UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
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Control of Apple Insects

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The purpose of this publication is to assist apple growers in determining the important insects present in the orchard, and to outline briefly recommendations for their control. In many cases, other publications which give more detailed information have been suggested as references.

Spray Combinations

Dormant oils may be used as recommended by the manufacturer during the season when the trees are dormant and until the buds start to open in the spring. Dormant oil sprays may cause severe injury to apples if applied just before a freeze or after growth is too far advanced.

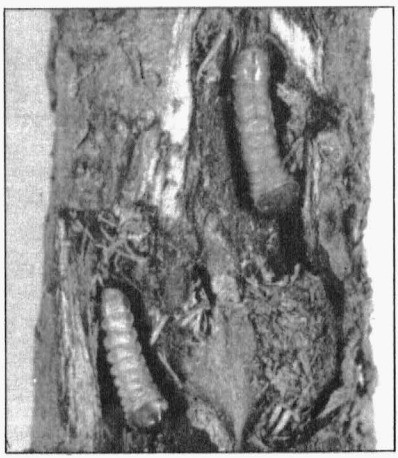
Summer oil is often used at a concentration of from ½ percent to as high as 1 percent as a spreader and sticker for lead arsenate and for fixed nicotine. An oil spray should not follow a sulfur spray any sooner than 10 days.

Fixed nicotine should never be used in combination with lime, since lime releases the nicotine too rapidly.

Arsenical injury to foliage will be reduced if a "safener" of either ½ pound copper sulfate and 1 pound lime is added as a bordeaux, or a zinc bordeaux of 1 pound lime and 1 pound zinc sulfate is added to each 100 gallons of lead arsenate spray, starting in the second cover spray or about a month after the petals have fallen. Safeners may cause russeting of the fruit if used too early in the season.

Typical injury to apple twig by shot hole borer.

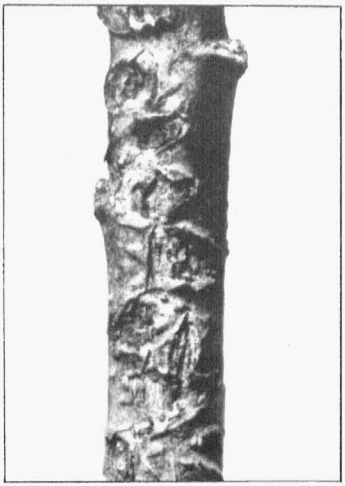
Flat-headed apple tree borer.



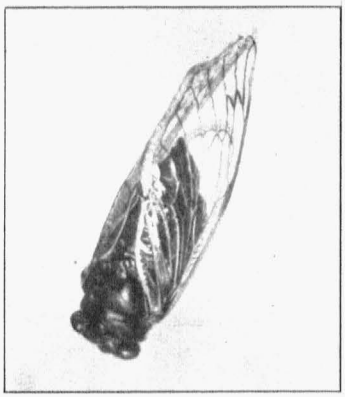
Larvae of round-headed apple tree borers.

Insects Affecting Twigs, Trunk, and Roots

Insect	Description and Type of Injury	Control
Round-headed borer	In the fall, newly hatched borers make small entrance holes in bark at base of trunk. Holes about the size of lead pencil with brown castings may also indicate the presence of year-old borers.	Examine trunks at ground level and 2 inches below in September and in April. Remove all borers with a knife. Keep trees vigorous and trunks free from grass and weeds. See Mo. Bul. 373.
Flat-headed borer	Broad, shallow burrows just under the bark on trunk and main branches. Usually found on weak or injured trees. Borers tunnel deeper as they reach maturity.	Keep trees vigorous and free from bark injuries. Avoid sun scald on trunk and branches. Remove borers with a sharp knife in late summer. See Mo. Bul. 373.
Bark Beetles	Small holes about the size of a pencil lead in bark of trunk or branches.	Keep trees vigorous; cut and burn all infested branches. Burn all old prunings and brush. See Mo. Bul. 373.
Wooly Aphid	Cottony masses of plant lice clustered in wounds on the tree trunk or on knots on the roots.	Spray with nicotine sulfate, 1 to 800, for those above ground. Control on roots difficult. Cultivation and fertilizer will help maintain tree vigor.



