III. DISEASES OF VEGETABLES AND FIELD CROPS

ASPARAGUS

CROWN AND ROOT ROT (Fusarium sp.) was reported causing sev. damage in a 5-acre planting of Viking (V 35) near Port Hope, Ont. Many crowns were completely dead and others appeared to be dying rapidly. The planting was in a high, well drained field on sandy loam over clay; part was planted in 1953 and part in 1954 with plants grown at St. Catharines. The disease was first noted this year. (C. B. Kelly).

FROST INJURY. All of the first cutting and 60% of the second were lost from being frozen off in the Toronto-Hamilton area, Ont., this spring. (W. S. Carpenter).

BEAN

Dr. R. L. Millar has prepared a special report on the bean diseases in s. w. Ontario. The survey in August was to determine the incidence of Anthracnose and secure material for physiologic form studies.

It is estimated that 6000-7000 growers had 60,000-70,000 acres under cultivation to dry beans in 1956. The Ontario Bean Growers' Marketing Board, London, Ont., is concerned with the marketing of only the white, Yellow Eye and Red Kidney varieties. Practically the entire production of these varieties is handled by the Board. Other bean varieties are mostly grown under contract with various commercial canners.

The areas of production for the different varieties are as follows: white beans in Huron, Lambton, Middlesex, Elgin, Kent and Essex counties; Red Kidney about Alvinston (Lambton) and Ridgetown (Elgin); and Yellow Eye about St. Thomas (Elgin). The center for the entire area under cultivation to beans is considered to be Strathroy in Middlesex County.

Source of seed for these fields is as follows: white beans, Michigan; Red Kidney, California; and Yellow Eye, no definite information obtained.

In Huron and Middlesex counties, Anthracnose was found in about half the fields of white beans examined. Infection ranged from tr. to sev. and in 75% of the infected fields it was sl. to mod. Collections of anthracnose were obtained from fields of the varieties Clipper, Michelite and Robust. Anthracnose was not observed on white beans examined in the other 4 counties; the reason for this distribution of the disease is not clear.

Anthracnose was present in about 80% of the fields of Yellow Eye examined; infection ranged from sl. to sev. The variety Red Kidney appeared to be free of disease in both areas in which it is grown.

The Bacterial Blights were present throughout the bean growing area; infection was tr. to sev. on white beans. They were slightly more prevalent in Elgin and Kent than in Huron and Middlesex counties. In the Chatham-Ridgetown area, their incidence was sufficiently high to cause considerable concern of the growers who feared their further development if conditions were favorable. Yellow Eye also showed a high incidence of bacterial blight in a few fields whereas these diseases were present in only tr. amounts in Red Kidney.

Mosaic was somewhat more prevalent than expected in white bean fields. While records were not kept for this disease, its prevalence, particularly in Elgin and Kent counties, suggests that it be given more attention in the future. In one field of Robust every plant was infected.

Rust and Sclerotinia Rot occurred in tr. amounts. The incidence of Root Rot appeared to be rather high although environmental conditions that prevailed this year favored good plant growth and tended to reduce above-ground symptoms.

In an area around Port Hope several fields of different snap bean varieties were examined. These beans were being grown for seed under contract in about 70 fields ranging from 2 to 35 acres in extent. The seed is obtained from Idaho and is increased in Ontario over a 3-year period. Anthracnose, bacterial blight and mosaic were found in varying degrees of severity. Anthracnose was present in King Orange, Landless New Stringless and Canadian Wonder whereas Top Knotch, Golden Wax, Pencil Pod Black Wax, Tenderbest and Dwarf Horticultural were free of disease.

Dr. R.N. Wensley has provided some observations on diseases of white beans in southwestern Ont., which supplement those of Dr. Millar.

Root Rot (Fusarium solani f. phaseoli and F. oxysporum) was prevalent in most fields visited in s.w. Ont. It was most severe in areas where flooding caused by heavy storms and low temperatures resulted in conditions unfavorable for plant growth. While F. oxysporum was associated with root rot in some fields, F. solani f. phaseoli was most prevalent and was the main cause of root rot where soil moisture was in excess. In 1955 when drought conditions prevailed, F. oxysporum was isolated to the exclusion of F. solani f. phaseoli from plants affected with root rot.

Common Blight (Xanthomonas phaseoli) was unusually scarce in s.w. Ont. A sl. infection was present in many fields but the disease spread under the prevailing weather conditions.

Sclerotinia Wilt (S. sclerotiorum) was found in a shaded area of one field. Cool wet weather combined with heavy growth and poor air circulation caused heavy infection.

Other Observations

GRAY MOLD (Botrytis cinerea). A sl. infection was observed on the lower leaves of pole beans received from 2 growers in the Lower Fraser Valley, B.C. This disease was reported in 1955 (P.D.S. 35:53), but it occurred only on mature pods in a few fields after a rainy period and actually caused little loss (H.N.W. Toms).

ANTHRACNOSE (Colletotrichum lindemuthianum) was more severe than usual in snap bean plantings in the Niagara Peninsula, Ont. (J.K. Richardson). A mod. infection was noted in a 5-acre field of Brittle Wax grown for seed at Standbridge East, Que. (E. Lavallee). Infection was sl. in a small field at St. Jean (R. Crete), sl.-mod. at Ste. Foy and sev. at St. Roch des Aulnaies (D. Leblond). Anthracnose caused up to 35% loss of crop in a field at Gagetown, N.B. (S.R. Colpitts). Several young plants were found sev. infected in a garden in King's Co., N.S., in July; the disease increased in the district and by fall, it caused 20% loss in one 3-acre field of dry beans (K.A. Harrison). Plants were 100% infected in a home garden at East Royalty, P.E.I. (J.E. Campbell). Anthracnose was tr.-mod. in 2 plots on the east coast of Nfld. and in 3 at Searston (G.C. Morgan).

HALO BLIGHT (Pseudomonas phaseolicola) was reported as follows: Mod.-sev. infection in 5/6 affected fields found in s. Alta. (M.W. Cormack); in variety trials, University of Alberta, Edmonton, infection ranged from none to very sev., no halo blight being recorded on Golden Wax, Golden Wax Dwarf and Topnotch Golden Wax, and a tr. on Seminole; also rather sev. and widespread in Edmonton City. (L.E. Tyner, W.P. Campbell); although the summer was generally cool and moisture plentiful in the Hamilton-Toronto area, Ont., disease less evident than common blight (W.S. Carpenter); infection abundant on unharvested pods, but damage sl. in a planting of Brittle Wax at L'Islet, Que., because disease developed late (L.J. Coulombe); destroyed 75% of crop and 50% of plants failed to set seed in a planting of Pencil Pod at Gagetown, N.B. (S.R. Colpitts); string beans very poor crop in the Annapolis Valley, N.S. and halo blight the most prevalent disease. (K.A. Harrison).

STEM ROT (Rhizoctonia solani). During a cool, wet period in June, most bean (Blue Lake) crops were affected, some seriously, about Kelowna and Vernon, B.C. Although some plants showed signs of recovery, these plants will be late and loss will be substantial (J. King, G.E. Woolliams).

SCLEROTINIA ROT (S. sclerotiorum) caused sev. damage in a garden planting in Fort Garry, Man. (B. Peturson). In an experimental plot at York, P.E.I. Puregold was most sev. affected, with lighter infection on Pencil Pod and Topcrop. Lesions were present on stems, petioles, peduncles, leaves and pods (J.E. Campbell).

RUST (Uromyces appendiculatus) was present in all canning-contract growers' fields of Blue Lake strains in the Lower Fraser Valley from Abbotsford to Chilliwack, B.C., and although infection was sev., loss was very sl. Rust usually appears first in late Aug., but it was reported this year in late June. 0-I stages were first recorded on 28 June at Huntingdon, II on 17 July at Langley Prairie and III on 29 Aug. at Matsqui Prairie. Specimens sent for deposit in DAOM (H.N.W. Toms). A sl. infection noted on Pencil Pod beans at Gagetown, N.B. (S.R. Colpitts). A tr. of rust noted in one planting in Queen's Co., P.E.I. (R.R. Hurst).

COMMON BLIGHT (Xanthomonas phaseoli) was evident in most plantings in the Hamilton-Toronto area, Ont., and periodically caused serious spotting of the pods; lesions most evident on pods of yellow varieties such as Kinghorn (W.S. Carpenter). Heavy infection noted in a field intended for canning at Ste. Philomene, Que. (E. Lavallee).

MOSAIC (virus) was noted as follows: sl. infection on Blue Lake about Kelowna and Vernon, B.C. (G.E. Woolliams); sev. in one planting at Burdett, Alta. (M.W. Cormack); tr. on Brittle Wax at Standbridge East (E. Lavallee); and Ste. Foy, Que. (D. Leblond); row of Black Seeded Pencil Pod in garden beside gladioli at Kentville, N.S., sev. infected causing pods to be twisted; also planting of Kenearly 100% infected (K.A. Harrison).

SEED DECAY was general in the Hamilton-Toronto area, Ontario, and occasionally sev. with seed corn maggot injury in very early plantings even where the seed was treated with fungicide-insecticide dressing. Cool, wet weather prevailed during germination. A few fields were replanted (W. S. Carpenter).

BEET

LEAF SPOT (Cercospora beticola). Tr.-mod. infection was observed in the Univ. plots, Fort Garry, Man. (W.C. McDonald). Leaf spot was general in fields on Jesus Island, Que., causing premature death of older leaves (E. Lavallee). Tr. observed in one planting in Queens Co., P.E.I. (R.R. Hurst).

LEAF SPOT (Phoma betae). Tr.-sl. infection noted in 1 plot at Brooks, Alta. (M.W. Cormack). Tr. in Univ. plots, Fort Garry, Man. (W.C. McDonald).

ROOT AND STEM ROT (Rhizoctonia solani) was sev. in hot beds or greenhouses on Jesus Island, Que., where seed was not treated or soil disinfected (E. Lavallee).

SCAB (Streptomyces scabies). Tr. observed on beets from a planting in Queens Co., P.E.I. (R.R. Hurst). Tr.-sl. infection in 5 fields about Manuels, Nfld., and mod.-sev. in 3 fields at Clarkes Beach (G.C. Morgan).

BORON DEFICIENCY. Petiole cracking and internal black spots in the roots were observed in a few fields at Ste. Rose and St. Martin, Laval Co., Que. (E. Lavallee).

BROAD BEAN

POD BLACKENING (physiologic), first noticed in July, became sev. in Sept. at Ste. Foy, Que. (D. Leblond).

CABBAGE

GRAY MOLD (Botrytis cinerea) was seen in Jan. causing sev. damage to a lot of Danish Ballhead in storage in Queens Co., P.E.I. (R.R. Hurst). The disease caused complete loss of cabbage in 2 cellars at Topsail, Nfld., and some loss in 2 warehouses at St. John's (G.C. Morgan).

SOFT ROT (Erwinia carotovora) sev. affected an occasional head in gardens in Queens Co., P.E.I. (R.R. Hurst). Soft rot caused almost complete breakdown of 3 carloads of cabbage in 2 common storage warehouses in St. John's, Nfld. (G.C. Morgan).

YELLOWS (Fusarium oxysporum f. conglutinans) affected about 5% of the plants in our laboratory plots at St. Martin, Que. (E. Lavallee).

DOWNY MILDEW (Peronospora brassicae). Apparently all plants of a 100,000 shipment were infected when set out at Avonport, N.S.; however, the plants outgrew the trouble and produced a healthy crop except for lesions on the outer leaves (K.A. Harrison).

BLACK LEG (Phoma lingam) was quite general but rarely sev. in the Toronto-Hamilton area; transplants apparently infected before setting in field (W.S. Carpenter).

CLUB ROOT (Plasmodiophora brassicae) present to some degree in Chinese market gardens about Vancouver, B.C. (H.N.W. Toms). Club root was observed frequently in the Fraser Valley and on Vancouver Island. Early-planted early varieties of cauliflower appeared to be affected less than later varieties (W.R. Foster). Four reports received from the Hamilton-Toronto area; crop a total loss in some pockets in these fields (W.S. Carpenter).

The club root organism has now become widely disseminated over the Bradford Marsh from one localized area following the 1954 flood. The disease was found this year in most fields of cabbage and cauliflower examined, some fields being 5 miles from the original infested field. Root infection of cabbage and cauliflower was mod. to sev. depending on the variety in plants grown on the Muck Research Station. The land in these crops this year had not previously been planted to cruciferous plants and weedy Cruciferae are uncommon on the land. Sweet alyssum (Lobularia maritima) in flower beds on an adjacent farm was found infected. On the farm where the disease was first observed in 1953, cauliflower failed to produce a marketable crop and was later disced under (O. T. Page). Club root is the principal disease of cabbage and cauliflower on Jesus Island, Que., but varies considerably in its severity from field to field. Losses were sev. on a farm at Canrobert, where cabbages have been grown on commercial scale for the last 12 years (E. Lavallee). A 5% infection was found in a 10-acre field at St. Martin (L. Cinq-Mars). About 50% of plants were sev. diseased in a home garden at Ste. Anne de la Pocatiere and about 10% of the plants were affected in the variety plots at the Experimental Farm (R.O. Lachance). Sufficient transplants for an acre had to be discarded by a grower at Annapolis, N.S., because he selected an infested area for his seed bed (K. A. Harrison). Club root infection was 6-sl. 8-sev. in fields in Conception Bay and 5-sl. 8-mod. 11-sev./31 fields in Trinity Bay and Bonavista Bay areas, Nfld. In the farming area on the West Coast, sl.-mod. losses occurred in cabbage and swede turnips although in some cases the land had only been newly cleared. Sl. infections were noted in 22 fields in 6 separate districts (G. C. Morgan).

SCLEROTINIA ROT (S. sclerotiorum). A tr. infection was observed in the field at Woodside, N.S. (K.A. Harrison).

BLACK ROT (Xanthamonas campestris) was quite prevalent in many early crops in the Harrow-Leamington area, Ont. Source of infection proved to be infected seed which had been obtained from the usual seed companies (C.D. McKeen). Black rot was general and caused total loss of crop in some fields, particularly of cauliflower, in late July and early Aug., in the Toronto-Hamilton area. Its prevalence this season was due to cool weather, moist conditions and lack of rotation (W.S. Carpenter).

BOLTING. About 20% of the plants of Golden Acre, Green Acre and Copenhagen Market were affected in one lot of transplants although planted by several growers in King's Co., N.S. The plants had been in cold frames during a succession of cold nights when the temperature reached 23°F. When set out they made no growth on account of unfavorable weather and they received a further chilling on 24 May (K.A. Harrison).

both callistephus virus 1 and virus 1A, the 'eastern' and 'western' strains of the aster yellows virus are, for convenience, referred to callistephus virus 1. Only when it has been shown experimentally is callistephus virus 1A reported, although it may be now more prevalent than virus 1 (I. L. Conners).

CAULIFLOWER

SOFT ROT (Erwinia carototora). In a 5-acre planting at Coaldale, Alta., about 1% of the tied heads showed mod.-sev. breakdown (F. R. Harper).

