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FRUITS

Pineapple

Date-palm

Banana

Papaw

Mango

Citrus

Pineapple

(*Ananas sativus* Schult.)

Most important pest: 384

Development of young plants impaired. Growth checked. Presence of knots or swellings on roots. root

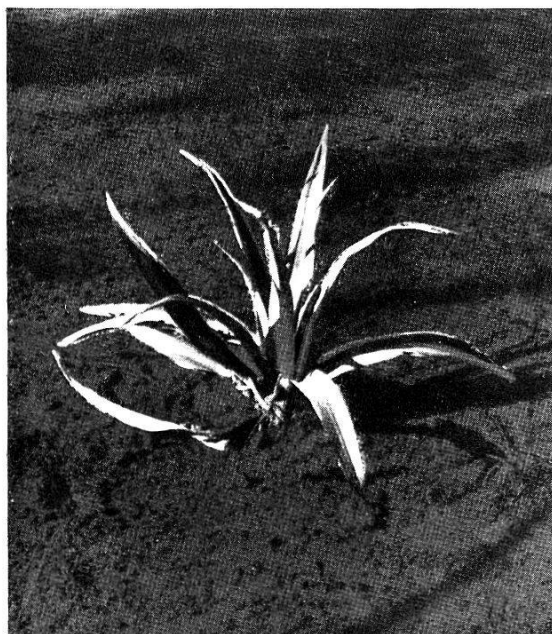
Meloidogyne sp.
Root knot nematode.

NEMATODA

381

The root knots harbour pear-shaped female endoparasitic nematodes (see page 37).

Distribution: widespread



**Reluctant growth of young plants.
Leaves slightly wrinkled and misshapen.
Roots injured.**

Radopholus similis Cobb.
Burrowing nematode.

NEMATODA

382

2, 353, 403, 404
625, 731, 746

Endoparasitic nematode, about 1 mm long, hiding in the roots (see page 38).

Distribution: widespread

rootstock

383



Plants turning yellow and withering. Earth galleries at the plant base. Usually only plants in unsuitable soil or climatic conditions exposed to injury.

Rhinotermes intermedius Br.

ISOPTERA; *Rhinotermitidae*

Light brown, dark-headed termites which build earth galleries and live in large underground nests. The workers are about 8 mm long.

Distribution: Australia

384

651



Damage showing itself in several ways.
1. Plants stunted, fruit formation reduced.
2. Leaves blotchy, dwarfed, often misshapen.
3. Only partial damage.

Dysmicoccus brevipes Ckll.
Pineapple mealybug.

HOMOPTERA; *Pseudococcidae*

The adult female is soft-bodied, about 3 mm long, with a white waxy covering and waxy filaments on the sides of the body. The female lays numerous eggs in loose clusters, from which the larvae emerge after one week and move about in search of succulent plant parts. After 3 days they settle down. The nymphs moult 4-5 times within 4 weeks. Numerous generations. The mealybugs are visited by ants; they transmit pineapple wilt disease.

Distribution: Africa, India, Indonesia, the West Indies, Central and South America, and other regions

Leaf base with silvery blotches. Leaf development of young plants often stopped.

leaves

Holopothrips ananasi Da Costa Lima.

THYSANOPTERA; *Tubulifera*

385

Small, brown thrips, about 1.5 mm long, with large, conspicuous eyes.

Distribution: South America

Plant growth stunted, plants partially deformed and chlorotic. Fruit formation reduced.

Planococcus citri Risso
Citrus mealybug.

HOMOPTERA; *Pseudococcidae*

386

100, 349, 423
530, 692, 779
873

see page 288 (Citrus)

Distribution: widespread

Plant development checked. Fruits dwarfed and fibrous. Leaves and fruits beset with small scales.

Diaspis bromeliae Kern.
Pineapple scale.

HOMOPTERA; *Diaspididae*

387



Yellowish-white to greyish scale insects, round and flat, 2.5 mm in diameter.

Distribution: practically wherever pineapple is grown

fruits



Fruit stalks broken; zone of rupture traversed by mines which harbour white, footless larvae. Fruits also mined, thus unfit for consumption.

Metamasius ritchiei Bs.

COLEOPTERA; *Curculionidae*

388

Robust black weevil, about 15 mm long. The female lays its eggs singly in the fruit stalk where the larvae hatch after 8-10 days and start tunnelling in the fruit stalk or in the fruit itself. The larval development requires 8-10 weeks. Pupation takes place inside the feeding galleries. Period of pupal stages: 3-4 weeks.

Distribution: the West Indies

389



Fruits with external feeding marks and gummosis. Fruit stalks gnawed to such extent that they may break under the weight of fruits.

Cholus sp.
Granada borer.

COLEOPTERA;
Curculionidae

Black weevil with a long beak, the elytra crossed by three irregular transverse bands. The females insert their eggs in the flower stalks. The larvae tunnel into the fruits or stalks. The adults also feed externally on the fruits.

Distribution: the West Indies



Fruits with soft, rotting patches where white maggots are found.

fruits

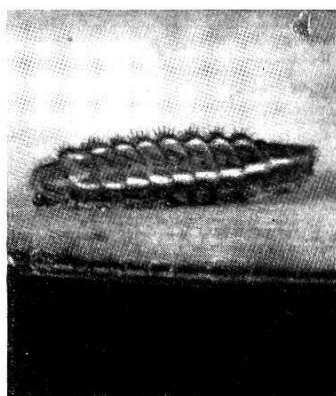
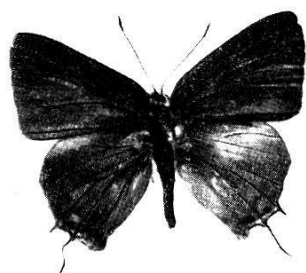
Atherigona sp.

DIPTERA; *Anthomyiidae*

390

Small fly, about 3 mm long. Its thorax is grey, the abdomen yellow, dotted with black, and the eyes are large. The eggs are placed into small or larger scars on the fruits (secondary damage!). The white maggots are footless, 3-4 mm long when full grown. Several generations each season.

Distribution: species of this genus: Africa, India, South America, the West Indies.



Fruits with signs of gummosis and round bore-holes. Rotting patches caused by fungus or bacterial infection.

Thecla basilides
Geyer

LEPIDOPTERA;
Lycanidae

391

Moth (female) with dark brown fore- and hindwings, expanding to 25-30 mm, the latter with a delicate prolongation with a dark orange spot at its base. The under-side of the wings is beige, marked with red dots. The caterpillars are strongly convex above and flat underneath, clothed with short fine hairs. Their head is strikingly small, retractable into the first segments. Total development period: 4-5 weeks. The adults are on the wing in August/September. Several generations.

Distribution: São Paulo

fruits **Fruits with bore-holes, signs of gummosis and large rotting patches.
Only ripe or half ripe fruits are attacked.**

Tmolus echion L.
Pineapple caterpillar.

LEPIDOPTERA; *Lycaenidae*

392

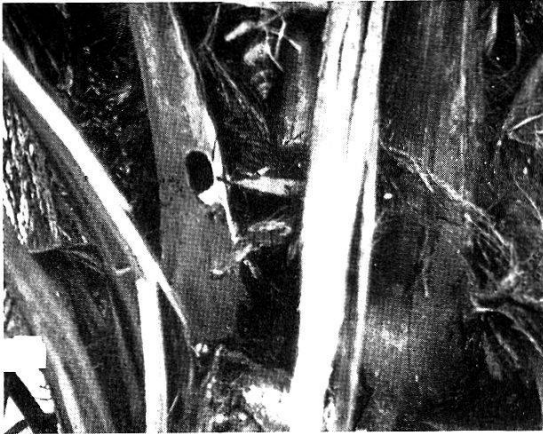
Moth (female) with plain brown fore- and hindwings. The wings of the males are iridescent blue, their underside creamy-white with red dots. The hindwing is furnished with a delicate prolongation. The wings expand to 20-25 mm (see No. 391). The eggs are deposited singly on the fruits or buds. The caterpillars are strongly convex above and flat underneath, clothed with short fine hairs. Their head is strikingly small, retractable into the first segments. Total development period: 4-5 weeks. Several generations.

Distribution: South America, the West Indies, Hawaii

Date-palm

(*Phoenix dactylifera* L.)

Most important pests: 394, 395, 396, 397, 399, 400



Some fronds die. Fruits ripen prematurely and shrivel. Bore-holes at the base of the crown.

Rhynchophorus phoenicis F.
Palm weevil.

COLEOPTERA; *Curculionidae*

leaves

393

see page 307 (Coconut palm)
= *Rhynchophorus ferrugineus* Ol.

Distribution: Africa



Young leaves covered on either side with viscous honeydew. Subsequent infestation with sooty mould.

Ommatissus binotatus Fieb.

Dubas.

HOMOPTERA;
Fulgoridae

394

Reddish-yellow to light brown froghopper, 3 mm long. The upper side of the head and the pronotum have pale, slightly projecting longitudinal ledges. The wings are distinctly veined. The larvae are light brown, striped with dark over the back, and bear a tuft of long hairs at the posterior end. The eggs are inserted in the leaves along the midrib on the underside, where the larvae hatch in April. They secrete small droplets of honeydew.

Distribution: Irak (Basrah), Egypt, Libyan Desert

leaves

395



Leaves covered with white fluffy material, turning yellow and withering. Growth impaired. Fruits often attacked also, underdeveloped and falling off. Young palms particularly liable to injury.

*Parlatoria
blanchardii* Targ.
Date palm scale.

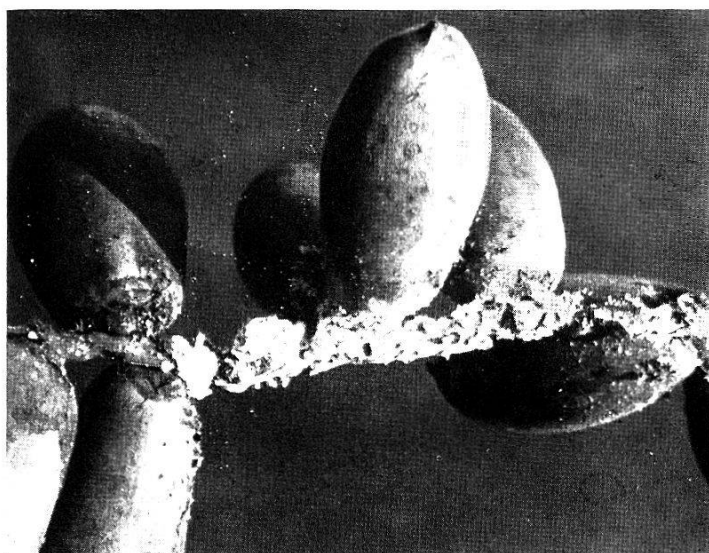
HOMOPTERA;
Diaspididae

Small, white scale insects, about 1.5 mm long. The scales are dark brown, oval and only slightly convex. The pest usually occurs in dense populations on the leaves. Several generations a year.

Distribution: Africa

fruits

396



Fruits dwarfed, the base stained dark and covered with sooty mould. Premature ripening and falling off.

Pseudococcus sp.

HOMOPTERA;
Pseudococcidae

Small, oval, yellowish-red mealybug, about 2 mm long, its body covered with white waxy substance. The pest attacks the fruit stems. Several generations.

Distribution: East Africa



Fruits reddish, shrivelled and dwarfed, with a small bore-hole top and bottom. Inside hollowed out and filled with excrement.

fruits

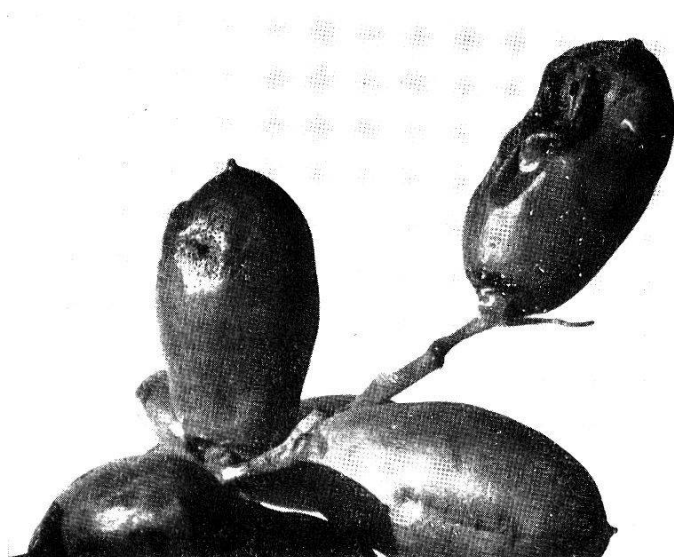
*Batrachedra
amydraula* Meyr.
Hemera.

LEPIDOPTERA;
Momphidae

397

Small, frail moth with a wing span of 10-12 mm. The forewings are beige to brownish, decorated with a faint, pale, longitudinal band. When the moth is at rest a pale lateral line is visible. The female deposits its eggs singly on fruit stalks or on young fruits, from whence the caterpillars penetrate into the fruits while still in the round stage and injure the soft stone. One caterpillar is capable of damaging several fruits. Full grown they are about 10 mm long. They usually pupate on the palm in small crevices of the trunk or in other hiding places.

Distribution: Irak



Fruits mottled and shrivelled. Small, round bore-holes, inside which a white to creamy-white caterpillar is found. Pulp of fruits heavily mined, the mines filled with dark excrement.

Myelois decolor Zell.

LEPIDOPTERA;
Pyralididae

398

Moth with beige to pale ochreous forewings; darker forms may occur also which have greyish-brown forewings. The hindwings are whitish-grey; they expand to about 25 mm. The eggs are placed on ripening or mature dates, several eggs on each fruit. The caterpillars are whitish to creamy-white, with scattered hairs and a dark thoracic shield. Full grown they are about 15 mm long. They feed on pulp, destroying the fruits, and subsequently pupate inside the fruits. Several, usually four generations each season. Flight periods: 1 = May/June; 2 = July/August; 3 = September/October; 4 = November.

Distribution: North Africa, Puerto Rico

fruits

Fruits dark and mottled, harbouring small, white to yellowish caterpillars. Fruits with tunnel openings, covered with webbing.

Ephesia cautella Walk.

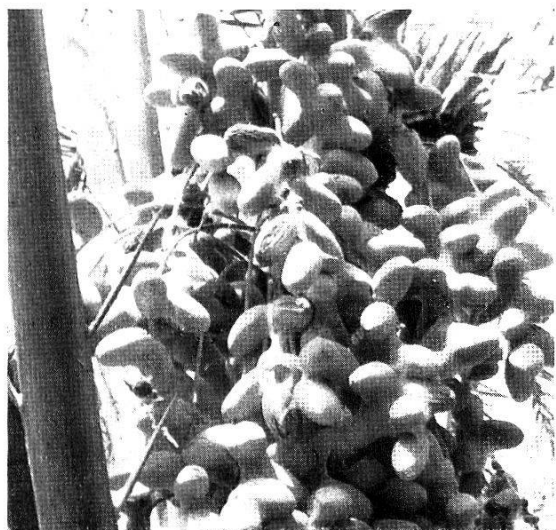
Fig moth.

LEPIDOPTERA; *Pyralididae*

399

Moth with reddish-brown forewings and pale hindwings, the latter edged with brown. They expand to 20 mm. The eggs are deposited on unripe fruits, into which the creamy-white caterpillars penetrate, feeding on pulp. Several generations.

Distribution: widespread



Flower stalks dwarfed and distorted. Fruits marked with small, red, conjoining spots and covered with webbing. Fruits shrivelled when heavily attacked.

Paratetranychus afrasiaticus
McGregor.

ACARINA; *Trombidiformes*

400

Minute, pale yellow mites, 0.3-0.4 mm long, resembling *P. simplex*, except for the shape of the male's legs and genital organs.

Distribution: North Africa, Irak

Inflorescences stunted, misshapen and bearing necrotic patches. Fruits with small, coalescent red spots and spun into a tent of webbing. Development disturbed.

Paratetranychus simplex Bks.

401

ACARINA; *Trombidiformes*

Minute, pale yellow mites, 0.3—0.4 mm long, which emerge during the dry season. Several generations.

Distribution: Africa, Southern parts of U.S.A.

Banana

(*Musa sapientum* L.)

