insect and mite

PESTS OF GRAPES IN OHIO

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Insect and Mite Pests of Grapes in Ohio

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INTRODUCTION

Several species of insects infest or feed on grapes. However, comparatively few occur in sufficient numbers to be of economic importance. This publication presents descriptions and illustrations of insects or insect damage associated with grapes and tells their relative importance as economic pests. Small plantings or backyard vines which are not subjected to regular insect control practices may have a larger number of insect species than the large commercial vineyards. Many insect species infesting grapes are classed as general feeders; that is, they also may infest other plant species. Only a few are specific to grapes.

New plantings of grapes located in areas in which vineyards or wild vines have not been present may not develop insect pest problems for several years. Wild grapevines harbor and perpetuate insects which could migrate to cultivated vines. Frequent and thorough observations of vines in the vineyard are necessary to detect insect infestations early enough to apply control measures.

Insect control recommendations with pesticides are not discussed here. Such information may be obtained from county and state offices of the Cooperative Extension Service.

Dates mentioned are approximate and apply mainly to the northern one-third of Ohio.

Photographs are from the U. S. Department of Agriculture and Ohio Agricultural Research and Development Center.

CHEWING INSECTS FEEDING ON FOLIAGE, FRUITS, STEMS, CANES, BUDS, OR ROOTS OF GRAPES

Grape Berry Moth

Paralobesia viteana (Clemens)

The grape berry moth is an important insect pest of grapes and, if not controlled, may cause considerable economic losses. Generally there are two generations of the insect each year. The adults or moths (Figure 1) emerge in late May from overwintering pupae and lay eggs (Figure 2) singly on the small grape berries or the cluster stems. Small larvae hatch from the eggs and enter the grape berries. If the berries are too small, the larvae make webs (Figure 3) on the cluster stem and feed there until the berries are of sufficient size for them to enter.

Fig. 1 (Left).—Adult of grape berry moth is mottled brown and about 5/16 to 3/8 inch in length. Fig. 2 (Right).—Grape berry moth egg on a grape berry with larva inside ready to hatch.

Fig. 3.—First generation of young larvae of grape berry moth forms webs in the clusters until the grape berries are large enough for them to enter.
Fig. 4.—Shriveled and webbed grape berries damaged by larvae of first generation grape berry moth.

Fig. 5.—Fully grown larva of grape berry moth is about 3/8 inch in length, greenish or purple color.

Fig. 6.—Fully grown larva of grape berry moth making cocoon on section of grape leaf.

Fig. 7.—Cocoon of grape berry moth on grape leaf. Cocoon overwinters on ground surface under trellis.

Fig. 8.—Grape berries severely damaged by second generation of grape berry moth.
Infested green berries of blue grape varieties sometimes prematurely turn red or partially red (Figure 4).

The full-grown larvae (Figure 5) form cocoons on leaf particles on the ground or on the leaves still on the vine in mid- to late July. Pupae are formed in the cocoons and moths emerge 5 to 10 days later.

Eggs for the second generation are laid on the grape berries singly from late July through August. The larvae from these eggs infest the grape berries and feed within the berries. A single larva may feed on two or three berries, webbing the berries together. The full-grown larvae drop to the ground and form cocoons (Figure 6) on the leaf trash under the trellis (Figure 7). They remain on the surface of the soil through the winter. Infestations by the second generation larvae cause the infested berries to fall or shrivel and they may become further damaged from molds, rots, and pomace fly infestations (Figure 8).

Rose Chafer
*Macrodactylus subspinosus* (Fabricius)

The rose chafer adult (Figure 9) is light brown in color, ungainly, and about \( \frac{5}{8} \) inch long. It occurs about the time of grape bloom in vineyards located near sandy soil areas. The beetles fly in from surrounding grassy areas and feed on the grape blossoms (Figure 10) or small grape berries, thereby reducing the fruit crop. They are present in vineyards for only a short time, 5 to 10 days. The larvae of this insect are whitish grubs which live in the soil and feed on grass roots. Apparently they have no effect on the grapevines or roots.

This insect rarely occurs in sufficient numbers on grapes to warrant control measures, although it may cause damage to other fruit crops and flowers.

Red-banded Leaf Roller
*Argyrotaenia velutinana* (Walker)

The larvae of the red-banded leaf roller sometimes attack the clusters and fruits of grapes. Moths (Figure 11) from overwintering pupae in cocoons on the soil surface emerge in late April and lay eggs in...
clusters on the grape canes. First generation larvae emerge and feed on the new grape foliage and grape clusters; they are protected by webbing constructed in the cluster (Figure 12). These larvae form cocoons which produce moths. The moths produce the second generation of larvae from late June to mid-August, when again moths are produced and lay eggs for a third generation.

The last generation is usually the most apparent and numerous. The webs and larvae are readily seen in the ripe or harvested grape clusters (Figure 13). The larvae do not crawl into the grape berry to feed but remain concealed in the webbing on the cluster stem and eat portions of the stem, as well as holes in the berries. The first and second generations do not cause as extensive damage as the third generation.

