazier and H.H.P. Severn (Hilgardia 16:629. 1945) have reported Polygonum convolvulus to be a host of the California aster yellows virus.

It should be mentioned that an unknown flax trouble reported as Bunchy Top in 1947 (P.D.S.27:29) appears now to have been a late infection of the aster yellows virus. It, also, was collected near Lanigan and at other widely scattered points.

MISCELLANEOUS. No fall survey was made in the park belt of northeastern Sask. where Browning and Stem Break (Polyspora lini) are usually prevalent. Neither is complete information available on Pasmo (Septoria linicola) in the extreme southeast of the province. One sample showing severe pasmo, collected in the late Sept. probably near Carnduff, was received from a former student. Black Mould was again conspicuous in some districts in fields where cutting was delayed.

Other Observations

RUST (Melampsora lini). Infection was 4-tr. 2-sl. 3-mod. 1-sev./20 fields in s. Alta. and 15-tr. 4-sl. 2-mod. 1-sev./46 fields mostly in the Peace River area (J.S.H., W.P.C.). A light infection was recorded in 5 fields in w.-central and s.w.Sask. (H.W. Mead).

BROWNING and STEM BREAK (Polyspora lini). Infection was 1-tr. 2-sl. 1-mod, 3 sev./20 fields in s. Alta.(E.J. Hawn); the disease was also sev. in 2 fields near Fairview (A.W. Henry).

LATE ROOT ROT (Rhizoctonia solani) was a trace in 3 fields at Hays, Alta. (E.J. Hawn).

YELLOWS (?aster yellows virus). About 50% of the Rocket plants were affected in the variety test rows of the Central Division, Central Experimental Farm, Ottawa, Ont., according to Dr. W.G. MacGregor. It was also present in Linum monogynum, but no other varieties were affected. A trace was present in other blocks of Rocket and yellows also occurred in buckwheat. As noted above, Severin and Houston report California aster yellows experimentally induced in flax. First symptoms are a yellowing experimentally induced in flax. First symptoms are a yellowing of the stems. Secondary shoots arise from the axils. Viridescence or greening and proliferation of the flowers occur. Petals often reduced or absent. The formation of secondary shoots and greening and proliferation of the flowers were evident in the affected specimens of the Rocket that were submitted (I.L. Conners).

HEAT CANKER (non-parasitic). Damage was 2-tr. 5-sl. 1-mod./20 fields in s. Alta., mostly near Hays (E.J.H.).

RAPE

STERILITY (?aster yellows virus). Some abnormal plants of Argentine rape were submitted to Winnipeg from Gunton, Man., and similar plants were found in the plots at Altona. Affected plants are taller than average. The inflorescence was completely sterile on some plants, whereas only the upper portion was sterile in others. Individual florets were distorted. Some seed pods were swollen, distorted, and empty. The older affected pods varied from pole buff to purple in colour. Some of the apparently normal lower pods on affected inflorescences were also purplish. No oospores were found in the tissue. Infection by the aster yellows virus may possibly be the cause of the trouble (W.E. Sackston).

SAFFLOWER

RUST (Puccinia carthami) was first noted at Lethbridge, Alta., on 7 July, but it did not become severe until mid-Sept. Infection was nil on W-014, sl.-mod. on Perkell, N-6 and N-10 and mod.-sev. on Indian, N-8 and N-10. Several lines supplied by B.C. Jenkins, University of Saskatchewan, showed sl. resistance. Infection was sl.-mod. at Brooks and Taber (F.R. Harper, M.W. Cormack). Rust infection was sev. at Altona, Man., where safflowers were grown on the same plots in 1952. Rust infection, apparently attributable to rust spores in the soil, killed most of the plants in several plots (see U.S.D.A. Pl. Dis. Reptr. 37(10): 522-523. 1953). Rust appeared late in the season in plots at Winnipeg. Some rust was present in all the plots of the Cereal Breeding Laboratory, but none was found in the University plots, 1½-2 miles away. No rust was found in a 2-acre planting near Holland. Uredinia and traces of pycnia were seen on safflower seedlings in the University plots, Saskatoon, Sask., on 25 June (W.E. Sackston).