Most important pests: 405, 407, 408, 409, 420

Growth checked. Leaves dwarfed. Fruit yield reduced. Signs of wilting, especially among young plants. Roots and rhizomes with distinct lesions and galls. Partly heavy rot infestation.

root

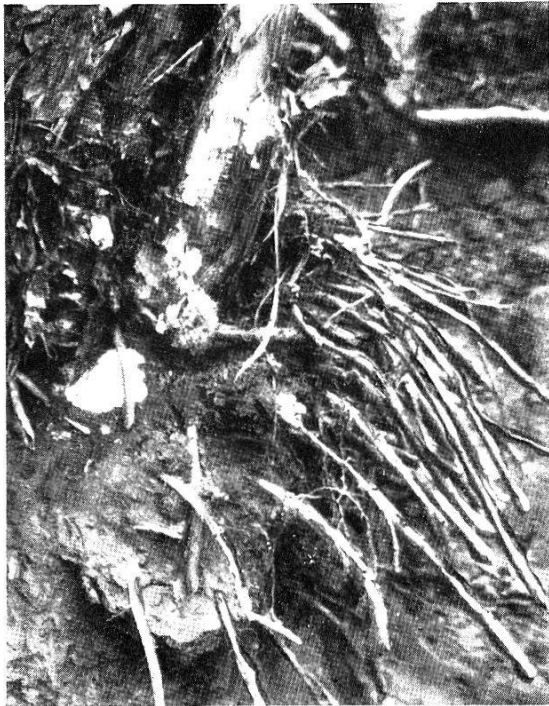
Meloidogyne sp.
Root knot nematode.

NEMATODA

402

The minute worms penetrate into the roots where their sucking causes gall formation. While the males remain filiform, the females grow fatter until they are almost round or pear-shaped. The conspicuous root galls harbour these latter (see page 37). In warm regions 8-10 generations may occur each year.

Distribution: wherever bananas are grown



Same symptoms as for *Pratylenchus coffeae*.

Radopholus similis Cobb.
Burrowing nematode.

NEMATODA

403

2, 353, 382, 4
625, 731, 746

Endoparasitic worm, 0.5-0.7 mm long, living inside the roots (see page 38).

Distribution: widespread throughout the Tropics and Subtropics

root **Growth checked. Foliage pale green and chlorotic. Fruit setting impaired. Roots with brown, parched or rotting patches. Frequent hypertrophy of roots, especially of the tips.**

Pratylenchus coffeae Z. (*musicola* Cobb.)
Coffee nematode.

404

NEMATODA.

Free-living root nematode.

Distribution: Africa, India, Indonesia, Fiji-Islands, Hawaii, South America

Growth checked. Foliage pale green and chlorotic. Fruit setting impaired. Roots with brown, parched or rotting patches.

Rotylenchus multicinctus Cobb.
Spiral nematode.

405

NEMATODA

Whitish endoparasitic worms, about 1 mm long.

Distribution: Africa, Fiji-Islands

**rhizome
and
pseudo-
stem**

Foliage drooping, bunches remaining small, eventually dying. Pseudostem easily broken by wind.

Odoiporus longicollis Ol.
Banana stemborer weevil.

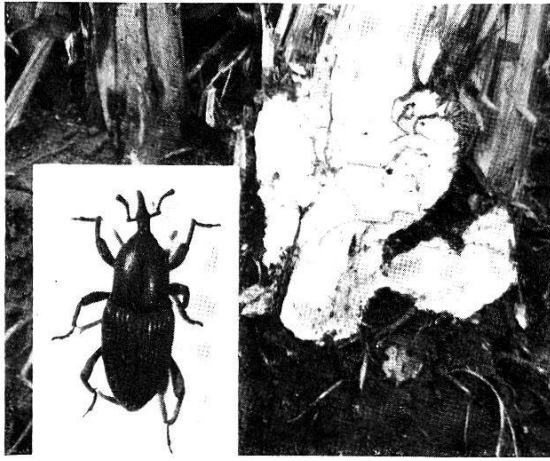
COLEOPTERA; *Curculionidae*

406



Strong, black to reddish-brown weevil, 15-20 mm long (without the snout). The prothorax is rather shiny; the elytra have distinct longitudinal ridges; they do not cover the whole abdomen. The female deposits its eggs in the trunk under the leaf sheaths. The larvae tunnel in the trunk above the ground and pupate in a cocoon below the surface of the trunk. Development period under optimal conditions: 8 weeks. 4-5 generations a year.

Distribution: Formosa



Reluctant growth. Leaves droop and wither. Bunches dwarfed. Pseudostem often broken off. Young plants turn yellow and collapse.

**rhizome
and
pseudo-
stem**

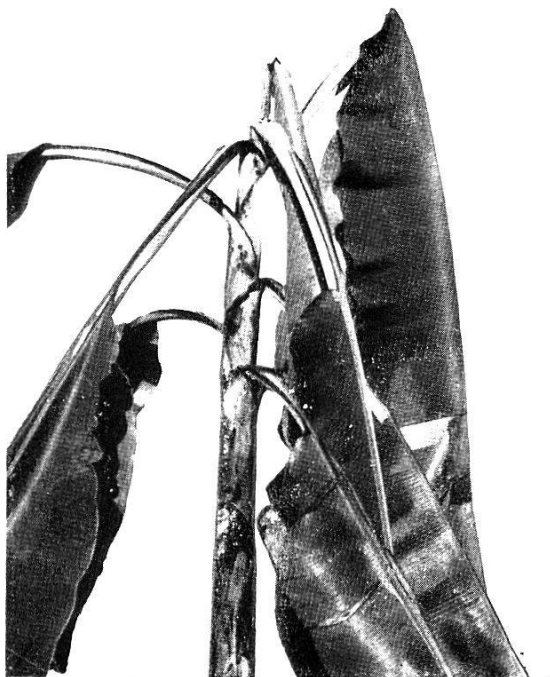
Cosmopolites sordidus Germ.
Banana root borer.

COLEOPTERA; *Curculionidae*

407

Black weevil, 10-15 mm long, which lays its eggs in small hollows near the leaf base of young plants. The pseudostem of older plants is covered with eggs near the soil surface. The hatching larvae bore into the rhizome, producing numerous irregular tunnels. The full grown larvae are 20 mm long, creamy-white and footless. They require about 20 days to reach the pupal stage. Development period: about 8 weeks. The adult weevils are long-lived and very active at night. They emerge mainly in the dry season.

Distribution: Australia, Indonesia, Ceylon, Formosa, China, South America and other banana growing countries.



Pseudostems heavily mined. Symptoms as for *C. sordidus*.

Tomnoschoita nigroplagiata Qued.
Banana weevil.

COLEOPTERA; *Curculionidae*

408

Robust weevil, 10-12 mm long (see also No. 407). The snout is relatively long, thin and slightly curved. The prothorax is dark brown to black. The elytra are of the same colour, with a red design tapering from the base to the centre. *T. nigroplagiata* often occurs in company with *Cosmopolites sordidus*. The larvae also mine in the rhizome and pseudostem. The biology of the two insects is similar.

Distribution: Uganda, Congo

rhizome
and
pseudo-
stem

Reluctant growth. Leaves droop and wither. Pseudostem heavily mined and often broken off. Young plants turn yellow and collapse.

Metamasius hemipterus L.
West Indian sugar-cane borer.

COLEOPTERA; *Curculionidae*

409

274

Robust weevil, 12-15 mm long, with a strong, long, slightly curved snout. The prothorax and elytra are black, with irregular, red decorations. The eggs are deposited singly in the shoots or in the leaf sheaths, whence the larvae tunnel towards the roots. They are pale yellow, footless, with a brown head and a distended abdomen. Pupation takes place inside a cocoon in the shoots.

M. hemipterus also attacks sugar-cane (see also page 174).

Distribution: the West Indies, Africa (West)

Reluctant growth. Fruit setting disturbed. Rhizomes mined with elongated galleries containing excrement.

Castnia atymnius humboldti Boisd.

410

LEPIDOPTERA; *Castniidae*

The females are marked with various colours; they deposit their eggs on the stem just above the ground. The caterpillars bore into the rhizomes and pupate in the ground. Total egg to adult development cycle: several months.

Distribution: South America

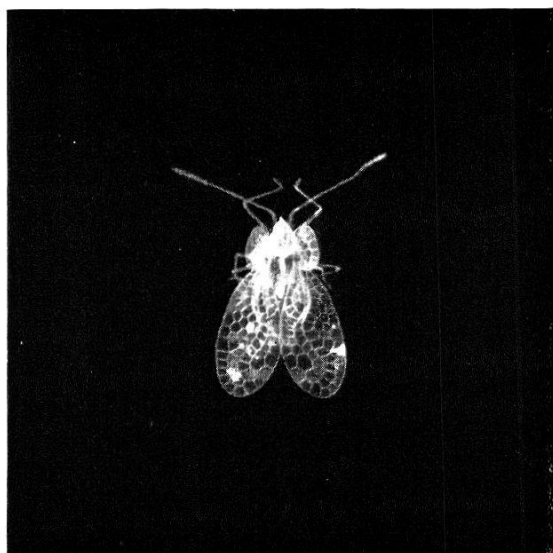
leaves

Growth disturbed. Leaves dwarfed, often showing necrotic patches.

Stephanitis typicus Dist.
Lace bug.

HETEROPTERA; *Tingidae*

411



Small plant bug with delicately veined wing membranes. The female places its eggs in the parenchymatous tissue of the leaves. The adult is usually gregarious. Development period: several weeks.

Distribution: India, China, Indonesia, Philippine Islands

Young plants, i.e. shoots deformed. Presence of colonies of black aphids.

leaves

Pentalonia nigronervosa Coq.
Banana aphid.

HOMOPTERA; *Aphididae*

412

Dark brown to blackish aphid, which lives in dense colonies at the stem base, in the edges of the leaf sheaths or on young shoots. It transmits bunchy top disease and banana mosaic virus. Several (8-12) generations a year.

Distribution: throughout the Tropics and Subtropics

Fruit setting impaired. Yellow stains on leaves. Generally poor condition of plants.

Pseudococcus comstocki Kuw.
Comstock mealybug.

HOMOPTERA; *Pseudococcidae*

413

Yellow to orange mealy bugs, which live in dense white and fluffy colonies on stem, leaf base or between the fruits. The plant is often covered with honeydew. There is abundant wax secretion and the eggs are covered with waxy filaments. Several generations a year.

Distribution: Africa, India, U.S.S.R., Formosa, China, Japan, Australia, U.S.A., South America

Inflorescence wrapped in fine web, containing excrement. Flowers attacked and fruits superficially gnawed, rotting.

flowers

Lamprosema octosema Meyr.
Banana scab moth.

LEPIDOPTERA; *Pyralididae*

414

Slender moth with a wing span of 20 mm. The forewings are brownish-yellow, bearing a dark brown, H-shaped design in the centre and a narrow, jagged, brown crossband near the apex. The hindwings are pale brownish-yellow with a small, dark dot near the base. The moth lays its eggs singly or in clusters on the bracts. The hatching caterpillars attack and damage the flowers and feed on the developing bunches. They pupate between the fruits which are spun together and covered with excrement, or on the leaf base. Total development from egg to adult: 35-40 days.

Distribution: Indonesia, Fiji-Islands, Queensland, islands of the West Pacific

fruits

Young plants and fruits heavily attacked.*Colaspis hypochlora* L.COLEOPTERA; *Chrysomelidae*

415

Oval, slightly convex beetle. The female lays its eggs in the leaf sheaths. The larvae feed on leaves and fruits. The insect requires a high degree of humidity; one generation develops within about 45 days. The pest is most active during the rainy season.

Distribution: Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, British Guiana

Fruits with bore-holes. Presence of caterpillars inside them. Rot infestation.

Hieroxestis subcervinella Meyr.LEPIDOPTERA; *Lyonetiidae*

416



Small, grey and shining golden moth which lays its eggs on the fruits. The creamy-white larvae, hatching therefrom tunnel into them. Full grown caterpillars are 12-15 mm long, with dark brown segmentation.

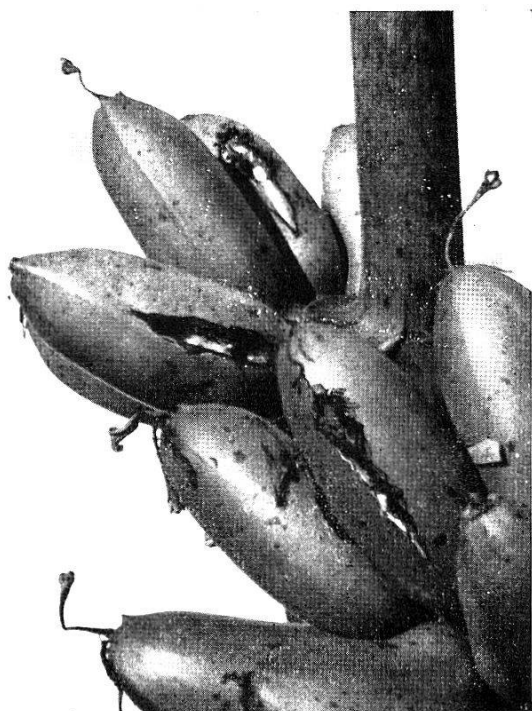
Distribution: Canary Islands, Seychelles, Mauritius, St. Helena

Fruit skins heavily attacked, often leaves injured.

Zonocerus variegatus L.*Stink locust.*ORTHOPTERA; *Acridiidae*

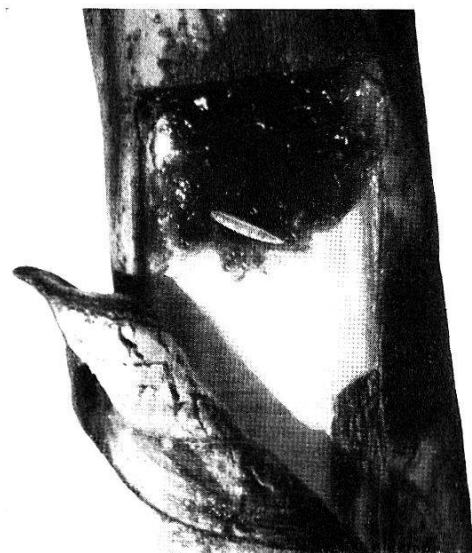
417

57, 376, 786



Large, polyphagous locust with green elytra. The head has yellow and black markings, the antennae are black with yellow tips, while the thorax of the hopper is striped yellow and black. Oviposition takes place in the ground. Egg-pods may be up to 40 mm long.

Distribution: Africa, the West Indies



Fruits with soft, brown patches. Pulp also stained brown and occupied by white maggots.

fruits

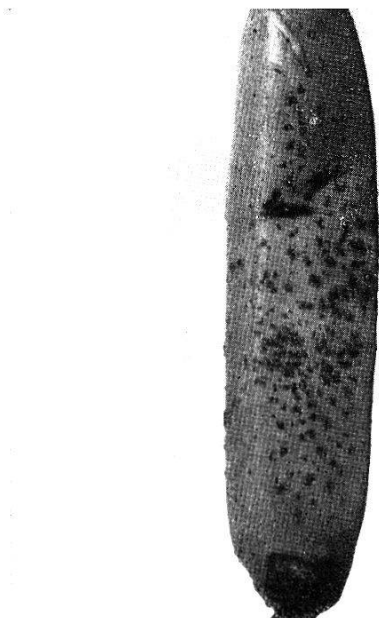
Dacus curvipennis Frogg.
Banana fruit fly.

DIPTERA: *Trypetidae*

418

Small fly, about 6 mm long, with 2 broad, white bands along the brownish-red thorax. The abdomen is elongate, very slender, broadened in the middle but distinctly more narrow than the thorax. The transparent wings have a broad, brown costal margin and a brown bar running from the wing base to the centre of the distal margin. The eggs are laid in ripening bananas. Development period of one generation: 6-7 weeks.

Distribution: Fiji Islands



Fruit skin with reddish-brown, hard, and corky spots. Similar spots on leaves.

Scirtothrips signipennis Bagn.
Banana thrips.

