II. DISEASES OF FORAGE AND OTHER FIELD CROPS

A. FORAGE LEGUMES

ALFALFA

BLACK STEM (Ascochyta imperfecta) was common and caused sl. damage to second growth alfalfa at Chilliwack; other infections were 2-tr.-sl. at Kamloops, 3-sl.-mod. at Galloway, and 2-tr.-sl. at Joffray, (E.J. Hawn, W.R. Foster) and 1-tr. nr. Dawson Creek, B.C. (W.P. Campbell). Present in s. Alta. in amounts comparable to 1955; 2-tr. 3-sl./28 fields (M.W. Cormack, E.J.H.). In n. and central Alta. infections were 2-tr. 13-sl. 15-mod. 5-sev./141 (W.P.C., J.B. Lebeau). In Sask. black stem developed slowly but after 1 July was prevalent in all 56 fields and plots examined and caused mod. damage (H.W. Mead). Sl.-mod. infections were general in Man. Sev. infections were observed on unthrifty crops grown in poor soil (W.C. McDonald).

LEAF SPOT (Cercospora zebrina) was common in plots at Winnipeg, Man., particularly on the variety Socheville and the Saskatoon line S 239 (W.C. McD.).

DOWNY MILDEW (Peronospora aestivalis) was found in tr.-sl. amounts nr. Merritt, B.C. (E.J.H., W.R.F.). Sl.-mod. amounts occurred on scattered plants in plots at Lethbridge, Alta. (E.J.H.). One field near Wembley was sev. affected /30 observed in n. and central Alta. (W.P.C.). Mod. infections occurred in plots at Brandon and Winnipeg, Man. The disease was sufficiently severe and uniform so that disease readings could be made on 2 replications of a group of 50 varieties and lines. Rhizoma, E44 and E153 appeared to be highly resistant (W.C. McD.).

ROOT ROT (Plenodomus meliloti) affected 15/141 fields surveyed in n. and central Alta. Infections were 8-tr. 6-sl. 1-sev. (J.B. Lebeau, W.P.C.).

YELLOW LEAF BLOTCH (Pseudopeziza jonesii). Ratings were sl. - mod. at Kamloops, Soda Creek, Whiskey Creek and Vernon, and mod.-sev. on second growth in the Bridesville and Kettle Valley areas of B.C. (E.J.H. and W.R.F.). In the Peace River area of Alta. 20/30 fields were affected at the following amounts: 2-tr. 13-sl. 4-mod. 1-sev. (W.P.C.). Sl. damage was found in 10/56 fields surveyed in Sask. (H.W.M.).

COMMON LEAF SPOT (Pseudopeziza medicaginis) was widespread but caused sl. damage on second growth alfalfa at Kamloops, Rosedale, Merritt, Whiskey Creek and Joffray, B.C. (E.J.H. and W.R.F.). In n. Alta. 27/30 fields were affected as follows: 11-tr. 8-sl. 7-mod. 1-sev. (W.P.C.). In central Alta. 6 fields were sl. and 1 was sev. affected out of 111 examined (J.B. Lebeau). Second growth alfalfa in plots at Lethbridge was sl.-mod. affected. Infection was 1-tr. 6-sl. in 7/28 fields examined in s. Alta. (M.W. Cormack, E.J.H.). In Sask. the disease was more prevalent than in previous

years; 25/56 fields were sl. affected (H.W.M.). Hay crops were sl. damaged and later in the season seed crops suffered mod. damage in Man. (W.C.McD.). In Ont. only tr. amounts were found early in the season. Considerable defoliation, particularly on second-cut fields, occurred later in the summer (L.V. Busch). Tr.-mod. infection was noted in Queens Co., P.E.I. (R.R. Hurst).

LEAF SPOT (Pseudoplea briosiana = P. trifolii) combined with boron deficiency caused sev. yellowing and defoliation in an 8-acre field in King's Co., N.S. (D.W. Creelman).

CROWN BUD ROT (Rhizoctonia solani, Fusarium spp., etc.) was present in irrigated stands of plants 2 years old and older. Ratings made on samples from 23 fields showed sl.-sev. infection in 21. The intensity of the disease was directly correlated with the age of the plants (E.J.H. and W.R.F.). All 28 irrigated fields examined in Alta. were damaged (E.J.H.).

CROWN AND FOOT ROT (Rhizoctonia sp. and Fusarium sp.) is the most serious disease of alfalfa and red clover in s.-w. Ont. Only the upper inch or two of the root and crown are affected while the remainder of the root is usually sound. This disease is very seriously reducing stands of clover and makes reseeding necessary every 2 or 3 years (L.V. Busch).

LEAF SPOT (Stagonospora meliloti) was found causing sl. damage in 1 field nr. Edmonton in a survey of 141 fields in n. and central Alta. (J.B. Lebeau).

LEAF SPOT (Stemphylium botryosum). Thirty fields were surveyed in n. Alta. and an adjacent portion of B.C. Four fields nr. Dawson Creek, B.C. were found to be diseased as follows: 2-tr. 1-sl. 1-mod. (W.P.C.).

WINTER CROWN ROT (low-temperature basidiomycete)caused sl.-mod. damage in patches in 6 fields in s. Alta. (M.W. Cormack, E.J.H.). In central and n. Alta. 69/141 fields were affected as follows: 9-tr. 25-sl. 20 mod. 15-sev. (J.B. Lebeau, W.P.C.). Two-year-old plants in scattered areas of a variety test plot at Winnipeg were dead in the spring. Isolations from rotted crowns showed the presence of the basidiomycete; the first record of its occurrence s. of the Duck Mountains in Man. (W.C. McD.).

ROOT ROT (various fungi). Root and crown lesions were found on plants that had wilted and turned brown. Most of the damage occurred in plots at Saskatoon. The av. damage was sl. in 10/56 fields surveyed in Sask. (H.W.M.).

