Vegetables / Legumes

Crop/Culture: Celery

Name and Agency / Nom et Organisation: MAGED SAID AND D.J. ORMROD. B. C. Ministry of Agriculture and Fisheries. 17720-57th Avenue, SURREY, B. C. V3S 4P9

Location / Emplacement: Cloverdale, British Columbia.

Title / Titre: FIELD SURVEY FOR FUSARIUM YELLOWS (Fusarium oxysporum f. sp. apii, race 2) OF CELERY IN CLOVERDALE, BRITISH COLUMBIA.

METHODS: Twenty farms in 1987 and seventeen in 1988 were surveyed once or twice during the growing season for the presence of Fusarium yellows of celery. Every five to ten beds of celery were walked and notes were taken on the appearance of yellows and other disorders. Fields were scored as having yellows if areas of stunted plants were found and roots planted onto SBM selective medium produced F. oxysporum cultures.

RESULTS AND COMMENTS: Results of the two years' surveys are given in Table 1. Yellows was not as severe in 1988 as it was in 1987, possibly due to the cooler growing season. It is widespread throughout the celery growing area, however, and growers must utilize resistant cultivars to avoid serious losses.

TABLE 1. Incidence of Fusarium Yellows of Celery in the Cloverdale Area.

Farm No.	Cultivars Grown * 1987	Cultivars Grown * 1988	Distribution of Yellows 1987	Distribution of Yellows 1988	Other Disorders 1987	Other Disorders 1988
1.	TU 52-70 HK	--	small area	--	--	--
2.	Florida 683 TU 52-70 HK	TU 52-70 HK	widespread	small areas	pink rot petiole lesions	pink rot blackheart petiole lesions
3.	TU 52-70 HK Napoleon	--	small area	--	blackheart	
4.	?	TU 52-70 R	not seen	small areas	--	--
5.	TU 52-70 HK	TU 52-70 R	small area	not seen	pink rot	--
6.	Florida 683	--	not seen	--	--	
7.	?	Bishop, Deacon, Napoleon	not seen	not seen	--	--
8.	TU 52-70 HK TU 52-70 R	Bishop, Deacon, Napoleon	small area	not seen	black heart	pink rot petiole lesions
9.	TU 52-70 R TU 52-70 HK	TU 52-70 R TU 52-70 HK	widespread	widespread	--	--
10.	Florida 683	TU 52-70 R	not seen	not seen	blackheart	--
11.	TU 52-70 HK	TU 52-70 HK	widespread	small areas	pink rot	--
12.	TU 52-70 R TU 52-70 HK Napoleon	TU 52-70 HK Napoleon	scattered	large area in Napoleon	pink rot	pink rot bolting
13.	Deacon, Bishop	?	scattered	not seen	pink rot bacterial soft rot	--
14.	TU 52-70 R	TU 52-70 HK	small area	not seen	--	
15.	?	TU 52-70 R	scattered	not seen	pink rot	--
16.	TU 52-70 HK	TU 52-70 HK Napoleon	not seen	not seen	blackheart	--
17.	TU 52-70 HK Napoleon	Napoleon	small area	not seen	blackheart	petiole lesions
18.	?	Florida 683 Deacon	scattered	scattered	pink rot	--
19.	TU 52-70 HK Florida 683	Florida 683 Deacon	not seen	small areas	pink rot bolting	--
20.	Florida 683	?	Widespread	Widespread	pink rot	--

* TU 52-70 HK, Deacon and Bishop are considered to be resistant; TU 52-70 R is highly susceptible; Florida 683 and Napoleon are intermediate.

Crop / Culture: Greenhouse Cucumber

Location / Emplacement: British Columbia

Title / Titre: 1988 Greenhouse cucumber disease survey in British Columbia

Name and Agency / Nom et Organisation:

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METHODS: A survey of greenhouses for cucumber powdery mildew (Sphaerotheca fuliginea and Erysiphe cichoracearum) was carried out in the Fraser Valley, May, 1988 in response to increasing concern over the early siting of powdery mildew. Cucumber growers were interviewed and crops in commercial greenhouses were visually assessed for powdery mildew and other diseases. Greenhouse cucumber samples, submitted by extension specialists and growers, were diagnosed throughout the year at the provincial plant diagnostic clinic. Greenhouse long English cucumber varieties grown in B.C. are predominantly Corona and Farona with a very limited amount of Farbiola and Mustang.

