Phony Peach and Peach Mosaic

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Phony peach and peach mosaic are virus diseases of peach. The first recorded observation of phony peach was made at Marshallville, Ga., more than 50 years ago. By 1915, the disease had increased to the extent that commercial peach growers in central Georgia were alarmed and J. H. Hale, a grower, asked aid from the Department of Agriculture. He said the disorder seemed to be the most serious menace to the industry ever encountered in that locality.

After preliminary investigations were made, the United States Peach Disease Field Laboratory was established at Fort Valley, Ga., in 1921. The phony peach control project was organized in 1929 shortly after the virus nature and communicability of the disease had been demonstrated by Lee M. Hutchins, of the Department of Agriculture. He said the disorder seemed to be the most serious menace to the industry ever encountered in that locality.

The disease that later was known as peach mosaic was brought to the attention of the Department in 1931 by inspectors who were making a survey for the presence of the phony peach disease near Bangs and Clyde, Tex. It later developed that a new peach disease, which proved to be peach mosaic, had attracted the attention of peach growers and pest control officials in Colorado that year. Growers in southern California detected a new peach disease in 1933. It also proved to be mosaic.

Both phony and mosaic produce a symptom complex in peach. Phony-infected trees are dwarfed, have a deep-green color, and present a rather compact appearance in comparison with healthy trees. The internodes are shortened and foliage is flattened. Viewed from a distance, the phony tree has a more or less even outline; a normal tree with long terminal growth presents an irregular outline. Phony trees bloom earlier and come into leaf earlier than normal trees and retain their foliage longer in the fall. Fruit on infected trees is much smaller in size and quantity. Phony weakens but does not kill the tree as do some other virus diseases such as yellows, rosette, little peach, and X-disease.

A chemical test helps to identify phony. Sections of roots or twigs from phony-infected trees show numerous, well distributed, purple spots after 3 to 5 minutes in a solution of methyl alcohol and hydrochloric acid. For general use the solution should be about 15 percent acid. There is no known chemical test as a confirmatory aid in identifying peach mosaic.

Mosaic-infected trees present symptoms that vary with the season, the variety, and the part of the tree affected. The more important symptoms may be classified in five general groups: Color breaking in the blossom petals of the varieties that have large pink blossoms; retardation of foliage development; mottling and deformity of leaves; deformity of fruit; and abnormal twig growth.

Mosaic is transmitted in nature, presumably by insects. It may be transmitted artificially by budding or grafting from any part of the affected tree. Mosaic, like phony, does not kill the tree.

Inspections made in 1929–1952 demonstrated a general distribution of the phony disease in Alabama, southern Arkansas, northern Florida, Georgia, Louisiana, Mississippi, south central South Carolina, and eastern Texas. Local areas of infection were found in Illinois, Kentucky, Missouri, North Carolina, and Tennessee. Isolated
cases occurred in Indiana, Maryland, Oklahoma, and Pennsylvania.

Similar surveys in 1935–1952 for mosaic revealed a general infection in Arizona and New Mexico and in parts of central and northeastern Texas; Riverside and San Bernardino Counties, Calif.; Mesa County in Colorado; Bryan County, Okla.; and Grand and Washington Counties in Utah. Localized areas of infection were found in other counties of those States and in southwestern Arkansas.

Both phony and mosaic occurred in 1952 in two States, Arkansas and Texas.

Peach mosaic has been observed in Baja California, Coahuila, and Chihuahua in Mexico.

Nearly 2 million peach trees were made unprofitable by the ravages of phony between 1929 and 1952 and were destroyed. In Georgia more than a million infected trees were destroyed before 1929. In the Southwestern States approximately 300,000 trees are known to have been destroyed because of mosaic infection—evidence that, if phony and mosaic were allowed to go unchecked, the peach industry could not prosper in those areas. The several States in which phony or mosaic are most prevalent and in which control programs are centered produce about two-thirds of the peaches in the United States and a yearly average of 10 million peach nursery trees.

The only control thus far devised for both phony and mosaic is the destruction, after inspection, of the infected trees. An obstacle is the incubation period, the time between the initial infection and the development of visible symptoms. The period varies from 14 days to 1 year for mosaic and from 1 to 3 years for phony. Obviously, therefore, when all visibly infected trees are eliminated, there are others which are actually infected but in which the disease is in the incubation period and cannot be detected.

In carrying out this process of elimination, one encounters other complicating factors. Almond, apricot, plum, prune, and certain varieties of peach, for example, are tolerant to the mosaic virus. Some of those hosts, in fact, are completely symptomless. Elimination of those species of Prunus, along with the visibly infected peach trees, is therefore necessary in some areas to obtain adequate control. It has also been established that wild plum is a host of the phony virus. Its elimination in orchard areas therefore must be included in an effective control program.

Department investigators in 1948 reported four species of leafhoppers to be vectors of phony. Studies of insecticidal sprays for leafhopper control were started in the hope that they might be another useful weapon against the disease.

Annual inspections have been made of peach trees in the control areas. Infected trees are removed immediately. Mosaic symptoms are more pronounced during the first part of the growing season. Phony manifestations are more evident during the last part. Inspections for mosaic therefore are made from April to August and for phony from June to October, depending on the locality. As an additional aid to control of phony, growers are urged to establish new orchard plantings as far away as possible from old orchards and thickets of wild plum.

The program of phony control was put in operation in 1929 and of mosaic control in 1935. The control project is conducted and financed jointly by the Bureau of Entomology and Plant Quarantine and the pest control agencies of the affected States.