BACTERIAL WILT (Corynebacterium insidiosum) was widespread and occurred in mod. - sev. amounts in 32/41 irrigated fields in B.C. The disease

also occurred in low areas of dry-land stands of alfalfa nr. Creston (E.J.H., W.R.F.). Infections were 5-sl. 8-mod. 1-sev. in 14/28 fields in s. Alta. (E.J.H.) and 5-tr. 6-sl. 4-sev. in central Alta. No infection was noted in the Peace River area (W.P.C., J.B.L.). Infection ranged from 10 to 40% and caused sl.-sev. damage in 200 acres of alfalfa inspected nr. Smithville, Ont. Extensive damage was caused in certain areas of 2 fields comprising a total of 14 acres near Sterling. Infection was estimated at 10-15% (J.A. Carpenter).

WITCHES BROOM (virus) caused sev. stunting in 1 field. Sl.-mod. damage was observed in 3/17 fields nr. Kamloops. Tr.-sl. damage was noted in 4 other fields in B.C. (E.J.H., W.R.F.).

ROSETTE (associated with spittle bug feeding) was mod.-sev. in 3 areas and sev. in 2 other areas of B.C. (E.J.H., W.R.F.).

WINTER KILLING was observed in the Peace River district of n. Alta. Many fields were wholly or partially lost. The low temperatures came before the fields were covered with snow following a warm fall (W.P.C.). At Saskatoon, Sask. alfalfa varieties that normally are winter-hardy were damaged by sub-zero weather that occurred in the early spring after the snow had melted (H.W.M.).

COMMON CLOVER

LEAF SPOT (? Cercospora zebrina) caused mod. damage in 16 fields and sl. damage in 2 fields /21 of red clover examined. The infected fields were mostly in n.-e. Sask. (H.W. Mead). Sl. infection occurred in alsike plots at Winnipeg, Man. (W.C. McDonald).

SOOTY BLOTCH (Cymadothea trifolii). One mod. infection /17 alsike fields in central Alta. (J.B. Lebeau) and mod. infection along roadsides near Edmonton (A.W. Henry). Late in the season moderate infection of alsike was evident in plots at Winnipeg, Man. (W.C. McD.).

POWDERY MILDEW (Erysiphe polygoni) was observed on red clover growing on roadsides. However, no damage has been observed in crops in B.C. during the past 10 years (H.N.W. Toms). Sl. infection was reported in 2 fields, one of alsike and the other of red clover nr. Hillspring out of 6 fields examined in s. Alta. Plots of red clover and Altaswede clover also had sl. infection at Lethbridge (E.J. Hawn). One mod. infection nr. Spirit River, Alta. was found out of 6 fields examined in central and n. Alta. (W.P.C.). Red clover in plots at Saskatoon occasionally exhibited symptoms. (T.C. Vanterpool). Sl. damage was caused to red clover in Queen's Co., P.E.I. (R.R. Hurst).

NORTHERN ANTHRACNOSE (Kabatiella caulivora) was much less sev. in n. and central Alta. than in the past 3 years. Infections were 1-tr. 5-sl. 1-mod. in 7/8 fields examined (W.P.C., J.B. Lebeau). Sev. infection was noted in variety test plots at Ste. Anne de la Pocatiere, Que. (D. Leblond).

ROOT ROT (Plenodomus meliloti) infections were 2-tr. 3-sl. 1-mod. 1-sev. in 7/17 alsike clover fields in central Alta. (J.B.L.).

LEAF SPOT (Stagonospora meliloti) occurred in mod. amounts on alsike clover at St. Clement, Que. (D. Leblond).

LEAF SPOT (Stemphylium sarcinaeforme) affected 4 fields of red clover nr. Dawson Creek, B.C.; 1-tr. 3-sl. (W.P.C.).

WINTER CROWN ROT (low-temperature basidiomycete) occurred in 2 red clover fields in central Alta. and caused mod. damage (J.B. Lebeau). All 17 alsike fields examined in central Alta. were affected; 4-sl. 8-mod. 5-sev. Most fields in the Peace River district were completely killed (W.P.C.).

PHYLLODY (? virus) was mod. - sev. in ladino clover plots at Ste. Anne de la Pocatiere, Que. (D. Leblond).

LEAF CHLOROSIS See Hrushovetz, S.B., J.B. Lebeau and H.B. Stelfox. Production of leaf chlorosis in red clover by the addition of chemicals to the soil. Plant Dis. Reporter. 41:120-122. 1957

SWEET CLOVER

GRAY STEM CANKER (Ascochyta caulicola) affected 17/22 fields examined in Sask. Damage averaged sl. and was sl.-mod. on sweet clover varieties at Saskatoon and occurred in fields in n.e. Sask. (H.W. Mead). Sl.-mod. infections were general in Man. (W.C. McDonald).

SUMMER BLACK STEM & LEAF SPOT (Cercospora davisii). Spotting of lower leaves was sl. in June and increased throughout the summer. Sl.-mod. infections of stems and pedicels were common during late summer. Virus-infected Brandon Dwarf plants were sev. damaged by black stem at Brandon, Man. (W.C. McDonald).

ROOT ROT (Fusarium culmorum) killed affected plants and caused mod. damage in a variety plot at Saskatoon, Sask. (H.W.M.).

LEAF SPOT (Leptosphaeria pratensis (Stagonospora meliloti). Sl.-mod. infections were common in Man. (W.C. McD.).

ROOT ROT (Plenodomus meliloti) occurred in 8/8 fields examined in central Alta. Ratings were 5-tr. 3-sl. (J.B. Lebeau).

COMMON LEAF SPOT (Pseudopeziza medicaginis). Sl.-mod. infections were observed in plots at Brandon and Winnipeg, Man., late in the summer, (W.C. McD.).

