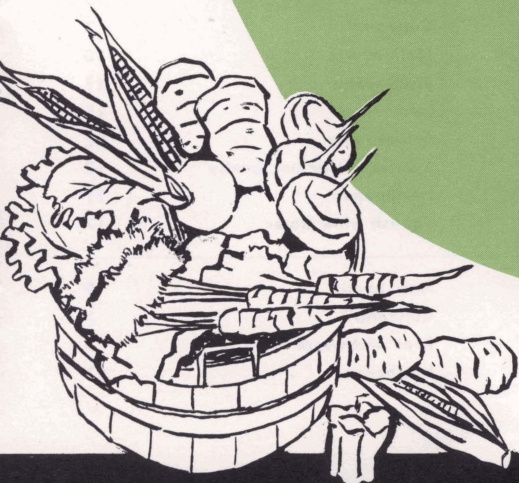




INSECTS ...

Attacking Vegetable Crops



CONTENTS

CHEWING INSECTS

Insects eating foliage and/or fruits of plants, leaving visible signs

| Pest | Page number | Pest | Page number |
|------------------------|-------------|-------------------------|-------------|
| Armyworm | 5 | Grasshoppers | 10 |
| Beet armyworm | 5 | Melonworm | 10 |
| Beet webworm | 6 | Mexican bean beetle | 10 |
| Blister beetles | 6 | Pepper-flower budworm | 11 |
| Cabbage looper | 6 | Pepper weevil | 11 |
| Cowpea curculio | 7 | Pickleworm | 11 |
| Colorado potato beetle | 7 | Salt-marsh caterpillar | 12 |
| Corn earworm | 7 | Spotted cucumber beetle | 12 |
| Cutworms | 7 | Texas harvester ant | 12 |
| Darkling beetle | 8 | Texas leaf-cutting ant | 12 |
| Diamond-back moth | 8 | Tobacco hornworm | 13 |
| Fall armyworm | 8 | Tomato hornworm | 13 |
| Flea beetles | 9 | Tomato pinworm | 13 |
| Garden webworm | 10 | Vegetable weevil | 13 |
| Golden tortoise beetle | 10 | Yellow-striped armyworm | 14 |

Insects feeding upon roots or within stems or leaves of plants

| Pest | Page number | Pest | Page number |
|------------------------|-------------|------------------------|-------------|
| Cabbage maggot | 14 | Southern corn rootworm | 12 |
| Cutworms | 7 | Squash vine borer | 17 |
| False wireworms | 14 | Sweet potato weevil | 17 |
| Leaf miners | 15 | Tomato pinworm | 13 |
| Lesser cornstalk borer | 16 | White grubs | 17 |
| Onion maggot | 16 | Wireworms | 18 |
| Seed corn maggot | 16 | | |

SUCKING INSECTS

Insects and mites that suck the juices from foliage, fruits, stems and roots, causing discoloration, stunting and other damage

| Pest | Page number | Pest | Page number |
|-------------------|-------------|--------------|-------------|
| Aphids | 19 | Spider mites | 22 |
| False chinch bugs | 20 | Squash bug | 23 |
| Garden fleahopper | 21 | Stink bugs | 24 |
| Harlequin bug | 21 | Thrips | 24 |
| Leafhoppers | 21 | Suckfly | 25 |
| Potato psyllid | 22 | Whiteflies | 25 |

INSECTS ATTACKING SPECIFIED CROPS

| Crop | Insect | Page number | Crop | Insect | Page number |
|-----------------------------------|---------------------|-------------|---|-------------------------|-------------|
| Beans (Snap or Lima) | Aphid | 19 | Cantaloupe, Watermelons, Cucumbers and Squashes | Squash bug | 23 |
| | Flea beetle | 9 | | Darkling beetle | 8 |
| | Leafhopper | 21 | | Aphid | 19 |
| | Corn earworm | 7 | | Cutworm | 7 |
| | Leaf miner | 15 | | Melonworm | 10 |
| | Mexican bean beetle | 10 | | Pickleworm | 11 |
| Beets | Beet webworm | 6 | Carrots | Leaf miner | 15 |
| | Beet leafhopper | 21 | | Spider mite | 22 |
| Cabbage, Broccoli and Cauliflower | Cabbage aphid | 20 | | Spotted cucumber beetle | 12 |
| | Cabbage root aphid | 19 | | Leafhopper | 21 |
| | Flea beetle | 9 | | Squash vine borer | 17 |
| | Cutworm | 7 | | | |
| | Harlequin bug | 21 | | | |
| | Cabbage looper | 6 | | | |
| | Diamond-back moth | 8 | | | |
| Cabbage maggot | 14 | | | | |

INSECTS ATTACKING SPECIFIED CROPS (continued)

| Crop | Insect | Page number | Crop | Insect | Page number |
|-----------------------------|---------------------------------|----------------|------------------|---------------------------|-------------------------|
| Eggplant | Leaf miner | 15 | Peppers | Tobacco & tomato hornworm | 13 |
| | Flea beetle | 9 | | Fruitworm (corn earworm) | 7 |
| | Spotted cucumber beetle | 12 | | Pepper weevil | 11 |
| | Spider mite | 22 | Potatoes (Irish) | Aphid | 19 |
| | Tomato fruitworm (corn earworm) | 7 | | Colorado potato beetle | 7 |
| Lettuce | Aphid | 19 | | Flea beetle | 9 |
| | Spotted cucumber beetle | 12 | | Leafhopper | 21 |
| | Cutworm | 7 | Potato psyllid | 22 | |
| | Cabbage looper | 6 | Potato (Sweet) | Sweet potato weevil | 17 |
| | Corn earworm | 7 | | Aphid | 19 |
| | False chinch bug | 20 | | Golden tortoise beetle | 10 |
| | Mustard, Turnips and Radishes | Leafhopper | 21 | Spinach | Spotted cucumber beetle |
| False chinch bug | | 20 | Leafhopper | | 21 |
| Aphid | | 19 | Cabbage looper | | 6 |
| Harlequin bug | | 21 | Aphid | | 19 |
| Flea beetle | | 9 | Onion maggot | | 16 |
| Onions | Cabbage looper | 6 | Tomatoes | Cutworm | 7 |
| | Thrips | 24 | | Flea beetle | 9 |
| Peas (Southern or Blackeye) | Onion maggot | 16 | | Darkling beetle | 8 |
| | Aphid | 19 | | Tobacco & tomato hornworm | 13 |
| | Cowpea curculio | 7 | | Fruitworm (Corn earworm) | 7 |
| | Corn earworm | 7 | | Leaf miner | 15 |
| Peppers | Stink bug | 24 | | Aphid | 19 |
| | Cutworm | 7 | | Spider mite | 22 |
| | Flea beetle | 9 | | Leafhopper | 21 |
| | Darkling beetle | 8 | | Potato psyllid | 22 |
| | Leaf miner | 15 | | Stink bug | 24 |
| Pepper-flower budworm | 11 | Tomato suckfly | | 25 | |
| | | | | Tomato pinworm | 13 |

MISCELLANEOUS INSECTS

| | | | |
|--------------------|----|------------------------|----|
| Armyworm | 5 | Salt-marsh caterpillar | 12 |
| Beet armyworm | 5 | Seed corn maggot | 16 |
| Blister beetle | 6 | Southern corn rootworm | 12 |
| Fall armyworm | 8 | Texas leaf-cutting ant | 12 |
| False wireworm | 14 | Vegetable weevil | 13 |
| Garden flea hopper | 21 | Whiteflies | 25 |
| Garden webworm | 10 | White grubs | 17 |
| Grasshopper | 10 | Wireworm | 18 |
| Red harvester ant | 12 | | |

INSECTS ATTACKING VEGETABLE CROPS

THE CONTROL OF INSECTS attacking vegetables assumes more importance than with most other crops because even minor damage may lower the crop's value or render it unfit for sale. Commercial vegetable growers should recognize the different insects in their various growth stages in order to begin control measures before damage occurs.

The insect pests presented in this publication are the most common ones encountered in the state's vegetable industry. However, some insects attack more and different vegetable crops than the ones they are listed under. Moreover, new or uncommon insects may occur on various crops and trained entomologists should be consulted when questions arise.

Beneficial insects often are found on vegetables, but seldom are abundant enough to keep destructive insects below damaging levels.

Specific control measures for individual pests are not included in this publication. For control recommendations, consult the current Texas Agricultural Extension Service publication MP-675, *Texas Guide for Controlling Insects on Commercial Vegetable Crops*. This guide can be obtained from your county agricultural agent or from the Department of Agricultural Information, Texas A&M University, College Station, Texas.

CHEWING INSECTS

INSECTS EATING FOLIAGE AND/OR FRUITS OF PLANTS, LEAVING VISIBLE SIGNS OF DAMAGE

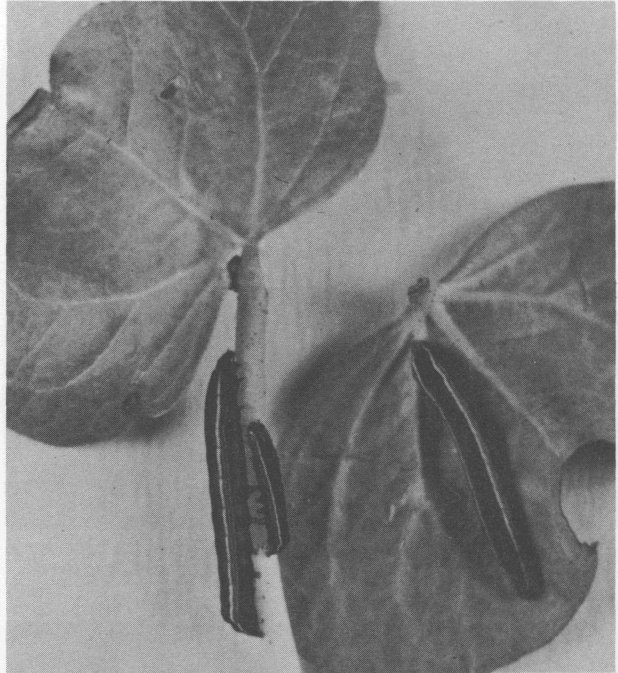
ARMYWORM, *Pseudaletia unipuncta* (Haw.)

Plants attacked: Sweet corn, beans and peas.

Description: Adult. Pale-brown or brownish-gray moths with wing expanse of about 1½ inches and a small but prominent white dot near the center of each forewing. *Larva.* Young worms are pale green and have looping habits; older worms do not loop while crawling. The mature larva is about 1½ inches long, greenish brown with three stripes on each side of the body. The upper stripe is pale orange, the middle one is dark brown and the bottom stripe is pale yellow. The worm has a smooth skin, honeycombed head, 3 pairs of true legs and 5 pairs of prolegs.

Life history: These insects usually pass the winter as larvae in soil around grass clumps. After a short feeding period in early spring, they pupate in the soil and moths emerge about 2 weeks later. The moths remain hidden during the day, but are active at night and are attracted to lights. Females lay greenish-white eggs in long rows or clusters on the lower leaves of host plants, but they frequently are deposited on clothes hung to dry. Each mass is composed of about 50 eggs. Each egg cluster is covered with a white adhesive fluid, fastening them together and drawing the leaf edges. Eggs hatch in 3 to 14 days, depending upon prevailing temperatures. The larval period usually extends from 20 to 30 days. There are three to five generations yearly.

Damage: Newly hatched larvae begin feeding immediately upon foliage, eating the epidermis first, causing a skeletonized appearance. Older larvae straddle the outer leaf margins, especially grass blades, and cut holes reaching to the midrib. They often cut heads off small grain plants. Although the insects prefer grass crops, they also feed on legumes. After devouring the feed supply in their hatching area, the larvae move in armies to nearby fields. Usually, most damage to field



Beet armyworm larvae.

crops is caused during the spring by first generation larvae.

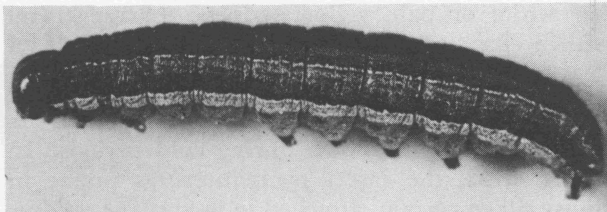
BEE T ARMYWORM, *Spodoptera exigua* (Hubner)

Plants attacked: Beets, asparagus, peas, beans, peppers and several weed hosts.

