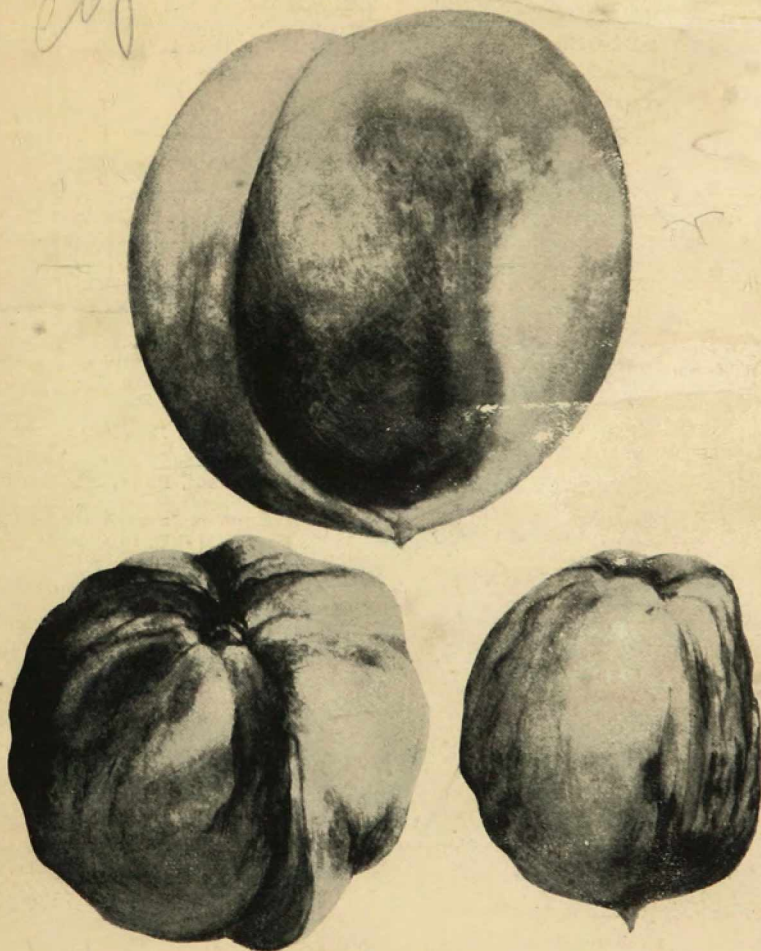


PEACH MOSAIC DISEASE  
IN COLORADO

By E. W. BODINE



Normal Peach (above) and the Distorted Fruit From an Elberta Tree Affected With Peach Mosaic Disease.

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## PEACH MOSAIC DISEASE IN COLORADO

By E. W. BODINE

A disease of recent occurrence in Colorado is peach mosaic. It was first identified in Texas by Lee M. Hutchins of the United States Department of Agriculture. A short time later it was found in Colorado by the writer.

The mosaic is caused by a virus which is present in living tissues of diseased trees. It may be transmitted from one tree to another by grafting or budding with diseased material. It is