Outbreaks of this insect seldom occur often enough to be of economic importance on grapes. However, a few larvae may be found each year as this insect may be present on other fruit. Outbreaks seldom last for more than 2 years in succession.

**Grape Blossom Midge**

*Contarinia johnsoni* Felt

The adult of the grape blossom midge is a very small fly which lays its eggs in the unopened grape flower buds. Small maggots develop inside the flower bud and devour the inner parts of the flower, thereby preventing formation of the fruit or berry. In-
fested flower buds enlarge slightly and the lower portions of these buds develop a red color (Figure 14). Normal buds are entirely green. Infested buds eventually fall from the cluster stem. This insect has just one generation a year and overwinters as a full-grown larva.

It is most likely to occur on vines near a brushy or wooded portion of the vineyard, but seldom causes widespread economic damage.

**Climbing Cutworms**

Several species of climbing cutworms may cause injury to grapes. The following climbing cutworms have been reported to feed on grapes: *Abagrotis barnesi* (Benjamin), *Euxoa messoria* (Harris), *Euxoa scandens* (Riley), *Feltia subgothica* (Haworth), *Lacinipolia meditata* (Grote), *Lacinipolia renigera* (Stephens), *Peridroma saucia* (Hübner), *Rhynchagrotis cupida* (Grote), *Rhynchagrotis placida* (Grote), and *Spaelotis clandestina* (Harris).

The larvae hide below the grape trellis under weeds, stones, or trash during the day and then climb up the grape trunk and canes on warm nights (Figure 15) to eat the developing primary grape buds (Figure 16). Since the buds grow rapidly during this season of the year, the period in which these insects do serious damage is short. Usually damage is confined to a relatively small area within a vineyard.

Fig. 15.—Larva of climbing cutworm *Feltia subgothica* (Haworth) on grape cane. It is about 1 inch in length and a dirty brown color with markings.

Fig. 16.—Three primary grape buds (right) eaten by climbing cutworms. Two canes at left show undamaged buds.

Fig. 17.—Development stages of Barnes climbing cutworm. A—eggs; B—lateral view of larva; C—dorsal view of larva; and D—adult.
Fig. 18.—Larva of pyramidal fruitworm is about 1-1/2 inches in length.

Fig. 19.—Overwintering grape flea beetle adult is dark bluish-black and about 3/16 inch in length. It feeds on developing grape buds in early spring.

Fig. 20.—Developing primary grape buds destroyed by feeding of adult grape flea beetle.

where there are weeds or grasses under the trellis. Although there may be more than one generation of cutworms (Figure 17) each year, only the larvae present at the time of grape bud swelling cause noticeable damage.

**Green Fruitworms**

The pyramidal fruitworm, *Amphipyra pyramidoidea* (Guenée), (Figure 18) is the most common fruitworm attacking grape. It is also known in literature as the pyramidal grapevine worm and the green grapevine worm. Other species of green fruitworms, such as *Lithophane antennata* (Walker) and *Orthosia hibisci* (Guenée), may occur on grapes since both species have a wide range of host plants.

The pyramidal fruitworm overwinters in the egg stage and has one generation each year. Larvae hatch from overwintering eggs about the last of April, when the new grape shoots are from 1/4 to 2 inches in length. Thus the newly hatched larvae find an abundance of tender foliage nearby. The larvae continue to feed on the foliage until they are fully grown in mid- to late June. At this time they crawl or drop to the ground and prepare a cocoon of silk and debris from the soil surface. After an average of 8 days in the cocoon, or about the first of July, moths emerge. These moths do not deposit their eggs until the end of September. Eggs are laid singly or in small groups on the old canes.

Fruitworms seldom occur in sufficient numbers in mature vineyards to warrant control measures.

**Grape Flea Beetle**

*Altica chalybea* Illiger

Two life stages of the grape flea beetle cause injury to grapevines. The overwintering adult beetle (Figure 19) feeds in the spring on the interior of the developing primary grape buds (Figure 20). These buds cannot develop into primary grape canes and thus the crop yield is reduced. After the buds are more than 1/2 inch long, the beetles do not cause serious injury. The beetles lay eggs on parts of the grapevine. Larvae hatching from these eggs (Figure 21) migrate to the developing grape leaves and feed on the upper surface (Figure 22). When fully grown, the larvae pupate near the surface of the soil and then emerge later as adults. There may be two or part of two generations each year.

The insect overwinters as a dark bluish-black, shiny beetle in trashy or wooded areas. The beetles sometimes appear to hop rather than fly and hence the name grape flea beetle.

Damage to buds generally occurs on vines located along the borders of the vineyard next to wooded or trashy areas. Control measures against adult
beetles on grape buds must be accurately timed before the buds are damaged. The beetles can be seen on the grape canes on warm, sunny, spring days.

