IVERSITY ARCHIVES
OF IDAHO LIBRARY

UNIVERSITY OF IDAHO
College of Agriculture

# Little Cherry and Western X-Disease

## In Cherries and Peaches

A. W. HELTON

LIBRARY
UNIVERSITY OF IDAHO

30.711
d16
no.259

IDAHO Agricultural Extension Service

Bulletin 259
June 1956

Department of Plant Pathology

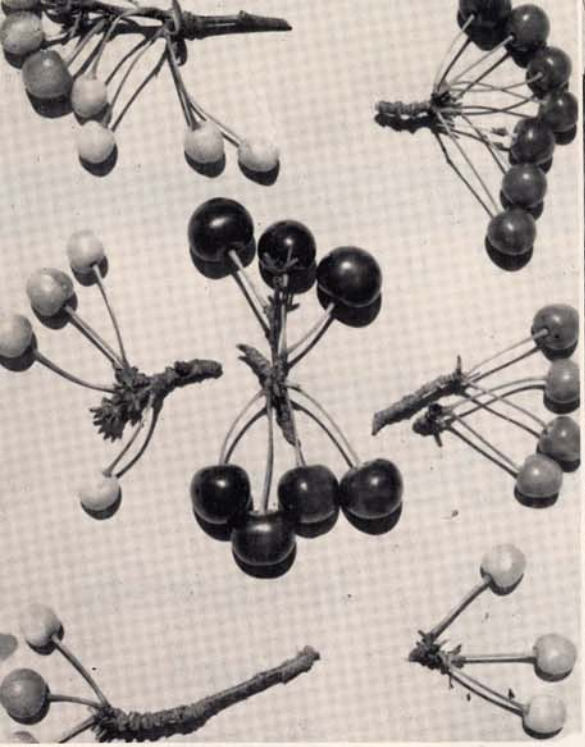

Figure 1.—Typical little cherry symptoms in the fruits of Montmorency. Two healthy spurs are surrounded by spurs bearing fruits with slight to severe symptoms.

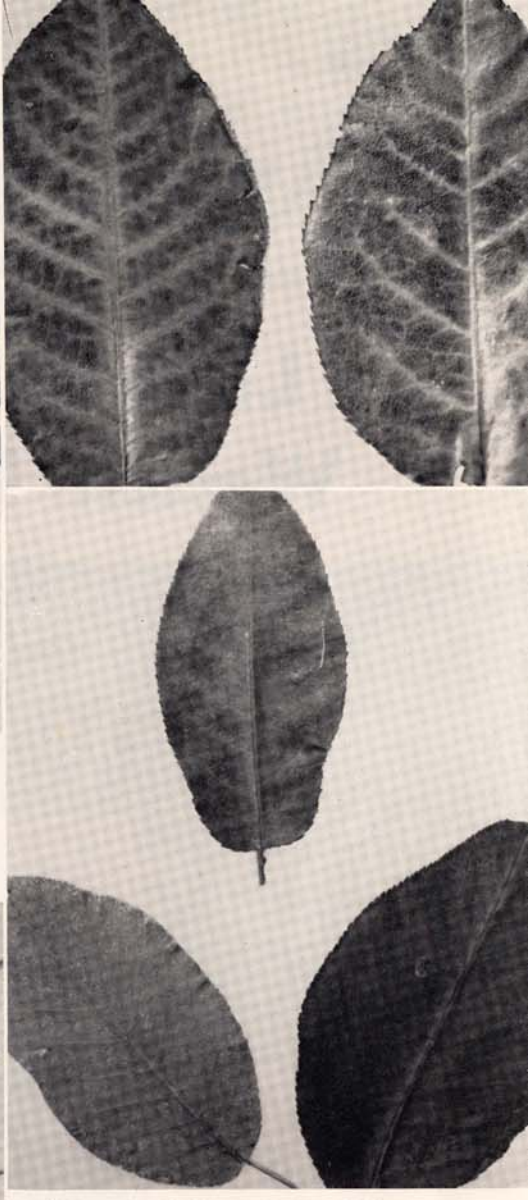

Figure 3.—(Above) Red leaf disease symptoms in the leaves of western chokecherry. The three leaves below are healthy (left), slightly affected (upper center) and severely reddened (right). The two leaves above are from a plant that has been infected longer and are beginning to show the red color giving way to yellow along the veins.

