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A STUDY OF SOME PLANT GALLS

OF COLES COUNTY, ILLINOIS

(TITLE)

BY

James M. Beveridge

PLAN B PAPER

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE MASTER OF SCIENCE IN EDUCATION
AND PREPARED IN COURSE

BOTANY 548

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY,
CHARLESTON, ILLINOIS

1967

YEAR

I HEREBY RECOMMEND THIS PLAN B PAPER BE ACCEPTED AS
FULFILLING THIS PART OF THE DEGREE, M.S. IN ED.

June 6, 1967
DATE


ADVISER

June 6, 1967
DATE


DEPARTMENT HEAD

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PREFACE

In doing research for this paper, it was found that the study of plant galls can be immensely interesting. There is an overwhelming abundance of materials and surprisingly few written articles on this subject. This paper will not attempt to cover all of the plant galls, but only a comparative few that can be found in Coles County, Illinois.

These will in turn be limited to a small part of the total kinds of plant galls, mainly those of shade trees, since the greatest majority of shade tree galls are caused by egg-laying insects. They are, if not most common, at least most noticeable on oaks, where they sometimes take the form of balls an inch or one and one-half inches across hanging from almost every twig or leaf.

In further limiting this paper to primarily leaf galls, an attempt will be made to help the amateur collector in identification and perhaps promote a further study into this fascinating area.

James Beveridge

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INTRODUCTION

Galls are abnormal growths that are globular, semi-globular, or cylindrical in shape. They are produced on leaves, petioles, twigs, roots, buds, and sometimes on flowers and acorns. Usually these growths are produced by the "sting" of parasitic wasps (Cynipids) or by midges, aphids or other insects, or by the infestation of bacteria or fungi.

Each gall has its own characteristics according to the insect, or fungus that produced it and there are no two kinds of galls exactly alike among the thousands of different species; however, it is possible to make some generalizations of plant galls even though the life cycles of each gall is different.

The adult gall maker will usually attack a specific region of a particular species of plant. The gall that is produced will resemble all the other galls produced by the particular species and in most cases the species can be identified by the type of gall that is produced on it.

INTRODUCTION cont.

Galls are usually classified according to the plant upon which they are found, for instance maple, oak, hackberry, and elm; and they are given names according to their shapes such as; oak apple, bud, bullet or pouch.

In this paper we will be concerned with only known galls that are produced by insects. Other insects may be gall producers but so many factors are yet to be discovered that only time and research will be able to tell us this. In some cases, their life cycle of gall insects may be as long as four years and other factors such as alternation of generation, "guest" insects, and predators make the study of gall insects challenging and interesting.

A GALL IS PRODUCED

On certain days of the year small wasps may be seen visiting the oaks, busily engaged in piercing leaf or twig with their ovipositor and depositing their eggs. They inject an irritant which causes a diversion of plant juices to the point and an over growth of tissue, resulting in the gall. After a period of time, the egg hatches into a larva which continues to produce an irritant and the gall enlarges. The tissue of the plant continues to develop and encloses the organism that caused it. Oddly enough like a tumor that the plant is trying to isolate. In doing this, the gall maker is not only protected by the plant but also has an abundant supply of food. Studies have shown that in the area of the gall the protein content is much higher than other areas of the plant.

The gall is an ideal "house". The maker is protected from the elements, from parasites and predators and is less likely to dry out. These are some of the reasons

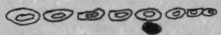
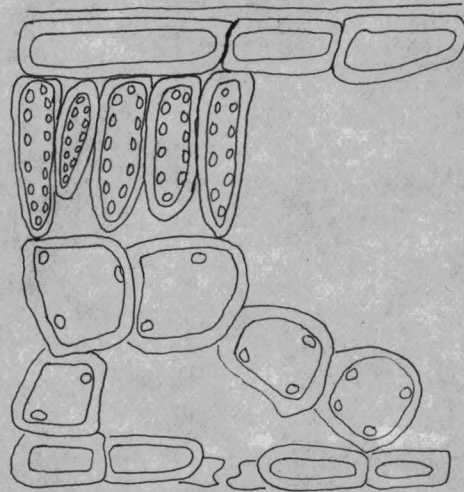
A GALL IS PRODUCED cont.

why so many insects make use of it. Galls caused by insects are perfect parasites and ordinarily, on shade trees, do no discoverable harm to their host.

