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Soft Scales Injurious to Deciduous Ornamentals
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Soft Scales Injurious to Deciduous Ornamentals

By E. I. McDANIEL



European fruit-scale on plum.

AGRICULTURAL EXPERIMENT STATION

MICHIGAN STATE COLLEGE
Of Agriculture and Applied Science

ENTOMOLOGICAL SECTION

East Lansing, Michigan

FOREWORD

The present bulletin is one of a series of popular nature dealing with insects affecting ornamentals. It is devoted to a discussion of soft scales infesting deciduous trees and shrubs in ornamental plantings. The many calls that have followed the publication of earlier parts of this series lead one to hope that the bulletin will find favor in the eyes of nurserymen, landscape gardeners, city foresters, and those interested in the beautifying of parks, boulevards, roadsides, and homes.

R. H. PETTIT,
Entomologist of Experiment Station.

Soft Scales Injurious to Deciduous Ornamentals

E. I. MC DANIEL

The natural group of scale insects or Coccidae includes a variety of forms which by reason of their similarity in appearance are not easily differentiated by the grower or, for that matter, by anyone not a specialist on this particular family. Many forms require the most careful microscopic study in order that they may be correctly placed. Furthermore, the development and life-histories of a variety of forms shows their close relationship but, at this point, the resemblance ceases to be.

With few exceptions, the different members of the family of Coccidae show decided preferences for certain definite food-plants, the list, in some cases, is more or less restricted and circumscribed while, in other instances, the list of host plants is more comprehensive and the insect is not averse to accepting a variety of host plants for feeding and breeding purposes.

To the grower of ornamental trees and shrubs it is of prime importance to be able to know just what may be the potentialities and the hazard involved whenever one of these insects appears in his plantings or in the nursery. It is very desirable that he be able to know with certainty just which varieties of neighboring shrubs and trees are open to attack, immediately after the acquisition of a new scale insect among his plantings. This is especially desirable in case of an attack in a nursery, cemetery, park, or wherever numbers of ornamental trees and shrubs are massed.

In case a certain scale is known to restrict its operations to working on no more than four or five different trees or perhaps even on one tree, the treatment called for is likely to be less drastic than would be the case should the scale regularly feed on a list of fifty or more different host trees. There seems to be no way of avoiding the necessity of considering each particular species on its own merits and in the light of what is known about its food habits and range of operations. Furthermore, the different species are influenced somewhat differently by weather conditions and by the attacks of natural enemies, many of them being held in subjection part of the time by native parasites. In the present discussion, only general appearances are discussed. Exact technical descriptions of a number of the species may be found by referring to Technical Bulletin No. 48 which will be supplied on request.

THE EUROPEAN FRUIT LECANIUM

Lecanium corni

This scale is believed to have come to us from Europe but it is now found throughout the United States and Canada.

The mature females are curious gall-like insects located on the twigs and branches. They become evident about the time leaves make their appearance on the deciduous trees, and may remain attached to the bark until late summer.

There is a decided difference in general appearance between female scales which have developed on different hosts. The scale thrives on a large number of deciduous trees, at least fifty, and at times has been found on conifers.

The mature females are large, brown, soft-bodied scales which measure from one-eighth to three-sixteenth inch in length. They are oval in form and, in general, elevated and are usually covered with a powdery or cottony material like the bloom on a plum.



Fig. 1.—European fruit-scale on hickory; enlarged.

The delicate male scales are less conspicuous, smaller, flatter, more elongated, almost transparent, and ornamented by well marked ridges.

Among the host-plants are maple, bittersweet, soft maple, tulip-tree, elm, *Eunonymus atropurpureus* (burning bush), wild cherry, peatree, blue beech, cucumber tree, willow (*Salix nigra*), buckeye, white oak, *Magnolia acuminata*, prickly ash, sycamore, beech, *Crataegus*, sassafras, black-berried elder, ironwood, basswood, honey locust, red elm, osage orange, white ash, butter-nut, black ash, hackberry (*Celtis occidentalis*), black walnut, black locust, red ash, black oak, hickory, pecan, green ash, European linden, rose, juniper, and white cedar. It also attacks various fruits among which are the following: plum, quince, apple, peach, pear, currant, apricot, and blackberry.