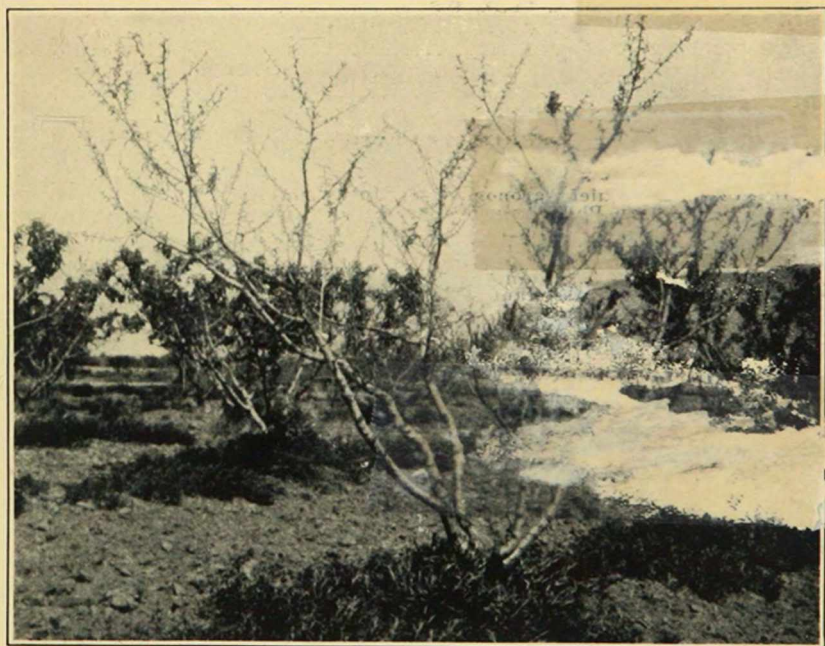


Figure 1. Spring symptoms of peach mosaic on a 12-year-old Elberta tree. Compare scanty foliage with abundant foliage on healthy tree in background. May 12, 1935.

possible, as in the case of mosaic diseases of other plants, that the virus may be transmitted by insects. Healthy trees become infected during the growing season and show symptoms the following year.

There is no known cure for this virus disease. The only way to combat it is to destroy the diseased trees, thereby preventing further spread. Control through eradication is being attempted in the Palisade district.

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As peach mosaic is a new disease, and growers are not thoroughly familiar with its appearance, it is the purpose of this bulletin to describe briefly and to illustrate the symptoms, and to indicate the manner and rate of spread from tree to tree in the orchard.

### SYMPTOMS

When affected trees leaf out in early spring, all peach varieties present similar symptoms of peach mosaic. However, with the advance of the season, symptoms in leaf, twig, and fruit may differ decidedly by varieties. The mosaic patterns in the leaves may be less distinct in all varieties as the season advances.

Early Elberta, Elberta, and J. H. Hale are the most common varieties in Colorado orchards, and they show the most pronounced symptoms. The symptoms of the disease as manifested in these varieties, therefore, will be described as typical of peach mosaic.

### Appearance of Tree

In early spring it is easy to detect trees affected with peach mosaic. Illustrated in figure 1 is an Elberta tree showing symptoms of peach mosaic disease for the first time. Here, at leafing time, the



Figure 2. Later symptoms of peach mosaic on a 10-year-old Elberta tree. July 21, 1934.

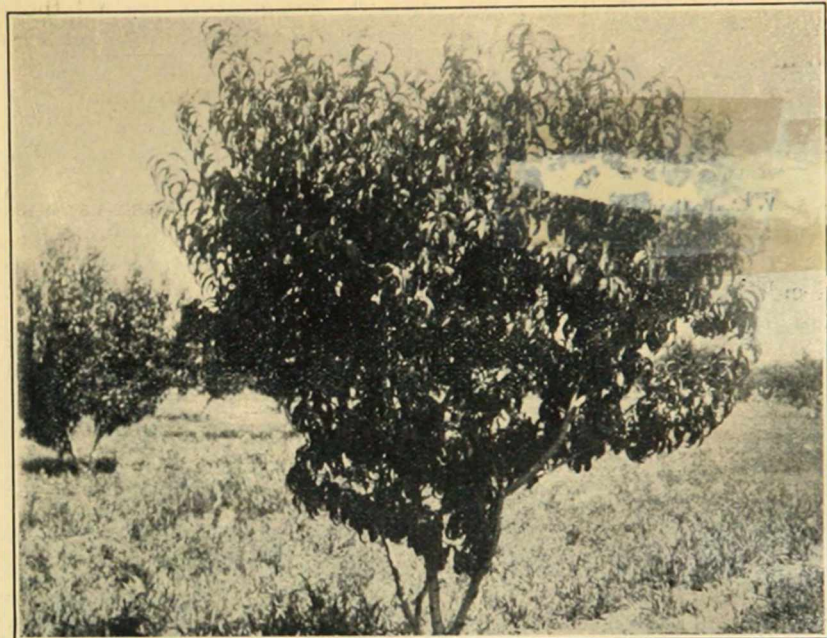


Figure 3. Healthy 10-year-old Elberta tree. July 21, 1934.

internodes are normal, but the trees are backward or delayed in leaf development. In figure 1, note the leaf development of the normal trees in the background as compared with that of the diseased tree. Throughout the remainder of the growing season, affected trees continue to grow abnormally (fig. 2). Compare this dense, bushy terminal growth of the diseased tree with the growth of the normal tree shown in figure 3.

