Small Fruits / Petits fruits

CROP: Raspberry, *Rubus idaeus* var. *strigosus*

LOCATION: Eastern Ontario

NAME AND AGENCY:
K.P. Schooley[1] and R.R. Martin[2]
[1] Ontario Ministry of Agriculture and Food, Kemptville, Ontario
[2] Agriculture Canada, Research Station, Vancouver, British Columbia

TITLE: SURVEY FOR TOMATO RINGSPOT VIRUS IN RASPBERRY PLANTINGS IN EASTERN ONTARIO

METHODS: Leaf tissue from young primocanes of raspberry was randomly selected from blocks of raspberries at 17 farms in eastern Ontario. Leaf samples of weed species known to be hosts of tomato ringspot virus (TomRSV) were also tested. Thirty samples were collected at each farm, each sample consisted of three leaves of raspberry or the weed species tested. Leaves were also taken from wild raspberries adjacent to the planting when available. The samples were collected over a two week period and shipped to Agriculture Canada Research Station in Vancouver for analysis.

Samples were tested by ELISA for TomRSV, raspberry bushy dwarf virus (RBDV) and tobacco steak virus (TSV). In each case the trapping antibody was IgG purified from a rabbit polyclonal antiserum and used at a concentration of 1 ug/ml. For TomRSV and TSV the secondary antibodies were specific monoclonal antibodies which were detected with rabbit antimouse alkaline phosphatase. For RBDV the monoclonal antibody was conjugated with alkaline phosphatase and used at 1 ug/ml. p-nitrophenyl phosphate in diethanolamine buffer was the substrate used and the absorbance values were determined with a 96 well plate reader.

RESULTS AND COMMENTS: Of the 17 farms surveyed, 7 **(41%)** tested positive for TomRSV. The virus was not specific to any one cultivar as four different cultivars, including one purple raspberry (Rayalty), tested positive. TomRSV was also found in some of the wild raspberries sampled. Wild raspberries that tested positive were only on farms where cultivated raspberries also tested positive. Most of the plantings that tested positive for TomRSV were greater than eight years old. Broad-leaved plantain, *Plantago major* L. and dandelion, *Taraxacum officinale* Weber were the most commonly sampled weed species, none of which tested positive for TomRSV. Only one sample tested positive for RBDV. The presence of TomRSV in wild raspberries suggests that when replanting these fields inoculum sources from field perimeters must be considered in site selection and preparation.

CROP: Saskatoon and Raspberry

LOCATION: Alberta

NAME AND AGENCY:
J.T. Calpas,' B.J. Penner[1], R.J. Howard[2] and R. Stace-Smith[3]
[1] Brooks Diagnostics Ltd., Brooks, Alberta T1R 1C5
[2] Alberta Special Crops and Horticultural Research Center, Brooks T1R 1E6
[3] Agriculture Canada Research Station, Vancouver, British Columbia V6T 1X2

TITLE: SASKATOON AND RASPBERRY VIRAL DISEASE SURVEY IN ALBERTA

METHODS: A survey for viral diseases in commercial saskatoon and raspberry plantings in Alberta was carried out in August by Brooks Diagnostics Ltd., the Alberta Special Crops and Horticultural Research Center, and the Vancouver Research Station. Laboratory confirmation of the presence or absence of viruses was carried out at the Vancouver Research Station.

Nine raspberry and nine saskatoon fields representing approximately 90% of the total commercial area for both crops were surveyed. Alberta has approximately 50 ha of raspberries and 125 ha of saskatoons in production, with another 250 ha of saskatoons planted but not yet bearing fruit. The fields were surveyed by walking individual rows and whenever a plant displayed characteristic virus-like symptoms, e.g. leaf mosaic, mottling, cupping or puckering, or general stunting, a portion was collected for further study. In the laboratory, the samples were examined to confirm whether or not the symptoms could be due to a viral infection and, if so, which virus or viruses might be responsible. To determine if sap-transmissible viruses were present, extracts of all suspect plants were inoculated onto three indicator hosts, i.e. *Chenopodium quinoa*, cucumber and Xanthi tobacco. These plants were rub-inoculated using a leaf tissue macerate, which was prepared by grinding a small amount of each sample in a 2% nicotine solution. The indicator plants were examined for symptoms of viral infection two weeks after inoculation.

RESULTS AND COMMENTS: Six raspberry and six saskatoon samples were suspected of being infected with viruses. Visual examination of the raspberries suggested that four of the samples had symptoms resembling raspberry leaf curl virus infection. As this virus is reported to be non-sap-transmissible, we did not expect to be able to transmit it to the herbaceous indicator hosts used in this study. Close examination of the saskatoon samples revealed that none exhibited symptoms characteristic of any known fruit crop viral disease. None of the indicators displayed any viral disease symptoms two weeks after inoculation. This suggested that either the symptoms observed were not due to any sap-transmissible viruses or that because the plants were surveyed late in the season, sap-transmissible viruses may not have been recoverable from the samples. These viruses are more readily recovered from young, succulent tissue than from mature plant material collected later in the growing season.