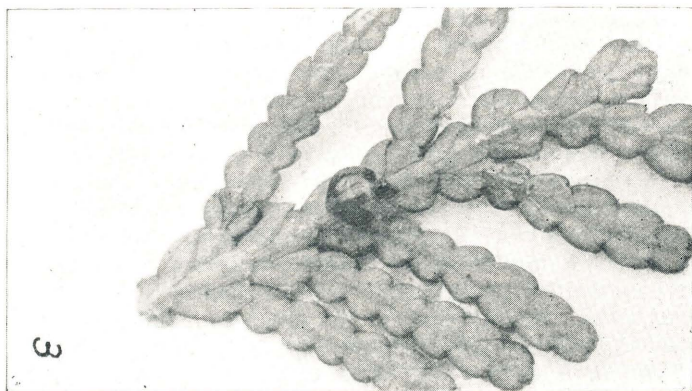


Fig. 2.—European fruit-scale on arbor-vitae; enlarged.

Only one generation develops each year. Winter is passed in a partly grown condition on the bark, usually on the under sides of the limbs. During the winter, they are difficult to detect, being very small, quite flat, and covered with a thin coat of transparent wax. Growth again starts in the spring when the sap begins to move, and, shortly after this, the insect molts. With this molt, the insect changes markedly in appearance. The male scales flatten and become elongate with conspicuous ridges, and the female becomes smooth, broadly oval, and convex.

The insects develop rapidly in the spring, and finish egg laying by the last of June. Each female produces a large number of eggs, ranging from

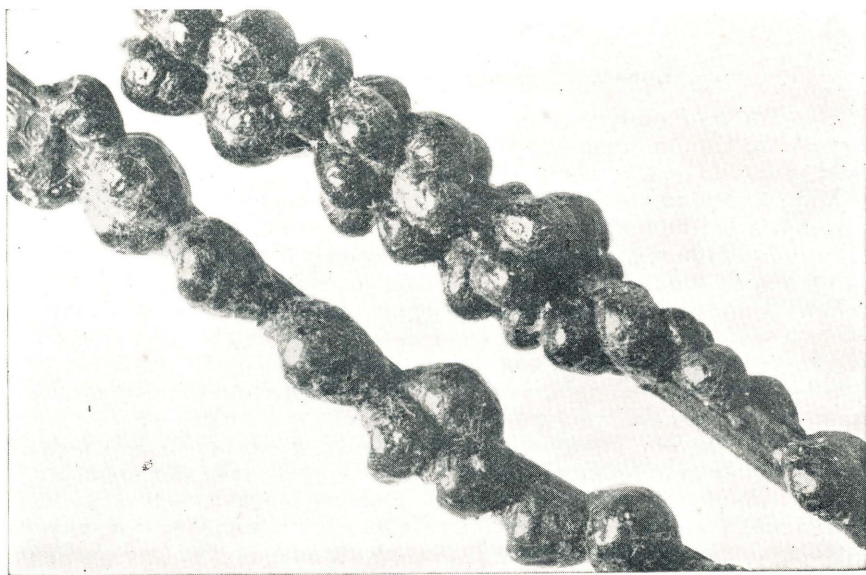


Fig. 3.—European fruit-scale on hickory; enlarged.

a few hundred to thousands. As the eggs are laid, the soft parts of the mother gradually harden and dry, thus forming a shell to protect the eggs. The young appear about the last of June and migrate to the leaves where they collect on the under sides along the mid ribs and main veins. They feed there until late summer and then migrate back to the limbs before frost. The young on the bark or leaves are difficult to detect since they harmonize so completely with their surroundings.

During the latter part of the nineteenth century and for a year or two in the twentieth, this scale appeared in alarming numbers all over the northern United States from the Atlantic seaboard to California. It was especially plentiful on plum and to a lesser degree on apple at that time. It attracted much attention and, in the absence of adequate control agents, did some little injury notably in plum orchards. It was at that time known as the "New York plum scale," having appeared first in destructive numbers in New York State. The development of adequate control measures, together with the appearance of parasites, finally reduced the numbers of this pest so that it is not now regarded as a major enemy of any of our fruits. The pest is now being held in check by parasites, and only occasionally are we called on to supplement the work of the parasites by sprays, although it is of course not impossible that another epidemic of this particular pest may occur at any time. When it occurs in numbers, an abundance of honeydew is produced and the foliage falls prematurely. When artificial control measures are necessary, satisfactory results can be secured by almost any one of the miscible oils, applied at the strength recommended by the makers, as late in the spring as possible before the buds open.

