Current status of little cherry disease in British Columbia'

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Little cherry disease was present in most sweet cherry trees (*Prunus avium*) tested from all districts in the Kootenay region where cherry trees were found from 1976 to 1979. In the Creston district where commercial cherry growing continues, most trees of 10 years or older were infected but several trees 25 to 30 years old in isolated sites were disease-free. The virus was graft-transmitted to Sam trees from two oriental flowering cherry trees (Prunus *serrulata*) found in Creston, and from 15 of 30 native bitter cherry trees (*P.* emarginata) growing near abandoned orchards in several Kootenay districts. The apple mealy bug (*Phenacoccus aceris*) a vector suspect, was found in some locations where natural spread occurred recently.

Little cherry disease has been found in the Okanagan Valley each year since 1969, except in 1972. The maximum was 314 diseased trees in 1977. The total including 1979 is 1.481 affected trees in the Okanagan, and three in the Sirnilkameen Valley. Intensive annual surveys followed by prompt removal of diseased trees, and since 1977, a spray program to eliminate the apple mealy bug in orchards where the disease has been found, appears to have reduced the rate of spread.

Little cherry disease was not found in sweet cherries in the Fraser Valley. despite the presence of infected oriental flowering cherry trees. This may be related to absence of the apple mealy bug to spread the virus.

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La plupart des cerisiers doux (Prunus *avium*) testes dans tous les districts de culture de la region de Kootenay de 1976 a 1979 étaient atteints de la rnaladie de la petite cerise. Dans le district de culture commerciale Creston, la plupart des cerisiers de 10 ans ou plus etaient infectes, mais plusieurs sujets isolés âgés de 25 a 30 ans etaient indernnes. On a transmis le virus par greffe à des cerisiers Sam provenant de deux arbres à fleurs orientaux (Prunus serrulata) trouves a Creston et de 15 à 30 cerisiers amers indigenes (*P. emarginata*) rencontrés pres de vergers abandonnes dans plusieurs districts de Kootenay. On a observe la presence de la cochenille du pommier (*Phenacoccus aceris*), vecteur possible, dans certains endroits atteints récemment par la propagation naturelle de la maladie.

Cette virose se rencontre dans la vallee de l'Okanagan chaque année depuis 1969, sauf en 1972. Le sommet de l'infestation a eu lieu en 1977 avec 314 arbres atteints. Le total atteint 1481 cerisiers infectes dans l'Okanagan (1979 comprise), et 3 dans la vallee Similkameen. Des releves annuels intensifs, suivis par l'enlevement rapide des arbres virosés et, depuis 1977, l'application d'un programme de pulverisation pour lutter contre la cochenille dans les vergers atteints, semblent avoir reduit le taux de propagation.

Les cerisiers doux de la vallee du Fraser sont exempts de la maladie malgre la presence de cerisiers a fleurs orientaux infectes, ce qui pourrait être attribuable à l'absence de la cochenille vectrice à cet endroit.

Introduction

Little cherry disease (LCD) was noticed first affecting sweet cherry *(Prunus avium* L.) in an orchard near Willow Point, on the west arm of Kootenay Lake in 1933. It soon was recognized to be serious because of its drastic effects on size and quality of fruit and its rapid spread from one orchard to another and to every tree in most orchards. By 1946, when it was reported to be caused by a graft-transmissible virus (LCV), it had spread about 32 km north, at least 24 km west and had crossed the lake and reached Creston 72 km southeast of the site of discovery (2).

The rate of spread of LCD appeared to diminish after 1949 (6). By 1949 most cherry trees in the Kootenay!; were diseased as far west as New Denver but the disease was not found around Nakusp, 50 km to the west on Upper Arrow Lake. It was present at Makinson and Burton 29 and 37 km southwest of Nakusp but was not found at Fauquier-Needles or at Edgewood 22 and 32 km southwest of Burton. A survey in 1960 disclosed no spread of the disease in the intervening 11 years into the Nakusp, Fauquier-Needles or Edgewood plantings. Similarly, by 1949 the disease had affected all trees in the Robson district at the southeastern tip of Lower Arrow Lake, but no diseased trees were found at Syringa Creek, Deer Park, Broadwater or Renata 15 to 35 km westward from Robson either in 1949 or in 1962.

Up to 1964 the disease had not appeared in the Okanagan Valley, and there was no evidence of spread from the Kootenays to sweet cherries in other fruit growing regions of British Columbia or Northwestern U.S.A. (6).