BASAL STEM ROT (Sclerotinia sclerotiorum) occurred mostly in n.-e. Sask.; Ratings were 2-sl. 8-mod. in 10/22 fields (H.W.M.).

WINTER CROWN ROT (low-temperature basidiomycete) caused sl. damage in 1 field near Edmonton /8 examined in central Alta. (J.B. Lebeau).

MOSAIC (bean virus ^{2}) occurred on Brandon Dwarf. Symptoms were observed on plants on roadsides s. of Brandon and e. to Glenboro, Man., but the disease was not observed in adjacent fields (W.C. McD.).

DECLINE (? virus) was noted from Kamouraska Co., Que. (R.O. Lachance).

BLACK LEAF BLIGHT (cause unknown). Several farmers in the Neepawa area reported a disease not previously encountered in Man. All the leaves and part of the petioles were black and completely shrivelled on plants in the bud stage. The diseased plants occurred sporadically among healthy plants. The stems and roots of affected plants appeared to be healthy. Isolations from leaves, petioles, stems and roots yielded only common saprophytes. All the leaves on all the branches of an affected plant were distorted as though acted upon by a toxic material. The sporadic occurrence of the disorder and the information that no spraying had been done within one mile of one of the fields ruled out herbicides as a cause. Nor did it appear that insects were directly responsible (W.C. McD.).

OIL-SEED CROPS

FLAX

Special reports of flax diseases were prepared for Sask. by T.C. Vanterpool and Man. by B. Peturson.

FLAX DISEASES IN SASKATCHEWAN IN 1956

Flax acreage and total yield in 1956 were the highest ever attained in the province. The average yield was 10.3 bu. per acre (18,000,000 bu. on 1,750,000 acres). This is about 2 bu. above the long-time average. The widely scattered, but slight, frost of 19 Aug., affected the seed quality

appreciably, as did the more severe frosts of 5, 6 and 7 Sept. The late seeding increased the chances of the crop being damaged from these frosts. The feeding of frozen immature flax to livestock has resulted in isolated cases of poisoning because of the hydrocyanic acid compounds produced as a result of certain breaking-down processes due to freezing.

May was dry; this resulted in uneven germination, the later plants emerging about 2 weeks after the first ones. In addition, Seedling Blight (Rhizoctonia solani) was conspicuous on the early seedlings, and Heat Canker caused by high temperatures and bright sunshine in early and middle June, further thinned the crop. Strong winds in several areas caused severe breaking-off of young plants partially damaged by heat canker earlier when in the seedling stage.

By the end of the third week of June, flax fields in general looked thin and uneven in height, and prospects for a good crop were not bright. Fortunately from then on the rainfall was distributed in numerous, relatively small, intermittent showers throughout June, July and early Aug., and the temperature remained below normal for the rest of the summer. These conditions favored growth and branching so that by flowering time flax fields generally showed good and moderately uniform stands, the late-sown fields being much the better.

Seedling Blight (Rhizoctonia solani). There were widely scattered mod. infections in many early-sown flax fields following fallow, but less on flax on cereal stubble fields. Seedling blight is rarely noticed by farmers, so that few enquiries are received and surveys are necessary to determine its extent.

Heat Canker. 1956 was a 'heat canker year' for flax. This can be accounted for by the high temperatures of early June; actually, the highest temperature of the summer, 97°F., occurred on 10 June. The high killing of seedlings in the early sown fields was caused by (1) Rhizoctonia blight and (2) heat canker, both troubles being favored by relatively dry soil and high temperatures. One to three weeks later, however, plants partially damaged at ground level by heat canker were broken off by strong winds and became quite conspicuous. This late type resulted in 10 enquiries from farmers, which is large when the short duration of the trouble is taken into account. Heat canker was more sev. on flax on fallow and definitely less on flax on cereal stubble where the trash helped to shade the soil near the seedlings. Chlorotic banding of cereals, which may also be caused by high soil-surface temperatures was more prevalent than normal.

Rust (Melampsora lini). Virtually absent except for reports of infections on Redwing around Prince Albert. Tr. or absent in central and s. Sask.

Wilt (Fusarium oxysporum f. lini). A few isolates were obtained from 1 sample sent in.

Rust and Wilt which were for many years the most important diseases of flax in Sask. are being adequately controlled at the present time by resistant varieties.

Pasmo (Septoria linicola) continues to spread westward though the affected fields may be widely scattered. Reports from agricultural workers in Assiniboia, Moose Jaw and Swift Current indicate that pasmo was common in those districts. Moderate infection on the Regina plains with sl. to mod. through the Weyburn district and eastward. In the area n. of the Qu' Appelle to Saskatoon pasmo was rarely found. Slight to moderate infections were found in the n.-e. which was formerly the stronghold of browning and stem-break. Pasmo is definitely a disease of maturing plants. This was strikingly brought out in a field 20 miles s.-w. of Regina in which the older, earlier emerged plants showed slight to moderate pasmo, while the younger, late emerged plants showed none to tr. (28 Aug.). The moist conditions of the last 3 years appear to have favored its westward and northwestward spread in Sask. No varietal differences in resistance could be discerned in plots at the Swift Current station.

Browning and Stem-Break (Polyspora lini). None was observed this year in the field. It is difficult to explain the decline in this disease which used to be serious on flax in the n. and n.-e. of the province, where seed with a 20 - 35% infection was often found.

Blight (Alternaria linicola). Conspicuous only in e.-central and s.-e. Sask. around Grenfell, Kennedy, Melville, Fort Qu' Appelle, Dysart, Cupar, Markinch, Halfield and Venn. It appeared as long, dirty, black lesions with smudged indefinite edges, or the whole top third of the plant may be brownish black. Alternaria linicola, A. tenuis type, and Fusarium spp. (not F. oxysporum f. lini) were isolated in that order of frequency.