ROOT ROT (Pythium sp.). Damage was 0-100% in the irrigated variety plots at Lethbridge, Alta. The varieties N-8, W-014, 520 and Indian appeared highly resistant. No damage was observed in the dryland plots at Lethbridge or in the plantings at Brooks and Taber (F.R. Harper, M.W. Cormack).

HEAD BLIGHT (Sclerotinia sclerotiorum) was present in the University plots, Winnipeg, and in a field near Holland, Man. Only a few plants were affected at each location (W.E. Sackston).

LEAF SPOT. Extensive spotting was present in the plots of the Cereal Breeding Laboratory, Winnipeg. Alternaria tenuis was the only organism that was isolated (W.E. Sackston).

SOYBEAN

"Diseases of Soybeans in southwestern Ontario in 1953" is the subject of a special report by Dr. A.A. Hildebrand.

The more important diseases of soybeans in southwestern Ontario in 1953 appeared to have been greatly influenced in their incidence and severity by the kind of weather prevailing during the growing season. Temperature and moisture are believed to have been the two most important limiting factors. In Tables 10 and 11 are summarized rainfall and temperature data for the last four years.

Table 10. Amount and distribution of summer rainfall in inches, 1950-1953

Year	June	July	Aug. 1-15	Total	Aug. 15-31 Daily Amounts						Total
1950	3.02	2.17	.68	5.87	Dates	17	18	28	29	31	
					Am't.	.18	.42	.75	.04	1.01	2.40
1951	3.83	1.71	.31	5.85	Dates	15	18	21	30		
					Am't.	.41	.78	.22	1.47		2.88
1952	1.19	1.79	1.08	4.06	Dates	15	16	20	21	30	31
					Am't.	.32	.18	.18	.05	.03	.07 .83
1953	2.16	.87	2.17*	5.20	Dates	30					
					Am't.	.06					.06

*2.10 inches of this amount fell during the first week in August

Table 11. Temperatures during August and the first week of September, 1950-53

Year	August No. of days in excess of 60°	70°	80°	90°	Mean max. temp.	September (1-7) No. of days in excess of 60°	70°	80°	90°	Mean max. temp.
1950	2	11	15	3	80.9	2	5			73.3
1951		14	14	3	79.8	2	5			72.3
1952		9	21	1	82.1	2	3	1	1	76.3
1953		9	16	6	84.4		3		4	89.0

The role of the weather on the development of Manganese Deficiency and Stem Canker will be discussed at some length, two diseases that seriously threaten the successful growing of soybeans in southwestern Ontario.

MANGANESE DEFICIENCY was scarcely apparent in 1951 and 1952 and yet this disorder became exceedingly prevalent over most of Essex County and in parts of Kent in 1953. By 6 July, manganese deficiency was widespread in the two counties. The affected plants showed not only the typical foliar symptoms, but also a pruning and discoloration of the roots suggestive of a root rot. It is known that the soils of Essex County are quite deficient in manganese. Besides it is now recognized that the soybean is extremely sensitive to a lack of this element. As might be expected under these circumstances, the disorder was accentuated this year for the availability of manganese must have been seriously curtailed by the lack of rain, which, as Table 10 shows, totalled only .87 inch in July.

Official estimates place the yield of soybeans in southwestern Ont. in 1953 at 20.4 bu. per acre as against 20.0 and 24.8 bu. per acre respectively in 1952 and 1951. The reduction in yield of about 4 bu. per acre in 1953 is considered to have been due to the lack of available manganese. This conclusion is supported by reports from growers who stated that on portions of affected fields sprayed with manganese sulphate yields were increased up to 4 bu. per acre.

A survey of Kent and Essex counties revealed that with few exceptions evidence of manganese deficiency in soybeans was confined to crops being grown on clay soils of the Brookston, Napanee and Caister series.