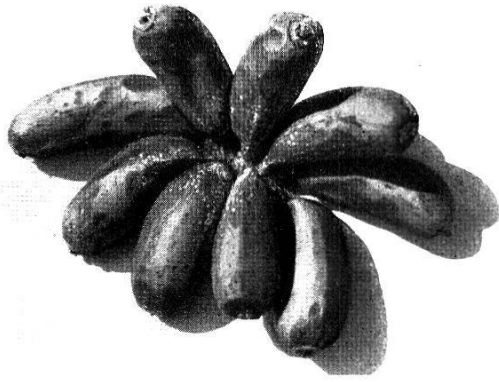
THYSANOPTERA; *Terebrantia*

419

Yellow thrips, 1-1.3 mm long, their wing base black. Dry and hot conditions favour their reproduction. The eggs are mainly deposited in the leaf sheaths, sometimes also on the fruits. Development cycle: 35-40 days.

Distribution: Africa, Australia, Fiji Islands, Florida, Honduras, Costa Rica, Panama, Trinidad, Brazil

fruits



Plant in poor condition, growth checked. Leaves with necrotic patches, fruit formation irregular. Presence of small, round scales at leaf base or on other parts of the plant away from the sun.

Aspidiotus destructor Sign.
Coconut scale.

HOMOPTERA; *Diaspididae*

420

597

Thousands of female scale insects on both sides of the leaves, small, round and flat, greyish-white or almost transparent and about 1.5 mm in diameter. They also infest the leaf stalks and fruits. Their sucking alters the chlorophyll, producing circular yellow zones round the punctures. With heavy infestation the puncture stains overlap. The pest disperses downwind. Several generations.

Distribution: Africa, India, Indonesia (practically wherever coconut palms are grown)

Papaw

(*Carica papaya* L.)

Most important pest: 423

Only sporadic attacks. Dark spots or feeding scars on trunk. Secondary infection with fungus or bacterial diseases. Young plants wilt and die.

trunk

Rhabdocnemis obscura Boisd.

Hawaiian sugar-cane borer.

COLEOPTERA; *Curculionidae*

421

Robust weevil, about 15 mm long. The upper side of its body is dotted or ribbed. Oviposition takes place in the trunk, where the resultant larvae bore galleries.

268

Distribution: Jamaica, Barbados, St. Lucia, British Guiana, Hawaii, Fiji Islands, New Guinea, Tahiti, Queensland

Young plants turn yellow and die. Stem often gnawed off below the ground and toppling over. Burrows of about 10 mm in diameter found in the ground. Root often attacked by termites, causing the same damage.

422

Gryllotalpa africana Pal.

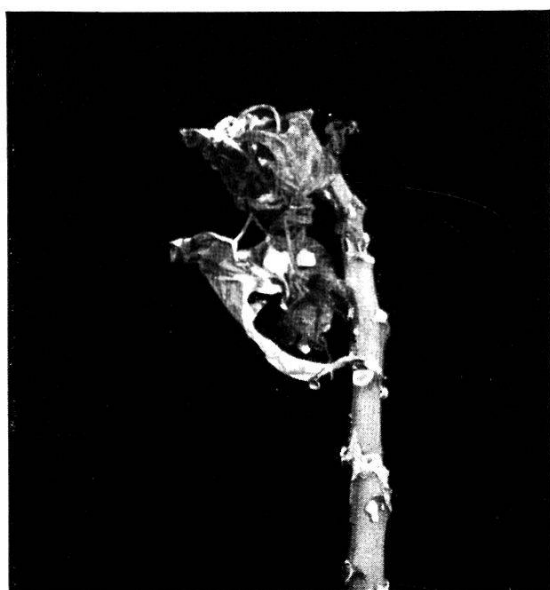
African mole-cricket.

7, 680

ORTHOPTERA; *Gryllotalpidae*

Mole-cricket, about 30 mm long, with strongly developed fore-legs (fitted for digging) (see Fig. 10).

Distribution: Africa



Leaf-shedding of young plants. Buds withered. Trunks covered with white fluff.

Planococcus citri Risso.

Citrus mealybug.

423

HOMOPTERA; *Pseudococcidae*

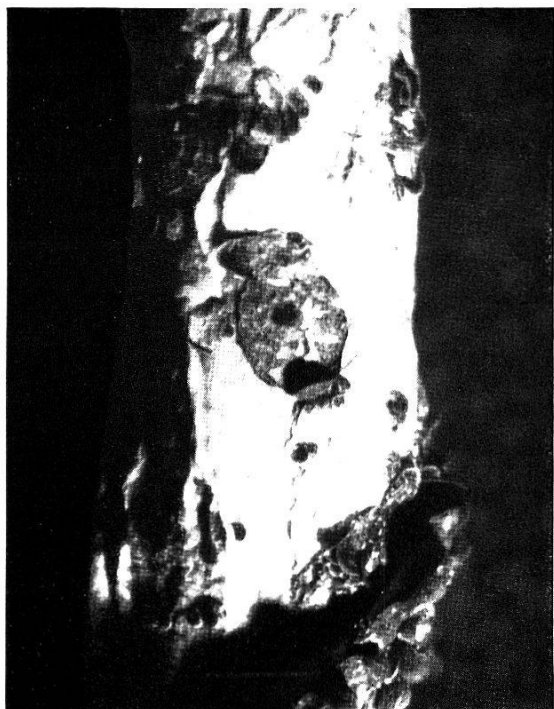
100, 349, 386

530, 692, 779

873

see page 288 (Citrus)

trunk



Trunks of saplings infested with scales which cause necrotic patches. Plant growth retarded.

Morganella longispina Morg.

HOMOPTERA; Diaspididae

424

Small, round scale insects, dark brown to black, about 1.5 mm in diameter.

Distribution: Africa, India, China, Japan, Indonesia, Australia, Central and South America

leaves

Foliage heavily attacked. Plants stripped bare.

Diacrisia investigatorum Karsch.
Tiger moth.

LEPIDOPTERA; Arctiidae

425

Moth with white fore and hind wings, the former marked with dark brown dots. The wings expand to 30-40 mm. The abdomen is brown. The caterpillars are 20 to 30 mm long, ochrous to brownish and densely clothed with hairs; they occur in great masses. Several generations.

Distribution: East Africa

Vector of Papaya ring spot virus.

Pergandeida robiniae Macch.

HOMOPTERA; Aphididae

426

669

see page 349 (Ground-nuts)

Distribution: Tropics and Subtropics



Ripening fruits with dark, soft spots, inside which white maggots are found. Premature shedding of fruits.

fruits

Dacus pedestris
Bezzi.

DIPTERA;
Trypetidae

427

Fly with a grey thorax and reddish-brown head and abdomen, a yellow band crossing the base of the latter. The wings are plain and transparent. The eggs are laid in the ripening fruits. Several generations.

Distribution: India (Eastern region), Ceylon

Fruit-shedding. Fruits partially rotting. Only secondary infestation of fruits previously injured by wasps or other insects, or mechanically damaged.

Ptecticus elongatus F.

DIPTERA; *Therevidae*

428

Slender, reddish-brown fly, 10 mm long, black-headed and with plain wings, which lays its eggs on the fruits. The maggots are short, stout and flat, oblong and convex, with a *conspicuous head capsule*.

Distribution: East Africa

Mango

(*Mangifera indica* L.)

Most important pests: 433, 435, 438, 440, 442, 445, 449, 450, 452, 453, 454, 458



Death of whole trees or large portions of them. Deep, serpentine galleries under the bark. Often deep mines in the sapwood.

trunk

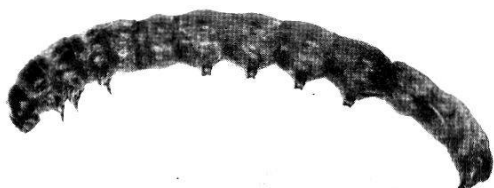
Batocera rufomaculata Deg.

429

775

COLEOPTERA; *Cerambycidae*

see page 397 (Rubber)



Patches of bark gnawed off down to the wood. Small or large bore-holes, covered with webbing, become visible. Dieback of whole branches.

Squamra tetraonis Moore
Barkfeeder.

430

477

LEPIDOPTERA; *Cossidae*

Moth with greyish-brown, slightly mottled forewings, expanding to 50-60 mm. The eggs are deposited on branches and trunks. The greyish to greenish, hairless caterpillars are 60-70 mm long when full grown. They feed superficially on the bark, also penetrating into the wood. In daytime they hide in galleries made in the wood; at night they feed on the outside of the trunk. The bore-holes are covered with webbing.

Distribution: India

Partial dieback of twigs and branches, these being mined and occupied by white larvae.

branche

Dinoderus distinctus Lesne.

COLEOPTERA; *Bostrychidae*

431

Brown beetle, 3-4 mm long. The prothorax is rounded off in front and the head invisible from above (see No. 14). The tips of the antennae are saw-like (3 large pointed segments). The base of the elytra has a reddish tinge. The female deposits its eggs on branches where the resultant larvae mine. *D. distinctus* attacks also bamboo.

Distribution: India

branches

Partial wilting and dieback of trees. Branches break off.*Rhytidodera simulans* Wh.COLEOPTERA; *Cerambycidae*

432

Reddish-brown Longicorn beetle, 30-40 mm long, the elytra of which are marked with pale yellow longitudinal rows of fine hairs. The antennae are saw-like, extending to the middle of the body, which is ventrally clothed with pale grey hairs. Oviposition takes place on the terminal shoots or young branches, into which the hatching larvae mine. Full grown these are 50-60 mm long. Pupation takes place in a crate-like cocoon under the bark. Development period of one generation: about 9 months.

Distribution: Indonesia

shoots

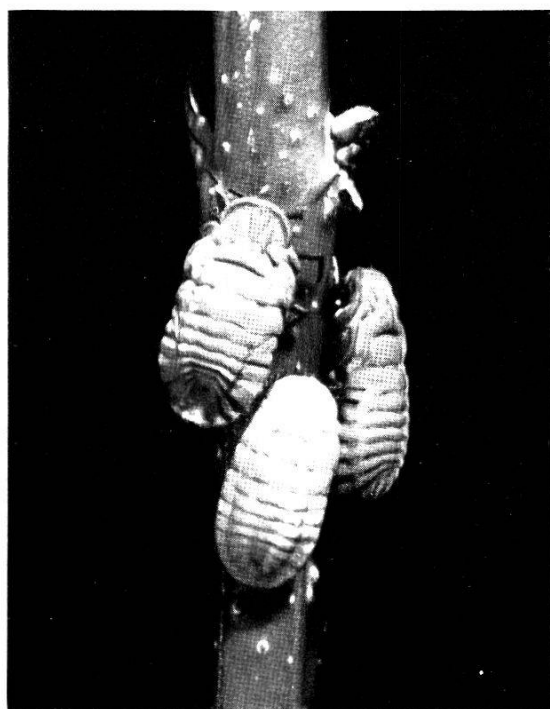
Branches, shoots, inflorescences and fruit stalks wither and dry up. Heavy infestation of leaves with black sooty mould.

Drosicha stebbingii Stebb.
Giant mealybug.

HOMOPTERA; *Margarodidae*

433

490



Coccid, about 15 mm long. The females are wingless and flat-bodied, covered with an ashy-white waxy coating. They lay several hundred eggs 5-7 cm deep at the base of the tree trunks. The nymphs hatch in January and reach the adult stage in April after 4 moults. From eggs laid in May the nymphs emerge in January of the following year.

Distribution: India, Pakistan

Stem base of young plants often injured. Buds and leaves destroyed.

leaves

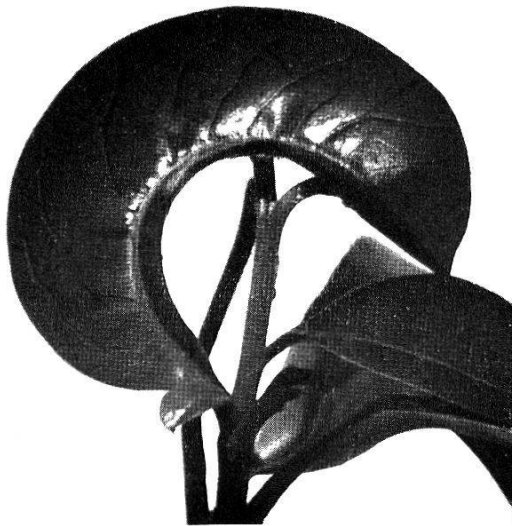
Bombotelia jocosatrix Gn.

LEPIDOPTERA; *Noctuidae*

Moth with a wing span of 30 mm. The forewings are light brown, with indistinct, dark crossbands, while the hindwings have a dark margin and a white pad. The female lays its eggs at night on the leaves. The multicoloured, hairless caterpillars attack young plants, feeding on their leaves as well as on shoots and buds. Pupation takes place in the ground. Several generations.

434

Distribution: Australia



Leaves discoloured; midrib slightly broken, leaves thus misshapen, their development impaired.

Rhynchaenus mangiferae Mshl.

COLEOPTERA; *Curculionidae*

435

Small, dark weevil, 1-1.5 mm long, which lays its eggs in the midrib of the leaves. The larvae mine in the leaves.

Distribution: Ceylon, Indonesia

Leaves curled into funnel-shaped rolls.

Deporaus marginatus Pasc.

COLEOPTERA; *Curculionidae*

Weevil, 4 mm long, the snout up to 1.5 mm long. The head, prothorax and legs are reddish-brown, the tarsi of the latter dark brown, while the elytra are black to light brown. The antennae are also dark brown. The weevils gnaw the midrib of the leaves, causing them to curl up, after which they lay their eggs in the leaf rolls. One generation a year.

436

Distribution: India

leaves

437



Young, succulent apical leaves slightly curled up. Leaf stalk and base of midrib perforated by small bore-holes and mined. Leaves often completely misshapen. Young trees often seriously injured.

Stathmopoda sp.

LEPIDOPTERA; *Heliodinidae*

Moth with a wing span of 10 mm. The greyish-brown forewings are crossed by two golden-yellow bars; the hindwings are greyish-brown to light grey. The females fix their eggs to the underside of the leaf base where the creamy-white caterpillars hatch after a few days and mine into the midrib, tunnelling their way up towards the tip. Full grown they are about 8 mm long. They pupate on the underside of the leaves, protected by a round piece of leaf which they cut for the purpose. Development period of one generation: 4-6 weeks. Several generations. Peak in March/April.

Distribution: East Africa

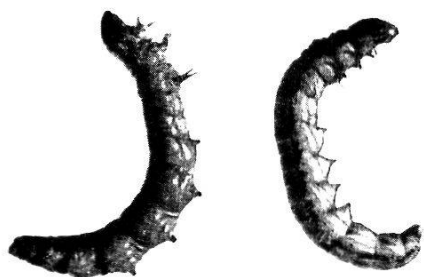
Leaves and shoots spun together. Leaves devoured.

Orthaga exvinacea Mi.

Mango webworm.

LEPIDOPTERA; *Pyralididae*

438



Greyish-brown to greyish-yellow moth, with a wing span of about 30 mm, which deposits its eggs on leaves or shoots. The caterpillars are yellow to brownish-yellow, with black lateral lines; the head and prothorax are black.

Distribution: India

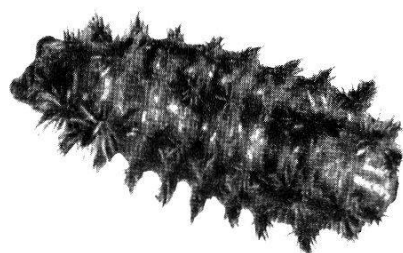
Leaves irregularly destroyed.

leaves

Parasa lepida Cram.

Bluestripped nettle grub.

LEPIDOPTERA; *Limacodidae*



439

79, 580

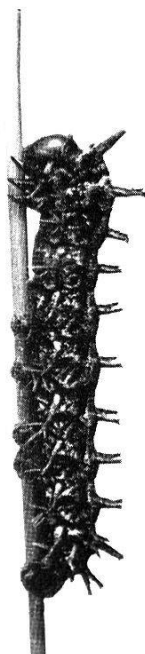
Moth with a wing span of 30 mm. The forewings are green, brown at the base and along the outer margin. The hindwings are yellow to yellowish-green, also with a brown outer margin. The eggs are fixed in clusters to the underside of the leaves. The yellow to green caterpillars are marked dorsally with a central blue stripe and yellow dots and covered with tufts of stinging hairs.

Distribution: South-East Asia

Leaves heavily attacked; plants often stripped bare. Young trees completely defoliated.

Nutaurelia zambesina L.