Because of the serious effects of the disease on the cherry industry in the Kootenays there was concern that it might become a serious threat to British Columbia's major cherry producing region, the Okanagan and Sirnilkameen Valleys.

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Under the British Columbia Plant Protection Act (1954), a Little Cherry Control Area was established including the principal little cherry-free cherry growing districts. Movement of all fruit trees and fresh fruits from the Kootenays and other areas into this region was prohibited. The Act provided for inspection of any grower's crop at any time. Surveys supervised by the British Columbia Ministry of Agriculture were conducted annually and all affected cherry trees found were removed. In 1958 the Little Cherry Control Regulations were amended to include eradication and exclusion from the control area of all oriental flowering cherry trees which might be carriers of LCV.

This report includes an up-dating of the status of little cherry disease in the Kootenay, Okanagan, Similkameen and Fraser Valley regions of British Columbia.

Materials and methods

Surveys for LCD were conducted just prior to fruit picking time which ranged from late June through July varying with location and weather. At this time the fruit on normal trees of the dark fruited cultivars, principally Lambert, Bing, Van and Sam, is dark red to black in color. The affected trees can be detected by the smaller size, dull color, sometimes triangular pointed shape and reduced sweetness and flavor of the fruit. The occurrence of affected fruit only on portions of some branches indicates that the trees is showing symptoms for the first time. The occurrence of affected fruit throughout a tree indicates that the tree has been infected for several years *(2)*.

Indexing to confirm the presence of LCV was done by graft transmission to Sam indicator trees (5). The indicator trees were prepared by bench grafting or shield budding from virus-free Sam trees maintained in the Virus-free Budwood Orchard at Summerland, onto virus-free Mazzard F12/1 rootstock 9 mm and up in diameter. These trees were planted 60 cm apart in rows 1.5 m apart in an isolation orchard at Summerland. Graft transmission was done by shield or T budding from source to test trees in August. Two buds from each source were grafted into each of two or sometimes into four test trees. The plots of trees were maintained with care to avoid stress from lack of water or nutrients and from fungal diseases or insect pests. The Sam test trees that received buds carrying LCV developed specific