Yellows (aster yellows virus). Absent or tr. only in most fields. In one field at Kisby there was 5 - 10% yellows at the edge of a late-sown field, with only a tr. further in. At Arcola there was mod. yellows in a weedy spot in one field. The gray leafhopper, the yellows vector, was less plentiful than in the last 3 years during which yellows was conspicuous. The leafhopper population was slow in building up compared with these years (based on information from entomologists).

Herbicide Damage and Thrip Injury. Boll fusion, or clumping of bolls, was conspicuous in the plots and in an occasional field. Thrips were always present in the clumps, but as there was usually other evidence of herbicidal injury in affected fields, it is thought that the thrips aggravated a trouble initially caused by herbicide. The symptoms of herbicidal damage on flax are constantly changing. This appears to be due to new herbicides and to different

formulations, as well as to the stage of development of the plant at which the herbicide is applied. Herbicidal damage to flax appears to have been worse than usual, probably the result of late application. Flax is not ordinarily sprayed until after the cereal spraying is complete. Delay in cereal seeding necessitated a delay in spraying generally. This was what happened in 2 cases of damage to flax near Regina where the herbicide was applied from an airplane on 12 July when the crops were too far advanced.

Lime-Induced Chlorosis was conspicuous in the corner of one field near Cudworth. It appears to be most common on semi-degraded soils.

Apical Injury. A type of apical injury involving death of the growing point followed by stimulation of side branches near the top, was observed for the first time. It occurred on plants approaching the flowering stage. Its cause is unknown.

FLAX DISEASES IN MANITOBA IN 1956

Weather conditions were favorable for growth of flax throughout Man. in 1956. The crop was not affected by disease to any marked extent and good flax yields were obtained in all crop districts. There were 808,000 acres sown to flax. The estimated yield was 10.4 bu. per acre, 1.4 bu. per acre higher than last year.

Rust (Melampsora lini). About 92% of the flax acreage in Man. was sown to rust resistant varieties. Practically no rust occurred on the rust resistant varieties anywhere in the province. A light rust infection was present on Bison and Dakota in experimental plots at Morden and Brandon and a light infection was observed in a few fields of Red Wing.

Pasmo (Septoria linicola). Pasmo was present in most fields but generally was very light and in many of the fields examined it occurred in tr. amounts only. However, a few fields which carried heavy infections were observed.

Yellows (aster yellows virus). Aster yellows was much less prevalent, in 1956, than in the 3 previous years. Many of the fields examined were free of aster yellows and where found it was present in tr. amounts only. The gray leafhopper, the vector of aster yellows, was very much less prevalent than during the period 1953-55 when this disease was common in flax.

Other Observations

WILT (Fusarium lini) was noted on irrigated crops at Vauxhall, Alta. (A. W. Henry)

RUST (Melampsora lini) affected 40/65 fields examined in central and n. Alta. Most of the rust was found in the Peace River district. Flax is a profitable crop but early-maturing varieties suitable for the district lack rust resistance. The acreage is extensive and flax is grown on the same or adjacent fields year after year. Consequently rust causes sev. losses (W.P.C.). Sl.-sev. infections were noted at Edmonton, Fayban, and Fairview, Alta. (A.W. Henry). Only 4/28 fields examined in s. Alta. were affected. Ratings were 2-tr. 1-sl. 1-sev. Bison was sev. damaged in irrigated plots at Lethbridge; Redwing was sl.-mod. infected and all other varieties and lines tested were not infected (J.S. Horricks).

BROWNING and STEM STREAK (Polyspora lini). Tr. infections occurred in 2 fields in the Peace River district /65 examined in central and n. Alta. (W.P.C.). At Berwyn 20% of plants in a 150 acre field were broken over (A. W. Henry).

ROOT ROT (Rhizoctonia solani) affected 6/28 fields in s. Alta. Ratings were 3-tr. 3-sl. (J.S.H.).

PASMO (Septoria linicola) affected 2 fields slightly in central Alta. /65 examined in central and n. Alta. (W.P.C.).

PREMATURE RIPENING (cause unknown) with consequent loss in yield occurred in patches in several fields near Brooks and Lethbridge, Alta. It was observed most frequently in spots where soil conditions appeared to be unfavorable. Rhizoctonia root rot was associated with the damage in some fields but not in others (E.J. Hawn, M.W. Cormack).

FIBRE FLAX

WILT (Fusarium oxysporum f. lini). A sev. outbreak was observed in Berthier and Soulanges Counties, Que., where a new, highly susceptible variety, Wiera, was introduced. Several fields were complete losses (R.O. Lachance, D. Leblond).

RUST (Melampsora lini) sev. affected 1 field of Liral Dominion in Soulanges Co. Fifty fields were surveyed in Soulanges and Berthier Counties of Que. (R.O. Lachance).

PEPPERMINT

RUST (Puccinia menthae) caused 100 percent infection of a row of plants at Experimental Station, Kentville, N.S. Spores were being discharged from aecia on swellings of the stems at ground level, on 13 June. Ten percent of the plants were girdled (K. A. Harrison).

RAPESEED

A Special Report "Rapeseed diseases in Saskatchewan in 1956" was prepared by T. C. Vanterpool.

RAPESEED DISEASES IN SASKATCHEWAN IN 1956

Rapeseed acreage for 1956 was 300,000; more than double that of 1955. With this increase in acreage from a low of 1,400 acres in 1950, there has been a general, concomitant increase in severity of the diseases affecting the crop. Particularly in areas where there is a concentration of acreage, such as around Prince Albert and Shellbrook, farmers have learned from experience the value of crop rotation in limiting losses from Sclerotinia Stem Rot. Downy Mildew (Peronospora parasitica) which was first observed in 1952 is definitely on the increase (P.D.S. 32:34).

