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Physical Injuries to Trees, with Special Reference to Winter Injury

By
S. M. Zeller and O. T. McWhorter

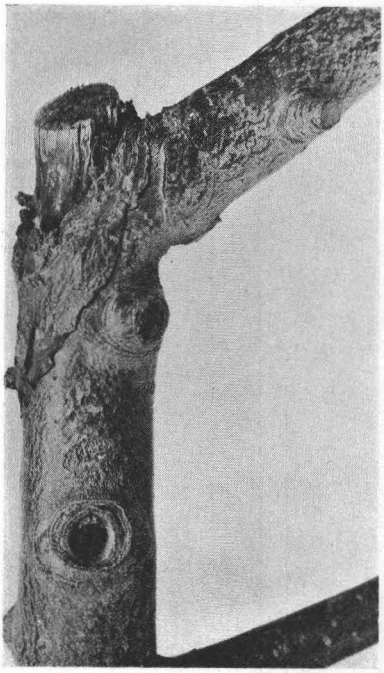

Figure 1. Heart-rot canker near a poorly executed pruning cut. Such pruning cuts never heal and are always courts for infection by wood-rotting fungi.

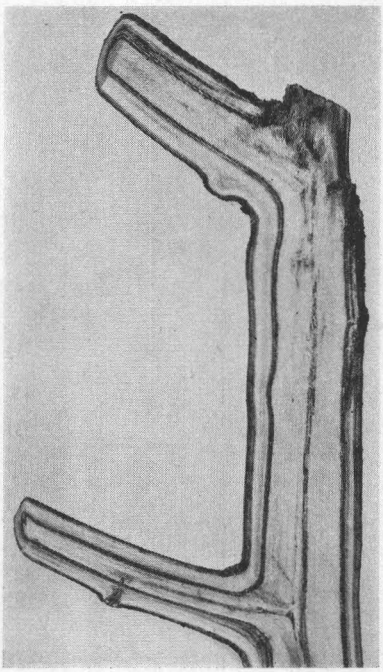

Figure 2. The interior of the same pruning cut and heart-rot canker as illustrated in Figure 1. Notice that all of the wood within the dark line is thoroughly rotted, leaving too small a proportion of wood for the conduction of sap.

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Figure 3. Pruning cut improperly made. The cut is diagonal so that the right side, which is even with the parent branch, is healing well, while the left side, which is long and stub-like, cannot heal. The bark was also stripped off below so that healing there is very slow.

Physical Injuries to Trees with Special Reference to Winter Injury

By

S. M. ZELLER and O. T. MCWHORTER

HOW to care for winter injury and other types of bark or wood injury in trees is always a live subject for the orchardist or for those who have valuable ornamental or shade trees.

Trees with large wounds left without care usually become devitalized with heart rot, a condition that may weaken the tree later until it cannot withstand the stress of wind or heavy crops. It also makes the tree more susceptible to winter injury.

Heart rot is a disease of the tree wood. The idea is too prevalent that heart rot is an inherent part of the life history of the tree. This is not true. *Heart rot is always caused by a fungus that enters through wounds in the bark or exposed wood.*

The wounds may be due to any cause, such as the following: cankers caused by parasitic fungi or bacteria, mechanical injuries such as pruning cuts, abrasions made by orcharding implements, or winter injury.

Neglect of wounds a source of loss. No matter what may be the cause of the wound, it should not be neglected or serious losses will be experienced. Early each spring the orchardist should make a thorough survey of all trees and treat *every wound* deserving attention.

The purpose of this bulletin is to discuss briefly the following items:

Winter injury and some specific suggestions concerning treatment.

How to treat wounds of all kinds.

One or two wound dressings and tree washes.

WINTER INJURY AND ITS TREATMENT

Early cold weather severe. During severe winters, low temperatures produce canker-like areas on bark. On the southwest side of tree trunks and scaffold branches winter "sun scald" may occur, due to the action of the sun in warming the tissues in the daytime, alternating with the severe cold of the nights. To avoid this injury, boards or barrel staves sometimes are driven into the ground on the south side of young trees to afford shade in the middle of the day, or whitewash may be applied.

General injury also may occur on the side of the tree facing severe freezing winds. Unusually cold weather, such as that of October, 1935, may come before the trees are dormant enough to withstand low temperatures. Those portions of a tree which go into dormancy early in the fall will show less injury than those in which the dormant stage is delayed. Trees that are but partly injured usually, therefore, will show most injury in

such places as the crotches, the bases of branches, and perhaps low on the trunk, while tips of branches may show no injury.

