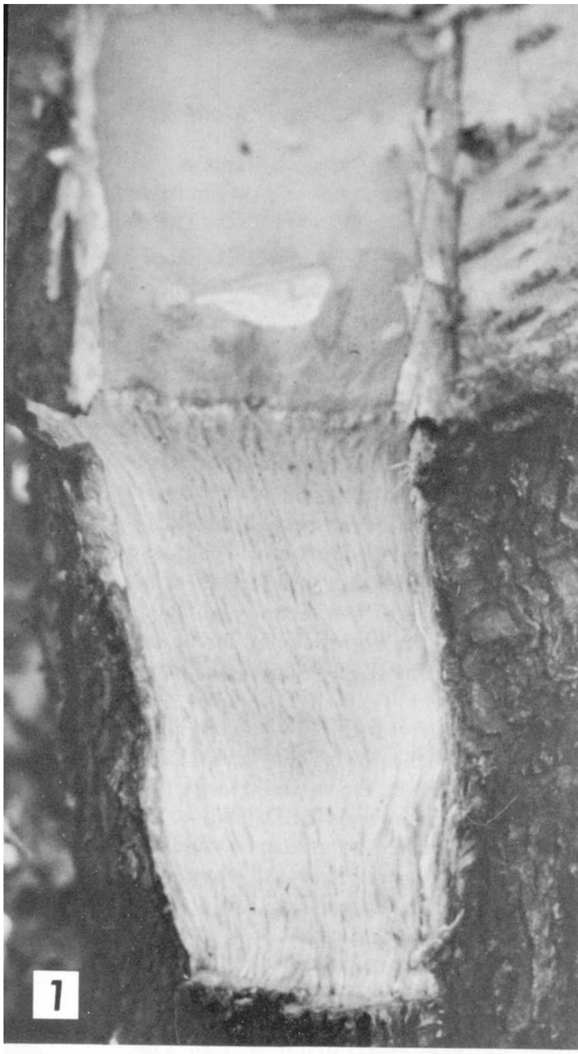

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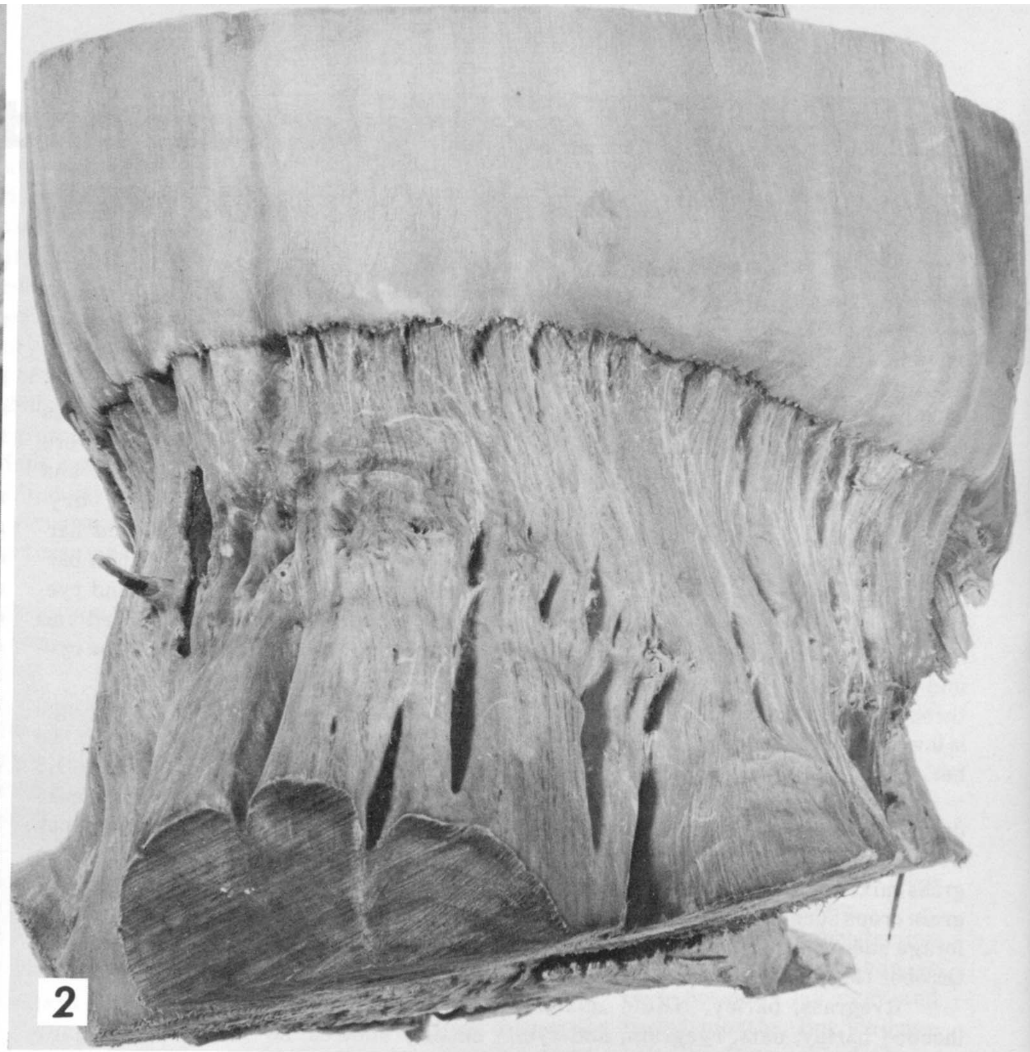