Figure 2.—(Left) The pseudo-little cherry symptom in fruits of Mahaleb cherry, one of the commonly used rootstocks for cherry trees. The cause of this is unknown, but it is suspected to be a non-infectious genetic characteristic.

# Little Cherry and Western X-Disease In Cherries and Peaches

A. W. HELTON*

Most of the peach and cherry orchards in Idaho have been visited by the virus responsible for the little-cherry and western X-diseases. Presumably the virus is carried by an insect or insects, but proving this has been very difficult. Transmission studies have been going on for many years throughout the West. The first real vector found was the leafhopper *Colladonus geminatus* (Van D.) Since the discovery of this one, others have been found to be capable of carrying the virus, but the overall picture of field spread still is far from complete.

Long before the first vector was found, transmission studies by means of budding and grafting showed that the "little-cherry" disease of cherries, the "red-leaf" disease of choke cherries and the "western X-disease" of peaches all were caused by the same virus. However, transmission of the virus from one type of tree to another was not always easy, nor does such transmission appear to take place with any degree of rapidity in the orchard areas of Idaho.

During the past decade, most of the western states have conducted state-wide surveys in their studies of these diseases. They have marked trees and growers have destroyed them in concerted efforts to bring the virus under control.

In Idaho, such surveys were conducted from 1948 through 1951. Personnel of the State Department of Agriculture and the Idaho Agricultural Experiment Station, covered the entire state with the intention of examining every cherry tree and every peach tree. In all cases growers were made acquainted with the diseases if they were found on their properties. The trees were marked and growers were advised to pull them at the earliest opportunity. After having this experience for four consecutive years, the survey was terminated with the expectation that most growers would be able to detect obvious cases of infection and destroy trees on their own.

Only in a problem of great importance would the exhaustive

**COVER PHOTOS**

**Color photographs bring out typical symptoms of the two fruit diseases discussed in this publication.**

*Assistant Plant Pathologist, Idaho Agricultural Experiment Station, Moscow.

effort of the surveys have been carried out. Yet little-cherry and western X-disease were not eradicated and probably never will be. They are annual problems in Idaho, varying with the area and orchard variety. In all those areas where they were found in the original surveys they still are to be found. Continued vigilance on the part of the grower is necessary if he is to accomplish a reasonable degree of control.

## Symptoms

Symptoms of the little-cherry, red-leaf and western X-diseases seldom are absolutely constant because of the effects of environment and tree variety and perhaps other factors. However, one acquainted with generalities and averages in sympton expression will be able to recognize the diseases more often than not. Where questions arise, Extension agents or members of the Experiment Station staff should be consulted.

As is so often the case in virus work, the diseases were discovered and recorded in the professional literature before the real nature of the viruses responsible for them was revealed. Because of this the disease in cherries called "little-cherry," the disease in wild chokecherries called "red-leaf," and the "western X-disease" in peaches are named differently even though they are presently considered to be caused by the same virus, or strains of a parent virus type.

### Cherries

There are two major types of reaction to the little-cherry virus in cherry trees. There are exceptions in both cases, but in general these two types can be described with reasonable safety as totally different reactions. The root stock is the key. Trees on Mahaleb roots generally react differently to the virus than do those on Mazzard roots.