The objectives are to prevent further spread of the diseases by adequate nursery and budwood (mosaic) inspection and quarantine enforcement; to control peach mosaic in the commercial areas; and to suppress and hold the phony disease in check in the commercial area of the generally infected States. The first aim, properly executed, assures the production and shipment of disease-free nursery stock,
The second and third arc measures of control in areas where the two diseases have ravaged commercial production of peaches. The operational programs differ somewhat by States to fit local conditions and requirements.

Several factors bear directly on the effectiveness of phony disease control: Abundance of the primary vector, density of peach and plum trees, and ecology. Certain latitudes, elevations, and soil types result in distinct types of agricultural crops and native plants, which have their effect on the abundance of vector population. The disease is most destructive in areas where *Homalodisca triquetra*, the primary vector of phony, is abundant and where peach and plum also are dense. As an example, in the Fort Valley, Ga., area, where phony was first discovered, those conditions favorable for the rapid development of the disease are present, and phony has taken its heaviest toll.

To be effective, control in commercial areas of high incidence must be on an area-wide basis. Experience has demonstrated that inspections made in that way will reduce or retard the annual increase in infection to the extent that peach production continues to be profitable. Annual inspections of only scattered orchards in such areas do not produce the maximum benefit.

In a phony-infected area it is a sound procedure to remove wild plums from a 300-yard zone around a new planting site at least a year before the orchard is set. That will prevent or retard vectors from picking up the disease from infected wild plums and establishing the disease in such new plantings at an early date. New orchards should not be set immediately adjacent to old infected orchards. When an old infected orchard is removed, it is not advisable to reset to peaches immediately because infected vectors may be present. At least a year should elapse between removal and replanting.

By means of chemically testing twigs of wild plums, surveys have been made in 83 counties of 11 States. In making the surveys, 16,104 plum twigs have been tested from 550 locations. The presence of phony was indicated in 611 twigs, an average incidence of 3.8 percent. Phony disease is known to occur generally in wild plums in substantially the same area as it is known to occur in peach. Orchardists in an infected area are requested to remove wild plums from the environs of their orchards as a prerequisite to having their orchards inspected.

The following reductions in disease incidence from the peak years to 1951 indicate the effectiveness of mosaic control: California, 5.78 percent in 1936 to 0.52 percent in 1951 (90 percent reduction); Colorado, 4.43 in 1935 to 0.22 (95 percent reduction); Oklahoma, 2.59 in 1941 to 0.005 (99 percent); Texas, 0.80 in 1937 to 0.04 (95 percent); Utah, 1.60 in 1936 to 0.38 (76 percent).

**Quarantines** regulating the movement of peach and related nursery stock from and within known affected areas have been in effect for both phony and mosaic since the beginning of control operations. Products have been regulated under uniform State quarantines.

The phony quarantine in 1952 had the following requirements: Each nursery in the regulated area producing the regulated products—peach, plum, apricot, nectarine, and almond—shall apply to the State quarantine official for approval of proposed nursery-growing sites on or before August 15 of each year; selected nursery sites shall be at least 300 yards from wild or domesticated plum, one-half mile from phony-infected commercial orchards, and one-half mile from urban areas; the ½-mile environs of the nursery site shall be inspected before October 1, and all phony trees found within such environs shall be removed prior to November 1; and all budding
shall be restricted to the slip-bud method.

The mosaic quarantine provides for certification of nurseries when no mosaic infection is found in the nursery stock and when mosaic-infected trees found within a mile of the nursery are removed before May 16 of each year. Because mosaic may be transmitted by means of buds from infected trees, all budwood sources must meet the same requirements as the nursery stock. The California quarantine prohibits movement of nursery stock from the regulated area.

Through the application of inspection and elimination of infected trees over a period of years, substantial reductions in the incidence of both phony and mosaic have been achieved. The practice has resulted in the apparent eradication of phony disease from Illinois, Indiana, Maryland, Oklahoma, and Pennsylvania, and from more than 100 counties in other lightly infected States. Mosaic has apparently been eliminated from 21 counties of the known infected States. All areas in which eradication apparently has been accomplished were lightly affected by the diseases when controls were first applied. In areas of general infection, control has been more difficult, but a persistent application of approved practices has achieved and maintained a sufficiently low level of infection that commercial fruit production has continued to be profitable.

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Brown Rot of Peach

John C. Dunegan

Brown rot has been the scourge of peach growing in the more humid sections of the United States since Colonial times. Sometimes it is called simply the rot because it occurs so commonly and affects so adversely the fortunes of all who handle and eat peaches.

Its first symptom on the fruit is a small, brown spot, which rapidly enlarges and soon destroys an entire peach and all peaches near it. Masses of gray spores form on the surface. As the fungus develops best in warm, humid weather, brown rot long was considered merely the aftermath of such conditions. By 1880, however, people realized that rot did not develop solely as the result of the "delicate" nature of the peach but that a fungus caused it.

Now we know also that a common insect, the plum curculio, is implicated in the spread of the brown rot disease. The punctures the insect makes when it feeds and lays eggs furnish ideal points of entry for the spores of brown rot. Although brown rot can be very serious even if the plum curculio is absent, it cannot possibly be controlled during harvest periods of warm, rainy weather if the insect is prevalent in an orchard.

For many years the fungus, Monellia fructicola, was considered to be identical with a brown rot fungus that attacks plums, apples, and pears in Europe. The two are distinct, however. The fungus on peaches, plums, cher-