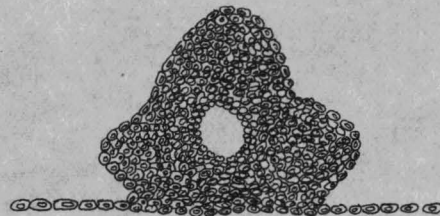
The actual substance that is thought to produce a gall is of a high nucleic acid - protein content and has been difficult to break down. There is also some thought given to the idea that a virus or fungus might play an important part in the development of a gall. All of these ideas will have to await further study and research.

HOW A GALL DEVELOPS

Normal Leaf



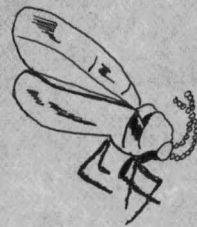
made up of primarily parenchyma tissue



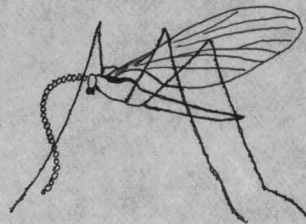
enormous increase in cells, large cavity

EZERASE
COTTON CONTENT

GALL WASP



FEMALE



MALE

USES OF GALLS

Many years ago galls were used to acquire tannic acid and ink however, due to scientific advances, modern chemical and biological laboratories now supply these with more convenience and less expense.

Galls are source of food for many animals. Mice and squirrels frequently eat the whole gall as well as the larva inside. In some countries, galls are eaten by man, sold on the open market. Here in parts of the United States galls are fed to cattle.

Probably their most important contribution though is their beauty. These curious structures are sometimes more beautiful than any structure the plant produces. In time the study of galls may give us many answers in the abnormal growth of human tissue and may result in cures for such diseases that are related to tissue development.

USES OF GALLS cont.

Some galls do cause damage, primarily among fruit growers. Such galls are pear leaf blister or apple leaf midges do considerable damage to commerical crops. In general though, the damage done by galls to plants is principally that of disfiguration.

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<u>Dryophanta polita</u> Bass	Plate 8
<u>Mordwilckja vagabunda</u> Walsh	"

A KEY TO SOME PLANT GALLS
OF COLES COUNTY

- I. Galls attached to the branch, separate from the blade or petiole of leaves.
- A. Round galls of a pithy substance with a central cell; may be single or in clusters.
1. Oak Bullet. Globular, single or in clusters, yellow sometimes tinged with red. 1/2 to 2/3 inches in diameter. White Oaks.
Amphibelips inanis Beutm Fig. 1
 2. Wool Sower Gall. Globular, small white pinkish wooly, matted hairs, many celled beneath fibers, diameter 1 1/2 to 2 inches. White Oaks.
Callirhytis seminator Harr. Fig. 2
- B. Round in shape, found on stem.
1. Golden Rod - Ball Gall. A round gall found on the stem of Canada Golden Rod, diameter 1 1/4 inches, inside gall is very pithy, retains coloration of plant. Euroata Solidaginis.
Solidago altissima L. Fig. 3

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

II. Bud galls consisting of one or more cells in a leaf bud.

A. Rosette in appearance.

1. Willow Pine Gall - Bud Gall. Rosette galls. Pine cone like gall, 1 to 1 1/4 inches in length.
Rhabdophaga strobiloides Walsh Fig. 4

III. Galls found primarily in petiole of leaf.

A. Tubular in shape, with ridges.

1. Poplar Stem Gall. Reddish green in color, globular and somewhat tubular in shape, diameter 1/4 inch, length up to 3/4 to 1 inch.
Ectoedemia populella Busck Fig. 5

IV. Galls found on blade of leaf.

A. A thickening of mid vein or lateral veins.

1. Sugar Maple Vein Gall. Galls found on underneath of leaf, along vein, 1/8 to 1/4 inch long, green.
Dasyneura communis Felt Fig. 6