STEM CANKER (Diaporthe sp.). In the study of stem canker it has been noted that the disease passes through two more or less clearly defined stages of development. For this reason, the rainfall during the summer for the last four years is recorded for two separate periods, the first extending from 1 June to 15 Aug. and the second from 16 to 31 Aug. Usually by the third week in August, infection by the stem canker organism is widespread, although up to this time the infection is confined mostly to leaf petioles and the smaller spurs on the lower part of the stem. The presence of fruit bodies on a high percentage of these organs suggests that there has been a significant build-up of inoculum potential. After this earlier or "spur-blight" stage, stem canker takes on a more serious form. The fungus then enters chiefly through leaf scars higher on the plant and causes lesions that girdle the stem and bring about the death of the plant.

The disease followed in general the two-phase pattern indicated above and was severe in 1949, 1950, and 1951, and somewhat less so in 1952. In 1953, however, although the inoculum potential judged by the number and size of the spur and petiole infections were as great by mid-August as in the previous four years, the subsequent development of the disease was almost negligible. Moreover, when some thousands of plants in outdoor plots were artificially inoculated in late August and early September with stem canker isolates known to be pathogenic, infection was so slight that it was apparent in only a few instances.

The weather, more than any other factor, is regarded as responsible for the non-appearance of the more serious stage of stem canker in 1953. As Table 10 shows, there was virtually no rain during the last 3 weeks of August. Although 2.10 inches fell during the first week of the month, this fell on a soil so parched and dry, having received only .87 inch of rain in the previous 32 days,

that most of it immediately and rapidly evaporated. Then as Table 11 shows, August was extremely warm, the maximum daily temperature never falling below 70°F. and with 16 days about 80° and six over 90°F. These conditions of extreme drought and high temperature were apparently not conducive to effective leaf-scar infection, which in large measure initiates the more serious late-season stage of the disease.

That adverse weather conditions do not, however, prevent considerable carry-over of the organism until next season is indicated by the following experiment. When stems of several susceptible varieties collected at random in the field in late fall were cut off at a point a little below ground level and placed in water in containers in the greenhouse, typical perithecia of the stem-canker organism soon appeared on the lower part of the stem where water had been absorbed. From the standpoint of disease control, these observations clearly indicate that soybeans should not follow soybeans in the rotation.

POD and STEM BLIGHT (Diaporthe phaseolorum var. sojae). For the reasons given above under stem canker, pod and stem canker attracted little attention in 1953. Almost 1,000 mature stems were carefully examined for perithecia of the organism and where a likely-appearing growth was observed cultures were made. As in previous attempts the study failed to find the ascosporic phase of the causal organism.

LEAF SPOT (Phyllosticta sojaecola). During casual examination, on 26 June, of the laboratory plots at Harrow, where soybeans have been grown for the third successive year, it was observed that the Phyllosticta leaf spot was unsually prevalent on Lincoln. In nearby plots, where soybeans were being grown for the first time, it was difficult to find the leaf spot except on Lincoln. Careful counts were made. It is evident from the data in Table 12, that Lincoln is more susceptible to the leaf spot than the other three varieties with which Lincoln was compared and that continuous cropping to soybeans is likely to increase the incidence of the disease. Infected leaves are easily tattered by the wind; the economic importance of the disease is unknown.

BROWN STEM ROT (Cephalosporium gregatum). Not only from the amount of disease seen during the survey but also from the increased number of affected plants sent in for diagnosis by growers and inspectors, it was evident that brown stem rot was becoming gradually more widespread in southwestern Ont. No serious outbreaks of the disease were encountered this year.

BACTERIAL PUSTULE (Xanthomonas phaseoli (E.F. Sm.) Dawson var. sojensis (Hedges) Starr. & Burhh.). A severe leaf spot was noted on 20 July on plants of Pagoda 17, which with other selections from the Forage Crops Division, Ottawa, had been included in the variety trials at Harrow in 1953. At first the leaf spot was thought to be bacterial blight, but the true cause of the disease was recognized when pronounced and unmistakable bacterial pustules were noted in the centre of the lesions particularly on the under side of the leaf. The presence of these pustules, the appearance of the disease only after the onset of warmer weather in July and the resulting severe defoliation of the affected plants are all characteristic of bacterial pustule. (This appears to be the first report of this bacterial disease to the Survey).