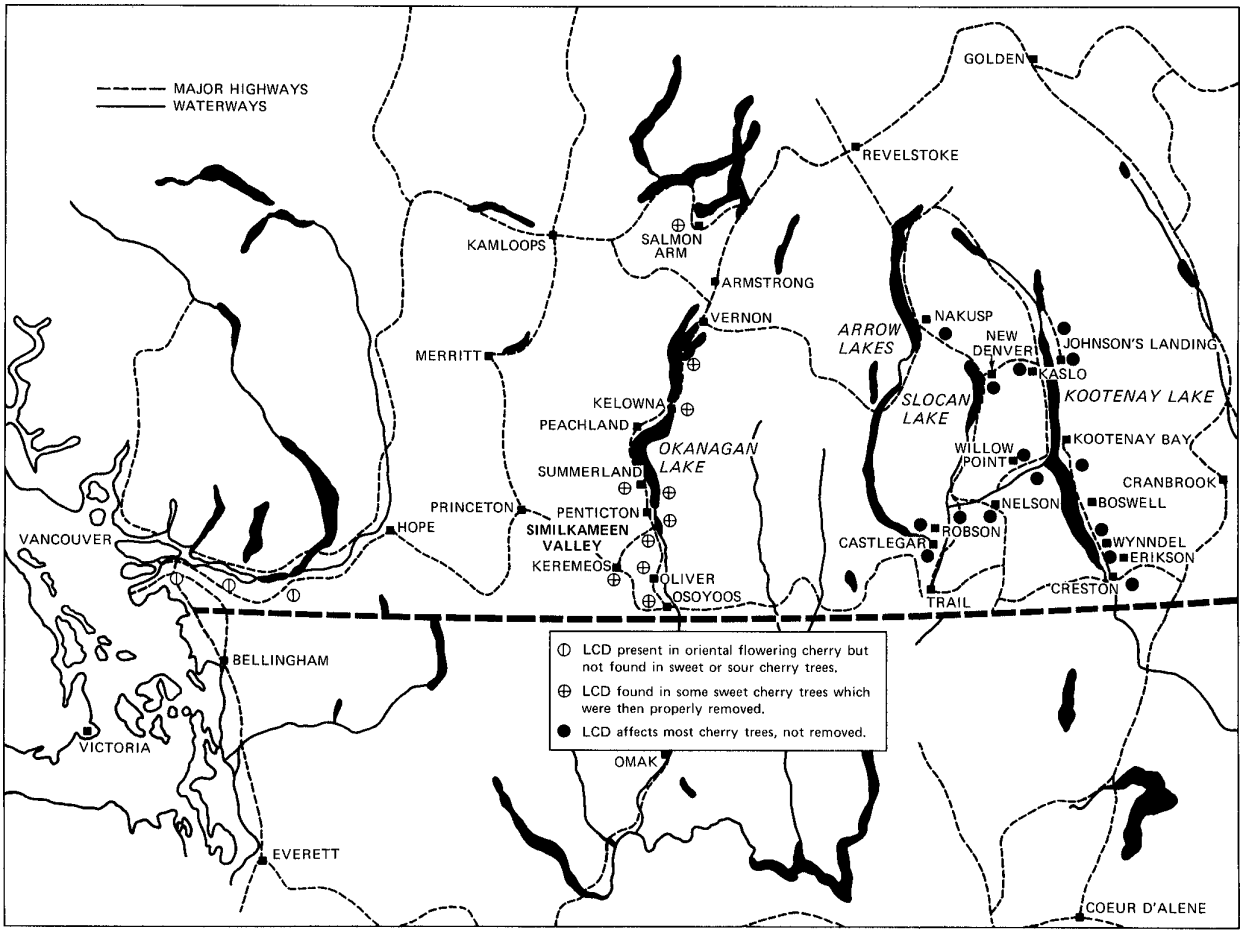

Fig. 1. Distribution of little cherry disease in British Columbia 1969 to 1979.

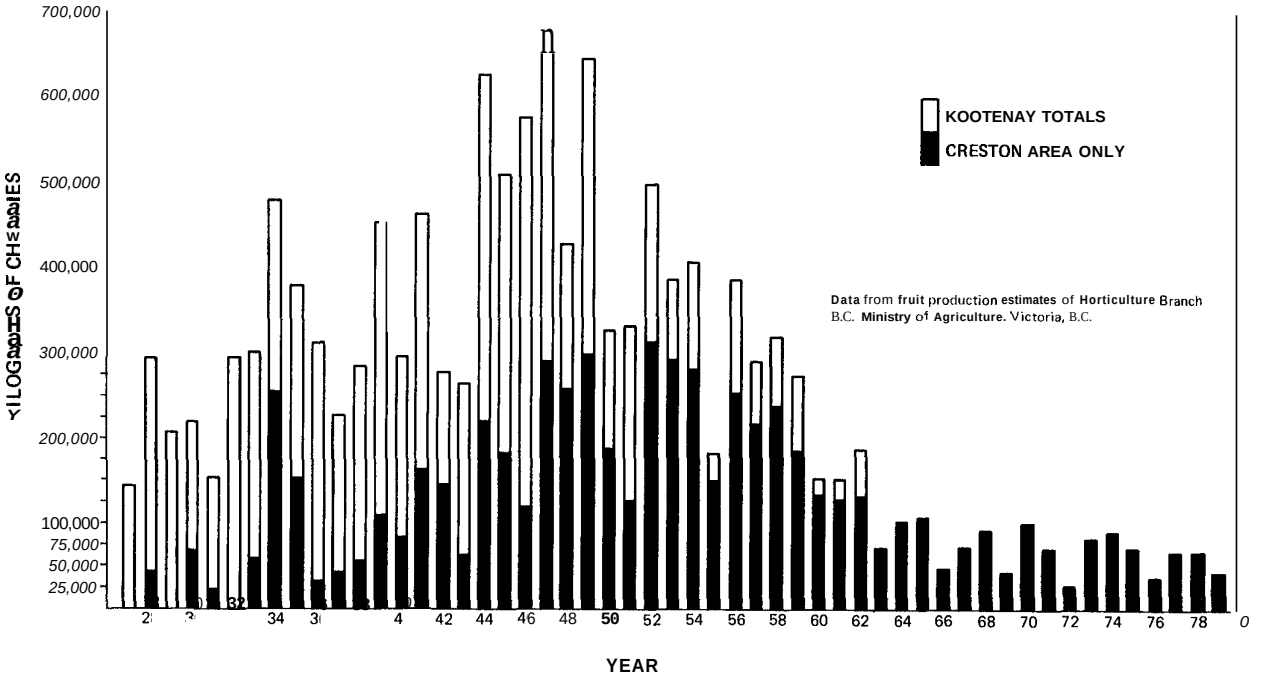

Fig. 2. Sweet cherry production in the Kootenay districts of British Columbia, **1927** to 1979.

interveinal reddening of leaves in August or early September of the following year. If the Sam grafts or buds failed, buds on the Mazzard F 12/1 rootstock were encouraged to develop. Reddening of the leaves of Mazzard F12/1, although not as distinct as on Sam, was useable as an indicator of LCV (4).