RESULTS AND COMMENTS: Cucumber powdery mildew in 1988 developed unusually early in the season in February to April. Growers were concerned because in previous years the disease occurred late in the season with little effect on yield. The May, 1988 survey recorded 13/25 greenhouses with a 1–5% level of powdery mildew infection. Three other greenhouses had such severe powdery mildew, exceeding a 40X level of infection, that replanting was necessary at substantial cost to the growers. One of the severely affected greenhouses produced a winter cucumber crop under lights which may have led to the early incidence of powdery mildew in 1988. Cucumber crops planted later in the year and greenhouses which were relatively isolated and had limited visitor access appeared to escape the early and severe development of powdery mildew.

Pythium crown rot is a persistent problem occurring in 7/25 cucumber greenhouses. One greenhouse reported a problem with Phomopsis black root rot (P. sclerotiodes) and four others had difficulty controlling gummy stem blight (Didymella bryoniae). Zucchini yellow mosaic virus infected 500 plants in one greenhouse.

Crop/Culture: Cucumber, European Seedless

Location/Emplacement: Southern Alberta

Name and Agency / Nom et Organisation:

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Title/Titre: SURVEY FOR STEM ROT AND CANKER DISEASES OF GREENHOUSE-GROWN CUCUMBERS

METHODS: Twenty commercial greenhouses in the Medicine Hat - Redcliff area were surveyed in September and October, 1988. Approximately 5% of the plants in each house were visually examined for rot and canker symptoms on the lower stems. Plants were selected at equally spaced intervals down each row according to the number/row required to be sampled. Disease incidence data were recorded. Presence of fungal pathogens was confirmed by isolation. This involved surface sterilizing pieces of infected stem tissue in 1% sodium hypochlorite for 1 minute, rinsing in sterile water, and plating onto selective media. Plates were incubated at 20°C for 4-7 days before observation. Subcultures of representative isolates were made for pathogenicity tests. Results are pending.

RESULTS AND COMMENTS: Of the 58,864 m^2 surveyed, approximately one-third was covered with polyethylene and two-thirds with glass. Artificial mixes were the most common growing media, followed by soil, rockwool and sawdust, respectively (Table 1). Corona was the most frequently grown cultivar (90% of greenhouses). Stem rot and canker diseases were very high in incidence ($\bar{x}$ = 82.8%). A number of crops were pulled early because of this disease. *Pythium* spp. were most commonly isolated (100% of greenhouses), followed by *Fusarium* spp. (90%), *Didymella bryoniae* (45%), and *Rhizoctonia solani* (25%). Poor sanitation and the failure to use pasteurize: growing media were the major factors which favored outbreaks in greenhouses with stem rot and canker diseases.

Table 1. Greenhouse cucumber production and disease survey data, 1988.

Greenhouse No.	Medium[1] type	Crop age (wk)	No. Plants examined	Stem rot/ canker (%)	Fungi isolated from diseased stems: Pythium	Fusarium	Didymella	Rhizoctonia
1	A	9	150	56	+	+	-	-
	R	9	170	96	+	+	-	-
	A	7	225	55	+	+	-	+
2	S	9	300	85	+	+	-	-
	A	10	270	24	+	+	-	-
3	S	9	126	41	+	+	-	-
	S	15	126	94	+	-	-	+
4	D	8	150	0	N/A	N/A	N/A	N/A
	R	8	50	94	+	-	-	-
	R	8	90	75	+	+	-	+
5	A	8	120	76	+	+	+	+
6	R	9	105	96	+	-	-	-
	A	8	90	97	+	-	-	-
7	S	13	135	14	+	+	-	+
8	D	10	300	48	+	+	+	-
9	A	10	140	85	+	+	+	-
10	A	10	140	97	+	+	+	-
11	A	13	112	90	+	+	+	-
12	A	10	451	27	+	-	+	-
13	A	10	156	16	+	+	-	-
14	A	13	124	25	+	+	+	-
15	S	13	84	28	+	+	+	-
16	A	11	120	93	+	+	-	-
17	S	9	120	50	+	+	-	-
18	A	11	145	96	+	+	+	-
19	A	28	215	94	+	+	-	-
20	S	11	180	87	+	+	-	-

[1] Medium type: A = Artificial (Metro, Grace or homemade mix), D = Sawdust, R = Rockwool, S = Soil.

Crop / Culture: Potatoes

Location / Emplacement: Manitoba

Title / Titre: 1988 Survey of Manitoba Potato Fields Affected by Early Senescence Caused by Verticillium Wilt and Other Diseases.

