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Cherry Crinkle-Leaf and Deep Suture Disorders

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INTRODUCTION

Crinkle-leaf ("bull trees," "unproductive cherry," or "male trees") and deep suture are very important disorders of sweet cherry because they are so widespread and have such a damaging effect on vegetative growth and fruit yield. Both disorders have been reported throughout cherry producing regions of California, the Pacific Northwest, Utah, and British Columbia. Although there is no complete accounting of the economic impact associated with affected trees in California, these two disorders together probably cost sweet cherry fruit and nursery tree growers more money each year than any other disease or disorder.

Over the past decade or more incidence of crinkle-leaf has fluctuated widely, seemingly independent of rainfall rates. One cherry orchard in particular had an abundance of crinkle-leaf one year but was virtually free of the disorder the next year, following a winter of normal precipitation. Boron nutrition may have been a factor in the transient nature of crinkle-leaf in this orchard: C. G. Woodbridge has reported results (based on his research in Summerland, British Columbia) that support this interpretation, and boron-deficient trees are often known to be poor-bearing. Woodbridge showed that cherry trees with narrowed leaves and irregular leaf margins (symptoms resembling those of crinkle-leaf) produced normal leaves on new growth after boron applications. Water inputs from rain or irrigation may alter the availability of soil-bound boron, making more of it available for uptake by trees.

CRINKLE-LEAF

Transmission

Cherry crinkle-leaf is neither contagious nor transmissible by normal methods of virus transmission, yet it is easily propagated through standard horticultural practices. It is thought to arise from bud mutations and may occur spontaneously on previously unaffected tree branches. Even though crinkle-leaf cannot be transmitted, buds taken from affected trees and used for propagation can perpetuate the disorder in subsequent generations of trees. Conversely, unaffected buds grafted onto crinkle-leaf–affected branches produce normal growth. Even though field observations of crinkle-leaf might suggest that the disorder can spread, increases seen in orchards appear to result from the development of symptoms from spontaneous mutations.

Distribution and spread

The 'Bing' and 'Black Tartarian' (*Prunus avium*) cultivars are most widely affected by crinkle-leaf. More crinkle-leaf is generally observed in hotter growing areas; the disorder is more prevalent in California than in Washington or Oregon. 'Lambert' and 'Royal Ann' ('Napoleon') cultivars do not regularly exhibit symptoms of crinkle-leaf. Crinkle-leaf has also been reported on *Prunus domestica* cv. 'Italian Prune.' In cherry, the disorder may affect only a single branch or spur of a tree, or it may affect the whole tree. Trees with the disorder may not exhibit symptoms for several years after planting.