THE TERRAPIN SCALE

Lecanium (Eulecanium) nigrofasciatum

The Terrapin Scale is a native insect, occurring throughout the eastern part of the United States and Canada. The species is gregarious and passes most of its life on the twigs and branches.

Mature females are common from May until August. They measure from one-eighth to three-sixteenths of an inch in length and are oval or pear-shaped in form with an elevation of nearly half their breadth. The top of the female scale is lighter in color than the sides. There are about twelve yellowish or red radiating lines extending to the slightly ridged outer edge on each side, the spaces between being darker. The surface is shiny, smooth, and covered with a delicate coat of wax. On living scales, the colors, while variable, are always bright, but the colors become dulled after death. In some individuals, the red predominates, in others the black.

There is but one generation each year, the immature fertilized females living over winter as small, circular, convex scales on the branches and twigs. These overwintering females measure about one-twelfth inch in length and vary in color from black with red markings to red with black markings. Growth starts early in the spring and by the last of May the females reach maturity. The eggs hatch over a period of a month or more and by the last of July the young have hatched and migrated to the leaves

where they feed until the latter part of August, at which time the males emerge, fertilize the females, and die. The females then migrate back to the branches where they winter over and reach maturity the following spring.

This species is found on the following host-plants: silver maple, hawthorne, sycamore, spicewood, basswood, birch, red maple, sugar maple, peach, and plum. It is most destructive to maple, ash, peach, and sycamore.

The vitality of the tree is decidedly impaired when this scale is present in large numbers, due not only to the amount of sap removed from the foliage and bark, but to the abundance of honeydew which is produced. A sooty fungus establishes itself on the honeydew and the respiration of the plant is checked.

Wherever it is necessary to employ artificial control measures against this species, any one of the miscible oils, used at the strength recommended by the makers, will control it provided the emulsion is applied just before growth starts in the spring. Lime-sulphur is not effective against this species.

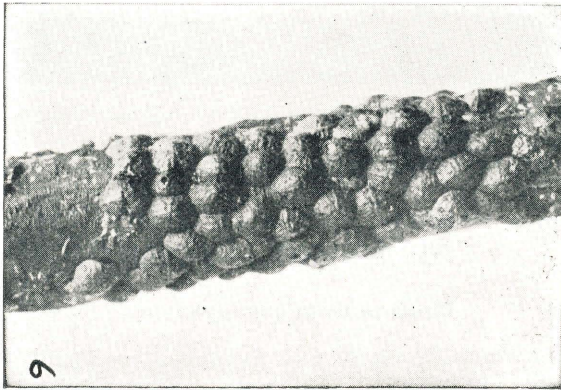


Fig. 4.—Terrapin scale, slightly enlarged.

THE HICKORY LECANIUM

Lecanium (Eulecanium) caryae

The Hickory Lecanium has been reported from Maine, Indiana, Massachusetts, Ohio, and Michigan. Doubtless it occurs throughout the north-eastern United States.

Mature females are large, oval, usually flat, with the cephalic third usually broader than the rear two-thirds. The color is mahogany-brown. The anal-cleft is deep and conspicuous. The anal-plates are proportionately small. The surface is wrinkled, usually varnished, and covered with a waxy pruinose coat. Specimens are often one-half inch long and, when on the larger limbs, quite flat. On smaller limbs they are more often elevated and of smaller size.

This species has been taken on the following hosts: blue beech, elm, birch, black willow, hickory, black walnut, sycamore, red cherry, and peach.

The life history of the Hickory Lecanium has never been worked out, but there is every reason to believe that it will coincide with that of *Lecanium corni*, since adults with their eggs are found on twigs at about the same time.

The species has never been found in large enough numbers to be of economic importance with us. It could doubtless be controlled by the same remedies as those used to control the European Fruit Lecanium.

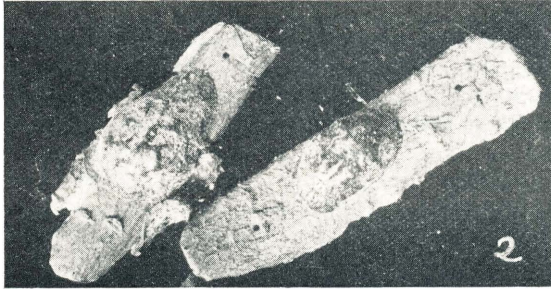


Fig. 5.—Hickory lecanium on elm, slightly enlarged.