**Grape Rootworm**

*Fidia viticida* Walsh

Adult grape rootworm beetles feed on the grape foliage, making characteristic chain-like feeding marks (Figure 23). The larvae or grubs feed on the grape roots, destroying the smaller roots and thus causing weakening or decline of the vine growth. Eggs are laid on the grape trunks or canes (Figure 24). The larvae from these eggs fall to the ground and penetrate the soil to feed on the roots. There is one generation each year.

The larval feeding causes economic losses and in extreme cases may kill the vines. The foliage damage caused by feeding of the adults is usually not of economic importance but offers an avenue for possible control measures. The obvious way to detect the presence of this insect is to observe the leaves for the chain-like feeding marks or the actual feeding of the adults in June and July.

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**Fig. 21.** - Larvae of grape flea beetle, about 1/4 inch long, feeding on upper surface of grape leaf.

**Fig. 22.** - Grape leaves with typical feeding injury by larvae of grape flea beetle.

**Fig. 23.** - Grape leaf feeding injury by adult beetle of the grape rootworm, with characteristic chain-like feeding marks.

**Fig. 24.** - Adult grape rootworm and eggs on grape cane. Adult is grayish-brown beetle about 3/8 inch in length.
Fig. 25.—Grape root and crown with severe boring and girdling damage below ground by larvae of grape root borer.

Fig. 26.—Pupa and two larvae of the grape root borer. Fully grown larva is about 1-1/2 inches in length and a dirty white color with brown head.

Fig. 27.—Adult female of grape root borer is about 3/4 inch in length. It has brown body with yellow markings, brown forewings, and clear hindwings.
Grape Root Borer
*Vitacea polistiformis* (Harris)

The larvae of this insect (Figure 26) cause severe damage to grape vines by tunneling into the larger roots and the crown below the surface of the soil. This feeding and boring cause decline of the vine and may eventually kill it by severe pruning of the roots and girdling of both roots and crown (Figure 25).

The adult is a moth with brown forewings and clear hindwings with brown borders. The body is wasp-like, brown with yellow markings (Figure 27). Eggs are laid singly on grape leaves or weeds or dropped on the ground, usually in July and August. Young larvae hatch and burrow into the soil to the grape roots, where they feed on the larger roots and crown. Larvae remain in the soil for about 22 months. When the larvae are fully grown, they migrate near the soil surface where they pupate and later emerge as moths. Larvae do not travel from one vine to another but remain on the roots of the same vine during their entire life.

This insect is difficult to control.

Grape Trunk Borer
*Clytoleptus albofasciatus* (Laporte and Gory)

The larvae of the grape trunk borer feed on the dead wood inside older grape trunks (Figure 28). Although the feeding tunnels in the dead wood may parallel and adjoin live wood in the trunk, the larvae do not feed on the live wood. Eggs are laid on the grape trunk by the adult beetle (Figure 29). The young larvae enter the grape trunk at cracks, old pruning scars, and pruning stumps where dead wood is present. The larvae live in the trunk for two seasons, emerging as adults the second season (Figure 30).

Since only old grape trunks with considerable dead wood are infested, starting a renewal trunk from the roots and cutting off the old trunk is a common practice. This insect apparently causes no economic damage to the vine.
Grape Leaf Folder  
*Desmia funerarlis* (Hübner)

The grape leaf folder usually has two generations each year. The second generation in August and September causes the most damage to the grape foliage.

Adult moths (Figure 31) emerge from overwintering pupae in late May and June to lay eggs on the grape foliage and canes. The young larvae feed in the foliage. By spinning webs, they draw a portion of the leaf over themselves for protection (Figure 32) and continue to feed on the leaf (Figure 33).

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Fig. 31.—Adult moth of grape leaf folder is black with white markings and about 5/8 inch in length.

Fig. 32.—Grape leaves folded by grape leaf folder larvae.

Fig. 33.—Folded leaf opened to show light green larva of grape leaf folder which has been feeding on upper surface of grape leaf within the fold. Larva is about 3/4 inch in length.

Infestations by this insect are sporadic and seldom cause economic losses over a large area. Young vines should be checked frequently for infestation outbreaks which generally occur along the borders of the vineyard.
Fig. 34.—Injury to grape leaf by larva of grape leaf miner, a very small worm, feeding between upper and lower epidermis of leaf. Damaged area eventually falls out.

Grape Leaf Miner
*Antispila viticordifoliella* Clemens

Grape leaf miners frequently occur in small numbers in grape leaves. This insect has no common name. Very small larvae feed between the upper and lower epidermis of the leaf. The larvae pupate within the feeding area (Figure 34) and this section of the grape leaf containing the pupae falls to the ground, leaving an oval hole in the leaf. This insect, which is of no known economic importance, is most likely to occur in abandoned vineyards or on backyard grapevines.

Grape Galls and Gall-forming Insects

Several forms of blister-type and fleshy galls occur on grapes and are caused by several species of insects (Figures 35-38). The galls may be present on the leaves, leaf petioles, tendrils, grape cluster stems, and canes. The galls are caused by several species of small adult flies or midges which lay eggs either on or within portions of the grapevines. A fleshy growth

Fig. 35.—Grape tomato gall, *Lasioptera vitis* Osten-Sachen. These fleshy-type galls form on grape cluster stems prior to grape bloom.