CLUB ROOT (Plasmodiophora brassicae). Infection was considerable in several fields about Oakville, Ont. One grower lost 10% of his crop and many other plants were stunted because of sev. root infections (J. K. Richardson).

BACTERIAL SPOT (Pseudomonas maculicola). A sample of curds received in Aug. 1956 showed rather numerous spots on the curds. The lesions were diagnosed to be those of this pathogen. The crop was grown at Carrying Place, Prince Edward Co., Ont., in 1954 under contract for processing into pickles. The curds were shipped in brine to Winnipeg (H. N. Racicot).

PYTHIUM ROT (P. ? ultimum). A curd and stem rot developed on 10-25% of the plants in 2 commercial plantings at Salmon Arm, B. C. (G. E. Woolliams).

BLACK ROT (Xanthomonas campestris). See under Cabbage.

YELLOWS (Callistephus virus 1) was noted in Alta., on Thalaspi arvense (W. P. Campbell) and on cauliflower (L. E. Tyner). Virus 1A has been reported on cauliflower from California by Weiss (Index of Plant Diseases in The United States, p. 240 (I. L. Conners).

WHIPTAIL (Molydenum deficiency) was observed at 2 new locations in addition to 2 previously found in the Toronto-Hamilton area; sodium molybdate mixed in the fertilizer is giving adequate control (W. S. Carpenter). Crop was almost a total loss in a commercial planting at Oromocto, N. B. (S. R. Colpitts). At Cornwall, P. E. I. healthy transplants set out in a deficient soil developed symptoms of whiptail. Seedlings grown in this deficiency area showed sev. molydenum deficiency, but the condition was corrected by a spray application of sodium molybdate, 1 lb. per acre, to the foliage and soil close to the plant (J. E. Campbell). Molybdenum deficiency was very evident in P. E. I. this year because of the dry season, however, most commercial growers now recognize the early symptoms and by promptly spraying their crops suffered little loss from the disease (R. R. Hurst).

BROWN HEART (boron deficiency). A few sev. affected plants were observed in a garden in Queens Co., P.E.I. (R.R. Hurst).

CELERY

EARLY BLIGHT (Cercospora apii) still occurs quite generally in the Niagara Peninsula, Ont., but although more prevalent in some localities than others it seldom causes as sev. damage as late blight (J.K. Richardson). Outbreaks are not uncommon in the Toronto-Hamilton area and have caused damage in a few instances; disease usually checked by spraying (W.S. Carpenter). On one muck area at Ste Dorothee, Que. where celery has been grown year after year, early blight is often quite prevalent (E. Lavallee).

CENTROSPORA ROT (C. acerina). The causal organism is known to be established in fields of 4 growers in the Burlington area, Ont. Growers are now using copper-8-hydroxyquinolinate as a butt drip at harvest to prevent its development in storage (W.S. Carpenter).

SOFT ROT (Erwinia carotovora). A heart rot was observed in Chinese market gardens near Vancouver, B.C.; some 4 acres being affected. The condition was not externally visible, but in some parts of the plantings all heads showed decay when cut into (H.N.W. Toms). Soft rot caused more than the usual amount of waste in January and February. In 1956 in the Toronto-Hamilton area, Ont. considerable wet weather occurred before and during harvest (W.S. Carpenter).

NEMATODES. Galls of the root-knot nematode, Meiloidogyne hapla, were generally light on celery in the Burlington area, Ont. and easily overlooked. The root-lesion nematode, Pratylenchus penetrans was also present. The amount of damage caused by these nematodes was obscured by a heavy fertilizer program, but the numbers of root-lesion nematodes present could be correlated within the numbers of scratch-like lesions on the roots (J.L. Townshend). Root-knot nematode was found at 2 locations and large populations of the root-lesion nematode at 5 counts of the latter ran as high as 12,000 per gram of air-dried root and 400 per pound of soil. Some fumigation demonstrations are underway (N.S. Carpenter).

BACTERIAL BLIGHT (Pseudomonas apii) was prevalent in all celery fields examined in the Bradford Marsh, Ont. The disease has become increasingly important in the last 4 years. In the variety plots at the Muck Research Sta. bacterial blight ranged from tr. to mod., while late blight rarely exceeded a trace. These plots were dusted weekly with a copper-lime dust. Spraying with bordeaux is also ineffective against bacterial blight. Of the varieties tested, Emerson Pascal exhibited considerable resistance to both diseases (O.T. Page). A tr. of bacterial blight was noted in most fields in the

Toronto-Hamilton area. In one field where no fungicide was applied a heavy infection of this disease was the only one seen. It is suspected that infection was carried on seedling plants obtained from the Bradford Marsh (W.S. Carpenter).

LATE BLIGHT (Septoria apii). Mod. infection was observed in a few fields of early celery at Leamington, Ont.; the disease was not present in well-sprayed fields (C.D. McKeen). Late blight was general and sev. throughout the Niagara Peninsula this year even in fields regularly protected with a fungicide. Some growers switched from dusts to sprays in Sept. because the latter appear to be more effective (J K. Richardson). Late blight was prevalent and sev. in many fields in the Toronto-Hamilton area; several crops were lost and storage loss will be high. The thoroughness of coverage appeared to be more important than the material applied (W.S. Carpenter). No special survey was made, but many truck loads of celery on the Beausecour Market, Montreal, Que., were more or less infected with late blight (E. Lavallee).

YELLOWS (Callistephus virus 1A). A count of several thousand plants on 3 farms in the Niagara Peninsula, Ont., revealed an infection of less than 0.5% (J.K. Richardson). Aster yellows was noted on the following wild plants in Lincoln and Welland counties: Aster novae-angliae, Cichorium intybus, Daucus carota, Erigeron annuus and E. canadensis. The leafhopper, Macrosteles fascifrons (Stal) transmitted the virus from D. carota and A. novae-angliae to celery, thus indicating that infection in these plants was due to the western strain (T.R. Davidson, J.A. George). Yellows was somewhat more prevalent in the Toronto-Hamilton area than in 1955, but its incidence is much less than in 1953 and 1954 (W.S. Carpenter). About a 1% infection of yellows was observed in celery in the London-St. Thomas area (W.A. Babbitt).

BLACK HEART, believed caused by flooding, was reported from a commercial planting in Edmonton, Alta. (A.W. Henry). In 2 one-acre fields at Leamington, Ont., the later part of the early summer crop was unmarketable because of black heart, which was attributed to calcium deficiency (C.D. McKeen).

CHLOROSIS (magnesium deficiency) occurs in the Toronto-Hamilton area, Ont. on Utah Salt Lake. The addition of magnesium sulphate to late blight sprays has given variable results. It is possible that in general applications were not started early enough after transplanting, but in 5 fields where chlorosis of the lower leaves was not controlled by magnesium sulphate high counts of root-lesion nematodes were found (W.S. Carpenter). Magnesium deficiency is reported on organic soils in N.Y. State (R.A.M. 33:9. 1954) (I.L.C.).

CRACKED STEM (boron deficiency) was not prevalent this year in the Toronto-Hamilton area, Ont. A few growers are now using foliar applications in dry years. Occasionally growers in the area complain of blackening of the

mesophyll tissue in the heart petioles when celery is sold for hearts after 2 months' storage. The trouble has been attributed to boron deficiency, but work on its cause is now in progress at Guelph (W.S. Carpenter).

CUCUMBER

LEAF SPOT (Alternaria sp.). Foliage of several varieties were sev. damaged, causing 50% defoliation in the plots at Kentville, N.S. (K.A.Harrison).

GRAY MOLD (Botrytis cinerea) was more prevalent in greenhouse crops in Essex, Co., Ont., this year than at anytime during the last 4 years; cloudy, cool weather in April and May favored its development (R.W. Walsh). The disease caused the death of 3-4% of the vines in a greenhouse at Kingston, N.S.; Burpee Hybrid appeared less sev. affected than other varieties (K.A.Harrison).

SCAB (Cladosporium cucumerinum) affected 90% of the fruits in an acre planting in the Toronto-Hamilton area, Ont. where no sprays were applied. Some loss was reported by 4 other market garden growers in the area (W.S. Carpenter). Scab was much less sev. in the Montreal district, Que., than in 1955 (E. Lavallee). In a variety trial at Ste Anne de la Pocatiere, scab infection was as follows: Merveille 50%; Iran, Magnolia and Ohio MR 17 30%; Early Fortune, Everbearing and Mincu 25%; National Gate and Sure Crop 15%; Hybrid and York State 5%; SMR-2 2%; and SMR-9 tr. (L.J. Coulombe). Scab was very sev. on slicing cucumbers in the Annapolis Valley, N.S.; the resistant pickling varieties were not affected (K.A. Harrison). The disease was only observed on slicing cucumbers brought to P.E.I. for sale on the Charlottetown market. Local growers are now growing the resistant variety Highmoor; the resistant Maine No. 2 is grown for pickling (J.E. Campbell).

ANTHRACNOSE (Colletotrichum lagenarium) was recorded in one planting in the Toronto-Hamilton area, Ont., although scab was the more destructive disease in the field (W.S. Carpenter).

BACTERIAL WILT (Erwinia tracheiphila) was reported to be sev. in a garden patch at St. André Avellin, Que. (H.N. Racicot). In trials at Ottawa, Cucumis prophetarum L. and P.I. 196477, a cucumber from Brazil, were highly resistant and a selection from P.I. 200818, a short fruited cucumber from Burma, was immune. A few healthy plants were found in AODI #1 (J.J. Jasmin).

POWDERY MILDEW (Erysiphe cichoracearum) occurred in 2 fields of pickling cucumbers at Harrow, Ont., prematurely killing the crop (R.W. Walsh). Infection was rather sev. in several greenhouse crops in the Niagara Peninsula, but where Karathane was used regularly good control was obtained (J.K. Richardson). Only 1 or 2 sl. infections were observed this year in the Toronto-Hamilton area (W.S. Carpenter).

BLACK ROT (Mycosphaerella melonis) caused a wilt and death of some plants in a planting at Ste Foy, Que., by mid July. The imperfect state, Ascochyta citrullina (Chester) C.O. Smith was found on affected stems (D. Leblond, R.A. Shoemaker).

In P.D.S. 35:61, a Phomopsis is reported causing a stem canker of cucumber. C.D. McKeen (Can. J. Botany 35:46. 1951) has named the pathogen P. cucurbitae and proposed the name Phomopsis black rot for the disease (I.L. Conners).

ANGULAR LEAF SPOT (Pseudomonas lachrymans) caused sev. infections this year and last at Lamont, Alta. Typical specimens were also received from an Edmonton garden (A.W. Henry). Noted in the Univ. plots (W.P. Campbell). Only one sample of infected leaves was received for diagnosis. Both pickling factories reported contract fields in Man. comparatively free of infection (W.A.F. Hagborg). The disease was general in the Toronto-Hamilton area, Ont., but infection was not so sev. as to cause undue alarm (W.S. Carpenter). Angular leaf spot was unusually prevalent on Ile Jesus, Que., on cucumbers grown in beds in the field; many growers lost 30-50% of their crop (E. Lavallee).

DAMPING-OFF (Pythium sp.) caused 50% loss in a field of cucumbers covered with wax paper in Essex Co., Ont. Cold wet weather after planting favored development of the organism (R.W. Walsh).

FOLIAGE DECAY (Trichothecium roseum) Leaf infections occurred in two 10,000 sq. ft. greenhouses at Leamington, Ont. Lesions began around faeces of honey bees on the upper surface of the leaves and then enlarged, covering up to 50% of the leaf surface and causing defoliation (R.W. Walsh).

MOSIAC (virus). A sev. infection occurred in a 3-acre field at Leamington, Ont.; 30-40% of the fruit were unmarketable (R.W.W.). Infection of cucumbers and other cucurbits in the Botanical Garden, Montreal, Que., was so sev. that the plants had to be destroyed (P. Duval).

EGGPLANT

WILT (Verticillium albo-atrum). Sl. infection in the Univ. plots, Winnipeg, Man. (W.C. McDonald). Wherever eggplant is grown in Essex Co., Ont., 5-15% of the plants show symptoms of wilt. In heavily infested soils, a good crop can be harvested despite wilting of infected plants provided the crop is adequately irrigated (C.D. McKeen). Wilt is regularly destructive where eggplant is grown extensively in the Toronto-Hamilton area. Losses were heavier than usual in 1956; although most plants produced a crop, the fruits were small (W.S. Carpenter). Wilt was found in several small plantings observed in the Niagara Peninsula and production was materially reduced (J.K. Richardson).

ENDIVE

HEART ROT (Pseudomonas cichorii (Swingle) Stapp). In a 1/2-acre field at Leamington, Ont. 25% of the plants were infected and unmarketable. Endive has been grown in this same patch for several years and the disease has been increasing in prevalence in the last few years (R. W. Walsh). This pathogen, apparently recognized only from symptoms produced has not been previously reported in Canada (I. L. C.)

TIPBURN (physiological) caused sl. injury in a late planting of endive on a farm in Lincoln Co. Ont.; an adjacent planting set at an earlier date appeared healthy (J. K. R.)

LETTUCE

GRAY MOLD (Botrytis cinerea) was a problem in several greenhouses in the Toronto-Hamilton area, Ont. in the spring during dull, cool weather. One crop was reported to be almost a complete loss from gray mold this fall (W. S. Carpenter).

ROOT ROT (Botrytis cinerea) slightly affected the variety Black-seeded Simpson in the vegetable plots at the Univ., Vancouver, B. C. during a wet, cool June (H. N. W. Toms). Root rot was less apparent than usual about Forest, Ont. on account of the damp weather. Losses ranged up to 15%, the heaviest losses being usually in crops on land in lettuce the previous year. Plants were able to survive because new roots were sent out from the plant about the decayed root. Crop rotation of 3 or preferably 4 years has been very effective in keeping the disease at a low level (J. L. Chard). Root rot caused mod. damage in the Springdale, Ont. area. The disease was sev. in the plots of the Muck Research Sta. where lettuce has been grown for 4 successive years (O. T. Page).

DOWNY MILDEW (Bremia lactucae) caused sev. leaf infection in a garden planting at Harrow, Ont. (C. D. McKeen). Downy mildew and gray mold (Botrytis cinerea) resulted in damage to the outer leaves of mature lettuce in the Bradford Marsh, but usually the damage was not sufficient to make the heads unmarketable (O. T. Page). Many fields were sev. infected in the Montreal district, Que. The disease appears to be more prevalent than formerly (E. Lavallee).

RUST (Puccinia extensicola). A few leaves were affected at Edmonton, Alta. (A. W. Henry).

BOTTOM ROT (Rhizoctonia solani) caused some plant loss to growers of early head lettuce in the Toronto-Hamilton area, Ont. in 1955; 50% of the plants were destroyed in some plantings (W.S. Carpenter).

DROP (Sclerotinia sclerotiorum) sev. infected 50% of the plants in a plot at Brooks, Alta.; also 5% of the crop was completely rotted in a market garden planting at Medicine Hat (M.W. Cormack, F.R. Harper). The disease destroyed 2-10% of the plants grown in a bed on Ile Jesus, Que. (E. Lavallee). For a short distance at one end of a field at Grand Pre, N.S., 30% of the plants were affected; over the rest of the field, very few plants were infected (K.A. Harrison).