#### Leaves

Heavily infected trees may be readily identified in the spring, as soon as the leaves have unfolded. The leaves in most cases are small, narrow, crinkled, irregular in outline, and definitely mottled with light-yellow and dark-green mosaic patterns. The light-yellow areas are most evident along the veins. Later, when the leaves are larger, the mottling becomes apparent over the entire leaf area (fig. 4). In young leaves heavily diseased, the mottling appears close to the midrib. Often the leaves in these cases wither and fall, and new leaves push out (fig. 5). The mosaic patterns in the leaves may become less distinct in all varieties as the season advances.

Leaves from trees that show only slight symptoms of peach mosaic are more nearly normal in shape. They are not mottled in

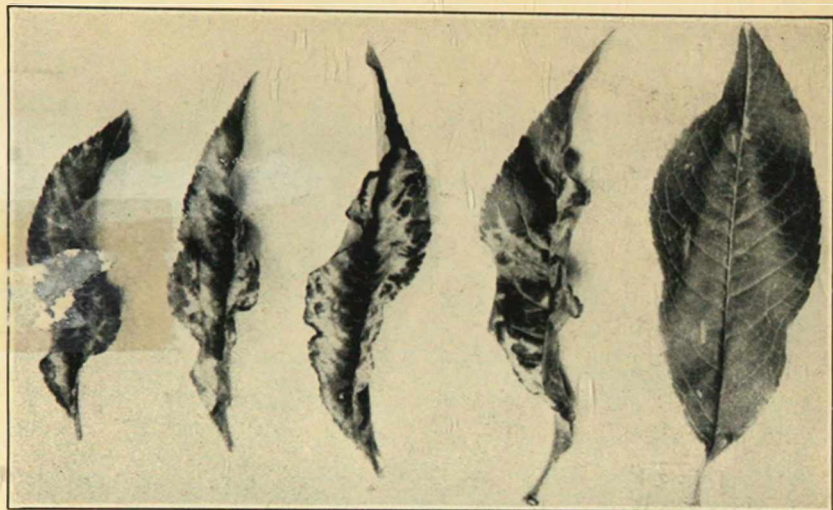


Figure 4. Leaf symptoms of peach mosaic disease, May 8, 1935. Note the mottling, irregular outline, and crinkled growth of the leaves as compared with healthy leaf at extreme right.

the same way as are leaves of heavily infected trees. Instead of distinct mottling, numerous small, transparent flecks appear throughout the leaf blade. This flecking occurs in and along the small veinlets of the leaf. These transparent, light-colored areas become frayed and give the leaf a shot-hole appearance. New leaves produced on the terminal twig growth of slightly infected twigs or branches in midseason are similar to those on heavily infected trees. The leaves are small, narrow, somewhat crinkled, and irregular in outline. They may or may not show mosaic patterns. A striking comparison of these new leaves with the older ones is illustrated in figure 6.

### Twigs

In early spring, trees that have been heavily diseased for more than 1 year will have an abnormal twig growth, both as to number and arrangement of branches. The internodes are conspicuously shortened. Due to this decrease in length of the internodes, the trees appear to blossom more profusely than do normal trees.

Trees that show mosaic symptoms for the first time at leafing have normal internode development (fig. 1). However, as the season advances, the internodes on new growth become shortened, and the number of branches increases. This results in a bunched and stunted appearance of twig growth, as shown in figure 2. This twig characteristic is definitely associated with the abnormal leaf char-