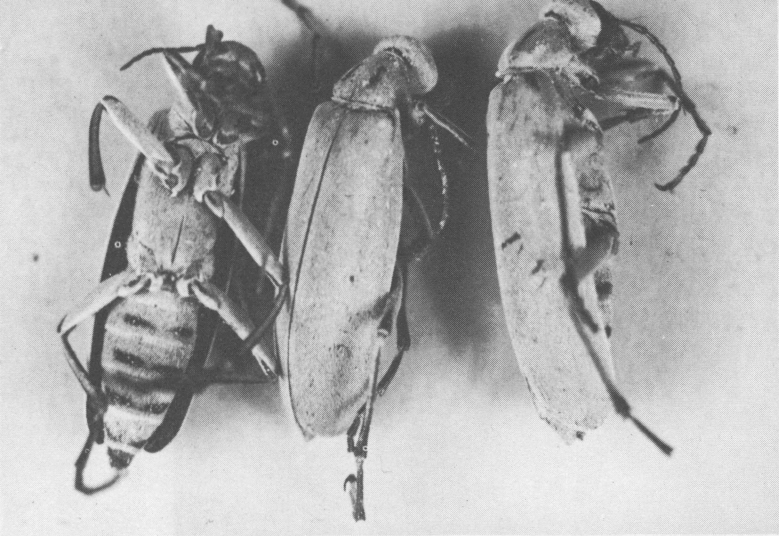
Description: Adult. Forewings are grayish-brown with a pale spot near the middle of the front margin and have an expanse of about 1¼ inches. Hind wings are silvery-white with a darker front margin. *Larva.* Bright green with dark lateral stripes and about 1¼ inches long.

Life history: In South Texas, all stages may be found throughout the year. In colder areas, the insect overwinters in the adult stage. Eggs are deposited in irregular masses of about 80 eggs, covered with scales or hairs from the adult's body, until 500 to 600 eggs have been laid. Eggs hatch in 2 to 5 days and larvae feed about 3 weeks before pupating in the soil. Egg to adult stage requires 24 to 36 days and there may be four generations per year.

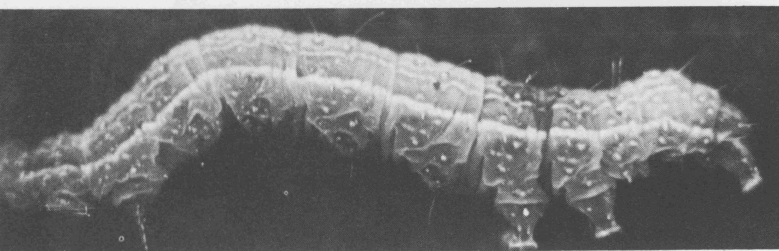
Damage: Larvae may defoliate plants by feeding on the leaves.



Armyworm larva.



A common species of blister beetle.



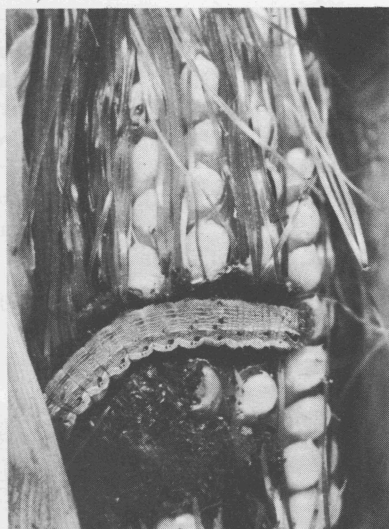
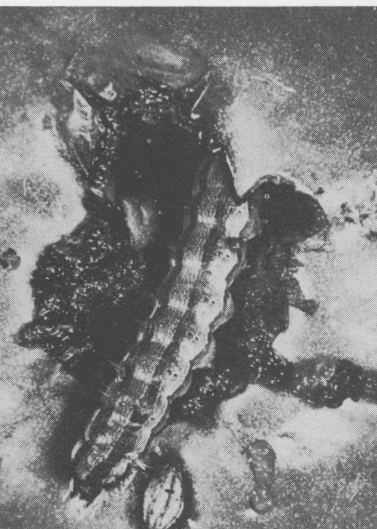
Cabbage looper larva.



Colorado potato beetles on potato plant.

Tomato fruitworm.

Corn earworm in sweet corn.



BEET WEBWORM, *Loxostege sticticalis* (Linnaeus)

Plants attacked: Beets, cabbage, beans, peas, carrots, potatoes, spinach and other crops.

Description: Adult. Brown moths with a 1-inch wing expanse and are mottled with lighter and darker spots. *Larva.* Slender, yellowish to green larvae with a dorsal black stripe and about 2 inches long.

Life history: Eggs are laid in rows, end to end, usually on the underside of leaves. After hatching, larvae spin webs over the leaves. Pupation occurs in the soil. There may be up to four generations yearly.

Damage: They web leaves and devour foliage, often migrating like an armyworm, leaving stripped crops behind.

BLISTER BEETLES, *Epicauta spp.*

Plants attacked: Potatoes, tomatoes, eggplants, beans, peas and others.

Description: Adult. Several species of these insects may be present. All adults are long and slender with distinct body divisions and may be black, gray or striped. *Larva.* Life cycle is complicated, with several larval stages. Some species are beneficial in that larvae feed on grasshopper eggs.

Life history: Eggs are elongated, cylindrically laid in clusters in the soil. Eggs hatch in 2 to 4 weeks. Larvae seek out grasshopper egg pods which they devour, passing through five larval stages. Some species have two generations per year, others but one.

Damage: Adults feed on the foliage of host plants.

CABBAGE LOOPER, *Trichoplusia ni* (Hubner)

Plants attacked: Cabbage, cauliflower, broccoli, brussels sprouts, lettuce and occasionally beans, tomatoes and other crops.

Description: Adult. Light grayish brown moth with a small, lighter colored spot near center of forewing. Moths have a wingspread of about 1½ inches. *Larva.* Light green caterpillars with a few white or pale yellow stripes. Larvae travel with a characteristic looping motion.

Life history: There are continuous generations in the Lower Rio Grande Valley with reproduction slowing down during cold periods. In colder areas, the insect overwinters as pupae in flimsy silken cocoons attached to food plant residue. A complete generation occurs in 4 to 6 weeks.

Damage: Cabbage loopers are voracious feeders, which can strip foliage from infested plants in a short time. Often, when populations become crowded, a virus disease strikes, causing a high larval mortality.

COWPEA CURCULIO, *Chalcodermus aeneus* (Boheman)

Plants attacked: Southern peas or cowpeas, string beans, lima beans, strawberries, young cotton seedlings and wild beans.

Description: *Adult.* About $\frac{1}{4}$ inch long, black, possess a distinct typical weevil snout and many rows of distinct pits on the elytra and dorsal surface of the thorax. *Larva.* Legless, white, C-shaped grubs, about $\frac{1}{4}$ inch long.

Life history: Overwintering adults emerge from hibernation in early summer and deposit eggs in feeding punctures as peas develop inside pods. Hatching occurs in about 3 days and larvae molt three times inside the developing pea. Larvae emerge, drop to the soil, pupate and emerge approximately 17 days later. The entire life from egg to adult may be completed in 30 days. Two generations per year may be produced.

Damage: Damage occurs from the chewing larvae feeding within the developing seed. Each larva feeds on one to two peas within the pod tissue. Adults feed and oviposit on the pod tissue.

COLORADO POTATO BEETLE, *Leptinotarsa decemlineata* (Say)

Plants attacked: Potatoes, tomatoes, eggplants, peppers, cabbage and solanaceous weeds. The potato is highly preferred.

Description: *Adult.* Robust yellow and black striped beetle about $\frac{3}{8}$ inch long. *Larva.* Reddish, humped and with two rows of black spots on each side of the body.

Life history: About 500 eggs are deposited in batches of about 24 on the underside of leaves. Eggs hatch in 4 to 9 days and larvae become full grown in 2 to 3 weeks, consuming the leaves. Pupation occurs in the soil and requires 5 to 10 days. Two to three generations occur in Texas.

Damage: Larvae and adults devour foliage.

CORN EARWORM, *Heliothis zea* (Boddie)

Also known as cotton bollworm and tomato fruitworm.

Plants attacked: General feeders on sweet corn, beans, peas, lettuce and tomatoes.

Description: *Adult.* Moth varies in color, but generally front wings are a light grayish-brown, marked with dark-gray to olive-green irregular lines and each has a dark area near the tip. Hind wings are light with slightly wavy dark bands, especially near the extremities. The moths have a $1\frac{1}{2}$ inch wing expanse. *Larva.* General color varies from light green or pink to brown or nearly black. Alternating longitudinal dark and light stripes mark its body, but colors are so variable that such characteristics are not dependable for identification. Short microspines (visible through a hand-lense) on the skin, abdominal segments and feeding habits are very useful identifying characteristics.

Life history: The corn earworm spends the winter as a pupa 2 to 6 inches below the soil surface. It emerges as a moth during spring and early summer and soon deposits eggs. Freshly laid eggs are waxy white but soon turn yellow. They are about half the size of a pin head and are hemispherical with ridges along their sides. A female oviposits 500 to 3,000 eggs singly on foliage and fruits of many plants. Fresh corn silk is a favorite place for egg deposition, but eggs commonly are deposited in the curl of young corn and grain sorghum plants. Later in the season, grain sorghum heads are preferred. During warm temperatures, eggs hatch in 2 to 4 days, but it may take up to 10 days in cold weather. The worm stage lasts from 2 to 4 weeks. Full-grown larvae crawl down the host plant or drop to the ground where they burrow, forming a walled cell and pupate. The adult or moth emerges 10 to 25 days following pupation. Time required from egg to adult varies from 1 to 2 months, depending upon weather conditions. Four to seven generations occur annually in the Southern states.

Damage: Newly hatched larvae begin feeding immediately on that part of the plant where eggs were laid. On corn silk, worms burrow into and eat the developing grains. Here, the larvae frequently is referred to as the "roasting earworm." It also feeds in whorls of young grain sorghum and corn plants, but usually is not considered of economic importance. Worms cause considerable damage to grain sorghum heads, but they are cannibalistic and usually only one larva reaches full growth in each head as well as in each corn ear.

BLACK CUTWORM, *Agrotis ipsilon* (Hufnagel)

Cutworms attack nearly all Texas vegetable crops.

This cutworm is greasy gray to brown above with faint lighter stripes. The skin has convex,

rounded, isolated large and small granules. The seldom feeding above ground, making control black cutworm often is subterranean in habit, difficult.

VARIEGATED CUTWORM, *Peridroma saucia*
(Hubner)

Larvae are ashy gray to light brown, mottled slightly with darker brown and have a pale yellow dot on the top of most segments.

GRANULATE CUTWORM, *Feltia subterranea*
(Fabricius)

Adults of all cutworms are moths with dark gray forewings variously marked with lighter or darker spots or stripes.

The larva is a large, dirty brown worm with a distinctly rough skin.

Life history: They overwinter as eggs, larvae or pupae, all emerging in spring. There are one to four generations yearly, depending on species.

Damage: Young plants are cut at the ground line with some species also feeding on foliage.

DARKLING BEETLE, *Ulus elongatulus* (Casey)

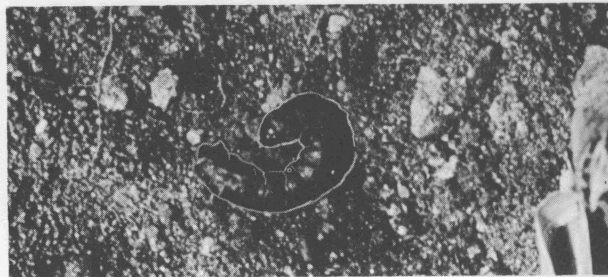
These black to brown beetles feed around the seedling base and some mature plants, causing damage resembling cutworm attack.

DIAMOND-BACK MOTH, *Plutella maculipennis*
(Curtis)

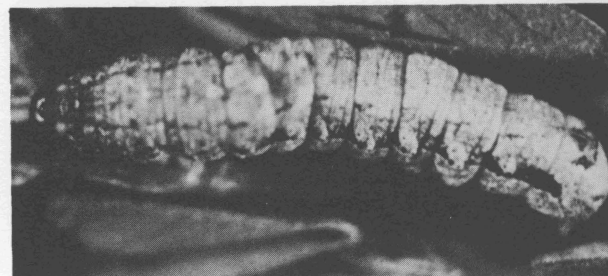
Plants attacked: Cabbage, cauliflower, broccoli and similar crops.

Description: Adult. The grayish moth, about $\frac{1}{3}$ inch long, has folded wings flaring outward and upward toward their tips. In the male, the wings form a row of three diamond-shaped yellow spots where they meet down the middle of the back. The hind wings have a fringe of long hairs. *Larva.* Rarely exceeds $\frac{1}{3}$ inch, is pale-yellowish-green with fine, scattered, erect black hairs over the body. Wiggles actively when disturbed. The pupa is in a beautiful, gauzy sack $\frac{3}{8}$ inch long, but so thin and loosely spun that it hardly conceals the pupa.

Life history: Adults lay minute, yellowish-white eggs, 1, 2 or 3 in a place. In a few days the eggs hatch and larvae feed on the underside of leaves. These larvae become full-grown in 10 to 30 days. The pupa usually is fastened to the leaf's underside. The small moth emerges in 7 to 14 days and starts another generation. There may be two or three generations per year.