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METHODS: Thirty-four fields of Russet Burbank and 16 fields of other varieties were surveyed for symptoms of early senescence in the Carman, Carberry and Winkler areas during the last two weeks of August, 1988. Stem pieces of plants showing symptoms were plated onto Potato Dextrose Agar and Sorbose Agar (2 g sorbose, 20 g agar, 100 ppm streptomycin sulphate and 1 liter distilled water). Plates were incubated at 25 C and examined after 7 days. Based on the recovery of pathogens, the incidence of fields with Verticillum dahliae (Verticillium wilt), Fusarium spp. (Fusarium root rot and wilt, Colletotrichum atramentarium (black dot) and Rhizoctonia solani (Rhizoctonia disease) was determined.

RESULTS: The survey results are presented in Table 1. On average, the incidence of fields of Russet Burbank potatoes in the Carman, Carberry and Winkler areas with Verticillium, Fusarium, Colletotrichum, and Rhizoctonia was 59%, 41%, 41% and 6%, respectively. In 6% of the fields, no pathogens were recovered. Fields of the varieties Norland, Pontiac, Norchip, Norkotah and Viking were also surveyed in the Winkler area. The isolation results for these varieties were combined as only a few fields of each variety were sampled. The incidence of fields with Verticillium, Fusarium, Colletotrichum, and Rhizoctonia was 69%, 27%, 27% and 0%, respectively. It is likely that the overall incidence of Rhizoctonia in Manitoba potato fields is much higher than detected in the survey. Isolations were made from the above ground portions of wilted plants, which are ideal for isolating Vericillium, Fusarium, and Colletotrichum, but not Rhizoctonia. Rhizoctonia is more commonly associated with stolons and tubers.

Verticillium, Fusarium, and Colletotrichum, are often isolated in combination from potato plants showing symptoms of early senescence and are the cause of a disease complex known as early dying. Verticillium and Fusarium are considered more serious pathogens of potatoes than is Colletotrichum, but Colletotrichum has been reported to play a role in accelerating the early senescence of potato plants.

Early dying has been observed in Manitoba potatoes in previous years, but it appeared to be much more common in 1988 than had been previously observed. It is difficult to establish what effect Verticillium, Fusarium and Colletotrichum or the complex of these organisms had on potato yields in 1988 as many of the fields sampled were also under severe heat and moisture stress. In nonirrigated fields of Russet Burbank near Carman, early senescence was very pronounced by mid August whereas irrigated fields of this variety in the same area were not as severely affected.

Results of the 1988 survey are compared to a similar survey conducted in 1987 in Table 2. The 1987 survey was conducted primarily in fields of Russet Burbank in the Winkler area. Verticillium was detected in 72% of the fields in 1987 and 67% in 1988. In the past two years, the higher than normal temperatures during the growing season have been favorable for this pathogen. Fusarium was detected in 28% of the fields in 1987 and 50% in 1988. The higher incidence of Fusarium in 1988 may be attributed, in part, to drier soil conditions. The incidence of black dot was similar in both 1987 and 1988 at 17% and 11%, respectively. Varieties other than Russet Burbank were also sampled in both years and Verticillium was found in 58% and 69% of the fields in 1987 and 1988, respectively. The incidence of Fusarium was similar in 1987 and 1988 at 25% and 27%, respectively. Black dot was not found in any fields in 1987, but was detected in 27% of fields in 1988. Black dot attacks potato plants under heat stress, which was a much more widespread problem in 1988 than in 1987.

Table 1. 1988 Potato disease survey results.

Variety	Location	Number of fields	Pathogens * % Vert.	% Fus.	% Coll.	% Rhiz.
Russet Burbank	Carman	11	82	28	28	9
Russet Burbank	Carberry	11	27	45	82	0
Russet Burbank	Winkler	12	67	50	17	8
Varieties other than Russet; Burbank	Winkler	16	69	27	27	0
Russet Burbank	Provincial average	34	59	41	41	6

* Vert. = Verticillium dahliae, Fus. = Fusarium spp., Coll. = Colletotrichum atramentarum, and Rhiz. = Rhizoctonia solani.

Table 2. Potato disease survey results Comparison 1987 - 1988.