Identifying freeze injury. Freezing injury is identified in the spring by the dead bark that usually has a sour odor. The bark may crack and peel, exposing a discolored cambium and sap-wood (black in the case of pear and walnut tissues), or adhere and shrink as it dries out, forming a sunken area. In other cases a new bark is developed beneath the old, which eventually scales off. Sometimes the wood is killed, but the cambium and inner bark remain alive. In such cases, a new sap-wood cylinder is grown covering a dead, black or dark brown heart. This "black heart" wood can be kept sound if protected from wood-rotting fungi. Winter injury cankers are commonly inhabited by wound parasites, such as those causing perennial, European, black rot, Cytospora, and superficial canker, as well as by wood-rotting fungi. For this reason all cankered areas after becoming clearly defined should be thoroughly cleansed of all dead, loose, or ragged tissues and coated with a wound dressing. (See page 7.)

Immediately after a freeze, trees should be examined but unless the bark is split, due to drying out, the trees should be left alone until spring when the injured areas are well defined.

Tacking loose bark sometimes is helpful. When bark is split and loose because of winter injury, it should be tacked down to keep the wood from drying out. Large-headed galvanized roofing nails are believed best because of beneficial effect from the zinc on the nails. The outer layers of wood are most important and every effort should be used to keep them alive.

Bark splitting for freeze injury inadvisable. Splitting the bark to prevent the spread of so-called "sour sap" is a bad practice and should not be followed.

Growers are cautioned against hasty action where winter freezing causes discoloration of the cambium layer or other tissues. Many times under favorable weather these tissues may clear up. It is always best to let nature take its course and in all cases no cutting should be done until spring growth is well under way, when dead parts can be seen quite easily.

Early dormancy aids winter injury control. Prevention of winter injury is aided by orchard practices that will throw the trees into the dormant stage early in the fall. In cultivated orchards, thorough cultivation early in the season is advised, but the operation should cease early enough to allow the trees to harden in the average season. No cultural practice, however, would have warded off the injury to certain kinds of trees in the fall of 1935.

A cover crop planted in August will do much to take care of any excess moisture in the fall. In irrigated districts, no water should be used late enough to hinder early maturity. Susceptible trunks and branches may be helped by painting with whitewash in the fall or early winter.

Trim and clean cankers only when necessary. Only when the grower is sure that the value of the branch warrants it, should cankers and other wounds be trimmed and cleaned. Tools must be sharp, a knife such as that used for budding being useful in cutting along the margins. For cleaning out crotches and crevices a farrier's knife is useful, while a drawshave may

be used for scarifying larger surfaces. When all of the diseased or dead and worthless tissue is removed, the wound should be shaped so as to be pointed above and below (Figure 4), since this facilitates healing (Figure 5). The edges of the wound should be cut at right angles to the bark surface because slashed cuts do not heal so readily.

The unhealed wound shown in Figure 6 is the same age as the healed wound shown in Figure 5. A square cut across the bark prevents rapid healing. If triangular pieces of bark in Figure 6 had been cut out at the top and bottom of the wound the calluses would have converged more readily to heal over the wood as in Figure 5.

Where a horizontal gash is found in the trunk of a tree the wound, therefore, should be made larger by streamlining at the top and bottom. Such treatment will result in much more rapid healing due to the fact that where a horizontal break in the bark occurs the top and bottom will be blocked by a transverse callus which will obstruct the natural lateral healing process (Figure 6).

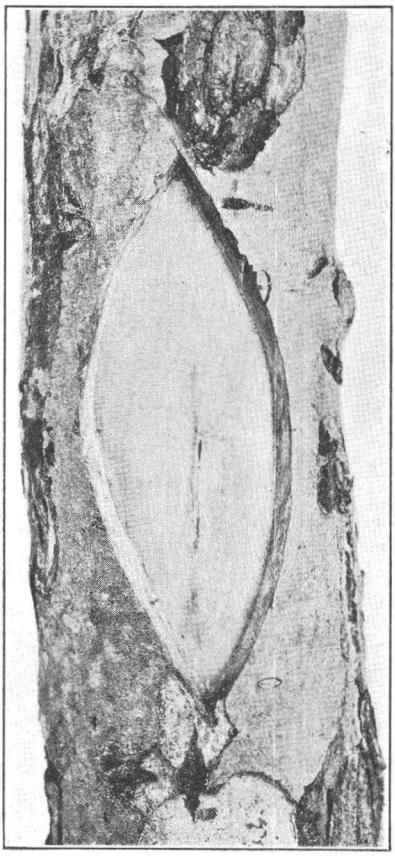

Figure 4. Proper shape to leave wound resulting from the removal of a canker or other bark injury. Notice the pointed ends of the wound and the perpendicular cut of the bark. Such stream-lined wounds heal best.