Surveys in the Kootenays 1976 to 1979

Among the many small districts scattered through the Kootenays, sites were found where cherries were grown in earlier years in small plantings in gardens or in small orchards seldom as large as two hectares. The plantings were in forest clearings on the gentler slopes or on lower bench lands and usually were within one or two km from the Kootenay, Slocan or Arrow Lakes, or on a valley bottom near a river or creek. Except in the Creston area, few of the cherry trees found in the Kootenays in 1976 to 1979 were receiving cultural attention (Fig. 1). The annual production in the Kootenays from 1976 to 1979, almost all of which was in the Creston area, was 39,000 to 68,000 kg in contrast to 430,000 to 680,000 kg in the years 1946-1949 (Fig. 2). Few of the sweet cherries produced now, even at Creston, are large enough for packinghouse trade so are trucked out privately, sold at roadside stands or sold on a U-pick basis principally to tourists. Little cherry disease appears to be the major factor contributing to the deterioration in size and quality and therefore of quantity of cherries produced in the Kootenay district.

From 1976 to 1979 fruit symptoms indicative of LCD were found on almost all sweet cherry trees examined that had been planted 10 years or longer in all districts where cherry trees were found. The districts in which diseased trees were found included Castlegar, Robson, Deer Park, and Renata near the southeastern tip of Lower Arrow Lake, Nakusp on Upper Arrow Lake, New Denver and Silverton on Slocan Lake, Nelson, Willow Point, Queens Bay, Ainsworth, Mirror Lake, Kaslo and Lardeau on the west side of Kootenay Lake, and Argenta, Johnson's Landing, Kootenay Bay, Wynndel, Creston and Erickson along the east side of Kootenay Lake.

The fruit on old Lambert and the few surviving old Deacon trees in the Kootenay Valley were very small, often 14 mm rarely 20 mm in diameter, and irregular in maturity. The cherries on Bing and Van trees wre generally larger than on Lamberts, but irregular in size and color. Sometimes it was difficult to judge whether the irregular fruit size was caused by LCD or some aspects of cultural neglect. A few Bing trees 25 to 30 years old were found in the Creston district with uniformly large fruit (25 to 28 mm diameter). These include three trees on a residential lot on the western edge of Creston, which indexed negative for LCD on Sam. A planting of about 15 trees, some about 25 years old, on the flats of Wynndel, also have had normal fruit each year (mean diam. 23-28 mm). The remaining trees in an experimental orchard of 1,000 Sam trees which was planted in 1975 in a field on the Creston flats about 2 km from other cherry trees, were still free from LCD in 1979.

Thirty-eight of 46 trees with small fruit symptoms that were indexed were found to carry a graft transmissible agent which caused red leaf symptoms on Sam. Also 3 of 22 trees with normal appearing fruit tested positive when indexed on

Sam. The results indicated that most trees of 10 years or older from all districts where samples were collected, including Robson, Nelson, Willow Point, Kaslo, Johnsons Landing, Creston and Erickson, were infected with LCV.

In most districts in the Kootenays, few or no cherry trees are being planted. Exceptions include a planting of 200 trees near Kaslo in 1975 by a new resident who was not aware of the history of the disease in the area. A number of replacement plantings occur in the Creston-Erickson district where cherries are grown despite the disease. Many of these trees have remained unaffected by LCD for 6 to 10 years, but others located near diseased trees have shown LCD fruit symptoms the first year of fruiting.

Kootenay Bay Lambert trees, which were propagated from a Lambert tree which remained free from LCD in an orchard at Kootenay Bay where all other trees were affected, were distributed for planting in different communities in the Kootenays from 1971 to 1974. In all locations where these trees were observed from 1976 to 1979, some of them already were affected by LCD in each community. They appear to be as readily infected and as severely affected as other Lambert trees. In an orchard at Creston where 27 Lambert, 32 Kootenay Bay Lambert and 5 Van trees were planted in a block in 1971, by 1979 only two trees had developed fruit symptoms characteristic for LCD. Both were Kootenay Bay Lambert trees. They were located at a corner of the planting nearest to (25 m) an old diseased cherry tree. The apple mealy bug (*Phenacoccus* aceris Sig.) which is suspected to be a vector of LCV (3), was found on the affected trees.