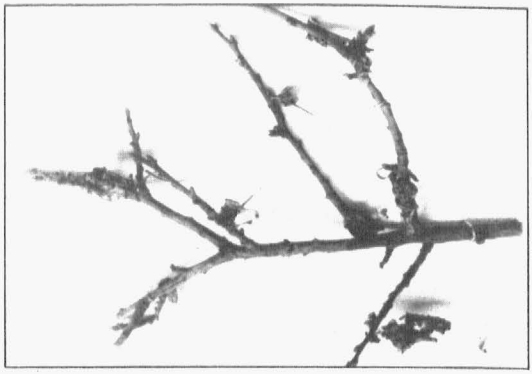
Apple twig injured by egg-laying punctures of buffalo treehopper.



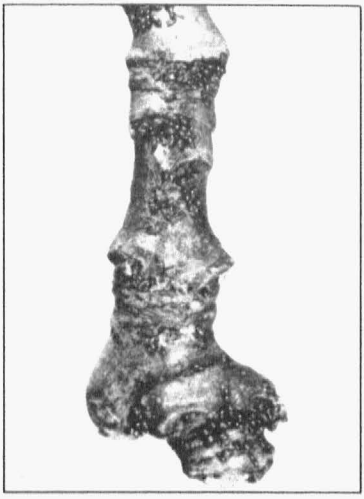
Periodical cicada.

Imbricated snout beetle.

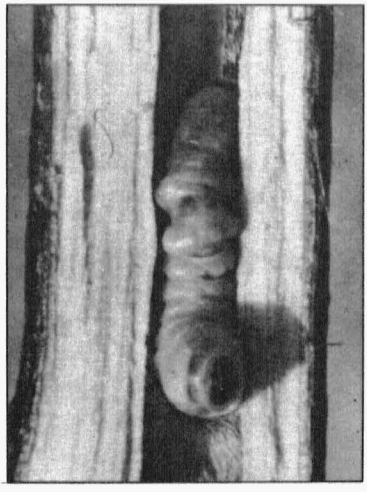
Insect	Description and Type of Injury	Control
Imbricated Snout Beetle	A grayish-brown snout beetle about ⅜ inch long. May injure apple buds by feeding on them in early spring.	Not often an important pest in Missouri. May be controlled to some extent by spraying with lead arsenate, 6 lbs. to 100 gal.
Periodical Cicada	Row of closely grouped egg-laying punctures on twigs and small branches, often causing the branches to break.	Young orchards planted on newly cleared land are more likely to be injured than those planted on ground cleared before the last appearance of the adults.
Buffalo Tree Hopper	Adult a light-green, triangular-shaped insect with a short horn-like projection at each side in front. Branches of young trees injured by egg-laying slits.	Most troublesome in young orchards. Avoid legume crops. In severe cases, it may be necessary to practice clean cultivation one or two seasons.
San Jose Scale	Small, grayish specks on the bark. In cases of heavy infestation, somewhat resemble a coating of wood ashes. Branches or entire trees may be killed or severely injured if heavily infested.	More important in southern half of state. Spray with 2% to 3% dormant oil emulsion as a delayed dormant, or liquid lime sulfur, 1 gal. to 7 gals. of water.
Scurfy Scale	Grayish-white scales, pear-shaped, and about ⅛ inch long.	Same as for San Jose Scale.
Oyster Shell Scale	Slender dark brown scales about ⅛ inch long resembling a small oyster shell. Bark may be cracked and scaly.	Lime sulfur as for San Jose scale.



Winter nests of leaf crumplers.

