



Gall-Making Insects and Mites

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A gall is an abnormal swelling of plant tissue. It can be caused by mechanical injury or by several species of insects, mites, nematodes, fungi and bacteria. In fact, there are more than 2,000 species of gall-making insects in the United States. The association between the gall-making organism and the host plant is usually quite specific. Different organisms produce galls of characteristic size, shape and color. These visual characteristics are useful in species identification. This publication has basic information on the biology and ecology of common gall-making insects and mites and suggestions for managing galls.

Gall Development

Galls usually occur on leaves and stems, but also may occur on flowers, fruits, twigs, branches, trunks and roots. Some galls are easy to recognize and the common terms used to describe them reflect their appearance—blister galls, bud galls, bullet galls, flower galls, fruit galls, leaf galls, leaf spots, oak apples, pouch galls, roly-poly galls, root galls, rosette galls, stem galls and twig galls.

Galls develop in three phases—initiation, growth and maturation. Gall initiation is a reaction of the plant to a specific stimulus by the gall-maker. The stimulus may occur during colonization, egg-laying or feeding. Galls can be induced

by secretions from developing eggs or larvae, by saliva or other substances associated with feeding, by insect or mite excretions, or simply by the presence of the insect or mite in or on the plant tissue. Once stimulated, the plant produces gall tissue to surround the egg or immature insect or mite. As it grows, the gall and the insect/mite use nutrients from the host plant. Gall makers may live within individual chambers or within communal chambers inside galls, depending on the species. Mature galls stop growing and cease to use host plant nutrients. The developing insects or mites remain protected inside mature galls, grazing on the ready food source.

Damage and Host Plants

Gall-making insects are generally not considered pests, and some galls are even considered attractive and are used in flower arrangements and other crafts. Most gall-making insects do not damage the host plant; however, certain species may cause aesthetic damage—such as leaf discoloration, early defoliation, or twig and stem drop—to valuable plants in the nursery or landscape. Heavy infestations of the pecan stem phylloxera can reduce pecan yield.

Galls occur on a wide variety of plants, but the most common ones occur in oaks, hackberries, roses and their relatives, willows and asters. The susceptibility of plant species varies. Some plants support only one or two species, while others, such as oaks and hackberries, are hosts to several species (Table 1). Individual plants of the same species, especially those propagated from seed, may also show differences in susceptibility.

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Table 1. Common gall-making insects and mites in Texas.

Host plant(s)	Type of gall(s)	Classification/pest
Apple	Gall on roots and twigs	Wooly apple aphid
Cypress	Swellings on growing tips	Branchlet (midge) gall, <i>Taxodiomyia</i> sp.
Elm	Bladder or finger-type leaf galls	Mite, <i>Eriophyes ulmi</i>
Ficus	Leaf folding and rolling	Cuban laurel thrips
Grape	Galls on roots	Grape phylloxera
Hackberry	Blister, nipple, petiole, bud gall and others Top-shaped galls on undersides of leaves	<i>Pachypsylla</i> spp. Cecidomyid fly
Hickory, pecan	Petiole and leaf stipule galls	<i>Phylloxera</i> spp.
Oaks	Leaf vein pocket gall Woody twig galls Leaf galls with orangish "hair" Sticky, spongy galls on twigs with seed-like structures inside	Fly gall Gouty oak and horned oak gall wasps Hedgehog gall wasp Wool sower gall wasp
Live oak	Woody twig and stem galls Leaf galls	Mealy oak gall wasp Wooly leaf gall wasp
Red oak	Spherical, spongy-filled galls	Oak apple wasp
Poplar, cottonwood	Pocket galls on leaves, leaf bases and petioles	Aphid
Willow	Cone-like gall on terminal	Willow cone gall fly
Yaupon holly	Pocket galls on leaves	Yaupon psyllid gall

Gall Wasps

There are more than 1,000 species of gall-making wasps worldwide (Hymenoptera: Cynipidae). Their biology is quite complex, with alternating sexual and asexual generations. Many species of gall wasps develop inside galls induced by other gall wasp species. Gall wasps produce species-specific and generation-specific galls on several species of oaks. In some species, the adults and galls are similar in the first and third generations, while very different in the second and fourth generations. The galls

produced by the sexual generation occur in the spring or early summer and the galls produced by the asexual generation occur in the summer and fall of the same year.

The mealy oak gall wasp, *Disholcaspis cinerosa*, is an example. It causes one of the most common galls on live oak. The generation-specific galls are different in size and general appearance. Galls of the asexual generation are spherical, $\frac{1}{8}$ to 1 inch in diameter, and appear on branches and twigs of live oak in late summer and early fall. When first formed, the galls



A gall-making cynipid wasp.



Mealy oak galls on post oak produced by the asexual generation of the mealy oak gall wasp.

are pink to pinkish brown outside and yellow-green inside. The inside tissue is moist and soft in newly formed galls but becomes brown and dry during late fall as the gall matures. Adult wasps emerge by chewing holes in the bases of the galls during December and January. All adults are female (asexual generation); they do not mate before laying eggs in swollen leaf buds.

Eggs laid by adults of the asexual generation hatch in early spring as leaf buds begin to open. The larvae develop quickly in the leaf tissue and stimulate the development of small, beige leaf galls that resemble kernels of wheat. Adults of both sexes emerge from these galls after a few weeks and then mate. Mated females lay eggs in twigs and branches. The eggs remain dormant for 3 to 5 months; then the larvae hatch and stimulate the formation of the spherical galls of the asexual generation.