LEPIDOPTERA; *Saturniidae*



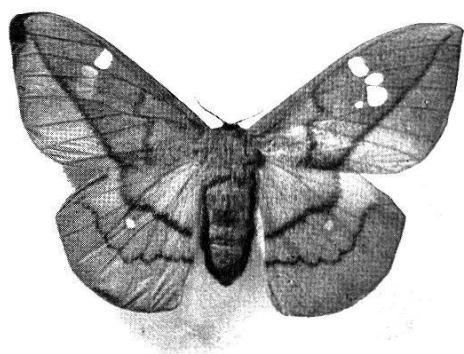
440

Moth with greyish-green forewings, the outer margin about 15 mm wide, with greyish-white bands. The centre of the wing is marked with a greyish-brown spot, 8 mm in size. The base of the hindwing is ruby-coloured; the hindwings themselves are brown with an olive-green margin and an ochrous, dark-edged, transparent eye, about 20 mm in diameter, in the centre. The wings expand to 120-150 mm. The body is fat and plump. The eggs are laid in clusters on the leaves. The black caterpillars, clothed with fine lustrous golden and silvery scales, are provided with strong spines. Full grown they may be up to about 80 mm long. Peak in March. Two generations.

Distribution: Africa

leaves

Leaves heavily attacked; plants often stripped altogether.



Cricula trifenestrata Helf.
Mango hairy caterpillar.

LEPIDOPTERA; Saturniidae

441

737

Butterfly with a wing span of 80 mm. The forewings are reddish-brown with 3 transparent spots and a dark, fine line, while the hindwings are greyish-brown with a broad, ochrous band in the centre. The body is densely clothed with hairs. The eggs are deposited on the leaves. The caterpillars are yellowish-brown to reddish-brown, with dark rings. Each segment bears 6 hair tufts. The hairs cause severe skin irritation. Pupation takes place on the trees. Development cycle of one generation: 8-9 weeks.

Distribution: India

Young, tender leaves turn yellow to brown along the midrib and at the base. Lower surface marked with small, black spots (excrement). Later whole leaves turn brown and fall.

Selenothrips rubrocinctus Giard.
Red-banded thrips.

442

85, 158

THYSANOPTERA; Terebrantia

Dark brown thrips, 1-1.5 mm long. Its first abdominal segment is red, while the wings are fringed with bristles. The eggs are laid in the leaves. The larvae are light in colour, with the abdomen decorated with red bands and red dots. They usually occur in colonies on the undersurface of the leaves and develop best in the dry season. Several generations.

Distribution: Africa, Central and South America, Ceylon

Flower stalks, leaves and leaf stalks covered with white fluffy material. Heavy infestation with sooty mould. Fruits rudimentary.

Pseudococcus adonidum L.
Longtailed mealybug.

443

HOMOPTERA; Pseudococcidae

Elliptical mealybug, 3-4 mm long, coated with white wax and furnished with waxy filaments, $\frac{1}{2}$ mm long, around the body and a pair of very long caudal filaments. The eggs are deposited in an egg sac made of loose waxy threads. The embryonic development requires about 8 days. After a few days the larvae suck and remain stationary, secreting a waxy substance. Several generations.

Distribution: Mediterranean region, Africa, India, South America



Leaf stalks and midribs covered with white fluffy material and infested with sooty mould.

leaves

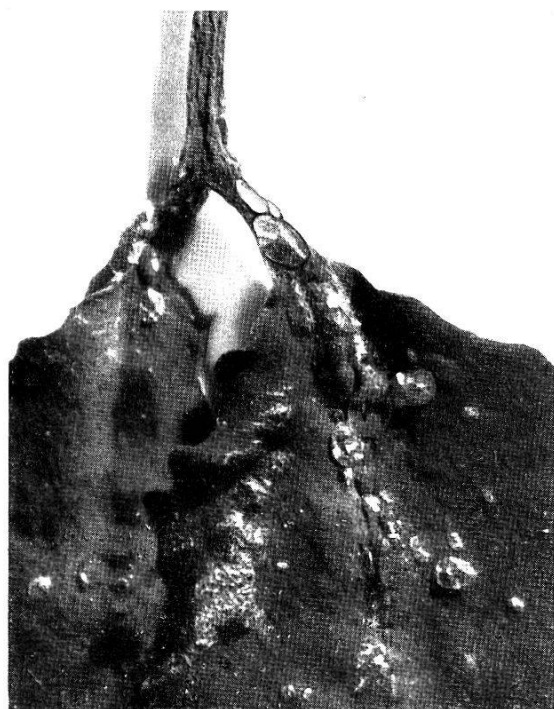
Ferrisia virgata Ckll.

HOMOPTERA;
Pseudococcidae

444

72, 113, 733
780, 819

see page 93 (Cocoa)



Flower buds and young leaves covered with sooty mould. Buds fail to open.

Coccus mangiferae Green
Mango scale.

HOMOPTERA; *Lecaniidae*

445

Female scale insects, elliptical in shape and grey-brown or pale grey in colour (cf. also *Coccus viridis*). The eggs are deposited in large numbers from February to March. After a few days the larvae hatch; they fix themselves on leaves or flower buds, sucking the cell sap.

Distribution: Africa, India, Indonesia, South America

leaves

Pale brownish or greenish-yellow, flat, soft, oval scales along the midribs of leaves. Leaves dwarfed; heavy infestation leads to leaf-shedding. Often fruit stalks and even fruits attacked, causing the latter to fall.

Coccus hesperidum L.
Soft scale.

HOMOPTERA; *Lecaniidae*

446

142, 506



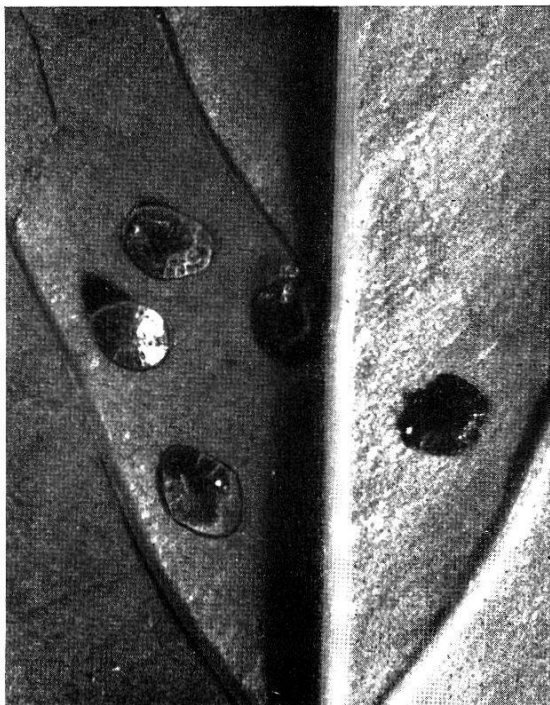
see page 276 (Citrus)

Young leaves covered with sooty mould. Flat, soft, oval scales on underside of leaves. Leaves dwarfed; heavy infestation leads to leaf-shedding.

Eucalymnatus tessellatus Sign.

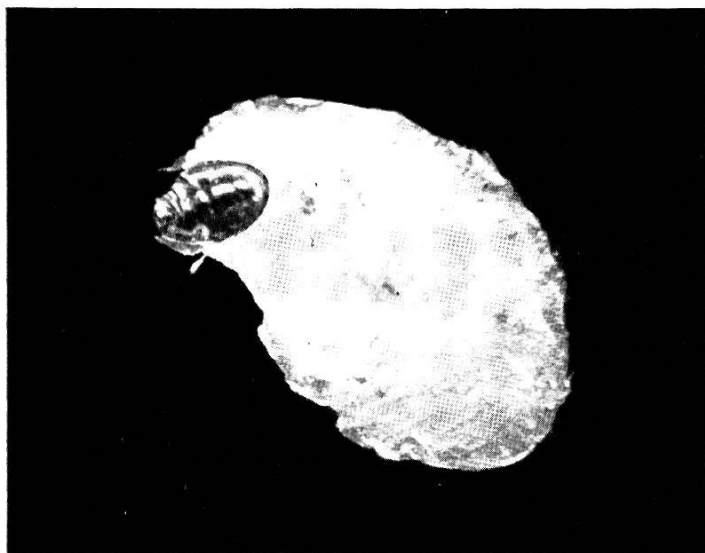
HOMOPTERA; *Lecaniidae*

447



Pale brownish or greenish-yellow, flat, soft and oval scales, about 2 mm long. *E. tessellatus* attacks also Coconut-palms.

Distribution: widespread in the Tropics



Leaves stained grey to yellowish. Leaf-shedding. Fruits also attacked.

leaves

Phenacaspis cockerelli
Cooley

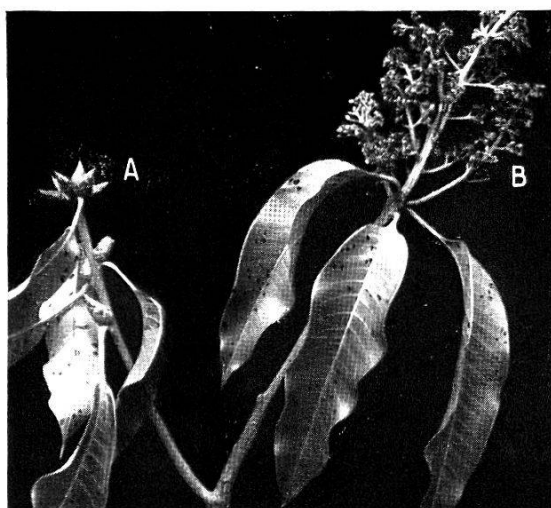
HOMOPTERA;
Diaspididae

448

607

Shell-shaped, flat, white scales, about 3 mm long. The light and dark brown exuviae are at the pointed end.

Distribution: East and South Africa, Madagascar, Seychelles, China, Japan, Hawaii, Australia



Mango-shoot gall: buds developed into large, conical galls. Full grown galls 15-30 mm long, harbouring small nymphs, coated with white powdery substance.

buds

A == attacked.
B = not attacked

Apsylla cistellata Buckton
Mango psyllid.

HOMOPTERA; *Psyllidae*

449

Light brown to dark brown Psyllid, 2-3 mm long, with transparent wings. The nymphs are yellow with red eyes. The insects develop inside conical galls. The eggs are laid at the beginning of summer in the midribs of the leaves. The egg stage persists through the summer until the nymphs emerge in September, breaking open the tissues of the leaf veins and crawling over to the adjacent buds which they enter and transform into galls.

Distribution: India

buds **Buds, ovaries, and young leaves wilt, wither and fall off, especially in young groves.**

Scirtothrips mangiferae Pr.

Mango thrips.

THYSANOPTERA; *Terebrantia*

450 Brown thrips, 1 mm long, with fringed wings. The eggs are inserted in the leaf tissue. The nymphs are yellow, wingless and more minute than the adults. They hatch after a few days and reach the adult stage after 25-30 days. Both nymphs and adults attack leaves and buds. Peak in June.

Distribution: Africa

flowers **Flowers stained beige to brown and with blistery swellings. Fruits fail to develop. Often flower buds attacked also, leading to brown stains and malformation.**

Erosomyia mangiferae Felt.

Mango blister midge.

DIPTERA; *Itonididae*

451 Small, frail, yellowish-brown midge, only about 3 mm long, which lays its eggs in the flowers. The yellow to reddish larvae feed on tissue of flowers and leaf buds. Pupation takes place in the ground. Development period of one generation: 4-5 weeks.

Distribution: India

Flowers flaccid, withering and turning brown. Fruit setting inhibited. Young fruits fall off. Heavy infestation with sooty mould.

Idiocerus clypealis Leth.

Mangohopper.

HOMOPTERA; *Jassidae*

452



Small, pale brownish-grey leafhopper, about 5 mm long, which bears 3 dark brown spots on the head, a medium band and two black spots on the pronotum. The eggs are laid in flower buds, tissue of panicles, and young leaves. The eggs hatch out in 8-10 days and the nymphs begin to feed, attacking the flower buds. They become adult after 15-20 days. Peak of adults: March/April and June/July. Several generations during the flowering season of Mango.

Distribution: India, Philippine Islands

Flower buds, flowers and ovaries wilt, turn dark and die.

flowers



Idiocerus atkinsoni Leth.
Mangohopper.

HOMOPTERA; *Jassidae*

453

Pale greyish-brown leafhopper, 6-7 mm long, with a plain yellow pronotum. The eggs are deposited in flower buds and ovaries in February/March. The insects hide in the bark during the hot part of the day. 1-2 generations.

Distribution: India

Flower buds, flowers and ovaries wilt, turn dark and die.

Idiocerus niveosparsus Leth.
Mangohopper.

HOMOPTERA; *Jassidae*

Greyish-brown leafhopper, about 4 mm long, with white markings on the darkish wings. The eggs are laid in flower buds and midribs of leaves. The embryonic development requires 5-8 days. The nymphs attack flower buds and young leaves; they reach the adult stage after 2 weeks. Several generations.

Distribution: India (Bombay Province), Indonesia, Formosa, Philippine Islands

454

Peduncles and fruit base infested with oval, convex, light and dark brown scales, causing the fruits to ripen and fall precociously. Formation of sooty mould on fruits.

fruits

Saissetia coffeae Walk.
Hemisphaerical scale.

HOMOPTERA; *Lecaniidae*

455

21, 350, 734

Oval, convex, dark brown scales, measuring 2-4 mm by 1-3 mm, which occur along the leaf veins or on young shoots. They oviposit under the scale and reproduce parthenogenetically.

Distribution: widespread

fruits

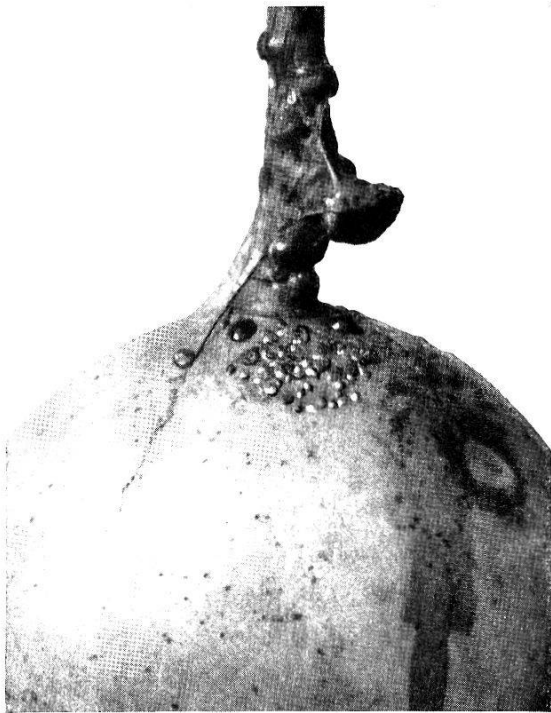
Fruit stalks and shoots dotted with flat, yellow to green scales. Fruits rudimentary. Heavy infestation with sooty mould.

Coccus viridis Green
Green coffee scale.

HOMOPTERA; *Lecaniidae*

456

5, 115, 756
781



see page 72 (Coffee)

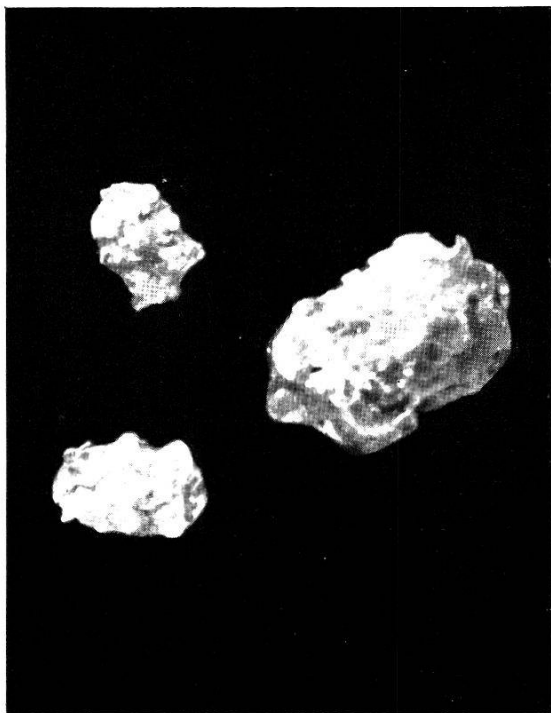
Distribution: widespread

Young shoots, fruit stalks and upper portion of fruits beset with reddish, convex scales. Development impaired. Fruits fail to ripen, and fall easily off. Heavy infestation with sooty mould.