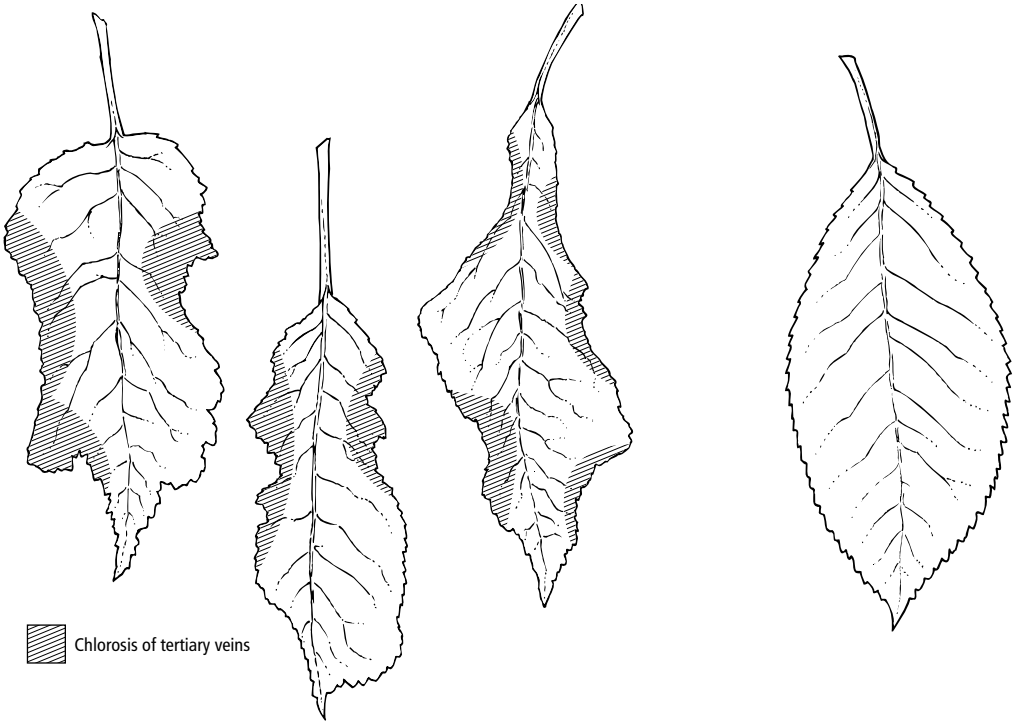

Figure 1. Leaf symptoms of crinkle-leaf on sweet cherry; healthy leaf at right. The shading indicates areas of chlorosis (yellowing) of tertiary veins where the leaf edges are irregularly shaped. Chlorosis may extend nearly to the center vein.

Leaf symptoms

Symptomatic leaves are variously misshapen and mottled; their margins are abnormally serrated, rough, and irregular (Figure 1). Leaves are narrower, and leaf bases are narrower and more angular. Leaves are lighter-colored than normal or are silvery. Leaves that develop later in the season will not normally be so severely affected as those that develop in the spring.

Growth, blossoming, and fruit

There is no difference in the rate of growth of affected and unaffected trees. Crinkle-leaf–affected trees often produce profuse quantities of flowers that may or may not open. Reproductive parts are often defective and smaller than those on normal trees. Pistils are often discolored (brown) as well as short and malformed. As a result of these abnormalities, crinkle-leaf–affected sections of trees produce few or no fruit. Fruit that do form are small, rough, and misshapen, with a pointed end, a raised suture line, or uneven ripening (Figure 2).

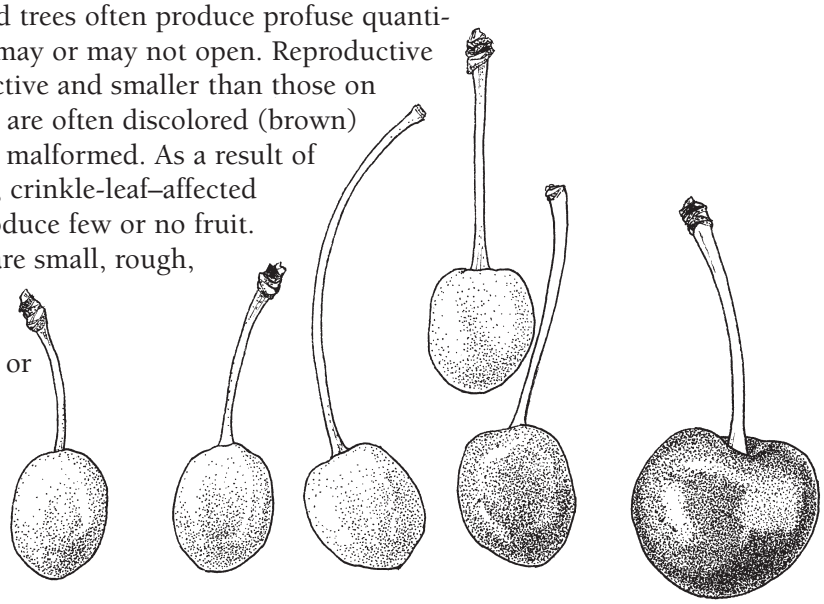

Figure 2. Fruit symptoms of crinkle-leaf on sweet cherry; normal fruit at right.