**Mahaleb.**—The reaction on Mahaleb generally is so different from the ordinary little-cherry symptoms that the condition often has been described as "wilt-and-decline" instead of "little-cherry." Infected trees may wilt any time during the growing season. The leaves often turn pale and droop early in the season. The wilting may be so rapid that there is no leaf abscission, the leaves turning brownish-red and hanging on all year instead.

Trees on Mahaleb roots die in one to several years after infection. They defoliate early in the fall. They bloom late and heavily. They set a heavy crop of fruit but often die quickly thereafter. The fruits color early if the trees remain alive, but they are pale and slightly elongate. In general, this is the closest approach to the typical "little-cherry" fruit symptom on Mahaleb rootstock.

The rootlets and outer parts of the roots generally die by fall.

**Mazzard.**—On Mazzard root both sweet and sour cherries infected with the little-cherry virus develop the fruit symptom from which the name was derived. Fruits on infected branches are small,

pale, pointed and lack flavor (*Front cover and Figure 1*). Sometimes they are pasty white and may have a slightly rusty cast. Sometimes the pointed shape of the fruit is not a prominent feature. Such fruits never color or mature normally no matter how long they hang on the tree. The amount of color developed largely depends on the variety. For example, dark-fruited varieties show more color in the little-cherry fruits than do the light-fruited varities, but the symptom is prominent in either case—especially in dark varities like Bing and Black Republican.

One of the most peculiar characteristics of the little-cherry disease is that there may be an occasional fruit or normal appearance on severely affected branches. Conversely, there may be only a few spurs showing symptoms on an otherwise healthy looking branch. In some cases the fruits of a single spur are not consistent in their appearance (*Front cover*), some showing typical little-cherry symptoms, some apparently normal, and some of a peculiar in-between-condition in which half a single fruit may be affected.

A little-cherry-like symptom often is found on Mahaleb trees or on fruiting Mahaleb suckers at the base of orchard trees (*Figure 2*). The cause of this has not been established, but it is suspected to be a natural or genetic characteristic of uneven ripening of the fruit crop and not a virus infection. One very good reason to suspect that such fruit symptoms are not due to the little-cherry virus is the fact that the usual symptom on Mahaleb is not typical "little-cherry" fruit symptoms but a severe wilt and decline that results in death of the tree.

Little-cherry infection usually starts in one of two branches on the tree, with the virus moving throughout the tree thereafter. The progress of the virus often is easily followed by the prominence of little-cherry fruit symptoms during the ripening period. On Mazzard root the orchard tree seldom develops a recognizable symptom in the foliage. However, under some conditions paleness or bronzing of the leaves and a rosetting of the terminals have been reported in areas outside Idaho.

Infected sweet cherry trees on Mazzard do not show decline for many years, the only recognizable symptom most often being the fruit symptom. Sour cherries seem to be a little more seriously affected in that die-back and decline often are associated with the disease. Montmorency trees sometimes produce no marketable fruits within two or three years after infection.

Distinguishing the little-cherry "die-back and decline" in sour cherries from that caused by numerous other debilitating factors is virtually impossible without association of the fruit symptom or painstaking transmission studies and elimination of other causes.

### Chokecherries

Western chokecherries (*Prunus virginiana var. demissa*) are widely scattered throughout the canyons and draws of the West. Control measures aimed at eradicating them would involve prodigious undertakings that are economically unsound and virtually im-

possible at the outset, although destruction of those in the immediate vicinty of commercial orchards probably should be considered. However, there is some doubt that the virus moves freely from chokecherries to cultivated species and varieties in Idaho. Theoretically, this is a good possibility, and because of this there is some reason to know what the symptoms of the red-leaf disease are. Little-cherry virus causes the red-leaf disease.