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

2. Oak Fig Gall. Soft, thin shelled, reddish in color, located on veins, found on chinquapin oaks.
Xanthoteras fortieorne Walsh Fig. 7
- a. Galls medium sized, faceted or spring surface.
- (1) Black Oak Gall. Found near mid vein, dark in color, tubular in shape, $1/4$ to 1 inch in length, $1/4$ in diameter.
Cecidomyia sp. Beutm Fig. 8
- (2) Oak Hedge Hog Gall. Globular, many celled leaf gall, covered with spines or hairs, reddish tint, $1/2$ to $3/4$ inches in length, diameter $1/4$ to $1/2$ inches. White Oaks.
Acraspis erinaoei Beutm. Fig. 9
- (3) Hairy Oak Gall. Globular, found in mid vein, covered with long stiff hairs, one celled. Diameter $1/3$ to $1/2$ inches, yellow in color. Burr Oak.
Acraspis villosa Beutm Fig. 10

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

- (4) Oak Pea Gall. Surface has many facets or hair like spines that have a reddish tint, turning yellowish brown. Gall is green, diameter 1/4 inch and has two cells. Found mainly on White Oaks.
Acraspis pezomachoides O.S. Fig. 11

B. Galls that are either attached to the blade or involves the whole blade of the leaf.

1. Galls with central cell, hard outer shell, spongy interior. Oak Apples.

a. Large Empty Oak Apple. Substance between rind and kernel is fibrous and often scanty. Gall large, diameter 1 inch or more, central kernel, leaf is usually distorted or aborted. Globular, bright green with red spots, turns yellowish brown in late summer, early fall, thin shelled, glossy, the central larval cell supported by fibers.
Amphibolips inanis Beutm. Fig. 12

b. Small Oak Apple. Globular, smooth, green, about half showing on upper surface of leaf, diameter 1/4 to 1/2 inch. Red Oak.
Andricus singularis Bass. Fig. 13

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

- c. Spongy Oak Apple. Globular, smooth, shining or apozque leaf gall, inside a white or gray spongy substance and a large, central larval cell, green turning to light brown in late summer early fall, diameter $1 \frac{1}{4}$ to 2 inches. Found on red and black oaks.
Amphibolips confluens Harr. Fig. 14
2. Galls with many cells and covered by wool.
- a. Oak Wool Gall. Found on mid veins as wooly tufts, $\frac{1}{2}$ inch long of rather long, whitish or reddish wool covering 2 to 6 cells, diameter $\frac{1}{3}$ inch. Found on oaks, shingle.
Andricus flocci Walsh Fig. 15
3. Blister like swellings on underneath, or upper surface of leaf.
- a. White Oak Blister Gall. Small blister or swelling on upper side of leaf, one celled found on leaf vein, nipple protuding on lower sides, diameter $\frac{1}{20}$ inch. Green.
Neuroterus niger Gill Fig. 16

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

(1) Nipple shaped galls.

- (a) Hackberry Spiny Gall. Cone like in shape, length $\frac{1}{6}$ inch, single cell, green turning to black.
Cecidomyia spiniformis Patton.
Fig. 17

(2) Short, one cell, spine shaped.

- (a) Hackberry Nipple Gall. Large, round, nipple shape, green to clear in color, diameter $\frac{1}{6}$ inch.
Pachypsylla cellidismamma Riley
Fig. 18

(3) Bladder Shaped Gall.

- (a) Hackberry Blister Gall. Small blister like shape, yellow to green in color. Various sizes in diameter.
Pachypsylla vesiculum Riley
Fig. 19
- (b) Maple Bladder Gall. Small bladder like projection on underside of leaf. Diameter $\frac{1}{8}$ inch, green to dark, usually single larvae.
Phylloctes quadripes Shim.
Fig. 20