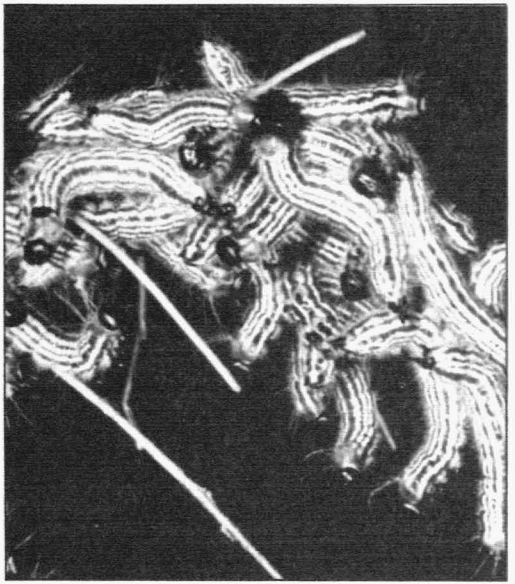


Aphid eggs on apple twig.

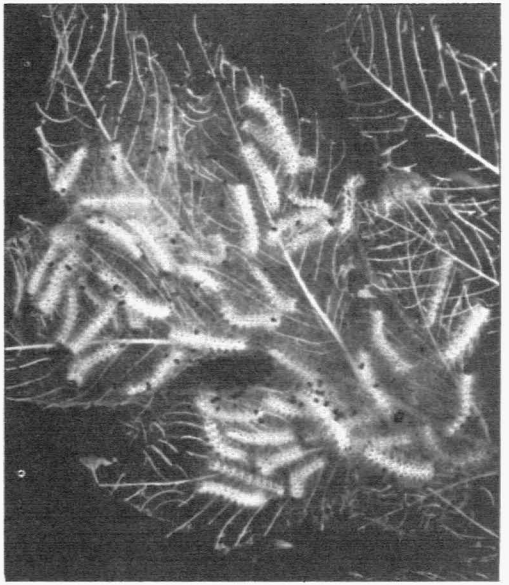


Twig pruner in tunnel in apple twig.

Insect	Description and Type of Injury	Control
Twig Pruner	Twigs or branches cut by a larva from inside. Cut-off part contains small white borer in central tunnel.	Collect and burn all fallen twigs or branches in the fall.
	Insects Affecting Foliage	
Rosy Aphid	Winters as very shiny black eggs in crevices of bark or twigs. Newly hatched aphids on opening buds in the spring. Leaves curled.	Difficult to control. Dormant oil with a strong ovicide such as a tar oil spray is most promising control.
Green Aphid	May cause some early leaf curling. Winters in egg stage similar to rosy aphid.	Usually do not cause much damage. Control same as for rosy aphid.
Leaf Crumpler	Tough curled cases usually partly enclosed in dead leaves attached to twigs in which caterpillars pass the winter, feeding on opening buds in the spring. Also a pest on plums and red haws.	Not of much importance in Missouri. Controlled by regular codling moth spray program. Spray infested young orchards with 4 lbs. lead arsenate to 100 gals. water just as growth starts in the spring or during first week in August.
Leafhoppers	Cause light-colored areas in the leaves. Most severe in late summer. Pale-green immature leafhoppers present on leaves.	Spray with nicotine sulfate, 1 to 800, plus ¾% summer oil when nymphs are present. Satisfactory control usually results from nicotine program for codling moth control.



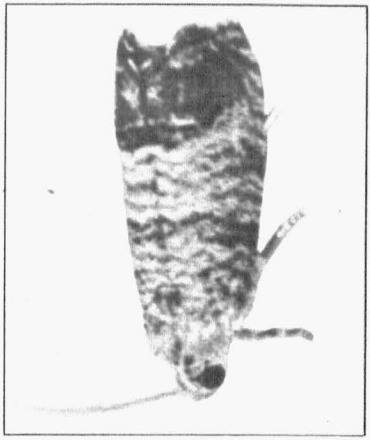
Yellow-necked caterpillars.