THE MAGNOLIA SCALE

Neolecanium cornuparvum

Mature females of the Magnolia scale are elliptical and measure about half an inch in length. Specimens range from flat to elevated, depending on their emplacement. The color is seal-brown with a varnished surface, marked with oval mottlings of light yellowish brown. The surface is dimpled and dusty with a waxy bloom.

The species has been reported from various localities throughout the eastern United States from the Gulf to the Great Lakes. All species of magnolia serve as hosts. Apparently, the scale is capable of maintaining itself wherever magnolia grows.

There is one generation a year in the north. The species winters over as immature individuals on the bark of the trees. Young begin to appear late in July or early in August.

This scale is capable of causing the death of its host-tree if the infestation is at all severe, provided no artificial measures of control are employed.

An abundance of honeydew is produced and invariably a black sooty fungus appears on the honeydew, which still further mars the beauty of the tree.

This scale can be controlled by an application of one of the miscible oils early in the spring before growth starts.

THE TULIP-TREE LECANIUM

Toumeyella liriodendri

The Tulip-tree Lecanium is one of our largest soft-scales. The dark brown bodies of the mature females are usually found on the undersides of the branches in spring and early summer. In this stage of development, they are from one-fourth to one-third of an inch in diameter, hemispherical, with shallow wrinkles. Wherever they have sufficient room, they are quite regular in form.

The Tulip-tree Scale is pretty well distributed over the United States and has been reported from Europe. It infests the tulip-tree, magnolia, and linden. Recently, the species has not been common in Michigan although Professor Cook reported it as causing the death of tulip-trees here in 1870.

There is one generation each year. The species winters over as a small, flat, immature scale on the undersides of branches. Growth is very rapid in the spring and young appear on the bark by the last of July or early August.

Where present in numbers this species is capable of killing trees. The lower branches are usually killed first. There is an abundance of honey-dew produced which not only renders the tree unsightly because of its untidy appearance, but it closes the breathing pores and sometimes smothers the tree.

This scale can be controlled by a dormant application of an oil emulsion applied just before growth begins in the spring.

THE COTTONY MAPLE SCALE

Pulvinaria vitis

The Cottony Maple Scale is usually found on the undersides of twigs and branches. It is most in evidence late in June or early July when the females develop their enormous white egg sacks. Up to this time, the females have inconspicuous, flat, oval bodies, quite similar in general appearance to those of Lecanium. The mature females measure about a fourth of an inch in diameter, each with an egg mass as long or longer than the insect itself, protruding to the rear from under the body. As the egg mass develops, the body of the female is elevated until it extends upward at an angle of about forty-five degrees.

The Cottony Maple Scale infests a number of deciduous trees and shrubs. It is especially destructive to soft maple, though hard maple is far from immune; currants, gooseberries and grapes also rank among the preferred host-plants. Among other hosts on which it has been recorded are Norway maple, willow, poplar, oak, sycamore, beech, box elder, osage orange, locust, elm, alder, hawthorne, hackberry, euonymus, sumac, poison ivy, Virginia creeper, rose, and lilac. On the various fruits, it has been recorded on apple, pear, plum, peach, and red mulberry.

This insect is widely distributed. It has been reported from Canada and most of the states in the Union. It is known in Europe where at times it is a serious pest. It is more destructive in its northern range than in the south. There is one generation each year. Winter is passed as a partially grown, flat, inconspicuous female on the bark of the twigs and smaller branches. Shortly after the trees put out their spring foliage, the females complete their development and the large white egg-sacks make their appearance. Each of these white egg-sacks contains from five hundred to several thousand eggs.

The eggs hatch in Michigan during July, and the young migrate to the leaves. Most of these immature individuals collect on the undersides of the leaves along the mid-rib or principal veins, though some individuals will be found on the upper surface. Before cold weather sets in, these individuals migrate back to the twigs and limbs for the winter.