Black cutworm larva.



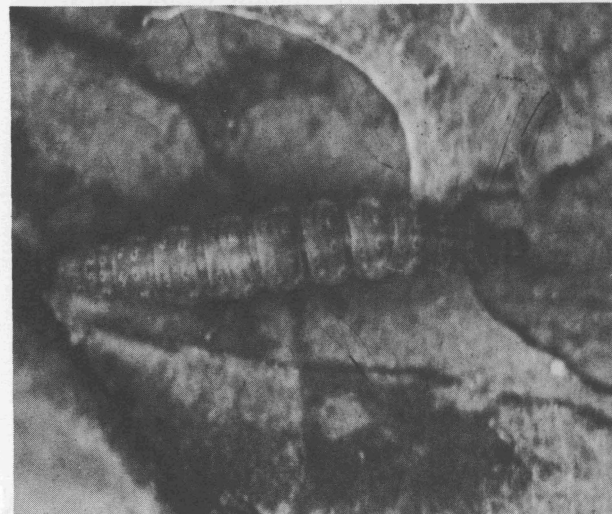
Variiegated cutworm larva.

Damage: Larvae feed on the underside of leaves, leaving shot-hole type damage. Usually, outer leaves are attacked.

FALL ARMYWORM, *Laphygma frugiperda*
(J. E. Smith)

Plants attacked: Sweet corn, beans and peas.

Description: Adult. Moths are about $\frac{3}{4}$ inch long and $1\frac{1}{2}$ inches across outspread wings. Male forewings are grayish with a mottled appearance and an irregular white spot near the tip. Female forewings usually are duller than those of the male. The hind wings of both sexes have a pinkish-white luster, bordered by a smoky-brown band. *Larva.* The newly hatched larva has



Diamond back moth larva.

a jet black head and light body, turning darker when about 3 days old. A fully grown larva is $1\frac{1}{3}$ inches and varies from light green to almost black. The head's front is marked with a prominent inverted Y, but this characteristic is not always reliable identification. Larvae have three yellowish-white lines down the back from head to tail. On each side next to each outer dorsal line is a wider dark stripe below which is an equally wide, wavy, yellow stripe, spotted with red.

Life history: Moths lay eggs at night in clusters of 50 to several hundred, most often on grass blades and frequently on lawn grass. Eggs hatch in 2 to 4 days. Larvae become full grown in 2 to 3 weeks. Then they burrow into the soil 1 to 2 inches and pupate, remain for 8 to 10 days and emerge as adults. This insect's biology resembles that of the cotton leafworm. It can, however, overwinter as an adult along the Texas Gulf Coast and fly north in the spring. Cold weather deters production of many insect enemies of the worm, and moisture provides conditions for luxuriant plant growth, where larvae thrive. Fall armyworm outbreaks usually follow wet seasons, especially during the summer and early fall. There may be five to ten generations annually.

Damage: The tiny larva begins feeding on its egg shell immediately after hatching, but soon attacks plants near the soil surface. Larvae grow rapidly and within 2 or 3 days begin devouring plants. They frequently do considerable damage to corn ears, similar to that caused by corn earworms. These worms also feed as "budworms" in grain sorghum and corn whorls. Unfolding leaves from whorls of such attacked crops are perforated with holes. Like the armyworm, they move in armies to other fields after devouring plants in the hatching area.

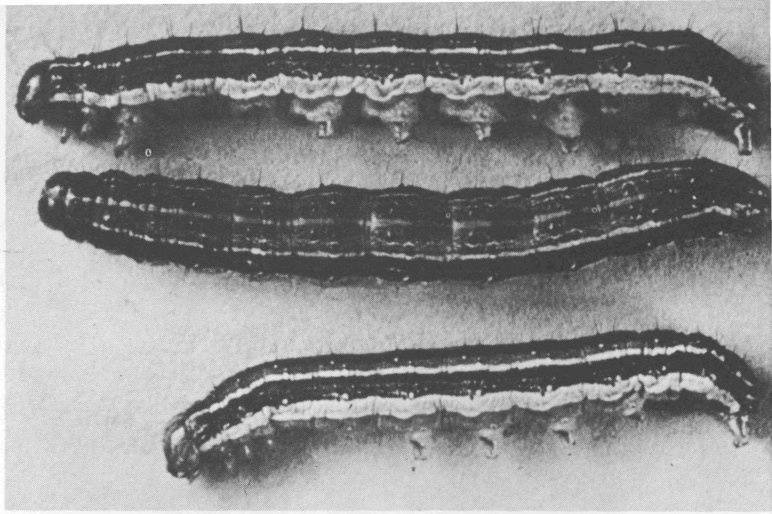
FLEA BEETLES

Several species of flea beetles attack Texas vegetable crops. Some more important species are the tobacco fleabeetle, *Epitrix hirtipennis* (Melsheimer), the eggplant fleabeetle, *E. fuscula* (Crotch), and the potato fleabeetle, *E. cucumeris* (Harris).

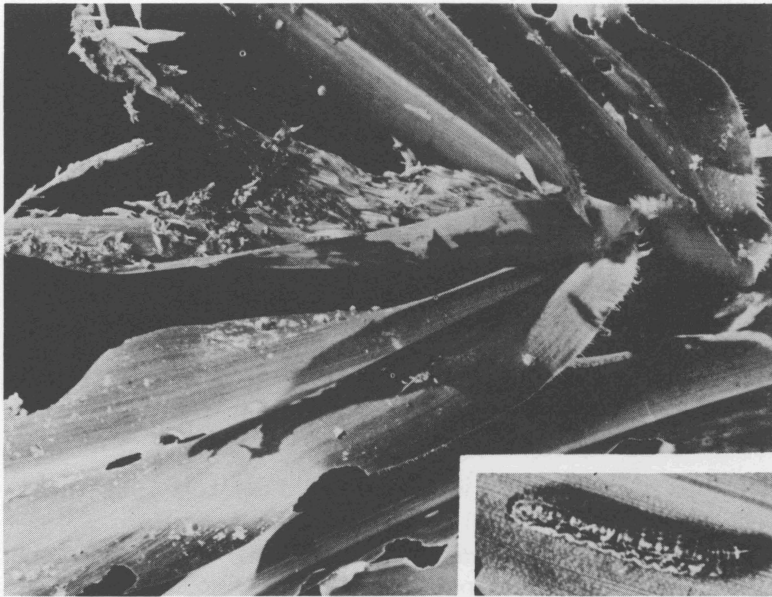
Plants attacked: Potatoes, eggplant.

Description: Adult. Approximately $1/16$ inch long. Some are entirely black, others brown-black with faint, lighter markings. *Larva.* Small, slender and white with a black band and 3 pairs of legs.

Life history: Adults hibernate in the soil, crop remnants and become active in spring, feeding on host plants as new growth appears. Eggs



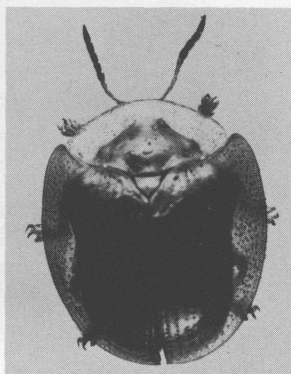
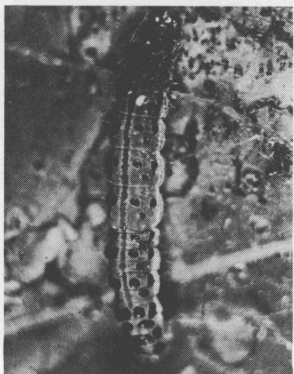
Fall armyworm larvae.



Fall armyworm damage to corn.

Potato flea beetles and damage to potato plant.





Garden webworm larva. Golden tortoise beetle.

are laid on or in soil near the plant base. They hatch in about a week and larvae feed on plant roots or tubers for 2 to 3 weeks, followed by pupation and adult emergence. Life cycle from egg to adult may be completed in 6 weeks or less. One to four generations develop each year depending on species. Adult feeding may extend over 2 months.

Damage: Plant foliage has numerous, very small, rounded or irregular holes eaten through or into the leaf, so that leaves look as though peppered with fine shot. When these small holes are numerous, leaves may wilt and turn brown, killing or stunting the plant.

GARDEN WEBWORM, *Loxostege similalis* (Guenee)

Plants attacked: General feeder, attacking beans and peas principally. Also feeds on other legumes, cotton and weeds.

Description: *Adult.* Buff moth with shadings and irregular markings of light and dark gray. Wingspread is about $\frac{3}{4}$ inch. Generally, they are active at night and attracted to lights, but often are found in fields during the day, darting away in short flights when disturbed. *Larva.* About 1 inch long, yellowish or pale to dark greenish with a light stripe down the back. Three dark spots form a triangle on each segment's side.

Life history: Webworms pass the winter as pupae or larvae within silk-lined cells in the soil or under plants fed upon by the fall generation. Some may be found in nearly every season in the lower Rio Grande Valley. Eggs are laid in masses of 2 to 50 on host plant leaves and hatch in 3 to 5 days. Larvae feed on foliage and mature in about 1 month. There are from three to six generations annually.

Damage: Larvae feed primarily on the underside of leaves, skeletonizing them, spin webs and draw additional leaves within the web as needed for food.

GOLDEN TORTOISE BEETLE, *Metritona bicolor* (Fabr.)

Plants attacked: Eggplant, sweet potato and other plants in the morning glory and night shade family.

Description: *Adult.* Oval, flattened, nearly $\frac{1}{4}$ inch long and golden. *Larva.* Short, flattened, and spring margined with a forked posterior appendage bent forward over the body, which holds a mass of cast skins and excreta.

Life history: Adult beetles hibernate in winter, become active in spring and feed on Solanum weeds until eggplants are available. Eggs are laid on foliage with larvae later pupating on leaves. New adults appear by summer, feed all fall and produce one to two generations yearly.

Damage: Adults and larvae feed on foliage, cutting holes and sometimes consuming entire leaves.

GRASSHOPPERS

These insects feed on a wide range of crops. Of approximately 600 species occurring in the United States, few are of economic importance. Most grasshoppers pass the winter in the egg stage. Eggs are laid during summer and fall in packet-like masses below the soil surface of pasture land, field margins and roadsides. Eggs hatch into small nymphs in April, May and June. Exact time and percentage of eggs hatching depends on weather conditions and locality. For detailed information on grasshoppers, see Extension Service Leaflet 429, *Grasshoppers Common to Texas*.

MELONWORM, *Diaphania hyalinata* (Linnaeus)

Plants attacked: Muskmelon, cucumbers and squash.

Description: *Adult.* Moth has velvety black wing margins with lighter, pearly-white areas. *Larva.* Larval stages have two dorsal white stripes running the length of the body, otherwise they resemble the pickleworm. Larvae can grow to $1\frac{1}{4}$ inches long.

Life history: Similar to pickleworm. See page 11.

Damage: Larvae feed on foliage rather than blossoms before they tunnel into stems and fruits, otherwise similar to pickleworm.

MEXICAN BEAN BEETLE, *Epilachna varivestis* (Mulsant)

Plants attacked: Bush, pole and lima beans and cowpeas.

Description: Adult. Yellow, coppery or bronze, depending upon age, with 16 black spots on the wing covers. It is hemispherical, about 5/16 inch long. *Larva.* Newly hatched spiny larvae are green, gradually becoming yellow as they near fully developed stage, then changing to broad, yellow pupae, attached at the posterior to plants by the gray colored, last molt skin.

Life history: Only the adult beetle overwinters, usually among plant remnants on the ground. When prevailing temperatures are optimum for adult activity, adults begin depositing eggs on host plants. The bright yellow eggs are deposited in groups of 40 to 60 on lower leaf surfaces and hatch in about 7 days. There are four larval instars, each approximately 5 to 7 days apart, followed by a week long pupal period. Shortest total development time is about 33 days and one to four generations occur, depending on latitude.

Damage: This beetle is confined to a small area in West Texas and feeding by larvae and adults is evident on the lower leaf surface.

PEPPER-FLOWER BUDWORM, *Gnorimoschema gudmannella* (Wlsm.)

Plants attacked: Peppers, cultivated and wild.

Description: Adult. Small, powdery, dark gray moths mottled with yellowish gray and with a wingspread of 3/8 to 1/2 inch. *Larva.* About 1/32 inch long and yellowish-white when first hatched. When full grown, they are 3/16 to 1/4 inch long with grayish-brown body and brownish-

black head. Just before pupation, color changes to brick red.

Life history: Small, pearly white eggs are deposited singly or in small groups along the leaf vein or in the leaf axils or branches, hatching in 4 to 7 days. Young larvae enter buds where they feed for 14 to 24 days before moving to the ground to pupate in cocoons of webbing mixed with sand. Pupation requires 11 to 21 days. From 32 to 51 days are required for a complete generation.