Stem Rot (Sclerotinia sclerotiorum) was absent to a tr. in most fields encountered on survey in central Sask., but it should be realized that many farmers were growing rapeseed for the first time. One field 6 mi. n. of Melville had 3-5% stem rot. This amount of stem rot tended to increase lodging, under the moist conditions prevailing, by bringing down healthy plants with diseased plants. The rape followed a ceral crop on fallow; it seems likely, therefore, that sclerotia were sown with the seed. In the Prince Albert area, one of the oldest rapeseed growing areas in the province, Mr. M. MacKay, the Agricultural Representative, reports that many Polish rape fields had large patches affected by stem rot that ripened prematurely with very little seed in them. He states that this condition was most common where the farmers had been growing rape for a few years.

Downy Mildew (Peronospora parasitica). At the present time severe outbreaks of this disease are confined to certain localities. Little or none was found in the Saskatoon area, but n. of Humboldt to Lake Lenore there were sl. to occasionally sev. infections. At Maryburg there was a field with 15% infection. The Agricultural Representative at Prince Albert reports that this year "downy mildew could be found in practically every field" and that "many of them would average around 5%".

Stem and Pod Black Spot (Alternaria brassicae) was more common this year than ever. It is the only seed-borne parasite of rape which I have isolated consistently from seed. That 1956 rape seed from Sask. will be highly infected with A. brassicae is indicated by preliminary isolation; seed treatment may be necessary.

Fusarium Stem Rot (Fusarium sp.). On 20 Aug. a few plants, which were drooping and ripening prematurely, in plots at Saskatoon were found to be attacked by Fusarium at ground level. There was slight pink discoloration of tissue, and spore masses were present. Isolations from internal portions of the roots and crown yielded Fusarium and a few cultures of Pythium debaryanum. In laboratory inoculations the Fusarium was only moderately pathogenic to rape. Pythium produced the usual damping-off.

Seedling Blight (Rhizoctonia solani). Some damping-off of rapeseed occurred in the greenhouse in fresh potting soil. Two strains of R. solani were isolated which were highly pathogenic. These findings suggest that Rhizoctonia seedling blight in the field has hitherto passed unobserved.

Yellows (aster yellows virus). A tr. was found in two fields only. The late-season flare-up on side branches of rape was not observed this year.

White Rust (Cystopus candidus). Traces only found on occasional plants attacked by downy mildew.

Other Observations

GRAY LEAF SPOT (Alternaria brassicae) caused sl. damage in 15/20 fields surveyed in Sask. It caused bleaching of stems and pods and shrivelling of seeds (H. W. Mead).

Heavy infections were noted from Balmoral and Hamiota, Man. and sl. infection in plots at Fort Garry. The characteristic long conidia of A. brassicae were obtained from leaf scrapings and from isolations (W. C. McDonald).

DOWNY MILDEW (Peronospora parasitica) was found on sl. damaged specimens from nr. Prince Albert, Sask. (H. W. Mead).

STEM ROT (Sclerotinia sclerotiorum) caused sev. damage in a 15-acre field nr. Colinton, Alta. Fifty to 75% of the crop was damaged and both yield and quality were affected (A. W. Henry). A survey of 20 fields in Sask. revealed 3-sl. and 10-mod. infections. Samples of this disease were received from Nipawin and Tisdale in n.-e. Sask. (H. W. Mead).

SAFFLOWER

LEAF SPOT (Alternaria carthami). In Late Sept. tr. infection was noted in plots at Lethbridge, Alta. (F. R. Harper).

RUST (Puccinia carthami) was sl.-mod. in irrigated plots grown from untreated seed at Lethbridge, Alta. (M. W. Cormack).

DAMPING-OFF (Pythium debaryanum, Fusarium sp.). About 10% of a 100-acre plot was destroyed and had to be resown. The second sowing did not blight off. Later, the disease was scattered throughout the whole plot. Occasional plants developed Fusarium root rot. Early isolations yielded Pythium predominantly with some Fusarium while later isolations were predominantly Fusarium. Both were severely pathogenic in artificial inoculations (T. C. Vanterpool).

SOYBEAN

A special report on "Diseases of Soybeans in Ontario in 1956" was prepared by A. A. Hildebrand for the Canadian Plant Disease Survey.

DISEASES OF SOYBEANS IN ONTARIO IN 1956

A discussion of the diseases occurring on soybeans in s.-w. Ont. in 1956 necessitates at the outset a consideration of the weather that prevailed in the area during the growing season. With the exception of July the summer was unusually wet. In the accompanying table a comparison is made between the average precipitation for April, May, June, July, and Aug., 1956, and that for the same months during the 25-year period, 1930-1955, and the 38-year period, 1917-1955.

Average Monthly Precipitation (in.)

Period	Apr.	May	June	3-month total	July	Aug.	5-month total
1956	3.30	4.54	4.13	11.97	1.74	5.67	19.38
1930-1955	2.47	2.55	2.95	7.97	2.25	2.35	12.57
1917-1955	2.65	2.40	2.95	8.00	2.10	2.30	12.40

From the table it may be noted that in April, May, and June, 1956, about 12 inches of rain fell in the Harrow area. Precipitation was as high, and often higher, in other parts of Essex and of Kent Counties. This meant that when

soybeans should have been planted, soils were extensively water-logged, and flooding of fields was frequent. According to official reports, by mid-June only 25% of the anticipated soybean acreage had been planted. Much of the earlier acreage was subjected to flooding for varying periods of time.

Also, during and after the period when soybeans are usually planted (about 20 May until 15 June), temperatures in 1956 were unfavorable for a warmth-requiring crop. Below, a comparison is made between the average weekly temperatures from 15 May-11 June, 1956, and those for the corresponding weeks during the 6-year period, 1949-1955.

Average Weekly Temperatures (°F.)

Period	15-21 May	22-28 May	29 May - June 4	5-11 June
1949-1955	60.0	60.3	64.5	67.5
1956	50.8	56.5	58.5	65.7
Difference	9.2	3.8	6.0	1.8

Such, then, in general, were the environmental conditions under which most soybeans got away to an unusually inauspicious start in s.w. Ont. in 1956.