Other diseases and pests noted during the survey were: powdery mildew (*Sphaerotheca macularis*) fire blight (*Erwinia amylovora*), iron deficiency, and spider mites on raspberries; and entomosporium leaf and berry spot (*Entomosporium mespili*), black leaf and witches' broom (*Apiosporina collinsii*), iron chlorosis, spider mites, and pear slugs on saskatoons.

Commercial raspberry and saskatoon plantings in Alberta appear to be relatively free from viral diseases. Further studies into potential viral diseases in commercial fields should be carried out early in the growing season to increase the chances of detecting any sap-transmissible viruses that may be present.

ACKNOWLEDGEMENTS: We gratefully acknowledge the assistance of Ms. Wendy Hale and Ms. Susan Sims for examining orchards and collecting plant samples during this survey.

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CROP: Saskatoon, *Amelanchier alnifolia* Nutt.

LOCATION: South-Central Alberta

NAME AND AGENCY:
R.J. Howard, M.A. Briant and S.M. Sims
Alberta Special Crops and Horticultural Research Center, Brooks, AB T1R 1E6
Tel: (403) 362-3391; Fax: (403) 362-2554

TITLE: SASKATOON LEAF AND BERRY SPOT IN SOUTH-CENTRAL ALBERTA IN 1993

METHODS: Five commercial saskatoon orchards (Fig. 1) were sampled in mid-July for leaf and berry spot caused by ***Entomosporium mespili.*** The total area surveyed was 33.5 ha. Depending on the size of the orchard, either every row (small plantings) or every 2nd or 4th row (large plantings) was sampled. This procedure consisted of picking leaves and berries from every 20th shrub in each row examined. Single leaves were collected from the upper and lower portion of individual shrubs and, where available, a cluster of berries was picked from the upper and lower portions *of* the same trees. Disease incidence and severity were assessed on all leaves and berries.

Disease incidence was determined by counting the number of leaves and berries with symptoms of entomosporium leaf and berry spot, then calculating the percentage of diseased leaves and berries out of the total number examined. Disease severity was estimated visually on the same samples using the following five-point scale: clean (0) = no lesions on leaves/berries; slight (1) = 1-25% leaf/berry surface lesioned; moderate (2) = 26-50% lesioned; severe (3) = 51-75% lesioned, and very severe (4) = >75% lesioned.

RESULTS: Overall, the average disease incidence was 62% for leaves and 29% for berries (Table 1). Leaves from the lower half of the shrubs generally had a higher incidence of disease than those from upper portions because *E. mespili* usually infects suckers and lower leaves first, then spreads upward. The average disease severity on the leaves and berries at each of the five locations was slight (<25% of leaf/berry surface lesioned). **All** seven of the saskatoon cultivars examined were susceptible to leaf and berry spot.

COMMENTS: Entomosporium leaf and berry spot was prevalent in all five of the saskatoon orchards surveyed in 1993. The cool, rainy growing season favored the spread and development of this disease.

Table 1. Area of saskatoon plantings surveyed for entomosporium leaf and berry spot, and average disease incidence and severity in five commercial saskatoon orchards in south-central Alberta in July, 1993.

Orchard No.	Size (ha)	Cultivar	Avg. age of orchard (yrs)	Avg. disease incidence (%)		Avg. disease severity (0-4)*	
				Leaves	Berries	Leaves	Berries
1	16.8	Northline (field #1)	3-6	81.3	0.0	1.1	0.0
		Smoky (field #1)		71.1	33.3	0.9	0.3
		Northline (field #2)		33.8	25.9	0.4	0.3
		Smoky (field #2)		36.5	16.2	0.4	0.2
2	12.0	Northline	1-22	51.6	0.0	0.5	0.0
		Honeywood		72.7	6.0	0.9	0.1
		Smoky		70.0	64.9	0.8	0.7
		Forestburg/ Pembina		89.7	59.0	1.1	0.7
3	1.1	Smoky	2-10	77.6	70.0	0.8	0.8
		Thiessen		66.0	57.7	0.8	0.6
		Pearson II		81.8	n/a	1.1	n/a
		Northline		88.3	n/a	1.0	n/a
4	0.8	Smoky	12-17	14.3	1.8	0.1	0.0
5	2.8	(A) Smoky, Pembina, Thiessen (mixed)	1-6	58.5	37.4	0.8	0.8
		(B) Smoky, Pembina, Thiessen (mixed)		24.2	2.5	0.3	***0.0***
		(C) Smoky		69.2	n/a	1.2	n/a

