Mistletoes on Hardwoods in the United States

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The traditional use of mistletoes during holiday seasons, their involvement in folklore and legend, their consumption by domestic and wild animals, and their use for medicinal purposes make mistletoes of widespread interest to the public. The fact that these plants are parasites that injure and eventually kill trees—both conifers and hardwoods—is not well known.

Two genera of mistletoes grow in the United States: the "dwarf mistletoes" (genus *Arceuthobium)*, and the "true mistletoes" (genus *Phoradendron)*. An introduced mistletoe, the European *Viscum album,* has been found only in northern California—the apple-growing region around Sebastopol and Santa Rosa. This mistletoe was presumably brought into this area inadvertently in the early 1900's on apple stock from Europe. Since then, it has spread over about a 16 square-mile area, and is found on at least 20 other native and introduced hardwood tree and shrub species.

Members of the genus *Phoradendron* are parasites of conifer and hardwood trees and shrubs in the Western Hemisphere. Their area of greatest diversity is centered in the tropics. This leaflet describes seven species of native true mistletoe that are found on hardwoods in many parts of Eastern, Western, and Southern United States. The one most commonly known and widespread is *P. serotinum* (also known as *P. flavescens)* which occurs mainly in the East and Southeast. *P. rubrum* which occurs on mahogany in southern Florida is the only other species in the East. The other five species of mistletoe occur in the Southwest and along the Pacific Coast.

General Biology

The mistletoes are green, flowering plants that require a living host. Some are rather specific and grow on only a single genus of tree; others occur on a wide range of hardwood species. Even though they are completely parasitic, they do manufacture much of their own food materials by photosynthesis and in general require only water and mineral elements from the host plant. In the absence of the green aerial portions of the mistletoe plant, however, the root system of the parasite can utilize host nutrients and remain alive within an infected branch for many years. The mistletoes are dioecoius in that male and female flowers are borne on separate plants (figs. 1, 2). Be-

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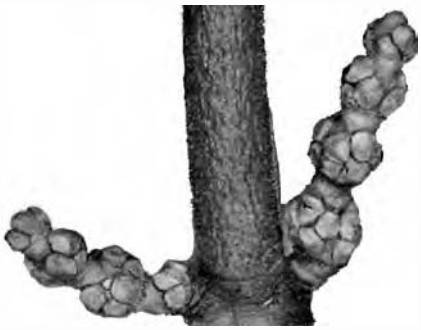

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Figure 1.—Unopened male flowers on an infloresence of *P. tomentosum* ssp. *macrophyllum*.

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Figure 2.—Mature female flowers on an infloresence of *P. villosum* ssp. *villosum*.

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Figure 3.—Shoots and mature fruit of *P. serotinum*.

cause male and female flowers are so similar in appearance it is difficult to tell the sex of the plant unless fruit are present.

Mistletoe infections are spread mainly by birds (robins, bluebirds, thrushes, cedar waxwings, phainopeplas) that feed on the berries. The berries are round, white to pink in color, occur in spikes and are about one-quarter inch in diameter (fig. 3). A berry usually holds a single seed surrounded by a sticky pulp. Birds digest the pulp of the berry and excrete the living seed. By this means seeds are often deposited on susceptible trees. A viscous coating and hair-like threads on the outer surface of the seeds attach excreted seeds firmly to tree branches. Upon germinating, the growing radicle becomes tightly pressed to the branch surface. Young or small trees are seldom infected by mistletoe. In nearly all cases, initial infection occurs on larger or older trees because birds prefer to perch in the tops of taller trees. Severe buildup of mistletoe often occurs within an infected tree because birds are attracted to and may spend prolonged periods feeding on the mistletoe berries.

Infection takes place by means of a specialized, penetrating structure that forces its way through the bark and into the living host tissues. Once infection has occurred, the root system of the parasite grows within the branch. The aerial shoot system begins to develop shortly after the root system is well established. Often several years are required after infection for a new seed bearing plant to develop. The parasite usually does not spread rapidly, but once a plant is established, the root system gradually extends up and down the branch. Defoliation or destruction of the aerial portion does not kill the