A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

4. Spot on leaf, may look almost like a blister.
- a. Purple or black spot, diameter $1/8$ inch.
- (1) Tulip Tree Gall . Dark spot on leaf varying in color from yellow to black. Globular in shape, mid rib or on veins, length $1/4$ to $1/2$ inch.
Cecidomyia sp. O.S. Fig. 21
- b. Yellow, reddish tint, diameter $1/8$ inch.
- (1) Red Leaf Spot Gall. Yellow to red, blister type spot found on red maple, diameter $1/8$ inch, usually single larvae.
Cecidomyia ocellous O.S.
Fig. 22
5. Galls, small, leaf present, numerous on leaf, have central cells.
- a. Polished Oak Gall. Globose in clusters on both sides of leaf, one celled, yellow in color, tinged with red. Thin shelled with fibers supporting cell, diameter $1/4$ to $3/4$ inch, found on Post Oaks.
Dryophanta polita Bass Fig. 23

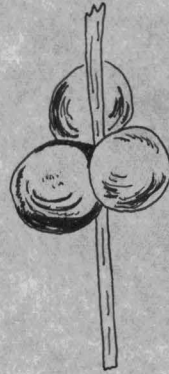
A KEY TO SOME PLANT GALLS OF COLES COUNTY cont.

6. Leaf completely deformed, spongy but looks woody, hollow.

a. Poplar Vagabond Gall. Irregularly folded deformity of the leaves, quite common on poplars, diameter 2 inches, green in color turning black in summer and fall.

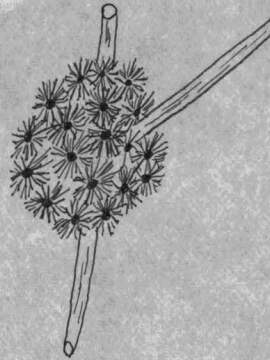
Mordwilckja vagabunda Walsh Fig. 24

PLATE 1



Oak Bullet

Fig. 1



Wool Sower

Fig. 2

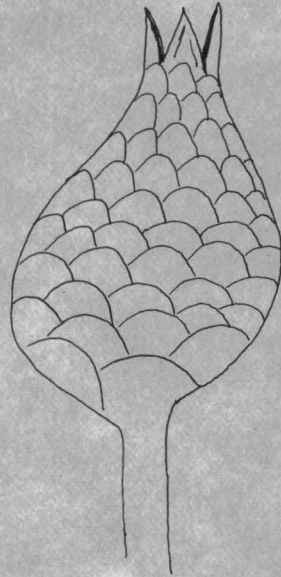


Golden Rod

Fig. 3

PLATE 2

Willow Pine
Fig. 4



Poplar Stem
Fig. 5

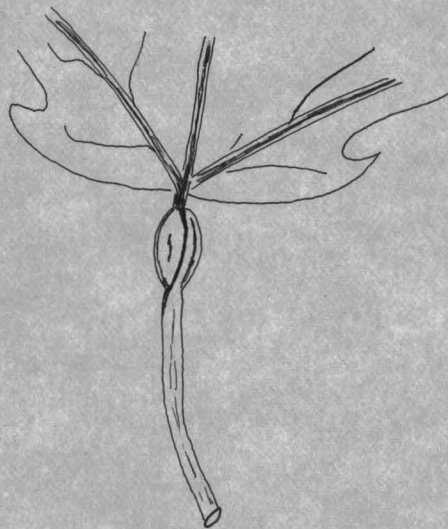
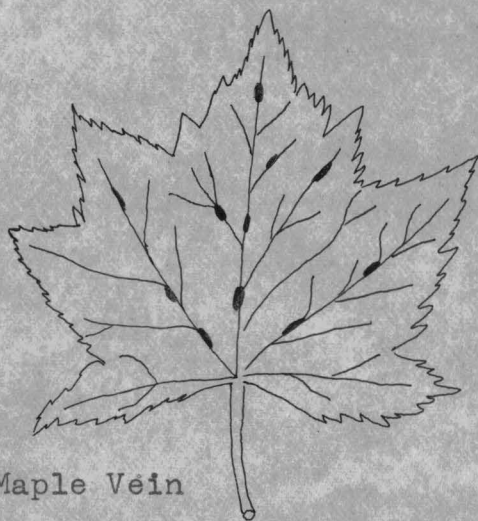
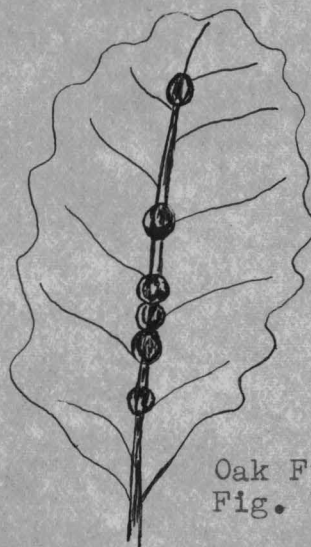