Variety	Location	Year	Number of fields	Pathogens * % Vert.	% Fus.	% Coll.	% Rhiz.
Russet Burbank	Winkler	1987	18	72	28	11	6
	Winkler	1988	12	67	50	17	6
Varieties other than Russet	Winkler	1987	12	58	25	0	0
	Winkler	1988	16	69	27	27	0

* Vert. = Verticillium dahliae, Fus. = Fusarium spp., Coll. = Colletotrichum atramentarum, and Rhiz. = Rhizoctonia solani.

Crop / Culture: Greenhouse Tomato

Location / Emplacement: British Columbia

Title / Titre: 1986 Greenhouse Tomato Disease Survey in British Columbia

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METHODS: A disease survey of greenhouse tomato was carried out in the Fraser Valley, October, 1986. Growers were interviewed and crops visually assessed for diseases. Samples of tomato stem cankers were collected for detailed microscopic examination and pathogen isolation on selective agar. The predominant greenhouse tomato variety grown in B.C. in 1986 was Dombito with some production of Caruzo, Dombello, Jumbo, Larma, Perfecto, Vedetto and 86–32.

RESULTS AND COMMENTS: Gray mold (Botrytis cinerea) stem cankers and leaf mold (Cladosporium fulva) were prevalent diseases late in the season when the 1986 survey was carried out. Two greenhouses grew Perfecto and Vedetto which are resistant to leaf mold. Maintaining proper night temperatures and improving air circulation and sanitation are important in reducing gray mold and leaf mold. Pruning techniques must ensure complete removal of the petiole without any stub which could become an infection court for gray mold. One grower used bamboo stakes to lift layered tomato stems off the ground, improve air circulation around the stems and reduce gray mold stem infection.

Four suspected isolates of Didymella stem rot sent to Biosystematics proved not to be D. lycopersici.

Fusarium crown and root rot (Fusarium oxysporum f. sp radicis–lycopersici) occurred in 9/15 greenhouses surveyed in 1986. An annual loss estimated at 10–15% is attributed to Fusarium crown and root rot which is the industry's major concern. Larma has resistance to Fusarium crown and root rot but is susceptible to Botrytis stem canker. Two greenhouses that continue to produce greenhouse tomatoes in soil and four others using sawdust culture had no apparent Fusarium crown and root rot problem. Competitive microorganisms could explain the absence of Fusarium crown and root rot in the soil grown crops. One tomato crop grown in sawdust culture was planted late and may have escaped early Fusarium infection. Lettuce interplanted with tomato in the sawdust bags reduced Fusarium crown and root rot in four greenhouses. One grower found no reduction in crown and root rot with lettuce but may have planted the lettuce too late. Low light levels in early spring make it difficult to establish the lettuce crop. Lettuce can develop gray mold and harbour insect pests. One grower cut off the lettuce tops in mid–season and still had a reduction in Fusarium crown and root rot.

Dandelions have a longer grower season and compact growth habit and were used instead of lettuce for interplanting with tomatoes in 1987. Growers have not been satisfied with interplanting lettuce or dandelion to control Fusarium crown and root rot because of the labour, management and pest problems. A control of Fusarium crown and root rot is urgently needed until resistant varieties become available.

Crop / Culture: Tomato

Location / Emplacement: Southern Alberta

Title / Titre: SURVEY FOR CORKY ROOT (PYRENOCHAETA LYCOPERSICI) IN PREENHOUSE-GROWN TOMATOES

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METHODS: Six commercial greenhouses in the Calgary-Medicine Hat area were surveyed between June and October, 1988. Approximately 5% of the plants in each house were dug and visually examined for symptoms of corky root rot. Plants were selected at equally spaced intervals down each row according to the number/row required to be sampled. Incidence and severity ratings were made for each diseased plant. Presence of the pathogen was confirmed by isolation. This involved surface sterilizing small pieces of infected root tissue in 1% sodium hypochlorite for 1 minute, rinsing in sterile water, and plating onto potato dextrose agar amended with penicillin (100 ppm) and tetracycline (50 ppm). The plates were incubated at 20°C for 5-7 days before observation. Isolates of P. lycopersici were induced to sporulate by transferring to potato dextrose agar for 5 days, then to water agar for 2-3 days, and finally to ¼-strength V-8 juice agar. The V-8 plates were incubated under continuous fluorescent light for 30 days before spores were collected and observed. Subcultures of P. lycopersici were retained for pathogenicity tests. Results are pending.