Fig. 36.—Grape tomato gall, *Lasioptera vitis* Osten-Sachen. Fleshy-type galls on grape stems, leaves, and leaf petioles. The galls frequently turn red.

Fig. 37.—Grape tomato gall, *Lasioptera vitis* Osten-Sachen. Fleshy-type galls on Fredonia grape cluster stem.

*The grape cane gallmaker and grape phylloxera are discussed in another section of this publication.*
occurs or blister-type galls are formed when the eggs are deposited in the plant tissues or when the larvae start to feed. After feeding within the galls, the full-grown larvae emerge and fall to the ground to pupate and emerge as small flies (midges). Some species have more than one generation during the season.

These insects and galls seldom cause economic damage. The grotesque growth formations are more alarming than detrimental. The galls may be cut from the vines and destroyed before the larvae emerge; small holes occur in the galls when the larvae have emerged.

**Grape Plume Moth**

*Pterophorus persicelidactylus* Fitch

Eggs laid on grape vines by the adult moths (Figure 39) produce larvae which feed on the upper surfaces of grape leaves early in the growing season (Figure 40). By use of webs, the larvae draw two edges of a terminal leaf together for protection (Figure 41).

This insect is found occasionally on home grape plantings but rarely in commercial plantings.

**Grape Sawfly**

*Erythraspides vitis* (Harris)

The adult of the grape sawfly is a small, black, wasp-like insect which lays eggs in clusters on the under surface of terminal grape leaves. The larvae feed...
Fig. 42.—Larvae of grape sawfly are light green in color with black heads and about 1/2 inch in length. They feed side by side on the under surface of the grape leaf.

side by side in characteristic rows (Figure 42) across the under surface of the leaves, leaving only the heaviest of leaf veins (Figure 43). Full-grown larvae drop to the ground to form cocoons and pupate. There may be two generations each season.

This insect is rarely found in commercial vineyards and causes no economic damage. On home grapevines, the infested leaves can be removed and burned.

Fig. 43.—Grape leaf damaged by larvae of the grape sawfly.

Eight-spotted Forester
*Alypia octomaculata* (Fabricius)

Concentrated infestations of larvae of the eight-spotted forester may cause almost complete defoliation of grapevines. Commercial vineyards are seldom damaged seriously, although small areas within a vineyard may be defoliated. Damage rarely occurs two consecutive years.

Black moths (Figure 44) with white and yellow markings lay eggs on the grape shoots or leaves. The larvae (Figure 45) devour the foliage, leaving only leaf petioles and heavy veins, and then drop to the ground to pupate within tunnels they make in old wood or trash just below the surface of the soil. This insect also feeds on Virginia creeper and Boston ivy.

Fig. 44.—Adult moth of the eight-spotted forester is primarily black, has two yellow spots on each forewing and two white spots on each hindwing, and is about 5/8 inch in length.

Fig. 45.—Fully grown larva of eight-spotted forester has distinct markings of orange, yellow, black and white and is about 1 inch in length.
Fig. 46.—Adult of Japanese beetle is about 1/2 inch in length. Body is metallic green and outer wings are coppery brown. It has white tufts of hair on each side of the body.

Japanese Beetle
*Popillia japonica* Newman

The adult of the Japanese beetle is about ½ inch long, with the head, thorax, and abdomen having a metallic green color and the outer wings a coppery brown. Tufts of white hairs along the sides of the body and behind the tips of the wing covers are helpful in identifying this insect (Figure 46).

The adults feed on the foliage of both wild and cultivated grapevines (Figure 47) and sometimes on the fruit. This is the only stage of the insect which attacks grapes, as the larvae or grubs feed mainly on grass roots. The beetles occur in July and August and their feeding is sporadic—large numbers may feed on a single vine and adjoining vines may be relatively untouched. Vines with thin, smooth leaves seem to be preferred over vines with thick, pubescent leaves.

The damage in commercial vineyards warrants special control measures only in rare instances. Young vines should be protected against severe feeding injury. The beetles feed on many species of plants and are capable of flying considerable distances. There is only one generation each year.

Grape Cane Girdler
*Ampeloglypter ater* (LeConte)

Damage to grapes from the grape cane girdler is startling in appearance but the economic loss usually is minor. A very small black snout beetle (Figure 48) overwinters in trash in or near vineyards. It then girdles the new grape shoots by chewing two series of holes a few inches apart around the grape shoot (Figure 49). This injury is done in early June when grape shoots are 15 to 20 inches long and usually before grape bloom. A single egg is deposited in each hole in the series and the larvae hatching from these eggs feed in the section of cane between the girdles. The shoot breaks and falls over (Figure 50) or off at the outer girdle, leaving the infested section still on the cane. This section may fall off later in the season.

Fig. 47.—Damage by Japanese beetles feeding on grape leaves.

Fig. 48.—Adult beetles of grape cane girdler are black and less than 1/8 inch in length.
Fig. 49.—Girdling holes in grape cane were made by adult snout beetle of the grape cane girdler.