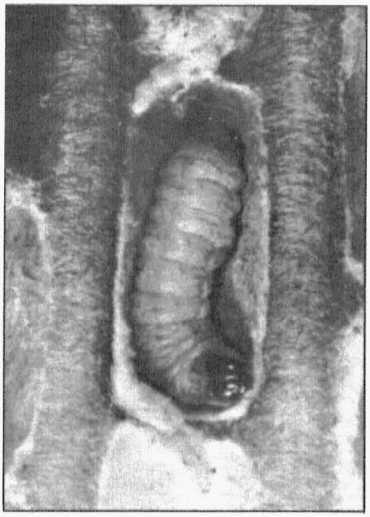
Fall webworms on elm leaves.

Bagworm case containing over-wintering eggs.

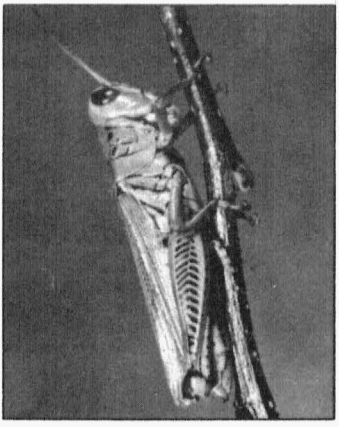
Insect	Description and Type of Injury	Control
Leaf Miners	Small larvae feeding between upper and lower surfaces of the leaf, causing dead areas in the leaf.	Turn under leaves in fall or winter. Native parasites are the most effective control.
Fruit Tree Leaf Roller	Terminal leaves webbed together in early spring. Fruit badly scarred or lopsided by larvae feeding on growing fruit.	Six percent dormant oil emulsion applied before growth starts in the spring. 4 lbs. lead arsenate to 100 gals. added to cluster bud spray. See Mo. Cir. 203.
Pistol Case Bearer	Small brown worms enclosed in a case about ¼ inch long which stands at right angles to leaf or fruit surface.	Not of much importance in Missouri. The regular orchard spray program usually gives control.
Yellow-necked Caterpillar and others	Black and yellow-striped caterpillars up to 2 inches in length, feeding in colonies on foliage in July and August.	Not a problem in sprayed orchards. Spray with lead arsenate, 3 lbs. to 100 gallons, when found.
Tent Caterpillar	Heavy webs containing numerous caterpillars. Found in forks of trees in the spring.	Controlled by the regular spray program in a bearing orchard. Use 3 lbs. lead arsenate spray to 100 gals. when found on young trees. Nests and worms may be removed and burned.
Fall Webworm	Numerous larvae feeding on leaves inside a protecting web in early summer or fall.	Control same as for tent caterpillar.
Bagworm	Caterpillar which makes a bag and hides in it. Winters as eggs in a bag attached to twigs of tree. Eggs hatch in early June. Especially fond of evergreens, often defoliating trees.	Spray with 4 lbs. lead arsenate to 100 gallons when found. Pick off and burn the bags containing the eggs in late winter.



Adult codling moth.

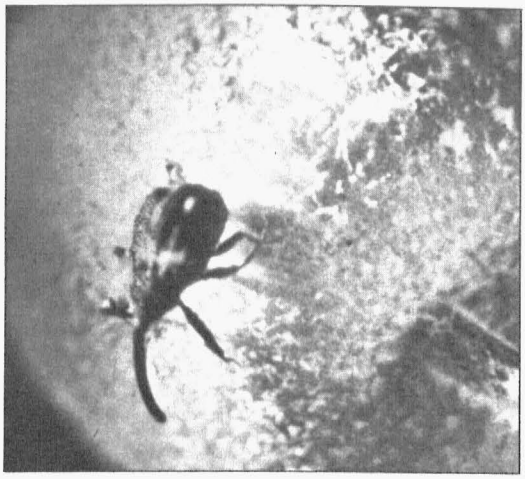


Codling moth larva in cocoon.

