

ALABAMA
Agricultural Experiment Station
AUBURN

Cedar Apples and Apple Leaf-Rust

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FIG. 1. CEDAR APPLE (*Gymnosporangium macropus*) ON RED CEDAR.

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CEDAR APPLES AND APPLE LEAF RUST.*

Among the various diseases of apples in Alabama the leaf-rust, apple-rust or orchard-rust, is one of the most important. The connection of this disease on the apple leaves with the so-called "cedar apples" on species of cedar is fully described in this circular. We desire to secure information regarding the distribution of this apple leaf disease in Alabama, the relative resistance of various sorts of apples to the disease and the date of the first appearance of both the cedar apple on the cedars and the leaf rust on the apple. We give below a description of the various sorts of cedar apples thought to occur in Alabama, and hope those to whom this circular is sent will co-operate in furnishing data on the points mentioned above. A sheet bound at the end of this circular can be torn off and returned to us after being filled out.

LARGE CEDAR APPLES (*Gymnosporangium macropus* Link.)

The large cedar apple occurs on the twig and small leaf-bearing branches of the red cedar (*Sabina virginiana*). They appear as globose or globular galls or swellings from the size of a marble to a couple of inches in diameter. During the fall and winter the swellings have a reddish brown color and harmonized well with a dark green of the tree. Upon looking closely at the gall it will be seen to be covered with small circular pits, each of which has a raised center. (See Figure 1). The gall feels somewhat spongy, or like very hard rubber. In Spring during damp rainy weather these galls send out numerous bright yellow spikes of a jelly-like consistency. In this stage they are very noticeable, and are sometimes referred to as "Cedar flowers."

*I wish here to make my acknowledgements to Dr. E. Mead Wilcox for his valuable suggestions and the photograph for figure 1; also to Dr. E. H. Jenkins, of the Connecticut Agricultural Experiment Station for the use of the plate for figure 2, photographed by Clinton.

These are, however, not flowers but enclose the spores of the fungus causing the cedar-apple galls.

When apple trees are grown near these cedar trees the leaves of many varieties become spotted with yellow spots from a quarter to a half an inch in diameter. On the under side of these spots are formed clusters of what appear to be holes surrounded by many large curled hairs. Upon examining with a lens the holes appear to be filled with yellow dust particles which are the spores of this stage of the fungus. (See figure 2). This stage is often called the

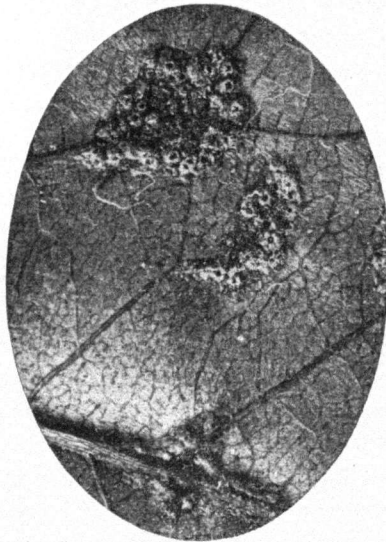


FIG. 2. APPLE LEAF RUST. (*Roestelia pirata* Thax.)
After Clinton.

apple-leaf rust or orchard-rust and before the connection between the cedar apple and the apple leaf rust was known it was called *Roestelia pirata* Thax. It is still widely known as *Roestelia*, and occurs on the wild crab-apple as well as on the cultivated apple.

The spots on the apple leaf and the cedar apple galls are caused by the same fungus. Spores are blown from the jelly-like spines on the cedar apple, and if they fall on the damp apple leaf germinate and grow into the leaf. After a

time, about 58 days, these leaves show the yellow spots which have just been described. The spores from the *Roestelia* on the apple leaf blow back to the cedar and growing produce the cedar apple galls.

CEDAR APPLE (*Gymnosporangium flaviforme* Atk.)

This cedar apple very closely resembles the large cedar apple just described; in fact, it looks so much like it that even with a microscope it can be separated from it only with difficulty. It also grows on the red cedar. It produces galls from a quarter of an inch to an inch in diameter of a reddish brown color. The surface is marked with shallow pits, having raised centers. In the Spring after warm rains the galls produce numerous spikes of a bright yellow color and jelly-like consistency which here also contain the spores. This cedar apple is especially numerous where there are sugar-haw trees. (*Crataegus spatula*), growing, as it has its *Roestelia* stage on this tree or shrub.

This *Roestelia* (*Roestelia flaviforme* Atk.) has essentially the same features as the (*Roestelia piriata* Thax.) on the apple leaf. It occurs, however, on the sugar-haw (*Crataegus spatula*).

SMALL CEDAR APPLE (*Gymnosporangium globosum* Farl.)