The broken cane is the startling feature. However, the girdles are usually beyond the grape clusters and there is seldom any loss of fruit. The broken cane prevents continued growth at the tip but lateral shoots usually develop back of the girdles. The larvae complete development in July. They emerge from the cane section as adult beetles in August and then overwinter. There is only one generation each year.

If control is attempted by cutting off the infested canes, the cuts should be slightly below the lower girdle. This should be done before the beetles emerge in late July or August. Damage is usually confined to vines closest to border or trashy areas.

Grape Cane Gallmaker
*Ampeloglypter sesostris* (LeConte)

Galls caused by this insect are most noticeable when they are first formed in the new shoot growth of grapes. A swelling on the cane develops a reddish color in contrast to the normal green color of the cane (Figure 51).

Fig. 50.—Grape cane girdler damage, with cane broken at the outer girdle.

Fig. 51.—Galls or reddish colored swellings of grape canes just above the cane nodes were made by the grape cane gallmaker.
A very small brown snout beetle, similar to the adult of the grape cane girdler (Figure 48), chews a series of holes along the grape cane just above a node. The beetle deposits an egg in one of the holes (Figure 52). The larva hatching from this egg feeds inside the cane which has developed a swelling or gall ¾ to 1 inch long. Eggs are laid from late May through June, starting when grape shoots are 10 to 20 inches long. The larvae become fully grown in late July and pupate within the galls. Adult beetles emerge during August and remain in or near the vineyard area, overwintering in trashy borders.

Most of the galls are formed beyond the grape clusters and there is no serious loss to the current crop. Strong winds early in the season might cause some breakage at the galls when canes are green, but as the canes mature the danger from breakage is reduced. Canes with galls are capable of producing a crop the following season. The old and empty galls are found readily during winter pruning operations (Figure 53).

Galls are found most frequently on border rows near trashy areas or on end vines of grape rows. If the galls are removed by summer pruning, it should be done before mid-July as the beetles will start to leave the galls by then.

Grape Seed Chalcid
*Evoxysoma vitis* (Saunders)

The grape seed chalcid is not common in Ohio vineyards. Although an occasional, small outbreak occurs, it is usually of no consequence. Sometimes grape-pomace piles will attract an infestation which could affect nearby grapevines.

A very small, black, wasp-like insect lays its eggs within the grape berry next to the seeds when the berries are almost full size but still green. The larvae from the eggs enter the grape seeds and feed on the inside of the seeds (Figure 54). The fruit surrounding the infested seeds shrivels and dries. This insect overwinters within the grape seed on the ground and then emerges as an adult in late May or June (Figure 55).

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**Fig. 52.**—Oviposition damage caused by adult grape cane gallmaker. Cutaway shows series of holes chewed into grape shoot just above the cane node by an adult grape cane gallmaker beetle. A single egg is placed in the series of holes and gall or swelling occurs here.

**Fig. 53.**—Interior and exterior of empty galls on mature grape canes, made by the grape cane gallmaker during the growing season.
Cultivated grape varieties with small berries or fruits seem to be preferred to the larger fruited varieties. This insect is more prevalent in wild grapes than in cultivated ones.

Spotted Pelidnota
*Pelidnota punctata* (Linnaeus)

The adult of the spotted pelidnota is reddish-brown in color, with eight black dot markings on the wing covers and prothorax (Figure 56). It feeds on grape leaves (Figure 57) but apparently does not occur in sufficient numbers to warrant economic consideration.

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**Fig. 54.** Cutaway of grape seed containing larva of grape seed chalcid.

**Fig. 55.** Grape seeds with exit holes of adults of grape seed chalcid.

The larvae feed and live in decaying tree stumps and logs, especially oak and hickory, and therefore cause no damage to grapes. The adult beetle may be seen in cultivated vineyards near wooded areas.

**Fig. 56.** Adult of spotted pelidnota is 3/4 to 1 inch in length. It is reddish brown and has eight black spots.

**Fig. 57.** Grape leaf with feeding injury caused by adult beetle of the spotted pelidnota.
Grape Leafhopper

_Erythroneura comes_ Say

Several species of grape leafhoppers may infest grapes. A common one is _Erythroneura comes_ Say.

Both adults and nymphs suck plant juices from the under surface of grape leaves (Figure 58). This causes the grape leaves to become discolored to a blotchy yellow (Figure 59) and the leaves fail to function normally. This leaf injury may reduce vine growth or sugar content of the grapes, prevent the grape wood or canes from maturing properly, and in cases of severe injury, the leaves may fall prematurely.

Adult leafhoppers (Figure 60) overwinter under leaves and trash near vineyards. In May these adults migrate into the vineyards and feed lightly on the grape leaves but cause no serious injury at this time. The adult females lay eggs just under the epidermis on the under surface of the leaves over a period of several weeks. Nymphs hatch from these eggs and feed on the under surface of the leaves, causing damage to them. During some seasons there may be a
partial second generation. The adults can fly but the nymphs cannot. Grape leafhoppers also feed on wild grapevines.

