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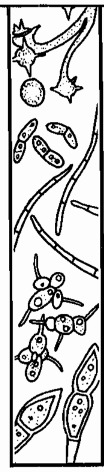
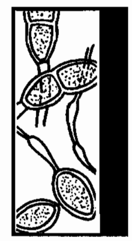


CANADIAN PLANT DISEASE SURVEY



EDITOR: D.W. CREELMAN

RESEARCH BRANCH CANADA DEPARTMENT OF AGRICULTURE

VOL.45, No.4, DECEMBER, 1965

CANADIAN PLANT DISEASE SURVEY

RESEARCH BRANCH CANADA DEPARTMENT OF AGRICULTURE

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"The Canadian Plant Disease Survey is a periodical of information and record on the occurrence and severity of plant diseases in Canada. It will also accept other original information such as the development of methods of investigation and control, including the evaluation of new materials. Review papers and compilations of practical value to phytopathologists will be included from time to time. It will not accept results of original research suitable for publication in more formal scientific journals".

BACTERIOSES OF STONE FRUITS IN NOVA SCOTIA[1]

C.O.Gourley[2]

Abstract

This is the first report of the isolation of Pseudomonas mors-prunorum Wormald from stone fruits in North America. It was found causing a serious shoot wilt, cankering and death of young trees in a sweet cherry orchard in Nova Scotia. Pseudomonas syringae van Hall, a closely related bacterium, was identified as the cause of an infection on sour cherry foliage.

Introduction

Bacterial canker is the most serious disease of stone fruits in many parts of the world. Pseudomonas mors-prunorum Wormald is considered to be the cause of bacterial canker of stone fruits in England (1, 8, 9, 10). The ubiquitous bacterial plant pathogen Pseudomonas syringae van Hall infects a wide range of host plants and has been the accepted cause of bacterial canker of stone fruits in North America (4, 5, 7).

In June, 1964, a wilt and canker of sweet cherry, Prunus avium L., was noticed for the first time at Kentville, Kings County, Nova Scotia. It was most noticeable during late May and early June and was more prevalent in the same orchard in 1965 than in 1964. In 1965 this disease was found in another orchard of young, non-bearing sweet cherry trees in Kings County.

The disease was first noticed as a wilting of the foliage on a branch. As the disease progressed main limbs and occasionally entire trees would wilt. The wilt was soon followed by death of the affected part. Closer examination showed the presence of girdling cankers. The gummy excretion which generally exudes from injuries and infections of the wood of stone fruits was not observed to occur with these cankers. Isolations made from the margins of cankers consistently yielded a pseudomonad-like bacterium. The symptoms and progression of wilt and canker on sweet cherry in Nova Scotia appeared to be similar to those described for bacterial canker, caused by Ps. mors-prunorum, of sweet cherry in Britain (3, 9).

During a survey for the presence of this bacterial disease on stone fruits in the Annapolis Valley, Nova Scotia, a pseudomonad-like bacterium was isolated from infections on the foliage of sweet cherry, sour cherry, P. cerasus L., peach, P. persica L., and the common and Japanese plums, P. domestica L., and P. salicina Lindl.

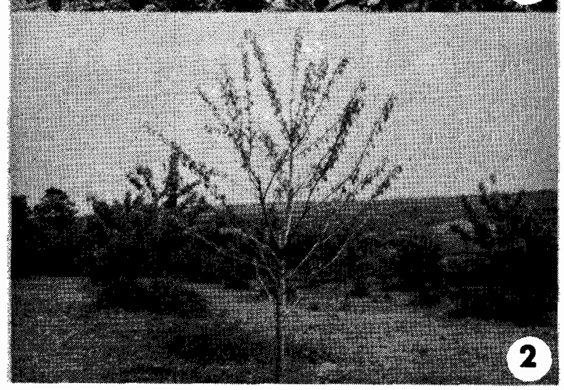

Fig. 1 Limb on sweet cherry tree girdled by canker

Fig. 2 Trunk of sweet cherry tree girdled by canker

Wilt and canker symptoms

The most obvious symptom was the wilting of the foliage of branches, limbs and entire trees. The wilt on branches and limbs was the result of a proximal positioned, girdling canker. When an entire tree wilted cankers were found to have girdled the trunk or crotch area. Cankers on branches and limbs often exceeded 30 cm in length and became somewhat sunken and more definite in outline as the season progressed. Buds above the visible cankered area of a branch appeared to have swelled and then withered. Beneath the outer bark tissue the centers of the cankers were brown; while water soaked and dark streaked areas appeared beyond their margins. Isolations made from the areas beyond and near the margins of cankers yielded only a pseudomonad-type bacterium.

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1 Contribution No. 1219 from the Research Station, Canada Department of Agriculture, Kentville, Nova Scotia

2 Plant Pathologist, Research Station, Canada Department of Agriculture, Kentville, Nova Scotia

Discussion

The bacterium isolated from cankers on sweet cherry was tentatively identified as Pseudomonas mors-prunorum. Because this species of bacterium had never been reported from North America, confirmation of identification was sought from three different sources.

Dr. J. W. Rouatt, Head, Ecology Section, Microbiology Research Institute, Canada Department of Agriculture, Ottawa, reported that a June, 1964, isolate belonged to the genus Pseudomonas and, except for some slight differences, very closely resembled the species Ps. mors-prunorum*. Dr. Eve Billing, Department of Microbiology, The University, Reading, England, conducted tests on a culture of the bacterium isolated in 1965 and found that the bacterium very closely resembled United Kingdom isolates of Ps. mors-prunorum*. Tests carried out at East Malling Research Station, England, by Dr. J. E. Crosse and Miss Constance M. E. Garrett confirmed that the bacterium isolated in 1965 was Ps. mors-prunorum*.

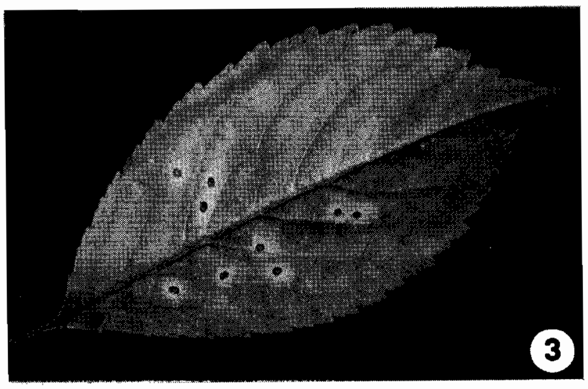

Fig.3 Sour cherry leaf infected by Pseudonomas syringae

An isolate obtained from a bacterial infection of sour cherry leaves, collected adjacent to trees where Ps. mors - prunorum was found, was identified by Crosse and Garrett as Ps. syringae. According to Garrett this Nova Scotia isolate conformed with her isolates of Ps. syringae in its reaction on media, but was insensitive to all of her phages for that species*. This is not surprising because of the evidence in the literature pertaining to the variation in isolates of Ps. syringae and the intermediate forms that exist between it and the biochemically distinct Ps. mors-prunorum (2).

Except for Ps. mors-prunorum, bacterial cankering organisms are not considered new to Nova Scotia. During the survey of stone fruits in the Annapolis Valley, the bacterial spot organism, Xanthomonas pruni (Smith) Dowson, occasionally appeared in culture plates when isolations were made from the foliage and branch cankers of peach and plum. This bacterium causes a yearly, sporadic infection on the foliage and fruit of these two hosts. The pseudomonad-type bacteria isolated from the foliage of the stone fruits included in the survey were probably Ps. syringae since it was isolated from sour cherry leaves. Although reported as a pathogen of lilac, Syringa sp., and the cultivated smoke bush, Rhus cotinus L. in Nova Scotia (6), Ps. syringae has never been found causing pear blight on Pyrus communis L. in the province.

As far as the author is aware Ps. syringae has not been heretofore reported as a pathogen of stone fruits in Nova Scotia. Ps. mors-prunorum is reproted as the cause of bacterial canker of sweet cherry in Nova Scotia and this is the first authenticated report of the disease in North America. The establishment of this bacterial pathogen poses a further threat to the stone fruit industry on this continent.

* Private communication

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SCREENING OF POTATO FUNGICIDES IN 1965[1]

L.C.Callbeck[2]

Introduction

Weather conditions over Prince Edward Island in 1965 were so contrary to those required by the late blight fungus that no disease was observed. It was, therefore, an unusual season, being the first in 30 years that late blight disease was unrecorded. Our weather and disease records, which have been maintained since 1922, show that in the past 44 years late blight was not observed in only 5 years, 1922, 1923, 1930, 1935, 1965. There were 13 years in which trace to very light epidemics were recorded and 3 of these occurred in the present decade, 1960, 1961, and 1964. In 26 of the years late blight was regarded as severe to extremely severe.

Materials and methods

Twelve fungicides for use against late blight of potatoes, Phytophthora infestans (Mont.) de Bary, were included in the 1965 Screening Test at Charlottetown, P. E. I. These products were as briefly outlined below.

1. Brestan 60. American Hoechst Corporation, California. A combination of triphenyltin acetate and maneb. 6 oz/80 gal.

2. Daconil 2787. Diamond Alkali Company, Painsville, Ohio. Tetrachloroisophthalonitrile. 1.0 lb./80 gal.

3. Dithane M-45. Rohm and Haas Company of Canada Limited, West Hill, Ontario. Zinc coordinated manganese ethylenebisdithiocarbamate. Mn, 16%; Zn, 2%. 1.0 lb./80 gal.

4. Duter. Philips-Duphar, Amsterdam, Holland. Triphenyltin hydroxide (20%). 0.75 lb./80 gal.

5. Difolatan 80W. California Chemical (Canada) Limited, Oakville, Ontario. N-(1,1,2,2, - tetrachloroethylsulfenyl) - cis - Δ - cyclohexene-1,2-dicarboximide. 1.0 lb./80 gal.

6. F-300. Green Cross Products, Montreal. A confidential product. 1.0 lb./80 gal.

7. Hortocritt. S.I.A.P.A., Rome, Italy. Ethylene thiuram monosulfide. 2.5 lb./80 gal.

8. Manzate D. DuPont of Canada Limited, Montreal. Maneb powder containing zinc sulphate in physical mix. 1.0 lb./80 gal.

9. Organil 66. Procida, Neuilly sur Seine, France. A confidential product. 1.0 lb./80 gal.

10. Polyram 80W. Niagara Brand Chemicals, Burlington, Ontario. Designated as "milled". Zinc activated polyethylene thiuram disulfide. 1.0 lb./80 gal.

11. Polyram 80W. As above but designated "retentive".

12. RH-90. Rohm and Haas Company of Canada Limited, West Hill, Ontario. A confidential product. 1.6 lb./80 gal.

Table 1. Effect of treatments on yield

Treatment	Total bu./ac.	Smalls bu./ac.	No. 1 bu./ac.
Organil 66	413.6	24.2	389.4
RH-90	412.0	25.3	386.7
Manzate D	405.9	27.5	378.4
Check	398.2	20.9	377.3
Hortocritt	396.0	25.3	370.7
Dithane M-45	393.8	26.4	367.4
Daconil 2787	387.2	25.8	361.4
Difolatan	383.4	22.0	361.4
Polyram (Milled)	386.1	25.3	360.8
Polyram (Retentive)	383.5	24.8	358.6
Duter	370.7	24.2	346.5
F-300	365.2	25.3	339.9
Brestan 60	331.0	26.8	304.2

1 Contribution No. 149, Experimental Farm, Research Branch, Canada Department of Agriculture, Charlottetown, Prince Edward Island.

2 Plant Pathologist

The plots, using the blight-susceptible cultivar 'Green Mountain', were planted on June 9, exactly 50 seed pieces being dropped in each 50-foot row. Each plot was 4 rows wide by 50 feet long and 13 plots, one for each chemical and an unsprayed control, were set out in each of four ranges. Single rows of potatoes were planted as buffers between plots and as borders for the area. These rows were not sprayed.

No insecticides were included in the spray mixtures, insects being controled by spraying all rows with Thiodan at appropriate times. The fungicides were applied on July 16, 26, August 5, 13, 24, September 2, 10; the mean interval was 9.3 days; by means of a tractor-sprayer unit which delivered approximately 120 gallons of liquid per acre at a constant pressure of 375 pounds per square inch. The boom carried 4 nozzles per potato row, 2 being above the plants and 2 on drop pipes.

Results and discussion

The season of 1965 was very dry, only 5.77 inches of rain being recorded on the plot areas for the July-September period. Of this amount, 1.07 inches fell after September 17, the day on which the plants were killed by spraying them with sodium arsenite. In addition, periods in which the relative humidity rose to 90 percent or higher were few and those that occurred were of such short duration as to be ineffectual in stimulating the fungus. Because of these unusual conditions, it was not possible to evaluate the fungicides on their relative efficiencies in the control of late blight of potato.

The yield date are presented in Table 1 in which the fungicides are placed in descending order according to the volumes of No. 1 tubers. Here it may be observed that yield differences are not significant and that the check or control falls in fourth place, a position that may have been attained, at least in part, by the fact that little or no wheel damage was inflicted on the unsprayed plots. The lower yield for the plots treated with Brestan 60 is probably a reflection of the phytotoxicity of this product. In 1961, a product designated as OSN-539, which, like Brestan 60, contained triphenyltin acetate, gave a similar bronzing of the foliage and plots treated with it produced the lowest yield. On the other hand, no phytotoxicity or yield depression have been observed for fungicides containing triphenyltin hydroxide.