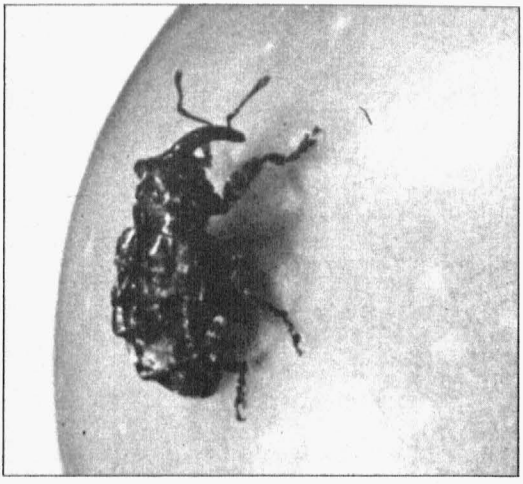


Grasshopper on apple twig.

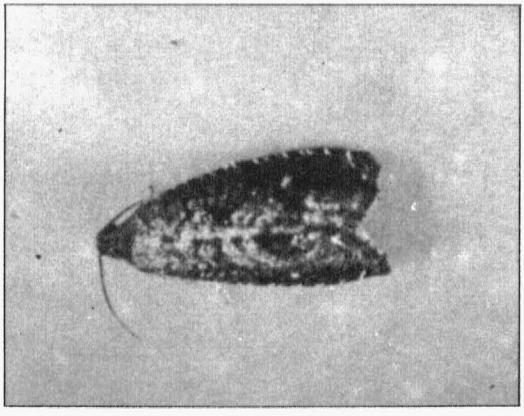
Insect	Description and Type of Injury	Control
Red Spider	Leaves webbed on underside, often turning brown and falling to the ground in case of severe infestation.	Not often important on apples in Missouri. Most severe in dry years. Spray with 1% summer oil, being careful to wet undersides of leaves.
Pear Blister Mite	Small brownish-colored blisters appear on undersides of pear and apple leaves. Blisters contain slender, minute, four-legged mites.	Not often a pest in Missouri. Controlled by spraying with lime sulfur or dormant oil as for San Jose Scale.
Apple Flea Weevil	Numerous small holes eaten in the leaves early in the spring by a small, dull-black snout beetle. Later the leaves may have the appearance of being riddled by very small shot.	Has been of very little importance in Missouri. Regular codling moth sprays usually give satisfactory control.
Cankerworms	Small measuring worms feeding on the leaves as they open in the spring. May defoliate entire trees.	Not often a problem in well-sprayed orchard. When present, spray with 3 lbs. lead arsenate to 100 gals. in cluster bud stage. See Missouri Cir. 205.
Apple Leaf Skeletonizer	Fleshy part of terminal leaves eaten away by brownish-green caterpillar. First brood appearing in early July. A second brood may appear in late August.	Usually controlled by the regular codling moth sprays. Spray with 4 lbs. lead arsenate to 100 gals. water plus a "safener" when injury first appears. Spray thoroughly tops of trees and tips of branches.
Grasshoppers	When grasshoppers are numerous young trees may be partly or entirely defoliated. May also cause considerable roughening of the bark.	Poison bait of bran, 100 lbs., paris green or white arsenic, 4-6 lbs., water to make a crumbly mash. Spread evenly at rate of 10-12 lbs. per acre. Apply early in the morning.
	Insects Affecting Fruit	
Codling Moth	Pinkish white worms with brown heads, which burrow into the fruit.	One calyx and 4 to 8 cover sprays of lead arsenate, 3 lbs. to 100 gallons, plus supplementary measures. Fixed nicotine may be used in the later sprays. See Mo. Bul. 459 and Apple Spray Calendar.



Apple curculio.

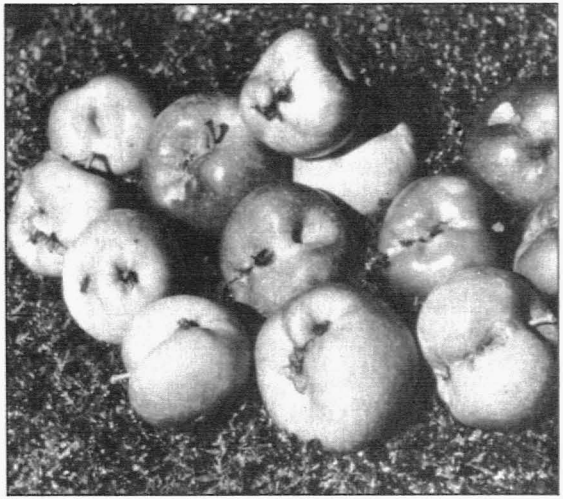


Plum curculio.