Ceroplastes rubens Mask.
Pink wax scale.

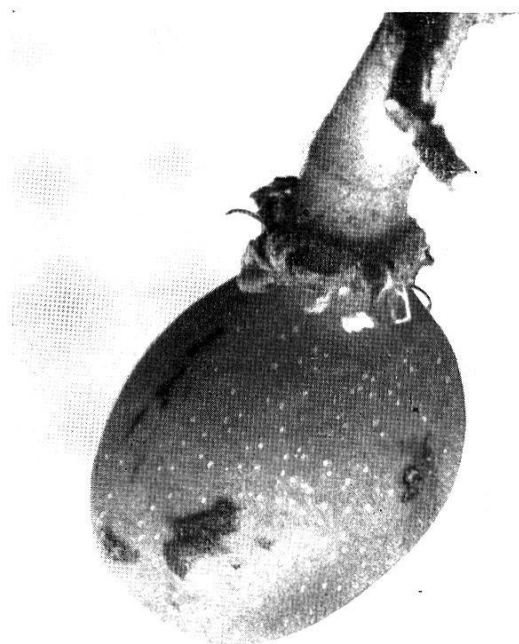
HOMOPTERA; *Lecaniidae*

457



Oval, convex, reddish-brown wax scale, 2-3 mm long.

Distribution: Africa, India, Indonesia, China, Japan, Queensland



Young fruits pierced by small, indistinct bore-holes, which cause them to turn pale, become mottled and stunted and to fall off. Seeds eaten out and occupied by white larvae.

fruits

Cryptorrhynchus mangiferae F.

Mango weevil.

COLEOPTERA; *Curculionidae*

458

Dark brown weevil, 6-8 mm long, with pale yellow markings. The surface of the elytra is granular, the snout short and strong. The eggs are introduced into the pulp of young fruits where the white, footless, brown-headed larvae eat into the seeds. Pupation takes place in the ground.

Distribution: most areas where Mango is grown: South Africa, Madagascar, India, Indonesia, Hawaii



Fruits with soft, often discoloured areas and traversed by feeding galleries which contain excrement. Seeds severely injured.

Cryptorrhynchus gravis F.

Northern mango weevil.

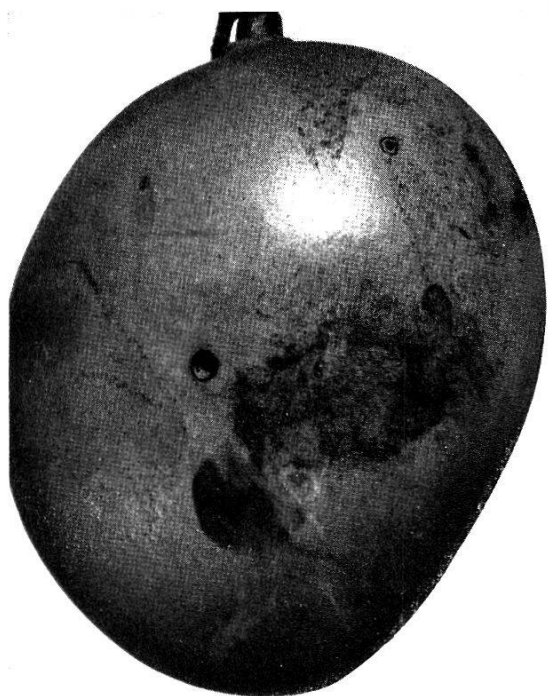
COLEOPTERA; *Curculionidae*

459

Dark brown weevil, 8-10 mm long, flecked with grey. The elytra have longitudinal ridges. With the long and thin, slightly curved snout the female pierces ripening fruits into which it inserts its eggs. The larvae eat their way through the pulp and into the seeds. They pupate inside the fruit. Development period of one generation: about 10 weeks.

Distribution: India

fruits



Fruits with bore-holes, from which frass protrudes. Pulp and stone traversed by mines.

Philotroctis eutrappera Meyr.

LEPIDOPTERA; *Pyralididae*

460

Greyish-brown moth with indistinct markings on the forewings. The female lays its eggs on the fruits. The hatching red to reddish-brown caterpillars tunnel into the fruits. They pupate in hiding places on the ground. Development period of one generation: 6-8 weeks.

Distribution: Indonesia

Ripening fruits fall off. Fruits with rotting, i.e. dark stains (punctures). Pulp heavily mined, the mines containing white maggots, about 5 mm long.

Ceratitis cosyra Walk.

Mango fruit fly.

DIPTERA; *Trypetidae*

461

Small fly, about 5 mm long, wearing its wings spread out. Its biology is similar to that of *Ceratitis capitata* (see page 285, Citrus). The flies pierce the ripening fruits and insert their eggs into the puncture. The maggots feed on pulp, rendering it worthless. Pupation takes place inside the fruit or underground. 2 generations (?).

Distribution: Africa (especially South Africa)

Fruits are shed precociously. Pulp shows dark, soft patches which contain white maggots.

fruits



Dacus ferrugineus tryoni Frogg.
Queensland fruit fly.

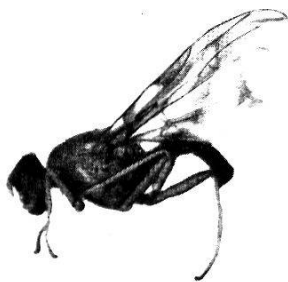
DIPTERA; Trypetidae

462

Light brown fruit fly, 5-6 mm long, with pale legs and a dark brown thorax. The wings are transparent, without any markings. Oviposition takes place in half ripe to ripe fruits, where the maggots mine in the pulp. They pupate in the ground. The development period is largely dependent on the temperature, one generation requiring an average of 4 weeks. Several generations. *D. ferrugineus* also attacks papaw.

Distribution: Australia

Fruits with dark, soft patches, falling precociously. Pulp partially destroyed, infested with white maggots.



Anastrepha chicalayae Greene.

DIPTERA; Trypetidae

463

Fly, 7-9 mm long, the thorax of which is greyish-brown and the abdomen brown. The wings are marked with light brown stripes. The female inserts its eggs into half ripe fruits, where the maggots feed, mining in the pulp. Pupation takes place underground.

Distribution: South America

fruits **Young fruits mottled, slightly shrivelled, falling off. (Damage occurs only when pest appears in large numbers.)**

Amblypelta lutescens Dist.

464

HETEROPTERA; *Coreidae*

605

Brownish-yellow to greyish-brown plant-bug, 12-15 mm long. Morphology and biology are similar to those of *Amblypelta cocophaga* (see page 322, Coconut palm).

Distribution: Queensland

Citrus

(*Citrus sp.* = various species and varieties)

Most important pests: 466, 483, 494, 497, 499, 501, 502, 503, 504, 505, 509, 510, 511, 518, 523, 527, 528, 530, 533, 535, 539, 541

Trees slightly chlorotic, their leaves dwarfed. Reluctant growth. Roots partially thickened and showing dark lesions. root

Tylenchulus semipenetrans Cobb.
Citrus root nematode.

NEMATODA

465
542

Whitish, ectoparasitic worms, about 0.5 mm long. The adult females, after fixing themselves on root tissue where they suck, swell slightly to a cone-shaped body clinging to the root. The eggs are laid underground.

Distribution: practically wherever Citrus is grown



Especially young plants stunted and showing chlorotic leaves. Roots often with dark lesions.

Radopholus similis Cobb.
Burrowing nematode.

NEMATODA

466
2, 353, 382, 40
625, 731, 746

Endoparasitic worm, 0.5-0.7 mm long, living inside the roots (see page 38).

Distribution: widespread throughout the Tropics and Subtropics

root **Foliage of trees chlorotic. Precocious leaf- and fruit-shedding. Often presence of earth galleries at the base of the trunk, in which termites are found. Roots destroyed by termites.**

Odontotermes obesus Ramb.

467 ISOPTERA; *Macrotermitinae*

The soldiers of this termite are 4-5 mm long. The oval, yellowish-red to brownish head, measuring 2-2.4 mm, tapers towards the anterior end.

O. obesus attacks also cereals and other crops.

Distribution: India

Leaves heavily attacked; plants often stripped bare. Young trees stunted, wilted and dead. Roots eaten away by grubs living amongst them.

Lachnosterna citri Sm.

May beetle.

468 COLEOPTERA; *Scarabaeidae*

Robust, reddish-brown may-beetle, which emerges in April/May, feeds on foliage and deposits its eggs underground. The larvae feed on roots of Citrus trees and pupate after 9 months.

Distribution: the West Indies

trunk **Numerous small holes in the earth around the base of the trunk, or earth galleries on the trunk where the bark is injured and gnawed away. Branches, shoots, buds and flowers injured with small gnawing marks. Often fruit skin also wounded.**

Solenopsis geminata F.

Fire ant.

469 HYMENOPTERA; *Formicidae*

Dark reddish-brown ants. The winged females measure about 5 mm, the small-headed workers about 3 mm and the large-headed ones 5-6 mm in length (see page 471).

Distribution: Central and South America, the West Indies

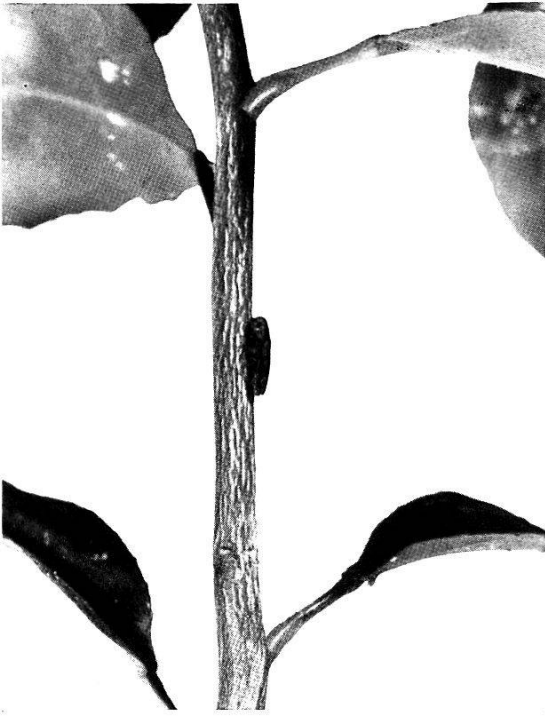
Some branches or whole trees become stunted and die. Under the bark and in the sapwood galleries with 10-20 mm long larvae are found.

Agrilus occipitalis Eschsch.

470 COLEOPTERA; *Buprestidae*

Slender, brownish-black, shiny metallic beetle, about 10 mm long. The elytra taper towards the rear end. The female places its eggs on branches and trunks. The very slender larvae have a strikingly thick head. They tunnel under the bark and inside the sapwood. One generation a year.

Distribution: Indonesia, Philippine Islands



Trees stunted and eventually killed by very slender larvae mining galleries under the bark and in the sapwood.

trunk

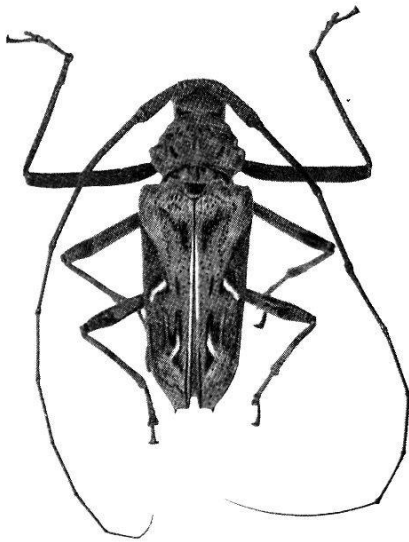
Agrilus auriventris Saund.

COLEOPTERA; *Buprestidae*

471

Very slender, brown lustrous metallic beetle, 10 mm long, which is on the wing from June to September. Clusters of eggs are placed in hollows of the bark. The long, slender, light-coloured larvae are strikingly broad-headed. One generation a year (see also Fig. 21).

Distribution: Japan, Formosa



Trees become stunted and die. Presence of deep galleries, occupied by larvae, under the bark and inside the wood.

Macrophora accentifer Ol.

COLEOPTERA; *Cerambycidae*

472

Beige-brown Longicorn beetle, about 30 mm long, the antennae of which are much longer than the body and the forelegs strikingly long. The beetles are on the wing from September to December. The female lays its eggs at the base of the trunk. The yellowish-white larvae tunnel into the wood. One generation a year.

Distribution: South America

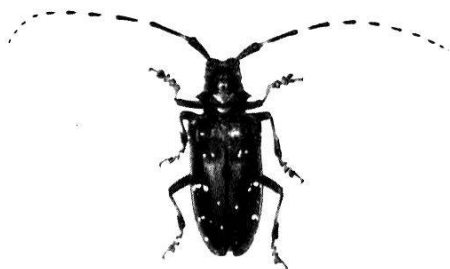
trunk

Trunks or branches of young trees show irregular feeding marks. Younger trees die, owing to deep galleries under the bark and inside the wood, in which yellowish-white larvae, thicker anteriorly, are found.

Melanauster chinensis Forst.

COLEOPTERA; *Cerambycidae*

473



Lustrous black Longicorn beetle, about 30 mm by 10-12 mm in size, with white dots scattered over the elytra. The prothorax bears a sharp thorn on both sides. The antennal segments are grey at their base. The eggs are placed singly on the trunk. The larvae gnaw galleries under the bark, tunnelling also into the wood. One generation a year.

Distribution: China, Japan, Formosa

Trunks of young trees with deep lesions caused by feeding.

Cratosomus punctulatus Gyll.

COLEOPTERA; *Curculionidae*

474



Dark weevil, 15-20 mm long, with 2 beige-brown bands across its elytra. The weevil attacks young orange trees. One generation a year.

Distribution: Mexico, Trinidad

Scion breaks, due to mining at its base. Small, pale yellow-brown excrement and small drops of gum on infested parts of Citrus bark. Callus formation infested with caterpillars and injured by their feeding.

trunk

Ephesia vapidella Mann.

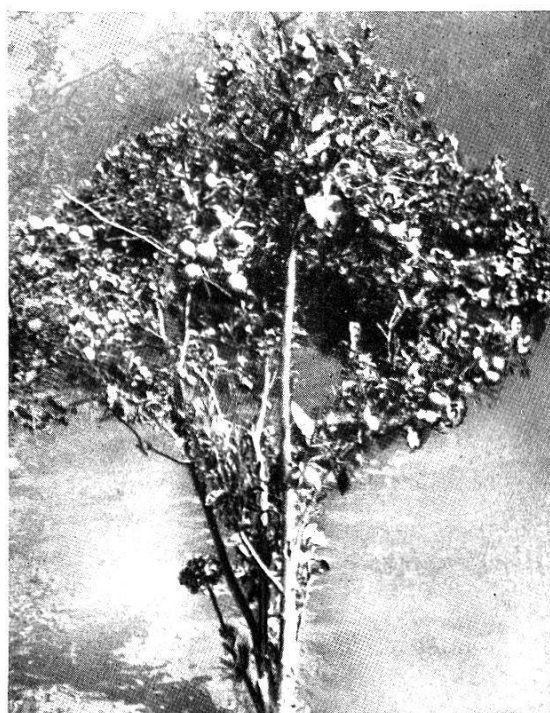
Stub moth of citrus root-stock.

LEPIDOPTERA; *Pyralidae*

Moth with narrow forewings, bearing indistinct designs in white and grey, while the hindwings are pure white. They expand to 12-14 mm. The caterpillars are yellowish-white to white, with a brown head-capsule. Full grown they may reach up to 10 mm in length. The brown pupae are found inside a white cocoon. Several (4-5) generations a year.

475

Distribution: Mediterranean region



Leaves turn slowly yellow. Branches break off, owing to long galleries traversing them, the large exits of which are visible on the outside (see coffee).

branches

Apate monachus F.

COLEOPTERA; *Bostrychidae*

476

14, 61, 151

see page 69 (Coffee)

Dieback of some branches, under the bark of which galleries and bore-holes filled with webbing become visible.

Squamura tetraonis Moore

Barkfeeder (shoot and stemborer).