Pruning cuts. When it is necessary to remove a whole branch, care should be taken to make the cut as near the parent branch as possible. This aids early healing. Stubs of branches can never heal (Figure 1); they die and become infection courts for wood-decaying fungi (Figures 1 and 2).

If orchard practice has been such that cavities and decayed hearts are present, a few simple methods of tree surgery now may obviate the need of much greater use of time and money later. The heart of a tree is dead wood and is of no importance to the tree except for strength. Its removal, if decayed, therefore will not be a detriment; it may be beneficial and worth while in cases where the time and labor involved are not too great. A mallet, chisel, and gouge are the essential tools. If the cavity extends down the branch for a considerable distance, it should be provided with a hole as a drain at its lower end, or if the cavity is cup-shaped the lower edge of the cup should be cut away to allow drainage.

TREATMENT OF WOUNDS

Large wounds must be properly and adequately treated to prevent heart rot. Orchardists often ask whether all wounds should always be covered with a dressing. In order to answer this question intelligently a survey was made of many well kept, consistently sprayed apple orchards in Western Oregon. This survey has revealed a surprisingly low percentage, less than 1 per cent, of wounds infected with heart rot. In pears such wounds are practically no more frequent; i.e., 1¼ per cent infection.

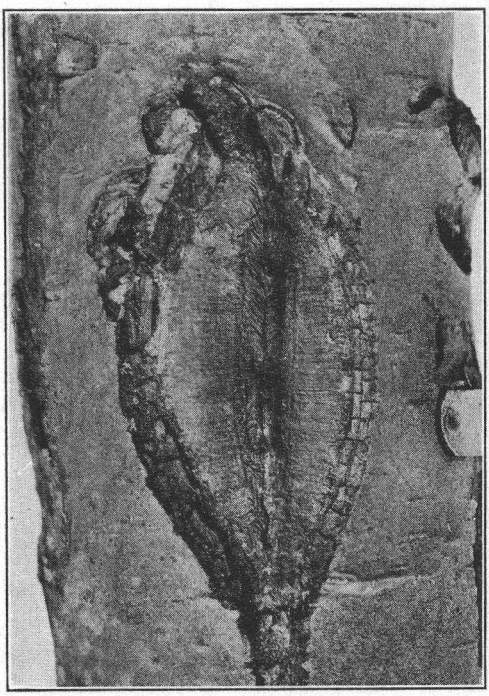

Figure 5. Wound, stream-lined as in Figure 4, which healed perfectly in three years.

In abandoned apple orchards, however, heart rot which apparently had entered through pruning cuts was found to run as high as 11½ per cent. Therefore in apple orchards of Western Oregon where bordeaux sprays for the control of anthracnose and other fungous diseases have been applied consistently, heart rots are not a menacing factor, unless some special condition (such as severe winter injury) has arisen, necessitating very large wounds or pruning cuts. The usual spray program in pear orchards seems to be sufficient to wash the ordinary pruning cuts for the prevention of infection by wood-decaying organisms.

Guard against infections. No chances should be taken with any wounds of considerable size, however, for the time necessary to bring about complete healing also allows too great chance for heart-rot infection. One cannot say that smaller cuts will not be infected to some extent in well sprayed orchards, especially under the semi-arid climatic conditions of Eastern Oregon, but the orchardist certainly should treat all apple and pear wounds two or more inches in diameter with a fungicidal wound dressing. This should be done as soon as practicable after the wounds are cleaned out or pruning is finished. If the weather is relatively dry when the wounds are fresh two or three days may not be too long to wait before bordeaux paste is applied; but under damp conditions spores on the surface of wood will germinate in a few hours. Then, too, in an extremely short time spores may

be drawn so far into the wood with rain water that the fungicide will not reach them effectively.

Prepare wounds correctly. There is a correct way as well as a wrong way to prepare wounds for successful and rapid healing. All the sides should be smooth and streamlined as shown in Figure 4.

WOUND DRESSINGS PREVENT INFECTION

The sole object of painting a tree wound is to prevent the wood from infection by decay-producing organisms until the wound is healed by callus formation. Wound dressings do not induce more rapid callus formation, but the protection they give allows the growth of healthy tissue over the sound wood.