Other diseases noted this year included: Pythium Stalk and Root Rot (P. ultimum), Downy Mildew (Peronospora manshurica), Sclerotinia Stem Rot

(S. sclerotiorum), Brown Spot (Septoria glycines), Bacterial Blight (Pseudomonas glycinea, Soybean Mosaic (Soja virus 1), Yellow Mosaic (Phaseolus virus 2), and Bud Blight (virus of tobacco ring-spot group).

Other Observations

BACTERIAL BLIGHT (Pseudomonas glycinea) was prevalent in the plots at the Farm, Brandon, Man. (W.C. McDonald). A sl. infection occurred in the University plots, Winnipeg. The causal organism was isolated (W.A.F. Hagborg).

WILT and ROOT ROT (Sclerotinia sclerotiorum, etc.). Sclerotia of S. sclerotiorum were found in the stems of several dead soybean plants collected in the University plots, Winnipeg. Other dead plants showing root-rot symptoms yielded Fusarium poae, F. acuminatum, Alternaria, bacteria and other organisms when the affected tissues were plated. F. acuminatum sporulated profusely on the surface of dead stems (W.E. Sackston).

Table 12. Incidence of Phyllosticta leaf spot on four varieties grown for the first and for the third successive year on soil of similar type.

Years on same site	Variety							
	Lincoln		Harman		A.K. Harrow		Blackhawk	
	Plants counted	Diseased plants	Plants counted	Diseased plants	Plants counted	Diseased plants	Plants counted	Diseased plants
		%		%		%		%
1	622	5.3	1047	Trace*	1183	Trace	969	Trace
3	1404	26.2	1192	7.8	1255	3.8	872	8.8

*less than .5%

SUNFLOWER

A special report on "Sunflower Diseases in Manitoba in 1953" has been contributed by Dr. W.E. Sackston.

Sunflowers were sown mostly early in the season on about 5,000 acres in 1953. The growers who might have sowed late were prevented from doing so by the rains which continued from mid-May to mid-June. Favourable growing conditions and a frost-free period extending into October resulted in the highest average seed yields since the crop was introduced into Man., with estimates ranging from over 700 to about 1,000 pounds per acre. In all, 36 sunflower fields were examined for disease, 29 of them in a disease survey made from 8-10 September, when most of the plants were still about 7-14 days from maturity. Dr. E.D. Putt, Experimental Station, Morden, Man., assisted in the survey.

RUST (Puccinia helianthi). Pycnia of rust were numerous on 12 June on volunteer seedlings in plots at Winnipeg. Traces of rust were found in experimental plots at Morden and Altona by 16 July, although no rust was seen in a

farm field examined on that date. Traces of rust were seen in 3 fields on 11 Aug., and on plants in gardens at Killarney, Man., and Oxbow, Sask., 18 Aug. Traces of rust were found in 10 fields examined during the survey. There was from 1 to 10% rust on the upper leaves in 15 fields, 20% in 2 fields, and 40% in 1 field at Altona, adjacent to the 1952 sunflower plot area. Relative freedom from sunflower rust in 1953, as in 1952, may be attributed largely to the scarcity of inoculu because of small acreages and good isolation of fields. Weather conditions were apparently not very favourable for rust development; infections in plots at Winnipeg, Morden, and Altona were considerably lighter than in previous years.

WILT (Sclerotinia sclerotiorum). Wilt infections seen in 1953 originated at or near the soil line in all but 2 plants. Wilted plants were conspicuous by the end of August in plots at Winnipeg which were inoculated in 1952. Traces of wilt were found in 17 fields during the survey, 1% in 1 field, and 25% in one part and 3% in another part of one 10-acre field of Foundation Sunrise. The foundation planting was immediately adjacent to a sunflower field in which 50% and 2% respectively of the plants were wilted in 1952. (P.D.S. 32:38).

