Secret Lives of Gall Makers

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Gall: An abnormal plant growth caused by the action of insects or other organisms.
Crown Gall  
*(Bacterium)*

Black Knot of Cherry  
*(Fungus)*

Some Plant Pathogens Produce Gall-like Growths
Fruiting structures of Rust Fungi can have unusual forms.
Primary Groups of Gall Making Arthropods in Colorado

- Gall-making aphids
- Psyllids
- Eriophyid mites
- Gall midges
- Gall wasps
Some New Words

• Cecidology – the study of galls produced by insects, fungi, mites and other organisms

• Cecidogen – a substance that can produce a gall
How do insects and mites produce galls in plants?

- Selective wounding of growing tissues produces cellular changes
- Introduction of chemicals (cecidogen) that cause cellular changes

Important Note: Gall production results from effects on actively growing (meristematic) tissues
Would a leaf curl be considered a gall?

Figure courtesy of Karsten Schonrogge
Leafcurl Injuries

Default Diagnosis: Produced by aphid feeding on emergent growth, producing distortion
Black Cherry Aphid

*Myzus cerasi*
Honeysuckle Witches’ Broom Aphid Injury
Green Peach Aphid Damage
Leafcurl Plum Aphid

*Brachycaudus helichrysi*
Snowball Aphid Injury
Leafcurl Ash Aphid Injury
Open galls are produced by insects (and mites) with sucking mouthparts.

These form when the plant responds to the feeding of the gallmaker by producing a growth that surrounds the insect.
Closed galls are produced by gall-making insects with chewing mouthparts.

Eggs inserted into tissues and the developing larvae develop within the plant.
Gall-Making Aphids

• Adelgidae (adelgids)
  – Associated with conifers
  – Host alternation common

• Eriosomatinae ("woolly aphids")
  – Associated with deciduous plants
  – Host alternation common
Adelgids

Hemiptera: Adelgidae

The “woolly aphids” on conifers
Cooley Spruce Gall - Produced by the Cooley Spruce Gall Aphid (Adelgid)
Cooley spruce gall adelgid – Woolly aphid form associated with Douglas-fir
LIFE CYCLE OF THE COOLEY SPRUCE GALL ADELGID
Aphids

Hemiptera: Aphididae
Pemphigus spp. galls on Populus
Pemphigus spp. galls on Populus
Poplar Petiolegall Aphid
(Pemphigus populitransversus)
Summer hosts of *Pemphigus* spp. are roots of herbaceous plants.
Psyllids

Family Psyllidae

Common symptom: Swelling of leaf at feeding site.
Hackberry nipplegall psyllid

Photograph by Jim Kalisch, University of Nebraska
Hackberry blister gall psyllid
Overwintered adults return to the new growth in spring to lay eggs.
Hackberry nipplegall psyllid
Mixture of blistergalls and nipplegalls
Psyllids make many kinds of galls on hackberry
Eriophyid Mites

Acari: Eriophyoidea
Eriophyid mites
Rust Mite Injuries
Pearleaf blister mite

Photo courtesy Elizabeth Beers

Photo courtesy H. Riedl

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OSU Insect Clinic
Walnut leaf blister gall mite

A transition symptom to what might be called a “pouchgall”
Pouchgalls or bladdergalls
Pouchgall on boxelder
Pouchgalls on Oregon ash
Pouchgall on aspen
Pouch-type gall from grape erienum mite
Bladdergalls on willow
Maple bladdergall mite
Maple bladdergall mite
Fingergalls
Fingergalls on maple
Fingergalls on littleleaf linden
Fingergalls on chokecherry
Fingergalls on American plum
Erieneum producing eriophyid mites
Cranberrybush viburnum erineum
Erinea associated with pouchgall of boxelder
Erineum associated with pouchgall of aspen
Grape erienum mite

Upper leaf surface

Lower leaf surface
Erineum on aspen leaf
Distortion of flowering structures
Ash flowergall mite
Cottonwood catkingall mite
Generally disorganized growths
Poplar bud gall
Various *Trisecatus* species are associated with distortions of conifers.
Undescribed species of eriophyid mite
Bindweed Mite: Biological Control Aid for Field Bindweed

Bob Hammon
Gall Midges
Diptera: Cecidomyiidae

Common symptoms:
Swelling and/or stunting of leaf growth
Honeylocust Podgall Midge
Adults lay eggs on emerging leaflets.