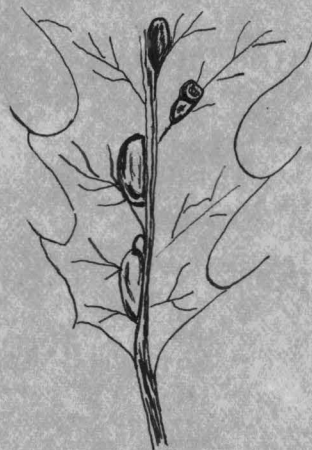
PLATE 3



Sugar Maple Vein
Fig. 6



Oak Fig
Fig. 7



Black Oak
Fig. 8



Oak Hedge Hog
Fig. 9

PLATE 4

Hairy Oak
Fig. 10



Oak Pea
Fig. 11

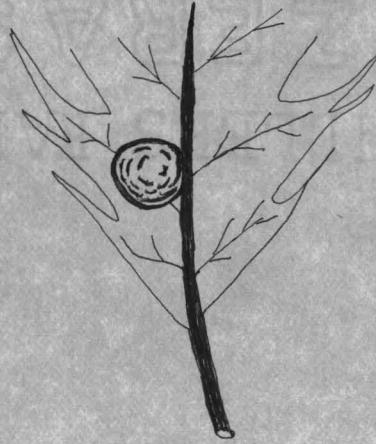


Large Empty
Oak Apple
Fig. 12



PLATE 5

Small Oak Apple
Fig. 13



Spongy Oak Apple
Fig. 14



Oak Wool
Fig. 15

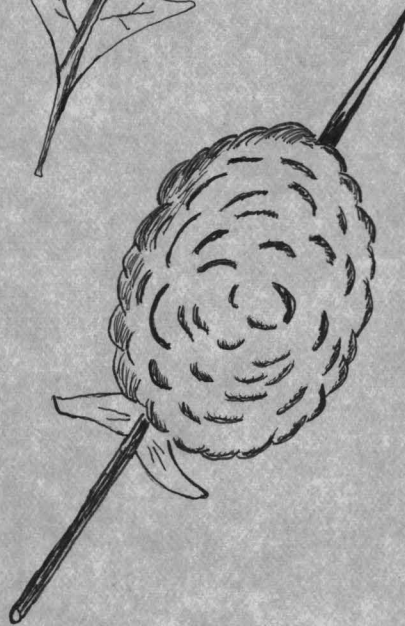
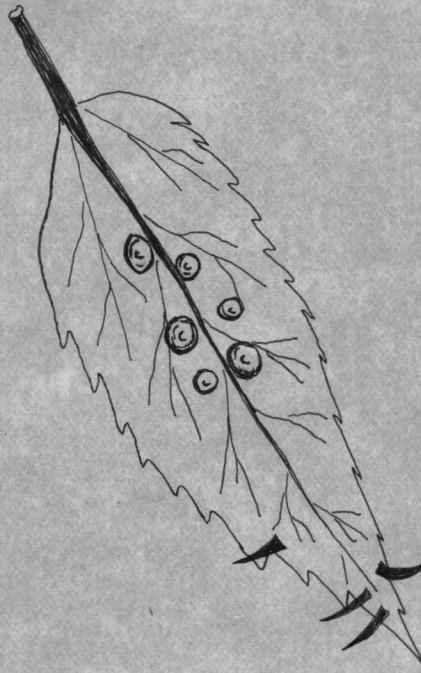


