

SOME UNREPORTED CECIDIA FROM CONNECTICUT

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Thru the winter of 1912-1913 and the summer of 1913, in preparing for some work on abnormally developed plant parts, the writer made a collection of insect galls in the eastern highland region of Connecticut. Most of the field work was done in the town of Mansfield in the vicinity of Storrs and Spring Hill. The extreme northern part of the eastern half of the state was visited a few times as well as the southern portion bordering on Long Island Sound. In the course of eleven months residence in the eastern Connecticut region, 204 galls were found, 22 of which are believed to be as yet unreported in the United States.

The object of the present paper is thus to present descriptions and illustrations of some heretofore undescribed cecidia produced by insects and mites in the eastern Connecticut highland region. A bibliography of the more important literature consulted, is appended.

The writer wishes to express his appreciation of valuable assistance rendered by Mr. Billings T. Avery of Ledyard, Conn. who not only materially assisted in enlarging the collection of previously described galls but found a number of the new ones described in the present paper.

It is self evident that such a report as the present one in which the galls only are adequately described, is an imperfect report. Yet, a list of these newly discovered definite hypertrophies and hyperplasias of plant parts should be set forth as a basis for future work, in which the whole of the subject entomological as well as botanical may be elucidated. Such a paper as the present one may perhaps act as a stimulus to the collection of cecidia by showing the unworked condition of the field. The animal induced pathologic structures developed on plant parts have not been collected with any degree of completeness; and no full and extended systematic studies have been made of those collected in America. Careful search in any locality, particularly among herbaceous plants is bound to bring to light some little known or entirely new cecidia.

The writer has left the matter of naming the causal organisms to future workers, believing that specific names should be originated by the first describer of the mite or insect concerned. The custom on the part of some of applying a specific name to an insect or mite merely on the basis of the intimately associated gall, is to be deplored. New names of gall producing forms should appear only with adequate descriptions of the arthropods concerned.

The galls herein described and believed to be heretofore unreported, are arranged on the basis of the plant affected. The plant genera are arranged alphabetically, Gray's Manual being followed in the matter of nomenclature.

Acer saccharum. Leaf Gall. Gall maker, not found.

A small, monothalamous, laterally flattened gall on the underside of the leaf veins. 3-4 mm. dia. Semicircular in outline as seen from the side. The vascular tissue traverses the edge of the gall. Gall opens above by a slit which is bounded by definite lips. No pubescence present. Green in summer, brown in dried condition. Fig. 1.

Amelanchier canadensis. Leaf Gall. Gall maker, not found.

A small, monothalamous, smooth, cone-shaped gall, prominently curved at the tip, occurring on either side of the leaf. On the side opposite the gall is a short narrow slit, definitely lip-bordered, which leads into the small chamber. In mid-summer the galls are yellowish at the base to red or brown black at the tip. Under lens the surface is finely striate. No pubescence. When found they occur in great numbers on the leaves of the shad-bush, where they are distributed heterogeneously; bearing no relation to the venation system. Common locally. Fig. 2.

Possibly the gall described by Hagen (33) and Chadwick (22) as "similar to a Phrygian cap, the tip rolled down; on the upper side of the leaf, rarely below."

Amelanchier canadensis. Leaf Gall. Gall maker, unknown.

A flattened, monothalamous, pocket gall occurring in numbers on the underside of the leaf. 3-4 mm. long. Distal edge toothed, rarely more than three pointed. Ivory white, smooth as tho polished. Cavity confined to the proximal two thirds of the gall. Wall smooth. Opens on the opposite or upper side of the leaf by a narrow slit sunken in a depression of the blade. Galls are locally abundant.

Undoubtedly an insect gall, whose larvæ leave the cecidia by mid-summer. The material described was collected in Aug. and showed no inhabitants of any kind. Fig. 3.

Possibly the same as Felt's (29) "flattened, white, pouch gall on leaf margin, denticulate. *Cecidomyia* sp." The galls, however, are scattered over the leaf blade.

Betula lenta. Leaf Gall. Gall maker, undetermined.