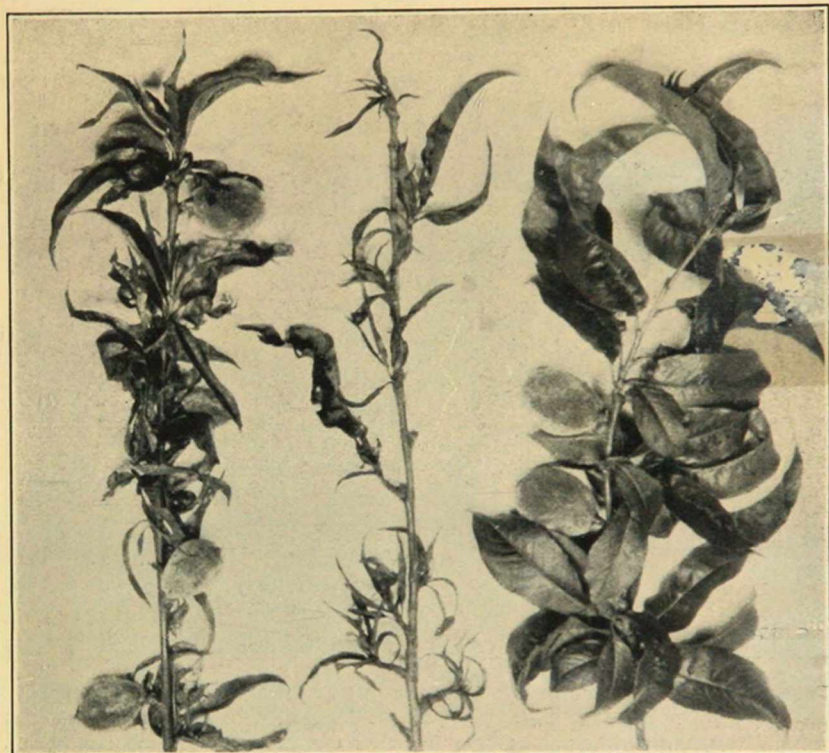


Figure 5. Comparison of diseased twigs and healthy twig. Left to right: Diseased twigs with abnormal foliage; extreme right, healthy twig. In the central figure most of the older leaves have fallen and new leaves are coming out. Note the abnormal clustered arrangement of the new leaves. May 17, 1934.

acters previously described. The new growth on heavily diseased trees rarely attains more than 4 to 8 inches of length during the growing season. That of a normal tree may reach 12 to 18 inches.

Trees with branches slightly infected with peach mosaic at the beginning of the season produce in mid-season the bunched, terminal growth shown in figure 6.

### Fruit

The fruit on heavily infected trees, while usually small, appears normal in early spring. About 6 weeks from blossoming time, the fruit in most cases on these trees starts to become bumpy and ridged in appearance. This appearance becomes more distinct as the season advances. Diseased fruit ripens about a week later than fruit on

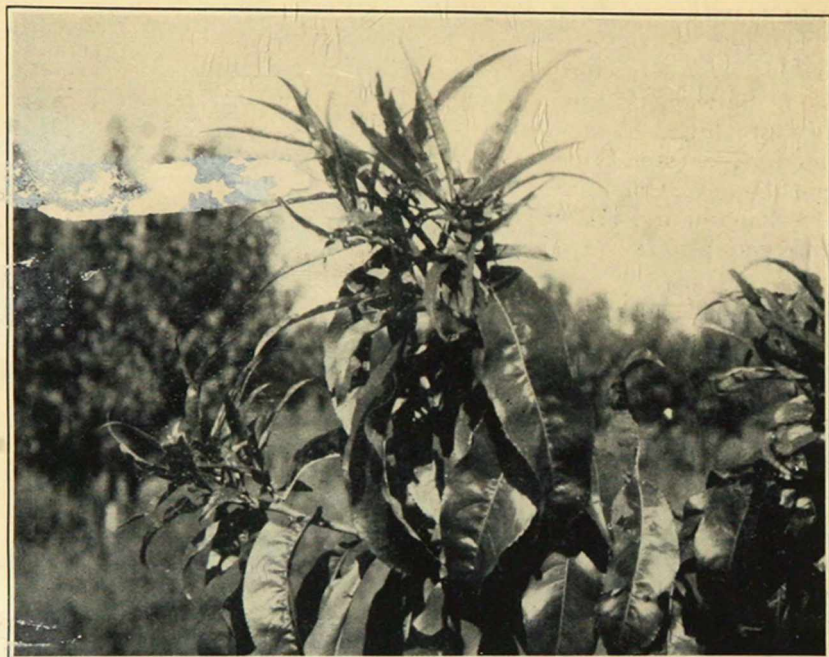


Figure 6. Summer symptoms. Tree partially affected with peach mosaic. Older leaves normal in size and shape, but with flecks and a few shot-holes not showing in the picture; young leaves narrow and irregular in growth; twigs bunched and internodes short. August 22, 1934.

normal trees and retains its distorted shape (cover plate). In color the fruit is blotched or streaked, but this characteristic alone is not sufficient for identification, since a somewhat similar appearance may be produced by other causes. The fruit, though usually smaller, may sometimes attain the size of a normal peach. The texture is somewhat coarse. Fruit on trees showing only slight symptoms of peach mosaic is in most cases normal.