The virus was detected, by indexing, in two oriental flowering cherry trees (*Prunus serrulata* Lindl.) on residential lots in Creston, and in 15 of 30 old bitter cherry trees (*P. emarginata* (Hook.) Walp.) growing near old orchard sites in several districts including Robson, Willow Point, Kaslo, Kootenay Bay, Wynndel and Creston.

Surveys in the Okanagan and Sirnilkameen Valleys

Intensive surveys supervised by the British Columbia Ministry of Agriculture did not detect LCD in the Okanagan Valley until 1969 when 49 trees with fruit symptoms characteristic for LCD were found in one orchard near Penticton. All diseased, suspect and adjacent trees were removed in an attempt to eliminate the disease. The presence of LCV in the trees detected by fruit symptoms was confirmed by indexing on Sam, the red-leaf indicator, but the results were not available until a year later. In 1970 only 16 affected trees were found in the same orchard and 5 on scattered residential lots in Penticton. A reduction to only 6 affected trees in 1971, and none in 1972 gave the impression that LCD had been eliminated from the Okanagan Valley, but in 1973 114 affected trees were found. Since then varying numbers of affected trees have been found and removed each year, the maximum being 314 in 1977 (Fig. 1 and 3). The total number of affected trees found in the Okanagan Valley from 1969 to 1979 inclusive is 1,481 out of an estimated total of 155,000 sweet cherry trees (Table 1). In the adjoining Sirnilkameen Valley one affected tree was found in 1974 and two in 1979. The presence of LCV in representative trees from each location has been confirmed by indexing on Sam.

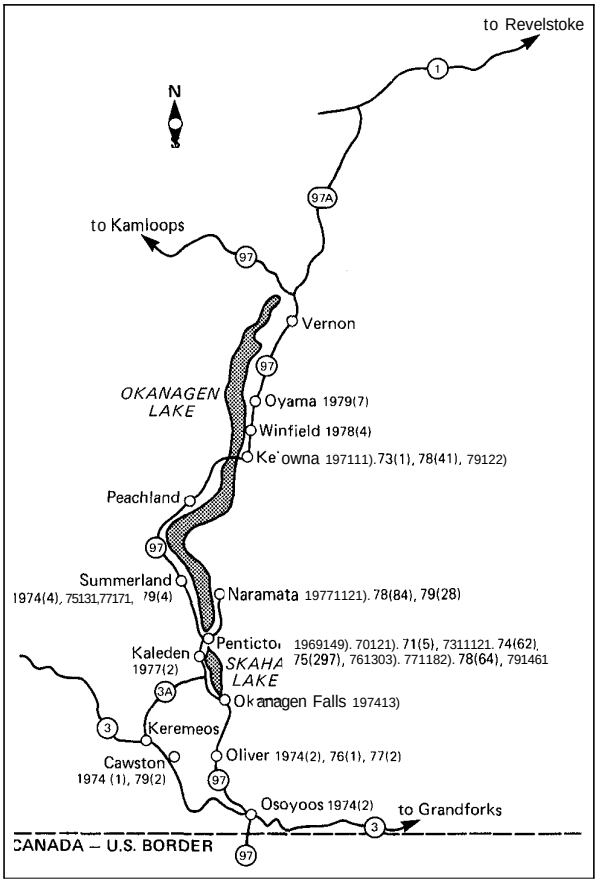

Fig. 3. Numbers of sweet cherry trees found with little cherry disease and removed in the Okanagan and Sirnilkameen (Cawston) Valleys each year including 1969 to 1979.

Prior to 1977 the fruit growers had agreed to remove all affected trees before October 1. Commencing in 1977, it was agreed that the affected trees be removed as soon as possible after picking and not later than August 10. In addition it was recommended that before removal of diseased trees the entire orchard should be sprayed with an insecticide (diazinon) to eliminate the nymphs of the apple mealy bug, frequently found on newly affected trees and suspected to be a carrier of LCV. Additional sprays recommended to control mealy bugs in the orchard for the next season included oil with ethion during early spring dormancy, diazinon at petal fall, and diazinon or dimethoate after harvest (1).