LEAF SPOT (Septoria lactucae) was more prevalent than usual in the s. part of Essex Co., Ont.; the lowest leaves on many plants were infected in several fields (C.D. McKeen).

YELLOWS (Callistephus virus 1). Very little yellows was observed about Forest, Ont. (J.L. Chard).

HIGH TEMPERATURE INJURY. As a result of 4 days of 90° temperatures in mid-June following a generally cool spring, the early lettuce crop in Essex Co. Ont., showed internal browning of the heads. About half the crop was unmarketable (C.D. McKeen).

MELON

LEAF SPOT (Alternaria cucumerina) was observed in many fields of muskmelons about Harrow, Ont. as the crop approached maturity (C.D. McKeen).

ANTHRACNOSE (Colletotrichum lagenarium) mod. infected stems and fruits in a 2-acre field of muskmelons at Leamington, Ont. Anthracnose lesions were also abundant on Zucca melon fruits sent from Leamington to the laboratory for diagnosis (C.D. McKeen). See also under Watermelon.

POWDERY MILDEW (Erysiphe cichoracearum) caused sev. defoliation in two 3-acre fields of Zucca melons at Leamington, Ont. when slightly over half of the crop was harvested. This melon appears to be about as susceptible as squash and pumpkin (C.D. McKeen).

FUSARIUM WILT (F. bulbigenum var. niveum). There is a noticeable spread of wilt to disease-free soils each year in s.w. Ont. thus decreasing the acreage that can be planted to susceptible muskmelon varieties; unfortunately the fruits of some resistant varieties are not so acceptable on the market as those of susceptible varieties (C.D. McKeen).

MOSAIC (virus). A 1/2-acre field of Perfection muskmelons in s.w. Ont. developed sev. leaf symptoms of mosaic and retarded growth (R.W. Walsh).

2,4-D INJURY. Two fields of early muskmelons at Leamington, Ont. were sev. damaged by drift of 2,4-D when the chemical was applied to an adjacent crop. The chemical caused yellowing and abscission of early formed fruits as well as causing sev. malformation and dwarfing of the foliage (C.D. McKeen).

ONION

PURPLE BLOTCH (Alternaria porri) caused the destruction of about 1 acre of white onions at Ste Dorothee, Laval Co. Que. (E. Lavallee).

NECK ROT (Botrytis allii). By Nov. neck rot was affecting 4-10% of the onions kept in common storage at Kelowna, B.C.; the bulbs had to be hand picked before marketing (G.E. Woolliams, M. King). From the few enquiries received since harvest, it appears that damage will be sl. in the 1956 crop in Sask.; although the disease is seldom seen in fields about Saskatoon, it occurs commonly in storage (R.J. Ledingham). A mod. infection was noted on 6 June in a planting at Roseneath, P.E.I. Lesions bearing conidiophores and conidia appeared on the plants near ground level. The early season was cool and damp (J.E. Campbell). A small amount of neck rot was present in onions offered for sale in Queens Co., P.E.I. in Jan. 1956 (R.R. Hurst).

LEAF SPOT (Botrytis squamosa) was present in tr. amounts on most onion plantings in the Bradford Marsh, Ont. in late August (O.T. Page).

Probably the same disease caused the loss of several plantings nearly ready for bunching in August in the Toronto-Hamilton area. In 1 field, tank-mix zineb sprays started at first appearance of the disease and applied weekly failed to give adequate control (W.S. Carpenter).

ANTHRACNOSE (Colletotrichum circinans). Affected red onions were received from St. Valier, Bellechasse Co. Que., 13 Aug. (D. Leblond). Because red onions are resistant to this pathogen, a specimen was requested. The red scales were indeed affected by C. circinans (DAOM 55034). According to J.C. Walker (Plant Pathology pp. 272-280. 1950) red and yellow varieties possess resistance, but if the dry outer scales are broken away and the fleshy scales exposed, the inner scales are susceptible. Also, unpigmented portions of partly colored scales are attacked by C. circinans. The latter phenomenon appears to be what took place on these red scales because acervuli are present only on the unpigmented area (R.A. Shoemaker).

PINK ROOT (Fusarium sp.) has been found for several years in the Oliver, Kelowna and Vernon districts, B.C. on fall planted Sweet Spanish onions imported from Walla Walla, Wash.; infection in June was mod.-sev. and in some fields about 40% of the onions failed to size (M. King).

BULB ROT (Fusarium oxysporum f. cepae). A tr. occurred in a planting at Brandon, Man. (J.E. Machacek).

DOWNY MILDEW (Peronospora destructor) was sev. and caused premature defoliation of the pickling varieties Silverskin, White Portugal, Australian White and White Creole planted in mats in the plots at Agassiz, B.C. (H.N.W. Toms). Only traces of downy mildew were observed in the commercial onion areas of the B.C. Interior. Its scarcity is attributed to the fact that nearly all commercial fields were sprayed with zineb (G.E. Woolliams, M. King). Downy mildew was mod.-sev. in fields examined on the Bradford Marsh, Ont. in late August (O.T. Page). The disease is rarely a problem in bunching onions in the Toronto-Hamilton area (W.S. Carpenter). Downy mildew and leaf spots caused premature drying down of the tops which resulted in sev. reduction of yield and bulb size in the cooking onion crop. In many cases yields were reduced more than 50% (J.L. Chard). A garden patch was reported infested at Eganville in July (H.N. Racicot). Downy mildew became sev. on white varieties in most onion fields on Ile Jesus, Que. about 1 Sept. In an experimental test, about 1 acre was sprayed 3 times with maneb and sticker; excellent control was obtained (E. Lavallee). A heavy late infection was found in a 2-acre field at Berwick, N.S. Its chief effect appeared to be the hastening of maturity of a very late crop. This was one of the first attempts in N.S. to raise onions commercially from seed sown in the field (K.A. Harrison).

SMUT (Urocystis cepulae). A light infection was observed in fields of Yellow Globe Danvers at Kelowna and Vernon, B.C.; first record of its occurrence at Vernon (M. King). Smut was prevalent in all onion-growing areas of the Bradford Marsh, Ont. Infections up to 84% were recorded (O.T. Page). Smut took its usual toll of onions grown on the Thetford Marsh. Formaldehyde and thiram were both fairly effective in controlling the disease (J.L. Chard). Smut caused sev. loss in 5 fields at Ste Rose and St. Vincent de Paul, Que. (E. Lavallee).

YELLOWS (Callistiphus virus 1). A tr. infection observed at Brandon, Man. (J.E. Machacek).

PARSNIP

CANKER (Itersonilia perplexans Derx) is now known from 3 farms in the Dixie Area, Ont. It caused considerable wastage in storage before the crop was sold (W.S. Carpenter). This is the first report of this disease to the Survey (I.L.C.).

LEAF SPOT (Ramularia pastinacae) mod. infected the lower leaves in a planting at Morden, Man. (W.S. McDonald).

PEA

Dr. B.H. MacNeill, Department of Botany, Ont. Agr. College, Guelph, has presented a special report on the diseases of canning peas in Ont.

ROOT ROT. During the last two seasons a root-rot survey has been carried out in the commercial canning areas of Ont. The region studied extended from Deseronto in the East to Windsor in the West and included, in particular, some large acreages in the vicinities of Picton (Prince Edward Co.), Whitby (Ontario Co.), Little Britain-Port Perry (Durham Co.), Greensville-Hannon (Wentworth Co.), Burford (Brant Co.), Simcoe-Port Dover-Port Rowan (Norfolk Co.), Chatham (Kent Co.), and Tecumseh-Leamington (Essex Co.). Samples of diseased material were taken at 10-day intervals from emergence of the plants to harvest of the crop; these samples were studied in the laboratory to determine the causal agents. Although the results for the early warm dry season of 1955 differed somewhat in detail from those for the late cold wet season of 1956, the results for both years, were essentially similar. Important pathogenic fungi isolated were Aphanomyces sp., Pythium ultimum, Rhizoctonia sp., Fusarium solani and F. oxysporum.

The relative prevalence of these fungi from week to week during the season or from season to season during this survey suggested very strongly that soil temperature was the important factor in their ecology. For most areas as the season progressed and the soil temperature rose Rhizoctonia and the Phycomycetes appeared less and less frequently. In the late season, the species of Fusarium were the dominant fungi in diseased plants. Unlike the situation in some areas in the United States, Aphanomyces appeared only infrequently and seemed not to be important in Ont. Pythium ultimum was of major importance in the early part of the season with Fusarium solani taking over in the later part. The role of a high temperature species of Fusarium found associated with a vascular disease similar to Near Wilt is being investigated. There is no evidence that nematodes were playing any significant part in the root-rot complex.

To estimate the loss of crop caused by root rot is difficult. Unless the crop is followed very closely, loss from root rot may be confused with that from flooding of the field, poor seed placement and fertilizer injury. However, there is little doubt that in spite of the universal practice of treating pea seed with fungicidal dressings, the crop suffers a great deal of damage as it emerges or shortly after. Moreover, established stands may succumb to root rot, the plants turning yellow at podding time and drying up before the crop is ready to harvest.

This survey has indicated that root rot was responsible for the complete loss of several large fields in each of the districts of Simcoe-Port Dover-Port Rowan and Tecumseh in both 1955 and 1956, while the yields of many other plantings throughout the area surveyed were seriously reduced.

VIRUS DISEASES. It was estimated that over 20% of the acreage in the Simcoe-Port Rowan area was abandoned in 1956 because of damage caused by virus diseases. Both Enation Mosaic and Streak were present in epidemic proportions. While aphids per se were not responsible for extensive damage, they were undoubtedly responsible for the widespread distribution of virus diseases in the area. It was obvious that the prolonged period of cool weather which delayed the maturing of the crop in 1956 served to favor the build-up of the vector population.

LEAF AND POD SPOT (Ascochyta pisi). A very serious outbreak of the disease was observed in a field near Copetown (Wentworth Co.). This was in the Early Sweet variety, the seed having come from Idaho. The processor estimated the reduction in yield of shelled peas at about 55%.

Other Observations

LEAF AND POD SPOT (Ascochyta pisi). A sl. infection occurred in many pea fields grown for seed in the Creston Flats, B.C. (G.E. Woolliams). Infection was a tr. in 5/17 seed fields and sl. in 1 of canning peas in s. Alta. (F.R. Harper, M.W. Cormack). The disease was widespread and sometimes sev. in Edmonton (W.P. Campbell). A sl. infection occurred on leaves, stems and pods of most plants in a 1/2-acre plot of Chancellor (Foundation stock) at the Farm, Ottawa, Ont. (V.R. Wallen). The disease became sev. in September along with Botrytis cinerea on pods of Guilbo green peas at Ste Foy, Que. (D. Leblond). Tr. infection on Stratagem in a garden in Queens Co., P.E.I. (R.R. Hurst).

POWDERY MILDEW (Erysiphe polygoni) sev. damaged a 12-acre field of Telephone peas on Lulu Island, B.C.; the summer was dry (H.N.W. Toms). The disease was mod. in 2 fields examined in early July and sev. in a number of garden plots late in the season in s. Alta. (M.W. Cormack). Tr. infection in a garden in Queens Co., P.E.I. (R.R. Hurst).

ROOT ROT (Fusarium spp. and Rhizoctonia solani). Mod.-sev. infections were noted in a number of fields of Wisconsin Early Sweet and in one of Lincoln peas grown for canning about Tabor, Alta. Tr. infection recorded in 3/17 seed fields in s. Alta. in late July. Isolations from sev. rotted roots from Creston, B.C., also yielded a high percentage of Fusarium (M.W. Cormack, F.R. Harper). About 10% of the plants in several garden

plantings at Harrow, Ont., developed a cortical rot which caused death of the plants just before harvesting (C.D. McKeen). Root rot was very prevalent in areas s. of Montreal where canning peas are grown. Several fields at Marieville, Rougemont and St. Cesaire were sev. damaged and a few were completely ruined (R. Crete).

WILT (Fusarium oxysporum) mod. infected a planting at Portage la Prairie, Man. (J.E. Machacek).

DOWNY MILDEW (Peronospora pisi). A tr. infection was present in 6/17 seed fields examined in s. Alta. (M.W.C., F.R.H.).

BACTERIAL BLIGHT (Pseudomonas pisi). A tr. infection was seen on the leaves in 2 fields in s. Alta.; no pod infection was noted (M.W.C., F.R.H.). A mod.-sev. infection was seen on leaves, stems and pods of Arthur (Foundation) in an acre plot at the Farm, Ottawa, Ont.; crop was reduced 25% because of poor seed set. Traces were also observed in Foundation plantings of Chancellor and Valley (V.R. Wallen).

LEAF BLOTCH (Septoria pisi). Infection was 3-tr. 2-sl./17 seed fields in s. Alta. A sev. infection also occurred in 1 garden planting at Lethbridge (F.R.H., M.W.C.). A tr. was recorded in the plots at Edmonton (L.E. Tyner), and small plot of Foundation seed of PE -4 garden peas at Ottawa, Ont. (V.R. Wallen).

RUST (Uromyces fabae). A tr. was observed on garden varieties in a garden in Queens Co., P.E.I. (R.R. Hurst). A sl. infection was observed in the experimental plots at St. Jean, Que. (R. Crete).

PEPPER

ANTHRACNOSE (Colletotrichum sp.) again caused sl. loss of fruit in the Toronto-Hamilton area, Ont. The crop was not sprayed (W.S. Carpenter).

DAMPING-OFF (Pythium sp. and Rhizoctonia solani) was noticeable in many greenhouses and cold frames in the Toronto-Hamilton area, Ont. (W.S.C.).

SCLEROTINIA ROT (S. sclerotiorum) destroyed a few fruits in the trial plots at the Farm, Agassiz, B.C.; it appeared after rain which was preceded by a long dry period (H.N.W. Toms).

VERTICILLIUM WILT (V. albo-atrum) was observed in fields at Kelowna and Vernon, B.C.; 10-100%, av. 20%, of the plants were affected in the diseased fields (G.E. Woolliams, M. King).

BACTERIAL SPOT (Xanthomonas vesicatoria) was unusually sev. throughout s.w. Ont. Initial infection resulted from using infected seed of some of the sweet varieties. Frequent rains spread the inoculum and weather conditions favored infection. Some crops were almost completely defoliated, resulting in losses of 60% of the crop (C.D. McKeen). One market gardener in the Toronto-Hamilton area lost his entire crop from bacterial spot and the disease was apparent in several other fields. California Wonder is very susceptible whereas Hungarian Yellow appears to possess some resistance (W.S. Carpenter).

MOSAIC (virus). The green peach aphid spread tobacco etch and cucumber mosaic viruses in a few fields of pepper about Harrow, Ont. Because the build-up of the aphid population took place only late in the season these virus diseases caused less damage than usual (C.D. McKeen). Virus-infected plants were quite common in most fields planted with California Wonder types in the Toronto-Hamilton area (W.S. Carpenter).

POTATO

The data in Tables 6 to 9 on Seed Potato Certification were submitted by the Plant Protection Division, Production Service.