Damage: Larvae feed on anthers, style and ovary of buds preventing fruit set.

PEPPER WEEVIL, *Anthonomus eugenii* (Cano)

Plants attacked: Pepper

Description: Adult. The weevil is black about 1/8 inch long with a sparse covering of tan to gray hairs. *Larva.* White grubs with brown heads characterize this growth stage.

Life history: Adults lay eggs in buds or young pods. Young larvae feed and develop in young pods where they pupate. There may be five to eight generations yearly and generations appear to be continuous in the Lower Rio Grande Valley.

Damage: Tunnels in seed mass in the center of pepper pods.

PICKLEWORM, *Diaphania nitidalis* (Stoll)

Plants attacked: Summer squash is the favored host, but cucumber and muskmelon also are attacked.

Cantaloupe plant damaged by melonworms; melonworm larva, right; melonworm adult, left.



Description: Adult. The moth has dark brown leaf margins merging into lighter areas toward the center, with the abdomen tip tufted with hairs. *Larva.* Bright green and black dotted. Does not exceed $\frac{3}{4}$ inch long.

Life history: New adults emerge after hibernating in the pupal stage and are active at night, laying tiny eggs in small clusters on leaves, buds, vines and fruits. Hatching occurs in a few days and larvae feed for approximately 2 weeks, then pupate inside silken cocoon on leaves. In 5 days or more, adults appear. Activity is continuous in the Lower Rio Grande Valley. There may be five generations per year.

Damage: Larvae feed on blossoms and vines and mine into the underside of fruits.

SALT- MARSH CATERPILLAR, *Estigmene acrea* (Drury)

Plants attacked: Most garden crops, many field crops, weeds and shrubs.

Description: Adult. White moths with wings freckled with black spots. In females, wings are yellow on the underside and males have the hind wings yellow above and below. *Larva.* When full grown, they are up to 2 inches long, covered with dense hairs ranging from yellowish to brown and nearly black.

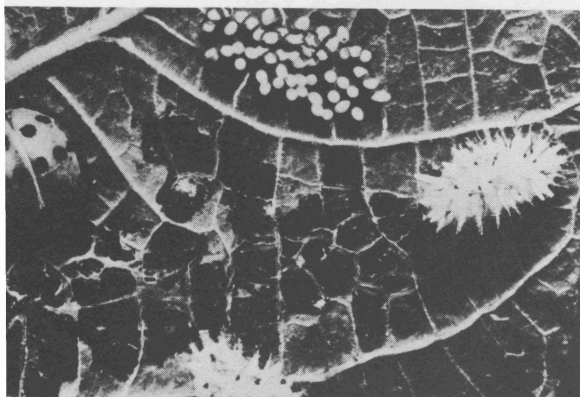
Life history: The insect overwinters in the pupal stage within thin silken cocoons. Adults emerge in spring and mate. Females then lay spherical eggs in patches on host plant leaves. Larvae feed for 1 to 2 months before pupation. There may be up to four generations yearly.

Damage: Larvae are present in large numbers and migrate similar to armyworms, stripping foliage from plants they attack.

SPOTTED CUCUMBER BEETLE, *Diabrotica undecimpunctata howardi* (Barber)

Plants attacked: Adults feed on foliage of beans, peas, cucurbits and 200 or more other cultivated and wild host plants. The larval stage, known as the *southern corn rootworm*, may destroy corn by feeding on roots and lower stalk parts.

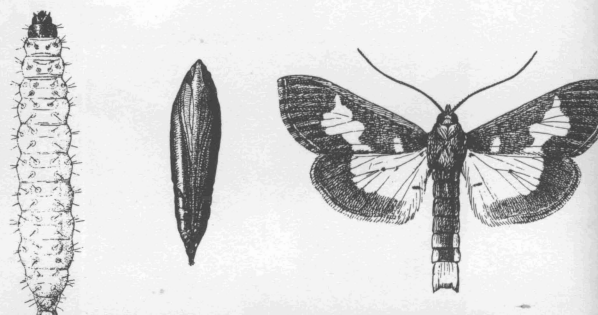
Mexican bean beetle adults, larvae and eggs.



Pepper budworm damage to pepper bud.



Pickleworm egg, larva, pupa and adult.



Description: Adult. Yellowish-green beetle about $\frac{1}{4}$ inch long with 12 distinctive black spots in the wing covers. *Larva.* Small yellowish-white grubs with a light brown head.

Life history: Adults overwinter in any type of cover such as plant stubble but may be active throughout the winter in warmer areas. Eggs are deposited in the soil about plant bases. Generally there are two generations yearly.

Damage: This insect pest often eats irregular holes in foliage and cuts off growing tips. Plant stems often are girdled at or near the ground so that the plant gradually dies.

RED HARVESTER ANT, *Pogonomyrmex barbatus* (F. Smith)

Plants attacked: This ant attacks plants which produce small seed, but their activity eliminates vegetation from infested areas.

Description: The worker ant is reddish-brown and $\frac{1}{4}$ to $\frac{1}{2}$ inch long. Males and females are larger than workers and are winged during the swarming season, but these two forms seldom are seen.

Life history: Eggs are laid in "ant nests", made up of chambers below the soil surface. Such areas are indicated by a barren mound. The diameter of barren areas depends upon age and vigor of the colony, but usually, it is from 3 to 35 feet. Swarming (appearance of winged males and females) takes place during early summer when new colonies are established.

Damage: Some damage is caused by ants collecting seeds from plants near the ant "dens" However, the most important loss is vegetation destruction around nests.

TEXAS LEAF-CUTTING ANT, *Atta texana* (Buckl.)

Plants attacked: Crops in general. These ants occur principally in the eastern part of Texas.

Description: The leaf-cutting ant is rusty brown. There are several castes or forms and considerable variation in size. The queen is ap-

proximately $\frac{3}{4}$ inch long. Common worker ants range from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length. Colonies usually are found in well-drained sandy soils and may consist of a few mounds covering a small area to many feet. A nest, the mound interior, consists of several chambers and may descend 15 feet.

Life history: Winged males and females develop in May and June, fly from their colony and mate. After mating, females lose their wings, establish nests beneath the soil and become queens of new colonies. They may continue reproduction within one nest for years. In such a case, they may build a nest 10 to 20 feet in diameter with numerous "craters." Each nest may contain many thousands of individuals.

Damage: Worker ants are active from May to September. They forage during the night on field crops as well as many other plants. They often defoliate plants, carrying severed leaves to their nest. Leaves are used to maintain their "fungus garden" which eventually is used for food. Well-defined foraging trails, resembling miniature highways, are established by ants traveling to and from nests.

TOBACCO HORNWORM, *Protoparce sexta* (Johannson) and the TOMATO HORNWORM, *P. quinquemaculata* (Haworth)

Plants attacked: Tomatoes and peppers.

Description: Adult. Large, fast-flying hawk moths, sometimes mistaken for humming birds, with a 5 inch wingspread. *Larva.* The large worms are similar, but there is an amber red horn on the tobacco hornworm posterior and a straight horn on the tomato hornworm. There are seven diagonal light stripes on the tobacco hornworm while there are eight curved stripes on the tomato hornworm.

Life history: Overwintering occurs in the soil as dark-brown pupae, nearly 2 inches long. Adults emerge in late spring and deposit spherical green eggs on the undersides of leaves. In 5 days, hatching occurs and larvae molt 4 to 5 times, reaching

full development in 3 to 4 weeks. Pupation occurs in the soil and 2 to 4 weeks later, adults emerge and lay eggs for a second generation. There may be one to four generations per year depending on the latitude.

Damage: Larvae feed voraciously on tomato and pepper foliage.

TOMATO PINWORM, *Keiferia lycopersicella* (Busck)

Plants attacked: Tomatoes

Description: Adults. Gray moths are $\frac{1}{4}$ inch long. *Larva.* Light orange at first, becoming purplish black with maturity and attaining a length of $\frac{1}{4}$ inch.

Life history: The moths, more active at dusk, deposit tiny oval eggs at random over the plant, but mostly on the underside of leaves. Hatching occurs in 1 week. After larvae complete development, pupation may occur in the soil, the folded leaves or in tomato fruit. The entire life cycle may occur in 3 to 6 weeks.

Damage: Infestation of larvae feeding similar to leaf miners causes damage to plants. Later invade stems and fruits. Invaded fruit are useless for canning purposes.

VEGETABLE WEEVIL, *Listroderes costirostris obliquus* (Klug)

Plants attacked: Carrots, turnips and similar crops.

Description: Adult. Grayish snout beetles about $\frac{1}{3}$ inch long with lighter v-shaped marking near hind end of wing covers. *Larva.* Light-green, legless grubs.

Life history: Eggs are laid on plants or in nearby soil and require 2 weeks or more to hatch. Larvae feed on buds, stems and roots of plants. Larvae require 3 to 6 weeks to complete development and pupation is in the soil, from a few days to 2 weeks, depending on temperatures. Only females of this species exist. There is one generation per year.

Salt-marsh caterpillar.



Spotted cucumber beetle adult.

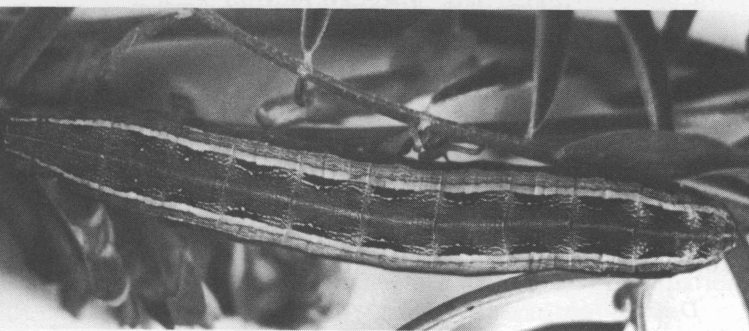


Southern corn rootworm in soil.

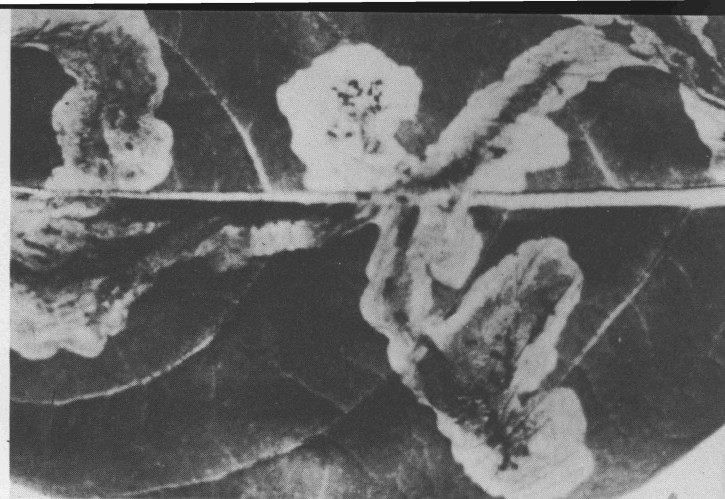




Tomato hornworm.



Yellow-striped armyworm larva.



Leaf miner damage on spinach.

Damage: Both larvae and adults feed on the plants, principally at night. Damage may resemble that of cutworms.

YELLOW-STRIPED ARMYWORM, *Prodenia ornithogalli* (Guenee)

Plants attacked: General feeder on many plants, including vegetable crops.

Description: *Adult.* Moth has a 2-inch wing-spread. Front wings are dark gray to brown with zig-zag lines of light and dark areas. Hind wings are pearly white with dark margins. *Larva.* Full-grown larva is 1½ to 1¾ inches long, with a

INSECTS FEEDING UPON ROOTS OF

CABBAGE MAGGOT, *Hylemya brassicae* (Bouche)

Plants attacked: All crucifers and occasionally turnips, radishes and spinach.

Description: *Adult.* Similar to the housefly but about half the size. *Larva.* Very small, tapered, white maggots.

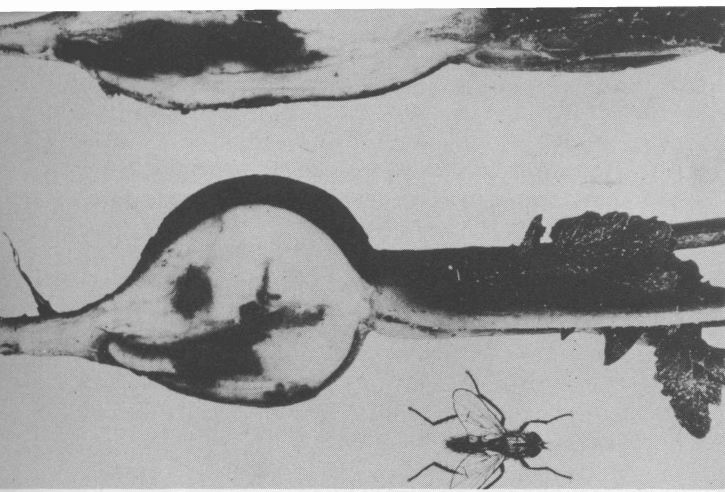
Life history: The small white eggs are laid at the base of young plants and hatch in 3 to 7 days. Larvae tunnel into roots. In 3 to 4 weeks larvae move into the soil where they pupate for 2 to 3 weeks. Some pupae may remain in the soil until the following spring. There may be two to four generations yearly.