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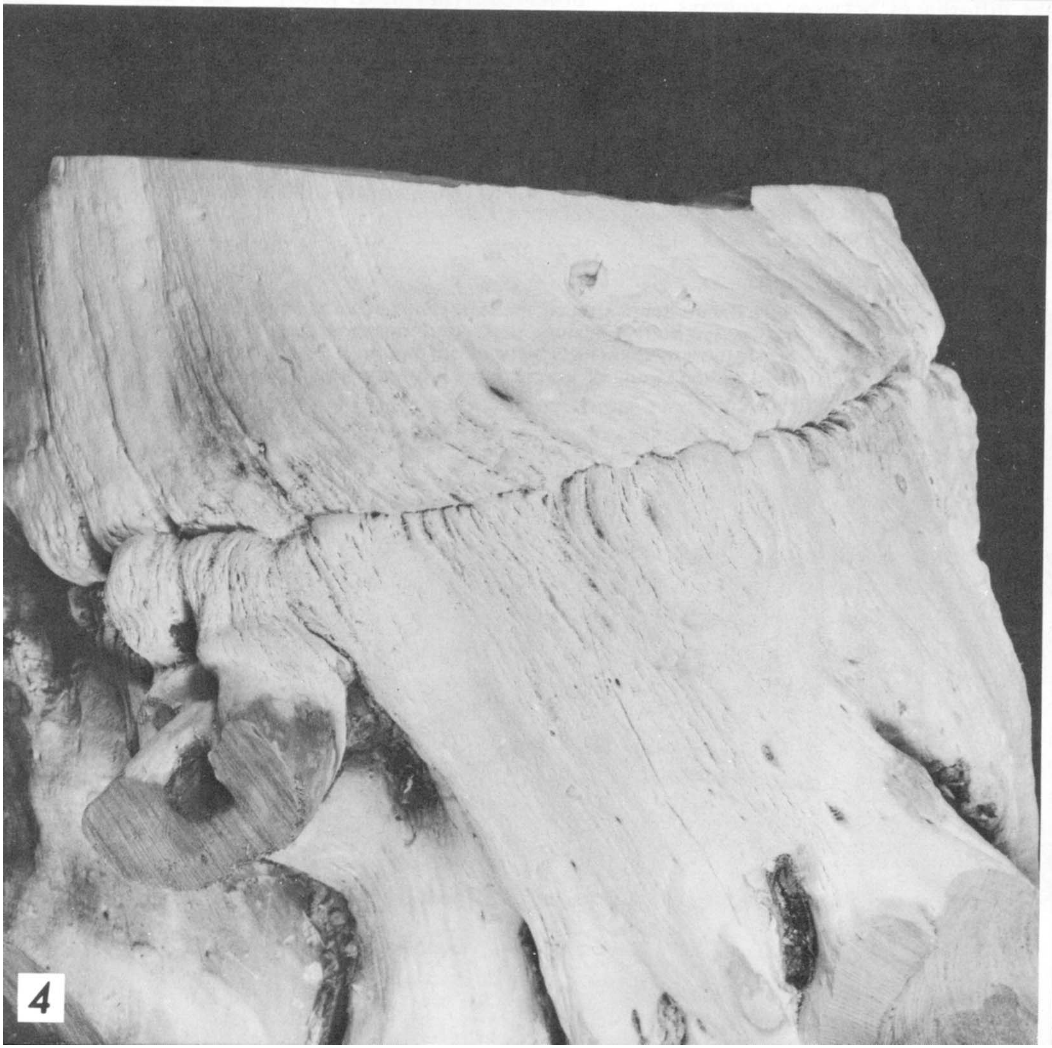