**Grape Phylloxera**  
*Phylloxera vitifoliae* (Fitch)

This insect forms galls on both grape foliage and grape roots (Figures 61 and 62). It is native to eastern North America and can be found on wild grapes as well as cultivated vines. The galls on the leaves can be seen readily (Figure 63), but the roots must be

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*Fig. 60.*—Adult or mature grape leafhopper, *Erythroneura come* Say, is whitish with lemon color markings and about 1/8 inch in length.

*Fig. 61.*—Upper (left) and lower (right) surfaces of grape leaves with phylloxera galls. The gall swelling is on the under surface and the opening to the gall on the top.

*Fig. 62.*—Grape roots with galls formed by the root-infesting form of grape phylloxera.
Fig. 63.—Leaf galls of grape phylloxera on under surface of a grape leaf. Galls seldom exceed the size of a small garden pea.

Fig. 64.—Leaf gall opened to show mature female and eggs of grape phylloxera. Number of eggs may range as high as 100 per gall. Upon hatching, the young phylloxera nymphs crawl out of the gall onto the upper surface of the leaf to start other galls.

Fig. 65.—Mature grape phylloxera female (dark center), young nymphs, and eggs (oval, light) on the outside of a grape root gall. Galls or root swellings are a solid growth of root tissue.

examined to observe the root galls. Some species and varieties of grapes are resistant to the galls forming on the roots, others have resistance to galls on the leaves, and some are resistant to both gall forms.

Severe infestations of galls on the grape foliage may cause defoliation and retard shoot growth. Severe root infestations produce general decline of vine growth and could result in death of the vine.

The same species of phylloxera infest both the roots and the foliage. The insects are inside the galls which occur on the foliage (Figure 64), while they are on the outside of galls or swellings on the roots (Figure 65). There may be several generations of each form each season.

The root gall form may be reduced materially if the desired grape variety is grafted onto resistant rootstock. Grafting vines onto resistant rootstock does not prevent the foliage on the susceptible varieties from becoming infested.

The life history of the grape phylloxera is quite complex and the development and life stages of the root form and the foliar form are not the same. The foliar form overwinters on the grape trunk as eggs which develop into asexual wingless forms in the spring. This insect crawls up the vine and develops a gall on a leaf in which it lays eggs. The eggs hatch into nymphs which crawl out of the galls and start more galls on the leaves. New galls are always formed on the new vine or leaf growth. Winged and wingless forms eventually evolve in the late season or fall to produce the overwintering eggs.

After a root infestation is started, perhaps by planting infested rootstock or by the foliar form entering the soil, it is perpetuated by overwintering asexual forms on the roots which produce eggs and nymphs and hence more root galls.

Most of the common grape varieties grown in Ohio are tolerant to both foliage and root forms of this insect and usually there is no economic loss.
There is a possibility that with the development and acceptance of new hybrid varieties, some may not be tolerant to one or both forms of phylloxera attack and will therefore need to be observed closely for symptoms.

**Grape Mealybug**  
*Pseudococcus maritimus* (Ehrhorn)

The grape mealybug is seldom of economic importance in commercial vineyards. It is most readily noticed when the grape berries are fully grown but the berries may or may not be ripe. The adults and nymphs of this insect suck plant juices from the stems and pedicles of grape clusters (Figure 66) or they may feed at the base of young grape shoots early in the season. They secrete a sweetish *honeydew* material on the grape berries (Figure 67) which molds and turns black, making clusters and berries sticky and unsightly and thereby reducing fruit quality.

The adults lay eggs in the fall in white cottony masses under the rough bark of grape trunks (Figure 68). These eggs hatch into nymphs in the fall but the nymphs remain in the cottony mass until spring, when they migrate up to the developing grape shoots. The nymphs are usually not numerous enough to cause any measurable damage as they feed at the base of the buds and shoots.

Some grape varieties are more subject to infestation than others. This insect is most likely to develop on vigorous vines with heavy foliage.

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*Fig. 66.—Adult or grape mealybug feeding at base of pedicle of a grape berry. It is cottony white and about 1/8 inch in length.*

*Fig. 67.—Honeydew on grape berries secreted by grape mealybugs. This material is sticky and sweet. It molds and becomes black, reducing quality of the fruit.*

*Fig. 68.—Cottony masses under grape bark contain overwintering nymphs of grape mealybug.*
Mites

At least three species of mites attack grape foliage. Two species are spider mites with eight legs and one is a grape erineum mite which is almost worm-like in appearance and has just four legs. All mites have several generations each year but it is seldom necessary to apply measures to control them on grapes.

European Red Mite

*Panonychus ulmi* (Koch)

This is a spider mite which frequently attacks fruit and foliage of apples and may also attack other fruits, including grapes. The adult is a small, dark red mite with eight legs which feeds on the under surface of grape leaves (Figure 69). It can be seen with the naked eye by looking closely. The eggs are globular in shape and red. They are laid individually on the under surface of leaves in summer. In late summer and fall, they are deposited around the cane nodes (Figure 70). The adults and nymphs extract plant juices from the cells of the leaves, causing them to become chlorotic and assume a bronze appearance (Figure 71). When the leaves are affected, they fail to function efficiently in converting raw materials into plant food. There are several generations each season.