DOWNY MILDEW (Plasmopara halstedii) infections were the highest yet seen in Manitoba since systematic surveys of sunflower fields were started in 1948. All the infections observed were systemic, with moderate to severe stunting of the plants, rugosity and chlorosis of the leaves, and erect, mostly sterile heads. No secondary infections were seen. More than 1% of the plants in a plot at Winnipeg where sunflowers have been grown for several years were stunted by mildew. The disease had not previously been found in this nursery. Traces of mildew were found in 8 farm fields, 1% in 1 field, and 60% in 1 field. In the field with 1% infection, up to 20% of the plants in low patches in the field were mildewed. In the higher parts of the field the plants were taller, more vigorous than those in the low spots, and only traces of mildew were present. The field with 60% of the plants mildewed was low and wet. Mildewed plants were numerous even on the higher ground, and in some of the lower areas from 90 to 95% of the plants in patches up to 15 yards in diameter were killed by the disease. Soil samples taken from the worst areas were put in pots in the greenhouse. Some of the seedlings grown in the pots were systemically infected by mildew.

POWDERY MILDEW (Erysiphe cichoracearum). Traces of powdery mildew were found in 3 fields. Heavy infections developed in the greenhouse on adult plants transplanted from field plots early in October and spread to plants which were started in the greenhouse in August. Powdery mildew infections killed many leaves on plants grown in the University Plant Science greenhouses in 1952-53, but the disease had not appeared previously in the Laboratory houses.

LEAF MOTTLE (cause unknown). Traces of leaf mottle (P.D.S. 28:32) were seen in 4 fields, and 5%, 10%, and 15% in 1 field each. Up to 75% of the plants showed mottling in patches in both of the last two fields. The vascular tissues of some of the plants in the patches had a greenish colour, similar to the "stalk rot" associated with premature ripening and mottle in 1949 (P.D.S. 29:35).

STALK ROT (cause unknown). Traces of stalk rot were seen in 4 fields, and 1% in 1 field. Symptoms varied from a greenish-black discoloration of the vascular ring to blackening and breakdown of the pith. Stalk rot was associated with leaf mottle in 3 of the 5 fields. Pith discoloration and breakdown were not associated with borer tunnels as it was in 1949; there were traces of stalk borer

injury in only a few stems.

BLACK STEM (cause unknown). Plants in a nursery at Altona, sown to sunflowers for the fifth consecutive year, were affected by a disorder not previously observed, although the symptoms were reminiscent of those associated with "black jelly rot" mentioned under Stalk Rot in 1951 (P.D.S. 31:38). The affected plants occurred in a patch extending about 40 feet along a field road and 20 feet into the plot. A few plants on the other side of the road, in a plot sown to sunflowers for the first time in 1953, were also diseased. When the trouble was first seen on 2 Aug. (by Dr. E.D. Putt), many of the plants had broken over and their stems were brown, but the leaves were still green. The area involved had enlarged appreciably when it was examined 7 Aug., but did not seem to have extended any further by September.

The earliest symptoms were found on plants outside the most severely diseased patch. An oily-looking area appeared along the margin of one or more of the upper leaves, which tended to curl unevenly. The pith was discoloured in many of the plants showing the leaf symptoms. Pith discoloration started as a slight greenish darkening which changed to a dirty grayish colour and finally became almost black. In some plants the pith discoloration was more pronounced near the base of the stem than just below the affected leaf. Vascular discoloration was seen in the petioles of affected leaves even on plants with no discoloration of the pith. The leaf symptom was apparently followed by a slight flattening and twisting of the "neck", or upper portion of the stem. Flattening and twisting involved the whole stem of some plants. External discoloration of the stem started in the neck area. The black discoloration extended to involve the entire stem in some plants, but was confined to relatively small areas of the stem in others. Most of the affected plants bent or broke over about half way up the stem. Plants which were affected early and were dead when examined 7 Aug., were completely flattened, twisted, and discoloured. When the area was re-examined in September, some plants which were badly twisted and discoloured were still alive.