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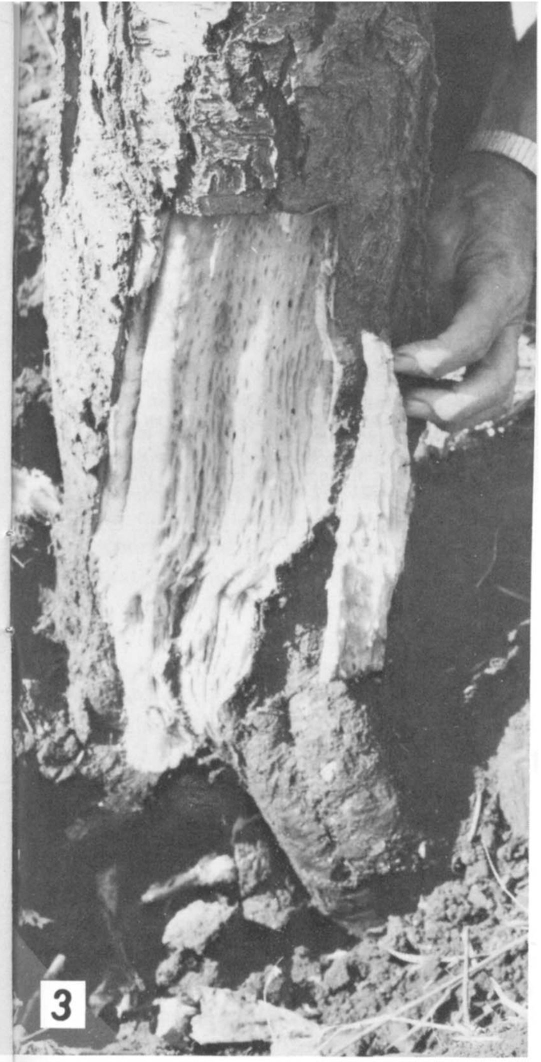

Stem pitting disease of cherries and other stone fruits

Srecko M. Mircetich ■ William J. Moller ■ George Nyland

Critical examination of declining cherry and other stone fruit orchards in California during recent years has frequently revealed the association with affected trees of a soil-borne virus disease known as Prunus stem pitting. The number of diseased trees has ranged as high as 90 percent in certain sweet cherry orchards in the Stockton-Lodi area; stem pitting has also been detected in other stone fruit orchards in the Central Valley and Sierra foothills.

What to look for

The disease appears as a girdling disorder in single trees or groups of trees. Other symptoms are poor terminal growth and color, with leaves frequently cupped or rolled. Many of the symptoms of stem pitting-affected trees are very similar to those caused by oak root fungus, crown and root rot, incompatibility, improper fertilization and cultural practices, or herbicide, farm machinery, and gopher damage.

However, careful examination of the trunk of stem pitting-affected trees just below ground level reveals an abnormally thickened and spongy bark. Removal of the bark also reveals varying degrees of pitting and vertical grooving in the woody cylinder. In many cases, depending on the scion variety and type of rootstock, the cambial tissue—source of new wood and bark tissues—may be severely affected and often totally destroyed, leading to overall tree decline, or even collapse.