A monothalamous, closed vein gall on the principal veins of the leaf. 5-10 mm. long, often merging into each other. Narrow, not over $\frac{1}{2}$ mm. wide. Smooth and color of the normal vein. Tubular cavity small. Larvæ not found. Not common. Fig. 4.

Carya ovata. Leaf Gall.

A bright red, sub-globular, monothalamous, fleshy gall on the under side of the leaflet. At first white, later red (July 16) 3 mm. high, 5 mm. broad. A slight papilla terminates the apex. Wall of larval chamber white, rest of tissue reddened. Larva white. Fig. 5.

Castanea dentata. Leaf Gall. Gall maker, an undetermined aphid.

A marked wrinkling and crumpling of the leaf particularly in the region of the mid-vein. No definite cavities formed. Aphids numerous, scattered in the folds of the distorted interveinal tissue. Not common. Fig. 6.

Castanea dentata. Leaf Gall. Gall maker, Eriophyes sp.

This gall consists of a yellowish erineum developed between the secondary veins of the leaf, chiefly on the upper side. Exhibits a shallow concavity above.

Clematis virginiana. Bud gall. Gall maker, Eriophyes sp.

A gall of the terminal leaf bud made up of the greatly hypertrophied and rigid leaf petioles. These assume the form of irregular flattened scales. On each of the outermost ones the three minute leaflets can be readily seen borne on the summit of the highly expanded petiole. The sub-spherical galled bud measures about 1 cm. in dia. The irregular cavities within are nearly filled by the dense growth of filamentous trichomes. This white pubescence chokes up the entrance way between the outermost scales.

This gall often develops irregularly and the enlarged semi-woody petioles are so compactly pressed together, that its essential morphology might be missed in a hasty examination. Fig. 7.

Evidently the same gall as one produced on *C. Flammula* and described by Frank, A. B. (30).

Decodon verticillatus. Bud Gall. Gall maker, a cecidomyid insect.

A gall formed by the thickening of the two or three uppermost minute bud leaves of the terminal or lateral buds. Galled bud 3-5 mm. long. Green. The two or three modified leaves neatly overlap forming a well protected chamber within, which contains a single salmon colored larva. Rather common. Fig. 8.

Dulichium arundinaceum. Stem Gall. (Rachilla.) Gall maker, a cecidomyid insect.

A monothalamous, open, "groove" gall of the rachilla. One or generally two internodes involved. The normal rachilla is grooved both sides and the gall chamber is an enlargement of the deeper one whose edges are the membranaceous, decurrent bract base. The galled rachilla is so prominently hypertrophied that the affected spikelets can be picked out at a glance due to their greater width.

Larvæ bright salmon color, breast plate prominent. Evidently mature Sept. 1. Galls common on *Dulichium* in the Conn. region. Figs. 9, 10 and 10a.

Hamamelis virginiana. Leaf Gall. Gall maker, unknown.

A monothalamous, "groove" vein gall opening on the upper side of the leaf. Affecting principal veins. Variable in length, 1-3 cm. long. Surface minutely roughened, green, turning black when old. Not common. Possibly the same as Felt's (29) "fleshy vein folds. *Cecidomyia* sp." Fig. 11.

Juncus canadensis. Bud and Stem Gall. Gall maker, not determined.

Elongated bud-like galls made up of overlapping leaves. The branch axes are very much shortened causing the leaves to tightly enfold one another. From four to seven of these affected branches or galls occur together in a cluster. Average length of gall, 4 cm. Green. Fig. 12.

A gall exactly similar to this is pictured by Connold (23) who states that the gall is formed by the larva of *Livia juncorum*, Latr. Reported from Hastings, England. Fig. 12.

Mikania scandens. Stem Gall. Gall maker, undertermined.

A large, monothalamous, fusiform gall of the stem internode. 1-2½ cm. long, ½ as wide. Six longitudinal low ridges divide the surface area into as many faces. Surface smooth, color of the normal stem. Texture tough almost woody. Cavity large (as wide as the wall is thick) extending the length of the gall. A single white larva found within. Fig 13.

Muhlenbergia mexicana. Bud Gall. Gall maker, undetermined.