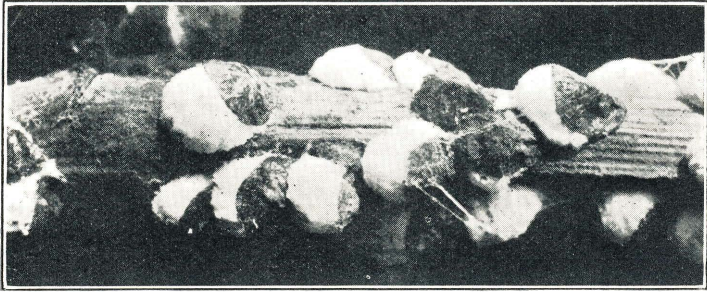


Fig. 6.—Cottony maple-scale; enlarged about twice.

The males are delicate two-winged creatures. Their lives as adults are brief, most of them reach maturity and perish in August before the migration of the females back to winter quarters.

Not only does the affected tree suffer because of its loss of sap but honeydew is excreted copiously by the insects. This honeydew drips down on the foliage and serves as a medium on which there develops a sooty fungus growth. Leaves thus coated never function properly and usually drop prematurely.

In spite of the enormous fecundity of this species, it is not troublesome all of the time, since it has many bird and insect enemies.

An oil spray applied just before growth starts in the spring is the best control measure. The strength of the various oil preparations varies with the type used. Therefore, use the dose recommended by the maker for the particular tree affected. It is well to avoid allowing the oil to puddle about the base of the tree, since many trees are susceptible to oils. Lime-sulphur has not proved to be effective against this species.

COTTONY MAPLE-LEAF SCALE

Pulvinaria acericola

There is a decided similarity both in habit and appearance between the Cottony Maple-Leaf Scale and *Pulvinaria vitis*. The leaf scale, however, is more southern in its range and is a curiosity rather than a pest in Michigan. It infests both sugar and soft maples.

The adults are conspicuous because of their long, white cottony egg-sacks. They prefer the undersides of leaves, but are occasionally found on the upper surfaces. The adults measure about one-eighth of an inch in width and are about three-sixteenths of an inch in length. They are purplish-brown, ornamented on the back with irregular patches of white, waxy material. The egg-sack is narrow with the sides nearly parallel and with longitudinal ridges.

There is one generation each year. Both the male and the female winter over on the bark of the host-plant. The males appear early in the spring, fertilize the females, and die. The females then migrate to the leaves and complete their development. Young may be found on the foliage as early as the last of June and are common throughout July. They feed on the leaves until just before cold weather when they migrate to the twigs and branches where they winter over as tiny, inconspicuous, flat scales on the bark.

The species is seldom numerous enough with us to be of economic importance. Most of the feeding is done on the leaf. If artificial control measures should become necessary, the same treatment recommended for *Pulvinaria vitis* will give control.

THE EUROPEAN ELM SCALE

Gossyparia ulmi

The mature females of the European Elm Scale are most conspicuous during the months of April, May, and June. At this stage, the plump bodies of the females are purplish-brown and measure about one-eighth to three-sixteenths of an inch in length. They expel an abundance of honeydew which is literally sprayed over the foliage and supports the black sooty fungus so common on honeydew. Individually, each female appears as if settled on a cushion of white, waxy material which protrudes around the sides and surrounds the body.

Elms of all ages and varieties are subject to attack, though the European elm seems to be the preferred host plant. It has been recorded on American, red, cork, English, Scotch, and slippery elms.

This scale was imported from Europe, where it is recognized as a serious pest of elm, sometime prior to 1884. It has been reported from many of the states in the Union.

There is one generation each year. Winter is passed as partially grown

individuals, tucked away in the cracks and crevices of the bark, where each of the insects protects itself with a translucent waxy covering.

They become active early in the spring, crawling about over the trees before taking up permanent abodes. Immediately after this, the males pupate in their white, cottony cocoons, and the females secrete the waxy cushions which protect the young for the brief period before they scatter and take up their summer locations on the bark or along the veins on the undersides of the leaves. Late in the fall before the leaves drop, the young which have fed on the leaves all summer, migrate to the bark where they settle for the winter.