THE OAT CYST NEMATODE, HETERODERA AVENAE WOLLENWEBER, ON CORN, ZEA MAYS, IN ONTARIO

S.G.Fushtey[1]

Abstract

Observations on field material and results of laboratory experiments are presented to establish the fact that Heterodera avenae Wollenweber invades roots of corn plants and is capable of causing appreciable damage to this crop in the province of Ontario.

Introduction

A report by Putnam and Chapman (4) constitutes the earliest record of the oat cyst nematode in North America. Since that time this nematode has frequently been observed causing serious injury to oat crops in parts of central and southwestern Ontario. Baker and Chapman (1) described the distribution of this nematode as the central part of the southern areas, ranging between the cities of Waterloo and Peterborough. Laughland (3) listed 16 counties in this general area in which oat nematode damage on grain had been observed. These reports described the nematode as attacking oats, barley and wheat, in that order of preference, but with serious damage occurring in oats only.

Studies on the oat cyst nematode were resumed at the Ontario Agricultural College in 1962 when facilities for research and instruction in plant nematology were established in the Department of Botany. Through the cooperation of the agricultural representatives for York and Ontario counties the author was able to assess the importance of this parasite by observing the extensive damage to oat crops in several parts of these two counties. Of particular significance to the present report is a comment that was made by Mr. H. L. Fair, Agricultural Representative for Ontario county, during a survey of some affected oat fields in the spring of 1963. Mr. Fair stated that he had observed corn crops, planted after oats which had been severely damaged by the oat cyst nematode, to be unthrifty and growth particularly retarded in roughly the same areas of the fields in which damage to oats had been most severe the previous year. Thus, he suspected that corn was being attacked by the nematode but he could not find support for this theory because corn was not listed as one of the hosts for Heterodera avenae.

[1] Associate Professor of Botany and Plant Pathology, University of Guelph, Guelph, Ontario.

Field observations

In early August, 1965, a sample of unthrifty corn plants was received from a farmer near Bowmanville. The primary root systems of these plants were stunted and stubby in appearance although healthy-looking adventitious roots were beginning to develop in abundance. When representative samples of these root systems were processed and examined microscopically the primary root and some of the secondary roots were found to contain numerous larvae of Heterodera in various stages of development. No nematodes could be found in any of the adventitious roots. Analysis of the soil received with the plants yielded an average of 54 cysts of H. avenae per 100 gm of soil, a relatively high level of infestation.

The field from which these plants had been taken was visited in mid-August and was found to resemble the condition which would be expected in an oat field heavily infested with H. avenae. The corn plants were stunted in irregular patches ranging from a few feet to 10 yards or more in diameter. Affected plants were only 2 to 3 feet tall and showed no signs of flower development whereas healthy plants in the same field were at least 6 feet tall with tassels fully formed. A second corn field with similar symptoms was located a few miles distant. Laboratory analysis of root and soil samples taken from this second field yielded results similar to those from the original field.

These fields were revisited 2 weeks later and it was surprising to note that the affected areas were difficult to recognize from a distance because the height of the corn plants in the affected areas was nearly equal to that of the healthy plants. Closer examination showed that the affected plants were thinner than healthy plants and were just beginning to tassel whereas the healthy plants had already been in full tassel for 2 weeks. Thus, development of corn plants in affected areas was retarded by an estimated period of 3 weeks.

Discussion and conclusions

The observations described provide strong evidence that H. avenae attacks corn and is capable of causing appreciable damage to a corn crop. This field evidence is confirmed by the recent work of Johnson (2) who, in controlled laboratory infection experiments during 1964-65, demonstrated that H. avenae, hatched from cysts produced on oat roots, freely invaded roots of corn plants and developed within them.

Swarup, Prasad and Raski (5) reported that in India, "numerous cysts of H. avenae and white females were observed on the roots of some maize plants" and when these cysts were used to inoculate maize seedlings a full life cycle was completed within 2 months. Present observations confirm their view that maize is a new host for H. avenae but differ in the details which lead to this conclusion. Thorough examination of infected corn roots taken from the field and of roots from Johnson's artificially inoculated corn plants failed to reveal any mature cysts or white females developing on the surface of the roots. Johnson observed mature males and mature-looking females within the root tissue but the females showed no signs of emerging from the tissue and there was no egg formation within their bodies even after 10 weeks' development. In oat roots the enlarged females show egg formation and begin to emerge to the surface of the root in 5 to 6 weeks from the time of original entry into the root.

This study is being continued to determine whether or not H. avenae will actually reproduce on corn or whether it is a terminal host as is Tagetes for species of Pratylenchus.

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EFFECT OF FUNGICIDE FIELD SPRAYS ON POSTHARVEST FRUIT ROT OF RASPBERRIES

Jack A. Freeman[2]

Abstract

Sixty-four to 93% rot developed in raspberries 40 to 60 hours after harvest, even though the incidence of fruit rot in the field was 1% or less. Field sprays of captan $1\frac{1}{2}$ lb/acre were most effective in increasing the holding quality of the fruit. DAC 2787 used at the same dosage was considerably less effective, while sprays of dichloran 1 lb/acre were ineffective. Neither marketable yield nor fruit size was affected by treatment. The results suggest that even in a season of low rot incidence a minimum of at least 2 sprays of captan should be applied: first, when blossoms open, and again 10 days later. In a wet year a more extensive schedule may be justified.

Introduction

In raspberry plantings in coastal British Columbia, Botrytis cinerea Pers. frequently causes loss of fruit by rotting and reduces quality by general softening and discoloration of the druplets. Once raspberries are picked they are extremely perishable because of the rapid development of postharvest rots. Jarvis (2) reported that mycelium infecting floral parts may subsequently invade the proximal end of both strawberry and raspberry receptacles. This mycelium may remain quiescent until the fruit ripens; consequently infected fruit may escape notice during picking and marketing. In the field, Botrytis is not as prevalent on raspberries as it is on strawberries. This, apparently, is because the fruits of raspberries are borne singly or in small open clusters and not close to or on the ground. Thus, growers are often reluctant, especially in dry seasons, to apply fungicide sprays to raspberries. The author, in a previous study with strawberries (1), found that a spray schedule consisting of four sprays of captan, folpet or thiram at approximately 10-day intervals beginning at first bloom gave effective control of fruit rot in the field. The holding quality of the fruit was improved by the field sprays. There has been no local investigation on the control of this fungus in raspberries. Thus, an experiment was conducted in 1965 to obtain information on the effectiveness of various spray schedules with captan, DAC 2787 and dichloran for the control of field and postharvest fruit rot of raspberries.

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Methods

A mature commercial 7-year-old planting of 'Puyallup' raspberries located on a Lynden silt loam at Abbotsford, British Columbia, was used in this trial. The experiment was laid out in a randomized block design with six replications. Each plot consisted of a single 25-foot row. Because the 1965 season was unusually dry, the planting was sprinkler-irrigated on July 12 and July 27. The treatments and spray schedules were applied as outlined in Table 1.

Control of preharvest infection was determined by weighing all infected berries from each plot at each picking. The crop was picked 9 times between July 12 and August 10. In addition to weighing the infected fruit, the weights of marketable and cull fruit were also recorded. The size index of sound berries from each plot was determined at each picking. The effect of treatment on postharvest fruit rot was determined from a random sample of at least two pounds of sound berries picked on July 15, 23, 29, and August 5 from each plot in each replicate. The berries were transported in shipping crates to Agassiz, 40 miles distant, and were placed in common storage. The percentage of sound berries was determined 40 and 60 hours after harvest.

Results and discussion

The incidence of fruit rot in the field was 1% or less, apparently due to the unusually dry season. Neither marketable yield nor fruit size was affected by treatment. The data on fruit size was not in accord with the recent findings with strawberries. The author (1), working with 'Siletz' strawberries, found that the trend was for fruit to be larger from plots treated with captan, folpet or thiram. Powell (3) reported that strawberry plants had benefited nutritionally from captan and that fruit size was increased.

Table 1. Fungicides and field spray schedules tested for control of raspberry fruit rot - 1965

Treatment lb a.i./acre (in 100 gal water)	When applied	Dates of application
Captan $1\frac{1}{2}$	Before flower buds opened through picking (8 sprays)	May 28; June 7, 14, 22, 30; July 12, 22, 29.
Captan $1\frac{1}{2}$	When blossoms opened through picking (7 sprays)	June 7, 14, 22, 30; July 12, 22, 29.
Captan $1\frac{1}{2}$	Before flower buds opened to picking (6 sprays)	May 28; June 7, 14, 22, 30; July 12.
Captan $1\frac{1}{2}$	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Dichloran* $1\frac{1}{2}$ + captan $1\frac{1}{2}$	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Captan $1\frac{1}{2}$	Before flower buds opened, repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 7, 17.
Captan $1\frac{1}{2}$	When blossoms opened and repeated once 10 days later (2 sprays)	June 7, 17.
DAC 2787** $1\frac{1}{2}$	When blossoms opened to picking (5 sprays)	June 8, 14, 22, 30; July 12.
DAC 2787 $1\frac{1}{2}$	Before flower buds opened, repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 8, 17.
DAC 2787 $1\frac{1}{2}$	When blossoms opened and repeated once 10 days later (2 sprays)	June 9, 17.
Dichloran $\frac{1}{2}$ + captan $\frac{3}{4}$	When blossoms opened and repeated once 10 days later (2 sprays)	June 7, 17.
Dichloran 1	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Dichloran 1	Before flower buds opened repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 7, 17.
Dichloran 1	When blossoms opened repeated once 10 days later (2 sprays)	June 7, 17.
Unsprayed control.		

* Dichloran (Botran) = 2,6-dichloro-4-nitroanile.

** DAC 2787 = tetrachloroisophthalonitrile

Table 2. Effect of field fungicide treatments on the holding quality of raspberries 40 and 60 hours after harvest - 1965

Treatment lb a.i./A with times sprayed	Percent sound fruit after 40 hours: Picking dates Jul 15	Jul 23	Jul 29	Aug 5	Mean	Percent sound fruit after 60 hours: Picking dates Jul 15	Jul 23	Jul 29	Aug 5	Mean
Captan 1½ (8x)	86.5*	74.2	45.3	76.2	70.6 a	70.6	20.9	5.4	56.3	38.3 ab
Captan 1½ (7x)	88.9	83.1	40.8	72.7	71.4 a	73.3	42.7	11.1	43.7	42.7 a
Captan 1½ (6x)	87.6	68.6	34.1	67.4	64.4 abc	73.8	24.2	7.6	29.3	33.7 ab
Captan 1½ (5x)	89.2	71.8	38.9	68.7	67.2 a	74.1	26.5	4.6	27.6	33.2 ab
Dichloran 1 + captan 1½ (5x)	82.9	65.3	37.6	76.8	65.7 ab	69.1	38.6	5.3	30.1	35.8 ab
Captan 1½ (3x)	91.8	72.6	29.7	53.9	62.0 abc	63.7	31.5	2.0	20.1	29.3 abc
Captan 1½ (2x)	89.6	73.1	35.7	46.5	61.2 abc	72.6	24.4	14.4	15.0	31.6 abc
Dichloran ½ + captan ¾ (2x)	85.9	65.6	29.0	46.5	56.8 bcd	41.7	14.2	3.9	14.7	18.6 bcd
DAC 2787 1½ (5x)	78.1	64.9	27.4	50.6	55.3 cd	50.4	30.3	9.6	26.9	29.3 abc
DAC 2787 1½ (3x)	79.3	46.1	26.4	39.2	47.8 de	50.0	13.9	2.9	10.0	19.2 bcd
DAC 2787 1½ (2x)	78.7	76.4	24.3	38.9	54.6 cd	51.3	15.6	9.2	17.5	23.4 abcd
Dichloran 1 (5x)	63.8	55.2	15.9	32.8	41.9 ef	28.1	11.0	1.1	9.8	12.5 cd
Dichloran 1 (3x)	65.8	39.2	12.0	28.8	36.5 f	10.3	5.3	1.5	7.4	6.1 d
Dichloran 1 (2x)	70.0	50.4	20.5	19.9	40.2 ef	16.7	4.4	1.6	3.1	6.5 d
Unsprayed	65.1	31.2	23.2	26.8	36.6 f	13.9	6.1	2.0	6.3	7.1 d
Mean	80.2	62.5	29.4	49.7	55.5	50.6	20.6	5.5	21.2	24.5
S.E. Mean					3.15					6.05

* Mean of 6 replications.

Means not followed by the same letter are significantly different at the 5% level (Duncan's Multiple Range Test).

Table 3. Effect of mean air temperatures on the percentage sound fruit of raspberries 40 and 60 hours after harvest.

	Picking and Storage Periods			
Temperatures	July 15-18	July 23-26	July 29-Aug 1	Aug 5-8
	Degrees F.			
Mean Max.	75.0	86.5	94.8	79.8
Mean Min.	52.0	54.0	61.7	55.7
Mean	63.5	70.3	78.3	67.8
	Percent sound fruit			
Postharvest Period				
40 hours	80.2*	62.5	29.4	49.7
60 hours	50.6	20.6	5.5	21.2

* Mean of 15 treatments x 6 replications = 90 samples.