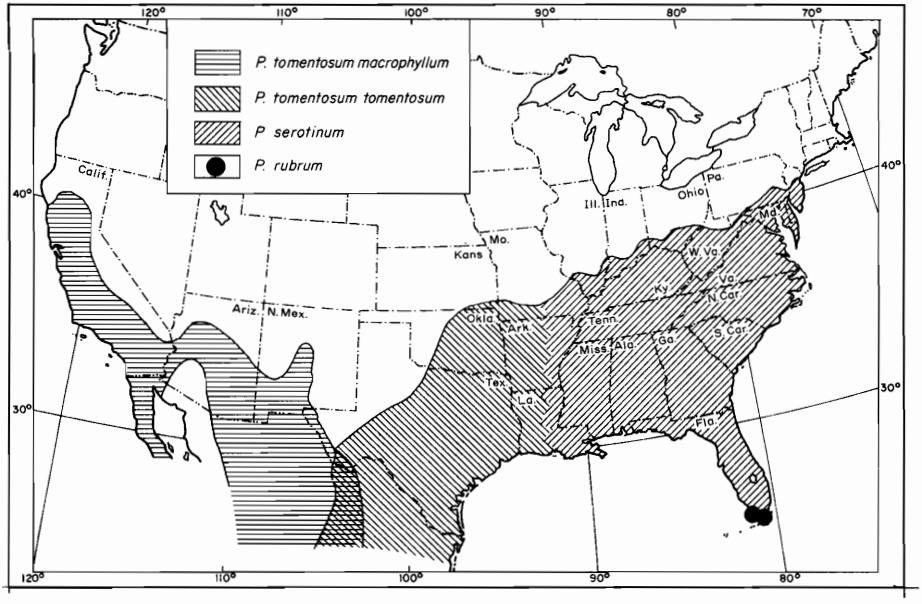

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Figure 4.—Geographic distribution of *Phoradendron tomentosum macrophyllum, P. tomentosum tomentosum, P. serotinum,* and *P. rubrum.*

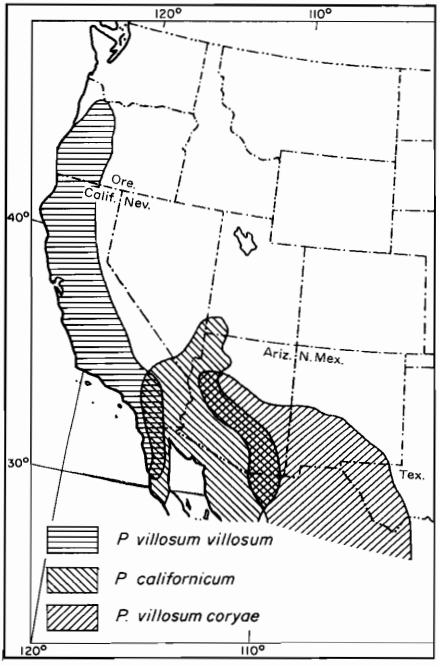

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Figure 5.—Geographic distribution of *Phoradendron villosum villosum, P. californicum,* and *P. villosum coryae.*

mistletoe. New shoots may be produced from the root system or the parasite may survive and grow entirely within the infected host tissues. Not until the tree dies, or the infected portion dies or is removed, is the mistletoe killed.

The mistletoes are rather intolerant of cold and near their northern limits aerial shoots are frequently killed by low winter temperatures.

Description of the Species

In general, the mistletoes on hardwoods are not always easy to distinguish from one another. Characteristics of the shoots, leaves, fruit and flowers are features used to separate the species. Two other aids to identification are: (1) geographic distribution (figs. 4, 5) and (2) host species infected (Table 1).

Economic Factors

Uses.—Mistletoes have some economic as well as social values.

Collection and sale of mistletoes during the Christmas holidays provide a limited income in some States, particularly in Texas. Certain animals use mistletoes for food. Mistletoe berries appear to be a favored food of several species of birds, particularly during winter when other food sources are in short supply. Deer and even cattle are known to supplement their winter diet with mistletoe on trees and shrubs that is low enough to reach or from mistletoe that breaks off trees in winter. In Texas, for example, mistletoe on mesquite is regarded as an "insurance" forage crop and is cut out of trees for cattle food when other forage may be scarce. On the other hand, mistletoes in California have sometimes been reported to be toxic to cattle.

Damage.—The damage caused by mistletoes in most cases outweighs their economic values.