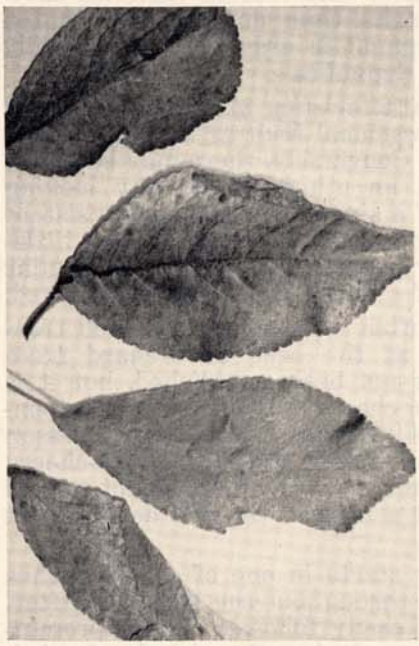

**Figure 4.—An unidentified "red leaf" condition in leaves of Italian prune which is found occasionally in Idaho.**

When the virus enters chokecherry plants, the effect is in a sense a combination of those in cherry orchards on both Mahaleb and Mazzard rootstocks in that there are both fruit and leaf symptoms. Rather than wilting or bronzing, however, the leaves turn red (*Figure 3*). The symptom is much like an unidentified red-leaf symptom sometimes found in Italian prunes in Idaho (*Figure 4*). Before the red color becomes prominent in chokecherries, the leaves become pale as do peach leaves in early stages of symptom development. They are bright red before the end of the first year. Thereafter the red begins to give way to yellowish colors (*Figure 3*, upper).

In general, growth of infected plants is stunted and the leaves are smaller in size. The red color effect is prominent enough on the landscape that surveys by plane were useful in the early stages of the state-wide survey in Idaho.

The fruits develop symptoms like those described above for sweet and sour cherries on Mazzard root.

Infected trees decline rapidly, much as do sour cherries, and often die soon after infection.

### Peaches

Western X-disease in peaches is attributed to the same virus that causes the little-cherry disease in sweet cherries and the red-leaf disease in chokecherries. Symptoms are predominantly foliar but the fruits also are affected.

The primary leaf symptom is one of irregular, vein-crossing spots that develop on the leaves of infected twigs and branches. The spots may be pale green, tan or dark purplish-brown, depending on the variety, the virus strain, and the season (*Figure 5*, right; *Figure*

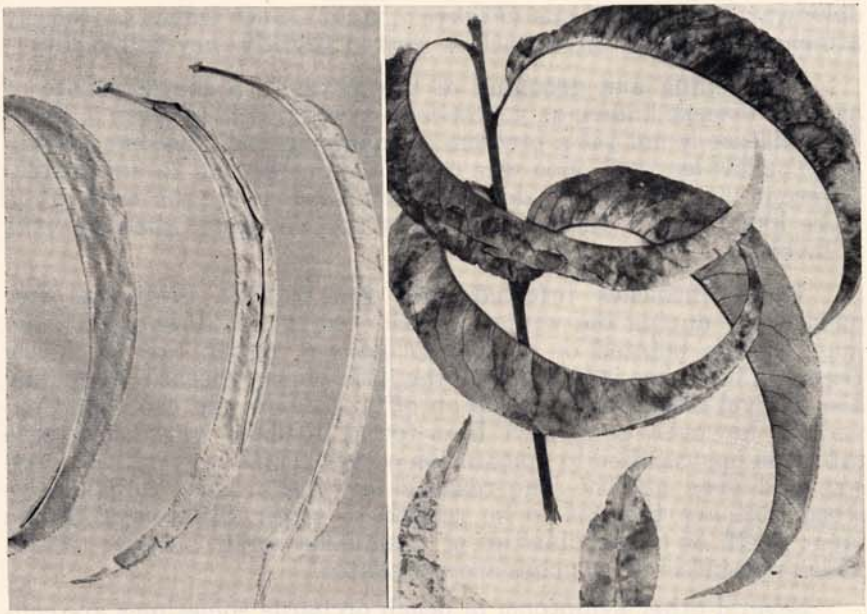

**Figure 5.—Yellow leaf roll disease in peach (left) and typical symptoms of western X-disease (right). Note that in both cases the leaves are rolled upward over the midrib and drooped downward toward the tip.**