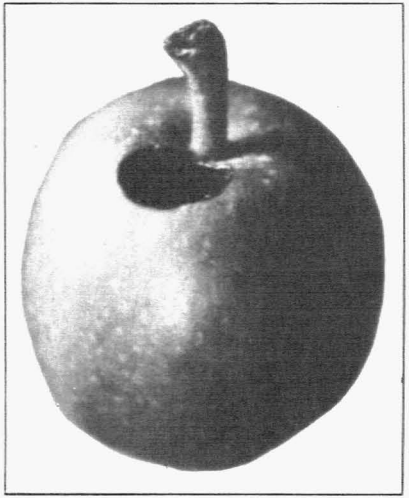


Adult of oriental fruit moth on an apple.

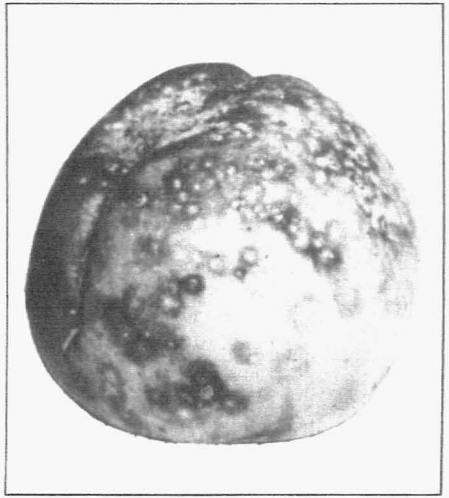
Insect	Description and Type of Injury	Control
Oriental Fruit Moth	Pinkish white worms resembling small codling moth larvae, which burrow in irregular shallow tunnels in the apples. More important where peaches and apples are close together.	Avoid interplanting apples and peaches. Better to have peaches at least ¼ mile from apples. Regular codling moth sprays and introduced parasites will help. See Mo. Bul. 424.
Apple Maggot	Numerous small crooked tunnels in the fruit containing small whitish maggots.	Not important in Missouri. Regular codling moth sprays will ordinarily control it by poisoning the adult fly.
Plum Curculio	Crescent-shaped incisions in the skin of fruit in May and early June. Later the fruit may be knotty and misshapen.	Spray with 3 lbs. lead arsenate to 100 gals. in calyx and again 10 days later. Avoid interplanting with stone fruits. Orchard sanitation is important. See Mo. Apple Spray Calendar.
Apple Curculio	Numerous small round holes in the apples. Small snout beetles with snouts nearly as long as the body.	Orchard sanitation and destruction of its winter quarters are the most important controls. See Mo. Apple Spray Calendar.



Mature apples injured by fruit-tree leaf roller feeding on the young fruit.



Apple damaged by green fruit worm.



San Jose scale on apple.

Fruit Tree Leaf Roller	Pale-green larvae that often tie a leaf to the side of the fruit and feed beneath the leaf. Apples may be seriously deformed.	See Fruit Tree Leaf Roller on the foliage, page 9. Also see Mo. Cir. 203.
Green Fruit Worm	Greenish-white worm which eats large hole in the side of apple about 3 to 4 weeks after petal fall.	Not often important in Missouri. To control, spray with 4 lbs. lead arsenate to 100 gals. in cluster bud stage.
San Jose Scale	Red spot or ring with a gray speck in the center.	See San Jose Scale under Insects Affecting Twigs, Trunk and Roots, page 5.
Rosy Aphid	Dwarfed, crinkled and deformed fruit usually in cluster or in definite areas on the tree.	See Rosy Aphid under Insects Affecting Foliage, page 7.
Red Bug	Apples have a somewhat similar appearance to those injured by rosy aphid.	Not important in Missouri. Control by nicotine sulfate 1-800 in cluster bud spray.