Both the acreage entered for certification and the acreage passed slightly exceeded the 1955 figures. Bacterial ring rot continues to be an important cause of rejection. Although fewer cases were recorded in N.B. and Que. than in 1955, the converse was true in P.E.I., which, until last year appeared to be almost free of the disease. Black leg was unusually prevalent in P.E.I. and Que. The great acreage of Sebago in P.E.I. accounts for over a third of the certified acreage. The acreage of the other leading varieties is accounted for by the large acreage of Katahdin in N.B., Irish Cobbler in P.E.I., Kennebec in N.B. and Green Mountain in Que., Netted Gem, which was about equally popular in B.C., Alta. and N.B.

EARLY BLIGHT (Alternaria solani) was reported as follows: Infection 107-sl. 1-mod. 2-sev./588 fields inspected in B.C.; present in most fields in the Interior, causing sl. reduction in yield; apparently associated with low fertility (N. Mayers); recorded in 23 (10%) of the fields in s. Alta. and in 61 (58%) in central and n. Alta; infection usually sl.-mod. (R.P. Stogryn); but again prevalent on Netted Gem after a lapse of several years, even causing some defoliation and, for the first time, well marked infection centers, similar to those caused by late blight (J.W. Marritt); noticeably prevalent in n. Sask. (A. Charlebois) where moist conditions apparently favored the disease (T.C. Vanterpool); sl.-mod. infection in 21 (15%) of the fields inspected in Man. and n.w. Ont., mostly on early varieties (D.J. Petty), sev. infected

Table 6. Seed Potato Certification: Fields and Acres Inspected and Passed, 1956

Province	Number of Fields Inspected	Fields Passed	Fields Passed %	Number of Acres Inspected	Acres Passed	Acres Passed %
P.E.I.	6,218	5,149	82.8	28,809	23,483	81.5
N.S.	255	228	89.4	501	424	84.6
N.B.	2,303	2,040	88.6	14,338	11,993	83.6
Que.	1,115	724	64.9	3,842	2,388	62.2
Ont.	582	487	83.7	1,828	1,419	77.6
Man.	138	129	93.5	825	749	90.8
Sask.	51	45	88.2	30	103	79.2
Alta.	220	186	84.5	1,329	1,128	84.9
B.C.	588	501	85.2	2,325	2,018	86.8
Total	11,470	9,489	82.7	53,927	43,705	81.0
Previous Yearly Totals						
1955	12,003	10,239	85.3	51,627	42,173	81.7
1954	13,783	11,959	86.8	59,360	50,686	85.4
1953	14,411	11,875	82.4	60,173	47,706	79.3
1952	12,169	10,985	90.3	45,988	41,315	89.8

Acres Inspected		Acres Passed	
1956	53,927	1956	43,705
1955	51,627	1955	42,173
Increase of 2,300 or 4.5%		Increase of 1,532 or 3.6%	

foliage of Keswick received from Thunder Bay (H.N. Racicot), general in Niagara Peninsula and poorly sprayed fields suffered sev. defoliation (J.K. Richardson); general in Toronto-Hamilton area but usually sufficiently well controlled to prevent loss (W.S. Carpenter); sl. infections occurred occasionally in seed potato fields in districts 1, 2 and 3 (J. McKercher, W.L.S. Kemp, H.W. Whiteside); infection 2-tr. 26-sl. 8-mod./59 fields in e. Ont. (E.H. Peters), and 174-sl. 19-mod./1115 fields in Que., mostly in the Lake St. John district (B. Baribeau); rarely observed in seed fields in N.B. (C.H. Godwin); reported in very few fields in sl.-mod. amounts in N.S., however, in one field for the second year in Irish Cobbler near Truro, 75% of the foliage was killed; season not particularly favorable for the disease and many growers using maneb and zineb (R.C. Layton); very little this year in P.E.I. (H.L. McLaren) except sev. infection in one field of Irish Cobbler in Queens Co. (R.R. Hurst); sl.-mod. infections in several fields in Nfld. (G.C. Morgan)

Table 7. Seed Potato Certification: Acreage Passed by Varieties, 1956

Variety	P.E.I.	N.S.	N.B.	Que.	Ont.	Man. - Alta.	B.C.	Total
Sebago	17,573	33	286	47	223	2	2	18,166
Katahdin	1,132	87	6,289	165	660	17	17	8,367
Netted Gem	71	53	1,089		1	1,075	1,460	3,749
Irish Cobbler	2,469	45	409	79	134	53	1	3,190
Green Mountain	964	37	208	1,783	17	5	46	3,060
Kennebec	558	72	2,044	220	24	57	42	3,017
Red Pontiac		1	642			197		840
Keswick	320	11	140	73	86		3	633
Russet Rural	2		589		30			621
Pontiac	141	9	188			41	61	440
Warba	37	18	7	14	20	141	92	329
Canso	178	7	28	1	14	5		233
Chippewa	8	4	20		186			218
White Rose							204	204
Columbia Russett					2	127	4	133
Cherokee	11	12	29		10	21		83
Bliss Triumph		24	24			28	1	77
Manota					1	66		67
Early Ohio						64		64
Waseca						47	1	48
Others (17)	19	11	1	6	11	34	84	166
Total	23,483	424	11,993	2,388	1,419	1,980	2,018	43,705

BLACK DOT (Colletotrichum atramentarium) was found in a garden in Edmonton, Alta. (A. W. Henry). Many tubers of Teton showed affected spots on the skin in a planting at Ste Anne de la Pocatiere, Que. Teton appears to be a susceptible variety (H. Genereux). A sl. infection was recorded in a field of Irish Cobbler in Queens Co., P.E.I. (R.R. Hurst).

BACTERIAL RING ROT (Corynebacterium sepedonicum) was found in B.C. in a field of White Rose in 1956 and during bin inspection in 4 seed stocks of the 1955 crop (N. Mayers). Ring rot was found in table stock fields on 20 farms in the Fraser Valley. Potatoes from nearly every farm in the Fraser Valley have been examined for ring rot as they went over a community grading and washing machine. A trace of ring rot was detected in potatoes from 19 farms while about 30% of tubers were affected from the remaining farms (W. R. Foster). Ring rot was found in 8 fields and it caused the rejection of 9 others in s. Alta.; of the 8 fields, 3 were Netted Gem from seed grown in Alta. and

Table 8. Seed Potato Certification: Fields Rejected on Field Inspection, 1956

Province	Leaf Roll	Mosaic	Ring Rot on Field	Ring Rot on Farm	Black Leg	Wilts	Adjacent Diseased Fields	Foreign Var.	Misc.	Total
P.E.I.	21	127	39	46	244	24	37	337	194	1,069
N.S.	6	3	-	-	4	3	2	9	-	27
N.B.	6	33	77	48	49	-	13	36	1	263
Que.	5	116	73	24	82	-	36	42	13	390
Ont.	13	13	10	6	24	4	10	8	7	95
Man.	3	-	1	-	3	1	-	1	-	9
Sask.	1	2	-	-	1	1	-	1	-	6
Alta.	-	-	10	19	3	-	-	2	-	34
B.C.	19		1	-	7	-	2	9	49	87
Total	74	294	211	143	417	33	100	445	264	1,981
Rejection as a percentage of fields:										
Inspected	0.7	2.6	0.8	1.2	3.6	0.3	0.9	3.9	2.3	17.3
Rejected	3.7	14.8	10.7	7.2	21.1	1.7	5.0	22.5	13.3	100%

Table 9. Seed Potato Certification: Average Percentage of Disease found in fields, 1956.

Average percentage disease found in	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Fields entered (first inspection)									
Black Leg	.42	.13	.23	.35	.13	.03	.10	.19	.05
Leaf Roll	.06	.19	.05	.07	.06	-	.17	.02	.08
Mosaic	.12	.12	.11	.37	.01	-	.24	-	.03
Fields passed (final inspection)									
Black Leg	.21	.07	.12	.12	.04	.12	.04	.09	.03
Leaf Roll	.02	.08	.04	.01	.03	.08	.05	.02	.03
Mosaic	.02	.09	.05	.04	.01	.01	.01	-	.02

the other 5 were Waseca foundation seed imported from N.D. (R.P. Stogryn). Ring rot was found in n. Alta. and it caused the rejection of 10 other fields on the same farm. In one field planted with Waseca foundation seed from Minn., 1% of the plants were infected. Traces in the other 2 fields were attributed to current infection from contaminated second-hand bags (J.W. Marritt).

In the provincial program to control bacterial ring rot in Alta., most 1955 affected stocks were cleaned up on the farm by 31 March. All storage premises on these farms were thoroughly fumigated after the clean up. To assist growers to secure fresh supplies of seed a list of sources and quantities of seed potatoes available was prepared and mailed to all commercial growers. For the second year the Department did not purchase seed stocks in s. Alta., but made arrangements with the local Certified Seed Growers' Association to accept orders from table stock growers that had to secure new seed because of ring rot. In other districts growers were directed to local and other seed channels.

The survey of the 1956 crop was carried out under conditions favorable for ring rot detection. Potato crops were sufficiently advanced for symptom expression and the inspection was nearly completed before the first killing frost. Ring rot was found in 102 farms (2,264 acres) out of 567 farms (9,297 acres) inspected, compared with last year when the disease was detected on 78 farms (1,407 acres) out of 599 farms (7,968 acres) inspected. Thus there was some increase in the incidence of ring rot, but in practically all fields where the disease was found there was but a trace of infection; in some fields only 1 or 2 plants being found after a thorough combing. With adequate supplies of Alberta grown certified seed now available, all growers that had ring rot in their potatoes in 1956 are required to obtain seed from growers whose fields have passed inspection for certification for their 1957 crop. It is hoped that the present regulations will lead to a further improvement in the ring rot picture in Alta. (W. Lobay).

Potatoes affected by ring rot were received from 8 places in Sask. (R.J. Ledingham). Ring rot was detected in one imported lot of seed before it was planted, but the disease was not observed in any seed crop inspected in Sask. No information is available of its prevalence in table stock (A. Charlebois). One field of Waseca grown from Minn. seed was rejected for ring rot in Man. According to P.J. Peters considerable ring rot occurs in table stock potatoes in certain areas as e. of the Red River, Winnipeg, Lockport and at The Pas (D.J. Petty, W.M. Whiteway). Ring rot was not detected in seed fields in the London district, Ont. (J. McKercher). It was found in a field of Chippewa in Durham Co. with the rejection of other fields on the same farm (W.L.S. King). Ring rot was found in 3 fields on one farm in district 3 and in an additional field at digging time (H.W. Whiteside). During a special third inspection in e. Ont. ring rot was found in 6 fields and resulted in the rejection of 4 others on the same farms (E.H. Peters). During the provincial ring rot survey in 1956, the disease was found on 92 farms in Ont. This is the smallest number

of positive cases reported since the survey was started 14 years ago. Two factors may have contributed to the low count. Relatively low temperatures and a plentiful supply of moisture tended to interfere with symptom expression and an early frost, particularly in n. Ont., killed the tops before the inspections were completed (D.S. MacLachlan). Ring rot was found in 73/1115 fields inspected in Que. and at harvest and bin inspection, 14 other lots were rejected. Bacterial ring rot caused the rejection of 77 fields in N.B. during field inspection and an additional 48 fields were not certified because of diseased table stock on the same farm (C.H. Godwin). Ring rot was not found in seed fields in N.S., although late fields were given a third inspection. The provincial department carried out a re-check of farms where the disease was found in 1955 and ring rot was found on one farm; a sl. infection was also found on one new farm, and one table stock grower in Kings Co. brought in an affected sample (R.C. Layton). Ring rot was found in several fields after second inspection in P.E.I. By 1 Dec., 15 positive cases in seed and 33 in table stock had been found (H.L. McLaren). It is not known how widely bacterial ring rot is distributed in Nfld. but it was found fairly widespread in certain parts of the West Coast. Sl. infections were noted in 15 fields of Arran Victory on the West Coast; light infections were also recorded in 2 fields at Torbay, 2 at Clarkes Beach and 1 at Pasadena (G.C. Morgan).

A special survey for bacterial ring rot and spindle tuber was conducted by Dr. D.S. MacLachlan in the Maritime Provinces. He reports as follows:-

During the last 2 years, there has been a renewed interest in bacterial ring rot and its control in Canada. At the same time spindle tuber has been mentioned more frequently in potato inspectors' reports. In order to gain first hand information on the prevalence of these diseases and the control methods employed in Eastern Canada a survey was made in Sept. 1956.

In recent years, bacterial ring rot has become a serious problem in P.E.I. Apparently the latest outbreak can be traced to seed stock imported from the U.S.A., but in spite of an all-out effort on the part of the growers to eliminate the disease their success to date is limited. The most important problem in P.E.I. at the moment is how to disinfect or fumigate potato bags. There are no facilities for fumigation on the Island and the cost of shipping used bags, even in large lots, for treatment to St. John, N.B. is prohibitive. Spindle tuber can be found in small amounts in most commercial fields, but in some instances 15-30% of the plants may be affected. Sebago, the principal variety grown, appears to be quite susceptible to infection with the spindle tuber virus.

Bacterial ring rot, particularly in table stock potatoes, is of great concern to government officials in N.B. It has been demonstrated in a disease-control area established a few years ago that with proper supervision and cooperation of the growers bacterial ring rot can be controlled or eliminated.

The greatest problem at the moment appears to be one of extension. Spindle tuber does not appear to be as prevalent in N.B. as in P.E.I. or Maine.

BLACK LEG (Erwinia atroseptica) was recorded in 93 (16%) of the fields inspected in B.C. and caused 7 to be rejected; it was rather evenly distributed in all sections (N. Mayers). Black leg was found in 71 (32%) of the fields inspected in s. Alta.; sev. harrowing in the spring caused sl. spread, but sev. hail damage caused abnormally high percentages of black leg in one important producing area (R.P. Stogryn). Elsewhere in Alta. black leg was found in 60 (53%) of the fields inspected. It continues to be a real threat to the production of certified seed although the favorable growing season kept the disease to a minimum in 1956. Planting whole seed has given real protection against loss provided the seed stock is free of the pathogen (J.W. Marritt). Black leg was found in 21% of the fields inspected in Sask. and caused one to be rejected (A. Charlebois). Black leg was found in 4/9 fields in n.w. Ont. and in 21/138 fields in Man; 3 fields were rejected (D.J. Petty).

SOFT ROT (Erwinia carotovora). Because the crop was well matured at harvest, very little rot occurred in district 3, Ont. (H.W. Whiteside). Lenticil infection was heavy, affecting 75% of the tuber surface, in a carload of washed potatoes shipped from Millville, N.B., when inspected at Windsor, Ont. The causal organism was isolated (H.N. Racicot, D.S. MacLachlan).

Small lenticular infections were frequent on washed potatoes in polyethene bags, also in low-lying areas in some fields in the Niagara Peninsula potatoes were a total loss from soft rot (J.K. Richardson).