FLORAL DEFORMITY (?aster yellows virus). A floral deformity, which was seen on one or two plants in 1952 and was assumed to be the result of a genetic disturbance, was conspicuous in plots at Winnipeg and Morden in 1953. It was also found in 17 fields surveyed in September. The characteristic symptoms are first seen when the plants come into bloom. The florets in a sector of the head are green, hypertrophied and sterile (Plate 1 (4)). The head sector is usually atrophied. Ray florets rarely develop on the diseased sectors. As the disease progresses, it usually involves a sector extending downward along the stem. Droplets of clear exudate often appear on the upper portion of affected stems. The stem and head sectors gradually become discoloured, (Plate 1 (5)) finally turning dark brown to black. The discoloration is superficial at first, but extends deeper into the tissues as it progresses, and is frequently associated with a longitudinal cracking of the stem and breakdown of the stem and head sectors, accompanied by the appearance of dark exudate. Affected stems have a characteristic odour suggesting fermentation. Some of the affected plants are stunted, others break over, but a few survive and set seed on the apparently normal portion of the head. A few plants showed virescence, hypertrophy, and sterility of the florets on the whole head, (Plate 1 (6)) and discoloration of the whole stem, but in most plants only a sector was involved. Sectors appeared in secondary buds which developed late in the season on some apparently normal plants. (H.H.P. Severin and J.F. Freitag, Hilgardia 16:603-4. 1945), state that sunflowers were proved to be naturally infected in California with California

aster yellows virus, which caused marked dwarfing of the plants and distortion of the leaves. The symptoms described by Sackston are not unlike those of ordinary aster yellows as it occurs in China aster. (I.L.C.).

MISCELLANEOUS. Hail and wind damage were severe in some fields in the area around Winkler. Head Drop (cause unknown) was seen in four fields, as well as in the plots at Winnipeg and Morden. Head and Neck Rot was found in five fields. In one field Sclerotinia sclerotiorum was isolated, in another, Sclerotinia, Botrytis cinerea, and bacteria were present, and in three fields only Botrytis was found on rotted heads. Damage caused by 2,4-D was striking in the plots at Winnipeg.

Other Observations

WILT (Sclerotinia sclerotiorum) affected about 25% of the plants in an acre of silage sunflowers in the Ladner area, B.C. Heads and stems were decayed with lesions on the leaf blades or rot of the petioles. Sclerotia were present on a few plants (H.N.W. Toms). Wilt was quite prevalent in the University plots, Edmonton, Alta., as a result of accidental infection (A.W. Henry).

C. ROOT CROPS

MANGEL

LEAF SPOT (Cercospora beticola). Infection was mod. to heavy on a planting of Frontenac in Queens Co., P.E.I. The disease was probably favoured by the heavy rainfall during August (R.R. Hurst).

ROOT ROT (Phoma betae) was causing considerable damage to roots in storage on 1 Feb. at Courtenay, B.C. (W. Jones).

STRANGLE (cause unknown) caused considerable damage to a planting of Frontenac mangels in Queens,Co., P.E.I. (R.R. Hurst).

SUGAR BEET

BLACK ROOT (various fungi) was found in all 42 fields examined during a pre-thinning survey in s. Alta. Samples indicated that 72% of the seedlings were infected and 2% were sev. damaged or killed. Rhizoctonia solani and Pythium spp. predominated among the fungi isolated from diseased seedlings. Phoma betae and Aphanomyces cochlioides were less prevalent this year than in 1952 (F.R. Harper).

ROOT ROT (various fungi). Infection was patchy in fields examined in early September in Alta., and varied from sl. to mod. In some fields the damage was associated with a weakening of the plants by wind or by sev. infestations of root aphids. A tr. of root rot was found in storage piles examined in November. Phoma betae, Pythium ultimum, and Rhizoctonia solani were isolated from diseased roots (F.R.Harper, M.W. Cormack).

D. MISCELLANEOUS CROPS

CORN

NORTHERN LEAF BLIGHT (Helminthosporium turcicum) caused sl. damage to a field of White Cap in Elgin Co., Ont. The disease was also present in Essex Co., but infection was very sl. (N.J. Whitney).