### SUSCEPTIBILITY TO PEACH MOSAIC

All studies to date indicate that all peach varieties in Colorado are susceptible to peach mosaic. In the spring, all peach varieties infected with peach mosaic present similar leaf symptoms. However, with the passing of the spring symptoms, the appearance of the tree will vary with different varieties. In some varieties the disease produces pronounced symptoms, while in others symptoms are much less distinct.

Those varieties showing most pronounced symptoms of leaf,



twig growth, and fruit distortion are Early Elberta, Elberta, and J. H. Hale. Varieties showing less distinct symptoms in midseason are Carman, Crawford, Champion, Salway, Phillips Cling, Orange Cling, Alexander, Triumph, Rochester, Belle of Georgia, Dewey, Colorado Prince, Greensboro, and Guinn. Seedling trees also fall in this latter class.

Stanwick and Red Roman varieties of nectarines show as pronounced symptoms as Early Elberta, Elberta, and J. H. Hale varieties of peach.

Trees of all ages are equally susceptible to peach mosaic (figs. 7 and 9). The infection may be light or heavy. It may cover the whole tree or be restricted to definite areas. Both healthy and weakened trees appear equally subject to the disease. Furthermore, trees grown on all types of soil represented in the peach areas have been found susceptible.

Tests are being made to determine the susceptibility of other stone fruits.



Figure 7.  
Two-year-old Elberta affected.

### SPREAD OF PEACH MOSAIC

No information on the factor causing the spread of peach mosaic in the orchards is available. However, from observations in the field, it is apparent that the spread of the disease is very rapid.

When mosaic first appears in an orchard, diseased trees occur sparsely as shown in figure 8-A. Where the disease has been present longer, say 3 years, infected trees may occur in larger groups and spotted throughout the orchard, as also illustrated in figure 8-B. As time elapses, practically all trees become diseased. Such a case is illustrated in the orchard diagram, figure 8-C. Where plantings are more or less close together, orchards of this type are not only a source of infection to neighboring orchards but also to the district as a whole.