Little Cherry Disease in the Lower Fraser Valley

Many thousands of sweet cherry trees occur in the Lower Fraser Valley, most of them in backyard gardens (Fig. 1). They occur in the residential areas of Vancouver and

surrounding municipalities, and near all Valley centers as far east as Hope. Remnants of a few orchards remain near Yarrow, Mission and Chilliwack. Some of the oldest trees occur near old churches in the New Westminster, Fort Langley and Ladner areas. Sour cherries, *P. cerasus* L., also are common in the Lower Fraser Valley, as are numerous volunteer seedlings of both sweet and sour varieties. In addition, some 60,000 ornamental flowering cherries, *P. serrulata,* line the boulevards of Vancouver and many more are found in parks and gardens throughout Vancouver and

Table 1. Cherry trees found with symptoms of little cherry disease in the Okanagan and Similkameen Valleys 1969 - 1979.

Year	Location	Diseased trees found: Each location	Diseased trees found: Total
1969	1 orchard - Penticton	49	49
1970	1 orchard - Penticton	16	
	5 urban lots - Penticton	5	21
1971	1 orchard - Penticton	1	
	4 urban lots - Penticton	4	
	1 urban lot - Kelowna	1	6
1972	none		
1973	7 orchards - Penticton (1 to 22 each)	112	
	1 orchard - Kelowna	2	114
1974	2 orchards - Oliver	2	
	2 orchards - Osoyoos	2	
	1 orchard - Cawston	1	
	1 orchard - Okanagan Falls	3	
	11 orchards - Penticton (1 to 16 each)	48	
	2 orchards - Summerland	4	
	12 urban lots - Penticton	14	74
1975	1 orchard - Penticton	273	
	9 orchards - Penticton (1 to 7 each)	19	
	2 orchards - Summerland	3	
	5 urban lots - Penticton	5	300
1976	1 orchard - Oliver	1	
	1 orchard - Penticton	290	
	3 other orchards - Penticton	4	
	9 urban lots - Penticton	9	304
1977	1 orchard - Kaleden	2	
	2 orchards - Oliver	2	
	4 orchards - Naramata (1 to 110 each)	121	
	30 orchards - Penticton (1 to 56 each)	182	
	2 orchards - Summerland	7	314
1978	4 orchards - Naramata (1 to 65 each)	84	
	15 orchards - Penticton (1 to 14 each)	64	
	10 orchards - Kelowna (2 to 8 each)	41	
	1 orchard - Winfield	4	193
1979	3 orchards - Naramata	28	
	15 orchards - Penticton	46	
	1 orchard - Summerland	4	
	10 orchards - Kelowna	22	
	1 orchard - Cawston	2	
	1 orchard - Oyama	7	109
Total 1969 to 1979			1484

the Lower Fraser Valley. Some flowering cherries planted on boulevards in Vancouver before 1956, when a virus-free program for ornamental cherries was established, induced red leaf symptoms when budded on Sam indicators, and little cherry fruit symptoms when budded on bearing Lambert trees.

A survey in 1977, of 1200 sweet cherry trees in Vancouver and Lower Fraser Valley districts failed to reveal any trees with small fruits characteristic of little cherry disease. In particular, sweet cherry trees near little cherry-infected flowering cherries on Vancouver boulevards did not show symptoms of little cherry disease.

Similarly, in 1979, a limited survey of Lower Fraser Valley districts for apple mealybug suspected to be a vector of little cherry disease in the Okanagan Valley (3) failed to reveal the presence of this insect on any of its common hosts.

Discussion

In the Kootenay region, LCD was present in all districts where cherry trees were found. No concerted efforts have been made to eliminate the disease by removal of all affected trees. Except in the Creston-Erickson district, few trees of 10 years or older are of commercial value because most cherries are very small and poor in flavour and few attempts have been made to control fruit flies, which are prevalent. Although young trees planted near diseased trees in the Creston area usually become affected by LCD before the 8th year, trees grown in several isolated locations have escaped infection for 25 to 30 years. These observations indicate that it may be possible to avoid infection of new cherry plantings in the Kootenays by elimination of diseased trees in the neighborhood before planting and by control of vector insects.

In the Okanagan and Similkameen Valleys where LCD has been detected on a few trees in some orchards in one year and on more trees in the same orchards in subsequent years, there is evidence that such spread can be reduced by sprays to eliminate apple mealybugs, and prompt removal of diseased trees. It appears that the disease could be eliminated from the Okanagan and Similkameen Valleys by vector control and by early detection and prompt removal of all diseased trees. Such a program is handicapped by lack of rapid and reliable methods for detecting infection in trees that do not display fruit symptoms.

Failure to detect LCD in sweet cherries in the Fraser Valley, despite the presence of oriental flowering cherries infected with LCV, may be attributed to absence of apple mealybugs to transmit the virus to sweet cherrv.

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