Gall Midges or Gall Gnats

Gall midges (Diptera: Cecidomyiidae) are the second largest group of gall-making insects, with more than 800 species in North America. The larvae are $\frac{1}{16}$ inch long with small and poorly developed heads. Severe infestations of *Asphondylia prosopidis* on mesquite trees may reduce seed pod development. There are several kinds of midge galls on cypress, with the branchlet midge gall, *Taxodiomyia cupressiananassa*, on bald cypress being one of the largest and most prominent. A new species of oak gall midge, *Arnoldiola atra*, was detected in 1999 on live oaks in Houston. This midge seems to cause a general unhealthy appearance in trees but it is localized to small areas. *Phytophaga painteri* causes a gall on the undersides of



Galls produced by the gall midge fly on cypress.



Elm finger galls.

hackberry leaves. Other galls caused by midges include the gouty vein gall on maple, the maple leaf spot gall, the ash midrib gall, and the pine needle gall.

Gall Psyllids

Psyllids, or jumping plant lice (Hemiptera: Psyllidae), also cause some of the most common galls. These insects resemble small cicadas and feed by sucking plant fluids. Some psyllid galls cause the leaf margins to roll, enclosing and protecting the nymphs (immatures).

Hackberry trees host several species of gall psyllids. They form $\frac{1}{8}$ - to $\frac{1}{4}$ -inch galls on the leaves and petioles. The insects overwinter as adults in bark crevices and other sheltered locations (including home siding and window frames). After mating in the spring, the females lay eggs on the undersides of leaves. Nymphs emerge from eggs in about 2 weeks and begin feeding, which stimulates gall formation. The



Hackberry nipple galls induced by the jumping plant louse or psyllid (*Pachypsylla* spp.).



Galls caused by the oak apple wasp on red oak.



Pocket galls on yaupon.



Leaf pocket gall on cottonwood.



Yaupon psyllid and pocket gall.

nymphs develop through several stages before emerging as adults in the fall, completing one generation per year.

Phylloxerans

Phylloxerans (Hemiptera: Phylloxeridae), which are very similar to aphids, usually cause blister-like galls on leaves. There are at least five phylloxera that occur on pecans, but the pecan leaf phylloxera, *Carya illinoensis*, is the most serious and it is the only one that has more than one generation per year. Adults are small, soft-bodied and pale yellow. Though pecan phylloxerans are small and difficult to see, the galls they produce are prominent. Galls are $\frac{1}{8}$ - to $\frac{1}{4}$ inch in diameter and develop between leaf veins. New galls can be formed throughout the season as long as new foliage is present. Severe infestations can be economically damaging.

Phylloxera overwinter as eggs in bark crevices. The small nymphs emerge in spring during budbreak and feed on tender new growth.

Their feeding stimulates gall development. Two generations are completed within the galls. Galls open in mid-May and the adult, winged phylloxera emerge to begin a new generation. For more information on pecan leaf phylloxera and other pecan insects, please see Texas Cooperative Extension publications E-341, E-145 and E-215 available at the TCE Bookstore (<http://tcebookstore.org>).

Managing Gall-Forming Insects and Mites

Prevention and cultural control. The only sure way to prevent galls is to choose plants that are not hosts to gall-making insects and mites. Should a susceptible plant already be in place, good horticultural practices will help keep it healthy. Gall-forming insects must attack host plants at a precise stage of tissue development in order to induce gall formation. Occasionally, certain trees will bear more galls than adjacent trees of the same species. For example,

studies showed that oak trees whose buds opened earlier than those of nearby trees had many more galls because the wasp causing the galls needed open buds in which to lay eggs.

Because most galls and gall-forming insects are not a threat to plant health, attempting to control them is not usually warranted. Learning to recognize different galls and the insects or mites that cause them may provide peace of mind and can be a good way to enjoy nature at our doorstep! If galls are considered unsightly, they can be removed by hand or infested plant parts can be pruned and discarded. However, this may not prevent future infestations. Removing the host plant and replacing it with a non-susceptible species or a more resistant specimen is the only sure method of control.

Biological control. Several species of wasps parasitize gall-forming insects and reduce the number of galls formed. These wasps are natural enemies of gall-making insects and function as their biological control agents. To protect these beneficial wasps, avoid using broad-spectrum insecticides during the time they are searching for hosts (from late spring through early summer).

Adult gall-forming insects leave galls through exit holes. The vacated space is almost immediately occupied by small spiders and other

beneficial insects such as lacewing larvae, ants or parasitic wasps. Thus, old galls house beneficial organisms that feed on insect pests. The honeydew-like substances associated with some galls may attract ants, wasps and bees.

Chemical control. Although there are some insecticides and miticides registered for use against gall-making insects (including insecticidal soaps, horticultural oils and several formulations of acephate and carbaryl), their use is generally unwarranted. It is very important to know the basic biology of the specific gall-making insect or mite involved before applying a pesticide. Unless pesticides are applied when adults are laying eggs or during the crawler stage (pecan phylloxera), they may not control the pest. Once galls begin to form, the insects and mites are protected inside them and can not be killed with either a surface-applied pesticide or a systemic pesticide. Furthermore, pesticides may kill the beneficial insects that help control gall-making insects.

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