LEPIDOPTERA; *Cossidae*

477

430

see page 241 (Mango)

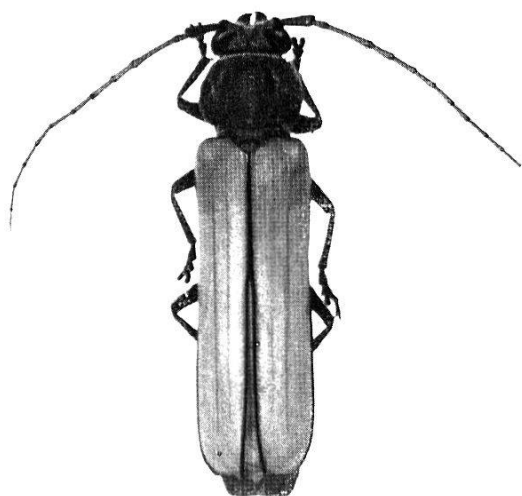
Distribution: India

ranches

Signs of partial dieback. Branches and shoots die, being traversed by mines filled with frass.

Diploschema rotundicolle Serv.

COLEOPTERA; *Cerambycidae*



478

Straight-sided beetle, 30-40 mm long, with a dark brown head and prothorax and pale yellow-brown, square-ended elytra. Antennae, legs, and ventral side of the body are brown. The eggs are deposited on the tips of twigs from January to April. The dirty white to yellowish larvae, slender and slightly thicker in front, mine in the twigs. One generation a year.

Distribution: South America

shoots

Main stems of young plants with sausage-shaped galls, slightly pinched at short intervals. Presence of thick, white, footless larvae, not longer than 3-4 mm inside the galls. Plant growth impaired.

Eurytoma fellis M.

Citrus gall wasp.

479

HYMENOPTERA; *Chalcididae*

Dark brown to almost black wasp, 3 mm long. The wings are transparent and have a strong, dark vein forked in the centre of the costal margin. The tips of the femora are yellow. The females may lay over 100 eggs between the bark and the wood of young, tender shoots. Galls are formed well after the hatching of the larvae. One generation a year.

Distribution: New South Wales



Tips of young plants wilt and die, or some of the shoots wilt.

shoots

Nezara viridula L.
Green plant bug.

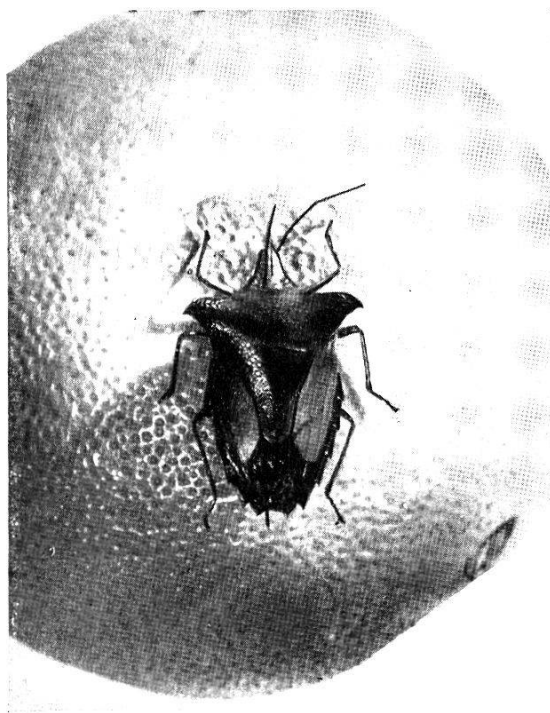
HETEROPTERA; *Pentatomidae*

480

250, 312, 638
691, 841

see page 363 (Tobacco)

Distribution: widespread



Young shoots mottled, precociously lignified, their vertical growth impaired. Fruits partially discoloured and falling off.

Rhynchocoris humeralis Thunb.

HETEROPTERA; *Pentatomidae*

481

Robust, olive-green and light brown plant bug, 20 mm long. Its prothorax extends on both sides to a point. The membrane is dark brown. Oviposition takes place on the leaves. Both nymphs and adults suck on young shoots and fruits. Development period of one generation: 8-10 weeks. Two generations. Peak in July/August.

Distribution: Assam, Formosa

shoots

Vertical growth of young shoots greatly impaired. Fruit setting reduced.

Biprorulus bibax Bredd.

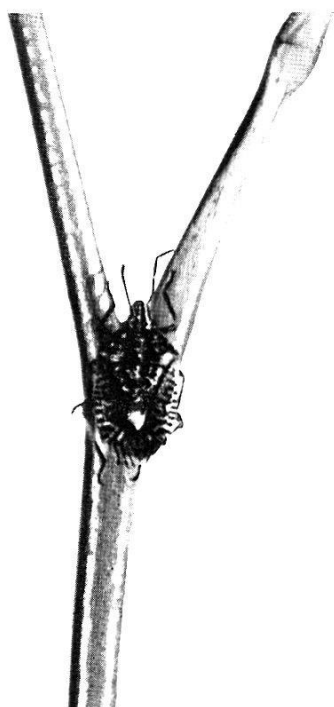
Green orange bug.

HETEROPTERA; *Pentatomidae*

482

Very robust, plain yellowish-red, reddish-brown or olive-green plant bug, measuring 18-20 mm by 10-12 mm. The prothorax is armed on both sides with a strong, sharp tooth. The eggs are deposited on the leaves. Several generations each season. Both adults and nymphs suck from young shoots.

Distribution: Queensland



Vertical growth of shoots impaired. Shoots wilt and die. Leaves mottled and often misshapen. Flower and fruit stalks heavily injured, leading to premature fruit shedding and preventing fruit setting.

Rhoecocoris sulciventris Stal.

Bronze orange bug.

HETEROPTERA; *Pentatomidae*

483



Large, robust plant bug, up to 20 mm long, dark reddish-brown with bronze iridescence. Old specimens are often dark brown to black. The female lays up to 10 greenish eggs in clusters on the leaves. The youngest stages hibernate and start their activity at the end of August or beginning of September, attacking young leaves and shoots. The 5th pupal stage is frequently found in November and the adults appear in December. After egg-laying the adults die towards the end of March. *M. sulciventris* prefers orange trees.

Distribution: Australia



Young shoots stained with dark patches. Vertical growth checked. Heavy attacks cause the tip to die.

shoots

Mictis profana F.
Crusader bug.

HETEROPTERA; *Coreidae*

484

Coffee-brown plant bug, 20-25 mm long. Its wings are edged with yellow, forming a pale yellow cross on the insect's back. The membrane is dark brown. The femora of the hindlegs are very broad. Oviposition takes place on the leaves. Both nymphs and adults suck the juice of young shoots. The pest also attacks grapevines.

Distribution: Australia, Fiji Islands



Young as well as ligneous shoots with round to oval necrotic patches. Tissue stained dark and decayed. Leaf-shedding and dieback of shoots.

Distantiella collarti Scho.

HETEROPTERA; *Miridae*

485

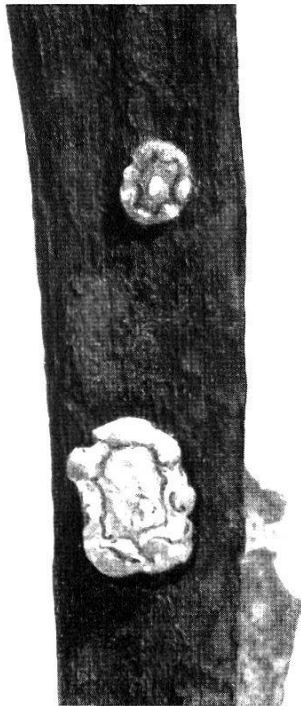
Brown plant bug, 8-10 mm long, resembling *Sahlbergella singularis* (cf. No. 94). The last 3 segments of the antennae are strongly clubbed. The pronotum and scutellum bear distinct dark humps.

Distribution: Congo

shoots

Young shoots underdeveloped and dwarfed, beset with pale green aphids.*Aphis spiraeicola* Patch.*Green aphid.*HOMOPTERA; *Aphididae***486**

Small, green aphid. The thorax of the winged adult is slightly hued with red. The young stages develop within 8 days into adults. The aphids infest young shoots and are particularly abundant in spring.

Distribution: Florida, Cuba, Puerto Rico**487**

Young shoots and leaves beset with large white, convex, slightly furrowed soft scales along the main veins. Abundant formation of honeydew, i.e. sooty mould. Leaves, shoots and fruits blackened.

Ceroplastes floridensis Comst.*Florida wax scale.*HOMOPTERA; *Lecaniidae*

Soft scale, about 3-4 mm long, 2-3 mm wide and 1.5 mm high, with a thick wax layer. The dorsal shield is furnished with rounded off lateral wax plates. The eggs are reddish to yellow. The flat, oval larvae are first reddish-brown, later also coated with wax. 3 generations a year.

Distribution: practically wherever Citrus trees are grown



Shoots, petioles and peduncles infested with dark brown to black convex scales. Leaf formation impaired. Fruits covered with sooty mould.

shoots

Saissetia nigra Nietn.
Nigra scale.

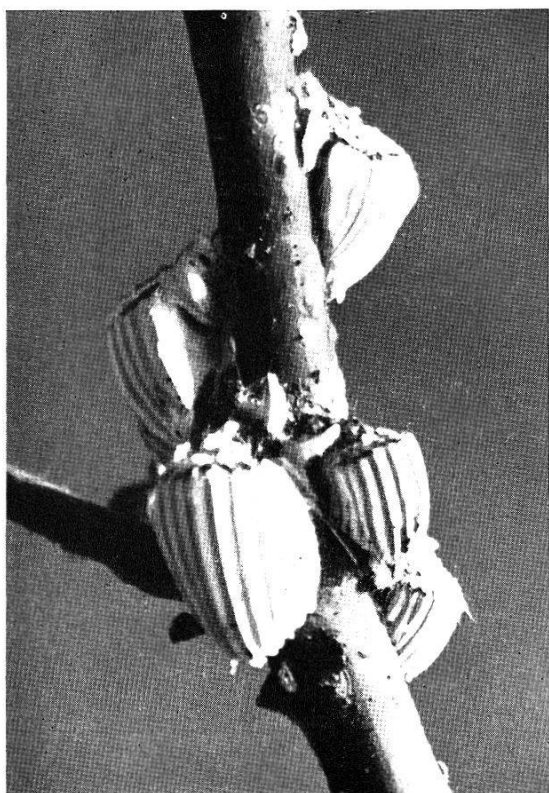
HOMOPTERA; *Lecaniidae*

488

153, 782

Oval, convex, dark brown to black scales, measuring 2-3 mm by 1.5-2 mm, which occur on young shoots or along the leaf veins. They oviposit under the scale and reproduce parthenogenetically.

Distribution: widespread



Shoots, petioles and peduncles as well as leaves and fruits beset with broad-oval insects, up to 10 mm long and coated with wax. Leaves stained yellow, misshapen and blackened with sooty mould. Skin near stem end of fruit mottled with discoloured patches and also blackened with sooty mould. Fruit-shedding.

Icerya purchasi Mask.
Cottony cushion scale.

HOMOPTERA; *Margarodidae*

489

Convex, broad-oval insects, 8-10 mm long, the front portion of which is reddish-brown, 4-5 mm long; together with the white waxy, longitudinally ridged egg-sac the total length is about 10 mm. Several generations.

Distribution: widespread

shoots

Shoots infested with large mealybugs. Growth impaired. Leaf-shedding. Formation of sooty mould.

Drosicha stebbingii Stebb.
Giant mealybug.

490

433

HOMOPTERA; *Margarodidae*

see page 242 (Mango)

Distribution: India, Pakistan



Shoots shrivelled and infested with white mussel-shaped scales. Leaf formation impaired.

Pinnaspis sp.

HOMOPTERA; *Diaspididae*

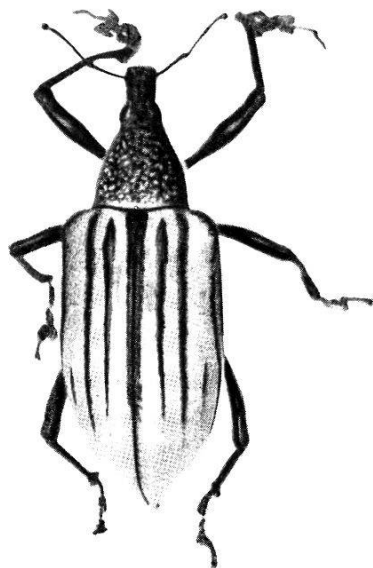
491

Female scales silvery-white, mussel-shaped, 1.5-2 mm in size. The brown exuviae are at the front end.

Distribution: Africa

Leaves devoured by beetles. Plants discoloured and stunted. Roots eaten away by larvae.

leaves



Diaprepes abbreviatus L.
Sugar-cane root borer.

COLEOPTERA; *Curculionidae*

492

284

Bluish-green weevil, 20 mm long, with a densely punctate prothorax and black ridges along the elytra. The legs are black, the snout short and broad. The females lay clusters of eggs on the leaves. The larvae burrow into the ground where they feed on roots. The adults emerge in May. One generation.

Distribution: Mexico, Central and South America, the West Indies

Leaves with irregular feeding marks, the upper epidermis being left intact (skeletonized). Heavy attacks lead to leaf-shedding.

Maleuterpes dentipes Hell.

COLEOPTERA; *Curculionidae*

493

Light brown weevil, 3 mm long, with a broad, obtuse snout and a faint, pale yellow crossband on the posterior half of the elytra. The legs are speckled yellow. The eggs are laid in the ground, where the larvae eat the roots of young trees. 1-2 generations a year.

Distribution: Indonesia

leaves



Leaves turn pale, curl up very badly and dry out, being mined by white serpentine or zig-zag galleries. Severe defoliation. Often young shoots attacked also.

494

Phyllocnistis citrella Staint.
Citrus leaf miner.

LEPIDOPTERA; *Gracilariidae*

Moth with a wing span of 8-10 mm. The forewings are white, with two narrow grey stripes, while the hindwings are white, edged with pale grey cilia. The female lays its eggs singly on the underside of the leaves near the midrib. Incubation period: 3-5 days. The young caterpillars enter the leaf tissue at once and start mining. The pupal cell is found near the margin of the mined leaf. Total life cycle: 3 weeks. Several (5) generations.

Distribution: South Africa, India, Burma, Malaya, Ceylon, Indonesia, Thailand, China, Japan, Philippine Islands, Australia

Tips of shoots spun together. Leaves and stalk base injured by feeding. Fruits fall precociously.

Sparganothis stultana Wals.

495

LEPIDOPTERA; *Tortricidae*

Moth, 10-12 mm long, with reddish-brown to greyish-brown forewings crossed by pale bands. The eggs are deposited on the leaves. The creamy-white to greenish caterpillars eat buds and flowers as well as the stalk base. Development period of one generation: 6-8 weeks. Several generations.

Distribution: U.S.A.

Leaves heavily destroyed, often stripped to the midrib. Young trees often very badly injured, i.e. attacked.

leaves



Papilio demoleus L.
Lemon caterpillar.

LEPIDOPTERA;
Papilionidae

496

Large, strikingly variegated butterfly. The forewings are intense dark brown, marked with yellow spots, the hindwings are of the same colour, decorated with a round, blackish-blue edged spot in the centre of the costal margin and a rusty-red spot at the outer margin near the tip. The female lays its eggs on the leaves, usually singly but sometimes in groups of 2 or 3. The young caterpillars are brownish or blackish, with irregular whitish stripes which give them the appearance of bird droppings. Full grown, the caterpillars are greenish. There are 5 larval instars. Pupation takes place on plants. Total life cycle: about 6 weeks. Several overlapping generations.

Distribution: widespread from Arabia to Formosa



Leaves spun together to form spherical nests, the size of a football. Several nests on each tree. Very aggressive, biting ants make fruit gathering impossible.

Oecophylla smaragdina F.

HYMENOPTERA; *Formicidae*

497

36

Very agile, reddish-brown ant, 10-12 mm long, which builds its nests on citrus trees, spinning the leaves together.

Distribution: Africa, Queensland, S.E. Asia

leaves **Trees partially or totally defoliated.**

Atta insularis Guér.

Bibijagua.

498

HYMENOPTERA; *Formicidae*

see page 467 (Leaf-cutting ants)



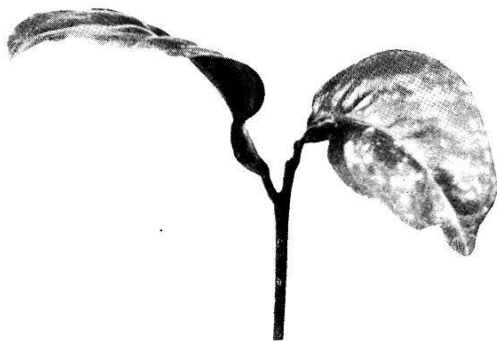
Leaves misshapen with blisters and wrinkles. Injury often massive in young Citrus groves.