Nursery stock recently transplanted, and young trees used in ornamental plantings, are often killed outright. Native trees, grown under natural

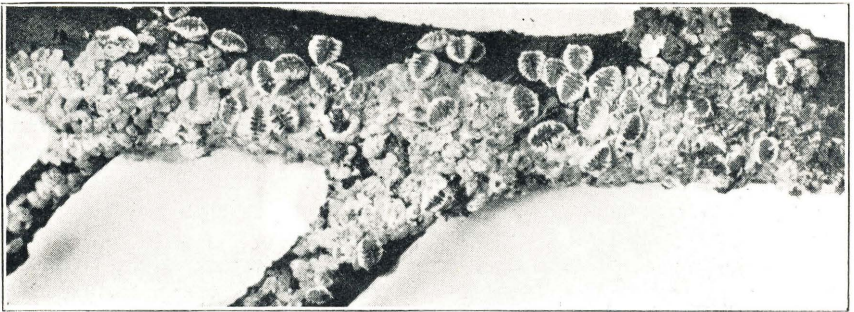


Fig. 7.—European elm scale; enlarged about twice.

conditions, less often suffer though when used as shade trees along streets or in parks, they may become infested to such an extent that remedial measures are warranted.

Small trees on lawns may be satisfactorily relieved of scale by the application of a jet of water under pressure, if applied just as the young appear. Several thorough washings at intervals of a few days, will do much to reduce the next year's infestation.

Perhaps the best method of cleaning up infested nursery stock is by the use of one of the miscible oils taking care to follow directions. Be sure that no free oil is present in the mixture in the tank and use the standard strength recommended by the maker, if a proprietary oil emulsion or one of the miscible oils is used. In any case, make the application during late dormancy. Do not apply when the temperature is below 40 degrees Fahrenheit or when it is likely that the temperature will fall below 40 degrees Fahrenheit before the spray dries.

THE BURR OAK KERMES

Kermes pubescens

The burr oak Kermes has been reported from various states in the north-central and eastern parts of the United States. It seems to prefer burr oak (*Quercus macrocarpa*), but has also been reported on Chinquapin Oak (*Q. prinoides*), white oak (*Q. alba*), and red oak (*Q. rubra*).

The gall-like bodies of the burr oak Kermes may be found on the terminal growth, and on the veins of the leaves themselves from May until late in the season. Wherever the leaves are attacked, they become distorted or puckered. When mature, the females look more like galls than like insects. Their mottled light-brown bodies are globular, and measure about one-



Fig. 8.—*Kermes pubescens* on oak twig. From Prof. J. S. Houser, entomologist, Ohio Agricultural Experiment Station; slightly enlarged

eighth of an inch in diameter. In the case of recently developed individuals, the surface is covered with a downy pubescence, which gradually disappears with age, leaving the surface polished. The bodies of the dead females remain attached to the leaves and twigs long after their young have taken up their winter quarters on the bark.

There is one generation each year. Immature individuals, both male and female, seek protected places on the bark, where they establish themselves for the winter. The male cocoons are usually found on the undersides of twigs and branches. Fertilization takes place in early spring. The females migrate to the leaves as soon as the leaves have developed sufficiently to serve as food, and, by the last of July, the young appear and establish themselves for the summer.

The presence of this insect in numbers causes a distortion of the leaves and terminals, which detracts from the appearance of the tree. During May, June, and July an abundance of honeydew is excreted.

This species has never been plentiful in Michigan. If it should ever become abundant enough to necessitate artificial control an application of one of the miscible oils just before growth starts in the spring, will undoubtedly give control.

THE MAPLE FALSE MEALY-BUG

Phenacoccus acericola.

The presence of the Maple False Mealy-Bug is indicated by irregular, masses of cottony material on the undersides of the leaves during the summer. A careful investigation at a favorable time will reveal the yellow body of the female inside each mass, for this conspicuous covering serves as an egg nest. Aside from the cottony deposits on the leaves, the pupal cases on the trunks may attract attention.