A lateral bud gall formed by an extreme shortening of the axis resulting in a compact structure made up of overlapping leaves. The leaves, tho greatly reduced in length and much broadened still show the sheath and blade portions definitely divided by the minute ligule. 4 cm. long, 1 cm. wide.

The larvæ (Aug. 20th) just visible distributed in the spaces at the very base of the sheaths. Fig. 14.

Myrica asplenifolium. Leaf Gall. Gall maker, *Eriophyes* sp.

A gall formed by the thickening and folding of the mid-vein, with which it associated an incurling of the leaf edges. If the entire mid-vein is affected, the whole blade is much contorted. Reddish and smooth without. A thick, white pubescence fills the cavity within. The trichomes are highly elongated. Not common. Fig. 15.

Ostrya virginiana. Leaf Gall. Gall maker, Eriophyes sp.

A small, sub-spherical pocket gall generally on the upper side of the leaf. 1-2 mm. dia. Red tinged, smooth. Opening below marked by a tuft of white hairs. Few or many on leaf. Not common. Fig. 16.

Rhus copallina. Leaf Gall. Gall maker, Eriophyes sp.

A terminal mass of dwarfed branches, bearing abortive leaves, the leaflet margins of which are strongly inrolled. In addition the leaflets are more or less contorted. No definite erineum present.

A gall identical to this has been collected on *R. glabra*.

Fig. 17 illustrates merely one of the numerous dwarf branches. Fig. 17.

Jarvis, 39th Ann. Rept. Ent. Soc. of Ont. 1908. p. 90 (35) a similar gall on *Rhus typhina*.

Salix sericea. Leaf Gall. Gall maker, undetermined.

A monothalamous, elongate, irregular, tubular gall formed in the blade of the leaf near to and paralleling the margin. The edge of the leaf is turned, simulating the nest of a leaf roller insect. There is, however, a marked hyperplasia of tissue. 1-1½ cm. long. Smooth, light green above. Thin walled. The escape-pore is below at the distal end. No larvæ or pupæ present Sept. 1. Fig. 18.

A similar gall is found in England on *Salix viminalis* caused by *Cecidomyia marginem-torquens*, Wtz. See Connold, (23) British Vegetable Galls, p. 194. 1902.

Solidago odora. Terminal Bud Gall. Gall maker, undetermined.

A monothalamous gall probably formed by the transformation of the growing point of the terminal bud into an olive shaped structure, 15 mm. long, 11 mm. wide. Base enveloped by an involucre like mass of overlapping leaves. Surface reticulately marked. Areas brownish. The distal region surrounding the mucronate tip, green and smooth. The single elongate flash-shaped cavity contains one large white larva. In long, section the walls are observed to be composed of a compact pith, thru which more or less prominent vascular bundles are distributed. Not common. Fig. 19. A longitudinal median section is shown in Fig. 19, a.

Spirea latifolia. Bud Gall. Gall maker, a cecidomyiid insect.

Galled terminal and lateral buds. The leaf primordia develop into thick green scales, which overlapping form the large larval chamber within. 7-10 mm. in length. Many larvæ (possibly inquilines) to a gall chamber. Possibly one of the following: Fig. 20.

Jarvis, "A bud-like sessile gall in the axil of the leaf." "Undescribed" 39th Ann. Rept. of the Ent. Soc. of Ont. 1908. p. 90.

Felt, (29) reports a "terminal globular bud gall, 4 mm. *Hormomyia clarkei*, Felt."

Tilia americana. Leaf Gall. Gall maker, undetermined.

A monothalamous, fusiform hypertrophy at the base of the petiole, 10 mm. long, 5 mm. wide. Surface and color same as the normal petiole base. Texture tough, almost woody. Chamber, elongate, narrow, flattened lying centrally. A single white larva present. Fig. 21.

Vitis aestivalis. Leaf Gall. Gall maker, an undetermined insect. A small, monothalamous, sub-cylindric gall, extending both sides of the leaf. Hairy on both sides with reddish brown hairs below, lighter above. 2-3 mm. Walls rather thick. Pupa present July. Not common. Fig. 22. Plate II.