Spanioza erythraeae d. Gue.

Citrus psylla.

HOMOPTERA; *Psyllidae*

499



Small, dull coloured Psyllid, 2.5-3 mm long (see Fig. 15). The female lays its eggs in young shoots. Both larvae and adults suck on the lower surface of the leaves. Development period of one generation: 4-6 weeks. Several generations.

Distribution: East and South Africa



Pale specks along leaf veins. Leaves dwarfed. Growth of shoots checked. Fruits pale green to yellowish. Growth of trees reduced.

leaves

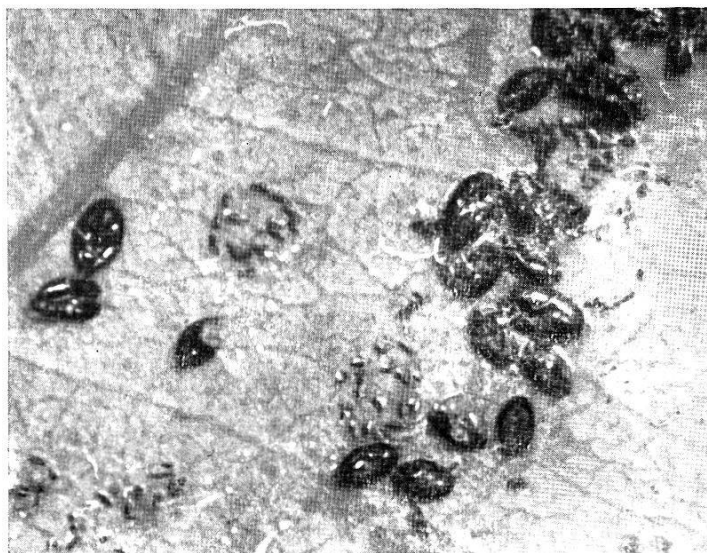
Scirtothrips citri Moul.
Orange thrips.

THYSANOPTERA; *Terebrantia*

500

Yellow thrips, about 2 mm long, which lays its eggs in leaves, young, tender shoots, buds and young fruits. Both nymphs and adults attack leaves and young fruits. Development period of one generation: about 4 weeks. Several generations during one season. Peak in March/June.

Distribution: California, Texas, Arizona



Leaves turn yellow and brittle, their margin is slightly curled downwards. Under-side covered with black, oval scales. Leaf-shedding. Fruit production inhibited.

Aleuracanthus woglumi
Ashby
Citrus black fly.

HOMOPTERA;
Aleyrodidae

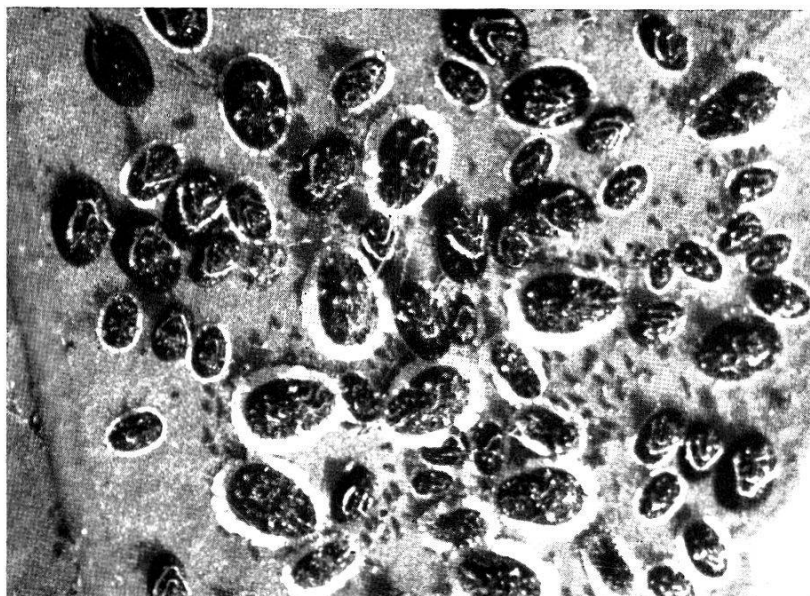
501

The adult insects are very small, winged and dark slate-blue, 1-1.4 mm long. The two pairs of wings are covered with a greyish-white pubescence. The female lays about 30-40 eggs in a characteristic spiral on the lower surface of Citrus leaves. The eggs, at first apparently reticulated, and creamy-white, change later to brown and finally become black. They incubate for 10 days. The pre-imaginal period varies between 6 and 12 weeks, according to the season. The young and pupal stages are oval, about 1 mm long, dark brown or black and with distinct dorsal ridges. 4-5 generations a year.

Distribution: India, Malaya, Ceylon, Burma, Thailand, Indochina, China, U.S.A., Central America, the West Indies

leaves

502



Leaves turn pale or brown and brittle. Lower surface of leaves beset with oval, black, white-edged scales, about 1 mm long. Leaf-shedding. Fruit production reduced.

Aleurotrachelus citri Prie. & Hosny
Citrus white fly.

HOMOPTERA;
Aleyrodidae

Minute insects, about 1-1.2 mm long, with two pairs of wings (see Fig. 16). The head and thorax are brown, the eyes black, the abdomen pale yellow with grey markings. The legs are pale yellow, the forewings clear, hyaline or white. The females fasten the brownish-yellow eggs by a pedicel on the lower surface of tender leaves. The immature forms as well as the pupae resemble scale insects. They are usually shiny black with a narrow ring of white waxy material encircling the body. 2-3 generations a year.

Distribution: practically wherever Citrus trees are grown (Mediterranean region, Africa, India, U.S.A., South America)

Leaves curled downwards, wrinkled and brittle, infested with aphids. Growth of shoots greatly impaired, shoots distorted. Flowers also attacked, failing to open or opening abortively. Ovaries deformed.

Toxoptera citricida Kirk.
Tropical citrus aphid.

HOMOPTERA; *Aphididae*

503

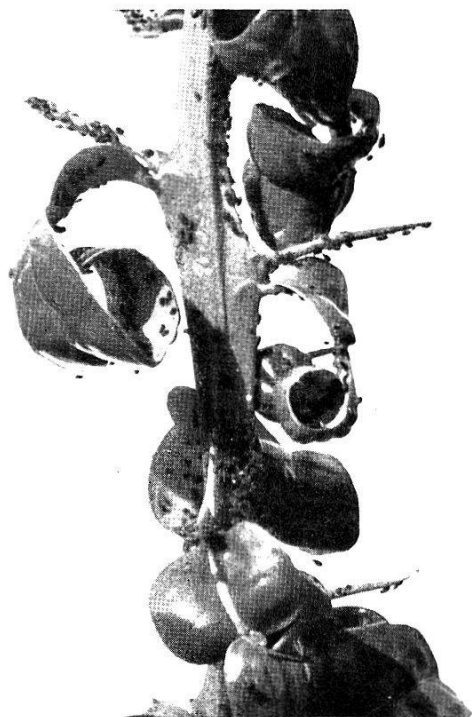


Reddish-brown to almost black aphid, 1.5-2 mm long, with distinctly cone-shaped cornicles and a hirsute caudal process. Parthenogenetic reproduction. Development period of one generation: 6-8 days. Several generations.

Vector of virus diseases of Citrus: Tristeza disease of Citrus; bud union decline of lemon and orange; stem-pitting disease; Citrus vein enation virus.

Distribution: Africa, America, Australia, Japan

leaves



Apical leaves of young shoots curl and twist. Cup-shaped leaves protect aphid colonies. Growth of shoots greatly disturbed; shoots distorted. Flower buds attacked also; flowers fail to open.

Toxoptera aurantii B.d.F.
Black citrus aphid.

HOMOPTERA; *Aphididae*

504

41, 141, 159

Dark reddish-brown to black aphid, about 2 mm long, with short cornicles and distinct caudal processes. Parthenogenetic reproduction. Development period of one generation: 6-8 days. Several generations each season. *T. aurantii* transmits various virus diseases of Citrus such as little leaf-virus; lemon ribbing virus.

Distribution: Tropico- and subtropico-political



Leaves and fruits covered with pear-shaped scales. Leaves stained yellow.

Parlatoria pergandii Comst.
Chaff scale.

HOMOPTERA; *Diaspididae*

505

Female scales flat, dirty white, pear-shaped, about 1.5 mm long. The brownish-yellow exuviae are excentrically borne on the obtuse pole. The female body under the scale is broad, pear-shaped, pale mauve; the pygidium (terminal segment of the abdomen) is yellow. Several generations.

Distribution: Tropics and Subtropics, Mediterranean region

leaves



Lower surface of leaves along the midrib beset with elongate, sometimes asymmetric scales. Growth of leaves stopped. Heavy infestation with sooty mould. Leaf-shedding.

Coccus hesperidum L.

Soft scale.

HOMOPTERA; *Lecaniidae*

506

446



Female about 3 mm long, flat oval, bright yellow or greenish-yellow, attacking mainly the leaves. Several generations.

Distribution: widespread wherever Citrus fruits are grown



Shoots, fruits and leaves infested with scales. Leaves stained yellow, slightly deformed and falling off. Shoots and twigs with necrotic areas and cracks.

leaves

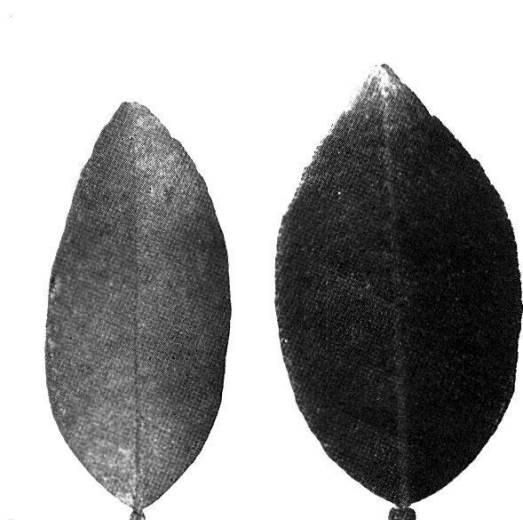
Unaspis citri Comst.
Citrus snow scale.

HOMOPTERA; *Diaspididae*

507

Elongate, pear-shaped scales, 2-2.5 mm long. The exuviae are at the front margin. The female body under the scale is elongate and narrow, reddish-yellow to yellow. 2-3 generations a year.

Distribution: widespread wherever Citrus fruits are grown



attacked

not attacked

Leaves pale, chlorotic, slightly mottled. Leaf-shedding of younger and older trees. Often also fruit shedding (peak in July/August).

Anychus latus C. et F.
Oriental red mite.

ACARINA; *Trombidiformes*

508

Broad, oval mite, 0.4-0.5 mm long, with legs as long as the body. The abdomen is brown, the cephalothorax reddish-yellow. The round, transparent, light brown eggs, 0.15 mm in diameter, are deposited on the *upper* surface of the leaves. Larvae, nymphs and adults are found on leaves and fruits. Development period of one generation: 8-10 days. Several generations a year.

Distribution: Southern Europe, Africa

leaves

Leaves stained yellowish to reddish-brown. Leaf- and fruit-shedding.*Metatetranychus citri* McGregor*Citrus red mite.*ACARINA; *Trombidiformes*

509

Small, yellowish to reddish mite, 0.5-0.6 mm long (see Fig. 44), which deposits its eggs on the leaves. Larvae, nymphs and adults attack leaves and young fruits. Development period of one generation: 8-12 days. Several generations. Peak in April/May.

Distribution: Ceylon, Citrus growing areas of the U.S.A. (Florida, California)



Leaves stained yellow to reddish-brown, brittle, their margin slightly curled up. Lower surface infested with small yellowish organisms.

Tetranychus urticae Koch*Common red spider.*ACARINA; *Trombidiformes*

510

see page 415 (Colton)

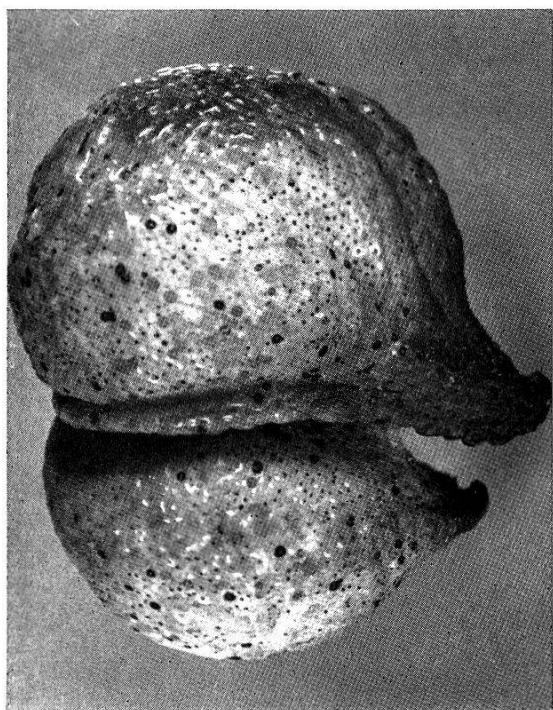
Distribution: widespread



Buds, flowers and young fruits misshapen. buds

Aceria (Eriophyes) sheldoni Ewing
Citrus bud mite.

ACARINA: *Tetranychus*



511

White to yellowish vermiform mite, measuring 0.15-0.18 mm by 0.04-0.05 mm (see Fig. 45). The eggs are laid in the buds at an early stage of the bud development. The damage becomes evident when flowers and fruits have developed. Development period of one generation: about 3 weeks. Lemon trees are preferred. Several generations.

Distribution: Italy, South Africa, California, Queensland

buds



Nymphs first attack buds, then soft, tender shoots. They secrete a dewy fluid from their anal ends. Malformation of leaves, which are badly curled, look sickly and fall off prematurely. Growth of sooty mould on leaves. In extreme cases complete defoliation may occur. Nymphs inject toxic substances into plant tissue, the effect of which is supposed to cause dwarfing, lack of juice and taste in fruits.

Diaphorina citri Kuw.
Citrus psylla.

HOMOPTERA; *Psyllidae*

512

Small Psyllid, 2.5 mm long. The wings are light brown with a broad, beige, longitudinal band in the centre. The legs are greyish-brown. The eggs are laid from March to May inside half-folded leaves of the buds, in leaf axils or suitable places on the tender parts. One female is capable of laying up to 800 eggs within 2 months. The larvae hatch after about 5 days and go through 4 instars before becoming adult. Total life cycle: 20-40 days (depending on temperature). Up to 9 generations a year. Heaviest injury is done when plants germinate and leaves unfold, the actual damage being caused by the nymphs.

Distribution: India, Burma, Ceylon, China, Formosa, Japan, Thailand, Indonesia, Philippine Islands

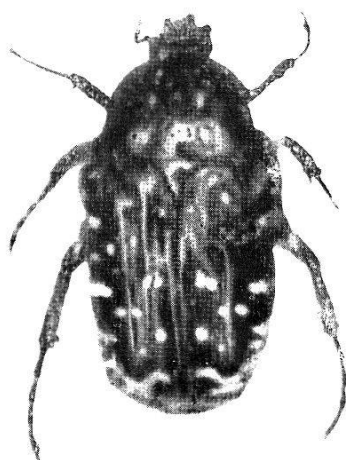
flowers

Stamens (pollen) as well as flowers themselves eaten away. Flowers often occupied by two or three beetles.