Damage: Larvae tunnel in roots until they may become honeycombed, causing plant death. Such crops as turnips and radishes, if not killed, have their market value destroyed. Mixed populations of onion maggots and cabbage maggots have caused severe damage to spinach in the Winter Garden area and the Rio Grande Valley by feeding in the crowns.

FALSE WIREWORMS (Several species)

Several species of false wireworms have been found which attack vegetable crops in Texas. The more important ones are *Blapstinus substri-*

Tomato pinworm damage to leaf.

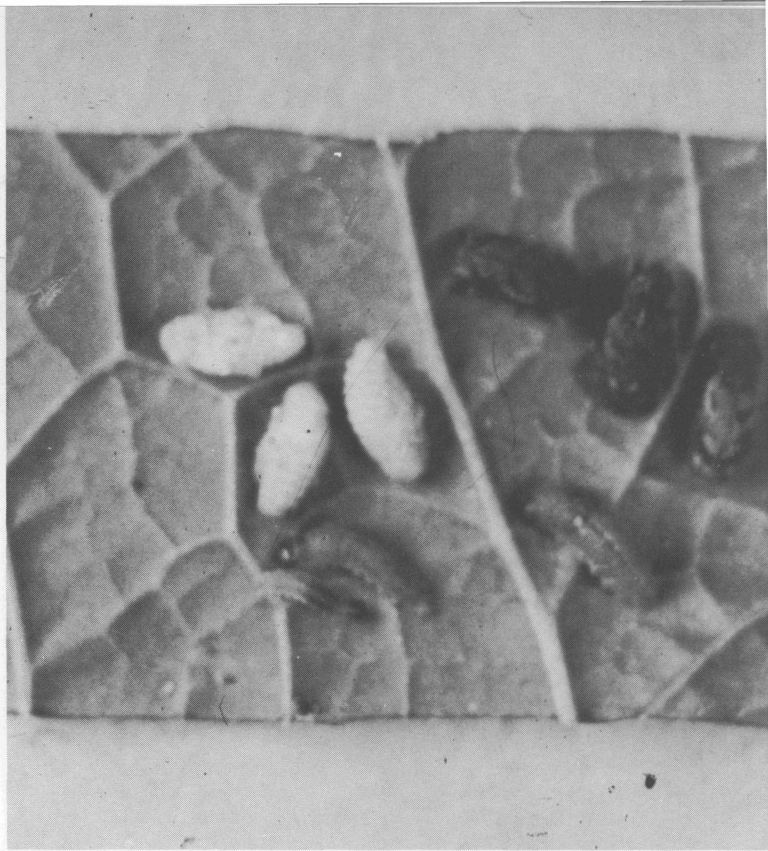


Cabbage maggot damage and adult.

pair of dorsal, triangular, black spots on most segments. There are three lines on the back; an outer, bright orange stripe on each side and a median, yellowish white line.

Life history: The female deposits eggs in masses on foliage of many plants, including trees, or on buildings and covers them with body scales. There are two to four generations yearly. Winter is spent in the pupal stage in the soil.

Damage: Larvae generally are day feeders on foliage of forage plants. They are solitary feeders, but otherwise their habits are similar to armyworms.



Vegetable weevil adults, larvae and pupae.

STEMS OR LEAVES OF PLANTS

tus (Champion), *Eleodes* spp. and *Ulus elongatulus*.

Plants attacked: Carrots, turnips and tomato and pepper seedlings.

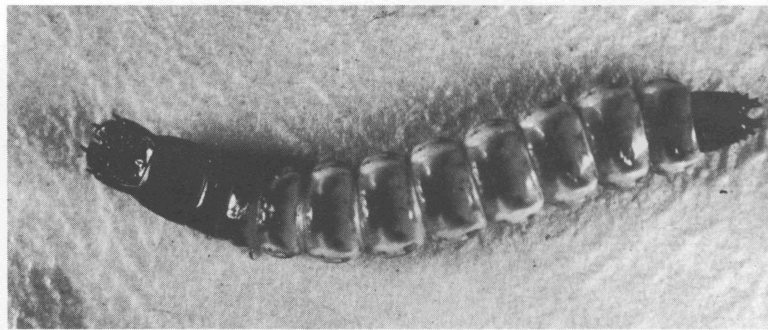
Description: *Adult.* Darkling beetles are black or gray, resemble ground beetles and measure about 1 inch in length. *Larva.* Resembles wireworms but can be distinguished from them by the prominent, thickened antennae and very large front legs. False wireworms are also more active than wireworms.

Life history: The life cycle of different species vary. Some have one and others have two-year life cycles. Eggs are laid in late summer and fall. The larva's most active feeding period is immediately after hatching. Partly grown larvae overwinter, pupate in spring and emerge as adults over several weeks.

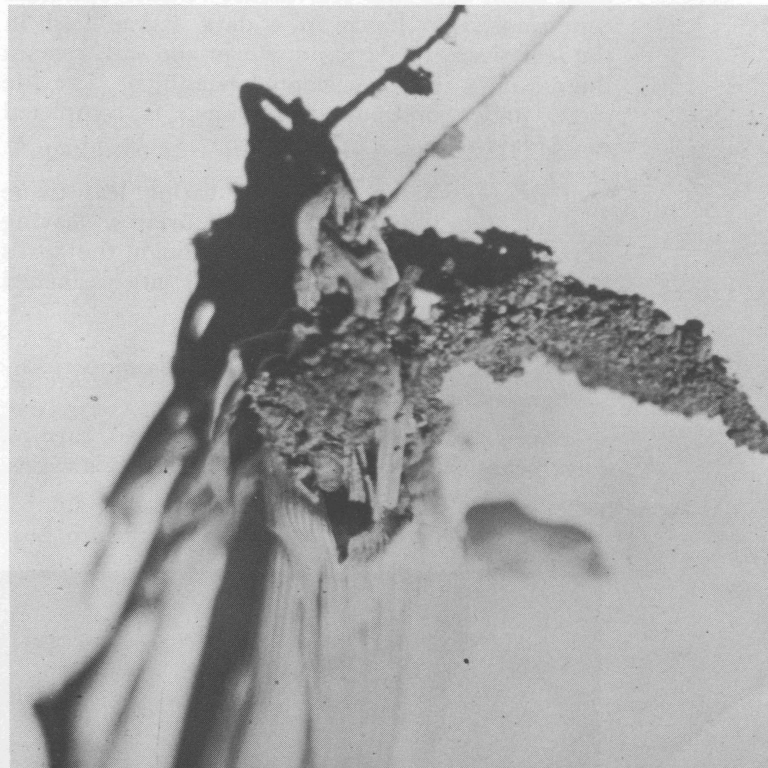
Damage: Damage caused by adult feeding is the destruction of seedling vegetable crops in the Lower Rio Grande Valley. Larvae feed on carrots and turnip roots in the Valley, making them unmarketable.

LEAF MINERS, *Liriomyza munda* (Frick), and others

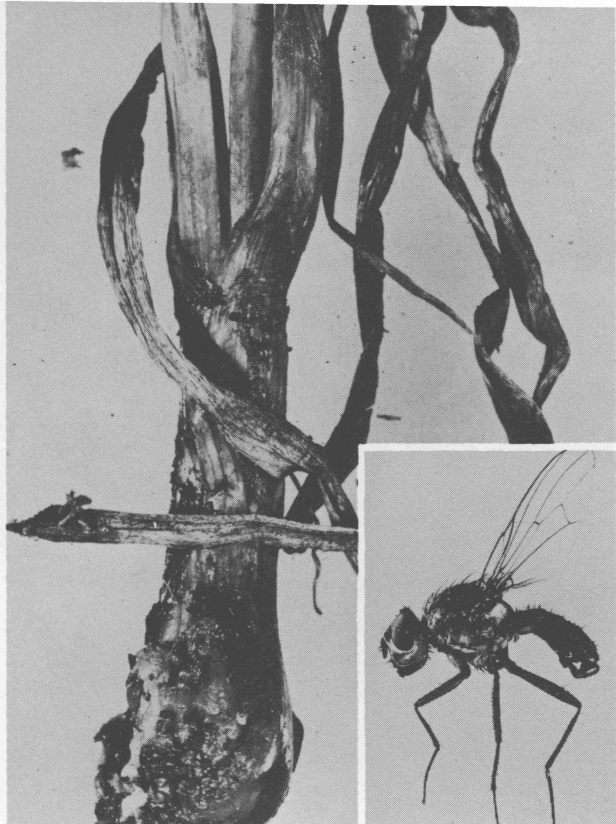
Plants attacked: Peppers, all cucurbit crops, beans, Southern peas, tomatoes, potatoes, eggplant.



False wireworm larva.



Webbing of lesser cornstalk borer on corn plant.



Onion maggot adult and damage.

Description: *Adult.* Small fly is $\frac{1}{8}$ inch long with a yellow and black thorax and a black head. Adults fly quickly for short distances when disturbed. *Larva.* Maggot is $\frac{1}{8}$ inch long, white, legless and wedge-shaped. Pupae are light brown, oval and ringed with ridges.

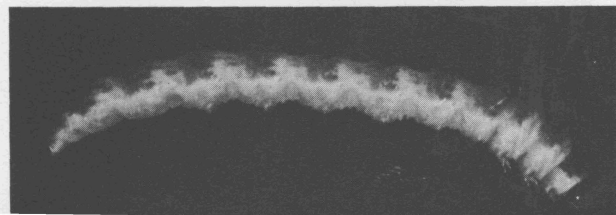
Life history: Ten to 20 generations occur in a year in the Lower Rio Grande Valley. Fewer generations per year occur in Northern Texas where the growing season is shorter. Adults deposit small eggs into leaf tissue. Under optimum conditions, eggs hatch in 4 days, larvae feed in the leaf tissue 14 days, pupate in the soil, remain there 5 days and then emerge as adults. The life cycle, under optimum conditions, is completed in 23 days.

Damage: Maggots live by eating leaf tissue between the upper and lower surfaces, leaving slender, white, tortuous trails through the leaf's interior. Leaves, especially peppers, are weakened greatly.

LESSER CORNSTALK BORER, *Elasmopalpus lignosellus* (Zeller)

Plants attacked: Beans, Southern peas, turnips, corn, peanuts, Johnsongrass and other grass weeds.

Lesser cornstalk borer larva.



Description: *Adult.* Moth is brownish gray with less than 1-inch wing expanse. Female forewings are darker than those of the male. *Larva.* Caterpillars are slender, about $\frac{3}{4}$ inch long, light green with faint stripes and more prominent, transverse brown bands.

Life history: Winter is passed in the soil as larvae or pupae. Adult moths emerge in spring and lay eggs on host plants. Hatching larvae feed first on leaves and then bore into stalks, resulting in damage similar to the Southern cornstalk borer. After feeding about 3 weeks, they leave their burrows and pupate in silken cocoons under debris at the soil level. There are two or more generations yearly. Larvae are active wigglers when disturbed.

Damage: Larvae bore into corn and bean stems at ground level or 1 inch below the soil line and tunnel upwards causing plant death. Injury can be severe in fields that had a previous growth of Johnsongrass or sorghum than fallow fields. Soils moist enough to germinate seed are optimum for adult emergence from pupal cases as compared to muddy wet or dry soils.

ONION MAGGOT, *Hylemya antigua* (Meigen)

Plants attacked: Onions and spinach.

Description: *Adult.* Flies are slender, long legged, grayish, large-winged, bristly-bodied and resemble the house fly except they are only half the size. *Larva.* White maggot up to $\frac{1}{3}$ inch long, resembling house fly maggot.

Life history: Hibernation is in the soil or in the shelter of weeds or crop remnants. Emerging adults appear in spring and lay white eggs in leaf axils and in soil near the plant. Eggs hatch in 2 to 7 days. Larvae then crawl down the plant and feed for 2 to 3 weeks. Pupation occurs in the soil near the plant and adults emerge in 2 to 3 weeks.