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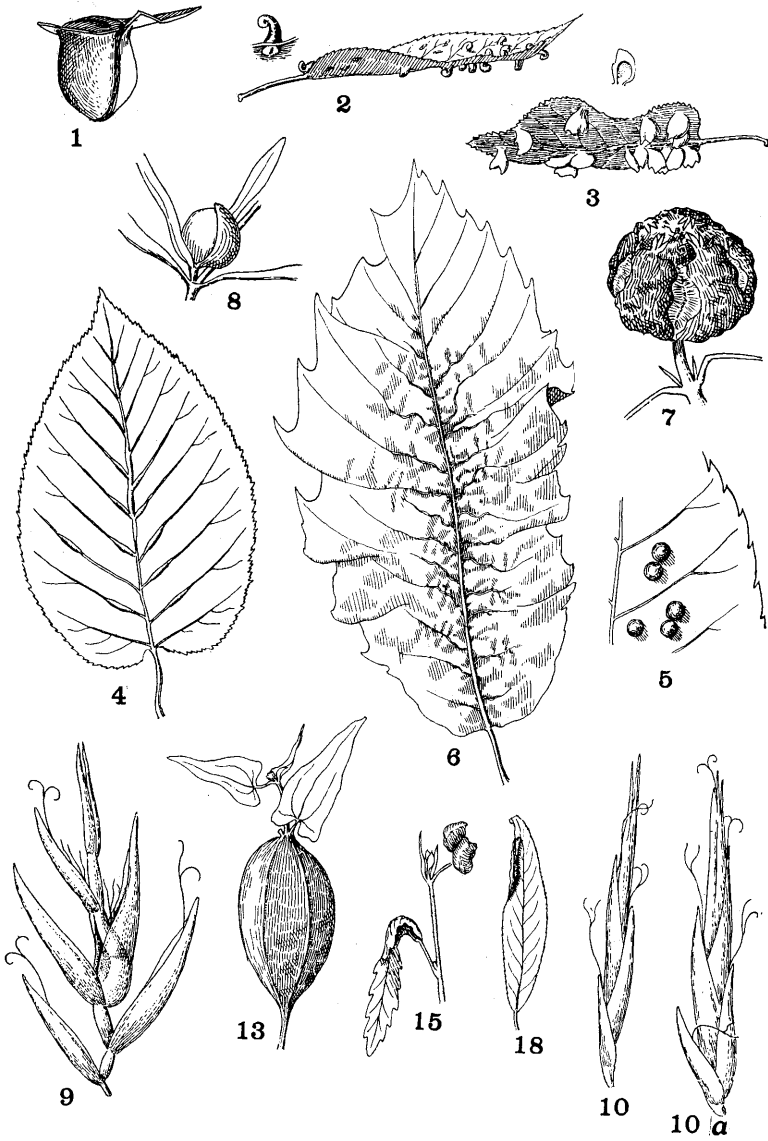
EXPLANATION OF PLATES.

PLATE XII.