Phytophthora Root and Stalk Rot (Phytophthora sp.). Two years ago, (P.D.S. 34:46), reference was made to a new disease of undetermined cause which was widespread throughout the soybean-growing area of w. and s.w. Ont. The disease was widely prevalent again in 1956, and more threatening than it had been in 1954. (The disease was present in 1955 but the writer was in Britain for most of the summer and had no opportunity of making any observations). On 4 July, 1956, attention was called to a 75-acre field of Harosoy soybeans in 30 acres of which most of the young plants were either dead or dying. The field had been flooded, and popular opinion held that the plants in this and other flooded stands had been killed or injured by "water damage". Wilting plants, all showing a depleted, necrotic root system and a characteristic, grayish-green or tan-coloured lesion extending upwards on the stem, were obtained. From them a Phytophthora was isolated consistently. During the first 3 weeks in July many fields over a wide area including Pelee Island were visited and the disease was observed in varying intensity on plants in various stages of development. In many fields only a few plants in small patches were affected; in others, loss of plants was sev. in areas up to 2 acres in extent. Often, but certainly not invariably, the disease was worst in low spots in a field, or in fields that had been flooded. When groups of plants were involved, spread of the disease tended to be along rather than across the rows. Most serious losses occurred in fields in which the disease was attacking nearly full-grown plants in the early podding stage. From late July, until the end of the season, infection of plants was reduced sharply, although dying, fully-podded plants were not difficult to find in Sept. Whether the reduction in infection in July was correlated with or merely incidental to the low rainfall for that month (only 1.74 in.) is not known.

From early July until mid-Sept., isolations from diseased specimens, selected in widely different areas, yielded cultures of a Phytophthora. Eleven representative isolates have been compared in culture on various artificial media, and they all appear to be the same. Moreover, they act similarly pathogenically. In greenhouse and in field infection tests these 11 isolates have been found to be highly pathogenic to soybeans of the varieties Harosoy, Lincoln, and Harman, their virulence being such as to kill Harosoy and Lincoln in a few days, and Harman in a slightly longer time. They infected Blackhawk slightly but Monroe remained immune from their attack. These results are closely in accord with those obtained in similar tests by investigators in Ohio and Illinois where the disease is also present. One isolate selected at random has been found to be pathogenic to Sanilac field and Black Valentine garden beans but innocuous to certain varieties of tobacco, cowpea, cucumber, and pepper.

No concerted effort has been made yet to identify the Ontario pathogen. Currently, it is being compared morphologically and pathologically with isolates obtained from Ohio and Illinois. The soybean pathogen in Ohio has been named Phytophthora cactorum; the Illinois fungus is still being referred to as Phytophthora sp.

A most unfortunate circumstance in regard to this disease is the almost complete susceptibility of Harosoy, a variety so promising in other respects that it is being adopted almost to the exclusion of other varieties.

Brown Stem Rot (Cephalosporium gregatum). It has been reported (Chamberlain, D.W., and W.B. Allington, Phytopath. 38:4. 1948) that low air temperature is the important factor in the development of brown stem rot. In the soybean-growing area of Ont. the summer of 1956 was appreciably cooler than usual. In the accompanying table a comparison is made on the basis of average weekly temperatures between a 6-week period in 1956 and a corresponding period for the previous six years.

Average Weekly Temperatures

Period	26 July-2 Aug.	3 - 9 Aug.	10-16 Aug.	17-23 Aug.	24-30 Aug.	31 Aug.-6 Sep.	Av.
1949-1955	74.0	73.6	73.6	75.6	75.5	73.2	74.2
1956	70.0	69.8	69.7	69.4	72.3	69.7	70.1
Difference	4.0	3.8	3.9	6.2	3.2	3.5	4.1

Whether the lower temperatures indicated above for the summer of 1956 were a predisposing factor is not known but certainly the disease appeared earlier and in more serious proportions than for a number of years previously. By 15 Aug. a field of Harosoy was observed in which about 2 acres were seriously affected by the disease. As the season advanced the disease was observed in an increasing number of fields regardless of variety. Observations in 1956, as in previous years, indicate that brown stem rot must be responsible for an appreciable reduction in the yield of soybeans in Ontario.

In 1952, the laboratory experimental plots in which soybeans had been grown successively for 3 years had to be relocated because of the severity of brown stem rot. In the new site the disease made its appearance in 1954, increased in 1955, and this year became a factor of such importance that the plots will again have to be abandoned. These circumstances furnish convincing evidence not only of the rapidity with which this disease can spread once a soil has become infested, but also of the inadvisability of growing soybeans after soybeans in the same location.

Rhizoctonia Root and Stem Rot (Rhizoctonia solani). Only once previously in these reports (P.D.S. 30:40) has R. solani been mentioned as a pathogen of soybeans. At the time it was reported that the fungus had completely destroyed a late-planted field of Lincoln soybeans under conditions of excessive temperature and moisture. This year, early in July, the fungus was found attacking plants in 11 different fields. Affected plants, moreover, showed a necrotic and depleted root system, and on the lower stem regions were numerous, reddish-brown lesions, not continuous and elongated like those caused by Phytophthora, but smaller and tending to be disposed irregularly. It was evident that the disease had been killing plants for some time before it first came under the observation of the writer. Incidence of the disease could not be associated with any recognizable topographical feature common to all fields. In the aggregate loss of yield was not high but foliar discoloration and mortality of plants were so conspicuous as to alarm the growers whose fields were affected.