The data on postharvest control of fruit rot show that captan was the most effective of the field sprays tested, while DAC 2787 was intermediate and dichloran was ineffective (Table 2). Captan gave very effective protection against spoilage in the first 40 hours after harvest. With the July 15 picking approximately 70% of the captan-treated berries were still sound after 60 hours. The efficacy of captan on the July 29 picking was considerably poorer than with the other pickings. In fact, the amount of spoilage was extremely high for this entire picking. The holding quality of the raspberries appeared to be directly correlated with the air temperature during picking and storage (Table 3). The July 29 picking occurred during a particularly hot period with temperatures rising to 97°F. However, even under such adverse conditions the beneficial effect of captan was still evident 40 hours after harvest with up to 45.3% sound berries as compared to 23.2% for the unsprayed fruit. After 60 hours very few sound berries remained, regardless of treatment.

On the basis of this experiment, even in a season of low rot incidence, a minimum of at least 2 sprays of captan $1\frac{1}{2}$ lb/acre should be applied: first, when blossoms open, and again 10 days later. There was a tendency for the percentage of sound fruit to increase with the number of captan applications. In a wet year a more extensive schedule may be justified. This will warrant further study.

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DISEASES OF RAPE AND CRUCIFEROUS WEEDS IN SASKATCHEWAN IN 1965

G. Allan Petrie[1] and T.C. Vanterpool[2]

Introduction

In 1965 approximately 555,000 acres were sown to rape in Saskatchewan, with an average yield of 20.5 bushels per acre now anticipated. Most of the major diseases were more prevalent than in 1964 both on rape and cruciferous weeds throughout the east-central and northern rape-growing areas.

Precipitation throughout the 1965 growing season was plentiful in the Prairie Provinces (2). May was generally wet and June extremely so. On June 12, a six-inch rainfall was recorded at Loon Lake in northwestern Saskatchewan. For the month as a whole, precipitation was about double the normal. Rainfall in most areas remained above normal in July, decreasing in August. In September, however, thunderstorms and hail were unusually prevalent and again some areas received more than twice the normal rainfall. In much of May, the latter part of August, and most of September subnormal temperatures prevailed. Record lows were recorded at many points in September.

Materials and methods

In the main surveys, made in late August and early September, a total of forty fields were visited in the Humboldt-Melfort-Nipawin and North Battleford - Meadow Lake - Turtleford areas and ratings made of the diseases present. Both the prevalence in the field and general severity of the diseases were included in the assessment in each case. Several more restricted surveys were also made throughout the year, mainly centered in the Annaheim - Lake Lenore area in connection with Plenodomus (Phoma) lingam (Tode ex Fr.) Höhn. (1) and Mycosphaerella brassicicola (Duby) Lind.

Isolations were made on V-8 juice and potato dextrose agars and pathogenicity tests conducted in Petri dishes containing sterile water-moistened filter paper or test tubes containing filter paper platforms and 20 ml of Hoagland's nutrient solution. Inoculations were made by placing a uniform mycelial disc next to sterile day-old seedlings. The amount of disease was recorded at one week for plates and two weeks for tubes.

Results and discussion

The ratings for the major diseases encountered in the principal late-season surveys are presented in Table 1. Alternaria stem and pod spots were surprisingly inconspicuous this year. An early build-up of inoculum apparently did not occur as a result of the heavy rains. Peronospora parasitica (Pers. ex Fr.) Fr. as part of the white rust-downy mildew disease complex, was strikingly severe in a few fields near Melfort and Nipawin, perhaps due to timeliness of rainfall. Bleached tops of rape plants suffering from sclerotinia stem rot were conspicuously scattered throughout many fields in these same areas. Peronospora, Sclerotinia and Albugo cruciferarum S. F. Gray were observed much more frequently in the northeastern region than around Glaslyn, St. Walburg and Meadow Lake. Aster yellows virus infections were more uniformly distributed. Diseased plants were noticeably taller and of a darker green color than the ripening healthy plants. Mycosphaerella brassicicola was present in over 80% of the fields in the Meadow Lake area.

The principal rape diseases were also collected on a number of hosts other than rape during 1965. Sclerotinia sclerotiorum (Lib.) de Bary was isolated from mustard (Brassica hirta Moench), stinkweed (Thlaspi arvense L.), sow thistle (Sonchus sp.) and garden beans (Phaseolus vulgaris L.). All these cultures were highly pathogenic to rape. Albugo cruciferarum (conidial stage) was obtained on Thlaspi arvense, Lepidium sp. and Rorippa sp., Mycosphaerella brassicicola on Capsella bursa-pastoris (L.) Medic. and aster yellows on Thlaspi arvense.

Rape seedlings suffering moderate to severe damping-off were obtained from a field near North Battleford and one at Melfort in June. Pellicularia praticola (Kotila) Flentje was largely responsible.

Damage due to 2,4-D drift was observed in at least six fields. Severe basal swellings were found on plants in three fields north of Meadow Lake. Spray drift was also confirmed as the cause of damage in a field near Birch Hills.

An interesting new record is the occurrence of Colletotrichum dematium (Pers. ex Fr.) Grove on Lepidium sp. and Descurainia sp. collected at Saskatoon. The isolates produced lunate spores and were moderately pathogenic to rape in laboratory tests. The organism has not yet, however, been isolated from naturally-infected rape plants.

Plenodomus (Phoma) lingam was first reported on rape in Canada by Vanterpool (3,4). The pathogen has subsequently been isolated from several cruciferous weeds from Saskatchewan and Alberta. It is definitely becoming more widespread in the east-central rape-growing area of Saskatchewan and is considered to be a potentially important pathogen on rape in the province. Approximately 60 separate isolations of P. lingam have been made from crucifers during the last three years, most of them in 1964 and 1965. Three main cultural types, the "rape", "Sisymbrium" and "Thlaspi" types, are recognizable, each being found primarily on its own particular host, but each having been isolated at least once from rape (Table 2). All three types are highly pathogenic to rape and several other crucifers tested, but Camelina sativa (L.) Crantz is highly resistant (Table 3). Evidence has been obtained which suggests that they represent different varieties or races of P. lingam. This and other data will be published at a later date. This is believed to be the first report of P. lingam on Thlaspi, Sisymbrium and Descurainia, at least in North America. The transmission of the "Thlaspi" type on seeds of T. arvense

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Table 1. Rape disease survey, 1965 (40 fields). Disease rating.

Disease organism	Trace	Slight	Moderate	Severe	% of total fields infected
Albugo cruciferarum	25.0*	25.0	10.0	5.0	65.0
Peronospora parasitica	2.5	2.5	0.0	5.0	10.0
Sclerotinia sclerotiorum	12.5	5.0	5.0	5.0	27.5
Mycosphaerella brassicicola	10.0	12.5	35.0	7.5	65.0
Aster yellows (callistephus virus 1)	22.5	5.0	2.5	0.0	30.0
Plenodomus lingam "Thlaspi" type**	22.5	0.0	0.0	0.0	22.5
Plenodomus lingam "rape" type	5.0	0.0	0.0	0.0	5.0

* Figures in each category are % of fields sampled.
** Collected on T. arvense in rape fields.

Table 2. Plenodomus lingam, 1963-65 surveys. Numbers of collections on cruciferous hosts.

Type	Rape*	Mustard (B. hirta)	Sisymbrium altissimum	Sisymbrium loeselii	Thlaspi arvense	Descurainia sp.
"Rape"	20	1	0	0	0	0
"Sisymbrium"	1	0	2	2	0	0
"Thlaspi"	1	0	0	0	28	1

* Brassica napus and B. campestris

Table 3. Disease ratings of Plenodomus lingam isolates on 'Nugget' rape (Brassica napus) and Camelina sativa, in test tube pathogenicity tests.

Cultural type	Rating (0 - 5 scale) Brassica napus	Camelina sativa
"Rape"	4.7	1.3
"Sisymbrium"	4.4	0.7
"Thlaspi"	4.5	0.3

has been demonstrated on several occasions.

The "Thlaspi" type, as was found during the general survey, occurs throughout much of the province and in Alberta, while the "rape" type appears to be mostly restricted to the east-central region of Saskatchewan. Within this area, however, it has been found in approximately 60% of the fields examined in 1965, in contrast to less than 25% of the fields in the 1963-64 period. This year the "rape" type was found for the first time at Saskatoon in plots of zero erucic acid rape belonging to the Canada Agriculture Research Station. As in most other cases observed, the disease was well-scattered throughout the crop but developed late and apparently caused only slight damage to individual plants.

During the past few years the importance of weed hosts in harboring rape disease organisms has come to be fully appreciated. Weed control should go hand-in-hand with crop rotation in any rape disease control program.

Acknowledgement

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VEGETABLE DISEASES IN MUCK SOILS SOUTH OF MONTREAL IN 1965 AND THEIR RELATIONSHIP TO CLIMATE[1]

Thomas Simard[2] and René Crête[3]

Abstract

The relationship between low rainfall in June and late occurrence of foliage diseases was again observed in 1965. This is interpreted as the influence of early season rainfall on inoculum build up. The effect of climatic conditions on plant "disease potential" as defined by Grainger is also referred to.

Résumé

On a observé de nouveau en 1965 une relation entre la basse précipitation de juin et l'apparition tardive des maladies foliaires. Cette relation est expliquée par l'influence de la précipitation sur la multiplication de l'inoculum en début de saison. Il est également fait mention de l'effet des conditions climatiques sur la "réceptivité aux maladies" (disease potential) telle que définie par Grainger.

Introduction

This annual survey was initiated in 1959. Its main purpose is to follow the annual development of diseases occurring on the main vegetable crops grown in muck soils, viz., carrot, celery, lettuce, onion and potato. It also aims to relate the development of the more economically important foliage diseases to annual variations in climatic conditions, especially rainfall. The 1965 survey was carried out during August and early September by the general methods previously described (2). The results appear in Table 2. Diseases of crops of less importance are reported in the annual summary number of the Canadian Plant Disease Survey. Rainfall and temperature for the season along with the 28-year averages are summarized in Table 1.

Table 1. Total rainfall in inches and mean temperatures at Ste. Clotilde, Châteauguay, Québec.

	June		July	
	R	T	R	T
1965	0.78	63.8°	4.37	64.2°
28-year average	3.40	63.8°	3.54	67.8°
	August		September	
1965	6.00	64.8°	4.55	58.6°
28-year average	3.49	65.7°	3.27	57.1°

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General results

Table 2 shows that, in general, the same diseases previously reported were again observed in 1965. Some of them are of special interest. Bacterial blight of celery (Pseudomonas apii Jagger), observed since 1962 on muck soil, appears mainly on the varieties Utah 10-B and Utah 1611 in farmers' fields as well as in celery plots at the Ste. Clotilde station. On lettuce, a disease tentatively identified as marginal leaf blight (Pseudomonas marginalis (N. A. Brown) F. L. Stevens) was observed for the first time in the area. As expected from the low population of six-spotted leafhoppers, aster yellows did not develop to any extent on lettuce and other hosts. White rot of onion (Sclerotium cepivorum Berk.), first detected in the area in 1962 (3), was again observed this year in additional fields. It has not yet been possible to explain how soils became infested with the organism since onion sets are not planted in the district. Although weather conditions appeared to favor leaf blight of onion (Botrytis squamosa Walker), the disease did not develop to serious proportions. The same may apply to late blight of potato (Phytophthora infestans (Mont.) de Bary) and leaf blights of carrot (Alternaria dauci (Kühn) Groves and Skolko and Cercospora carotae (Pass.) Solh.). Detected for the first time in 1962 (3), downy mildew of radish (Peronospora parasitica (Pers. ex Fr.) Fr.) was again observed in 1965. This disease seems to be influenced by special environmental conditions and it develops only sporadically. No special effort was made to evaluate damage by the root-knot nematode (Meloidogyne hapla Chitwood). However, samples from a plot known to be heavily infested, at the Ste. Clotilde station, showed only slight damage to carrot, both in 1964 and 1965.

Relation between climate and disease development

In 1965, foliar diseases did not develop extensively and their intensity remained at a low level, in spite of the fact that rainfall in both July and August were above normal as shown in Table 1, whereas the June rainfall was much lower than the 28-year aver-

Table 2. Diseases in the muck soil area south of Montréal, Québec in 1965.