POWDERY MILDEW (?Erysiphe cichoracearum) has caused trouble on certain wild Solanum species at Fredericton, N.B., for several years. In 1955 it appeared on cultivated varieties in the greenhouse. It was sev. and destructive to maturing plants in the spring and again in the fall in 1956. S. demissum and S. gibberulosum were the most susceptible of the wild species and Green Mountain, Plymouth and Delus of the cultivated varieties examined. The late blight differentials 1488b (1), 2070ab (31), 1506b (9) and 1563c (14), as well as a number of the 1955 potato seedlings, were also quite susceptible. On the other hand S. polyadenium x S. tuberosum hybrids, S. longipedicelatum, S. antipoviczii, S. stoloniferum, S. rybinii, S. bulbocastanum and the variety Merrimac were quite resistant. The perfect state has not been noticed. Karathane has been used successfully to control powdery mildew on various plants in the greenhouse (J.L. Howatt).

STORAGE ROT (Fusarium spp.). The 1955 crop in Que. did not keep well on account of adverse growing and harvesting conditions. Dry rot was observed in many bins during winter and spring, 10-40% of the tubers being affected in a few bins (B. Baribeau). The 1955 crop was harvested and stored under ideal conditions in N.B. and dry rot was rarely observed during the

winter and spring shipping season (C.H. Godwin). A few tubers of Sebago sev. affected by F. coeruleum were observed in one lot in Queens Co., P.E.I. in March 1956 (R.R. Hurst). Losses from Fusarium storage rot were sl. in the 1955 crop in P.E.I. (G.W. Ayers).

A dry storage rot caused by Fusarium was reported from Myronam, Alta. Storage rots caused by Pythium and other fungi were common in Edmonton. A dry rot caused by Phytophthora infestans was identified in Edmonton material and was probably quite prevalent (A.W. Henry).

WILT (Fusarium oxysporum, Verticillium albo-atrum). Sl. amounts of wilt were recorded in only 19/588 fields inspected in B.C. (N. Mayers). Wilt was observed in 11 fields in s. Alta. and caused sev. wilting in 2 fields of Netted Gem (R.P. Stogryn). Mostly traces occurred in 6 fields in central and n. Alta. (J.W. Marritt). Sl. infections were recorded in 10% of the fields inspected in Sask. but a sev. infection believed caused by Verticillium in a field of Kennebec resulted in its rejection (A. Charlebois). Wilt caused the rejection of one field of Waseca, but otherwise the disease was of no consequence in Man. and n.w. Ont. (D.J. Petty). Sl. infections were recorded in most fields in the London district, Ont. (J. McKercher) and in 9 fields in district 2 (W.L.S. Kemp). Wilt was observed in several fields, particularly of Keswick, in district 3 and caused rejection of 2 fields (H.W. Whiteside). The disease was seen in 8 fields and caused 2 rejections in e. Ont.; in one field of Kennebec 14% of the plants were affected (E.H. Peters). Wilt was found in 71 (6.3%) of the fields inspected in Que. and caused one rejection; the disease was found only in Kennebec (B. Baribeau). Wilt was recorded in only 20 fields in N.B. and none were rejected; it was even less prevalent than in 1955 (C.H. Godwin). Wilt was reported in 39/255 fields inspected in N.S. and caused 3 fields to be rejected; one field showed 10% infection (R.C. Layton). Wilt caused the rejection of 24 fields in P.E.I. (H.L. McLaren).

RHIZOCTONIA (Pellicularia filamentosa (R. solani). Infection was 306-sl. 140-mod. 33-sev. in 479 (81%) of the fields inspected in B.C. (N. Mayers). Sl. infection occurred in all potato fields in s. Alta. and half of the stocks showed sl.-mod. infection on the tubers. Its above normal prevalence in 1956 is attributed to the half dead condition of the tops for several weeks before the tubers were dug (R.P. Stogryn). Sl.-mod. infections were observed in 92 (81%) of the fields inspected in n. and central Alta.; scurf development on the tubers was about normal (J.W. Marritt). Rhizoctonia was present to some extent in most fields examined; the disease is responsible for considerable loss in Sask. (R.J. Ledingham). Sl. infections were seen in most fields in Man. and n.w. Ont. (D.J. Petty). A mod. infection with aerial tuber formation was observed in a field at Altona, Man. (J.E. Machacek). Fields of Irish Cobbler, Katahdin and Kennebec throughout the London district, Ont., were sl. affected (J. McKercher). Rhizoctonia caused some damage to crops on lighter soils and the sclerotia were heavy on crops unharvested after the tops

were killed by frost in district 2 (W. L. S. Kemp). Rhizoctonia was unusually prevalent in district 3; tuber infection occurred mostly in northern locations (H. W. Whiteside). Sl. infections were recorded in half the fields inspected in e. Ont. (E.H. Peters). Infection was 139-sl. 7-mod. 2-sev. in 150 (13.5%) of the fields inspected in Que. being especially prevalent in Labelle Co. Scurf development was usually sl. in 325/531 bins inspected but in 4 bins infection was sev. (B. Baribeau). About 10% of the plants and 40% of the tubers were affected in a field at Ste Clothilde (R. Crete). Only sl. infections were noted in the field in N. B. Scurf development on the tubers also appears to have been light (C. H. Godwin). Rhizoctonia development was very sl. both in the field and on the tubers in N. S. in 1956 (R. C. Layton). Traces were observed on the tubers of Irish Cobbler and Green Mountain in Queens Co., P. E. I. (R. R. Hurst). Rhizoctonia was again prevalent in Nfld. both on the east and west coast. Sl.-mod. infections were noticed, particularly in newly cleared fields at Cartyville, Robinsons and Doyles where much of the top soil had been removed and at the government land settlement, Cormac, where most farmers have not renewed their seed for 5-10 years (G. C. Morgan).

LATE BLIGHT (Phytophthora infestans) was prevalent on Vancouver Island, B. C., and caused some reduction in yield as a result of early defoliation of the vines; the disease was of little consequence on the Lower Mainland on account of dry weather during the summer (N. Mayers). Late blight was not observed in the field, but affected tubers were received from 2 growers in the Brooks and Calgary areas respectively (R. P. Stogryn) and the fungus was isolated from table stock tubers from Ranier (F. R. Harper). Mod.-sev. infections were noted in some fields in central Alta. (L. E. Tyner). A tr. infection was observed on one farm in south Edmonton and mod.-sev. infections in 3 fields at Spruce Grove (J. W. Marritt). Affected tubers were received from several localities (A. W. Henry, W. P. Campbell). Sl. infections were recorded in seed fields near Prince Albert and Norquay, Sask. and traces were noted in table stock fields near Kamsack and Yorkton (A. Charlebois). In 1956, a tr. of late blight was first seen in a field on 7 Aug. and sl.-mod. infections were observed a week later at Winnipeg and Portage la Prairie. Although the disease was never very conspicuous in the field, numerous samples of blighted tubers were received from growers after the crop was harvested. The disease was noted on tubers of Cherokee, Kennebec, Osseo, Warba and Waseca as well as unidentified varieties (J. E. Machacek). Losses usually did not exceed trace to 5% of the tubers but in the Portage area there were parts of a few fields where 50% of tubers were destroyed (D. J. Petty).

Late blight was first observed in Ont. on 23 July in a field of Irish Cobbler near Hespeler by L. V. Busch and in e. Ont. on 2 Aug. at Metcalfe, by O. W. Lachaine (C. B. Kelly). Late blight was more prevalent and sev. in the Niagara Peninsula than for many years. Regardless of the spray schedule followed no field was free from infection. Also scarcely a late crop was harvested without the use of a vinekiller (J. K. Richardson). Late blight was

widespread in the London district. In some plantings the vines were almost completely defoliated and tuber infection was high. Continued wet periods in August made a normal spray program ineffective. However, many growers by extra application of fungicide and by the killing the vines mechanically or with a chemical were able to harvest a crop nearly free of rot (J. McKercher, W. S. Babbitt). Late blight was also serious in the Blackwell area and in the Grand Bend and Thedford Marshes. It first appeared about 31 July. Katahdin and Irish Cobbler were more sev. affected than Sebago or Keswick. Top killers were used except where the tops were dead several weeks before harvest. In potatoes harvested during wet weather in September, tuber infection was high. Where growers waited until October when the weather was dry, tuber infection was fairly low. Both unfavorable growing conditions and late blight reduced the crop at least a third to a half (J. L. Chard). Some loss occurred in the Toronto-Hamilton area where some growers were unable to protect their crop properly. (W. S. Carpenter). Late blight was widespread in district 3, but very few crops suffered sev. from tuber infection (H. W. Whiteside).

Late blight was first reported in Que. near Montreal on 25 July in a field of Irish Cobbler. Spread was slow, but frequent rains and wet ground prevented growers spraying their fields regularly. By 31 Aug. nearly all unsprayed fields were affected and in some localities 10-20% of the crop was reported lost. Its spread was checked by heavy frosts at the end of August in some localities and by mid September in all other districts. Tuber infection was very light throughout the province (B. Baribeau). Late blight was mod.-sev. in unsprayed home gardens in Rouville Co. (R. Crete). Late blight was first reported in N. B. on 11 July at Kingsclear, York Co. By mid-August sl. infection was noted in many fields particularly in York and Carleton counties and sev. in few fields of early varieties inadequately protected by a fungicide and at the end of the month a sl.-mod. infection was general in these counties. The disease was less prevalent elsewhere in N. B. Tuber rot was more prevalent in the field than in 1955, but because tuber symptoms were readily observed, few affected tubers showed up upon bin inspection (C. H. Godwin).

For the 3rd consecutive year a survey was conducted at Fredericton to determine the races of the late blight fungus present in Canada except Nfld. By 14 Dec., 1956, 212 collections had been examined and 310 races had been identified. These races were isolated from potato tubers and vines and tomato fruits; 36 varieties of potatoes were represented. The results of the survey are given in Table 10.

Table 10. Distribution by Provinces of Physiologic Races of Phytophthora infestans in Canada in 1956

Physiologic Race	Provinces									
	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Total
1	1	6	1	1	1					10
2	1	3								4
3	7	8	6	4	6		1	1	1	34
4	31	7	30	18	8	2	2	1	3	102
1.2		1								1
1.3	4	23	1	1	1					30
1.4	4	59	6	6	3					78
2.4	2	2			2					6
3.4	3	11	1	18	9		1			43
1.3.4		2								2
Total	53	122	45	48	30	2	4	2	4	310

The results are based mainly on a single determination on the differential hosts. Race 4 appears to predominate as in previous years. This result may be due to the masking of race 0, which takes place in the presence of every other race. The second most prevalent race collected was race 1.4, and the third most prevalent was race 3.4. Race 1.3.4 was encountered only twice in all the collections (J.L. Howatt).

Late blight was first reported in N.S. in 1956 in Colchester Co. on 26 July. Scattered infections began to be noted by mid-August and an occasional infection was sev. One of these was in a field of Kennebec in Colchester Co. Except in this county, late blight was less sev. than in 1955. Tuber rot also appears to be light. In a blight resistance test, 7 varieties were planted at 6 illustration stations in western N.S. No late blight was observed at Rawdon but the percentage of late blight recorded at the other stations is shown in Table 11. Mr. G.G. Smeltzer provided the readings (R.C. Layton).

Table 11. Percentage of Late Blight Recorded at Illustation Stations in Western Nova Scotia

Variety	Location				
	East Stewiacke	Noel Shore	Lunenburg	Mavillette	Yarmouth
Menominee	0	4	1/2	3	42
Saco	5	15	1	15	2
Keswick	0	7	6	7	0
Empire	8	36	50	95	50
Cherokee	0	0	0	0	0
Canso	6	14	9	21	5
Kennebec	3	11	1	28	21

Although late blight was first observed in the field in P.E.I. on 24 July, 9 days earlier than in 1955 when a sev. epidemic occurred, the disease never seriously threatened the crop in 1956.

From the humidity-rainfall-temperature pattern for the first 3 weeks of July, it was predicted that late blight would appear about a week earlier than in 1955. As mentioned above it was found in the field on 24 July and in the next several days it was reported in numerous fields in all 3 counties. However, before mid August the weather changed: rain fell only once or twice a week for the next 5 weeks, mean relative humidity dropped to the 70's and temperatures were often low. Under these conditions the disease spread slowly. Growers who applied only 3 sprays had no trouble. Soon unsprayed fields were defoliated and most fields were killed down by frost or a chemical vine killer. Even in the experimental plots where an effort was made to create an epidemic by spraying the foliage with late blight spores, the plots receiving no fungicide were not more than 40% defoliated on 19 September when the tops were killed with sodium arsenite (L.C. Callbeck).

Losses from late blight were generally heavy in the early crop in Conception Bay and sl.-mod. in Trinity and Bonavista Bays, Nfld. The disease was sev. on the foliage of later varieties in Conception Bay and sl.-mod. in Trinity and Bonavista Bays, but tuber infection was generally less sev. Early frosts killed the foliage and probably reduced tuber infection. On the West Coast, there was little evidence of late blight (G.C. Morgan).

LEAK (Pythium ultimum) was rarely observed during digging operations and little developed in storage in B.C. (N. Mayers). Leak and soft rot caused breakdown in some early harvested potatoes in s. Alta., especially when packaged in plastic bags (M.W. Cormack). The disease was observed in 5 lots of Kennebec at shipping inspection this spring in Que.; infection was 1-7% (B. Baribeau).

SILVER SCURF (Spondylocladium atroviirens) was noted in a few lots of Green Mountain at bin inspection in Que., but infection was sl. (B. Baribeau). A sl. infection was seen in a few lots in N.S. (R.C. Layton). An occasional tuber was affected in a lot of Irish Cobbler in an unventilated storage in Queens Co., P.E.I. (R.R. Hurst).

POWDERY SCAB (Spongospora subterranea) sev. infected tubers on 2 farms in the Cloverdale area, B.C. (N. Mayers). The disease was reported in a few bins in Que.; infection was sl. (B. Baribeau). Powdery scab was reported in 2 lots in the Halls Harbour area, N.S.; in a field of Kennebec infection ran as high as 25% and averaged 5% (R.C. Layton). Mod. infections were noted in 5 fields on the east coast and in 4 fields on the west coast, Nfld.; these were mostly Arran Victory (G.C. Morgan).

COMMON SCAB (Streptomyces scabies) was fairly prevalent in B.C. mostly on smooth skinned varieties in the Interior (N. Mayers). Scab was rather heavy on 4 crops grown near Calgary, Alta. (R.P. Stogryn). Reports from Rumsey, Stettler, Violet Grove and Benalto indicate that common scab was particularly troublesome in these districts in 1956 (A.W. Henry), but in seed stocks sl.-mod. infections have been seen only on Warba (J.W. Marritt). Very little scab was noted in Man. and n.w. Ont. (D.J. Petty). In the London district scab was heavy on tubers from one field of Katahdin; most fields yielded fairly clean tubers (J. McKercher). Scab continues to be the major problem in the growing of potatoes in district 2, particularly on the lighter soils in the district. On the average not less than 25% of the crop is affected by sl. scab and 10-15% by mod.-sev. scab. For many growers 20-25% of the tubers have to be culled out on account of scab before the remainder can be given seed grade. Apparently potatoes have been planted so frequently on most potato growing farms that the scab organism is now abundant in nearly every field. Despite heavy and frequent rains this year, scab was about as prevalent as usual (W.L.S. Kemp). Scab was considerably less prevalent in district 3 than in 1955. However, in a field of Green Mountain in the Algoma district where the disease has seldom been observed, over 50% of the tubers were affected; investigation revealed that lime had been applied to this field several years ago (H.W. Whiteside). Scab was heavy in a few lots grown on the lower St. Lawrence, Que. (B. Baribeau). The disease was less prevalent in N.B. than in 1955 and has caused little difficulty during grading (C.H. Godwin). Scab was generally light in N.S. but in one lot of Bliss Triumph 30% of the tubers showed sev. scab (R.C. Layton). Scab infection was mod. in P.E.I. (H.L. McLaren). Scab appeared to be less prevalent than in 1955 although mod.-sev. infections were rather common in the Avalon Peninsula, Nfld; sl.-mod. infections were found in about a third of the fields inspected on the West Coast (G.C. Morgan).