BACTERIAL SPOT (Pseudomonas syringae) was observed at the Station, Melfort, Sask.; damage was sl. on one plant. (H.W. Mead, W.A.F. Hagborg).

RUST (Puccinia sorghi). Infection was 25% on Falconer and 5% on a Morden hybrid in demonstration plots at Portage la Prairie, Man.; tr. in one field at Altamont and nil at St. Adolphe (W.E. Sackston et al.). In the official hybrid test plot at Malden, Ont., all hybrids, field and sweet, were infected with rust. Infection was heavy on the sweet corn, causing mod. damage (N.J. Whitney). A sl. infection was observed in Queens Co., P.E.I. in Sept. (R.R. Hurst).

ROOT ROT (chiefly Pythium and Fusarium spp.) was general sometimes causing severe damage, throughout southwestern Ont. on hybrid field corn and many inbreds (N.J. Whitney).

STALK ROT (chiefly Pythium and Fusarium spp.) was general in Essex, Kent, Lambton and Middlesex counties, Ont. In some fields, as high as 75% of the plants were affected. In the plots at the Station, Harrow, Ont., some inbred lines were completely affected (N.J. Whitney).

SMUT (Ustilago maydis) infected up to 10% of the plants in fields of hybrid corn in southwestern Ont. (N.J. Whitney). A sl. infection was recorded in one field of fodder corn in Queens Co., P.E.I. (R.R. Hurst).

EAR ROTS (various fungi) affected up to 20% of the ears in some hybrids in the plots at Malden, Ont., causing some damage. The following fungi were observed: Fusarium moniliforme, F. graminearum, Diplodia zeae, Nigrospora oryzae, and Penicillium spp. (N.J. Whitney).

MUSTARD

WHITE RUST (Cystopus candidus). Sl. infection in 2/3 fields examined in the Milk River area, Alta. (M.W. Cormack).

SUDAN GRASS

LEAF SPOT (Pseudomonas syringae). Mod. infection in the plots, Lacombe, Alta. (W.P. Campbell).

CULTIVATED and OTHER GRASSES

AGROPYRON - Wheat Grass

Ergot (Claviceps purpurea). Collections of ergot were made in central and n. Alta. as follows: 36 on A. repens, 4 on A subsecundum and 2 on A cristatum

(W.P. Campbell). A 25% infection was observed on A. repens at Kentville and Berwick, N.S. (D.W. Creelman, C.O. Gourley). A few heads of A. repens were infected, where the grass was growing adjacent to a severely infected rye field, at Charlottetown, P.E.I. (J.E. Campbell).

Powdery Mildew (Erysiphe graminis). Oidia only heavy in patches on A. repens about Kentville, N.S. (D.W. Creelman).

Tar Spot (Phyllachora graminis) was heavy on A. repens at Upper Ohio, Shelburne Co., N.S. (D.W. Creelman).

Stripe Rust (Puccinia glumarum). Sl. infections in the plots of A. cristatum and A. trachycaulum at Lethbridge, Alta. (M.W. Cormack).

Smut (Ustilago bullata) infected 5% of the heads of A. trachycaulum in the plots at Lethbridge, Alta. (M.W. Cormack), and 3% of the heads in the University plots, Winnipeg, Man. (W. Popp).

Stem Smut (Ustilago hypodytes) was observed over quite a wide area in the Trout Creek district, B.C., where it appears to be gradually spreading (P.D.S. 32:39). Affected plants produce no seed (G.E. Woolliams).

AGROSTIS

Stem Rust (Puccinia graminis). A 25% infection on A. tenuis at Summerville, Queens Co., N.S. (D.W. Creelman).

Leaf Rust (Puccinia rubigo-vera) was heavy on A. tenuis at Milton, Queens Co., N.S. (D.W.C.).

ALOPECURUS

Leaf Spot (Mastigosporum album Riess) caused mod.-sev. damage in a field of A. pratensis at Kentville, N.S. Although Sprague (Diseases of Cereals and Grasses in North America pp. 402-404. 1950) does not record this species from North America the fungus in this collection agrees well with descriptions of M. album (D.W. Creelman).