There are many antiseptics for tree wounds that have been recommended by different experimenters and applied with various degrees of satisfaction. These wound coverings are either "air tight" or "air porous." Asphalts, lead paints, and grafting waxes are sometimes used as "air tight" coverings, while some coal tar products and bordeaux paste or bordeaux paint are examples of "air porous" coverings. There have been some objections to both kinds of dressings. The chief objection to the "air tight" coverings is that the moisture back of such a coat will rupture it and there will be enough of the sap retained behind the coat to keep the wood moist and thus to insure rather than prevent infection by wood-rotting fungi. For this reason the plant pathologists at the Oregon Experiment Station for some time have recommended the use of an "air porous" wound antiseptic since the trees under Western Oregon conditions usually are relatively sappy during the winter months.

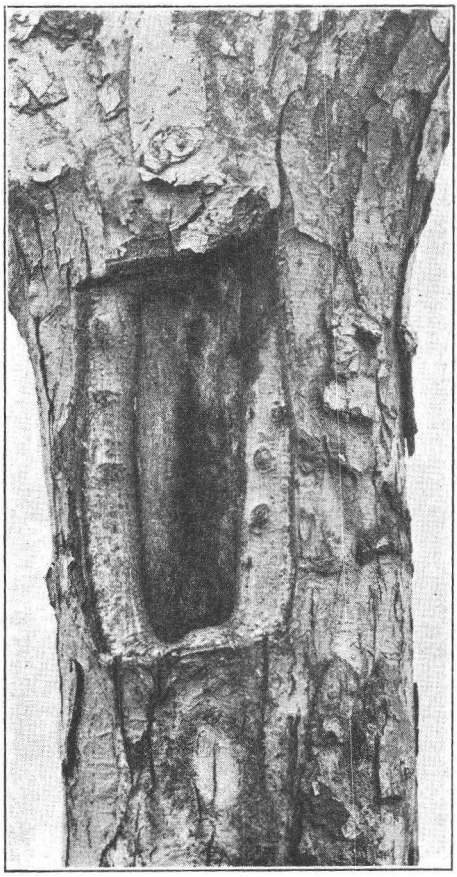

Figure 6. A poorly shaped wound. Notice that the ends have very little callus. Such wounds heal very slowly, affording a ready entrance for wood-decaying fungi if untreated.

For this dressing bordeaux paste made up with

water has been used with success, except that it is not durable and the orchardist cannot afford to repeat the wound dressing each season. If the pruning operations must be done during wet weather, however, bordeaux paste should be used at once as a temporary coat. This paste is a heavy bordeaux made in the usual way or by mixing a bordeaux powder with water.

Bordeaux paint is a good dressing. The permanent wound dressing that more nearly combines the necessary properties for a successful tree paint is bordeaux paint. This is a wound coating that will remain for at least four years. Bordeaux paint should not be applied to fresh cuts because the oil may injure exposed cambium.

If applied after the callus begins to form it does not injure the bark, makes a close union with the wood, is not hard or thick enough to prevent free callus formation, and is easily applied. If made up properly it forms a skin-like coating as does a lead-paint, although sufficiently "air-porous" so that pockets are not formed behind it.

How to prepare Bordeaux paint. This wound dressing is made by stirring raw linseed-oil *into* one of the commercially prepared bordeaux dusts. A quantity of the dust, sufficient for the project at hand or convenient for a day's operations, is placed in a pail. While stirring, raw linseed-oil is *slowly* added until a thick smooth paint is formed. It is desirable that the paint be thick when prepared, for it apparently becomes thinner after standing a short time. It is most conveniently applied with a brush and should be brushed out to a thin smooth coat.

Tree whitewash frequently used. Whitewashing trees is widely used as a preventive for sunburn or winter injury of young trees and for the protection of old trees that may have exposed parts.

A tree-whitewash formula that was used by the Oregon Agricultural Extension Service in a trial with six other mixes in 1935 gave promising results for adhesiveness.

It is as follows:

4 ounces domestic powdered casein.
1 quart of skim milk.
4 pounds of quick lime. (Do not substitute.)
Soak the 4 ounces of casein in 1 quart of hot water for 2 hours.
Water-slake the quick lime.
Add the casein to the lime and stir thoroughly.
Add the skim milk.
Add water to make 1 gallon or thin to the consistency of housepaint.
Apply to the trees with brush. Cover the tree trunks and lower parts of scaffold limbs.

Note: A lime mix using ½ skim milk and ½ water rated third in this trial for adhesiveness.