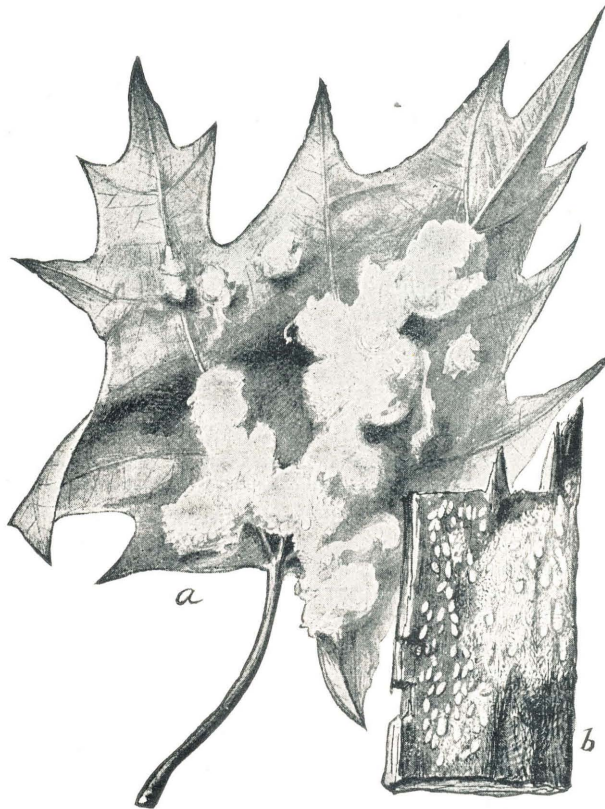


Fig. 9.—Maple false mealy-bug from L. O. Howard, Insect Life, Bureau of Ent. U. S. D. A.

Several different trees, among which are maple, hornbeam, basswood, and horsechestnut, have been reported as host trees for this species. In Michigan, it has been found on maple only. The species is of European origin and is now well established in the northeastern United States.

There are three generations each year. Winter is passed by the immature Mealy-Bug in a hibernaculum on the rough bark of the tree. In the spring the young migrate to the leaves, mature, and each female secretes a woolly mass of wax in which she lays about 500 eggs. The young hatch and feed on the leaves until mature. The males take up their quarters on the trunks of the trees where they construct their peculiar elongate cocoons. At times, these cocoons are numerous enough to give limited areas a chalky appearance. The young females of the last generation remain on the leaves until fall when they migrate to the bark. Adult females appear on the leaves in June and August, the young of the August brood being the overwintering individuals.

In spite of the fact that this insect is distributed pretty generally over the northeastern United States, we receive only occasional complaints of injury. It is, however, capable of seriously injuring trees and usually the lower branches are killed first.

It can be controlled by a miscible oil applied in the spring just before growth starts.

A closely allied species *Phenacoccus dearnessi* has been collected in Lansing on hawthorne.

THE GOLDEN OAK SCALE

Asterolecanium variolosum

The tiny Golden Oak Scale is circular, and slightly convex, measuring about one-sixteenth of an inch in diameter. Living, individuals are the color of green gold, but after death the color becomes less vivid, usually turning yellow or brown. The smooth, polished body bears a marginal fringe of minute glassy rods. Wherever the insect settles on the bark, small pits or depressions result, so that the insect appears to be lightly imbedded in the bark. Owing to this peculiarity, it is sometimes known as the Pit Making Oak Scale.

So far as is known, only oaks are attacked. It has been recorded from the following varieties and it is altogether probable that other varieties are

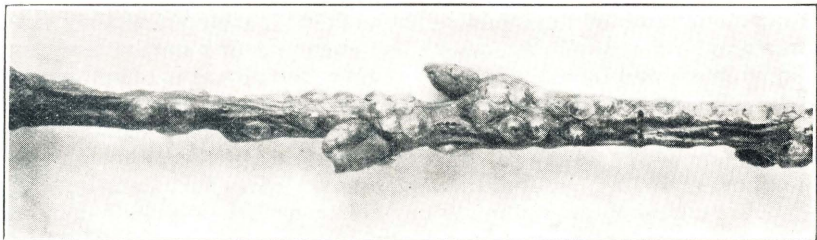


Fig. 10.—The golden oak scale, on oak twigs; enlarged about four times.

infested as well: English oak (*Quercus robur*), white oak (*Q. alba*), white swamp oak (*Q. platinoidea*), golden oak (*Q. glandulifera*) and (*Q. sessiflora*).

A single generation is produced each year in Michigan, the young appearing early in the spring and settling on the bark. This species is one of the most destructive scale-insects known to attack oak. A severe infestation gives the tree a ragged, untidy appearance and it is not unusual for young trees or even mature trees to be killed outright. The attack usually starts on the lower branches, spreading in time over the entire tree. Nursery stock and trees in ornamental plantings are most frequently attacked.

This scale can be controlled by a dormant application of a miscible oil early in the spring before growth starts.