Two-spotted Spider Mite

*Tetranychus urticae* Koch

The two-spotted spider mite is similar in many ways to the European red mite. The color of this mite varies from a yellowish-white to a bright orange tint. In the yellowish form, two dark markings on

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**Fig. 69.**—Adult of European red mite is dark red with spines on the back and about 1/50 inch in length.

**Fig. 70.**—Overwintering eggs of European red mite are laid around the cane nodes. The eggs are dark red and globular shaped.

**Fig. 71.**—The large grape leaf in the center is dark green and has not been infested with European red mites. Other leaves have been infested and color has changed to a light bronze.
the back of the mite aid in its identification. Damage to the grape foliage is similar to that caused by the European red mite (Figure 71). The mite feeds on the under surface of the leaves and lays pale yellow-white eggs during the summer, but overwinters as an orange-colored adult under the bark of the grape trunks. There are several generations each year.

Grape Erineum Mite
Eriophyes vitis Pagenstecher

This mite is very small (1/250-inch) and is worm-like in appearance compared to the spider mites. It is an off-white color and almost impossible to see without magnification. This mite overwinters under loose bark of 1-year old canes (Figure 72) and then migrates to the leaves to feed and reproduce in the summer. There are several generations each year.

The presence of the mites is noticeable by the gall-like or blister-like erineum on the upper surface of the leaves and the white, very dense growth of abnormal curled plant hairs on the under surface of the leaves (Figure 73). The mites feed and lay eggs in the hair-like plant growth on the under surface of the grape leaves.

In severe infestations, heavy feeding on new leaves and cane terminals could reduce vine growth and vigor. Fortunately, this mite is rare on cultivated Eastern grapes and has not caused any serious damage to vineyards. Some of the newer hybrid grapes and some of the vinifera varieties grown in Ohio may be subject to infestations by this mite. It can be spread from wild vines by wind or be present on new cuttings from nurseries.

Fig. 72.—Erineum mites overwinter under the bark of grape canes. These mites are nearly or fully mature, about 1/250 inch in length, and an off-white color.

Fig. 73.—Grape leaves with gall-like or blister-like erinea on the top surface of the leaf caused by feeding of erineum mites on the under surface. The white hair-like growths are formed on the erinea on the under surface of the leaf.
European Fruit Lecanium
*Lecanium corni* Bouché

The mature female of the European fruit lecanium is a soft-bodied, large, brown scale which occurs on many deciduous trees as well as on grape vines. The mature female scale attaches itself permanently to the bark of trees and on 1-year wood of grape canes in early spring. The scale is partially covered with a white powdery substance over the brown scale portion (Figure 74). In June the female lays large numbers of white eggs which completely fill the cavity beneath the scale previously occupied by the live female. In July and August, the nymphs hatch and crawl onto the grape leaves, where they establish themselves temporarily in the leaf crevices (Figure 75) and suck plant juices from the leaves. In late summer and before the leaves fall, the nymphs crawl onto the grape canes, become established there as oval-shaped, immature, brown scales, and overwinter. These scales become full grown in late spring.

These insects are rarely of economic importance on grapes. The mature scales containing the dead females and unhatched eggs can readily be rubbed off the grape canes.

Grapevine Aphid
*Aphis illinoisensis* Shimer

The grapevine aphid is dark brown (almost black) in color and resembles other common aphids. These insects feed and reproduce on young shoots and leaves of grape during the summer, sucking plant juices from the vines (Figure 76). They seldom occur on grape clusters. There are several generations each year and they have winged and wingless forms. No eggs or males are produced during the summer as the females give birth to living young. The aphids overwinter as eggs from winged females and males on plants outside the vineyard, such as black haw.

In commercial vineyards, this insect does not occur in sufficient numbers to warrant special control measures and damage is not severe in vigorous vineyards. The aphids are most likely to be abundant in dry weather and often disappear completely after heavy rains or storms.

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**Fig. 74.** Mature female scales of the European fruit lecanium on 1-year-old grape cane in late spring. They are about 5/16 inch in length, dark brown with a white powdery coating. Scales at this stage contain the dead female and eggs.

**Fig. 75.** Newly hatched nymphs of European fruit lecanium migrating and feeding on the upper surface of a grape leaf. They are 1/20 inch in length and light color.

**Fig. 76.** Colony of grapevine aphids feeding on the new cane or shoot growth on grape vine. They are dark color and mature insects are about 1/10 inch in length.
INSECTS CAUSING INJURY DUE TO EGG PUNCTURES IN GRAPE CANES

Periodical Cicadas
*Magicicada septendecim* (Linnaeus)
*Magicicada cassini* (Fisher)
*Magicicada septendecula* Alexander and Moore

The adults of these insects occur every 17 years in Ohio and can cause injury through breakage of the grapevines by the oviposition slits made in the grape canes by the females (Figure 77). The nymphs of these insects feed on the roots of deciduous trees for about 17 years. Although eggs are laid in the grape canes, the larvae fall to the ground and do not readily establish themselves on grape roots. So they do not cause serious damage to grape roots.