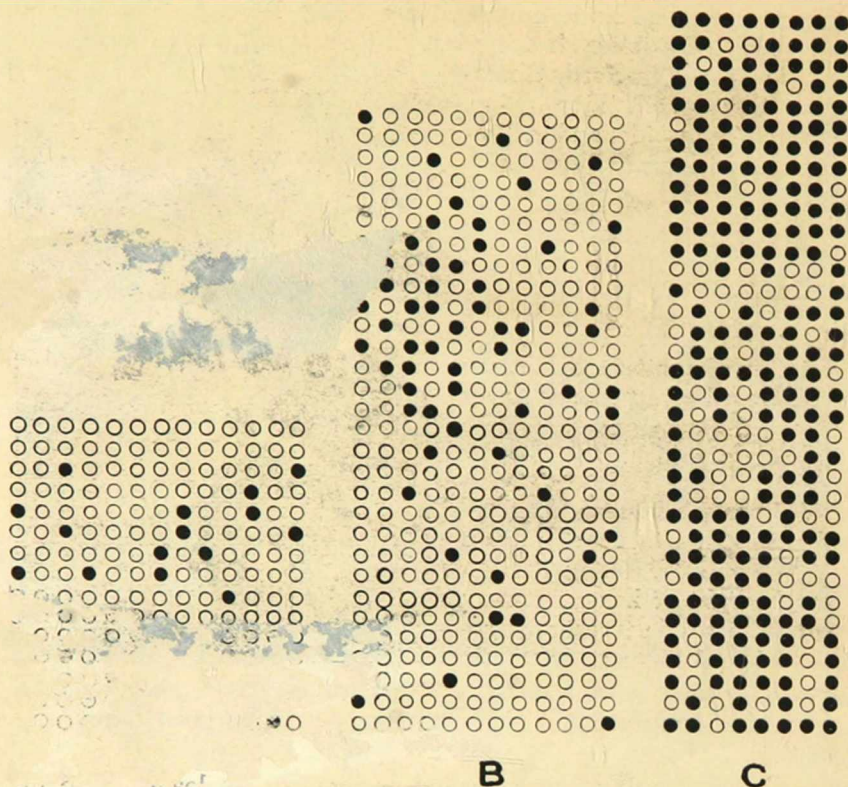


Figure 8. Chart showing typical cases of the spread of peach mosaic. The black circles represent infected trees. (A) An orchard the first year mosaic occurred; note that the diseased trees are found singly and in groups of two when the disease is first evident; (B) an orchard the third year; note that the diseased trees are now in larger groups and spotted; (C) diagram of orchard in which the disease started five years ago with only a few trees; now practically all trees are infected.

## CONTROL

To control peach mosaic, frequent growing-season inspections of the orchards, followed by immediate removal and burning of all diseased trees, root and branch, is essential. Partially diseased trees are as dangerous as completely affected ones. The cutting off of branches will not eliminate the disease, as the virus is in the tree.

It is not known what causes the spread of peach mosaic, but judging from experiences with mosaic diseases of other plants, the virus may be transmitted by insects from tree to tree. Therefore, any diseased tree left standing constitutes a source of infection for neighboring trees. The longer it stands, the greater the chance of spread.

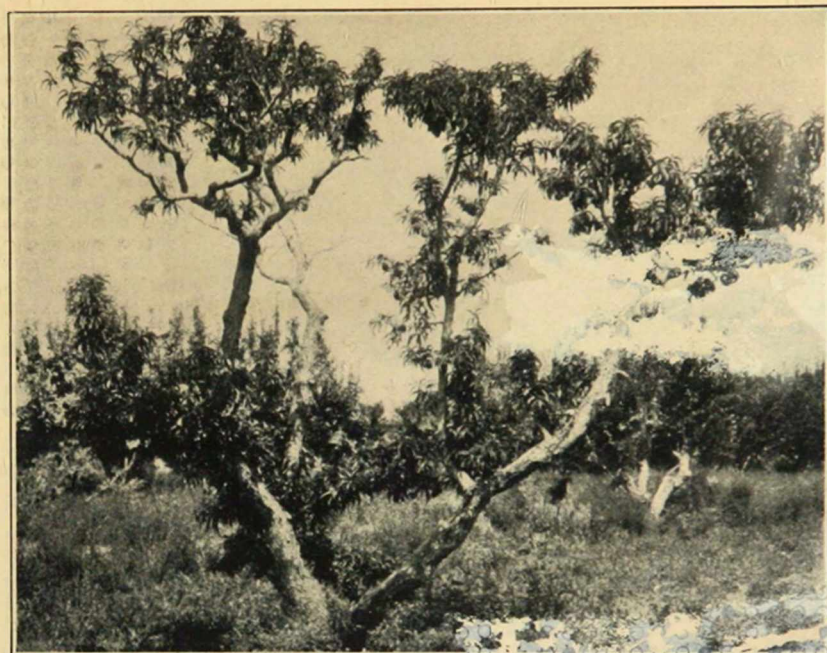


Figure 9. Thirty-year-old Elberta tree affected by peach mosaic disease. All ages are susceptible.

Orchards should be inspected as soon as the leaves have unfolded in early spring. This is the most important inspection of the year.

A follow-up inspection is necessary within 7 to 10 days, in order to locate infected trees of varieties which are later in leafing out. Also, this inspection affords an opportunity to locate trees showing slight symptoms, or trees which were missed on the first inspection. It is very important to check carefully odd varieties in the orchards, because, as the season advances, these varieties may show symptoms less apparent than on the Early Elberta, Elberta, and J. H. Hale varieties.

Inspections shortly before harvest are also important, since at this time the disease is easily identified on the fruit. Also, after midseason, the terminal growth of slightly infected twig or branches is bunched. Flecking is common in the older leaves.

The disease is readily transmitted in propagation if infected material is used. Consequently, in budding and grafting, every precaution should be taken to use only healthy stocks and scions.