Control: What to do?

We do not know why certain buds produce crinkle-leaf. We do know that certain buds from specific trees will have a greater potential to produce crinkle-leaf as they develop. As a consequence, it is important to know the history of the budwood being used in your orchard and to select budwood from trees with a low potential for crinkle-leaf. In the nursery, mother block trees should be inspected regularly, especially early in the season (April, May, and June), and any crinkle-leaf–affected trees or portions of the canopy should be cut out. Select budwood source trees at this time: crinkle-leaf is more easily recognizable during this period than in the fall. Progeny performance records from budwood source trees would help ensure your ability to select budwood with a low or reduced potential to produce crinkle-leaf trees. Budwood should not be taken from trees that show any symptoms of the disorder. Because crinkle-leaf is more common on weaker lateral shoots in the lower parts of low-vigor trees, regular, invigorating pruning may help to minimize the occurrence of crinkle-leaf in source trees.

Top-working with crinkle-leaf–free sources of identical or more desirable sweet cherry varieties is recommended. Regularly inspect young trees. Top-work the trees while they are still young (5 to 6 years old).

DEEP SUTURE

Cause

Deep suture is not graft transmissible, but it is thought to be genetic in origin.

Distribution and spread

This disorder has been reported throughout the sweet cherry growing regions of the western United States and Canada. The disorder has not been proven to spread from tree to tree in orchards. Whole trees or portions of trees can be affected. Deep suture occurs commonly on 'Bing' and 'Black Tartarian' cultivars.

Symptoms

Affected fruit have a deepened groove or are cleft along the suture line (Figure 3), which is subject to splitting and colonization by fruit rotting organisms. Fruit set is not always reduced, but the fruit have abnormal shapes. Trees affected with deep suture grow slowly and can be dwarfed. 'Bing' cherry leaves show deep suture symptoms that differ from those of crinkle-leaf, although both produce malformed leaves with more or less regular margins. Deep suture leaves are much narrower than those affected with crinkle-leaf, and the narrowness helps to distinguish between the two disorders (Figure 4). Affected leaves are leathery with a pebble-like surface texture. The best time to view leaf symptoms is in the spring. A faint interveinal chlorosis may be seen on affected leaves in late spring. Leaf and fruit symptoms must be present for proper diagnosis of deep suture disorder.

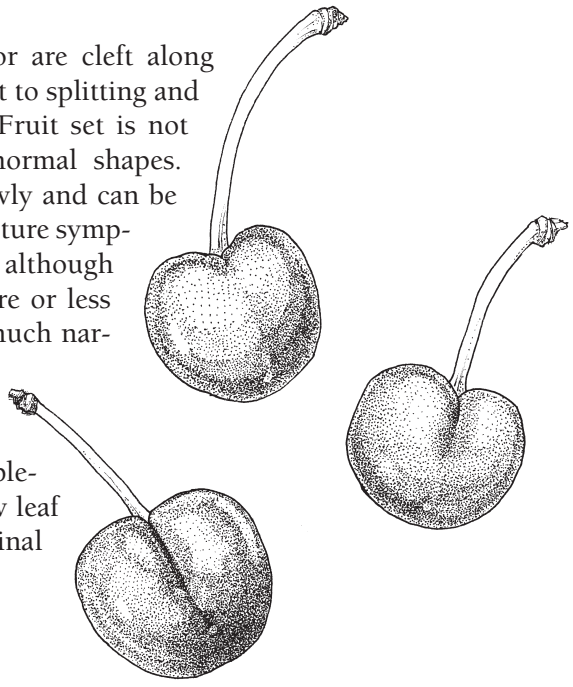

Figure 3. Fruit symptoms of deep suture on sweet cherry; normal fruit at top.