Varietal effects

Different cherry variety/rootstock combinations show varying reactions to the disease: sweet cherry on diseased Mahaleb rootstock for example (figure 1) shows numerous short, relatively shallow pits in the rootstock wood, whereas the less common Stockton Morello rootstock shows deep, extensive grooving and cambial necrosis (figure 2). Thus trees on Stockton Morello often collapse whereas trees on Mahaleb show slow decline. Stem pitting in the Mazzard rootstock has been detected in only a few instances, although in one 20-acre orchard of the Bing variety on Mazzard, incidence in the Bing tops was nearly 100 percent. Affected trees of the widely-known Bing variety show severe pitting in the upper trunk (figure 3) reaching into the lower scaffold branches, unlike the Royal Ann (Napoleon) variety which develops no pitting in the woody cylinder (figure 1). The state has a low number of commercial sour cherry trees, but the disease has also been found in one southern California orchard where Montmorency cherries were growing on Mahaleb rootstock. Stem pitting is also known to occur on cherries in the Pacific Northwest, as well as in the eastern states.

Other stone fruits affected

In addition to appearing on cherries, stem pitting has been observed on apricot (figure 4) and European plum trees growing on peach or Marianna rootstock, as well as on peaches on Nemaguard rootstock (figure 5). Almond, so far, appears to be resistant, only showing symptoms if grown on stem pitting-affected peach rootstock. The present status of the disease in prune orchards is under further investigation.

Greenhouse tests have demonstrat-

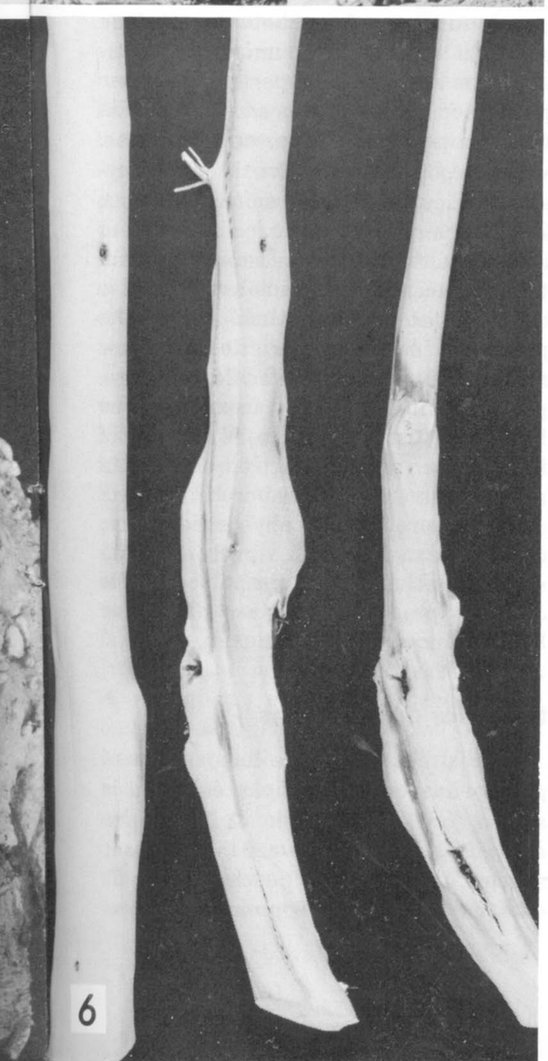

Fig. 1. Stem pitting in Mahaleb rootstock of Royal Ann cherry tree. Note absence of symptoms in the Royal Ann scion and the fine pitting in the rootstock.

Fig. 2. Deep extensive grooving exhibited in the highly susceptible Stockton Morello rootstock and no pitting in Royal Ann scion portion.

Fig. 3. Widely-grown Bing variety shows extensive pitting which extends into lower scaffold branches.

Fig. 4. Slowly declining Blenheim (Royal) apricot on peach rootstock shows some pitting and pronounced invagination accompanied by narrow strip of dead cambium at junction of stock and scion.

Fig. 5. A young 'Starn' peach tree on Nemaguard rootstock shows pitting and woody tissue disorganization below union.

Fig. 6. Lower stems of Mahaleb seedlings artificially inoculated with root chips and buds from sweet cherry orchard trees (left); inoculated with root chips (center) and buds (right) from naturally-pitted Royal Ann cherry tree.

ed that stem-pitting symptoms can be reproduced by budding or grafting tissues from diseased trees onto healthy Mahaleb (figure 6) and Stockton Morello cherry rootstocks and peach seedlings. Present studies suggest that the disease is caused by strains of the tomato ringspot virus, known to be carried in the soil and spread by the dagger nematode (*Xiphinema americanum*), but the possible implication of some causal agent other than tomato ringspot virus is also being investigated.