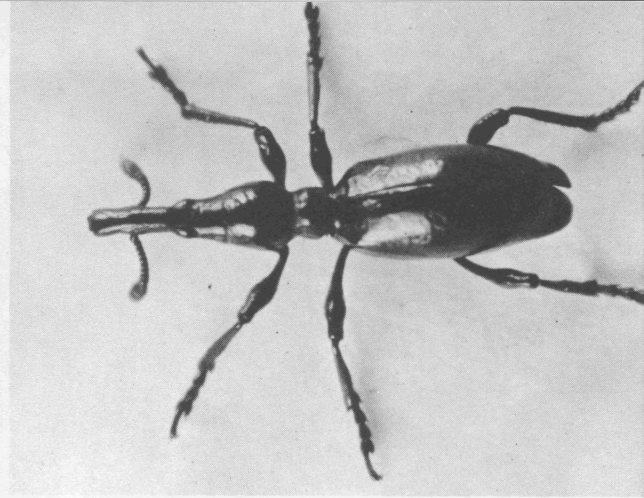
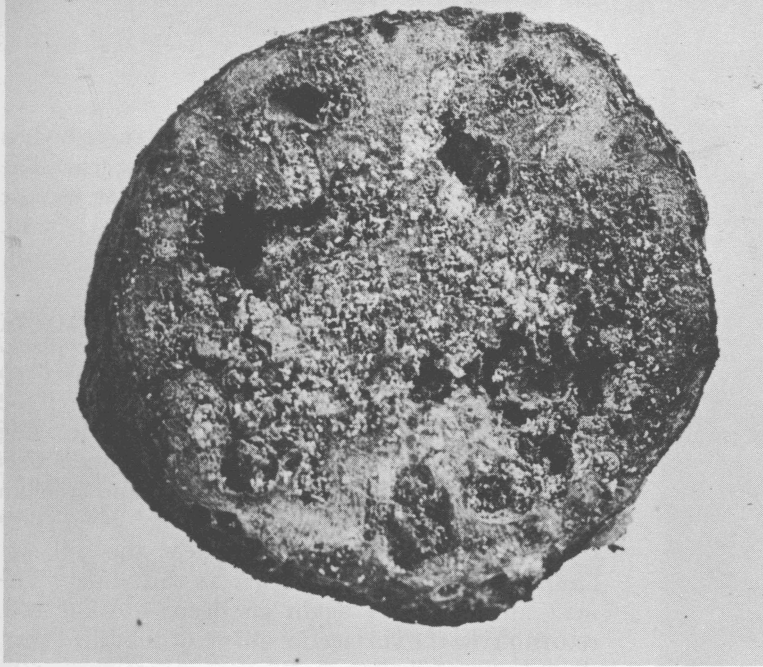
Damage: Maggots burrow into onion bulbs, causing them to turn yellow and die before maturity. This insect also has damaged spinach in the Lower Rio Grande Valley and Winter Garden districts.

SEED CORN MAGGOT, *Hylemya cilicrura* (Rondani)

Plants attacked: Seed of corn, peas and beans are preferred hosts with occasional damage to



Seed corn maggot.



Sweet potato weevil adult and damage.

spinach, turnips, onions, beets, radishes and cabbage.

Description: Adults. Grayish brown fly about 1/5 inch long. *Larva.* When full grown, they are yellowish-white maggots about 1/4 inch long, sharply pointed at the head.

Life history: Larva overwinter as maggots in dark brown, capsule-like puparia about 1/5 inch long. Adults emerge in early spring and lay eggs in the soil where they emerge in temperatures as low as 50 degrees F. Maggots burrow into the seed destroying the germ. Life cycle may be completed in as little as 3 weeks. Most active during cool, moist periods.

Damage: Stands of beans, peas and corn often are damaged severely by the larvae destroying the seed.

SQUASH VINE BORER, *Melitta cucurbitae* (Harris)

Plants attacked: Pumpkins and squashes. A great variation exists in the susceptibility of squash and pumpkin varieties. Hubbard squash is highly susceptible.

Description: Adult. The moth is one of the "clear wings" type because the hind wings lack scales. It has a 1 1/2-inch wing expanse, metallic green-black color and hind wings fringed with black and orange hairs and similar colored markings over much of the abdomen. The moths are day fliers. *Larva.* White, heavy-bodied and over 1 inch long when full grown.

Life history: Insect overwinters in soil as a larva or pupa enclosed in a cocoon. Moths emerge in early summer and lay eggs on plant

stems, usually during April and May in the South, where two generations occur. On hatching, larvae bore into vines and complete development in 4 or more weeks, leave the plant, crawl into the soil, spin a cocoon and transform to pupae.

Damage: Larvae bore into vines. Where larvae are found together, the vine is destroyed.

SWEET POTATO WEEVIL, *Cylas formicarius elegantulus* (Summers)

Plants attacked: Sweet potato, morning glory and other plants of the same family.

Description: Adult. Slender, ant-like weevil about 1/4 inch long with dark blue head, snout and back and bright red prothorax and legs. *Larva.* White, legless grubs with pale brown heads.

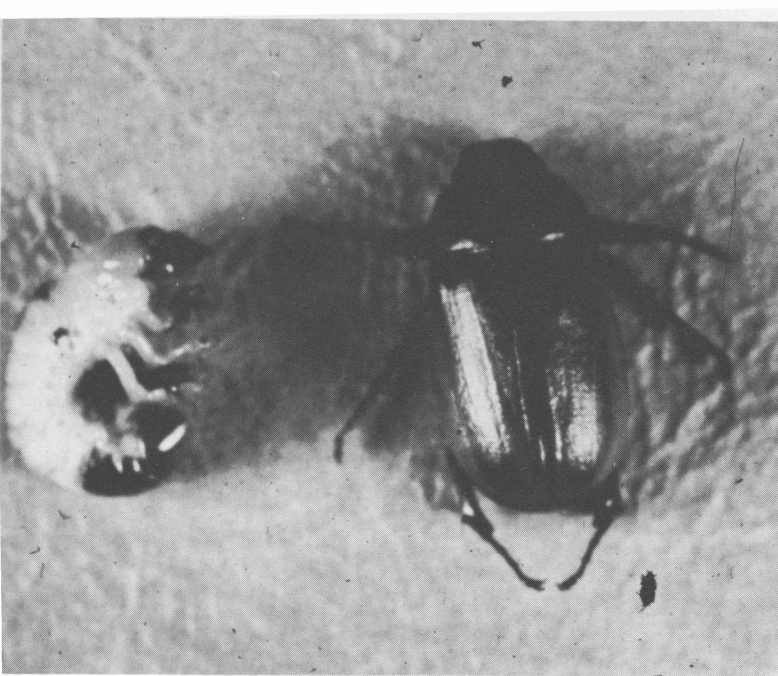
Life history: Eggs are laid in plants near the soil surface where they hatch in about a week. The small grubs burrow into vines and down to the tubers where they feed for 2 to 3 weeks. Pupation occurs in the tuber and after about a week, adults emerge, eat their way out and feed on stems and leaves for a short time before laying eggs. There are up to eight generations yearly and weevils continue to feed and mate in stored potatoes.

Damage: Tubers are rendered unfit for consumption by the larvae burrowing and feeding within.

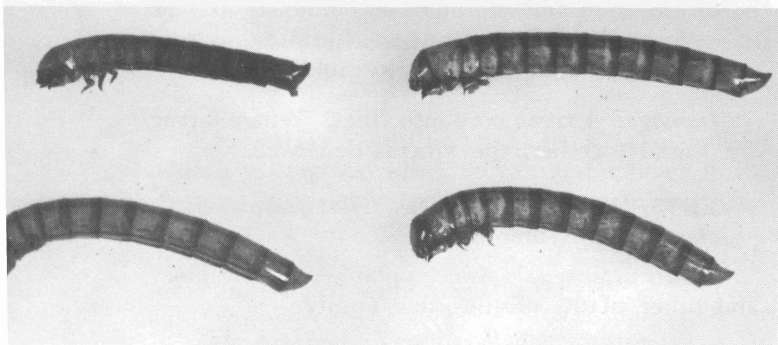
WHITE GRUBS, *Phyllophaga* spp.

Plants attacked: Corn, beans and potato tubers and other root vegetable crops.

Description: Adult. Beetles are from 1/2 to 1 inch long, vary from light to dark brown and



White grub and May beetle.



Wireworm larva.



are robust in form. *Larva.* White, curve-bodied grubs with brown heads and three pair of legs. The hind part of the abdomen appears darker because soil particles inside show through the body wall. Probably 100 species may cause damage.

Life history: The life cycle of the more abundant species extends over 3 years. In late spring, pearly white eggs are deposited 1 to 8 inches deep in the soil. Approximately 3 weeks later, the eggs hatch and larvae feed on roots and decaying matter. In autumn, when cooler temperatures prevail, larvae emigrate downward and remain inactive until the following spring when they return to feed on plant roots near the soil surface. Greatest damage occurs at this time. The next autumn, they again go deep into the soil, returning to the surface in spring of the third year, they feed until June. Then oval earthen cells are made and pupation follows. Adult beetles form in these pupae in a few weeks, remain in the cells throughout the winter and emerge from the soil the following year in May and June then feeding, mating and egg-laying take place. In the Texas latitude, the period from egg to adult seems to be 2 years for most species.

Damage: Most severe damage by grubs occurs on crops which follow grass sod the next year. Grubs feed on the roots of crops attacked and destroy the root system.

WIREWORMS (Several species)

Plants attacked: Corn, small grains, grasses, potatoes and other root crops, vegetables and flowers.

Description: *Adult.* Usually hard-shelled, brownish-gray or nearly black, somewhat elongated, "streamlined," with the body tapering toward each end. *Larva.* Usually hard, dark brown, smooth, wire-like worms, varying from 1/2 to 1 1/2 inches long when grown.

Life history: Young adults remain in the soil until spring. The subsequent egg stage requires a few days to a few weeks to hatch. Larvae spend from 2 to 6 years in the soil feeding on roots of grasses and other plants. Pupation usually is completed in a few weeks.

Damage: Crops may fail to emerge or they may appear thin and patchy. Wireworms feed on seeds and other underground plant parts.

Wireworm damage to Irish potatoes.

SUCKING INSECTS

INSECTS AND MITES THAT SUCK THE JUICES FROM FOLIAGE, FRUITS, STEMS AND ROOTS, CAUSING DISCOLORATION, STUNTING AND OTHER DAMAGE

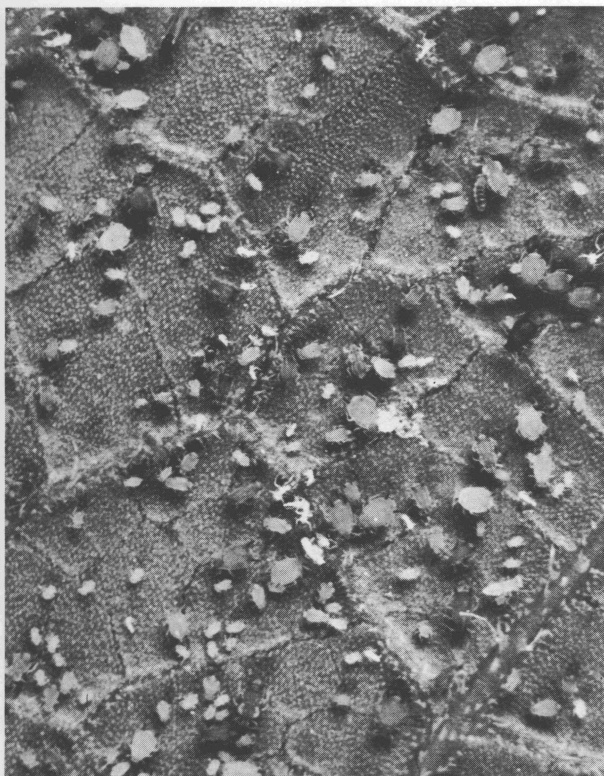
APHIDS

Aphids are small, sluggish, soft-bodied insects often called plant lice. A number of species attack various crops, sucking plant sap, causing stunting, leaf curling and leaving undersirable honeydew deposits. Most species give birth to living young and build up very rapidly.

MELON OR COTTON APHID, *Aphis gossypii* (Glover)

This aphid, usually about 1/16 inch long, attacks most cucurbits, is pale yellow to dark green or dark brown with black leg joints, eyes and cornicles. Aphids build up very rapidly and leave copious quantities of honeydew on leaves. Adults and nymphs suck juices from leaves, sapping the plant energy and causing leaves to curl, become malformed and eventually die. A dark sooty mold grows on the honeydew these aphids excrete. A particularly important aspect of this aphid damage is the spread of plant viruses.

Melon aphids on cantaloupe.



RED LETTUCE APHID, *Microsiphum ambrosias* (Thomas)

This aphid is larger and more slender-bodied than the melon aphid and is dark, rusty red. Infestations build up rapidly and often are unnoticed until damage appears. It is impossible to remove aphids from infested lettuce heads and these heads are not acceptable to shippers.

GREEN PEACH APHID, *Myzus persicae* (Sulzer)

This slender-bodied, bright green aphid attacks a wide variety of crops including melons, peppers and tomatoes.