CROP	DISEASES	DISEASE INTENSITY
CARROT	Alternaria leaf blight (Alternaria dauci)	6-tr./13 fields
	Cercospora leaf blight (Cercospora carotae)	5-tr./13 fields
CELERY	Bacterial blight (Pseudomonas apii)	3-tr./10 fields
	In experimental plots at Ste. Clotilde: sl. on Utah 10-B and Utah 1611; tr. on Utah D-5 and Utah 5270	On Utah 1611 and Utah D-5
	Pink rot (Sclerotinia sclerotiorum)	3-tr./10 fields
	Manganese deficiency	2-tr./10 fields
	In experimental plots at Ste. Clotilde: mod. on Utah 10-B and Utah 1611	
	Common mosaic (Marmor umbelliferarum)	2-tr./10 fields
	Aster yellows (callistephus virus 1)	1-tr./10 fields
LETTUCE	Aster yellows (callistephus virus 1)	4-tr./6 fields
	Downy mildew (Bremia lactucae)	3-tr. 1-sl./6 fields
	Mosaic (Marmor lactucae)	2-tr./6 fields
	Drop (Sclerotinia sclerotiorum)	3-tr./6 fields
	Bottom rot (Rhizoctonia solani)	4-tr./6 fields
	? Marginal leaf blight (Pseudomonas marginalis)	2-tr./6 fields
ONION	Leaf fleck (Botrytis cinerea)	2-tr./24 fields
	Leaf blight (Botrytis squamosa)	8-tr. 2-sl./24 fields
	Mechanical leaf damages (wind, hail, etc.)	5-mod./24 fields
	White rot (Sclerotium cepivorum)	2-tr. 4-sl. 3-mod./30 fields
	Purple blotch (Alternaria porri)	1-tr. 2-sl./24 fields
	Pink root (Pyrenochaeta terrestris)	1-tr. 1-sl./24 fields
	Smut (Urocystis magica)	1-tr. 1-sl./25 fields
POTATO	Black leg (Erwinia atroseptica)	4-tr./16 fields
	Early blight (Alternaria solani)	8-tr. 1-sl./16 fields
	Late blight (Phytophthora infestans)	1-tr./16 fields
	In experimental plots at Ste. Clotilde: tr. on Irish Cobbler and G. Mountain	
	Verticillium wilt (Verticillium albo-atrum)	1-tr./16 fields
RADISH	Bacterial leaf spot (Xanthomonas vesicatoria var. raphani)	1-tr. 2-sl./7 fields
	Downy mildew (Peronospora parasitica)	1-tr. 3-sl./7 fields

age. These observations seem to support our hypothesis on the influence of June rainfall on the time of appearance and severity of foliage diseases. The late occurrence of diseases and their low intensity in 1965 may again be explained, as in the previous years, by June rainfall being below the long range average, resulting in a delayed build up of inoculum and lack of early primary disease foci (3, 4).

Another effect of low rainfall at the beginning of the season is reflected in plant growth. In 1965, subnormal rainfall in both May and June delayed emergence to a great extent and growth was further slowed by a July mean temperature lower than normal. Under these conditions, the disease potential or receptivity to disease as defined by Grainger (1) may have remained low until late in season. This is supported by the results of a first-year experiment on the evolution of the disease potential of five varieties of potato. These results showed that potatoes remained non-receptive to disease until late in August. This may explain why only traces of late blight were detected while an epidemic was expected under the rainy conditions that prevailed late in the season based on the criteria of the two forecasting methods used. The same explanation may also apply to onion leaf blight (B. squamosa) of which only traces were observed even in unsprayed plots following periods of apparently favorable weather conditions.

The results of the 1965 survey also seem to indicate that the development of white rot of onion and downy mildew of radish appear to be dependent on restricted weather conditions. Both diseases develop sporadically and were observed only in 1962 and 1965, both years similarly characterized, in July, by higher rainfall and lower mean temperature than the 28-year average.

Conclusions

It is obvious that the complex relationships between plant diseases and climatic conditions cannot be elucidated by field surveys alone. However, it is felt that annual observations of this type may help research workers in the planning of their experiments as well as extension men in their recommendations for disease control.

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CEREAL DISEASES IN CENTRAL ALBERTA IN 1965

L.J.Piening[1]

General remarks

The spring and early summer of 1965 in central Alberta was cool and wet, which probably facilitated the infection of cereal plants by fungal and bacterial plant pathogens. The weather was warmer in mid-July and encouraged the development of abundant vegetative growth providing ample infection courts and favorable microclimates for considerable disease development.

Disease surveys were conducted the last week of July and the first week of August. Barley, oats, wheat, and rye were examined in fields west of Lacombe to Rocky Mountain House, from Lacombe east to Coronation and north to Hardisty and west to Camrose and Lacombe. A third survey included fields from Edmonton east to Lavoy and north to Ashmont and back to Edmonton via Smokey Lake. A fourth survey covered the area between Alix, about 30 miles east of Lacombe, and Drumheller. The incidence of the major leaf diseases of barley is presented in Tables 1 and 2.

Barley diseases

The data in Table 1 show that there was less scald, Rhynchosporium secalis (Oud.) Davis, in barley fields northeast of Edmonton than in the other regions. All fields examined west of Lacombe showed scald whereas 23% of all barley fields east and north of Lacombe and 14% of fields south and east of Lacombe were free of scald. There was a higher incidence of fields with severe infection northeast of Lacombe than in other areas.

Table 1. Percentage of barley fields showing scald.

Rating	west of Lacombe	ne. of Lacombe	ne. of Edmonton	se. of Lacombe
Severe	17	20	--	29
Moderate	50	15	7	14
Slight	33	20	8	29
Trace	--	22	40	14
No disease	--	23	45	14

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Table 2. Percentage of barley fields showing net blotch.

Rating	west of Lacombe	ne. of Lacombe	ne. of Edmonton	se. of Lacombe
Severe	--	16	--	29
Moderate	16	26	46	14
Slight	50	18	18	57
Trace	34	33	36	--
No disease	--	7	--	--

Net blotch (Pyrenophora teres (Died.) Drechsl.) was more severe in barley southeast of Lacombe than in the other regions. Less than 1/10 of the barley fields east and north of Lacombe were free of net blotch. The data in Table 2 indicate a more general or widespread distribution of net blotch than of scald though there were fewer fields in the entire region that showed severe net blotch infection than severe scald. The reason that net blotch was not as severe as scald might be explained by the late occurrence of warm weather in July and August. The cooler spring and early summer undoubtedly favored scald, hence the greater number of fields showing severe infection by this disease. Factors other than climate influence disease incidence. It was noticed that barley showing severe net blotch infection was frequently grown following a crop of barley as evidenced by the remains of the straw from the previous crop.

Loose smut (Ustilago nuda (Jens.) Rostr.) was in evidence in about 50% of the barley fields in the areas southeast of Lacombe and west of Lacombe. Sixty percent of the fields were infected east and north of Lacombe whereas only 25% of the fields had loose smut northeast of Edmonton. Infection ranged from trace to moderate. In two fields at least 10% of all heads were smutted, one being covered smut (Ustilago hordei (Pers.) Lagerh.). Septoria leaf blotch (Septoria passerinii Sacc.) was in evidence particularly in the areas close to Lacombe. The disease, however, did not appear to be harmful. Root rot of barley caused by Bipolaris sorokiniana (Sacc. in Sorok.) Shoem. and Fusarium spp. was noticed more frequently in fields west and north of Lacombe than in the other regions. About 75% of the fields in these areas were affected. Stem rust (Puccinia graminis Pers.) was recorded on barley in the Lacombe experimental plots in the following varieties: 'Olli', 'Wolfe', 'Gateway', 'Gateway 63', 'Cornpana', 'Parkland', 'Palliser'. Several fields of barley in the Ashmont area were severely infected with stem rust. This was in the same area where severe wheat stem rust was found. Bacterial stripe (Xanthomonas translucens Jones, Johnson & Reddy) was abundant on 'Olli' and 'Gateway' barley at the Lacombe Experimental Farm, though it was not recorded from any other place.

Wheat diseases

The major disease problem in wheat in this region of Alberta was leaf rust (Puccinia recondita Rob. ex Desm.). At the time the surveys were conducted, leaf rust was moderate to severe in the eastern area of the survey whereas it was virtually absent at Lacombe or west of there. Within several weeks, by mid-August, the wheat in these western areas was found to be heavily infected with leaf rust. Stem rust (Puccinia graminis Pers.) was observed on 'Garnet', 'Cypress', 'Chinook', 'Thatcher' and 'Red Bobs' at the Lacombe Experimental Farm. Considerable stem rust was observed in the Ashmont area where several fields of wheat appeared red-brown from the roadside. Approximately 2/3 of the fields of wheat examined north and east of Edmonton had stem rust with 1/2 of the affected fields scoring severe. Leaf rust was found in about 90% of the fields surveyed in this area. Other wheat diseases recorded in trace amounts were septoria leaf blotch (Septoria avenae Frank f. sp. triticea T. Johnson) ergot (Claviceps purpurea (Fr.) Tul.) and powdery mildew, (Erysiphe graminis DC.). In the latter part of August, considerable black chaff (Xanthomonas translucens) was noticed on wheat in the Lacombe and Ponoka areas. There was evidence of take-all (Ophiobolus graminis Sacc.) in a few wheat fields east and north of Lacombe.

Oat diseases

Oats were relatively free from disease. There was some halo blight (Pseudomonas coronofaciens (Elliott) F.L. Stevens) on the oats in the experimental plots at Lacombe but very little was found in oats in the areas surveyed. Blast was found ranging from trace to severe amounts in about 1/2 of the fields examined. A trace to slight amount of leaf blotch (Drechslera avenacea (Curt. ex Cke.) Shoem.) was also found on oats in the Lacombe area.

Rye diseases

Rye was rare in the areas surveyed. The six fields examined were found to have a trace amount of leaf rust (Puccinia recondita) and scald (Rhynchosporium secalis). Later in the season, considerable ergot was found on rye at Lacombe, though no more than is usually encountered.

DISEASES OF BROMEGRASS IN SASKATCHEWAN IN 1965

J.Drew Smith [1]

General

Field surveys for leaf-spot diseases of bromegrass, Bromus inermis Leyss., were made between 30 June and 5 August in 55 districts of the province when 89 fields and roadside areas used for hay were examined. Field diagnoses were confirmed by microscopical examination and isolation of the organisms involved in pure culture when necessary. The principal aim of the survey was to obtain information on the severity and distribution of the leaf spots caused by Selenophoma bromigena (Sacc.) Sprague & A. G. Johnson and Pyrenophora bromi (Died.) Drechsl. and to collect isolates for pathogenicity studies. Noviello (1) found these to be the most prevalent diseases of brome in Saskatchewan.

Frequency and distribution of selenophoma and pyrenophora leaf spots

The symptoms of selenophoma leaf spot did not become apparent on bromegrass plots at Saskatoon until early June and little leaf blotch was noted there all season. P. bromi was first isolated from brome collected at Outlook on 3 June.

In the first field survey, 30 June - 1 July, from Saskatoon to Swift Current and Regina, S. bromigena was found at 15 and P. bromi at 2 of 17 locations.

In the survey to the northwest, 20-22 July, P. bromi was not encountered between Saskatoon and Unity and then was found as frequently as was S. bromigena. At three locations near Big River no S. bromigena was collected. On the return trip P. bromi faded out south of Shellbrook. S. bromigena was found on 12 and P. bromi on 11 of 15 stands of bromegrass.

S. bromigena was noted at 40 and P. bromi at 28 of 42 locations in a survey through the northeast from St. Louis, Nipawin, Carrot River and Tisdale to Melfort between 28 and 30 July. P. bromi was as frequently noted as S. bromigena north of latitude 53° on this survey but the latter was more common to the south.

On 5 August, in a survey southeast of Saskatoon towards Watrous and Nokomis, S. bromigena was found on brome at 15 and P. bromi at 8 of 16 locations. In late August S. bromigena and P. bromi were found on roadside brome north of La Ronge and S. bromigena at Otter Rapids. Isolations of both fungi were made from active spots in late October at Saskatoon. Rarely was P. bromi found in the conidial form in leaf lesions during the surveys.

Table 1. Severity* of two bromegrass leaf spots at 89 localities.

	4	3	2	1	0
Selenophoma leaf spot	11	12	25	31	7
Pyrenophora leaf blotch	2	12	26	11	35

* Where 4 is severe disease and 0 no symptoms seen

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Clonal reaction to S. bromigena

There are marked differences in susceptibility of bromegrass clones to infection by this fungus. Spaced plants in a nursery at Saskatoon were scored for natural infection by the disease in late July. The results are presented in Table 2. Considerable differences were also noted by Dr. R.P. Knowles in spaced plants of known parentage in other locations.

Table 2. Disease ratings for strains of B. inermis.

Strain	Mean* Rating	Strain	Mean Rating
Commercial (1)	1.80	S-6324/1	1.52
" (2)	2.02	" /2	1.47
" (3)	2.06	6325/1	1.59
Carlton	2.08	6349 (USSR)	2.08
Lincoln	0.82-	6362/1	1.35
Saratoga	1.42	6363/2	1.07-
Red Patch	1.05-	6732/1	1.60
S-4088/1	1.37	6733/2	0.89
" /2	1.21	6430 (Bulgaria)	2.00
" /3	1.48	6433 (USSR)	1.77
" /4	1.54	6449/2	1.58
" /5	1.19		
S-5824/2	1.59		
S-6211/1	1.30		

* On a scale 4 to 0 where 4 is severe disease and 0 no disease. Mean of 22-23 plants.

Other diseases of B. inermis

SEPTORIA LEAF SPOT (Septoria bromi Sacc.) was seen from late July through September. The fungus was isolated from 11 localities. It was frequently found on leaves with S. bromigena and P. bromi and the symptoms might be confused with those caused by the former. Infection was never seen to reach the severe category.

SCALD (Rhynchosporium secalis (Oud.) Davis. Light infections were noted on plants at Saskatoon in July and August and at Weirdale in July.

ROOT ROT. White rhizomorphs of an unidentified fungus were found on living roots of spaced plants in two nurseries and on roadside brome near Saskatoon. The affected plants were of low vigor and seed yield. One small fruiting body, associated, indicated that the fungus was a basidiomycete.

LEAF SPOT. A Sporotrichum was associated with linear gray lesions on brome leaves in September on the University campus at Saskatoon.