*6*, below). The lighter spots often are bordered with a line or ring of purplish color. Late in the season purplish discolorations may extend along the veins. A prominent characteristic of the leaf spots of X-disease is that, as the season progresses, they tend to break loose from the surrounding tissue and drop out leaving the leaves ragged (*Figure 6*, lower). During the same period the leaves tend to roll upward toward the midrib and droop

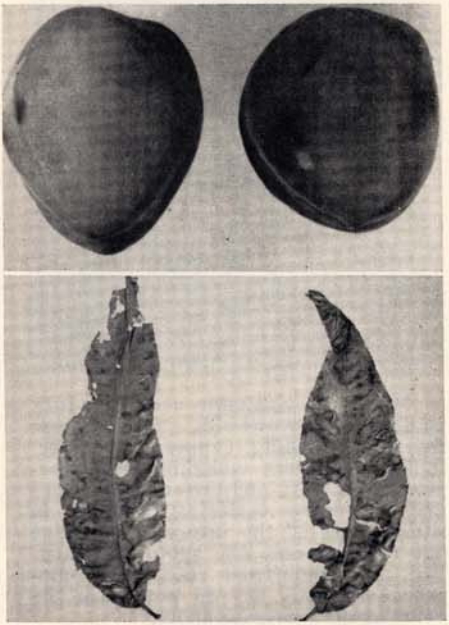

**Figure 6. — Western X-Disease symptoms in peach fruits (upper) and leaves (lower). Fruit symptoms are not common or prominent, but when affected the fruits tend to become pointed, insipid, sometimes shriveled and often drop. The leaves show the irregular, purplish, vein-crossing spots that break up and drop out leaving a ragged leaf.**

downward from the stems (*Figure 5*, right). Such leaves are loosely attached and when the branch is shaken slightly they fall easily.

The rolling and drooping of the leaves is a characteristic of another disease known as yellow-leaf-roll of peach (*Figure 5*, left). This disease is not yet a problem in Idaho but could become a problem. Yellow-leaf-roll once was considered to be due to an entirely different virus, but such does not now seem to be the case. It is more likely that a different strain of the western X-disease virus is involved.

Peach branches infected with the western X-disease frequently die during the winter. Or, the fruits that develop on them may become pointed or conical (*Figure 6*, upper) as do cherry fruits on branches infected with the little-cherry disease. They may also shrivel somewhat, develop an offtype flavor and drop off. Conversely, however, cases have been found in Idaho where X-disease infection has resulted in maturation of few fruits but fruits of large size and good quality. The reasons for this are not fully understood, but are thought to be related to strain differences in the virus itself, or to peculiarities of virus behavior in a single tree in which non-infected branches are stimulated.

Several other symptoms in peach orchards sometimes are confused with western X-disease. They are symptoms of disorders of lesser importance than X-disease in that it is not necessary to destroy affected trees to protect other trees in the orchard.

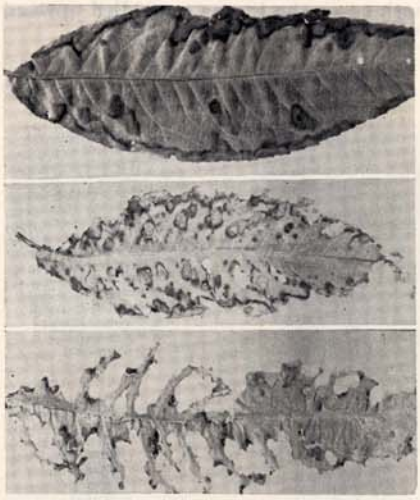

**Figure 7.—Systemic arsenic injury in peach leaves showing an early stage marginal burning (upper), an intermediately severe marginal and intervenous spotting and tattering (center) and a severe tattering (lower) in which most of the intervenous tissue has disappeared. The spots are purplish and sometimes resemble X-disease symptoms but do not cross the veins as do X-disease spots.**

One of the easiest leaf symtoms to confuse with X-disease is injury from systemic arsenic. In such cases the trees have picked up old residues of arsenic from the soil (usually on old apple orchard sites) and translocated the arsenic to the leaves where severe symptoms developed.