POPLAR PETIOLE GALL APHID, *Pemphigus populitransversus* (Riley)

Known as the cabbage root aphid in the Lower Rio Grande Valley, this aphid feeds on roots of cabbage, turnips, broccoli and cauliflower. Infestations are not found easily until the dwarfed and misshapen plants are noticed.

Red lettuce aphids.



Cabbage plants damaged by popular petiole gall aphid (cabbage root aphid).



CABBAGE APHID, *Brevicoryne brassicae* (Linnaeus)

A pale green aphid covered with a dusty wax secretion. Infestations usually appear in late winter or early spring crops.

TURNIP APHID, *Rhopalosiphum pseudobrassicae* (Davis)

It resembles the cabbage aphid in appearance and feeds on many of the same crops. Life his-

False cinch bugs.



tory also is similar to the cabbage aphid and from 15 to 45 generations a year may occur.

PEA APHID, *Macrosiphum pisi* (Harris)

This aphid attacks most leguminous crops, sucking sap from leaves, stems, blossoms and pods. This feeding transmits several virus diseases. Adults are large, light to deep green with red eyes and legs. There may be 12 or more generations yearly if host plants are available.

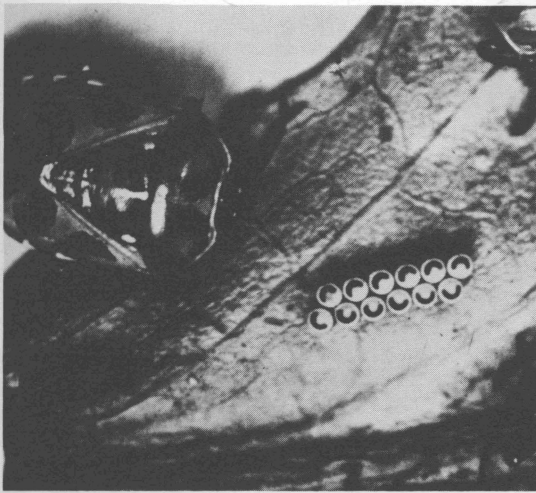
POTATO APHID, *Macrosiphum euphorbiae* (Thomas)

A general feeder, this aphid often concentrates on potatoes and tomatoes. Adults are either winged or wingless, nearly $\frac{1}{8}$ inch long and clear green or pinkish. Aphids suck plant juices, curl leaves in a typical aphid fashion and on tomatoes devitalize blossom clusters, preventing fruit set. Disease transmission is probably of more importance than actual feeding damage.

FALSE CHINCH BUGS, *Nysius* spp. (Schilling)

Plants attacked: Lettuce, beets, cabbage, turnips and other greens as well as cotton and grain sorghum. A number of winter weeds also serve as host plants.

Description: Adult. Small, slender brownish bugs about $\frac{1}{4}$ inch long with grayish brown



Harlequin bug and egg mass.



Harlequin bug damage to cabbage.

wings. *Nymph*. Reddish brown and slightly smaller than adults.

Life history: These insects overwinter as nymphs and adults, moving in large numbers to young plants where they congregate to feed. Eggs are laid in the soil where they hatch in about 4 days. Nymphs feed for about 4 weeks before becoming adults.

Damage: Usually, these bugs congregate behind the leaf or around the plant base, sucking plant sap. Plants often wilt and dry out until death occurs.

GARDEN FLEAHOPPER, *Halticus bracteatus*
(Say)

Plants attacked: Southern peas, many other garden crops and weeds.

Description: *Adult*. Males are winged and females are short-winged and both are nearly black. Maximum length of winged forms is about 1/10 inch. Large hind legs enable them to hop actively. *Nymph*. Look like adults; however, they are smaller, greenish and do not have wings.

Life history: Fleahoppers hibernate as adults and five generations usually occur in southern states.

Damage: They suck sap, making small discolored areas on the foliage. These areas often become numerous enough to coalesce and cause the death of the leaf, injuring the plant seriously.

HARLEQUIN BUG, *Murgantia histrionica*
(Hahn)

Plants attacked: Cabbage, cauliflower, collards, mustards, turnips, brussel sprouts, radishes and many others.

Description: *Adult*. Red and black spotted, shield-shaped bugs about 3/8 inch long. *Nymph*. Yellowish to red and black spotted, oval in outline and without adult wings.

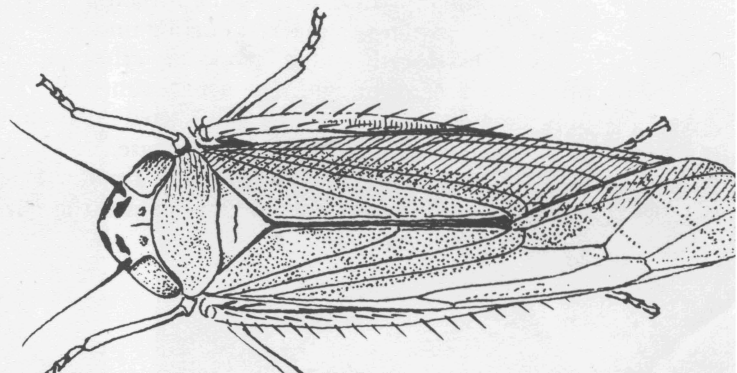
Life history: Insects feed and mate throughout the winter in warmer areas and adults hibernate in crop residues and other debris in colder areas. Eggs are laid on end in double rows on leaf undersides and look like white kegs with two black hoops, with hatching occurring in 4 to 30 days. Nymphs feed for 1 to 4 weeks before becoming adults. Three or more generations may occur yearly.

Damage: Insects congregate in large numbers on host plants, sucking juices until the plants wilt and often die.

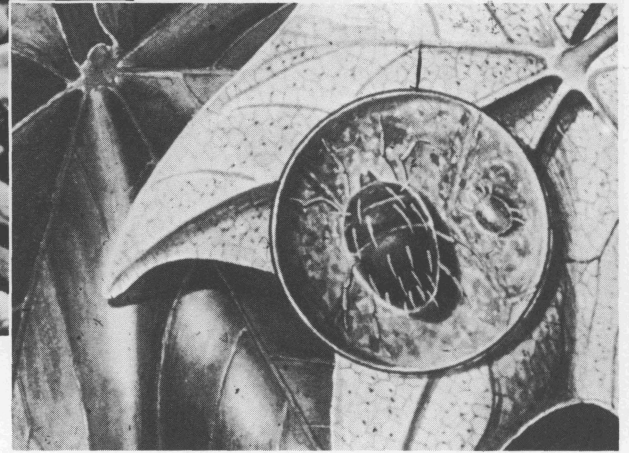
LEAFHOPPERS

Several species of leafhoppers attack vegetable crops in Texas and some more important species are the southern garden leafhopper, *Empoasca solana* (Delong), known as the bean leafhopper in the Lower Rio Grande Valley; the six-spotted leafhopper, *Macrostales fascifrons* (Stal); the potato leafhopper, *E. fabae* (Harris); *E. abrupta* (Delong) and the beet leafhopper, *Circulifer tenellus* (Baker).

Six spotted leafhopper.



Spider mite and damage to spinach.



Plants attacked: Hosts of the *Empoasca* spp. are lettuce, eggplant and rubarb. Hosts of the six-spotted leafhopper include lettuce, carrots, parsley and celery. Hosts of the beet leafhopper are beets, tomatoes, snap beans and certain weeds.

Description: *Adult.* *Empoasca* spp. Adults and beet leafhoppers are green to pale green, somewhat wedge-shaped, $\frac{1}{8}$ to $\frac{1}{4}$ inch in length. The six-spotted leafhopper adult is brownish gray and has 6 spots on the face above the antennae. *Nymph.* Green with wing buds instead of wings; smaller than adults, but the same shape.

Life history: Females deposit slender, white eggs into stems and larger veins of plant leaves. Hatching occurs in 6 to 9 days during summer; nymphs moult four times before becoming adults. Shortly before adults appear, mating takes place followed by oviposition. Several generations overlap each season. Adults are very active, jumping or flying when disturbed. Both adults and nymphs can run backwards or sideways as rapidly as they move forward. In general, the same history applies to the six-spotted leafhopper and the beet leafhopper.

Damage: Leafhopper feeding causes curling, stunting and dwarfing, accompanied by a yellowing, browning or blighting of foliage. This is caused by injection of saliva into the phloem during feeding, resulting in a physiological disturbance producing disease-like manifestations. On beans and eggplant, a marked curling-under of leaf edges is produced and a crinkling effect of the upper surface, along with the usual stunting. The only damage caused by the six-spotted leafhopper is the transmission of the virus disease, Aster yellows, occasionally evident in South Texas. Feeding of beet leafhoppers sometimes causes the curly

top disease, which stunts or kills plants. Leaf veins become warty, veinlets transparent, petioles kinked and leaves roll upward at the edges, becoming brittle and shriveled.

POTATO PSYLLID, *Paratrioza cockerelli* (Sulc)

Plants attacked: Both potatoes and tomatoes are attacked by this insect which develops in weeds in the nightshade family.

Description: *Adult.* Resembles a tiny cicada about $\frac{1}{10}$ inch long with membranous wings held roof-like over the body. *Nymph.* Yellowish-green and flattened, giving a scale-like appearance.

Life history: Adult psyllids pass the winter in Texas and New Mexico. Tiny, light-yellow eggs are suspended from the underside of leaves on short stalks and hatch in 3 to 8 days. In 2 to 3 weeks the five nymphal instars have developed.

Damage: Psyllids, by their feeding action, cause a condition known as psyllid yellows. Affected plants first take on a purplish cast which progresses to a pale color with twisted underdeveloped leaves and stunted plants.

SPIDER MITES

Two-spotted Mite, *Tetranychus telarius* (Linnaeus), Tropical Mite, *Tetranychus marianae* (Linnaeus) and *Oligonychus* sp.

Plants attacked: The two-spotted mite occasionally attacks several vegetable crops including tomatoes, eggplants, beans and corn. The tropical mite attacks tomatoes and eggplants prin-

cipally. *Oligonychus stickneyi*, which has no common name, may damage sweet corn seriously.

Description: The two-spotted mite has two forms, a green form with a dark spot on each side and the more common carmine form. The tropical mite is red as an adult. Nymphs of both species are yellowish. *Oligonychus stickneyi* is yellowish in all stages. All these mites are about 1/60 inch long.

Life history: Adult mites lay eggs on leaf underside and spin webs beneath which eggs hatch and mites feed. Spider mites reproduce rapidly during hot, dry weather.

Damage: Mites pierce leaf tissues and suck sap in larval, nymphal and adult stages. Plants attacked begin to lose color, fading from green to yellow and eventually turn reddish. Heavy infestations can kill peanuts.

TOMATO RUSSET MITE, *Vasates lycopersici* (Masse)

Plants attacked: Tomatoes and occasionally other solanaceous crops.

Description: Mites are microscopic, orange-red and wedge-shaped.

Life history: Reproduction may be continuous under warm conditions, but slows down in cool weather. Complete development from egg to adult requires about a week.

Damage: Leaves and stems begin to turn bronze and the whole plant may turn brown and die if mites are not controlled.

Adult squash bug and egg mass.



Left, normal potato plant; right, psyllid damaged plant.

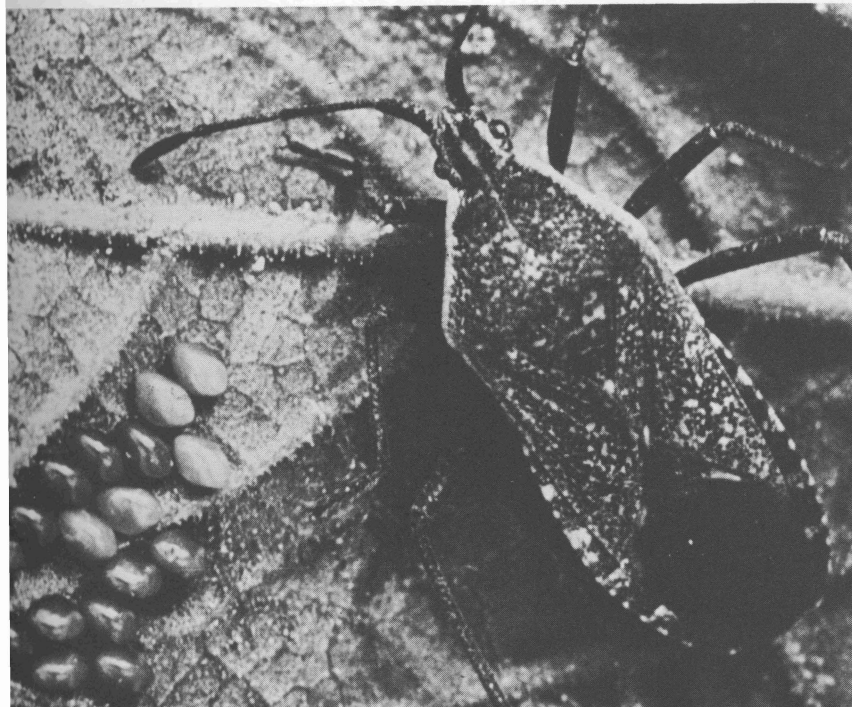
SQUASH BUG, *Anasa tristis* (De Geer)

Plants attacked: All cucurbits with preference for squash.