Literature cited

1. Noviello, C. 1963. A survey of leaf and head diseases of bromegrass in Saskatchewan 1963. Can. Plant Dis. Surv. 43: 163-165.

A COMPARISON OF STANDARD AND DRILLBOX SEED TREATMENT CHEMICALS[1]

H.A.H. Wallace[2]

Introduction

Thirteen standard and eleven drillbox seed-treatment chemicals were tested in 1965 against bunt of wheat (Tilletia foetida (Wallr.) Liro), covered smut of oats (Ustilago kolleri Wille), covered smut of barley (U. hordei (Pers.) Lagerh.) and seed rot of flax, rye and durum wheat caused by a complex of soil-borne and seed-borne microorganisms.

The object of this experiment was to compare standard and drillbox seed-treatment chemicals applied a week or more prior to seeding, with the same chemicals applied an hour or more before seeding. The differences are in the concentration of the formulation and the dosages applied to the seed. Since concentration and dosage are interdependent, the results should be the same if the seed is treated at the same time.

Standard seed-treatment chemicals may be applied at any time from early fall to the seeding day, whereas drill box seed-treatment chemicals are applied within an hour or two of seeding.

Materials and methods

The seeds used in these trials were as follows:

Wheat - Variety 'Red Bobs'. Seed artificially contaminated (1:200 by weight) with spores of T. foetida.

Oats - Variety 'Vanguard'. Seed naturally contaminated by covered smut (U. avenae).

Barley - Variety 'Plush'. Seed naturally contaminated by covered smut (U. hordei).

Flax - Variety 'Marine'.

Rye - Variety 'Antelope', a fall rye.

Durum - Variety not known. Obtained from Saskatchewan Wheat Pool, Regina, Sask.

The pesticides used and the P. C. P. No. of each are shown in Table 2. Treatments numbered 2 to 5, 7, and 9 to 18 were collected by the Production and Marketing Branch, Canada Department of Agriculture, analysed by the Pesticide Unit, and a portion of each sent to us for these trials. Formulations 6 and 8 were no longer available so that old stocks in our laboratory were used. Formulations 19 - 25 were products developed for drillbox application whose registration was anticipated.

The sources of these materials were: F. W. Berk and Co. Ltd., P. O. Box 500, No. 8, Baker St., London W. 1., England whose Canadian representative is Leytosan (Canada) Limited, 345 Higgins Ave., Winnipeg, Manitoba; Chipman Chemicals Ltd., 519 Parkdale Ave., N. Hamilton, Ontario; Interprovincial Co-Operatives Ltd., 1700 Portage Ave., Winnipeg, Manitoba; Dupont Company of Canada Ltd., P. O. Box 660, Montreal, Quebec; Morton Chemical Co., 11710 Lake Ave., Woodstock, Ill., U. S. A.; Niagara Brand Chemicals, 1274 Plains Rd. E., Burlington, Ontario and Sherwin-Williams Co. of Canada Ltd., (Green Cross Products), 2875 Centre St., Montreal, Quebec.

Two hundred grams of seed were used for each treatment. The required amount of seed-treatment chemical was applied to the seed in a sealer and then well shaken. The time lapse (storage period) between dates of treatment and dates of seeding are shown in Table 1. The "A" treatments were made 7 - 30 days prior to seeding. The "B" treatments were made on the spot an hour or two before seeding. Rye and durum wheat were subjected to the "A" treatments only.

The plots, which were 12 feet long and 9 inches apart were replicated 4 times at each station. Two hundred seeds per plot were sown and all emerged plants counted. The percentages of smutty heads (Table 3) is based on counts of all heads in the row.

Table 1. Time lapse in days between dates of treatment and dates of seeding.

	"A"		"B"	
	Brandon	Morden	Brandon	Morden
Common wheat	8	7	0	0
Oats	12	25	0	0
Barley	17	14	0	0
Flax	30	28	0	0
Rye	28	20	-	-
Durum wheat	7	20	-	-

[1] Contribution No. 200 from the Canada Department of Agriculture Research Station, Winnipeg, Manitoba.

[2] Plant Pathologist.

Table 2. P. C. P. No., source and formulations of pesticides.

					Active Ingredients			
Exp. No.	P. C. P. No.	Source		Form	Fungicide		HGE	Insecticide
1	--	--	Untreated Check					
2	8448	Morton	Panogen 15B	Sn*	MMD**	3.7 oz/gal	2.5 oz/gal	
3	9201	"	Panogen PX	Du	MMD	0.9%	0.6%	
4	2521	Dupont	Ceresan M	WP	EMS	7.7%	3.2%	
5	9134	"	Ceresan M-DB	Du	EMS	1.93%	0.8%	
6	8754	Green Cross	San	Du	MMO	7.3%	3.0%	
7	9229	" "	Drillbox San	Du	MMO	1.83%	0.75%	
8	6337	" "	Dual Purpose Bunt-No-More	Pd	HCB	16.0%		ALD 40.0%
9	9205	" "	Drillbox Dual Purpose Bunt-No-More	Du	HCB	6.7% CAP 13.4%		ALD 16.7%
10	3633	Chipman	Agrox C	Du	PMA	7.15% EMC 1.00%	5.0%	
11	9209	"	Agrox DB	Du	PMA	1.79% EMC 0.25%	1.25%	
12	6595	"	Mergamma C Dual Purpose	WP	PMA	2.86% EMC 0.40%	2.0%	LIN 30.0%
13	9219	"	Mergamma DB Dual Purpose	Pd	PMA	1.79% EMC 0.25%	1.25%	LIN 18.75%
14	9130	Co-op	MMH Liquid Dual Purpose	Li	MMH	1.36 oz/gal	0.75 oz/gal	HEP 2.5 lb/gal
15	9128	"	MMH Liquid Mercury	Li	MMH	2.25%	1.25%	
16	9120	"	Liquid Wireworm Seed Treatment	Sn				HEP 2.5 lb/gal
17	7208	Morton	Pandrinox	Sn	MMD	1.33 oz/gal	0.89 oz/gal	HEP 42.0 oz/gal
18	989	Berk	Half-Ounce Leytosan	Du	PMU	8.1%	4.5%	
19	--	"	Leytosan 1.	Du	PMA***		1.25%	
20	9289	Morton	Drinox PX	WP				HEP 25.0%
21	9421	Niagara	Puraseed DB	Pd	PMA	1.55%	0.95%	
					PAC	1.55% CDE 0.44%		
22	--	Co-op	Metasol MMH-DB	Du	MMH	1.43%	0.80%	
23	9205	Green Cross	Drillbox Dual Purpose Bunt-No-More	Du	HCB	10.0% CAP 20%		ALD 25.0%
24		" "	Drillbox Merlane	Du	MMD	1.83%	0.75%	ALD 25.0%
25		" "	Drillbox Wireworm Killer	Du				ALD 25.0%

* Formulation code: Du = dust; Li = liquid; Pd = powder; Sn = solution; WP = wettable powder.

** Active ingredients code: ALD = aldrin; CAP = captan; CDE = cadmium equivalent; EMC = ethylmercuric chloride; EMS = ethyl mercury p-toluene sulfonanilide; HCB = hexachlorobenzene; HEP = heptachlor; HGE = mercury equivalent; LIN = gamma BHC (from lindane); MMD = methyl mercuric dicyandiamide; MMH = oxine-methylmercury; MMO = methylmercury pentachlorophenolate; PAC = phenyl amino cadmium dilactate; PMA = phenylmercuric acetate; PMU = phenylmercuric urea.

*** Data not available.

Table 3. Standard and Drillbox Treatments 1965.

		Dosage		Disease Rating (%)						Germination (%)			
		Cereals	Flax	Bunt		Oat Smut		Barley Smut		Flax		Rye	Durum
Exp. No.	Formulation	oz/bu	oz/bu	A	B	A	B	A	B	A	B	A	A
1	Untreated	--	--	30.31	21.20	1.91	2.09	8.39	7.43	66.6	65.8	51.1	87.4
2	Panogen 15B	0.75	1.50	0.09	0.00	0.00	0.00	0.15	0.77	84.3	80.2	65.9	90.9
3	Panogen PX	2.00	4.00	0.22	0.48	0.00	0.04	0.57	0.91	80.1	79.6	62.2	91.1
4	Ceresan M	0.50	1.50	0.12	0.00	0.00	0.08	0.49	0.31	79.6	82.9	62.3	89.9
5	Ceresan M-DB	2.00	4.00	0.51	0.00	0.00	0.07	0.05	0.26	82.6	82.3	61.5	91.0
6	San	0.50	1.50	0.17	0.00	0.00	0.15	0.53	0.59	80.2	83.0	65.3	91.1
7	Drillbox San	2.00	4.00	0.48	0.12	0.00	0.22	0.35	0.27	78.4	83.3	62.9	91.4
8	Dual Purpose Bunt-No-More	1.25	2.50	0.14	0.05	1.33	1.69	6.46	3.96	62.4	61.4	41.8	87.4
9	DB-Dual Purpose BNM	3.00	6.00	0.00	0.09	0.33	0.23	3.64	2.09	82.6	77.6	59.3	89.3
10	Agrox C	0.50	1.50	0.08	0.00	0.00	0.00	0.05	0.21	80.1	80.3	59.0	93.3
11	Agrox DB	2.00	4.00	0.00	0.04	0.00	0.04	0.24	0.44	81.4	80.8	59.4	90.3
12	Mergamma C Dual Purpose	1.25	2.50	0.08	0.00	0.00	0.07	0.10	0.15	77.4	79.4	57.9	90.4
13	Mergamma DB Dual Purpose	2.00	4.00	0.00	0.00	0.00	0.00	0.41	0.10	79.8	78.6	56.6	93.3
14	MMH Liquid Dual Purpose	2.00	4.00	1.72	0.45	0.00	0.25	0.80	0.59	75.4	78.7	60.1	91.3
15	MMH Liquid Mercury	0.75	1.50	0.05	0.17	0.00	0.00	0.36	0.48	79.3	78.1	66.8	92.4
16	Liquid Wireworm Seed Treatment	2.00	4.00	22.47	16.98	2.57	1.97	7.80	6.66	62.5	59.9	43.1	86.4
17	Pandrinox	2.00	4.00	0.27	0.66	0.00	0.07	0.68	0.98	79.6	77.0	64.4	89.5
18	Half-Ounce Leytosan	0.50	1.50	0.00	0.00	0.00	0.11	1.02	0.98	79.1	79.1	64.6	90.7
19	Leytosan 1.	2.00	4.00	0.05	0.00	0.00	0.00	0.15	0.37	81.9	78.8	59.6	92.4
20	Drinox PX	*3.00	*3.00	25.83	19.38	2.26	2.96	8.29	4.58	62.1	64.9	42.1	83.5
21	Puraseed DB	2.00	4.00	0.00	0.00	0.11	0.15	0.80	0.82	72.2	77.8	58.1	90.2
22	Metasol MMH-DB	2.00	4.00	0.34	0.56	0.00	0.00	0.05	0.18	80.0	81.6	65.5	87.4
23	Drillbox Dual Purpose Bunt-No-More	2.00	4.00	0.00	0.00	0.41	0.37	2.35	1.44	81.6	80.0	60.8	93.6
24	Drillbox Merlane	2.00	4.00	0.34	0.00	0.00	0.15	0.24	0.18	79.3	82.4	66.6	92.8
25	Drillbox Wireworm Killer	2.00	4.00	31.18	24.91	1.86	4.18	6.05	7.73	68.6	59.5	38.9	88.3
	Min. Sign. Diff.			3.59	4.39	0.51	1.61	1.84	2.25	5.8	6.0	4.6	5.0

* 1.50 oz on oats 2.50 oz on barley 3.00 oz on wheat.

Experimental results

The field data collected in 1965 are summarized in Table 3. Considering that it is difficult to obtain good bunt infections in this region, the degree of infection achieved in these experiments was exceptionally good. The incidence of oat smut was exceptionally low, and that of barley smut was somewhat below average. The oat and barley smut tests should be repeated another year. There were significant increases in emergence when flax and rye seed were treated, but durum wheat generally showed little effect of treatment on emergence. The weather was ideal for germination and seedling development.

No significant differences were obtained between standard treatment chemicals and drillbox treatment chemicals or between seed treated prior to seeding and seed treated and sown the same day.

All wireworm-treatment chemicals (Nos. 16, 20 and 25) significantly lowered the emergence of rye below that of the check. While Drillbox dual purpose bunt-no-more (No. 9) and Drillbox bunt-no-more (No. 23) significantly increased emergence of flax and rye and were about equal to the mercurial seed dressings, Dual purpose bunt-no-more (No. 8) significantly lowered rye emergence below the check.

Acknowledgement

The writer wishes to thank J.B. Russell and Charles V. Marshall, Production and Marketing Branch, Canada Department of Agriculture, for collecting and chemically analysing many of the seed dressings and the staffs of the Morden and Brandon Experimental Farms who were frequently inconvenienced by us due to the necessity to treat seed immediately before seeding. Thanks are also due to the latter for making available the large area of land which was required for our tests.

CO-OPERATIVE SEED TREATMENT TRIALS-1965[1]

H.A.H.Wallace[2]

Introduction

Fifty-one seed treatment materials were tested in 1965 against common bunt of wheat (Tilletia foetida (Wallr.) Liro), covered smut of oats (Ustilago kolleri Wille), covered smut of barley, (U. hordei (Pers.) Lagerh.), seed rot of flax, rye and durum wheat caused by a complex of soil-borne and seed-borne microorganisms, and root rot of durum wheat caused by soil-borne organisms.