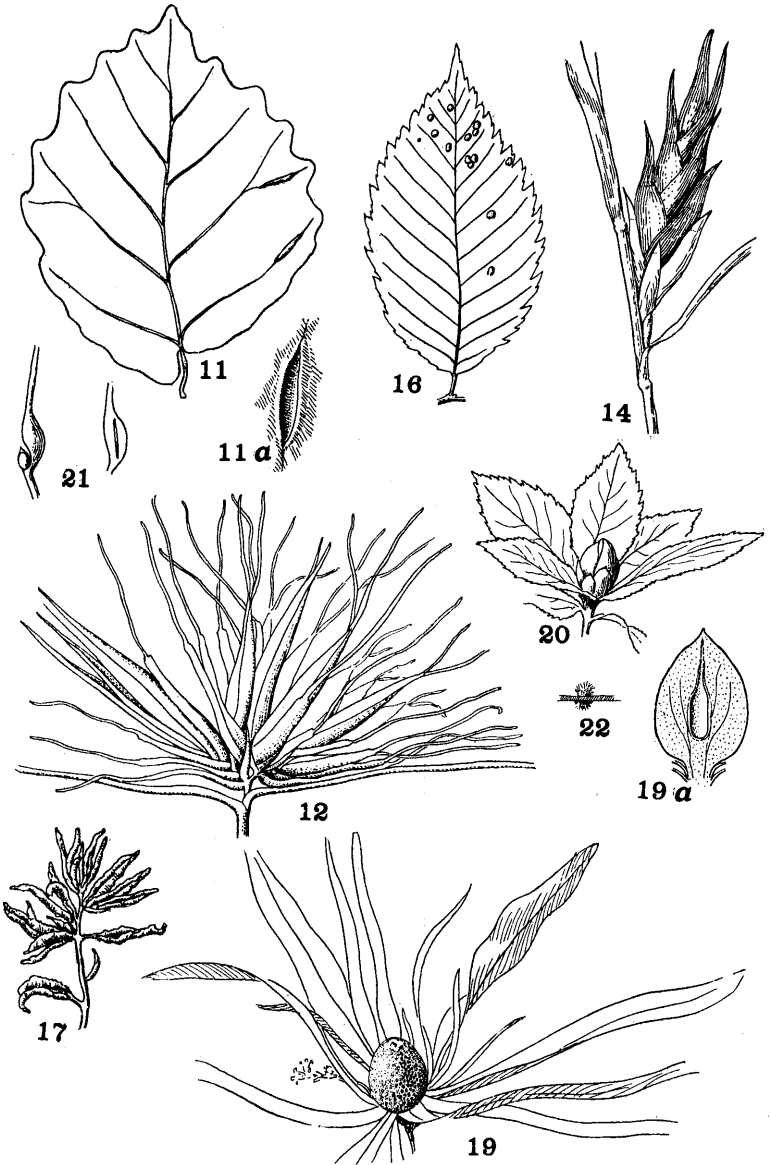
- Fig. 1. *Acer saccharum*. Vein gall. x4.
- Fig. 2. *Amelanchier canadensis*. Leaf with galls. xl. Single gall. x5.
- Fig. 3. *Amelanchier canadensis*. Leaf with galls. xl. Single gall in section slightly enlarged.
- Fig. 4. *Betula lenta*. Vein gall. x $\frac{3}{4}$.
- Fig. 5. *Carya ovata*. Leaf gall. x $\frac{3}{4}$.
- Fig. 6. *Castanea dentata*. Aphid leaf gall. x $\frac{1}{4}$.
- Fig. 7. *Clematis virginiana*. Bud gall. xl.
- Fig. 8. *Decodon verticillatus*. Bud gall. xl.
- Fig. 9. *Dulichium arundinaceum*. Opened spikelet showing galled rachilla.
- Fig. 10. *Dulichium arundinaceum*. Normal spikelet.
- Fig. 10a. *Dulichium arundinaceum*. Galled spikelet. See Fig. 9.
- Fig. 13. *Mikania scandens*. Stem gall. xl.
- Fig. 15. *Myrica asplenifolium*. Mite leaf gall. x $\frac{1}{2}$.
- Fig. 18. *Salix sericea*. Leaf gall. x $\frac{1}{2}$.

PLATE XIII.

- Fig. 11. *Hamamelis virginiana*. Leaf with vein galls. x $\frac{1}{4}$.
- Fig. 11a. *Hamamelis virginiana*. Vein gall from upper side. x $\frac{3}{4}$.
- Fig. 12. *Juncus canadensis*. Bud and stem galls. x $\frac{1}{2}$.
- Fig. 14. *Muhlenbergia mexicana*. Bud and stem gall. x $\frac{1}{2}$.
- Fig. 16. *Ostrya virginiana*. Leaf with galls. x $\frac{1}{3}$.
- Fig. 17. *Rhus copallina*. Galled leaflets. xl.
- Fig. 19. *Solidago odora*. Terminal bud gall. x $\frac{1}{4}$.
- Fig. 19a. *Solidago odora*. Long. med. section of 19. x $\frac{1}{2}$.
- Fig. 20. *Spiraea latifolia*. Bud gall. x $\frac{2}{3}$.
- Fig. 21. *Tilia americana*. Petiole gall. x $\frac{2}{3}$.
- Fig. 22. *Vitis aestivalis*. Leaf gall. xl.



Wells on "Cecidia."



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