* **Clean (0) = No lesions on leaves/berries; slight (1) = 1-25% leaf/berry surface lesioned; moderate (2) = 26-50% lesioned; severe (3) = 51-75% lesioned, and very severe (4) = >75% lesioned.**

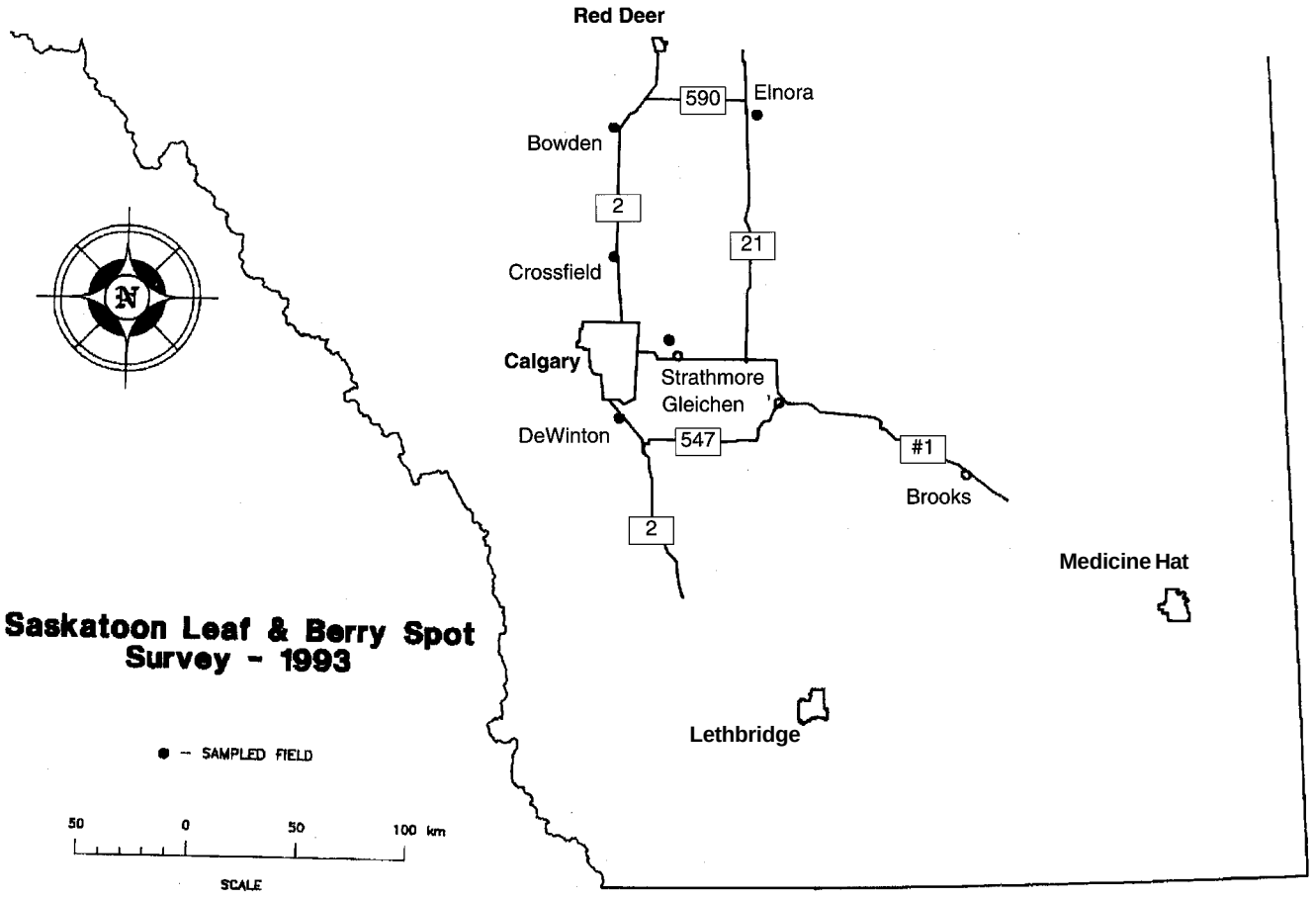

Figure 1. Location of saskatoon orchards surveyed for entomosporium leaf and berry spot in south-central Alberta in 1993.

CROP: Saskatoon, *Amelanchier alnifolia* (Nutt.)

LOCATION: North-central and Peace River regions of Alberta

NAME AND AGENCY:
R.M. Lange and P.S. Bains
Alberta Tree Nursery and Horticulture Centre, Edmonton, Alberta

TITLE: SURVEY OF ENTOMOSPORIUM LEAF AND BERRY SPOT OF SASKATOON IN 1993

METHODS: Four commercial orchards and one wild stand of saskatoon in north-central Alberta were surveyed for entomosporium leaf and berry spot caused by *Entomosporium mespili* (DC ex Duby). Randomly selected samples were taken from 10% of the bushes at each location. Racemes and leaves were taken from the middle and lower portions of each bush sampled, although samples from the bottom of the bushes did not always have berries. Leaves and berries were rated for the percentage of surface area affected by the pathogen: 0 = *0%,* 1 = 1-25%, 2 = 26-50%, 3 = 51-75% and 4 = 76-100%.