Materials and methods

'Red Bobs' wheat artificially contaminated (1:200 by weight) with spores of T. foetida; 'Vanguard' oats and 'Plush' barley both naturally infected with smut; 'Marine' flax, 'Antelope' fall rye, and durum wheat of unknown variety obtained from the Saskatchewan Wheat Pool, Regina, were used in these tests.

The fifty-one materials received for testing and brief statements concerning their nature and source are given in Table 1. The required amount of chemical was applied to 200 grams of seed in a sealer and well shaken. A day or two later 200 seeds were placed in envelopes, the envelopes placed in polyethylene bags and stored at 40°F until required for seeding (7 to 40 days later). The slurries were prepared by adding 4.2 cc of water to each gram of wettable powder. The "Lanstan 20G", a granular product, was not applied to the seed, instead 0.83 grams were scattered along the V belt seeder and sown together with the seed, as suggested by the manufacturer. In previous years these tests were sown at many stations in United States and Canada, but in 1965 they were planted only at Morden and Brandon, Manitoba. A third series planned for Winnipeg could not be sown because of wet ground.

The seed was sown in rows 12 feet long, 9 inches apart and replicated four times. The flax, rye and durum wheat were pulled and all emerged plants counted. The durum plants were 34 - 35 days old and these were also rated for root rot using a scale of 0 to 5. The results were later converted to a percentage disease rating. The percentage smut counts are based on all heads in the row.

Chemagro Corporation, P. O. Box 4913, Hawthorne Rd., Kansas City, Missouri, U. S. A.
Chipman Chemicals Ltd., 519 Parkdale Ave. N., Hamilton, Ont.
Diamond Alkali Ltd., T. R. Evans Research Center, P. O. Box 348, Painesville, Ohio, 44077.
Dupont Company of Canada Ltd., P. O. Box 660, Montreal, Que.
F. W. Berk and Co. Ltd., P. O. Box 500, No. 8, Baker St., London W. 1. England.
Leytosan (Canada) Ltd., 345 Higgins Ave., Winnipeg, Man.
Morton Chemical Co., 11710 Lake Ave., Woodstock, Illinois, U. S. A.
Niagara Brand Chemicals, 1274 Plains Rd. E., Burlington, Ont.

Results

In 1965 bunt infection was considerably heavier than is usually obtained in experiments in this area. In contrast, the intensity of oat smut was very low and barley smut infection was moderate. Seed treatment, in some cases, increased flax emergence 25% and rye emergence 50%. No definite trend was noted in the root rot test. In 1964 the soil was very dry, germination was patchy and often delayed for several weeks, and these conditions favored root rot in treatments containing mercury (Supplementary Seed Trials - 1964). In 1965 conditions were very wet and root rot in mercury treatments was about the same as the check. Hence, the weather may account for the difference between the two years in respect to root rot infections.

The majority of the chemicals used were satisfactory against smut diseases and they improved the emergence of flax and rye. Several materials warrent further comments.

Materials numbered 5, 26 and 32 (Tables 1 and 2) were unsatisfactory for smuts but significantly increased emergence of flax and rye.

Chemagro 4497 (No. 15) (Table 2) at 2.4 oz controlled smuts but decreased emergence of rye.

The addition of captan to DAC 2797 (No. 17, Table 1) markedly increased the effectiveness of the latter (compare with No. 16, No. 18) (Table 2) against smut and increased seed germination.

The high bunt infection and low oat and barley smut infections obtained with formulation No. 28 (Table 2) is unusual. The results suggest the possibility of an escape from infection of oat and barley smuts due to reasons unknown.

The concentration of Lanstan 20G (No. 51) was too strong and greatly reduced the emergence of wheat and rye.

Formulation Nos. 2, 3, 30 and 31 were unsatisfactory.

Acknowledgements

The writer wishes to thank the staffs of the Morden and Brandon Experimental Farms for their assistance at various times, and especially for making a large area of land available for the tests.

[1] Contribution No. 201 from the Canada Department of Agriculture Research Station, Winnipeg, Manitoba.

[2] Plant Pathologist.

Table 1. Source, formulation and composition of seed treatment materials.

Treatment No.	Source	Formulation		Composition
1	--	--		Untreated check
2	Morton	EP-304	WP	Identity not available
3	"	EP-305	WP	" " "
4	"	EP-306	WP	" " "
5	"	EP-307	WP	" " "
6	"	EP-301-A	Dust	" " "
7	"	EP-301-B	Dust	" " "
8	"	EP-301-C	Dust	" " "
9	"	EP-302-A	Dust	" " "
10	"	EP-302-B	Dust	" " "
11	"	EP-302-C	Dust	" " "
12	"	EP-303-A	Dust	Pandrinox PX methylmercury dicyandiamide 0.72% + heptachlor 20%
13-15	Chemagro	4497	WP	Bis (1,2,2-trichloroethyl) sulfide 50%
16	Diamond Alkali	2787	Dust	Tetrachloroisophthalonitrile 20%
17	" "	2787	Dust	" 20% + captan 20%
18	" "	2787	WP	" 75%
19	Green Cross	65-3	Dust	Identity not available
20	" "	65-4	Dust	" " "
21	" "	65-5	Dust	" " "
22	" "	65-6	Dust	" " "
23	" "	65-14	Dust	" " "
24	" "	Tillex	Liquid	Alkoxy-alkyl-mercury hydroxide 5%
25	" "	Tillex	Liquid	" " " " 33%
26	" "	RD8684	Dust	Identity not available
27	" "	"	Dust	As above + captan
28	" "	RL/70/S/E	Dust	Identity not available
29	" "	TCNA	WP	Tetrachloronitroanisole 67%
30	" "	TRO 142	WP	Identity not available
31	" "	TRO 28	Liquid	" " "
32	Chipman	57-64	Dust	Captan 50%
33	"	53-64	Dust	Identity not available
34	"	58-64	Dust	" " "
35	"	55-64	Dust	" " "
36	Niagara	ME E 326	Dust	NIA 9130 N,N-dimethylcarbamyl N,N-dimethylthiocarbamyl disulfide 75%
37-38	"	ME E 326	Dust	" " 20%
39	Berk	Leytosan 1	Dust	Phenylmercuric acetate (1.25% Hg)
40	"	Leytosan 2	Dust	" "
41	"	Leytosan 3	Dust	" + lindane 20%
42	"	Leytosan 4	Dust	" "
43	"	Leytosan 5	Dust	PMA + ethyl mercury chloride (1% Hg)
44	"	Leytosan 6	Dust	" " + lindane 20%
45-46	Niagara	NIA 102 EC	Liquid	Phenylmercuric acetate (2% Hg)
47-48	Morton	EP 254	Liquid	
49-50	Niagara	Puraseed	Liquid	Phenyl amino cadmium dilactate (2.5% cadmium) + phenyl mercury formamide (5.5% Hg)
51	Niagara	Lanstan 20G	Granules	1-chloro-2-nitropropane 20%
52	"	Guardtox	Liquid	Phenyl mercury acetate (Hg?)
53	Chipman	65-5-2	Dust	Identity not available
54	"	65-5-3	Dust	" " "
55	"	65-5-8	Dust	" " "
56	"	65-5-9	Dust	" " "
57	"	65-5-10	Dust	" " "
58	Morton	Panogen 15B	Liquid	Methylmercury dicyandiamide (2.5 oz/gal Hg)
59	Dupont	Ceresan M	Dust	Ethyl mercury-p-toluene sulfonanilide (3.2% Hg)
60	--	--		Untreated check

Table 2. Co-operative Seed Treatment Trials - 1965

Treatment No.	Dosage Cereals oz/bu	Dosage Flax oz/bu	Disease Rating (%) Bunt	Oat Smut	Barley Smut	Flax Emergence	Rye Emergence	Durum Emergence	Durum Root Rot
1	CHECK		21.44	2.42	7.07	62.8	43.7	89.1	13.2
2	1.50	3.00	24.68	1.58	7.92	70.4	37.2	86.5	10.1
3	1.50	3.00	2.96	1.27	9.98	73.6	43.7	90.8	12.1
4	1.50	3.00	0.84	0.07	2.46	71.1	36.8	89.2	16.3
5	1.50	3.00	11.50	0.53	6.95	82.0	53.7	93.3	11.4
6	3.55	7.10	0.05	0.00	0.00	77.4	38.4	86.4	14.4
7	2.12	4.24	0.57	0.09	0.23	76.5	57.4	93.8	15.0
8	1.41	2.82	0.29	0.05	0.00	85.4	57.0	92.3	14.3
9	3.25	6.50	0.00	0.00	0.00	77.2	37.7	81.2	16.3
10	2.00	4.00	0.29	0.00	0.00	82.3	49.9	91.9	16.1
11	2.00	4.00	0.09	0.00	0.21	83.3	56.9	92.1	14.5
12	2.50	5.00	1.83	0.00	0.88	79.1	68.0	92.7	15.0
13	0.60	0.60	10.83	0.23	1.40	63.4	37.1	81.1	16.3
14	1.20	1.20	2.65	0.00	0.00	60.1	40.2	86.7	12.5
15	2.40	2.40	0.14	0.00	0.00	59.9	30.9	78.0	14.5
16	2.00	4.00	3.75	0.30	1.73	73.3	39.1	91.9	14.3
17	2.00	4.00	0.57	0.27	1.82	84.3	60.1	95.9	16.5
18	*0.50	*1.50	2.65	0.61	2.43	71.5	43.8	90.8	14.4
19	2.00	4.00	0.14	0.25	0.67	83.7	62.6	97.1	14.4
20	1.50	3.00	0.19	0.00	0.79	83.8	60.1	92.6	13.0
21	1.00	2.00	0.05	0.00	0.68	81.4	61.9	93.6	13.4
22	1.00	2.00	0.10	0.07	0.31	80.9	60.7	94.1	15.8
23	1.00	2.00	0.00	0.07	0.18	79.8	54.6	89.8	11.2
24	0.50	1.00	0.14	0.00	10.71	77.9	56.5	94.4	15.4
25	0.75	1.50	0.05	0.00	9.07	74.9	52.6	92.6	14.0
26	2.00	4.00	18.37	0.68	7.74	81.1	54.8	93.6	11.6
27	2.00	4.00	2.98	0.76	10.98	74.2	51.3	93.2	10.8
28	0.50	1.00	34.37	0.25	0.76	61.1	33.5	82.3	15.5
29	*0.75	*1.50	0.19	0.68	5.53	68.8	37.1	87.5	13.1
30	*1.00	*2.00	21.97	1.32	10.49	74.6	44.2	91.6	14.6
31	0.75	1.50	18.02	1.81	7.83	65.7	45.9	88.9	14.0
32	2.00	4.00	9.64	0.41	2.11	88.3	66.2	95.4	12.2
33	2.00	4.00	0.14	0.00	0.00	80.4	57.9	92.5	14.4
34	2.00	4.00	0.71	0.46	2.08	87.3	62.0	95.8	15.0
35	2.00	4.00	0.38	0.00	0.04	83.6	65.8	92.6	16.2
36	2.00	4.00	4.68	0.17	0.69	80.0	48.4	94.5	14.0
37	8.00	8.00	0.33	0.04	0.58	75.4	34.6	87.7	14.8
38	4.00	4.00	1.71	0.28	4.27	81.7	44.9	90.2	13.1
39	2.00	4.00	0.29	0.00	0.34	74.2	58.6	94.9	16.5
40	2.00	4.00	0.71	0.00	0.41	83.6	52.1	94.2	16.9
41	2.00	4.00	0.76	0.00	0.45	74.4	52.1	93.6	18.2
42	2.00	4.00	0.19	0.00	0.05	83.8	55.5	92.9	15.0
43	2.00	4.00	0.80	0.00	0.19	81.5	56.5	91.9	15.5
44	2.00	4.00	0.76	0.21	0.13	71.3	54.4	95.1	19.4
45	1.50	3.00	0.48	0.23	0.29	81.4	57.3	93.5	16.5
46	2.00	4.00	0.00	0.00	0.00	82.0	56.2	92.1	20.0
47	0.50	1.00	0.52	0.00	1.78	85.1	59.0	93.4	15.1
48	0.75	1.50	0.24	0.00	0.60	83.6	63.5	96.1	13.0
49	0.75	1.50	0.05	0.36	1.49	82.6	51.4	92.3	17.8
50.	1.00	2.00	0.00	0.12	0.98	79.4	58.1	87.9	16.1
51	**	**	7.15	0.00	0.79	53.7	24.2	41.8	12.4
52	0.75	1.50	0.00	0.07	0.91	78.8	56.9	91.3	17.5
53	2.00	4.00	0.00	0.00	0.00	77.5	57.3	91.1	12.0
54	2.00	4.00	0.00	0.00	0.00	81.3	57.4	93.9	17.9
55	2.00	4.00	0.00	0.00	0.00	81.2	62.3	95.3	14.7
56	2.00	4.00	0.00	0.20	0.79	82.6	55.3	93.5	12.5
57	2.00	4.00	0.00	0.50	0.50	76.7	57.8	94.1	14.0
58	0.75	1.50	0.00	0.00	0.17	86.4	68.8	94.6	11.0
59	0.50	1.00	0.33	0.00	0.09	81.0	57.0	93.9	12.4
60	CHECK		31.05	2.44	8.63	62.9	41.7	87.9	14.9
Least Sign. Difference			4.78	1.36	2.69	10.2	6.4	8.4	5.5

* Applied as a slurry; ** Applied to the soil.