There are multiple generations produced annually.
A larva and two pupae of the honeylocust podgall midge
Pinyon Spindlegall Midge
Adults emerge coincident with new growth of the following June.
Gouty veingall midge of boxelder
Larvae of ash midrib gall midge
Juniper tipgall midge
Willow cone gall
Wreath made of willow cone galls (David Leatherman)
Chokecherry fruitgall midge
Poplar Twiggall

Produced by the poplar twiggall fly, *Hexomyza schineri*
Poplar Twiggall Fly

Above: Adult

Top right: Adult resting on leaf

Right: Leaf tatters symptom produced by feeding (oviposition punctures)
Top: Ovipositing adult
Upper Right: Oviposition wound in early stage gall
Right: Early stage galls
Cumulative effects of galling (left), new galls (below left) and cross-section of gall (below)
Old poplar twiggall damage in forest near Salida
Gall Wasps
Hymenoptera: Cynipidae
Translucent oak gall
Upper side of leaf – raised bumps

Under side of leaf – fuzzy balls
Mossy rose galls
This photo series courtesy of Ken Gray Collection/Oregon State University
Bulletgalls on oak twigs
Most gall wasps on oak have two generations that produce two different types of galls.
Oak rough bulletgall wasp
Stunting produced by oak rough bulletgall wasp
Old Story

Adults emerge from galls in mid-October to mid-November and lay eggs in buds…….
The eggs from this hatch in spring to produce a generation within a budgall.
A spring stage gall is produced. Adults from this lay eggs in the growing stems of branches. Spring stage adults are much smaller than those observed in fall. Spring stages consist of both males and females.
A spring stage gall is produced. Adults from this lay eggs in the growing stems of branches.

Spring stage adults lay eggs in the emergent twig growth.
New galls begin to erupt in late spring/early summer. They become full-sized by late summer.
These galls exude **honeydew**
The honeydew on the galls attracts many kinds of insects.
Oak rough bulletgalls produce a sweet exudate that is attractive wasps
A Collage Made of Galls from Oak Twigs

Artist: Crystal Cooke
An interesting gall wasp-woodpecker interaction on bur oak
The gall wasp *Callirhytis flavipes* develops under the bark of twigs branches, and the trunks of oak
They are small and develop within small chambers. There are dozens of these chambers in the above photo.
Downy woodpeckers work the bark and extract the developing gall wasp larvae in winter and early spring.
This can result in extensive debarking of trunks, branches
This can lead to dieback of limbs and the upper trunk.
After this gall wasp emerges from the trunks//branches, it moves to new leaves. The summer generation develops within an irregularly shaped gall of the midrib.
Gall Insect Management

• Carefully assess the actual damage
  – Overestimation of effects is typical; Gall production typically looks worse than it is
  – Only developing tissues can be transformed to galls
Only actively growing tissues are “gallable”
Do they overwinter on the plant?

Dormant season sprays can usually be effective.
They are in this stage today, and through the next couple of months. Very easy to kill with most anything now (If you want to do that.)

Wait too long and you have 800 eggs or nymphs to kill.
Spruce recovery from Cooley spruce gall injury – insects killed by soil-applied imidacloprid
Do they overwinter off the plant?

Treatments should coincide with egg laying
Hackberry psyllids – eggs laid on emergent foliage
Honeylocust podgall midge – eggs are laid on newly emerging leaflets (multiple generations)
Pinyon spindlegall midge – eggs are laid at base of newly emerging needles in June
One group of gall makers that is never well controlled with insecticides

Gall wasps on woody parts of the plant
COLORADO STATE SYMBOLS

STATE FLAG

STATE BIRD
LARK BUNTING

STATE FLOWER
COLUMBINE

STATE GALL
COOLEY SPRUCE GALL
This presentation will be posted at the Insect Information Website

- Housed at Department of Bioagricultural Sciences and Pest Management
  - Search “BSPM CSU”
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Thank you!

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For more information on Colorado Insects check out the CSU Insect Information Website
For more information on Hemp Insects check out the CSU Hemp Insect Website