In addition, berry samples from 11 commercial orchards in the Peace River region of Alberta were supplied by Peace Country Fruit Growers' Co-operative. Ungraded samples from individual orchards were withdrawn at random intervals from the processing line until approximately 1 litre of berries was collected from each orchard. A subsample of at least 500 berries per orchard was evaluated using the rating scale described above. Microscopic examination of affected berries and leaves was used to confirm the presence of *E. mespili* at all locations. *Entomosporium mespili* cultures were isolated from infected berries.

RESULTS AND COMMENTS: Signs and symptoms of entomosporium leaf and berry spot of saskatoon were observed on each bush at each location surveyed in north-central Alberta (Table 1). Absence of affected berries at a stand of wild plants in the bottom of the North Saskatchewan River valley in Edmonton (Site 5 in Table 1) may be due to a loss of infected berries through picking or fruit drop. Diseased berries were present in all samples from the Peace River region (Table 2). A 100% disease incidence among saskatoon bushes in five orchards in central Alberta was also observed in 1990 (Pesic-van Esbroeck *et al.*, 1991). The results of the previous survey and this study, taken together, indicate that disease incidence is almost 100% in most years.

While disease incidence remained constant when compared with data from the previous central Alberta disease survey (Pesic-van Esbroeck *et al.*, 1991), disease severity appears to have decreased. The rainfall patterns of the 1990 and 1993 growing seasons may explain the differences between the observed disease severities for these years. Weather data collected at the Alberta Tree Nursery and Horticulture Centre indicated that precipitation in spring and summer of 1990 and 1993 was above the long-term average, and 1990 was substantially wetter than 1993. Furthermore, June and July of 1993 were characterised by below-average precipitation, whereas rainfall in amounts nearly two-thirds greater than the long-term average was received during the same months in 1990. The comparatively dry conditions in June of 1993 may have prevented a recurrence of the entomosporium berry and leaf spot epidemic of 1990.

All cultivars appeared to be equally susceptible to the disease; however, the survey revealed some variation in susceptibility to *E. **mespili*** among bushes selected from wild stands. This was particularly apparent at one orchard, where the variation for disease severity among plants transplanted from wild stands was greater than among plants of various commercial cultivars. Genotypes resistant to *E. mespili* selected from wild populations may offer an effective method of disease control.

Table 1. Incidence and severity of entomosporium leaf and berry spot of saskatoon in north-central Alberta in 1993.

SITE	NO. BUSHES SURVEYED	BERRIES (B) OR LEAVES (L)	AFFECTED CLUSTERS*	DISEASE SEVERITY** (% BERRIES AND LEAVES PER CATEGORY) 0	1	2	3	4
1	22	B	90.4	33	39	16	7	5
		L	96.5	25	69	6	0	0
2	72	B	60.8	39	49	12	1	0
		L	***				-	-
3	22	B	83.3	45	34	7	5	9
		L	97.7	31	66	2	1	1
4	95	B	85.7	49	32	7	4	8
		L	94.7	17	74	7	1	1
5	19	B	0	100	0	0	0	0
		L	70.0	70	28	2	0	0

*
** **Racemes with leaves attached.**
*** **Leaves and berries rated according to percentage of surface area affected: 0=0%, 1=1-25%, 2=26-50%, 3=51-75% and 4=76-100%.**
Not collected.

Table 2. Disease severity of entomosporium berry and leaf spot of saskatoon in the Peace River region of Alberta in 1993.

ORCHARD	NO. BERRIES OBSERVED	DISEASE SEVERITY* (% BERRIES PER CATEGORY) 0	1	2	3	4
1	575	19	41	21	14	5
2	520	32	44	15	6	3
3	524	42	38	10	7	3
4	597	18	41	21	10	10
5	608	86	12	2	0	0
6	500	69	30	1	0	0
7	559	37	51	8	3	1
8	513	72	27	1	0	0
9	585	98	2	0	0	0
10	602	84	16	0	0	0
11	577	23	48	22	6	1

* **Berries rated according to percentage of surface area affected: 0 = 0%, 1 = 1-25%, 2 = 26-50%, 3 = 51-75% and 4 = 76-100%.**

REFERENCE

1. Pesic-van Esbroeck, Z., P.S. Bains and **J.A.** Motta. 1991. Survey for common leaf spot, blight and berry spot of saskatoon in central Alberta. Can. Plant Dis. Surv. 71(1):125.