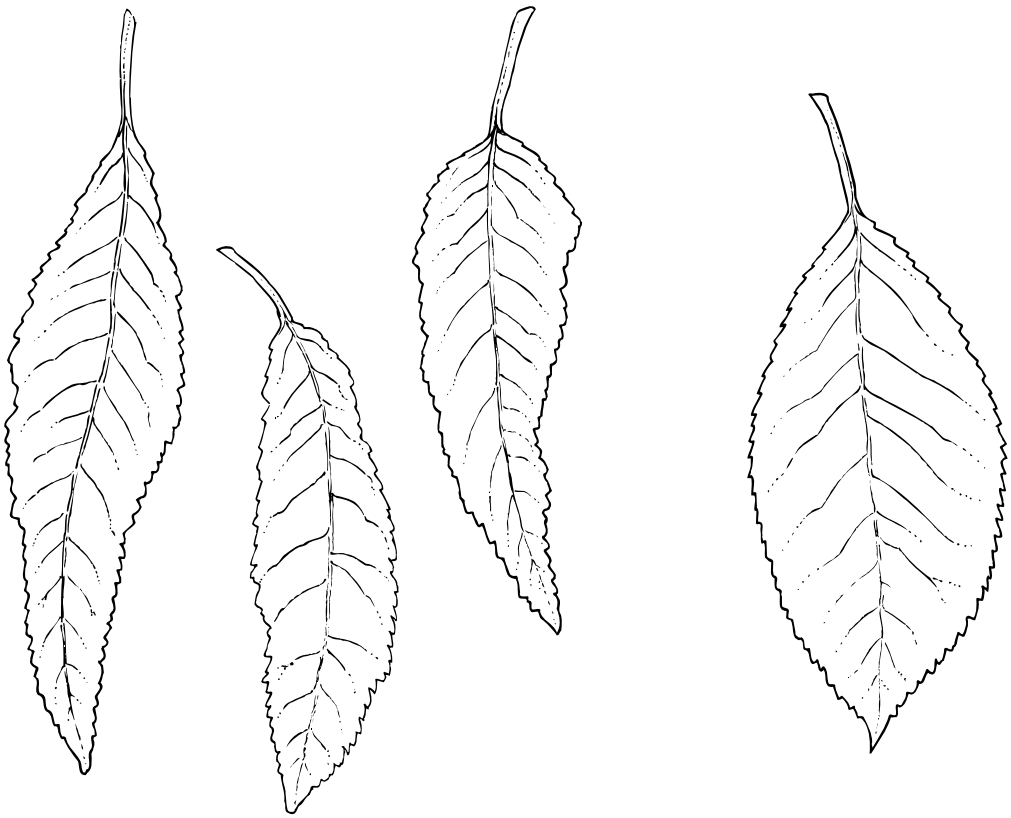

Figure 4. Leaf symptoms of deep suture on sweet cherry; normal leaf at right.

Control: What to do?

Control mostly takes the form of prevention. Use the same procedures as those outlined for crinkle-leaf with regard to the selection of budwood and nursery sources.

FRUIT ABNORMALITIES (DEEP SUTURE, DOUBLES, SPURS) AND TEMPERATURE

Bud development

'Bing', 'Burlat,' 'Van,' and several other cherry cultivars in many California growing regions produce high numbers of fruit with deep suture. Some years are worse than others. Deep suture may be severe enough to make the cherries unacceptable as US#1 grade. This disorder arises in the bud during flower formation. Research to document the development of cherry flower buds has shown that floral initiation begins in mid-May (California, Central Valley conditions). Inside the developing buds, carpels (which ultimately develop into fruit) begin to take shape at the end of June. Double fruits form when two carpels fuse together during development and grow to equal size. Spurs also arise from two carpels fusing together, but in this case one fruit does not develop fully and remains as a small attachment on the other normal-sized fruit. In a fruit with deep suture, the carpel margins do not fuse at the base and remain open. By mid- to late July, floral buds with the potential to produce double or spurred fruit can be distinguished under a microscope. The potential for deep suture cannot be evaluated until bloom.