PLATE 6

White Oak Blister
Fig. 16



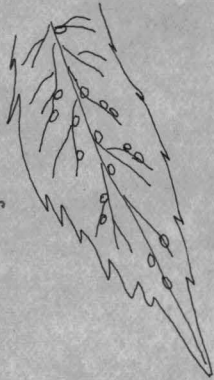
Hackberry Nipple
Fig. 18



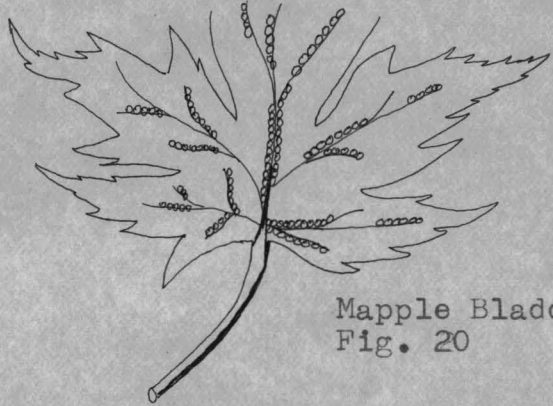
Hackberry Spiny
Fig. 17

PLATE 7

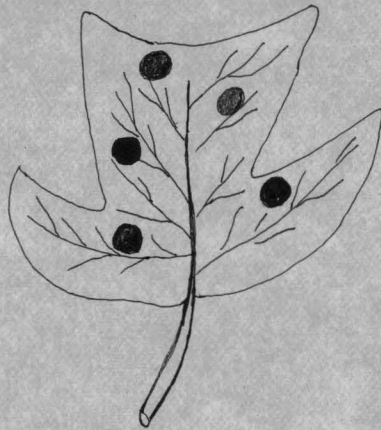
Hackberry Blister
Fig. 19



Maple Bladder
Fig. 20



Tulip Tree
Fig. 21



Red Leaf Spot
Fig. 22

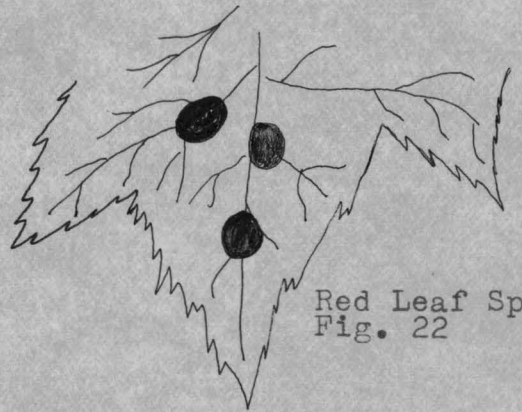
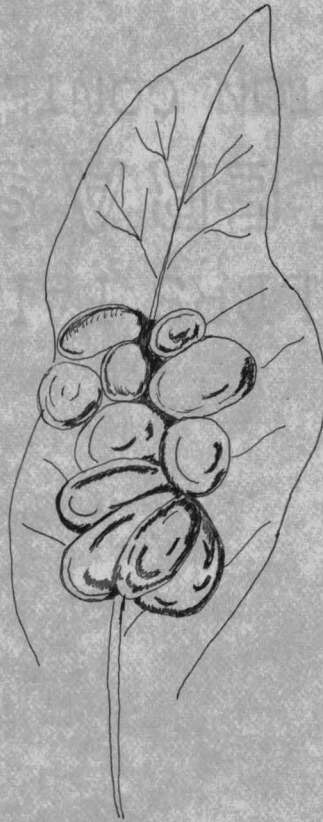
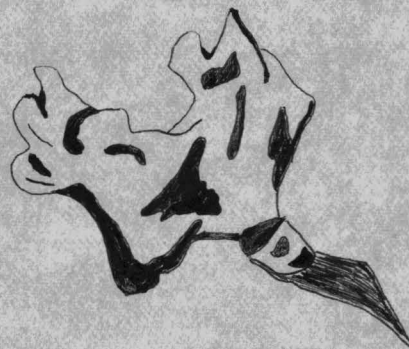