This also occurs on the red cedar, and is much like the two preceding species. However, it is usually smaller, hard, woody, and often accompanied by an old, hard, dry swelling of which the growing portion may form but half or a third of the gall. In the Spring the living part of this gall produces flat tongues of brownish color about one-fourth to a half an inch long, and not nearly so conspicuous as the large cedar apple. Where the large cedar apple with its bright yellow spikes of jelly-like substance lasts but one season this small cedar apple lasts a number of years.

The *Roestelia* stage of this cedar apple occurs on many varieties of the haw tree (*Crataegus*), also on the service berry or June berry (*Amelanchier alnifolia*). This stage has been known as *Roestelia lacerata* Am. Auct.

Gymnosporangium clavipes C. and P.

This occurs on the red cedar but does not produce a large gall like those just described. It is small and inconspicuous and occurs on the small scaly branches under the leaves forming a little brown cushion about the size of a pin head. The small scale-like leaves on the affected branches often become somewhat elongated and sharp pointed so they resemble the leaves of the common low juniper (*Juniperus communis*). In the Spring these cushions are orange colored and become a jelly-like mass about a quarter of an inch long.

The *Roestelia* stage of this *Gymnosporangium* (*Roestelia aurantiaca* Pk.) occurs on the leaves, stems, and young fruit of the pear, quince and service berry or June berry (*Amelanchier*.) The aecia are closely connected together and appear a bright orange color from the spores within. The peridium is erect or somewhat curved, about a quarter of an inch long, whitish in color, shining and toothed at the apex.

BIRD'S NEST OR WITCH'S BROOM OF THE RED CEDAR.

(*Gymnosporangium nidus-avis* Thax.)

This also occurs on the red cedar. When this fungus attacks the red cedar an enormous number of short branches are formed. They are bunched together and look not unlike a small tree growing on the limb of the cedar tree. This bush like growth is known as a witches' broom, and from a distance somewhat resembles a large bird's nest. Upon examining the affected branches the leaves are found to be longer, sharper and stand out at a greater angle than those on the healthy twig. The leaves closely resemble those of a low juniper in general appearance. At the base of the leaves on the diseased twigs there may be found small brownish gellatinous cushions containing the spores. These appear in early spring.

The *Roestelia* stage of this fungus is formed on apple leaves and on the service berry or June berry (*Amelan-*

chier). This stage has been known as *Roestelia nidus-avis* Thax.

CLUB RUST OF THE JUNIPER (*Gymnosporangium clavari-forme* (Jacq) Ress.)

This is found on the common low juniper (*Juniperus communis*). The attacked branch swells up into a club shaped or spindle shaped body often several inches long and an inch or more in diameter. The gall is from necessity very hard and woody. In early Spring small club-shaped or cone-shaped masses of bright yellow jellatinous substance are sent out from the surface of this gall. These masses make the gall more conspicuous and they contain the spores of the fungus.

The *Roestelia* stage (*Roestelia clavariforme* Jacq.) is found on the leaves of the apple and haw or thorn tree.

(*Gymnosporangium bermudianum* Earle.)

This occurs on the cedar (*Sabina barbadensis*) in the counties very near the Gulf, especially near Mobile, and farther south near Bayou Labatre.

The diseased spots are on the small branches carrying the scale-like leaves. Very often the branches have somewhat enlarged portions in which cup-shaped depressions. Early in the Spring these enlarged portions give rise to the small orange gellatinous spikes of material. Sometimes the end of the affected twig dies and falls off.

This does not produce an apple leaf rust nor a leaf rust on the haw or service berry. The *Roestelia* stage (*Roestelia bermudianum* Farl) is formed on the same tree (*Sabina barbadensis*) and in the same enlargement that gives rise to the winter-spore masses.

(*Gymnosporangium biseptatum* Ellis.)

This occurs on the white cedars (*Cupressus thyoides*) on or under the leaves as small erumpent velvety masses. In damp weather in the Spring these become reddish brown and gellatinous.

The *Roestelia* stage (*Roestelia botryapites* Schw.) occurs on the leaves and fruit of the service berry or June berry (*Amelanchier canadensis* or *Amelanchier botryapis*) as little, reddish, brown, cylindrical tubes which are frayed out at the ends.

The first five species described are definitely known to occur in Alabama, having been collected at Auburn. The last three species have not been collected, but since the host plants are present it is not improbable that they also occur.

RELATIVE SUSCEPTIBILITY OF APPLES TO RUST.