WART (Synchytrium endobioticum) was widespread in e. Nfld. and losses were sev. in small garden plots. In many plots of Arran Victory, Green Mountain and Arran Pilot visited in Conception Bay and on the South Shore 80-100% of the plants were infected and yields were negligible. Other sev. infected varieties were Bliss Triumph, Arran Banner, Kerr's Pink and Irish Cobbler. From reports and letters received it is evident that disease was heavy in settlements such as Fogo Island, Carmanville and Harry's Harbour. The cool, moist weather during the growing season was nearly ideal for the development of wart. The sev. infection in e. Nfld. may be a blessing in disguise because many plot owners were spurred to take an active interest in control of the disease.

Sebago continued to show very high resistance to wart and is becoming increasingly popular not only in Conception Bay but also in other wart-infested areas.

During the wart survey on the West Coast the disease was found to be fairly widespread in the St. Georges-Port au Port areas, particularly in garden plots. Severe infections at St. Davids is a cause of much concern as this settlement borders an approved seed area (G. C. Morgan).

WILT (Verticillium albo-atrum). About 25% of the plants in a field at Altona, Man., showed wilt symptoms and some plants were dead; the pathogen was isolated from the stems (W. C. McDonald). The organism was isolated from a plant received from Fort William, Ont. (H. N. Racicot).

LEAF ROLL (virus) was reported in every province in Canada and caused the rejection of 74 fields entered for certification. Details of only a few observations will be recorded (I. L. C.). Leaf roll continues to be a major problem in s.e. B.C. and the North Okanagan areas. Applications of Malathion to the foliage are being recommended in place of DDT for the control of aphids and soil treatments for flea beetles. Little net necrosis was observed in seed stocks during bin inspection, but in crops of Netted Gem table stock in the Okanagan necrosis was severe in many cases, reducing the sale value of the tubers (N. Mayers). In district 3, Ont., Keswick and Cherokee appeared to be highly susceptible to leaf roll (H. W. Whiteside). In recent years, leaf roll has been of minor importance in N. B., and only 6 fields out of 2303 inspected were rejected (C. H. Godwin). For the first time in several years rejections on account of leaf roll occurred in N. S.; 6 fields out of 255 inspected were rejected (R. C. Layton). Leaf roll and mosaic was widely distributed on the east coast of Nfld. and was particularly sev. in fields of Arran Victory and other European varieties. Sl.-mod. infections of leaf roll were noted in 5 fields of Keswick. These diseases were not prevalent on the west coast, but mod.-sev. infections occurred on Arran Victory at Cormac where few farmers had renewed their seed stock for some time (G. C. Morgan).

MOSAIC (virus) was likewise reported in every province and caused the rejection of 294 fields entered for certification, nearly double the number rejected in 1955. Again only details from a few reports will be included (I. L. C.). Mosaic appears to be more prevalent than usual in Sask. and caused the rejection of 2 fields (A. Charlebois). Mosaic was observed most frequently in Keswick and Green Mountain in district 3, Ont. Katahdin is also affected but it shows rarely more than a mild mottle (H. W. Whiteside). Mosaic was reported in 480 (43%) of the fields inspected and caused the rejection of 116 fields in Que.; in 1955 the corresponding figures were 248 (22.5%) and 65. Masking of symptoms and heavy aphid populations in 1955 may account for the heavy incidence reported this year (B. Baribeau). Mosaic also appeared to be somewhat more prevalent in N. B. (C. H. Godwin).

VIRUSES M AND S. A special report on 'Potato Viruses M and S' has been prepared by Dr. R. H. Bagnall for the Survey as follows:-

Interveinal mosaic (IVM), a virus-incited disease of Irish Cobbler and other American potatoes, is best seen in the field during cool, cloudy weather. Affected plants show slight stunting and a diffuse interveinal foliar mottle. Presence of virus X was confirmed and the previously little-understood potato virus S was revealed in all Irish Cobbler plants, whether showing symptoms of IVM or not. Presence of a third virus in Irish Cobbler showing IVM was suspected, but no known strains of potato viruses A, F or Y were found.

Eventually, a virus designated as potato virus M was isolated from Irish Cobbler affected by IVM. Virus M was separated from virus X in the IVM complex by sap transfer to potato seedling 41956, and from virus S by passage through a source of Datura metel in which virus M becomes systemic more rapidly than virus S. Subsequently virus M was maintained in a potato seedling known to have been virus-free, and virus S. in "healthy" Seedling 41956. Serological antisera were prepared for viruses M, S. and X. Each virus could be specifically identified by this means even when all three were present. Cross-precipitin tests showed some serological relationship between viruses M and S, but the factor in common represented only a small fraction of the respective antigenic activities of the two viruses. The common component could be eliminated by cross-absorption or dilution of the antisera.

Mechanical inoculation with sap extract containing virus S, at 18° to 20°C., resulted in: local yellow spots on Chenopodium album; no local symptoms but a well-defined systemic vein-clearing and chlorotic mottle on Nicotiana debneyi; a systemic foliar necrosis on Solanum rostratum; and necrotic local lesions on guar, Cyamposis tetragonoloba. No symptoms appeared on either the cowpea Vigna sinensis or Datura metel. The latter plant was the only Datura species tested in which virus S became systemic.

Inoculated with virus M: D. metel reacted with a local and systemic spotting; cowpea with reddish local lesions; guar with necrotic local lesions; N. debneyi with irregular brownish ringlike local lesions, but without systemic symptoms; and S. rostratum with a necrotic streaking of the stem, petioles, and leaf veins. C. album developed no symptoms.

Tomato and eggplant were symptomless hosts of virus M but were immune from virus S. Physalis philadelphica was a systemic host of virus S only. Several species of Datura, D. bernhardii in particular, developed local lesions in response to combined virus S and virus M inoculum, but no clear symptoms to either virus alone. Virus M alone became systemic, inciting necrotic ringlike lesions, when scions bearing the two viruses were grafted to these Datura species. Capsicum annuum, Nicotiana tabacum, and N. glutinosa were immune from both virus S and virus M. Virus M alone, from a mixture of the two, survived 10 minutes heating at 65°C. Virus S alone survived 4 days at 20°C.

Eighty varieties of potatoes from Canada, Europe, and the United States were tested serologically for the presence of virus S. The great majority of these varieties, all or in part, proved to be infected. This indicates that virus S rivals virus X as the most widespread amongst the potato viruses. Numerous older varieties appear to be entirely infected with both. Varieties free from

virus S included: Alpha, Jubel, Saco, Sebago, and Voran. Sebago has been infected with virus S by grafting, but not by sap inoculation. Despite repeated attempts, Saco has not been infected by either method.

In a number of potato varieties, the common strains of virus S alone produced a slightly ruffled "off-type" appearance and a few necrotic lesions surrounded by dark green spots on mature lower leaves. Strains of virus S are known which incite a necrotic spotting and "bronzing" on the foliage of certain varieties. It is doubtful, however, if the presence of this virus could be safely predicted on the basis of symptoms on potatoes. A significant reduction in yield resulting from virus S infection has been reported in Europe. Our own approach to the problem has been to make in the first place a thorough study of the virus itself; consequently little work on symptomatology on potato, or on yield factors has been done as yet.

Viruses M, S. and X have also been isolated from Green Mountain potatoes showing Schultz and Folsom's "leafrolling mosaic" (Solanum virus II of Smith). The varieties Fortuna and King Edward reported in Europe to harbor strains of virus S were shown to contain both virus M and virus S. Interveinal mosaic and leafrolling mosaic have been reported from time to time in the United States and Canada, and an apparently similar disease termed "curl" has been reported in Germany. Nevertheless, little is definitely known of the incidence of potato virus M.

Little is known either concerning varietal resistance towards virus M. The variety Saco, which appears to be immune from viruses S and X (and field immune from virus A), was readily infected with virus M by sap inoculation. This method was recently used to separate virus M from virus S.

The isolation of virus M from the King Edward variety was of particular interest. There is now good evidence that this virus is responsible for the "paracrinkle disease" which is latent in the King Edward variety, but which develops symptoms in other varieties grafted with King Edward scions. The "paracrinkle virus" was frequently mentioned in discussions of virus origin as an example of a virus having originated "de novo" from plant components. It had been shown by previous workers to be present in all King Edward plants tested by the grafting procedure, but it had not been found elsewhere in nature and no natural means of transmission had been demonstrated. The present work, so far as is known, is the first in which the "paracrinkle virus", as distinct from virus S, has been identified with a virus occuring naturally in a potato other than King Edward. Furthermore, numerous varieties of potato are known to be latent carriers of specific viruses. The "paracrinkle virus" latent in King Edward potato can, therefore, no longer be regarded as unique.

For an account of the original isolation of virus M see Bagnall, R.H., R.H. Larson and J.C. Walker, University Wis. Research Bull. 198. 1956, and summary in Am. Potato J. 33:271-273. 1956 (I.L. Conners).

PURPLE OR BUNCH TOP (virus). Sl. infections were noted in Alta., Sask., Man. in n. and e. Ont., Que., N.B., N.S. and P.E.I. and generally appeared to be less prevalent than in 1955 (I.L.C.).

HAYWIRE (virus)was in tr. amounts in 5 fields of Netted Gem in s. Alta. (R.P. Stogryn), and in 24 (21%)of the fields inspected elsewhere in Alta. It appeared to be sl. more prevalent (J.W. Marritt). Ten fields in the Pemberton district, B.C., showed symptoms that appeared to be those of haywire infections never over a tr. (N. Mayers).

SPINDLE TUBER (virus) occurred in negligible amounts in Man. and n.w. Ont. (D.J. Petty). Two fields of Katahdin were rejected in the Lafontaine area in district 3 (H.W. Whiteside). In Que. a few affected plants were observed in 3 fields and a few tubers found in 7 lots on bin inspection (B. Baribeau). Small amounts were observed in N.B. in a few bins of lots of the more susceptible varieties. No fields were rejected; it appeared to be less prevalent than in 1955 (C.H. Godwin). Tr.-sl. infections were reported in N.S. in several fields but none were rejected (R.C. Layton). Spindle tuber caused the rejection of 58 fields in P.E.I. in 1956 compared with 30 in 1955 (H.L. McLaren). Spindle tuber caused 10% infections in 12 fields of Arran Victory on the East Coast of Nfld., and 5-15% infections in 20 fields of the same variety at Cormac in the West Coast area (G.C. Morgan). See also MacLachlan's survey in Eastern Canada, p. 72.

WITCHES' BROOM (virus) was noted in several fields in the Cariboo, and in small amounts in some other districts in B.C. (N. Mayers). The disease was recorded in one field of Warba in s. Alta. (R.P. Stogryn), and in 24 (21%) of the fields inspected elsewhere in Alta. It appeared to be sl. more prevalent than usual (J.W. Marritt).

YELLOW DWARF (virus). A few affected plants were found in fields of Katahdin at Strathroy and Komoka, Ont. (J. McKercher).

ENLARGED LENTICILS (nonparasitic). About half the tubers in low end of a field of Sebago in Queens Co., P.E.I. were sev. affected; soft rot was also present (R.R. Hurst). In several fields in the Ridgeville area, Ont., almost every tuber showed several lenticils enlarged (J.K. Richardson).

FROST INJURY. Killing of tops by frost caused a few cases of stem-end discoloration in B.C. (N. Mayers). Field frost caused some damage in the Peers-Edson area, Alta. (J.W. Marritt). Frost damage was remarkably light on tubers in fields of Sebago, in e. Ont., although the tops were green until frozen in late September (E.H. Peters). Owing to unfavorable weather in the fall digging was delayed in Que. and late heavy frost caused damage to the tubers. In about 40% of the bins inspected 1-7% of the tubers were affected.

Frost also caused some stem-end discoloration in a few bins (B. Baribeau). Field frosts during the harvest period caused fairly extensive damage in N.B. particularly in the northern sections. Sev. frost damage occurred 11-12 Oct. when temperature reached 16-20°F. Because of tuber breakdown in several carload lots, they had to be regraded (C.H. Godwin). Because the crop was planted late and the growing season cool a great many fields were green until killed by frost. The quality of the crop in N.S. was considerably reduced (R.C. Layton). Frost on 17 Sept. completely defoliated the potato crop on the West Coast of Nfld.; yields were considerably reduced at Cormac (G.C. Morgan).

GIANT HILL. Somewhat atypical plants singly or in units were reported in several varieties, particularly Green Mountain, Irish Cobbler and Netted Gem throughout N.S. In one field of Green Mountain 1/2% of the plants were affected (R.C. Layton).

HEAT NECROSIS. Internal discoloration caused by extreme heat particularly on light soils was uncommon in district 3, Ont. this year (H.W. Whiteside).

HOLLOW HEART. Although the tubers were generally smaller than usual in the crops in s.e. B.C., hollow heart was present in some lots. It was also found in a few bins in the North Okanagan (N. Mayers). Traces were seen in one bin of Irish Cobbler grown in Queens Co., P.E.I. (R.R. Hurst)

LIGHTNING INJURY. Lightning struck several times on a farm at Englehart, Ont.; several areas about 30 feet in diameter were completely destroyed (H.W. Whiteside).

MAGNESIUM DEFICIENCY. Scattered plants were affected in a field of Irish Cobbler at North Wiltshire, P.E.I. (R.R. Hurst).

STEM STREAK NECROSIS (manganese toxicity) was troublesome in several areas where the soil is light in P.E.I., Sebago being most commonly affected (L.C. Callbeck). The disorder has been described by D.B. Robinson and L.C. Callbeck in Am. Potato J. 32:418-423. 1955 (I.L.C.).

PUMPKIN

POWDERY MILDEW (Erysiphe cichoracearum) caused sev. defoliation in late Aug. and Sept. in Essex Co., Ont. (C.D. McKeen).

STORAGE ROTS were sev. in Oct. in pumpkins grown at Ste. Foy, Que. (D. Leblond). Helminthosporium sorokinianum was the only pathogenic fungus recognized on the specimens sent (R.A. Shoemaker).

MOSAIC (virus). About 50% of the plants of an unnamed variety were affected in fields at Kelowna, B.C. The seed had been supplied by Canadian Canners. The disease occurred in every field planted with this variety. This observation seems to corroborate Bewley's statement (cf. K. Smith Textbook of plant virus diseases, Churchill, London. 1937, p. 54) that the disease is seed-borne (G.E. Woolliams, M. King).