Description: *Adult.* Brownish gray to dark gray bugs about 5/8 inch long. *Nymph.* When first hatched, they have a green abdomen with crimson head, thorax, legs and antennae, later becoming grayish-white with nearly black legs and antennae.

Life history: Adults overwinter unmated in any type of shelter. They appear in spring as plants begin to vine and mate. Yellowish to bronze-brown eggs are laid in clusters on the underside of leaves, usually in vine angles. Eggs hatch in 1 to 2 weeks and nymphs feed in groups on the

Squash bug damage to pumpkin.



stems of the plant for 6 to 8 weeks before transforming to adults.

Damage: Leaves attacked by the squash bug wilt rapidly and soon become blackened, crisp and dead. Attacked plant stems often are enlarged but later wither and die.

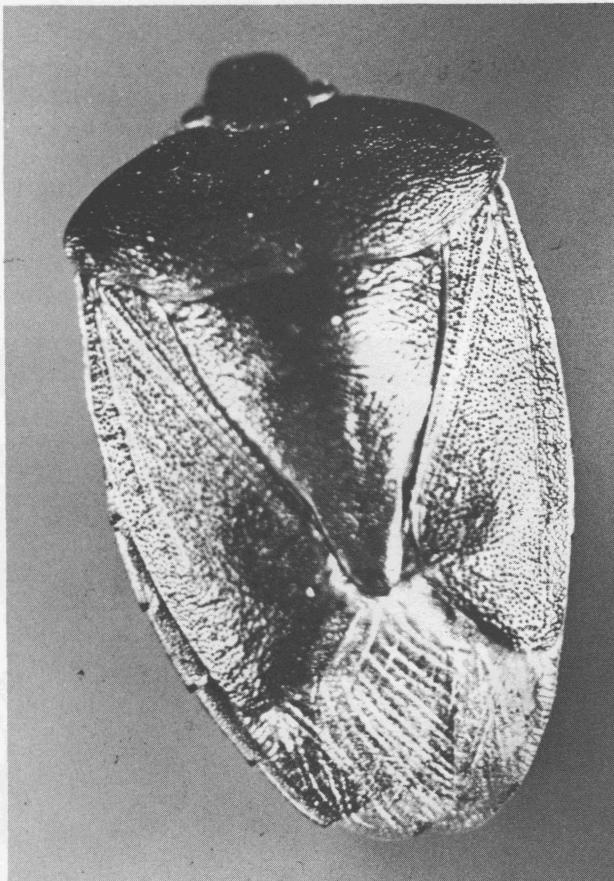
STINK BUGS

Several species of stink bugs attack vegetable crops in Texas. Some important species are the southern green stink bugs, *Nezara viridula* (Linnaeus); Conchuela, *Chlorochroa ligata* (Say); rice stink bug, *Oebalus pugnax* (Fabr.), and Say stink bug, *Chlorochroa sayi* Stal.

Plants attacked: Seed beets, okra, squash, beans, peas, corn, cowpeas, tomatoes and many weeds.

Description: Adult. Approximately 1/2 inch long and each has a triangular-shaped scutellum that extends from just back of the "shoulders" narrowing posteriorly to a point. Front wings are thickened and stiff about the base, but the distal half is much thinner and membranous. These membranous wing areas overlap on the back when

Southern green stink bug.



Rice stink bug.

not in use. Crushed bugs have an odor fitting their names. **Nymph.** This stage is without wing covers and smaller but otherwise similar to adults.

Life history: Life history and habits of each of the stink bugs are similar. Generally, barrel-shaped eggs are deposited in clusters usually on the underside of foliage. Eggs often are beautifully colored and ornamental. Development from egg to adult occurs in 4 to 6 weeks. From one to three, or perhaps four generations may occur annually. They overwinter as adults in places affording protection from cold weather.

Damage: Damage is caused by nymphs and adults sucking sap primarily from pods, buds, blossoms and seeds. Removing the liquid contents of developing seeds causes them to become flattened and shriveled. If the pods are attacked at an early stage of development, "catfacing" or pitted holes will occur on bean pods and squash fruit.

WESTERN FLOWER THRIPS, *Frankliniella occidentalis* (Pergande)

ONION THRIPS, *Thrips tabaci* (Lindeman)

Plants attacked: General feeders, vegetables, flowers and field crops.

Description: These are slender, spindle-shaped, active insects varying from pale yellow to yellowish-brown. Adults average about 1/25 inch long. Four slender wings are present on females, fringed with long hairs on back margins. Males are wing-

less. Larvae resemble adults, but have no wings and are smaller.

Life history: The minute eggs are inserted into leaves or stems. These hatch in 2 to 10 days. The larval stage lasts from 5 to 30 days. Adult females can reproduce regularly without mating with the rarely found males. All stages can be found during warmer months but during colder months only adults and larvae can be found. It is probable that five to eight generations occur per year, but more may occur in the warmer parts of the State.

Damage: Thrips puncture plants, rasp the surface and then suck the juice. This causes the formation of whitish blotches that first appear as dashes. Severely attacked plants develop a gray or silver appearance and may become distorted. Damage may be found first in the leaf sheaths and stem or on the undersides of a bent leaf where the insects always are most abundant.

SUCKFLY, *Cyrtopeltis notatus* (Distant)

Plants attacked: Tomatoes, tobacco and horse-nettle.

Description: Adult. True bug of the family Miridae. It is greenish-black, slender with long legs and antennae. It is about $\frac{1}{8}$ inch long by $\frac{1}{32}$ inch broad.

Nymph. Light green, developing black wing pads as they reach maturity. Both adults and nymphs stand very tall and move forward in spurts.

Life history: The tomato suckfly overwinters as an adult probably around old tomato fields. As temperatures become warmer and tomato plants are available, adults move into plantings and lay eggs in growing leaves. The life cycle requires about 2 weeks. Several generations per year may occur.

Damage: Adults and nymphs of the insect suck plant juice from the leaves, thereby reducing the plant's ability to maintain maximum vigor. The leaves will exhibit chlorosis and are covered with specks of excrement. Flowers are often blasted from feeding of this insect.

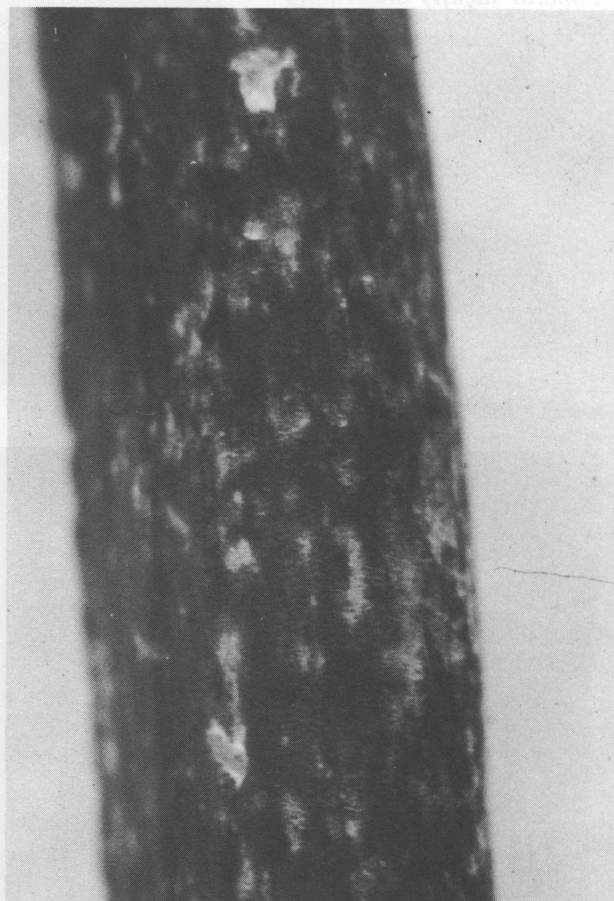
WHITEFLIES, *Bemisia tabaci* (Gennadius) and *Trialeurodes vaporariorum* (Westwood)

Plants attacked: Tomato, potato, eggplant, pepper and sweet potato.

Description: Adult. About $\frac{1}{16}$ inch in length, has four wings which, along with the dorsal



Enlarged drawing of thrips.



Thrips damage on onion plants.

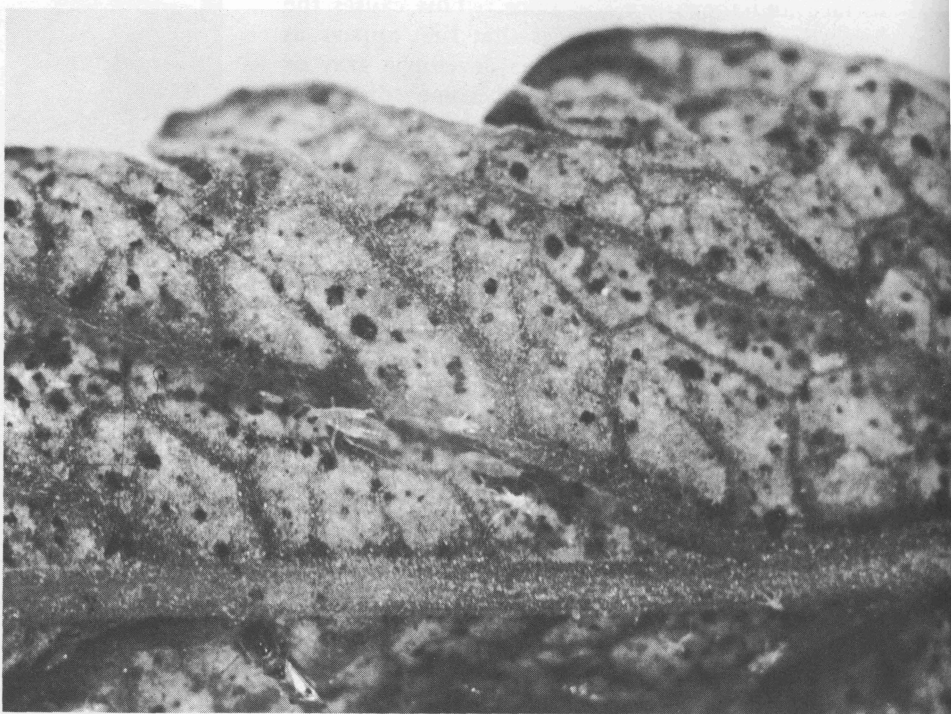
part of the body, are covered with white waxy powder. *Nymph*. Light green, oval, flattened and about the size of a pin head. They are attached to the leaf surface until mature, with the last instar more elevated and slightly segmented. Their bodies are covered with radiating, long filamentous threads, resembling young soft-scale insects.

Life history: Overlapping generations occur in the Lower Rio Grande Valley during spring, summer and fall. Adults emerge, mate and begin

depositing elongated, yellow eggs, attaching them to the host plant by a short stalk. Before hatching, the eggs darken. Nymphal period is one month.

Damage: Both nymphs and adults feed by sucking plant juices. Heavy feeding gives plants a mottled appearance or causes them to turn yellow and die. The sticky honeydew excreted by the insect often glazes the lower leaves and permits the development of black sooty mold on plants, thus detracting from the plants' beauty.

Tomato suckfly on tomato leaf.



Whiteflies and sooty mold leaf.



THE AUTHORS

WELDON H. NEWTON, Associate Extension entomologist, College Station

JAMES A. DEER, Area Extension entomologist, Weslaco

PHILIP J. HAMMAN, Assistant Extension entomologist, College Station

DAN A. WOLFENBARGER, Associate entomologist, Texas Agricultural Experiment Station, Weslaco

JAMES A. HARDING, Assistant entomologist, Texas Agricultural Experiment Station, Lubbock

MICHAEL F. SCHUSTER, Assistant entomologist, Texas Agricultural Experiment Station, Weslaco

TEXAS A&M UNIVERSITY



Ready to serve YOU...

are your COUNTY EXTENSION AGENTS. They represent both the U. S. Department of Agriculture and Texas A&M University in your county. These agents have ideas and materials that are helpful to everyone, regardless of whether you live on the farm or ranch or in a town or city.

Extension agents have information on a wide variety of subjects. For example, you can learn from them how to farm and ranch more efficiently achieve more satisfying family living discover how much we *all* depend on agriculture.

This publication is one of many prepared by the Texas Agricultural Extension Service of Texas A&M University to present up-to-date, authoritative information, based on the results of research. Such publications are available from your local agents whose offices usually are in the county courthouse or agricultural building.

Give your agents a try. They welcome your visits, calls or letters.