Stem Canker (Diaporthe phaseolorum var. caulivora), which a few years ago constituted the most serious threat to soybeans in s.w. Ont. was almost innocuous in 1956. In early August, as usual, the disease had affected spurs and petioles on the lower half of stems of susceptible varieties. However, in only a few instances did infection advance into the main stem. In commercial stands, stem-canker infected plants did not attract attention until about 7 Sept. A reason for the low incidence of the disease is the widespread adoption of Harosoy which is an "escape" variety. Stands of susceptible varieties such as Hawkeye and Blackhawk are rare, and only small acreages are planted to the formerly popular but susceptible variety Lincoln.

Manganese Deficiency. Usually an appraisal of the extent and the effect of manganese deficiency can be made about 15 June. This year, however, because of delayed planting, such an appraisal could not be made until early in July. Despite an abundance of moisture in the soil, the deficiency was as widespread as usual and its effects even more sev. than in previous years. This deficiency, more correctly a non-availability, of manganese is, in the opinion of the writer, one of the most important factors that modify the yield of soybeans in much of Essex and in parts of Kent County.

ROOT CROPS

MANGEL

BROWN HEART (boron deficiency) was found in samples brought in by 2 growers from Sooke B.C. (W.R. Foster).

SUGAR BEET

DODDER (Cuscuta sp.). An infestation that evidently had spread from a single parasitized beet planted 2 or 3 years previously now was fairly prevalent on seedlings in a field at Tempest, Alta. (M.W. Cormack).

BLACK ROOT (various fungi) was found in all 42 fields examined in s. Alta. An av. of 57% of the seedlings were infected and 7% were sev. damaged or killed. Rhizoctonia solani was found in 55% of the fields, Pythium spp. in 38%, Phoma betae in 24% and Aphanomyces cochlioides in 10%. One late-seeded field was sev. damaged by the 4-leaf stage and was ploughed under in September (F.R. Harper).

DAMPING-OFF (Rhizoctonia solani) was observed in several fields at St. Hyacinthe, St. Thomas-d'Aquin, and St. Hilarie, Que. In some fields 20% of plants were affected; most fields had 5-10% infection. After thinning the same fields had root rot caused by the same organism on about 1% of plants (R. Crete).

MISCELLANEOUS CROPS

FIELD CORN

A special report was prepared by N.J. Whitney to record the results of a survey for ear and stalk rots of field corn in Essex, Kent, and Lambton Counties in s.-w. Ont. Fifty consecutive plants were rated in two different locations within each of the 25 fields surveyed.

Pink Ear Rot (Fusarium moniliforme) was present in 15 fields and ranged from 1 - 4%, av. 1.6%. Gibberella Ear Rot (Gibberella zeae) was present in 18 fields and ranged from 1 - 7%, av. 1.9%. Diplodia Ear Rot (Diplodia maydis) was present in 6 fields and ranged from 1 - 9%, av. 0.4%. It was present chiefly in Lambton Co.; none was found in Essex. The ear rots caused only sl.-mod. damage and would not reduce yield to any extent.

Stalk and Root Rot (Fusarium spp., Pythium spp.) was found in all 25 fields and ranged from 4-70%, av. 33.4%. It was more common in Kent and Essex Counties than in Lambton Co., where the crop was later. Damage caused by stalk rot was mod.-sev. Yield would be reduced because of difficulty in harvesting ears from lodged plants.

Other Observations

CORN SMUT (Ustilago maydis) was noted from Moose Jaw, and Davidson, Sask. (T.C. Vanterpool). Smut affected 6/25 fields surveyed in Essex, Kent, and Lambton Counties, Ont. Infections ranged from 1-3%, av. 0.3% (N.J. Whitney). Tr. amounts were observed at Montreal Botanical Garden, Que. (P. Duval).

BRITTLENECK (2,4-D injury). About 12 acres in Queen's Co., P.E.I., showed wind and cultivator damage, after 2,4-D had been applied. Abnormal growth of brace roots occurred but total damage was sl. (J.E. Campbell).

HOP

DOWNY MILDEW (Pseudoperonospora humuli) was found in sl. amounts in the Sardis district, B.C. Zineb is being used as a fungicide against the disease (W.R. Foster).

BLACK ROT (Pythium ? ultimum) affected 50% of plants at one farm in Lillooet Township, B.C. (G.E. Woolliams).

WINTER INJURY. Temperatures below 0°F. in mid Nov., 1955, killed nearly all plants in commercial plantings near Kamloops, B.C. The farms had to be replanted (G.E. Woolliams).

MUSTARD

WHITE RUST (Albugo candida) affected 4/8 fields in s. Alta.; ratings were 2-tr. 2-sl. (J.S. Horricks). Mod. infection was noted at Botanical Gardens, Montreal, Que. (P. Duval).

ROOT ROT (Rhizoctonia solani) caused tr. damage in 1/8 fields surveyed in s. Alta. (J.S.H.).

E. CULTIVATED AND OTHER GRASSES

AGROPYRON

Ergot (Claviceps purpurea) was found on A. inerme nr. Fort Vermilion, Alta; on A. repens at 3 places in central Alta.; on A. smithii nr. Cecil Lake, B.C.; on A. spicatum at Worsley, Alta.; on A. subsecundum at 2 places nr. Fort Vermilion (W.P. Campbell).

Stem Smut (Ustilago hypodytis) occurred in one section of the Trout Creek District. The disease seems to have started in a local field and is steadily spreading to nearby fields nr. Summerland, B.C. (G.E. Woolliams).

AVENA FATUA

Stem Rust (Puccinia graminis) was found commonly on wild oats throughout central Alta. (W.P.C.).

Stripe Blight (Pseudomonas striafaciens) was found in tr. amounts nr. Morrin, Alta. (W.P.C.).

BROMUS

Ergot (Claviceps purpurea) was noted on B. inermis at 21 locations in n. and central Alta. (W.P.C.). In Sask. 10/15 fields were affected; ratings were 2-sl. 8-mod. It was also present on brome grass planted on roadsides to control weeds (H.W. Mead).