RESULTS AND COMMENTS: Three of the six greenhouses surveyed had corky root rot (Table 1). In two, disease incidence was 98% or more, severity ranged from moderate (index = 66) to high (85), and crop vigor was poor. Greenhouses 2 and 4 had a previous history of tomato production, whereas, #1 was growing its first crop in virgin prairie soil. In #1, it is believed that P. lycopersici was introduced via soil amendments. In greenhouses 1 and 2, Dowfume MC-2 (98% methyl bromide + 2% chloropicrin LI) was applied at 1 and 2 lb/100 ft^2 (49-98 g/m^2) to half of a single bay at each house after the crops had been removed. Followup sampling of the new plantings in September, 1988, revealed that the fumigant had only slightly reduced corky root rot incidence. A similar result was observed in an area of #2 where the sand had been given a solarization treatment.

Table 1. Greenhouse tomato production and disease survey data, 1988.

Greenhouse No.	Growing medium	Cultivar	Age (wk)	No. plants examined	Corky root rot Incidence (%)	Corky root rot Severity[1]
1	Soil	Laura, Caruso	30	145	98	85.0
2	Sand	Dombito	32	46	100	81.9
3	Soil	Caruso	28	100	0	0
4	Soil	Terrific	24	17	100	66.7
5	Soil	Laura	47	248	0	0
6	Soil	Tropic, Caruso, Capello	40	80	0	0

[1] $$\text{Severity Index} = \left[\frac{(S_1 \times 1) + (S_2 \times 2) + (S_3 \times 3)}{T \times 3}\right] \times 100$$

Where S_1 = No. of plants with 1-25% of roots rotted.
S_2 = No. of plants with 26-75% of roots rotted.
S_3 = No. of plants with 76-100% of roots rotted.
T = Total No. plants examined, including healthy ones.

Crop/Culture: Vegetables

Location/ Emplacement: Manitoba

Title / Titre: Incidence of Vegetable Diseases in Manitoba in 1988

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METHODS: Results are based on samples of vegetables submitted to the Plant Pathology Laboratory and field examinations.

RESULTS:

Lettuce: Commercial lettuce fields in the Portage area were surveyed for disease. In fields not sprayed, aster yellows caused about a 4% plant loss in leaf lettuce and 13% in Romaine lettuce. Where insecticides were sprayed regularly throughout the season, the incidence of aster yellows in leaf lettuce was less than 2% and in Romaine 6%. There were no other diseases detected in either the leaf or Romaine lettuce.

Tomatoes: The incidence of blossom end rot, caused by a calcium deficiency, was higher than normal in tomatoes. Septoria leaf spot (Septoria lycopersici) was detected in five samples of tomatoes submitted from the Winnipeg area.

Cabbage: Internal tip burn caused by a calcium deficiency was a problem for a commercial grower of cabbage in the Winnipeg area. Loss from this problem was about 10% but restricted to varieties that produce very large heads. A field of cabbage, grown in a commercial field near Winnipeg was found to be affected by Fusarium yellows (Fusarium oxysporum) causing a yield loss close to 50%.

Onions: A basal root rot caused by Fusarium oxysporum was a problem in two fields of commercial dry bulb onions near Winkler and Portage. These fields were under severe moisture stress. Loss from this disease was difficult to separate from moisture stress damage, but probably accounted for about a 15% loss. Slippery skin (Pseudomonas alliicola) caused a storage problem in commercial spanish onions grown in the Winkler area in the 1987 harvested crop. Loss was estimated at 5%. Slippery skin was not detected in commercial onions in 1988.

Carrots: Disease levels in commercial carrot fields were very low in 1988. The major disease detected was aster yellows caused by a mycoplasma–like organism. Two fields in the Portage area were monitored for the effect of insecticide sprays on disease incidence. One field had 6 sprays and the other 12 sprays between May 27 and August 15. Aster leaf hoppers were monitored on yellow card sticky traps at 2–day intervals. Aster leaf hoppers were first detected May 18 and peak populations occurred around July 11. Populations remained fairly high for several weeks and then declined to low levels. Trapping was discontinued August 19, at which time there were relatively few aster leaf hoppers present on the traps. The effect of insecticide sprays was evaluated by sampling fields at harvest and determining the percentage of roots showing symptoms of aster yellows. In one field, the incidence of infected roots in the untreated area was 3.2%, but significantly (P–0.05) reduced to 0.7% in the portion of the field which was sprayed six times. Similarly, in the second field, the incidence of infected roots in the untreated area was 2.1%, but significantly (P–0.05) reduced to 1.0% in the portion of the fields which was sprayed 12 times.