Temperature

The number of 'Bing' cherry fruit exhibiting deep suture increases when summer temperatures are very high during bud formation. Slight increases in average daily temperatures in July, August, and September correlated closely with increased incidences of deep suture in 'Bing' (Figure 5). As periods of elevated temperatures (average daily temperatures above 77°F [25°C]) in July and August grow longer, the incidence of spurs and doubles increases (Figure 6).

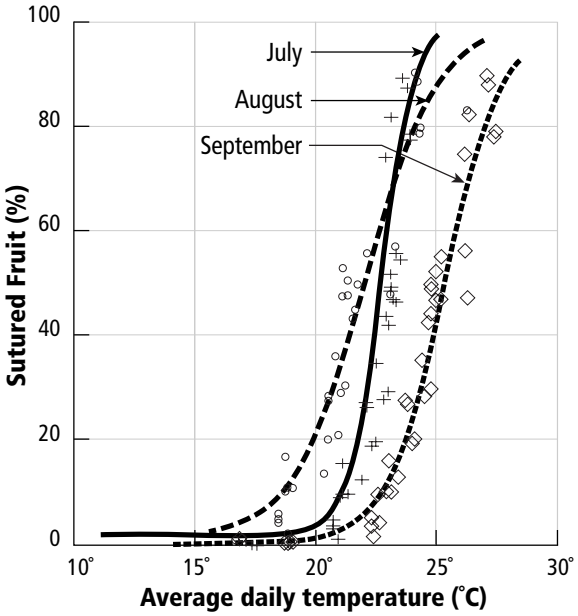

Figure 5. Percentage of fruit with deep suture as a function of average daily temperatures during bud formation (July, August, and September)

Control

Growers can use over-tree sprinkling to reduce the average daily temperature in the tree canopy (and so on the buds) and with it reduce the incidence of doubles, spurs, and deep suture. Water used for this purpose should be low in dissolved sodium, chlorine, carbonates, and boron. The sprinkling period should extend from late June through early September, and it is especially effective from late afternoon until sunset. Sprinkling should be intermittent if possible and should begin when temperatures exceed 95°F (35°C). Regular irrigation is still required, and water stress during the growing period from late June to early September should be kept to a minimum. Neither additional under-tree irrigation nor the use of cover crops has proven effective at sufficiently reducing canopy temperatures and thus the incidence of suturing in seasons when the potential for suturing is high.

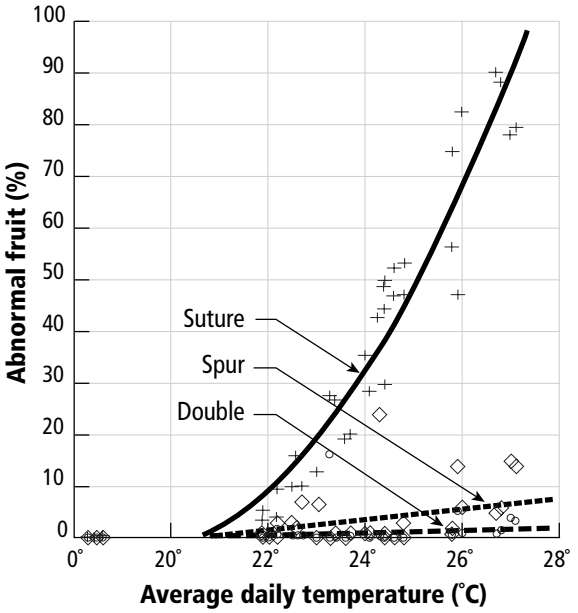

Figure 6. Percentage abnormal fruit by category (deep suture, spur, double) as it correlates to average daily temperatures

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FOR MORE INFORMATION

You'll find detailed information on many aspects of cherry production and other stone fruits in these UC ANR publications:

Diseases of Temperate Zone Tree Fruit and Nut Crops, publication 3345

Integrated Pest Management for Stone Fruits, publication 3389

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