PLATE 8



Polished Oak
Fig. 23



Poplar vagabond
Fig. 24

OAK APPLES

Collected : June 6, 1966 at
Fox Trails State Park

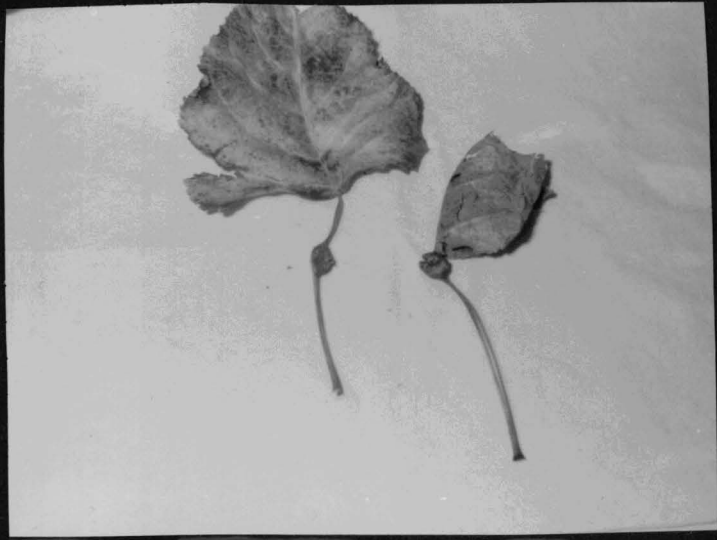
Found on : Quercus rubra L.
Quercus alba L.



PETIOLE OR STEM GALLS

Collected : June 6, 1966 at
Fox Trails State Park

Found on : Populus deltoides Marsh



BLISTER GALLS

Collected : June 6, 1966 at
Fox Trails State Park

Found on : Quercus alba L.
Quercus velutina Lam.



SPOT GALLS

Collected : June 6, 1966 at
Fox Trails State Park

Found on : Populus deltoides Marsh
Quercus alba L.
Quercus rubra L.



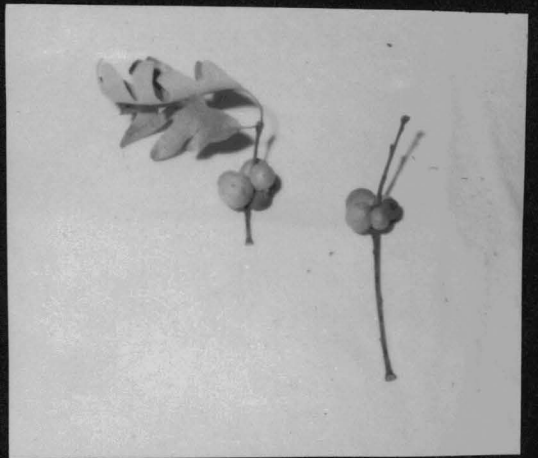
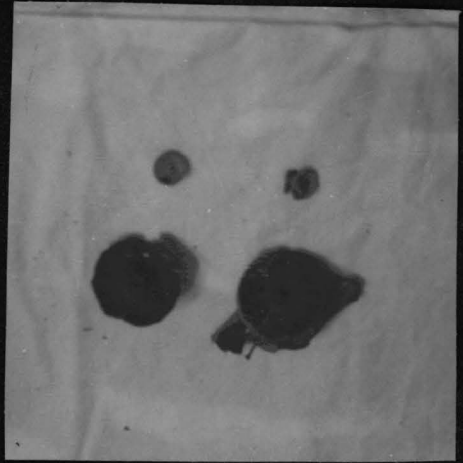
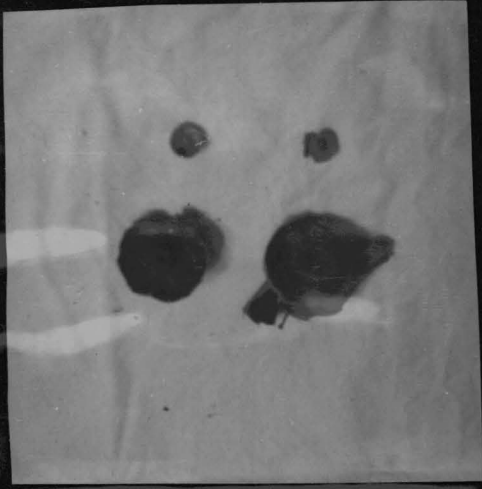
BULLET GALLS

Collected : June 6, 1966 at
Fox Trails State Park

Found on : Quercus alba L.
Quercus bicolor Willd.



GALLS COME IN DIFFERENT
SIZES AND SHAPES







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