Leaf Blotch (Helminthosporium bromi) caused sl. damage on Bromus spp. in plots at Saskatoon and on roadsides in Sask. (H.W.M.). Also present at Guelph, Ont. (L.V. Busch).

Leaf Spot (Helminthosporium sorokinianum) caused sev. damage in College plots at Guelph, Ont. In many cases the lower leaves were completely killed. The total reduction of leaf surface approached 50% in many plots. H. bromi was also present but to a lesser degree. Both organisms would be found on the same plants and could not be distinguished on symptoms alone (L.V.B.).

Scald (Rhynchosporium secalis) was collected on B. inermis nr. Duhamel, Alta. (W.P.C.). Scald was less sev. than usual at Guelph, Ont. (L.V.B.).

Leaf Spot (Selenophoma bromigena) was mod.-sev. on roadside stands at Pincher Creek, and Cowley, Alta. (E.J. Hawn). Sl.-mod. infections were found in 10/15 fields examined in Sask. and on roadside plants (H.W.M.).

CALAMAGROSTIS

Ergot (Claviceps purpurea) was found at Ft. Vermilion and Legal on C. canadensis and at Ft. Vermilion and Dewberry, Alta. on C. inexpansa (W.P.C.).

Tar Spot (Phyllachora graminis) occurred in mod. amounts on C. canadensis at St. Roch des Aulnaies, Que. (D. Leblond).

DACTYLIS GLOMERATA

Ergot (Claviceps purpurea) was present in mod. amounts at St. Clement, Que. (D. Leblond).

Stem Rust (Puccinia graminis var. phlei-pratensis) occurred in tr.-sl. amounts in plots at Lethbridge, Alta. (E. J. Hawn).

Leaf Scald (Rhynchosporium sp.) together with brown stripe caused by Scolecotrichum graminis usually affects orchard grass severely at Guelph, Ont. Frequently all the leaves are killed by these two pathogens. However, damage was much less this season (L. V. Busch).

Brown Stripe (Scolecotrichum graminis) was present in tr.-sl. amounts in plots at Saanichton, and at Sardis, Chilliwack, Whiskey Creek and Soda Creek, B.C. (E. J. Hawn, W. R. Foster). It occurred in sl.-mod. amounts in pasture plots at Lethbridge, Alta. (E. J. Hawn).

Stagonospora Leaf Spot (Stagonospora arenaria) caused sl. damage at St. Clement, Que. (D. Leblond).

Leaf Rust (Uromyces dactylidis) was present in mod. amounts at St. Clement, Que. (D. Leblond).

ELYMUS

Ergot (Claviceps purpurea) was collected at 7 stations in the Peace River area of Alta. on E. innovatus (W.P.C.).

Brown Stripe (Scolecotrichum graminis) was found in sl.-mod. amounts on E. canadensis near Scandia, Alta. on 14 Aug., 1956. Apparently this is the first report of the disease in the area (E. J. Hawn). The fungus comes within the limits of S. graminis on various grasses, but is unusual in having sl. roughened spores. It matched in this respect one collection on Poa compressa. There may be several varieties of this organism (D. B. O. Savile).

FESTUCA

Ergot (Claviceps purpurea) was found nr. Gordondale and Legal, Alta. on F. rubra (W.P.C.).

Net Blotch (Helminthosporium dictyoides). Light infection was observed in a field of Sturdy meadow fescue grown for seed at Fort Garry, Man. (W.C. McDonald).

Winter Crown Rot (low-temperature basidiomycete) was found in mod. amounts in 2 fields examined nr. Edmonton (J.B. Lebeau).

HORDEUM JUBATUM

Dwarf Leaf Rust (Puccinia hordei) was observed at several locations in central Alta. (W.P.C.).

Scald (Rhynchosporium secalis) was collected at 11 stations in n. and central Alta. (W.P.C.).

Leaf Speckle (Selenophoma sp.) was collected nr. Beaverlodge, Alta. (W.P.C.).

Head Smut (Ustilago bullata) was seen at several locations in central Alta. (W.P.C.).

PHLEUM PRATENSE

Ergot (Claviceps purpurea) was found nr. Legal, Alta. (W.P.C.). A few affected plants were seen at St. Gregoire, Que. (R. Crete).

Stem Rust (Puccinia graminis var. phlei-pratensis) was mod.-sev. at the Exp. Farm, Lethbridge, Alta. (E. J. Hawn).

Winter Crown Rot (low-temperature basidiomycete) caused sl. damage in a field nr. Edmonton, Alta. (J.B. Lebeau).

POA SPP

Winter Crown Rot (low-temperature basidiomycete) caused sev. damage in both stands of P. annua examined nr. Edmonton, Alta. (J.B. Lebeau). Four stands were sev. and 1 was sl. damaged out of 5 stands of P. pratensis examined nr. Edmonton, Alta. (J.B.L.). Several circular patches of dead grass occurred in University lawns at Fort Garry. Cultures typical of the basidiomycete were obtained. These are the first isolations of this fungus from grass in Man. (W.C. McDonald).

SETARIA ITALICA

Gray Leaf Spot (Piricularia grisea). A specimen was received from St. George, Ont., where the disease caused mod.-sev. damage in a 10-acre field (L.V. Busch).

SORGHUM VULGARE

Bacterial Leaf Spot (Pseudomonas syringae). Five varieties of sorghum; technicum, caffrorum, saccharatum, sudanense, and durra were grown in the Montreal Botanical Garden. All 5 varieties were badly spotted by this bacterial disease (E. Jacques).

TURF

Damping-off (Pythium arrhenomanes) sev. damaged a new lawn started in poor soil at Kindersley, Sask. P. arrhenomanes was isolated from the sample (T.C. Vanterpool).

Grass affected by the alga Symploca muscorum was sent by W.R. Foster from a bowling green in Victoria, B.C. S. muscorum had previously been reported as causing blackening of a lawn in B.C. (P.D.S. 34:54) (I.L.C.).