In describing several of the cedar apple fungi we have mentioned the apple as a host for the *Roestelia* form, but not all varieties of apples are equally susceptible to the disease. The following varieties are usually free from rust, as shown by our Experiment Station records:

Apple of Commerce,	Mammoth Black Twig,
Arkansas,	Maiden Blush,
Black Buda,	Noble Savor,
Summer,	Pasman,
Black Ben Davis,	Ponjik,
Champion,	Red Astrechan,
Cooper's Early,	Early Red Margaret,
Epic,	Sabadka,
Fanny,	Summer Queen,
Fall Pippin,	Saxon Priest,
Garvenstein,	Selymes,
Hyari Piros,	Summer Cheese,
Hershall Cox,	Shackleford,
Henis Crab,	Tuscaloosa,
Jennings,	Seedling,
Kennard's Choice,	Winesap,
Maggar,	Yakar,
Mitchel,	Yates.

The following varieties are usually slightly affected:

Aikin,	Keeskemet,
Babbitt,	Mavarack,
Buncomb,	Oszi-voj,
Bledsoe,	Pear (Palmer),
Bradford,	Red Limber Twig,
Bennony,	Rowls Janeton,
Cillagoes,	Red Beltigheimer,
Cannon,	Sekula,
Pearmain,	Summer Wafer,
Cooper's Red,	Sweet Bough,
Dam,	Thornton's Seedling,
Early Harvest,	Taunton,
Elgin Pippin,	Texas Red,
Grimes Golden,	Yellow English,
Hands,	Yellow Horse,
Homing,	York Imperial.
Jefferies Ever Bearing,	

The following varieties are badly affected:

Carolina Greening,	Marvina,
Carters Blue,	Nickajack,
Chattahoochee,	Red June,
Equinettelee,	Rome Beauty,
Family,	Rodes Orange,
Haygood,	Shockley,
Jonathan,	Senator,
Julian,	Santa Mwalolybi,
Moultiers,	Yopps Favorite.
Mangum,	

MEANS OF PREVENTING APPLE RUST.

Spraying does not seem to be very successful. Some stations report some good results, others report no effect or negative results. In our experiments here spraying did not seem to check the disease.

The best plan is to plant those varieties that are not susceptible to the disease. All cedar trees in the vicinity of

the orchard should be removed. These seem, at present, to be the only means of controlling the apple leaf rust.

Since the cedar apple fungus has not been thoroughly studied in Alabama, we are trying to gather as much material as possible. It is not possible for us at this season to visit all parts of the state. It would be a great help to the Agricultural Experiment Station for any one seeing any of the above described cedar apple fungi or *Roestelia* to send them to Department of Botany, Auburn, Alabama.

In sending material the following directions should be observed: If cedar apples are sent, cut off the branch a little below the gall so that there will be four or five inches of the branch with the leaves accompanying it. Also cut off a small healthy branch and if possible include a few of the little blue fruits. These should be packed with paper in a pasteboard box. Place inside a slip of paper giving your name and address and also the date on which the material was gathered. If convenient, fill out the lower blank in the last half of this circular and return it with the specimen.

If leaf rust of the apple, haw, or June berry, is sent do as follows: Take a small twig with the diseased leaves or fruit. Straighten out all the parts and press slightly between two pieces of blotting paper and allow to dry under pressure for a day or two. If possible, a few flowers should be treated the same way and at the same time. If later in the season a fruit or two will help to identify the haws and service berries. These may be placed in a small box or carefully wrapped in wrapping paper. Include a slip giving name, address, and date on which material was collected, or better still fill out and inclose the blank in the upper half of the last page of this circular.

On the last page of this circular are printed two sets of questions, one with reference to the cedar apple and one with reference to the apple leaf rust. These are to be filled out and sent in to us if possible. We would appreciate it if you would fill out these blanks and return them to us

as soon as you have been able to make the observations. These might be sent back inclosed with a sample of the material.

Please address all information, inquiry, or material, to
DEPARTMENT OF BOTANY,
AUBURN,
ALABAMA.

APPLE-LEAF RUST OR ORCHARD RUST.

(Fill out this blank and return it as soon as the leaf-rust appears.)

1. What varieties of apples are you growing?
 2. Which varieties are most affected by leaf-rust?
 3. Which varieties are least affected by the leaf-rust?
 4. At what date did the leaf-rust first appear this year? ..
 5. What is the distance from your apples trees to the nearest cedar trees?
 6. Are these cedar trees affected with the cedar-apple disease?
- Name
- Post Office County R. F. D. No...

CEDAR APPLES.

(Fill out this blank and return it as soon as the gelatinous spines appear on the cedar apples.)

1. At what date did the gelatinous spines first appear? ..
 2. Do you find more than one sort of cedar-apple?
 3. Are these cedar trees near apple, wild crab, quince, pear, haw or service berry trees?
- Name
- Post Office County R. F. D. No...