Long-term control measures consist in careful selection and use of propagation material from healthy trees, which should be planted only in noninfested soil. Because Prunus stem pitting is caused by a soil-borne virus and spreads slowly from diseased to adjacent healthy trees, roguing of diseased orchard trees is advisable. Before replanting in stem pitting-affected orchards, it is desirable to fallow the soil after tree removal, seed the area with a cereal crop for at least one year, and then fumigate for residual nematode control. The causal agent of Prunus stem pitting has a wide host range but it does not include cereals such as oats, barley, wheat, *etc.*

Stem pitting cannot be avoided by use of Nemaguard rootstock. Nemaguard is resistant to the important root-knot nematodes (*Meloidogyne* spp.), but not to the suspected vector of stem pitting, *Xiphinema americanum.*

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Mites in almonds and stone fruits

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It has been observed that almonds suffer more severe infestations of pest mites than do other deciduous fruit trees. Until recently, the reasons for this were not known, but were usually thought to be due to differences in cultural techniques or other undefined management practices.

In 1972 a study was initiated to examine the relationships of pest and predaceous mites on peaches, nectarines, and plums. The objective of this work was to help develop integrated pest management programs for mites on these crops. During this study, samples were also taken from almonds for comparison with the other types of trees. The results of those comparisons are reported here.

Sampling procedures

Six cultivars in the genus *Prunus* were selected for continuous sampling throughout the study. These were Santa Rosa plum, *P. domestica* Lindl., Fay Elberta and Halford peaches, *P. persica* Batsch, Independence nectarine, *P. persica* var. *nectarina* Maxim., and Merced and Mission almonds, *P. amygdalus* Batsch. Four trees of each of these cultivars were randomly planted in a 1.0-acre experimental block of mixed stone fruits at the San Joaquin Valley Agricultural Research and Extension Center, Parlier. Trees were 3 years old when mite sampling started in March, 1972, and were not treated with insecticides or miticides before or during the study. The orchard was furrow irrigated and weeds were controlled by cultivation.

Mites were sampled at about 2-week intervals during the 1972 and 1973 growing seasons: 25 mature leaves were picked at random from each selected tree and processed through a standard mite-brushing machine. All leaf samples were brushed within 24 hours of picking and mite counts were made within one-half hour of brushing to insure optimum recovery and identification of mites. All mites were identified by species. Summaries of the data from each year are shown in tables 1 and 2. Mites were grouped as *Tetranychus* spp., which included the twospotted and Pacific mites, *Tetranychus urticae* Koch and *T. pacificus* McGregor, the European red mite *Panonychus ulmi* (Koch), two species of rust mites in the family Eriophyidae, four species of predaceous mites in the family Phytoseiidae, and another predaceous mite, *Zetzellia mali* (Ewing). The eriophyids collected were predominantly the big-beaked plum mite *Diptacus gigantorhynchus* (Nalepa), and peach silver mite *Aculus cornutus* (Banks). The phytoseiids collected were *Neoseiulus caudiglans* (Schuster), *Typhloseiopsis citri* (Garman and McGregor), *Typhlodromus occidentalis* Nesbitt, and *Amblyseius hibisci* (Chant). Leaf samples occasionally included specimens of Tydeidae and Tarsonemidae, but these were relatively infrequent and were not included in the tabulations of species.

Some notable differences in mite populations were found between the four soft-fruit and the two almond cultivars. Almonds appear to support much lower populations of eriophyids and phytoseiids than do peaches, plums, or nectarines, whereas populations of the three tetranychid species did not vary among cultivars. *Zetzellia mali* was never collected from almonds, although it was common on plum trees adjacent to almonds and was also collected at various times from the peach and nectarine varieties. The low numbers of twospotted, Pacific, and European red mites collected from all of the host trees are believed to be a result of the general predator activity found on mites in the experimental orchard. In addition to predaceous phytoseiid mites, other predators of mites present in the orchard included the sixspotted thrips *Scolothrips sexmaculatus*, *Stethorus* beetles, and green lacewings.

Predator distributions

Distribution of the four species of phytoseiids on the various cultivars is shown for 1973 in table 3. *Neoseiulus caudiglans* and *T. citri* were the dominant species on plums and peaches, while *T. citri* and *A. hibisci* predominated on nec-