SOME RECORDS OF KNOWN AND SUSPECTED PLANT-PARASITIC NEMATODES ENCOUNTERED IN CANADA IN 1965

M. Walker[1]

Root-knot nematodes

The peanut root-knot nematode, Meloidogyne arenaria (Neal, 1889) Chitwood, 1949, was intercepted on rose roots from Texas. A probable case of this nematode possibly mixed with the southern root-knot nematode, M. incognita (Kofoid & White, 1919) Chitwood, 1949, was reported on tomato from Georgia.

The northern root-knot nematode, Meloidogyne hapla Chitwood, 1949, was intercepted on several occasions on rose roots from the U. S. A., from Texas, Pennsylvania, and Ohio, and from Belgium, Holland and France. It was also intercepted on Lonicera sp., Ligustrum sp., and Vinca minor from Tennessee, on Spiraea sp. and Weigela sp. from New York, on Lycopersicon sp. from Georgia, Berberis thunbergii atropurpurea from Missouri, strawberry from Indiana, Clematis jackmanii superba, and phlox from Holland. It was reported on Impatiens sp. roots from Calgary, Alberta, and cyclamen from Côte St. Luc, Quebec. There was one possible case of M. hapla on Berberis sp., 'Sheridan Red' from Islington, Ontario, and two cases of M. hapla, possibly mixed with M. incognita on Rosa sp. from Tyler, Texas, and Syringa sp. from Iowa.

The southern root-knot nematode, Meloidogyne incognita (Kofoid & White, 1919) Chitwood, 1949, was found on interceptions of Hydrangea sp., Forsythia sp., and Weigela sp. from Alabama, Catalpa bungei from Tennessee, and tomato roots from Georgia and Mississippi. Three possible cases of this nematode were found on importations of shrubs from Tennessee, caladium from Japan and tomato roots from Georgia. One case of Meloidogyne sp., possibly a mixture of M. incognita and M. arenaria was reported on tomato roots from Georgia.

There was one possible case of the cotton root-knot nematode, Meloidogyne incognita acrita Chitwood, 1949, reported on Rosa sp. from Tyler, Texas. The Javanese root-knot nematode, Meloidogyne javanica (Treub, 1885) Chitwood, 1949, was found on 12 shipments of tomatoes from Georgia. There were also three reports of M. javanica possibly mixed with M. incognita intercepted on tomato plants from Georgia. Meloidogyne spp. were recorded on rose roots from Holland, Ligustrum sp. from Tennessee, and tomato plants from Georgia.

Cyst-forming nematodes

The oat-cyst nematode, Heterodera avenae Wollenweber, 1924, was intercepted from Holland in soil associated with Ribes sp., azalea, Hydrangea sp., Berberis thunbergii, Juniperus sinensis glauca, fruit understock, Malus sp. rootstocks, Viburnum sp., Chamaecyparis sp., Prunus cistena, Prunus sp., Taxus cuspidata hillii, Thuja sp., evergreens, Rhododendron sp., Ilex sp., Japanese maple, Rosa multiflora, Ligustrum amurense, nursery stock, Juniperus pfitzeriana, Taxus cuspidata, Juniperus virginiana glauca, Taxus sp., magnolia, Fagus sp., Vinca minor, Picea sp., Juniperus sp., cherry, Cotoneaster sp., Buxus sp., conifer, and several ornamental plants. In addition it was found on seed potatoes and Mahonia sp. from Germany, primrose from England, oleander, Ficus sp. from Italy, and soil from France. It was also tentatively identified from Holland on Cornus sp., Rhododendron sp., Clematis sp., Thuja sp., apple, Juniperus sabina, rose, magnolia, blue spruce, Betula laciniata, Thuja linus, Juniperus sp., and various trees and ornamentals; from an improperly washed car from Belgium, and Lonicera sp. from Tennessee.

There were three probable cases of cactus-cyst nematode, Heterodera cacti Filipjev & Schuurmans-Stekhoven, 1941, in soil from France, fern from Portugal and calamondin from New York. Two possible cases of cabbage-cyst nematode, Heterodera cruciferae Franklin, 1945, were recorded from Holland on Calluna sp. and ornamental plants. The fig-cyst nematode, Heterodera fici Kirjanova, 1954, was intercepted on Ficus sp. from Norway, and tentatively identified from Rhododendron sp. from Holland. There was one possible case of the pea-cyst nematode, H. goettingiana Liebscher, 1892, on ornamentals from Portugal.

The hop-cyst nematode, Heterodera humuli Filipjev, 1934, was intercepted from Holland in soil associated with Hydrangea sp., Deutzia sp., Ampelopsis sp., Cornus sp., and Hydrangea sp., Thuja sp., Malus sp., Juniperus sp., Pyracantha kasan, Kerria sp., Chaenomeles sp., Picea sp., Betula laciniata, mugho pine and several ornamental plants. It was recorded from Italy from shrubs, cactus, grapevine cuttings, Prunus sp., Ulmus sp., Vitis sp., potted hyacinth, and soil from one unidentified host. It was also found in soil from an improperly washed truck from England, Crassulaceae from the United Kingdom, tulips from Hungary and hop roots from Sardis, British Columbia.

In addition it was tentatively identified from Holland on Hydrangea sp., Picea sp., barberry, Dicentra sp., fruit understock, Malus sp., Prunus sp., Viburnum sp., Clematis sp., Thuja sp., Taxus sp., Acer palmatum atropurpureum, Austrian pine, Juniperus sp., Pinus sp., and various ornamentals. It was also tentatively identified from Italy on Crassulaceae, heather, herbaceous plants, ornamental plants, Ficus sp., and grape cuttings; from France in soil; from Poland on asparagus; from Yugoslavia on carnation; from Argentina on woody plants.

The grass-cyst nematode, Heterodera punctata Thorne, 1928, was found in soil from Holland associated with ornamental plants, Hydrangea sp., azalea, Rhododendron sp., apple, Japanese maple, Picea pungens glauca, Viburnum sp., fruit understock, Thuja sp., evergreens, Ligustrum sp., Prunus sp., Acer sp., Ilex sp., Picea kosteri, Taxus sp., Juniperus

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spp., shrubs, Calluna sp., Ligustrum amurense, Lonicera sp., Populus sp., Pyracantha kasan, Buxus sp., Juniperus sabina, nursery stock, Taxus cuspidata, Juniperus canaertii, Berberis sp., Taxus sp., Picea sp., magnolia, Ligustrum sp., Chaenomeles lagenaria rubra, prune and pear, shrubs, phlox, Betula sp., Picea glauca conica, mugho pine, Juniperus sp., blue spruce, Cotoneaster sp., Taxus cuspidata nana, Thuja sp., and Juniperus sp.; from England associated with fruit understock and primrose; from Italy in soil from Euphorbia sp. It was also recorded in soil from Port-aux-Basques, Newfoundland; through a cyst survey in Montreal; a first report of Heterodera punctata in Saint John, New Brunswick, found through a nursery survey. There were four tentative identifications of H. punctata, all from Holland in soil associated with Thuja sp., Dicentra sp., various ornamentals and fruit understock.

The golden nematode, H. rostochiensis Wollenweber, 1923, was found in a soil survey in Newfoundland. It was intercepted in soil associated with Malus sp. understock from Holland, carnation, Hydrangea sp., and various other plants from England, potato from France, Betula sp. and Rosa sp. from Germany, perennial roots from the United Kingdom, and, for the first time, from potato roots on Vancouver Island, British Columbia. There was one tentative identification on greenhouse plants from England.

The sugar-beet nematode, Heterodera schachtii Schmidt, 1871, was found on Ribes sp. from Holland and tentatively identified from Holland on Philadelphus coronarius aureus and azalea.

The clover-cyst nematode, Heterodera trifolii Goffart, 1932, was intercepted from Holland on shipments of Abies sp., Acer sp., apple, azalea, barberry, begonia, Buxus sp., Calluna sp., Chamaecyparis sp., evergreens, fruit understock, Hydrangea sp., Juniperus sabina, Juniperus sp., Taxus sp., Juniperus virginiana, Lilium sp., Malus sp., nursery stock, ornamentals, Picea sp., Populus sp., privet, Prunus sp., Pyracantha kasan, Rhododendron sp., shrub, Sorbus sp., strawberry, Taxus sp., Thuja sp., Philodendron sp., Vinca minor, and Weigela sp.; from Italy on fern and hardwood and grape cuttings; from an improperly washed truck and greenhouse plants from England; from Germany on Tilia sp., Betula sp., and soil from Belgium; in heather plants embedded in potatoes from Scotland; in soil from Pilea microphylla from Michigan, U. S. A. Here in Canada it was found in soil associated with grass from Constance Bay, Ontario, Dracaena indivisa from Montreal, Quebec, soil from Saint John, New Brunswick, raspberry from Agassiz, British Columbia, and cyst surveys from Prince Edward Island, London, Ontario, and Montreal, Quebec.

There were several tentative identifications reported from Holland on Euonymous sp., Hydrangea sp., ornamentals, Juniperus sp., Buxus sp., Taxus sp., Betula sp., Picea sp., Rhododendron sp., Picea alba conica. It was also recorded tentatively from carnation from England; Iridaceae from Italy and a cyst survey from Montreal.

The knotweed-cyst nematode, Heterodera weissi Steiner, 1949, was reported in a cyst survey from Montreal and tentatively identified from soil from tobacco from St. Catharines, Ontario.

Cysts identified only as Heterodera sp. were reported from Holland on Rhododendron sp., Hydrangea sp., various trees and ornamental plants, azalea, shrub, Ribes sp., Acer palmatum corallium, Leucothoë catesbaei, fruit understock, Viburnum sp., Picea pungens glauca and kosteriana, Juniperus sinensis keteleeri, Malus sp., Cydonia sp., Chamaecyparis filifera, Taxus sp., Juniperus sp., Juniperus virginiana canaerti and glauca, Japanese maple, evergreens, Pyrus sp., Juniperus sinensis pfitzeriana, Thuja sp., Picea sp., Sorbus sp., Lonicera sp., nursery stock, Pinus sp., Calluna sp., Vinca minor, Chaenomeles lagenaria rubra, arborvitae, Cotoneaster sp., cherry, Picea glauca conica, Juniperus sabina, Thuja compacta, Taxus media hicksii, Mahonia aquifolium; from Italy on fern, oleander, heather, lily; from Scotland in heather plants embedded in potatoes; from Tunisia on Thuja sp.; from Portugal on fern; from France in rose soil; from Ireland in shamrock soil; from two improperly washed cars from the United Kingdom and Germany; from Germany on house plants; from England on heather plants; from cyst surveys from Prince Edward Island and London, Ontario.

Root- lesion nematodes

Pratylenchus crenatus Loof, 1960 was found in soil about the roots of apple trees from Kentville, Nova Scotia, Picea sp. from Belgium, and Prunus sp. and Pinus nigra from Holland. Pratylenchus penetrans (Cobb, 1919) Filipjev and Schuurmans-Stekhoven, 1941 was found in soil around the roots of lily plants from Lorne Park, Ontario; strawberry and apple from Kentville, Nova Scotia. Pratylenchus pratensis (de Man, 1880) Filipjev, 1936 was found in strawberry soil from Kentville, Nova Scotia. Pratylenchus sp. was found in apple orchard soil from Kentville.

Stunt nematodes

Tylenchorhynchus clarus Allen, 1955 was found on Rosa sp. from California. T. claytoni Steiner, 1937 was found on two occasions on Rhododendron sp. from Holland. T. dubius (Bütschli, 1873) Filipjev, 1936 was found in soil from Picea sp. from Belgium. T. latus Allen, 1955 was tentatively identified from Rosa sp. soil from California. T. maximus Allen, 1955 was found in apple orchard soil from Kentville.

Ring nematodes

Criconemoides lobatum Raski, 1952 was found in apple orchard soil from Kentville. Criconemoides sp. was found from Holland on Pinus nigra.

Pin nematodes

Paratylenchus brevihastus Wu, 1962 was found in apple orchard soil from Kentville, Nova Scotia. Paratylenchus nanus Cobb, 1923 was found in apple orchard soil from Kentville and in soil from Hydrangea sp. from Holland.

Other tylenchids

Aglenchus sp. (Andrassy, 1954) Meyl, 1961 was found in apple orchard soil from Kentville, Nova Scotia and Hydrangea sp. from Holland. An unidentified species of Tylenchus (Cephalenchus) was recorded from Holland on Rhododendron sp. and Hydrangea sp. Ditylenchus sp. was found in soil about the roots of rose from Holland.

Tetylenchus sp. was intercepted from Holland in soil associated with Rhododendron sp., Hydrangea sp., Prunus sp., and Pinus nigra. Unidentified species of the genus Tylenchus were reported from Holland on Hydrangea sp., Philadelphus sp. and rose; from California on rose; from Kentville, Nova Scotia in apple orchard soil.

Aphelenchids

Aphelenchoides parietinus (Bastian, 1865) Steiner, 1932 was identified from Ottawa, Ontario, in soil associated with zinnia. Aphelenchoides saprophilus Franklin, 1957 was found in daffodil bulbs from Ottawa, Ontario. Aphelenchoides spp. were recorded in soil associated with Hydrangea sp. and Philadelphus sp. from Holland, lily plants from Lorne Park, Ontario, and apple and strawberry from Kentville, Nova Scotia.