CONTROL

OILS—In the present state of our knowledge based on experiments, it would appear that the most satisfactory treatment for the control of soft scales on deciduous trees is an application of one of the commercial miscible oils or emulsions applied at the strength recommended by its maker for the particular species of insect under consideration. The large number of oils and emulsions now marketed by various manufacturers of insecticides, are compounded according to formulae often quite dissimilar one from another. These oil compounds all become emulsions after being diluted with water and their effects on the tree and on the insect, while being quite similar to each other, are not by any means identical. The assortment of miscible oils and prepared emulsions from which the grower may choose is so large that it would be impractical to discuss each one in a work of this kind. It is therefore recommended that the grower use the strength stipulated by the manufacturer in each case.

Whichever emulsion or miscible oil is chosen, it is imperative that certain precautions be observed in order to avoid injury to the host trees on which the insects are present.

1. None of these oil sprays should be applied when the temperature is lower than 40 degrees Fahrenheit or when it is likely to fall below freezing before the spray is thoroughly dried.

2. It is likewise imperative that a complete emulsion be secured before making the application. By this is meant that the miscible oil must become thoroughly emulsified in the water and that no film of oil be allowed to float on the surface of the liquid in the tank. If, after thoroughly churning the mixture by means of the agitator, oil rises in a film on the surface when the liquid is allowed to stand for a short time, then there is something wrong, and the mixture should not be used until the difficulty is overcome.

3. It is well to use the minimum dosage in preference to the maximum dose recommended. Many of our shade trees are not very tolerant to oils.

It is understood that oil mixtures recommended in this bulletin should be applied with a pump giving a pressure of from 150 pounds to 225 pounds to the square inch. A small hand pumping rig is very likely to lead to disappointment.

4. A special effort should be made to hit the under surfaces of branches and twigs, since scale insects usually collect in such places.

5. Practically all the sprays recommended in this bulletin would prove injurious to the trees if applied at any time other than just before growth starts in the spring. Oil sprays suitable for summer spraying may be developed eventually but no consideration of summer oil sprays is included in this bulletin.

6. Most of the oil emulsions and miscible oils are incompatible with lime-sulphur. In other words, a little lime-sulphur in the tank would break down the oil emulsion and produce a mixture which would be unsafe for use. It is therefore important that, before mixing any of these oil compounds with water, the tank should be thoroughly cleansed and all traces of lime-sulphur should be removed. This, of course, does not apply to the small number of miscible oils or emulsions that are compatible with lime-sulphur, for which advantage claims will be made by the maker.

7. HOME-MADE OIL EMULSIONS—It is entirely possible for the grower to compound his own emulsion, perhaps with a slight saving in cost. However, many of the materials that go into home-made emulsion are variable in composition. Even water from different sources in various parts of the state, react differently when combined with some of the chemicals used for producing the emulsion. Anyone desiring to experiment with home-made emulsions can secure the formula from the Spray Calendar which is available on request at all times, but home-made oil emulsions are very likely to depart from the desired standard so that results obtained in one part of the state will not exactly coincide with those obtained by another worker who uses slightly different materials and who is forced to use water taken from another source.

LIME-SULPHUR—Commercial lime-sulphur 32 degrees Baumé diluted one part in eight of water, has proved effective against the Cottony Elm Scale, *Gossyparia ulmi*. The spray must be applied with considerable pressure and the application must be made before the leaf buds burst in the spring. This bursting of the leaf buds follows the blooming period.

Lime-sulphur leaves the trees with a white-washed appearance, also all paint and stone work is likely to be stained by its use.* Lime-sulphur is better suited to work in the nursery than in plantings close to dwellings or in conspicuous places.

NICOTINE SULPHATE—Whenever it becomes necessary to apply summer sprays for soft scale, nicotine sulphate would appear to be the most effective and promising. Use one pint of 40 per cent nicotine sulphate in 100 gallons of water with four pounds of common laundry soap dissolved in the water. In order to secure any marked success, it will be necessary to apply this spray with force just after the young have been born or have hatched out and before they are able to protect themselves with waxy coverings. At such times, one should remember that the under surfaces of the leaves are usually preferred by the young insects, and therefore the spraying should be very thoroughly done in such a way that the spray is directed upward from beneath.

*Lime-sulphur should not be used in any place where the solution may drift on to paint work, stone work, such as cemetery monuments or ornamental stone walks, nor should it be allowed to drift on to brick walls or buildings. Such surfaces are sure to be seriously injured if lime-sulphur comes in contact with them. For this reason, oil is usually chosen for use in city cemeteries and parks.