Sometimes in the early stages of arsenic toxicity only the margins of the leaves tend to burn (*Figure 7, upper*). *As the* condition worsens, the effect expands inward between the veins and spots of the discolored leaf tissue begin to drop out (*Figure 7*, center). The discoloration of the leaf at this stage is especially like that due to the western X-disease virus in that

it is a purplish color, blending into browns. In advanced stages most of the leaf tissue may be gone (*Figure 7*, lower), but still the effect is predominantly between the veins. This distinguishes arsenic toxicity from western X-disease infection.

Under certain unusual conditions the *Coryneum* blight fungus is capable of causing a purplish spotting and a purple-ringed shot-holing (*Figure 8*, upper), but in this case the shot-holes are small and scattered randomly in relatively unaffected leaf tissue.

Sometimes, particularly in newly set orchards or in flowering peach varieties, a reddish - purple - brown leaf spotting develops (*Figure 8*, lower) which can be confused with some forms of western X-disease symptoms. Here again, however, the spots are smaller and more localized.

**Figure 8.—Coryneum blight shot-holing of peach leaves (upper) in which the margins are purplish and a genetic purplish leaf spotting of flowering peach (lower) that have some of the characteristics similar to those of X-disease symptoms.**

Various forms of mechanical injury such as wire girdling are capable of causing a reddish-purple discoloration in peach foliage that is suggestive of western X-disease. Other factors sometimes enter in, but are less directly confused with the spot symptoms themselves.

## Varietal Reaction

Describing differences in varietal reaction to the western-X or little-cherry virus is difficult when certain other influences are considered, such as those found in local environment characteristics and in the fluctuations of weather. A few generalities can be made, however, and are worthy of mention.

The virus is capable of causing disease in all common cherry and peach varieties, in nectarines, and in certain varieties and hybrids of apricots and plums. However, the disease has never been found in Idaho in Moorpark apricot or in Italian prune. Reports from elsewhere indicate that even when these two varieties have been grafted with infected wood, symptoms have not developed except in root suckers when the root stock is peach. This indicates a high degree of tolerance in these varieties.

Little-cherry symptoms in cherries on Mazzard and Mahaleb rootstocks previously described emphasize the differences in varietal reaction to the virus of the rootstocks themselves.

Experimental inoculation studies conducted by various stone fruit virus workers have shown that the virus can be transferred to several other varieties and hybrids, including almond. These hosts have not been infected in economic proportions in the field.

## The Virus Complex

As more information on viruses in tree fruits has been accumulated, the term "complex" has arisen to satisfy the need for a word meaning several different viruses or virus strains thought to be largely of one parent type. Originally each disease, e. g. little-cherry, western X-disease, red-leaf, etc., was considered to be due to an individual virus. As research continued, similarities began to be noticed among several of these virus diseases. The practice now has arisen in which research people attempt to relate such viruses or virus diseases as much as possible in order to reduce the confusion existing in investigation of those viruses.

Such has been the case in recent years where the little cherry or "western X-little cherry" virus is concerned. The investigation is by no means complete, but some of the more prominent diseases that may prove to be members of the western X-little cherry complex are the "buckskin" of California cherry orchards, the "X-disease" of peaches in the eastern United States and Canada, the "albino" of Oregon cherry orchards, the "little-cherry" of British Columbia, the "pink-fruit" of cherries in western Washington, the "small-bitter-cherry" of British Columbia, and the "yellow-leaf-roll" of peach in California. The commonly encountered "western X-disease" of peach and "western X-little cherry" of cherries are distributed throughout the western states and the Northwest in particular.