The adults (Figure 78) occur in May and can invade vineyards from nearby trees or wooded areas. The deep slits made in the grape canes during oviposition cause breakage during the current season (Figure 79) and perhaps during the following year. Both crop and vine growth are reduced considerably through this breakage. Control by screening the vines from adults does not seem practical except for single isolated vines or newly planted vineyards.

Four different broods of cicadas occur in Ohio. Although the life cycle of each brood occupies a period of 17 years, the different broods cause cicadas to occur at intervals of 2 to 8 years (Figure 80).

Fig. 77.—Oviposition slits in grape cane were made by female of periodical cicada.

Fig. 78.—Adult periodical cicada on grape cane. It is about 1-1/2 inches in length, has clear wings and a dark body with orange and red markings.

Fig. 79.—Grape cane broken at oviposition slits made by female of periodical cicada.

Fig. 80.—Areas and years of expected emergence of the 17-year cicada in Ohio.
The snowy tree cricket causes injury to grapes by depositing its eggs in a series of punctures it makes in the grape canes in early autumn (Figure 81). Usually the canes are the current season growth (Figure 82). After overwintering in the canes, the nymphs hatch in the spring and feed on various plants (usually weeds, grasses, and legumes) in the vineyard or in areas adjoining the vineyard. Except for damage from cane breakage and possible entrance of diseases through the egg punctures, no serious losses to grapes occur from this insect. The adult insect resembles a cricket somewhat but is more slender, has antennae much longer than the body which is about 5/16 inch long, and is pale whitish-green in color.

Vineyards which have overgrown natural ground cover or cover crops are the most susceptible to infestations as they afford cover as well as food for the feeding nymphs. Control measures are not required if the ground cover is reduced or eliminated.

**GRAPE INSECT PESTS NOT OFFICIALLY RECORDED IN OHIO RECENTLY (MORE THAN 40 YEARS).**

**Grape Colaspis**  
*Colaspis brunnea* (Fabricius)

**Grape Curculio**  
*Craponius inaequalis* (Say)

**Grape Leaf Skeletonizer**  
*Harrisina americana* (Guérin)

**Grapevine looper**  
*Lygris diversilineata* (Hübner)

**Grape Scale**  
*Diaspidiotus uvae* (Comstock)
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BETTER LIVING IS THE PRODUCT

of research at the Ohio Agricultural Research and Development Center. All Ohioans benefit from this product.

Ohio’s 110,000 farm families benefit from the results of agricultural research translated into increased earnings and improved living conditions. So do the families of the thousands of workers employed in the firms making up the state’s $8 billion agribusiness complex.

But the greatest benefits of agricultural research flow to the millions of Ohio consumers. They enjoy the end products of agricultural science—the world’s most wholesome and nutritious food, attractive lawns, beautiful ornamental plants, and hundreds of consumer products containing ingredients originating on the farm, in the greenhouse and nursery, or in the forest.

The Ohio Agricultural Experiment Station, as the Center was called for 83 years, was established at The Ohio State University, Columbus, in 1882. Ten years later, the Station was moved to its present location in Wayne County. In 1965, the Ohio General Assembly passed legislation changing the name to Ohio Agricultural Research and Development Center—a name which more accurately reflects the nature and scope of the Center’s research program today.

Research at OARDC deals with the improvement of all agricultural production and marketing practices. It is concerned with the development of an agricultural product from germination of a seed or development of an embryo through to the consumer’s dinner table. It is directed at improved human nutrition, family and child development, home management, and all other aspects of family life. It is geared to enhancing and preserving the quality of our environment.

Individuals and groups are welcome to visit the OARDC, to enjoy the attractive buildings, grounds, and arboretum, and to observe first hand research aimed at the goal of Better Living for All Ohioans!
Ohio's major soil types and climatic conditions are represented at the Research Center's 13 locations. Thus, Center scientists can make field tests under conditions similar to those encountered by Ohio farmers.

Research is conducted by 15 departments on more than 6500 acres at Center headquarters in Wooster, nine branches, Green Springs Crops Research Unit, Pomerene Forest Laboratory, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres
Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres
Green Springs Crops Research Unit, Green Springs, Sandusky County: 26 acres

Jackson Branch, Jackson, Jackson County: 344 acres
Mahoning County Farm, Canfield: 275 acres
Muck Crops Branch, Willard, Huron County: 15 acres
North Central Branch, Vickery, Erie County: 335 acres
Northwestern Branch, Hoytville, Wood County: 247 acres
Pomerene Forest, Laboratory, Keene Township, Coshocton County: 227 acres
Southeastern Branch, Carpenter, Meigs County: 330 acres
Southern Branch, Ripley, Brown County: 275 acres
Western Branch, South Charleston, Clark County: 428 acres