RADISH

BLACK ROOT (Aphanomyces raphani) destroyed 35% of the plants in a garden at Highbury, N.S. (K.A. Harrison).

SQUASH

LEAF SPOT (Septoria cucurbitacearum) was sev. at Kentville, N.S. in a field of squash that had produced an infected crop in 1955. Commercial fields were unaffected where the crops were rotated (D.W. Creelman).

ROT (various fungi) affected 10-20% of fruits of 1500 bu. of Butternut squash from a field in Oxford Co., Ont. (J.K. Richardson).

MOSAIC (virus) affected several plants of Mammoth Table Queen in a row at the Exp. Farm, Agassiz, B.C. The virus was transmitted to cucumber (H.N.W. Toms).

SWEET CORN

EAR ROT (Fusarium sp.). A tr. was observed at La Gorgendiere, Que. at the provincial school farm at harvest time (D. Leblond).

RUST (Puccinia sorghi) sl. infected a 7-acre field of canning corn at St. Louis de Gonzague, Que. (R. Crete).

SEED ROT (organisms undetermined). Most of the early crop was a complete loss about Jemseg, N.B. because of failure of seed to grow; the weather was cold and wet (S.R. Colpitts).

SMUT (Ustilago maydis). Affected specimens were received from a field near Saskatoon, Sask. (R.J. Ledingham). Several affected specimens were received from places in the Annapolis Valley, N.S. (K.A. Harrison).

MAGNESIUM DEFICIENCY was mod. on corn examined at St Nicholas and Ste. Foy, Que. (D. Leblond).

TOBACCO

A special report on "Tobacco Diseases" was prepared by Dr. Z.A. Patrick and Dr. L.W. Koch.

SEEDBED DISEASES

BLUE MOLD OR DOWNY MILDEW (Peronospora tabacina). No cases of blue mold were observed in seedbeds in the Old or New Tobacco Belts of Ontario and as yet this disease has not appeared in Quebec. As it is well known that blue mold spores can be carried by the winds for long distances and in all instances where serious outbreaks of this disease have occurred in Canada the inoculum, in the form of spore showers, came from the tobacco growing areas of the United States, the growers are strongly advised to follow a regular spray program for blue mold control. The recommended program for blue mold control (P.D.S. 34: 95) has also been found to aid considerably in the control of damping-off organisms.

DAMPING-OFF OR BED ROT (Pythium spp. and Rhizoctonia solani) was present in most of the seedbeds. In most instances, however, it occurred in a few small patches in the bed and did not cause much damage. There were a few instances, however, where, due to crowding of plants and faulty watering, the loss of plants was heavy.

YELLOW PATCH (excessive nutrients). Next to damping-off, yellow patch was the most common seedbed trouble especially in the burley tobacco area. This condition arises in most instances as a result of over fertilizing the seedbed during preparation and often as a result of seeding too soon after steaming the soil.

CHEMICAL INJURY There were still a few cases of 2,4-D injury due to the use of improperly cleaned sprayers.

FIELD DISEASES

BLUE MOLD (Perenospora tabacina). A few outbreaks of blue mold occurred in fields in the Delhi area. This was the result of spores carried by the winds from the tobacco growing regions of the U.S. s. and s.w. of Lake Erie. The spore showers occurred around 20-25 July. Fortunately in most of the tobacco growing areas around Delhi the environmental conditions were not suitable for fungus infection and consequently the disease did not become established. In a few low lying fields there was some damage.

BROWN ROOT ROT (nematodes) is one of the most serious diseases of burley and flue tobacco. The disease was widespread, occurring in all the tobacco growing areas. It was most sev. in light sandy soils following a rye rotation. Large populations of the root-lesion nematodes, Pratylenchus spp., were found in these soils.

BLACK ROOT ROT (Thielaviopsis basicola). On account of cold and wet weather in the early part of the season some black root rot damage was noted. Although the tobacco varieties used in Canada are moderately resistant to black root rot and in the past the damage caused by this disease has been negligible, unfavorable growing conditions in some areas during 1956 resulted in some black root rot damage. Most of this damage, however, was confined to low lying parts of the field.

FRENCHING (?soil toxins). A few fields, mainly those on soils marginal for growing tobacco, were moderately damaged by frenching.

SOFT ROT (Pythium spp.) and SORE SHIN (Rhizoctonia solani) were both found in a number of fields and caused mod. losses in the new transplants.

FUSARIUM WILT (F. oxysporum var. nicotianae). A few fields were found where a few plants were infected.

ANGULAR LEAF-SPOT AND WILDFIRE (Pseudomonas tabaci and P. angulata). These leaf spot diseases causing large irregular brown and black lesions on the leaves were found in a number of fields at the end of July. Although the leaves affected were not suitable for harvest only a few plants in each field were affected.

NONPARASITIC LEAF SPOT (cause undetermined) was widespread in 1956 throughout most of the flue tobacco growing regions of Ont. Loss in yield was mod.-sev. and it also caused a considerable reduction in quality. The disease appears to be physiological in nature brought about by the interaction of certain nutritional and environmental conditions.

BROWN SPOT (Alternaria longipes (Ell. & Ev.) Mason) was also quite common on flue cured tobacco. It was found on maturing leaves. The lesions are large, circular and frequently marked by concentric rings. (This pathogen has not been previously reported in Can., although according to J.W. Groves, he has detected it once on seed. - I.L.C.).

FROGEYE (Cercospora nicotianae) is another disease attacking maturing leaves. The lesions in this case are small, one-fourth inch or less in diameter, and the centers are often parchment-like, with a scattering of minute, black dots. The damage from these two diseases was sl.-mod.

MOSAIC (virus). Injury from TMV was widespread throughout the burley, dark and flue-cured tobacco growing areas of Ont. and Que.

ETCH (virus). Damage from etch to burley tobacco was not as serious as in 1955. However, a number of fields in the Leamington-Harrow areas of Ont. showed up to 75% infection. Some etch was also noted on flue-cured tobacco.

OTHER VIRUS DISEASES. There were several other virus diseases present in the field throughout the tobacco growing areas of Ont. and Que. However, only a few plants were affected in each field and the losses were negligible. The viruses included ring-spot virus, streak virus, vein-banding virus and several of the cucumber-mosaic and potato viruses.

SUMMARY

In general the predominant feature of the tobacco disease picture in the tobacco growing areas of Ont. during the 1956 season has been the increasing severity and economic importance of leaf spots, mainly of the non-parasitic type which are often referred to as "physiological leaf spots", "weather fleck", and "immature firing". The exact causal factors responsible for these leaf disorders are as yet unknown. Another potentially serious trend in the tobacco disease situation noted in the last few years is the increasing number of cases of brown root rot in fields which have been following the typical rye-tobacco rotation for some time.

TOMATO

Dr. W.G. Benedict has prepared a special report on "Diseases of Canning Tomatoes in southwestern Ontario in 1956."

The disease situation in canning tomatoes in s.w. Ont. in 1956 was characterized by (a) an early serious development of early blight and Septoria blight in the transplant beds, (b) an epidemic of tomato anthracnose in mid-September predominantly in fields located on sandy soils and (c) a preponderance of soft rots on fruits especially in fields located on clay soils.

EARLY BLIGHT (Alternaria solani). On 25 April primary inoculum was found on overwintered, infected tomato debris. Near Harrow 400 stems were picked at random from 4 unplowed tomato fields on Brookston clay loam and 4 fields on Perth clay loam. A. solani was found infecting 169 stems; 421 sporulating lesions were present on 225 sq. in. of the infected stems. Because of generally cool temperatures and heavy rains during May and June much of the clay land could not be prepared for transplanting. Consequently young plants

remained in the outdoor beds. While being so held, a short period of hot humid weather, 11-15 June, with day temperatures over 90°F. and night temperatures above 70°F. contributed to heavy natural infection by early blight. Frequent surveys of growers' establishments indicated that some defoliation of young plants occurred in the beds and most plants were infected with early blight as they were transplanted into the fields during the whole month of June. Some of this early blight was checked by "trailing in" the plants which covered with soil most of the stem and the lower leaves. On 6 July a survey of late tomato fields on sandy soil in the Harrow-Colchester districts showed that early blight lesions were abundant on the foliage. A similar survey of 13 late tomato fields on clay soil on 10 July showed only 2 heavily infected by early blight. However, the first application of fungicide around 8 July reduced the incidence of early blight to low levels in these fields. Later, in August, in unsprayed fields of tomatoes early blight occurred in epidemic proportions and caused some defoliation of plants. By 5 September when the first tomatoes began to be picked, many fields located on sandy soils the plants of Clark's Special, Rutgers, John Baer, Redjacket and some other varieties were 75% defoliated and the earlier variety Ferguson was 90% defoliated. Early blight was not a problem in fields sprayed regularly with a suitable fungicide up to this time. About mid-September and for 3 weeks thereafter, some to all of the foliage was infected by early blight in nearly every field. Heavy infection of the stems was also noted on a survey of fields on 1 October.

SEPTORIA BLIGHT (S. lycopersici). The disease picture presented by Septoria blight resembled closely that of early blight throughout 1956 with one difference. There were about 4 times as many lesions of Septoria blight as those of early blight on the overwintering stems: 1606 sporulating lesions on 221 sq. in. of 151 of the 400 stems collected on 25 April. In general about 4 out of 5 of the leaf spots on young plants and more than 1/2 of the defoliation of older plants in the unsprayed fields in August and later was due to infections by Septoria blight. Before the harvest began it was as readily kept under control by fungicidal sprays applied to the foliage but it built up later and was quite evident on the stems.

ANTHRACNOSE (Colletotrichum phomoides). The first anthracnose lesions appeared on late crops of Ferguson, Redjacket and Early Rutgers, on 17 Aug. in unsprayed plots located on sandy loam at Harrow. (Lesions had been found on early tomatoes in the same locality 2 days earlier.) As other varieties of late tomatoes produced red ripe fruit more anthracnose was found. The incidence of anthracnose in Ferguson, which was defoliated early in September, was so high by 5 September that the fruits were not worth picking. More than 90% of the ripe and near ripe fruits showed one or more anthracnose lesions. The incidence of anthracnose on the same date in 7 other varieties of tomatoes that were unsprayed and located on sandy loam is shown in Table 12.

Table 12. Incidence of Anthracnose and other Rots in 7 Varieties of Unsprayed Tomatoes on Sandy Loam at Harrow

Variety	Fruits harvested from 25 plants	Percentage of Fruits Disease free	Rotted	Anthracnose-infected
John Baer	679	41	41	18
Rutgers	679	53	35	11
STEP No. 174*	987	58	21	21
Homestead No. 2*	1253	63	22	14
Clark's Special	703	66	18	16
Redjacket	885	70	16	14
CRW No. 169*	783	80	15	5

*Varieties reputed to have some resistance to anthracnose: seed obtained from C.F. Andrus, Vegetable Breeding Laboratory, Charleston, S.C.

In Table 12 the varieties are listed in order of increasing percentage of disease-free fruits harvested. The variety CRW No. 169 alone showed a low incidence of both anthracnose and other fruit rots.

Further, the increase in the incidence of anthracnose in the tomato crop was very great after mid September as indicated in Table 13.

Table 13. Incidence of Anthracnose at two Harvest Dates

Treatment	Harvest date	Disease-free	Rotted	Anthracnose-infected
Unsprayed check	Sept. 13	66	18	16
Sprayed with Manzate	" 13	87	12	1
Unsprayed check	" 28	28	8	64
Sprayed with Manzate	" 28	42	10	48

The data in Table 13 show that a 48% increase in loss from anthracnose occurred in both the unsprayed and sprayed plots of tomatoes, during a harvest period of 15 days. Also anthracnose was virtually controlled as long as the fungicide was effective. The last application of fungicide to the sprayed plots was made on September 6. The tomato was Clark's Special, which was the most important variety grown locally in 1956.

Finally, soil type seems to have a distinct influence upon the incidence of anthracnose in the tomato crop as seen in Table 14.

Table 14. Effect of Soil Type and Spraying on the Incidence of Tomato Anthracnose

Soil type	Treatment	Fields	Percentage of Fruits		
			Disease-free	Rotted	Anthracnose-infected
Clay	Sprayed	13	78	20	2
Clay	Unsprayed	8	64	34	2
Sand	Sprayed	7	73	21	6
Sand	Unsprayed	9	57	23	20

The data in Table 14 show that Manzate applied to 6 Sept. at the rate of 3 lb. per acre did not decrease the incidence of anthracnose in tomato fields located on clay soil but decreased by 14% the fruits lost because of fruit rots other than anthracnose. On the other hand, in tomatoes grown on sandy soil the fungicide had the effect of reducing the amount of anthracnose-infected fruits by 14% while the loss due to other fruit rots remained about the same.

LATE BLIGHT (Phytophthora infestans). None was found on tomatoes in Essex and Kent Counties in 1956.

Other diseases noted this year were Brown Wall (tobacco mosaic virus), Streak (virus), and Fruit Rots caused by bacteria and Rhizoctonia solani. The fruit rots caused losses of 8-41% of the fruits (see Tables 11 and 12) depending upon variety, soil type, and time of year but were generally more serious among common tomato varieties extensively grown on clay soils. Greatest losses occurred during the peak of the harvest season.

Other Observations

EARLY BLIGHT (Alternaria solani) apparently caused sev. damage to a field of tomatoes at Cochin, Sask. (R. J. Ledingham). Sl. infection in a planting at Morden, Man. (J. E. Machacek). Early blight was extremely sev. in the Niagara Peninsula, Ont., on both staked and canning crops. Every planting was infected and many were so sev. defoliated that losses were heavy both in yield and quality. Because of early infection and conditions favorable for disease development, the usual spray schedule was ineffective (J. K. Richardson). Early blight was quite general throughout the Toronto-Hamilton district. In many cases the spray program failed to prevent its spread and by 7 Sept. many plantings were defoliated. Only in plantings sprayed regularly at weekly intervals with either maneb or zineb were not defoliated. This program is only economical in the fresh market crop (W. S. Carpenter). Sl. infection at St Jean (R. Crete), and at St Roch, Que. (L. J. Coulombe). Early blight was general in Sunbury and Queens counties, N. B. but in only two of the fields inspected was there any loss (S. R. Colpitts).

NAIL-HEAD SPOT (Alternaria tomato). A sl. infection was noted on the fruit in a commercial planting at Plum Coulee, Man; the plants were from Ont. (J.E. Machacek).

BOTRYTIS RING SPOT (B. cinerea) affected a few fruits in a greenhouse crop at Brighton, Ont. (H.N. Racicot).

GRAY MOLD ROT (Botrytis cinerea) affected 3% of the fruits in a garden at Ste Foy, Que. (D. Leblond) and 2% in a small market garden near Charlottetown, P.E.I. (J.E. Campbell). Grey mold caused a few insignificant stem lesions about pruning wounds in a greenhouse at Falmouth N.S.; Captan dust was being used. About 30% of the fruit (10,000 baskets) were lost from rot following a spell of dull humid weather in a field at Berwick. The field was being irrigated with various fertilizers and a small quantity of sugar added. Dichlone and Zineb were ineffective; Thylate gave some control (K.A. Harrison).

