

Ages:

12 & up

Exploring Plant Galls

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Main idea: A gall is an abnormal growth on a plant. Many galls on plants are caused by insects, and they provide a home for the insects to grow and develop in. Bacteria and fungi are two plant pathogens (disease-causing organisms) that may cause galls on plants.

Objective: Learn to recognize some plant galls, and discover what causes them.

Materials:

- q a meadow or wooded area to look for plant galls
- q a bag for collecting
- q a sturdy garden shears for clipping branches with galls
- q a hack-saw for cutting woody galls (adult supervision required)
- q a pocket knife (adult use only)
- q magnifying glass, hand lens or microscope
- q note paper

q pencils to write/draw with

Motivator: Let's go on a plant gall search!

Activity (See factsheet "Some Plant Galls" for illustrations and descriptions of common galls):

1. Go on a gall hunt - see who can collect the most different types of plant galls (abnormal growths on plants) in 10 minutes. Take the class out first to show them the area of collection, and even show them a few galls so they know what to look for.
2. Bring collected "galls" back to the meeting site.
3. Cut open the gall to see what is inside, without cutting through and destroying whatever is there. If the plant tissue is soft, a pocket knife or pair of scissors may be best, but if the plant material is hard and woody, you may want to put the gall in a vice to hold it, and gently cut through with a hack-saw.
4. Make a chart of what you found, or draw a picture of a gall or two.

Background:

A gall is an abnormal development or outgrowth of plant tissue resulting from an irritation often caused by insects, bacteria or fungi. Insects cause the majority of plant galls, and it is the immature (often the larva stage) that is found inside. The larvae cause irritation and the extra growth to occur, and they may also gain their food from the inner walls of the gall where they are living.

Galls interfere with the normal function of twigs and other plant parts, causing curling, stunting, and

tumor-like growths. Some galls are harmful to the plant, and may cause death to the part of the plant beyond the gall, while others are not.

Of the insects, the Hymenoptera (the ants, bees and wasps), and the Diptera (the two-winged flies) are the two orders (groups of related insects) that cause the majority of plant galls. A number of oak galls are caused by tiny gall making wasps, and the goldenrod ball gall is an example of a fly-caused gall. In addition, aphids and mites cause a large number of galls.

Bacteria may cause galls on the stems and crowns of plants such as blackberry or roses and fungi may cause galls that at various times in the season produce fungal spores. If there is no hollow area inside the gall, it may be caused by something such as bacteria or fungi.

A gallmaker's life cycle: The goldenrod ball gall will serve as our example. A female picture-winged fly lays her shiny white egg in the bud tissue at the top of a young goldenrod plant. She usually lays one egg per plant, but sometimes more. She makes a little hole in the stem with her ovipositor (egg laying tube) and then puts the egg in the hole.

The young larva (maggot) bores down into the growing part of the stem and begins to hollow out a chamber. A gall begins to form, probably in response to some chemical the larva gives off, and this gall will provide both shelter and food for the gall fly larva.

The insect inside the galls remains as a larva until late March or April in the Northeast, when it changes into a pupa. (The pupa is a resting stage of the life cycle in which the insect transforms from a larva to an adult.) A few weeks later when the goldenrod has just started to grow, the adult fly emerges, mating occurs, and the female will again begin the cycle again by laying an egg in the young goldenrod plant.

Vocabulary:

Gall: An abnormal growth of plant tissue.

Host plant: The plant an insect, mite, or plant disease organism occurs on.

Order: A group of related organisms.

Extensions:

q There are over 100 species of gall makers that attack oaks alone. The galls come in many sizes and shapes, and may be found on leaves, stems, flowers, and even roots. Have the group explore some oak trees to see how many different galls they can find on this one host.

q Keep a record book. Write down what you find and attach your note to the gall or draw a picture of the gall in your notebook. Ask: What is the host plant? Is there only one insect cell inside, or many? Are the insects present? Do you see larvae? Adults?

q Start a collection of plant galls and gall makers. If you are able to collect mature galls when the insects are still inside, you might try keeping them in a jar with a lid with a few holes punched in for air (or a piece of nylon stocking stretched over the top and held in place with a rubber band) and wait to see if anything comes out of the gall.

Helpful hint: When galls are collected during the winter, it is a good bet that the gall makers will emerge the following spring when the temperatures warm up and plants begin new growth. You may be able to find the adults of insects whose larvae you saw earlier in the season. Add these to your collection even if you do not know the names of the insects causing the galls. A scientist may be very interested to see what you have reared, and may be able to help you with some identifications too.

4-H Activity Supplement

SOME PLANT GALLS



OAK APPLE GALL - A round, one to two inch in diameter growth with a spongy inside and a hard central core. These galls are seen on the leaves of scarlet and black oaks. They are caused by a tiny wasp and are usually seen in May or June.



OAK HEDGEHOG GALL - Present on the leaves of white oaks, these galls appear as tiny spheres covered with spines. Inside small wasps are developing. The galls are about 1/2 inch in diameter and are often a burnt red color.



MAPLE BLADDER GALLS - Caused by mites, the tiny growths are about 1/8 inch in size, with most of the swellings occurring on the upper leaf surfaces. The newly formed galls are a yellowish-green color. Towards the end of June they turn a rose color, and late in the season they are black.



MAPLE SPINDLE GALLS - Also caused by mites, they are found on soft maples and sugar maples. The galls are about 1/5 inch long and about as thick as a pencil lead. The galls stand erect and are easily seen and identified.



GOLDENROD BALL GALLS - Globe like galls seen on goldenrod stems in the fall and winter. The galls are quite hard and if cut open before spring, you will see a white-yellow fly larva inside.



ASH MIDRIB GALLS - Found in the center of the leaf along the midrib of white ash, this gall may be up to an inch in length and is plump and spindle-shaped. It is caused by a tiny fly called a midge.



COOLEY SPRUCE GALL - A 1 to 1½ inch cone-shaped overgrowth that first appears on the tips of the spruce branches in early June. If cut open, one will find numerous tiny gray aphids (adelgids) inside. The galls open in August and September, and the adults emerge to lay eggs. The young adelgids overwinter on the buds and twigs of the host tree.



GOUTY OAK GALL - Caused by a wasp, these galls appear on the stems of black, red, pin and scarlet oaks. They have been known to cause small branches to be killed and break off the tree.

Other common galls include the hickory leaf and petiole gall, first appearing on leaf petioles and small stems in June as hollow green growths, they later turn black. The cause of this gall is a phylloxeran, a small aphid-like insect. The poplar petiole gall is seen as a swelling of the leaf petiole which turns black upon maturity, and it is caused by an aphid.



CROWN GALL is one example of a gall that is harmful and often kills plants. It is caused by a bacterium. Crown gall is usually found at or near the soil level and appears as rough-shaped, hard or soft, spongy swollen tumors. The color of the galls varies from flesh-colored to greenish or dark. Where this gall is discovered it is best to discard the plant altogether.

WILLOW PINE CONE GALL - CAUSED BY A MIDGE
Rhabdophaga strobiloides



SAWFLY GALLS ON A WILLOW LEAF
Pontania proxima



SHOOT GALLS ON WILLOW - CAUSED BY SAWFLIE
Tenthredinidae: Euura sp.



HORNED OAK GALL - CAUSED BY A GALL WASP
Callirhytis cornigera