Stem Rust (Puccinia graminis). A single plant of A. pratensis was sev. infected near Elnora, Alta. (W.P. Campbell).

AMMOPHILA

Ergot (Claviceps purpurea). A few sclerotia present in the heads of A. breviligulata collected at Cape Traverse, Prince Co., P.E.I. (R.R. Hurst).

BROMUS INERMIS - Awnless Brome Grass

Ergot (Claviceps purpurea). 50 separate collections were made in n. and central Alta. (W.P. Campbell). A tr. infection was recorded at La Trappe, Que.,

in 1952 (Fr. M. Claude).

Browning Root Rot (Pythium spp.). A severe outbreak was reported from Grandview, Man. The infected field was later plowed down as a complete failure. Isolations from the infected roots yielded P. arrhenomanes and P. ultimum. Wheat sown in soil collected from diseased areas was severely damaged by browning root rot. (W.C. McDonald, T.C. Vanterpool).

CALAMAGROSTIS CANADENSIS

Ergot (Claviceps purpurea). 8 collections made in n. and central Alta. (W.P. Campbell).

Crown Rust (Puccinia coronota). Tr. infection collected at Liverpool, N.S. (D.W. Creelman).

CALAMOVILFA LONGIFOLIA

Ergot (Claviceps purpurea). One collection near Penhold, Alta. (W.P. Campbell).

DACTYLIS GLOMERATA - Orchard Grass

Ergot (Claviceps purpurea). Diseased material received from Sumas, B.C. (H.N.W. Toms).

Brown Stripe (Scolecotrichum graminis) was common on Vancouver Island in April (W. Jones). Infection heavy in one field at Kentville, N.S., in September (D.W. Creelman).

Stripe Smut (Ustilago striiformis). Odd plant found infected at Sidney, B.C. (W. Jones).

ELYMUS

Ergot (Claviceps purpurea). One collection was made on E. canadensis near Coronation and 7 collections on E. innovatus in central and n. Alta. (W.P. Campbell).

GLYCERIA STRIATA

Choke (Epichloe typhina) was noted on the grass along a trail by edge of Ahmic L., Parry Sound District, Ont. (C.B. Kelly).

HORDEUM JUBATUM

Stripe Rust (Puccinia glumarum). Collections made at Grande Prairie and at Olds and Elnora, Alta. (W.P. Campbell).

Stem Rust (Puccinia graminis). A small collection was obtained near Trochu, Alta. (T.R. Davidson).

Head Smut (Ustilago bullata). Tr. found along roadside at Castor, Alta. (W.P.C.), and at Union Point, Man. (W. Popp).

PHALARIS

Crown Rust (Puccinia coronata) was heavy on P. arundinacea at Broad River, Queens Co., N.S. (D.W. Creelman).

PHLEUM PRATENSE - Timothy

Ergot (Claviceps purpurea). 6 collections made in n. and central Alta. (W.P.C.) and trace seen at Kentville, N.S. (D.W.C.).

Rust (Puccinia graminis var. phlei-pratensis). Traces seen at La Trappe, Que., in 1952 (Fr. M. Claude).

POA

Ergot (Claviceps purpurea). 12 collections made on P. pratensis in n. and central Alta. (W.P.C.).

Powdery Mildew (Erysiphe graminis). Tr. infection noted on P. ampla at the Station, Lacombe, Alta. (W.P.C.), and sev. infections on P. pratensis at Cayley and Lethbridge (M.W.C.).

SPARTINA PECTINATA

Rust (Uromyces acuminatus). Sl. infection at Cape Traverse, Prince Co., P.E.I. (J.E. Campbell).

STIPA VIRIDULA

Ergot (Claviceps purpurea). One collection near Alix, Alta. (W.P.C.).

LAWNS

Fairy Rings (Marasmius oreades). Several rings appear each year on one lawn on the U.B.C. campus, Vancouver, B.C. (H.N.W. Toms).