There are differences in all the above named diseases but there are similarities also. As the names indicate, their symptoms are different in one or more characteristics. Their rates of spread within a variety and among varieties also are different. For example, interplanting of peaches and sweet cherries is a common practice in Idaho, yet there is insignificant development of little-cherry in the cherry trees of such orchards even when there is a great deal of X-disease in the peaches. Moreover, the little-cherry disease seems to spread in cherry orchards much more slowly than does X-disease in peach orchards. There has been little evidence accumulated in Idaho to indicate that the presence of red-leaf infected chokecherries nearby results in greater incidence of the little-cherry or X-disease disorders in commercial orchards. On the other hand, there does seem to be a correlation in some other parts of the West and in the eastern United States.

## Control Suggestions

The foremost recommendation in Idaho is based on the four-year state-wide survey. The grower is urged to inspect his orchards frequently for evidence of little-cherry or western X-disease. When such trees are located, he should destroy them at once and suckers should not be allowed to come up from parts of the root system that may remain. Replanting in the same spot is not recommended for at least one year to allow for complete dying of old root system parts. Once they are dead the odds on contamination of the new tree are so low that, for practical purposes, they are non-existent. Moreover, sufficient evidence has not been accumulated to indicate that the virus can survive in the soil outside the living root tissue.

Roguing, or tree pulling, operations can keep the diseases in check where a serious effort is made to discover infected trees early and where such trees are destroyed as soon as they are found. Obviously a heavily infected orchard cannot be rogued economically. In such cases it is suggested that for the good of the whole area the orchard be destroyed. As a second choice the orchard may be maintained without roguing as long as it is profitable for the grower to do so. In orchards where only a few trees are infected, the grower is urged to destroy them because of the danger that the virus will spread through the orchard and because of the excellent opportunity offered for keeping the disease from getting out of hand in that orchard. This is of great importance in peach orchards because the X-disease spreads rapidly.

Routine observations made during the four years since the Idaho survey was terminated have shown that where growers continued to watch for and remove infected trees the virus has not been nearly as damaging as it once was. The effect has been much more pronounced in cherries than in peaches. In several cases where infected cherry trees were pulled in 1948 or 1949 no new cases have developed.

Although there is no proof that infected chokecherries near Idaho orchards are a serious threat to the orchards, it is recommended that chokecherry growth be discouraged for a considerable distance in all directions. This is a precautionary measure based entirely on reports that have come in from other parts of the country. A distance of at least 500 feet has been recommended in such areas as desirable between chokecherries and orchard trees.

Thus far there is no satisfactory spray or other chemical treatment that can be used to free an infected tree of a virus. Certain heat treatments have done so in strawberries and appear promising in experiments recently reported with small trees, but the principle obviously cannot be applied to existing orchards. The value of such chemo-therapeutic or physico-therapeutic measures, should they be developed successfully in the future, will be in establishing and maintaining virus-free source materials from which nurseries can propagate clean planting stock. This is not yet a reality by any means.

Disease resistance or tolerance is by far the best approach for virus disease control. As indicated in the preceding description of differences in varietal reaction, some varieties are less affected than others. Research programs in the various states of the United States and the provinces of Canada are continuously encountering new differences in reaction to the virus. Thus far there is no good resistance or tolerance generally available to the industry, although progress is being made in developing such traits. Much time has been spent and much more will be necessary before the problem is solved, but within 10 years significantly tolerant or resistant varieties may be available to the public. In the meantime, good production can continue where good cultural practices are followed and where good roguing operations are maintained for the control of virus diseases.

Cooperative Extension Work in Agriculture and Home Economics, James E. Kraus Director, University of Idaho College of Agriculture and United States Department of Agriculture Cooperating.
Issued in furtherance of the acts of May 8 and June 30, 1914.