LEAF MOLD (Cladosporium fulvum) was reported by greenhouse growers in the Lower Fraser Valley, B.C., even in varieties supposedly resistant; the greenhouses were poorly ventilated (H.N.W. Toms). Leaf mold appeared on a staked tomato crop in the Toronto-Hamilton area, Ont. on 1 Aug., but it caused little damage as the weather cleared almost immediately (W.A. Carpenter).

ANTHRACNOSE (Colletotrichum phomoides). A single tomato fruit attacked by late blight from a garden at Saskatoon, Sask., developed anthracnose after storage in a refrigerator for some time. This is the first time that I have seen the disease in Sask. (T.C. Vanterpool). Anthracnose was quite prevalent in the Toronto-Hamilton area, Ont., on field tomatoes, where the crop was largely defoliated by early blight (W.S. Carpenter). It was also quite general in the Niagara Peninsula, although apparently less sev. than in 1955 (J.K. Richardson). A sl. infection was recorded in the experimental plots at St. Martin, Que. (E. Lavallee).

During a study on anthracnose, a strain of C. phomoides that produces the perfect state in culture was isolated. The morphology of the perithecia, asci and ascospores conform with the description of Glomerella phomoides Swank (Phytopathology 43:285-287. 1953).

Of hundreds of isolates made at this laboratory from affected tomatoes sent in by canners in s.w. Ont. this fall, none produced perithecia in culture. All of the cultures taken from a fruit in my own garden at London, however, produced perithecia on PDA in a couple of weeks. As these isolations were made by the plate dilution method from a spore mass on the surface of the fruit the majority of the discrete colonies undoubtedly originated from single conidia. They differed from isolates from other sources in producing a reddish pigment in the medium. They also produced fewer sclerotia and these were submerged, usually at the bottom of the agar (L.T. Richardson).

BACTERIAL CANKER (Corynebacterium michiganense) was observed in an occasional field at Ashcroft and Vernon, B.C., where it caused fruit spotting (G.E. Woolliams, M. King).

COLLAR ROT (?Fusarium sp.) caused sev. rotting, at the soil line, of several plants in a garden at Lethbridge, Alta. (M.W. Cormack).

PHOMA ROT (P. destructiva) caused mod. damage in a garden at Ste Foy, Que. (D. Leblond). A few diseased fruits were found in field plots at St. Pacome (L.J. Coulombe).

BACTERIAL SPECK (Pseudomonas tomato). About 50% of the seedlings were discarded by a grower at Morden, Man., on account of infection by the disease; the seed had been produced locally and sown without treatment (W.A.F. Hagborg).

LATE BLIGHT (Phytophthora infestans). Because of a dry, sunny summer, crop was ripening better than usual by the end of August when blight appeared at the Exp. Farm, Agassiz, B.C. The remaining crop of all varieties became a total loss by 26 Sept. following a period of rain and cool weather in mid-September (H.N.W. Toms). One affected fruit was received from a garden in Saskatoon, Sask. Reports supported by specimens indicate considerable fruit rot occurred in the Yorkton area (R.J. Ledingham), and at Windthorst (T.C. Vanterpool). A diseased fruit was received from Hamiota, Man. (J.E. Machacek). Late blight was reported from several localities in the Niagara Peninsula, Ont. A diseased fruit was received from Dunville on 16 Aug. (J.K. Richardson). Symptoms suggestive of late blight appeared in the Toronto-Hamilton area in August but it was only in a field not regularly sprayed that the disease appeared on fruits and stems after the defoliation of the plants by early blight (W.S. Carpenter).

Late blight first appeared on 27 Aug. in the experimental plots at St. Martin, Que. but by 15 Sept. over 40% of the crop was infested (E. Lavallee). The disease destroyed 60% of the crop in the Botanical Garden, Montreal (P. Duval), and 47% in a garden at Ste Foy (D. Leblond). Late blight was general on tomatoes in Sunbury and Queens Counties, N.B.; in some plantings up to 80% of the crop was destroyed (S.R. Colpitts). A sl. general infection developed on unsprayed plots at Kentville, N.S. the last 10 days of September, but frost killed most of the plants on 1 Oct. (K.A. Harrison).

DAMPING-OFF (Pythium, etc.) was generally present in many plant growers' greenhouses and cold frames in the Toronto-Hamilton area, Ont. Small losses occurred in many (W.S. Carpenter). Damping-off was general in most greenhouses in Sunbury and Queens counties, N.B.; losses were negligible (S.R. Colpitts).

SCLEROTINIA ROT (S. sclerotiorum). About 5% of the fruits were affected by this rot in the plots at St. Martin, Que. (E. Lavallee). A 3% infection was seen in a 2-acre field under irrigation at Berwick, N.S. A neighboring field of lettuce had suffered earlier from Sclerotinia rot (K. A. Harrison).

SEPTORIA LEAF SPOT (S. lycopersici). A sl. infection was seen at Morden, Man. (J.E. Machacek). In some unsprayed fields grown for fresh fruit in s.w. Ont. this leaf spot caused early defoliation. The more general use of protective sprays has reduced its prevalence greatly in the last 5 years (C.D. McKeen). This disease and early blight caused considerable defoliation in fields in the Niagara Peninsula (J.K. Richardson). The same situation held in the Toronto-Hamilton area; perhaps Septoria leaf spot was the more sev. of the two (W.S. Carpenter). Two acres of Ferguson tomato was sev. defoliated by Septoria leaf spot near Vineland while several adjacent acres of Stokesdale and Longred were much less sev. affected although stem lesions were present (G.W. Eaton). The variety Ferguson was grown commercially on a large scale for the first time in 1956. Observations made in these plantings indicate that the variety is extremely susceptible to Septoria leaf spot. In certain areas in Essex Co., where it was possible to compare, side by side, unsprayed Ferguson with unsprayed standard varieties it was obvious that the new variety was completely lacking in field resistance to the disease (B.H. MacNeill). Mod. infected leaves were seen from a garden at Ottawa (H.N. Racicot).

VERTICILLIUM WILT (V. albo-atrum) caused very little damage to the tomato crop this year in the Okanagan and Thompson Valleys, B.C. Traces only were recorded on Gem, Clark's Early and Earliana in August. The summer has been warm and sunny, favorable to tomato growth (G.E. Woolliams, M. King). According to L. Lyall, a few plants were affected in every field examined both at the Substation, Smithfield, Ont., and in commercial fields in the Brighton area and in Prince Edward Co. Isolations attempted from 2 plants; one from Smithfield yielded the pathogen (H.N. Racicot). Verticillium wilt occurred in 3 fields of staked tomatoes in the Burlington district; in one of Earliest of All, it caused 20% loss of crop (W.S. Carpenter). Verticillium wilt sev. affected a tomato crop in a market garden near Charlottetown, P.E.I.; potatoes had been planted in the same field in 1955. The disease is not common in tomatoes (J.E. Campbell, G.W. Ayers).

BACTERIAL SPOT (Xanthomonas vesicatoria). Several reports of the disease were received from the Niagara Peninsula, Ont. In one field adjacent to a planting of peppers, about 20% of the fruit was spotted (J.K. Richardson).

BLACK CORE (? virus). Affected fruits were received from a few canning crops in Essex Co., Ont. An unidentified virus was demonstrated to be present in the blackened tissue (C.D. McKeen).

BROWN WALL (virus) was prevalent in several early fresh fruit crops and in canning crops in s.w. Ont. Juice from affected fruits contained tobacco mosaic virus. The disease was more prevalent than usual (C.D. McKeen).

MOSAIC (virus). Infection from mosaic was very sl. in tomato fields in Okanagan, Thompson and Upper Fraser valleys, B.C., being only 0.1 to 1.0% of the plants (G.E. Woolliams). Few greenhouse crops were free of TMV infection in the Niagara Peninsula, Ont.; a few cases of cucumber mosaic and sl. infections of streak were also noted (J.K. Richardson). Mosaic was observed in some fields in the Toronto-Hamilton area; although rarely sev., one grower lost about an acre of early field tomatoes from mosaic. Cucumber mosaic (shoestring symptoms) was observed on a few plants in about 6 fields; however, in one field about 10% of the plants were affected (W.S. Carpenter). Mosaic sev. affected a 10-acre field of canning tomatoes at St. Denis, Que. (E. Lavallee). All plants in 2 large greenhouses at Kingston, N.S., were affected; growth was good but fruit set was poor (K.A. Harrison).

STREAK (virus). Two major outbreaks of streak were observed during the 1956 season, one near Hornby, Ont., on a field of about 20 acres and another near Port Hope in a 10-acre field. On the assumption that the disease was of the "double virus" type, containing a strain of tobacco mosaic virus and the potato X virus, an attempt was made in each case to trace the disease to its source. The investigation did not suggest any clear-cut answer. However, studies carried out later have indicated that in some cases of streak the aphid-borne potato virus Y was present in the diseased tomatoes; possibly outbreaks of the disease may be correlated with presence of aphids on potatoes and tomatoes grown as companion crops in an area (B.H. MacNeill). A sev. infection of streak was seen in Quebec 13 grown in a greenhouse at Mastai, Que. (D. Leblond).

BLOSSOM-END ROT (nonparasitic) affected 15% of the fruit in a garden plot at Lethbridge, Alta. (M.W. Cormack). Typical specimens were received from several places in Alta. (A.W. Henry, W.P. Campbell). Observed in several gardens in Saskatoon, Sask. (R.J. Ledingham). Reported by a few greenhouse growers in the Niagara Peninsula, but appeared to be less prevalent in the field than usual (J.K. Richardson). The disorder was found in only a few fields in the Toronto-Hamilton area this season (W.A. Carpenter). A few affected fruits were seen at the Botanical Garden, Montreal, Que. (P. Duval). Blossom-end rot affected 3-5% of the fruits of most varieties and 15% of those of Chatham under test at Ste Anne de la Pocatiere (L.J. Coulombe).

CHEMICAL INJURY. Injury from 2,4-D was generally sl. in the Saskatoon area, Sask. in 1956 (R.J. Ledingham). Mod. injury occurred in a planting at Morden, Man. (J.E. Machacek). About a dozen fields of canning

tomatoes in Essex Co., Ont., showed sl.-sev. injury by 2,4-D drift from applications made to the roadside or adjacent crops; both foliage and fruit were affected (C.D. McKeen). About 3 acres of tomatoes was damaged in the Burlington district where the grower used aldrin, 1 pint in 45 gal. in the planting water with 3 lb. of 10-52-17 fertilizer (W.S. Carpenter). Artificial fertilizer applied in the greenhouse at Minto, N.B., burned the plants; when transplanted to the field, crop was delayed but recovered (S.R. Colpitts).

CAT-FACE (nonparasitic) was sev. on fruits of the first picking on Ile Jesus, Que. (E. Lavallee).

DROWNING. Some 25 acres of tomatoes in 2 fields on heavy clay soil n. of Harrow, Ont., were drowned out following a heavy rain of over 3 in. around 10 Aug.; many other cases were also reported from Essex and Kent counties (R.W. Walsh).

FROST INJURY. Temperatures as low as 28°F. ruined about half of the early plantings in the Toronto-Hamilton area, Ont.; about 80% were replaced (W.S. Carpenter).

TURNIP

SOFT ROT (Erwinia carotovora). Various samples of Ont.-grown waxed swedes submitted 14 March showed pockets of rot under the wax; E. carotovora and secondary saprophytes were isolated. Samples of waxed swedes from Tavistock received 9 Nov. exhibited rot; again E. carotovora was isolated (J.A. Carpenter). Mature Laurentian roots were observed infected in the field at several points in Ont.; about 2 acres in a field in Huron Co. was a total loss (J.K. Richardson). Soft rot was observed in 2 fields of Laurentian in Queens Co., P.E.I.; in one where 1% of the roots were decayed, entry was through growth cracks (R.R. Hurst). Soft rot sev. affected 2 carloads of swedes in 2 warehouses at St. John's and one at Clarkes Beach, Nfld. (G.C. Morgan).

BLACK LEG (Phoma lingam). Diseased specimens of swede turnip from Abitibi Co., Que., were received from E. Lavallee; the pathogen was isolated (A.T. Bolton). This fungus caused a very destructive rot in a lot of Laurentian swedes in storage in Queens Co., P.E.I. (R.R. Hurst).

CLUB ROOT (Plasmodiophora brassicae). Diseased specimens were received from Laurierville, St. Nicolas, Neuville and Rouyn, Que. (D. Leblond), and St. Edividge (L. Cinq-Mars). Club root was unusually sev. in swedes in the Pownal and Vernon districts, P.E.I. in 1956. Conditions were favorable for infection in June and early July. A 2-acre field at Pownal was completely

destroyed (G.W. Ayers). Infection was sev. in many garden crops in Conception and Trinity Bays, Nfld., and sl.-mod. in 13 commercial plantings mostly on the West Coast (G.C. Morgan).

SCAB (Streptomyces scabies). An affected swede root was received from Creston, B.C. (G.E. Woolliams). A sl.-mod. infection of scab developed on Laurentian swedes in experimental plots that had been limed to induce brown heart, at Charlottetown, P.E.I. Quicklime was broadcast on the soil at the rate of 1000 lb. per acre (J.E. Campbell).

BLACK ROT (Xanthomonas campestris). Foliage infection, sometimes rather sev. was present in most fields visited in Ont., probably because of weather conditions being favorable for its spread. However, at harvest time it was difficult to find any vascular blackening in the roots. In the dry season of 1955, root symptoms were easy to find (J.K. Richardson). Samples of waxed swedes from Simcoe Co., examined 14 March showed pockets of decay; X. campestris and numerous secondary saprophytes were isolated (J.A. Carpenter). Black rot was observed in 3 fields at Lethbridge, Nfld., destroying 25% of the crop. The crop of one field put in storage, showed 50% of the roots infected in November (G.C. Morgan).

BROWN HEART (boron deficiency) was found affecting a swede root received from Creston, B.C. (G.E. Woolliams). Affected roots were seen in the local market in Quebec City and were received from Pierreville and from St. Laurent, Isle Orleans (D. Leblond).

Brown heart affected 75% of the roots of Laurentian in a plot on sandy soil at Ste Anne de la Pocatiere (R.O. Lachance). Brown heart was sev. in Laurentian grown in plots that received lime at the rate of 1000 lb. per acre and it was mod. in the plots receiving no lime. Soil applications of borate-fertilizer and boron dust applications to the foliage effectively controlled brown heart on both the limed and unlimed soils (J.E. Campbell). Brown heart affected about 5% of the Laurentian roots in the 5 fields inspected in e. Nfld. (G.C. Morgan).

CHEMICAL INJURY Drift from a grain field sprayed to control weeds caused sev. injury to an adjacent 3-acre field of Laurentian swedes at Brackley, P.E.I. (J.E. Campbell).

WATERMELON

ANTHRACNOSE (Colletotrichum lagenarium). A sl. infection was noted on the fruit in a planting at Altona, Man. (J.E. Machacek). Sl.-mod. infection was observed on muskmelon and watermelon in the College plots, Guelph, Ont.; this is the first time a natural infection has been observed in these plots (L.V. Busch).