Aphelenchus avenae Bastian, 1865 was identified from Kentville, Nova Scotia on strawberry and in apple orchard soil. There was one tentative identification of A. avenae on Philadelphus sp. from Holland. Aphelenchus spp. were reported from soil associated with shrubs from Tennessee, and Eragrostis sp. from California.

Paraphelenchus sp. was found in apple orchard soil from Kentville, Nova Scotia. Seinura sp. was found in soil from chrysanthemum from Port Burwell, Ontario.

Dorylaimids

Longidorus elongatus (de Man, 1876) Thorne & Swanger, 1936 was found associated with sweet corn in Essex and Kent Counties in Ontario. Trichodorus christiei Allen, 1957 was reported on Eragrostis sp. from California. Trichodorus primitivus (de Man, 1880) Micoletzky, 1922, as well as nematodes identified only as Trichodorus sp., were intercepted from Holland on Rhododendron sp. Xiphinema americanum Cobb, 1913 was found from Texas on Rosa sp. from Tennessee on shrubs, and from Kentville, Nova Scotia, in apple orchard soil.

BRIEF ARTICLES

Disease survey of registered bean fields in Ontario 19

V.R.Wallen and M.D.Sutton [1]

During the latter part of August, an extensive disease survey was made throughout the main field bean growing areas of southwestern Ontario. Two general areas were inspected: north of London in the Exeter, Hensall area and the Chatham, Blenheim area. Some fields were inspected between these two major areas. As this was the first year that Michigan breeder seed had been grown in Ontario, following an agreement between the Canadian Seed Growers' Association and the producers of Michigan breeder seed, the survey was made primarily to compare the incidence of bacterial blights in the fields produced from Michigan-grown and Ontario-grown seed.

A total of 61 fields were examined representing the following grades of seed: breeder, foundation, 1st generation registered and 2nd generation registered. Twenty-four fields from Michigan-grown seed and 37 fields from Ontario-grown seed were inspected representing four varieties: Sanilac (1192 acres), Seaway (434 acres), Saginaw (27 acres) and Michelite 62 (1 acre).

Of the 61 fields inspected, 27 were infected with bacterial blight, three of 24 fields from Michigan-grown seed and 24 of 37 fields from Ontario-grown seed. The degree of infection ranged from trace amounts in some fields to a 130-acre field of Sanilac in which all plants were infected. Yield in this particular field could be reduced by as much as 50 percent as the crop was five weeks from maturity. Eighty percent of the fields planted with Ontario-grown Seaway were infected in varying degrees. In contrast, 20 percent of the fields sown to Michigan-grown Seaway were infected in trace or slight amounts. Fields of Saginaw and Michelite 62 from Michigan-grown seed were free from blight. Only one field of Ontario-grown Saginaw was inspected and a trace amount of blight was located in this field.

Infected plant material was collected from diseased fields and bacterial isolations were made. Following isolation, the cultures were tested for their pathogenicity. The results of this test showed that 19 fields were infected with fuscans blight (Xanthomonas phaseoli var. fuscans); 12 fields were infected with common blight (Xanthomonas phaseoli) and three fields were infected with halo blight (Pseudomonas phaseolicola).

Sclerotinia wilt appeared to be the most important disease in the bean crop this year. Of the 61 fields inspected 25 were infected. Both of the main varieties, Sanilac and Seaway, were infected. Thirty fields of Sanilac were inspected and 10 were found to be infected. Twenty-six fields of Seaway were inspected and 13 were infected. From a few plants to 50 percent of the plants were infected in the various fields. Most plants infected were almost a total loss as the stem, petioles and a high percentage of the pods were rotting. With continued wet weather this disease could lower yields considerably in the bean crop this year.

Root rot, (cause undetermined) but probably fusarium dry root rot because of symptomatology, was present in 11 of 61 fields inspected. The disease appeared primarily in patches in fields and the disease severity was generally low. However, some plants were affected severely and yields in certain fields will be reduced. The disease was present in Seaway and Sanilac but not in Saginaw or Michelite 62.

[1] Plant Pathologists, Plant Research Institute, Research Branch, Canada Department of Agriculture, Ottawa, Ontario

Diseases of grapevine in Ontario

H.F. Dias [1]

A preliminary survey of grapevine viruses was made in late spring and summer of 1965. Fanleaf-like symptoms, mainly leaf mottle or mosaic and leaf deformity were observed in some vines of 'Agawam', 'Delaware', 'Elvira', 'Pinot Chardonnay', 'Seibel 10878' and 'Seibel 14660'. Characteristic symptoms of fanleaf were observed in some plants of the rootstock V. riparia x rupestris '3309' imported from France.

The indexing method consisted of mechanical inoculation of Chenopodium amaranticolor and C. quinoa with sap from young grape leaves. Fanleaf virus was isolated from 2 out of 62 vines of '3309' tested. Similar attempts to transmit virus from suspect plants of the other varieties to herbaceous hosts all failed.

Leaf roll symptoms were often observed in the variety 'Veeport', but to what extent the leaf roll virus is involved is not yet known. No symptoms of Pierce's disease, yellow mosaic, yellow vein or corky bark were observed in the surveyed vineyards. Work is now in progress to establish an indexing program using 5 indicator varieties to detect grapevine viruses in Ontario and to evaluate their economic importance.

Xiphinema index Thorn & Allen, the vector of the soil-borne grapevine viruses, was not found in soil samples from the different vineyards whereas X. americanum Cobb was present in all samples.

A root disease problem was found in 3 vineyards in Ontario. Vines showed a gradual decline in vigor, sudden collapse and subsequent death as a result of either girdling of the underground stem or death of the larger roots. The disease appears in spots in vineyards with wet heavy soils. Spread to neighboring plants was apparent. Fructifications of a Roesleria sp., possibly R. hypogaea (Thüm. & Pass.) were found on all dead roots and stems. Whether the fungus is a real parasite in grapes in Ontario or whether it is a saprophyte on tissues affected by other root fungi is not yet known.

[1] Plant Pathologist, Canada Agriculture Research Station, Vineland Station, Ontario.

Oat leaf yellowing

M.L. Kaufmann and L.J. Piening [1]

An unreported and rather spectacular oat "disease" was noticed in central Alberta for the first time in 1963 when shortly after the plants in certain plots came into head the leaf blades changed to a yellowish-bronze color. All plants in these plots were uniformly affected. The discoloration which was uniform over the leaf, began at the tip and spread down to the base. The sheaths were not affected. There were no lesions or leaf curling and the plants were not stunted. The visual symptoms of affected oat lines were striking when compared with adjacent normal green lines. The disease occurred in 'Glen'-'Garry' lines and in 'Garry' itself where it appeared at a slightly later stage. Symptoms were observed at both Lacombe and Acme.

There was no sign of the disease in 1964. In 1965 'Garry' and approximately 20% of all lines which contained 'Garry' as a parent showed these symptoms at two locations, whereas lines from other crosses were normal. There is substantial evidence, therefore, that this premature leaf discoloration is inherited from 'Garry'.

The causes, effects, and inheritance of this disease are not known at the present time, but there are grounds for speculation as to the causes. The lack of lesions and absence of other conditions associated with pathological diseases would tend to reduce the possibility of pathogenic bacteria or fungi. The possibility of a virus infection is not ruled out although it is unlikely because of the distribution pattern and the uniformity of symptoms within plots. The symptoms do not resemble those brought about by known nutritional deficiencies, according to soils specialists, and the distribution pattern would indicate that the disease is not caused by a soil condition per se. This leaves only climatic conditions or a combination of climatic and soil conditions for consideration. The influence of season on the disease would tend to indicate that climate plays a major role. It is suggested that the susceptible lines possess an inherited weakness that is associated with chlorophyl production or breakdown, and that this weakness may be fostered by a combination of environmental conditions hitherto unknown.

Although 'Garry' is grown to a limited extent in central Alberta, there have been no reports of leaf symptoms similar to those described. Possibly the disease, if present, has gone undetected being confused with natural senescence. Critical and detailed surveys are necessary to determine its presence outside the experimental plots. It is suggested that this disease should be no cause for alarm, but we consider it to be of more than academic interest.

[1] Cerealist and Plant Pathologist, respectively, Experimental Farm, Research Branch, Canada Department of Agriculture, Lacombe, Alberta.

Plant-parasitesitic nematode genera associated with crops in Ontario in 1964 and 1965

J.L.Townshend [1]

Soil samples, submitted by growers to the Research Station, Vineland Station, Ontario, are examined for plant-parasitic nematodes and recommendations are given for their control. The soil, which is taken from about the roots of a crop, is processed by the Baermann-pan technique. The nematodes extracted are identified to genus, counted and recorded. The plant-parasitic genera detected in 1964 and in 1965, along with the crops with which they were associated, are compiled in Tables 1 and 2.

The root lesion nematode *Pratylenchus*, generally *P. penetrans*, continues to be the predominant plant-parasitic nematode in Ontario in distribution, numbers and damage done. Stone fruits, strawberry and tobacco suffer the most damage from this nematode. Large populations of *Pratylenchus* build up on clover and corn but no damage or losses have been noted in these crops. Such populations, however, pose a threat to succeeding susceptible crops.

The root knot nematode, *Meloidogyne hapla* occurs sporadically throughout Ontario and causes considerable damage to vegetable crops.

The dagger nematode, *Xiphinema diversicaudatum*, has been found on rose only in greenhouses. this nematode is quite destructive and can reduce production by 25 percent.

The cyst nematodes recorded here are *Heterodera trifolii* and *H. avenae*. The former is found on clover and latter on oats which suffer considerable damage from the nematode in certain areas in Ontario.

The pin nematode *Paratylenchus* is not generally harmful though it is widely distributed and occurs in large numbers.

The samples in 1965 were processed by the recently-established Ontario Nematode Diagnostic and Advisory Service.

[1] Nematologist, Research Station, Canada Department of Agriculture.

Table 1. Plant parasitic nematodes associated with Ontario crops in 1964.

Crop	Nematode genera									
	Pratylenchus	Paratylenchus	Xiphinema	Criconemoides	Rotylenchus	Tylenchorhynchus	Meloidogyne larvae	Heterodera larvae	Hoplolaimus	Longidorus
apple (2)[1]	60/2[2,3]	1020/2								
asparagus (2)	10/1									
barberry (2)	205/2	210/1					4000/1			
buckwheat (3)	540/3	187/3								
cherry, sour (10)	1248/10	303/9	25/2			173/3			300/3	
cherry, sweet (8)	2760/8	2867/6	30/1						700/1	
clover (3)	373/3	673/3			557/3	210/2				
corn (1)	60/1	200/1			90/1			10/1		
fallow (3)	840/2	453/3				360/1	20/1			
oats (2)	40/2	790/2	25/2		60/1	20/1		30/2		
onion (2)		10/2					60/1			
ornamentals (2)	40/1	70/1								
parsnip (1)										
peaches (9)	999/9	942/9		100/2						
pears (3)	2800/3	2680/3				120/2				
plum (2)	1860/2	1633/2				20/1		220/2		
potato (1)	340/1	50/1								
prune (1)	100/1	160/1	160/1	40/1	140/1					
raspberry (12)	808/12	364/7	18/5	10/1						
rose, field (5)	680/5	420/3			430/2	100/1	650/2			
rose, greenhouse (13)	105/2	20/1	304/13							
spruce (1)	20/1		40/1							
strawberry (18)	2006/14	368/5	160/2							
Total Samples (106)	1192/85	839/64	174/27	63/4	340/8	153/11	1126/5	102/5	250/4	

1 No. of soil samples processed.
2 Av. no. of nematodes per lb. of soil.
3 No. of samples containing the nematode.

Table 2. Plant parasitic nematodes associated with Ontario crops in 1965.

Crop	Pratylenchus	Paratylenchus	Xiphinema	Criconemoides	Rotylenchus	Tylenchorhynchus	Meloidogyne larvae	Heterodera larvae	Hoplolaimus	Longidorus
	Nematode genera									
bean (1)[1]	160[2]/1[3]					80/1				
carrot (1)	20/1				60/1					
celery (1)	100/1									
cherry, sour (2)	2290/2	20/1								
cherry, sweet (16)	2277/16	332/9		100/1	100/1	100/2	1200/1		362/5	
clover (3)	3057/3	320/1				240/3	100/2			
corn, sweet (4)	1287/4	20/1	20/1							630/2
corn, hybrid (1)		120/1	180/1			180/1				
evergreen (1)	3400/1	300/1								
fallow (4)	1280/4	445/4	40/1				40/1			
grass (1)										
oats (5)	2166/5	170/3			20/1	100/1		50/1		
onion (2)	20/1									
peaches (3)	420/3	333/3				20/1		370/2		
pear (12)	782/12									
potato (3)	450/2	40/1			20/1					
rose (1)			400/1							
strawberry (19)	2133/16	623/8						300/1		
tomato (2)	1090/2	180/1								
Total Samples (90)	1640/74	398/46	160/4	100/1	50/4	145/9	360/4	273/4	362/5	315/2

1 No. of soil samples processed.
2 Av. no. of nematodes per lb. of soil.
3 No. of samples containing the nematode.

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