Table 1.—Mistletoes Found on Hardwoods in the United States

Phoradendron	Hosts and Distribution	Remarks
P. serotinum (*P. flavescens*)	Known on more than 100 species of 50 genera of native and introduced trees. Eastern United States.	Leaves smooth. The western limits of *P. serotinum* and the eastern limits of *P. tomentosum* subsp. *tomentosum* have not been precisely determined. They tend to grade into each other in Arkansas and Louisiana.
P. tomentosum ssp. *tomentosum* (fig. 6)	Hackberry and mesquite; less common on oak and elm. Primarily Texas and Oklahoma.	Similar to *P. serotinum* except mature leaves slightly hairy, and less than 28 mm long or 18 mm wide.
P. tomentosum subsp. *macrophyllum*	At least 60 hardwood species of about 30 genera including willow, poplar, black locust, maple, ash, walnut, alder, and sycamore; not found on oaks. California to west Texas.	Mature leaves slightly hairy, usually more than 28 mm long and 18 mm wide and about twice as large as those of *P. villosum*.
P. villosum subsp. *coryae*	On oaks from extreme west Texas to western Arizona.	Except for the difference in structure of leaf hairs, this subspecies is indistinguishable from *P. villosum* ssp. *villosum*. Locally very common in Arizona.
P. villosum subsp. *villosum* (fig. 7)	Mainly on oaks, but occasionally on manzanita, buckeye, and a few other western hardwood species. California and Oregon.	Mature leaves somewhat stiff and hairy; 15-45 mm long and 10-22 mm wide.
P. californicum (fig. 8)	Mostly on leguminous trees and shrubs of the Southwest.	Leaves reduced to small inconspicuous scales. Stems reddish.
P. rubrum	Mahogany, Florida Keys.	A Caribbean species, rare in the United States.

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Figure 6.—Hackberry (*Celtis* sp.) heavily infected by *P. tomentosum* ssp. *tomentosum* in Texas. Photo taken in winter. The foliage on the tree is entirely that of the evergreen mistletoe.

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Figure 8.—*P. californicum* on mesquite (*Prosopsis* sp.) in the Southwest.

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Figure 7.—Large California black oak (*Quercus kelloggi*) bearing massive clumps of *P. villosum* ssp. *villosum* (Sonoma County, Calif.)

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Figure 9.—Trunk swelling of California black oak (*Q. kelloggi*) by *P. villosum* ssp. *villosum*.

Trees heavily infected by mistletoe are weakened, reduced in growth rate, and sometimes killed. Weakened trees are predisposed to attack by insects and often succumb during periods of drought or other adverse conditions.

Branch and trunk swellings frequently result from mistletoe infection (fig. 9). Trees with trunk swellings are of reduced timber quality and may even be unmerchantable. Trunk swellings also provide an entrance point for decay fungi.

Branches heavily laden with mistletoe often break off during storms or periods of high wind. As a result, damage to property from falling branches can be costly — particularly in heavily populated urban areas.

In some areas, native mistletoes are a problem in orchard crops, for example, *P. tomentosum* subsp. *macrophyllum* is found on walnut trees in the Sacramento Valley of California.

Control

Control of mistletoe may be difficult in forests. To eliminate the parasite, the infected limbs must be pruned off or, if badly infected, the tree should be cut. Pruning should be undertaken in forest stands only when it is considered economically feasible. Some measure of control can be accomplished by harvesting infected trees. Mistletoe that has been removed from the tree, cannot cause new infections; therefore, it need not be burned or disposed of. However, subsequent cleanup and removal may be desirable for other reasons. Detection and control of mistletoes can best be done in fall and winter when the leaves are off the trees and the mistletoe is readily seen. But eradication of the pest will not insure protection from further infection. Birds, the natural vector, are likely to reintroduce the parasite from nearby infected trees. About 5 to 10 years are required, however, for the parasite to build up to damaging proportions before control would again be necessary.

Homeowners with only a few to several infected trees will not find control difficult. Infected limbs can be pruned off, if possible. If this is not practical for esthetic or other reasons, the mistletoe shoots can be broken off periodically. Shoot removal will not be necessary more than once every 2 or 3 years. Breaking off the foliage and shoots of the mistletoe alone will reduce the drain on the branch by the parasite and also prevent localized spread and buildup of mistletoe by reducing the seed source. For valuable trees infected in the trunk, breaking off of the mistletoe shoots is the only method of control now available.

Another method of direct control that has been tried is removing shoots and covering the affected part of the branch with creosote or opaque material, such as tar paper. However, none of these has been particularly effective. Coverings, such as tar paper, only temporarily limit shoot production and are esthetically not very pleasing.

Planting resistant trees that are not susceptible to local species of mistletoes is a sound approach to control.

Several chemicals have been tested for control of *Phoradendron* on hardwoods. Some are apparently effective, although no chemicals have been registered by the Federal Environmental Protection Agency for control of mistletoe.

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