Tropinota vittula Reiche

COLEOPTERA; *Scarabaeidae*

513

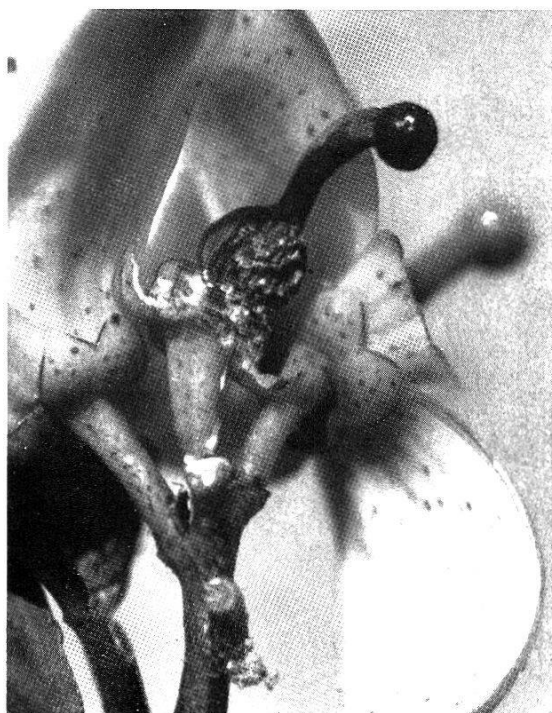


Shiny black beetle, cockchafer type, 10-12 mm long, the prothorax and elytra decorated with numerous fine white dots. The femora are densely hirsute. The

female lays its eggs singly in the ground. The larvae are white, curved (grubs); they feed on roots of various plants and on decayed vegetable matter. One generation a year. The beetles emerge in April/May.

flowers

Distribution: Europe, Africa



514

Flowers spun together and eaten away. Presence of small caterpillars under the webbing. Fruits with small swellings (larvae in the fruit skin). Grafting union begins to dry out and bud dies. Larvae penetrate into living cambium.

Prays citri Mill.

Citrus flower moth.

LEPIDOPTERA; *Hyponomeutidae*

Small, frail moth, about 5 mm long, with a wing span of 8-10 mm. The forewings are greyish-brown with dirty white markings, while the hindwings are greyish-brown with long fringes at the inner margin. The female lays its eggs on the flowers, which the yellowish-white to greenish, brown-headed caterpillars destroy; they also attack shoots and prefer lemon trees. Development period of one generation: 8-10 weeks. Several generations a year. Flight periods in Southern Europe: April, August, October/November.

Distribution: Southern Europe, Africa, Mauritius, India, Ceylon, Indonesia, Philippine Islands

fruits

Leaf margin heavily attacked. Surface of fruits mottled with large feeding marks, where rotting may set in.

Pachnaeus litus Germ.

COLEOPTERA; *Curculionidae*

515

Bluish-green weevil, 10-12 mm long, with a short, broad snout and convex elytra. The weevil attacks leaves and fruits. The eggs are laid underground where the larvae feed on roots, and more particularly on the back at the base of the tree, just below the surface of the ground. Larval development from egg to pupa: about 9 months.

Distribution: Cuba, Jamaica

Rind of young fruits scarred with irregular elongate, interlacing feeding marks, which appear as dark furrows on older fruits. Margins of young leaves jagged.

Maleuterpes spinipes H.

Dicky rice weevil.

COLEOPTERA; *Curculionidae*

516

Greyish-brown weevil, about 3 mm long. The elytra are crossed with pale bands. The snout is short and broad. The eggs are deposited underground. Full grown the larvae are footless and bear long, reddish-brown bristles on the last segment. The adults emerge from August to October.

Distribution: Australia

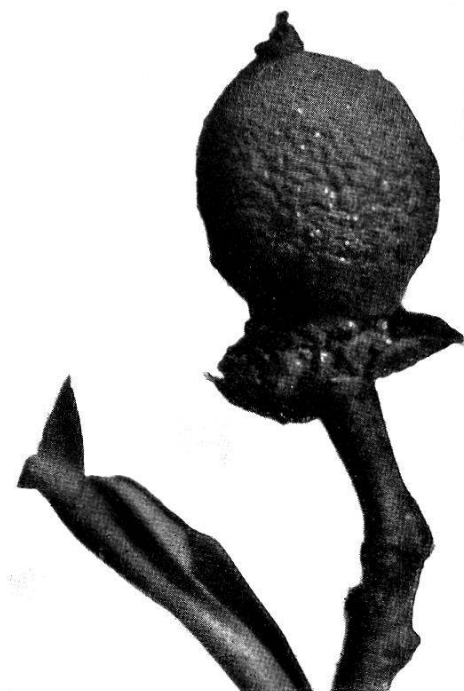
Leaves and fruits spun together and showing feeding injuries. Rind of oranges mined. Fruit-shedding.

Argyrotaenia citrana Fern.

Orange tortrix.

LEPIDOPTERA; *Tortricidae*

517



Moth with a wing span of 20-25 mm. The forewings are speckled greyish-brown to light grey, while the hindwings are plain light brown to silvery-grey. The female fixes its egg clusters on the underside of leaves where the young caterpillars hatch after a few days. They are first creamy-white to light green, turning

to brownish or grey later on. Full grown they are 20-25 mm long. They feed on leaves covered with webbing as well as on fruits and buds. Up to 3 generations a year. Many host plants.

Distribution: U.S.A., Mexico, Brazil

fruits



Ripening fruits fall off. Rind with dark, circular, slightly sunken spots, in the centre of which is a small bore-hole. Pulp soiled with excrement and occupied by flesh-coloured caterpillars.

Argyroploce leucotreta Meyr.
Orange moth.

LEPIDOPTERA; *Tortricidae*

518

836

Moth with variegated brown and grey forewings, a white spot in the centre, while the hindwings are light brown to grey. They expand to 18-20 mm. The eggs are deposited on ripening fruits. The full grown caterpillars are about 15 mm long, fleshy red with a dark prothorax. They eat their way into the fruit pulp, where they remain until they descend to the ground for pupation. Several overlapping generations.

A. leucotreta attacks also cotton.

Distribution: Africa

Fruits the size of nuts and older ones show small bore-holes from which balls of excrement mixed with gum exudation protrude. Tissue round the punctures rots. Precocious fruit-shedding.

Same damage as that produced by *Cryptoblabes gnidiella* Mill.

Citripestis sagittiferella Moore.

LEPIDOPTERA; *Pyralididae*

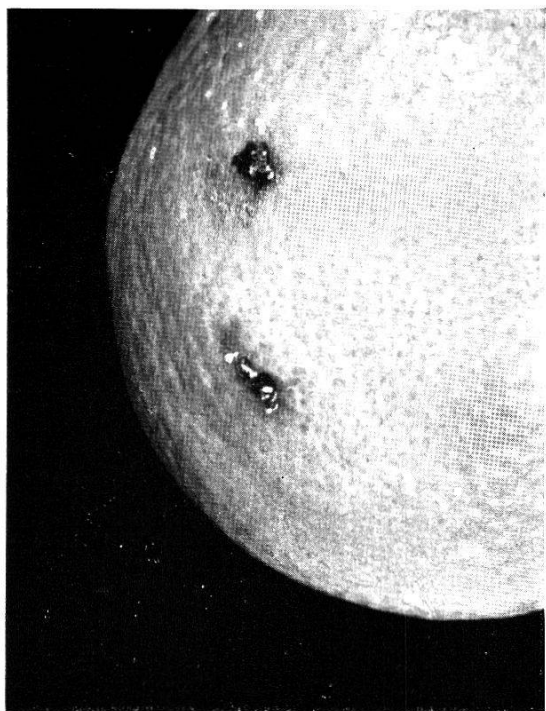
519

Moth with a wing span of 25-30 mm. The forewings are brownish-yellow with brownish-grey specks, while the hindwings are pale yellow with hardly any scales, thus appearing almost transparent. The body is reddish-yellow, relatively slender. The eggs are laid either singly or in small clusters on the fruit. The creamy-white caterpillars penetrate into the fruit, tunnelling through the rind into the pulp. For pupation they leave the fruit and hide underground. Development period of one generation: 6-7 weeks. Several generations.

Distribution: Malaya, Indonesia

fruits

520



Fruits ripen precociously and fall off, showing small bore-holes (exits) with gum exudation.

Cryptoblabes gnidiella Mill.
Honey dew moth.

LEPIDOPTERA; *Pyralididae*

Moth, 7-10 mm long, with greyish-brown forewings, covered with white scales. A white, strongly curved narrow transverse band runs along one third of the body. The base and the margins are darker than the centre. The hindwings are whitish-grey. The moths cover fruits and leaves with honeydew and eggs. The young caterpillars first feed on honeydew, the older stages tunnel into the fruits (oranges and grapefruits). The caterpillars are greyish-brown, their pronotum dark brown. The back is decorated with whitish-pink and the sides with blackish-brown longitudinal stripes, while the ventral side is pinkish. 3-4 generations a year.

Distribution: Mediterranean region, Africa

521



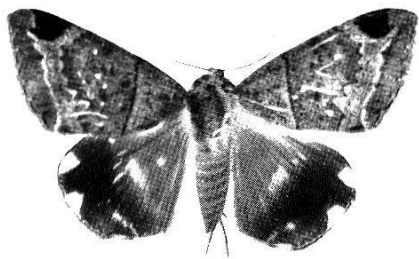
Ripening fruits with slightly darkened, rotting patches.

Ophideres fullonia Cl.
Fruit piercing-moth.

LEPIDOPTERA; *Noctuidae*

Large moth with dark brown forewings and brown hindwings, marked with orange. The wing span may be up to 80 mm. The eggs are laid on various shrubs. The moth sucks the juice of the fruits. Several generations.

Distribution: Africa, India, Australia



Ripening fruits with slightly darkened, rotting patches.

fruits

Achaea lienardi Boisd.

Fruit piercing-moth.

LEPIDOPTERA; *Noctuidae*

522

Brown moth, with pale ochreous zigzag lines near the outer margin of the forewings and a dark brown spot at the costal margin near the tip. The hindwings are greyish-brown to dark brown, with 2 white spots at the margin. The wings expand to 50-60 mm. The eggs are deposited on various shrubs. The moth sucks the juice of the fruits. Several generations a year.

Distribution: Africa, Madagascar



523

Fruits fall off, showing dark soft patches of various sizes. Fruit pulp soft, rotting and infested with whitish-yellow maggots, up to 8 mm long.

Ceratitidis capitata Wiedm.

Mediterranean fruit fly.

DIPTERA; *Trypetidae*

Fly, 5-6 mm long, brown-headed and with red and blue iridescent eyes. The thorax is black with white and yellow markings, the abdomen yellow with 2 grey crossbands. The transparent wings are decorated each with a yellow, brown-edged band across and along, while the wing base bears a black, reticulate design extending to the yellow crossband. The female becomes sexually mature 4-5 days after leaving the pupal stage, and the first oviposition occurs after 8 days. The female inserts the eggs with its ovipositor into the pulp, where they develop within 3 days. The maggots, feeding on the pulp, pupate after 10-12 days in the ground. Several generations.

Distribution: Europe, Africa, Asia, Australia, Hawaii, South America

fruits

Fruits show dark, rotting patches and fall off precociously. Pulp mined by white maggots.

Dacus ornatissimus Frogg
Mandarian fruit fly.

DIPTERA; Trypetidae

524

The female fruit fly, 6 mm long, has a brown to ochrous body and a black dorsal surface of the thorax. The abdomen is fairly broad, marked with dark, narrow transverse lines. The transparent wings have light brown stripes at the costal margin. The eggs are inserted in the fruits where the white, footless maggots feed on pulp, causing it to rot. Development period of one generation: 4 weeks. Several generations.

Distribution: New Caledonia

**Same damage as that produced by *Ceratitis capitata*.
Orange trees preferred.**

Anastrepha ludens Loew.
Mexican fruit fly.

525

DIPTERA; Trypetidae

Fly, about 5 mm long, with light and dark markings. The base of the abdomen is spherical, tapering to a point at the rear end. The biology of *A. ludens* is similar to that of *Ceratitis capitata*. It also attacks mango and tomatoes. Several generations.

Distribution: Mexico, Costa Rica

Shoots and branches more or less severely injured. Gummosis. Skin of ripening fruits show deep gnawing marks.

Vespa orientalis F.
Levantine hornet.

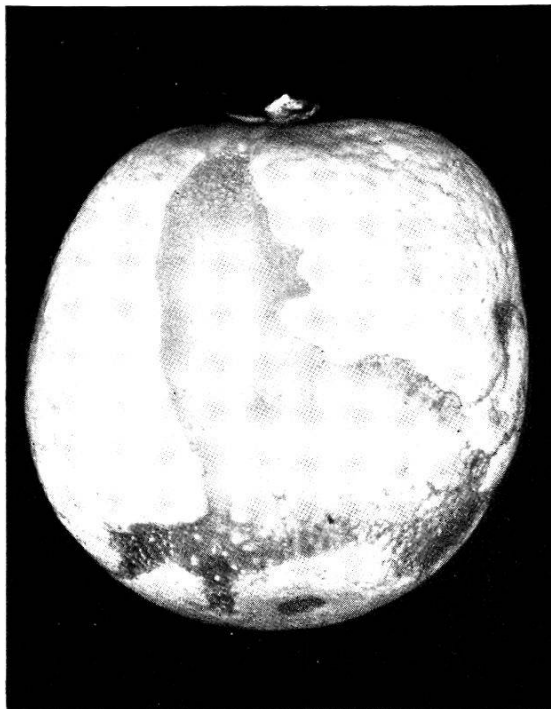
HYMENOPTERA;
Vespidae

526



Robust wasp, 20-30 mm long. The head is reddish-brown with a yellow clypeus, the thorax and abdomen are also reddish-brown, the third and fourth segments of the latter mostly yellow while the legs and wings are brown. The wasps build earth nests.

Distribution: Mediterranean region, Africa, Madagascar



Ripe fruits slightly mottled or marbled and shrivelled. "Oleocellosis".

fruits

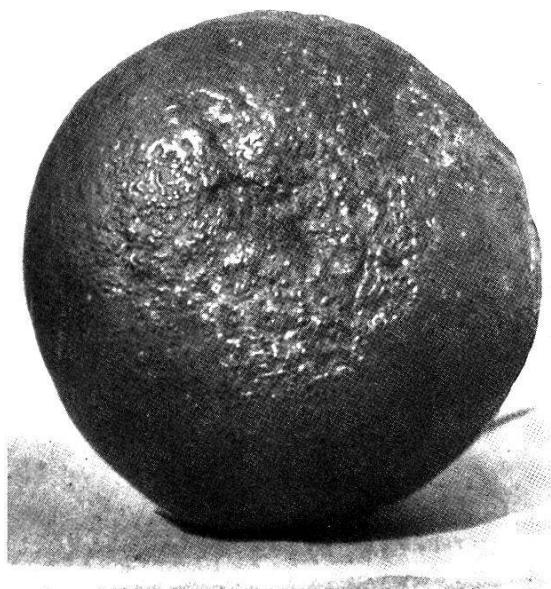
Scirtothrips aurantii Faure
Citrus thrips.

THYSANOPTERA; *Terebrantia*

527

Small brown thrips, about 1.5 mm long, which lays its eggs in young tissue of shoots, leaves, flowers and young fruits. Development cycle of one generation: 5-6 weeks.

Distribution: South Africa



Half ripe or nearly ripe fruits with irregular, smaller or larger corky patches. Leaves stained with silvery dots along the veins.

Heliothrips haemorrhoidalis Bouché
Coffee thrips.

THYSANOPTERA; *Terebrantia*

528

709, 766

Small, elongate and flat, dark brown insect, about 1.5 mm long (see Fig. 13). The eggs are inserted into the parenchymatous tissue. The adults attack both leaves and fruits. Several generations.

Distribution: Tropical and subtropical countries.

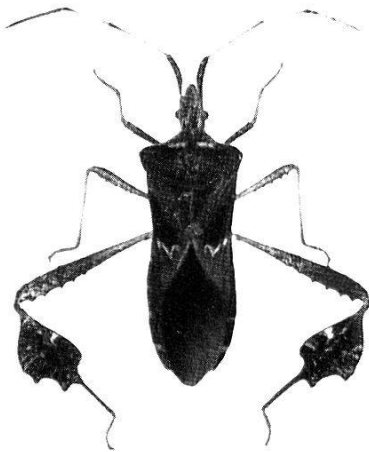
fruits

Immature to half-ripe fruits fall off, their skin showing numerous dark sucking punctures.

Leptoglossus zonatus Dall.

HETEROPTERA; Coreidae

529



Straight-sided, dark brown to reddish-brown plant bug, about 20 mm long, with a black membrane. The tibiae of the hindlegs are broad and flat, shovel-shaped. The bugs suck from young fruits.

Distribution: California, Mexico, South America

530



Shoots, leaves and peduncles covered with white fluffy bodies. Leaves with discoloured patches and misshapen. All attacked plant parts heavily infested with sooty mould, the development of these parts severely impaired. Fruit and leaf-shedding.

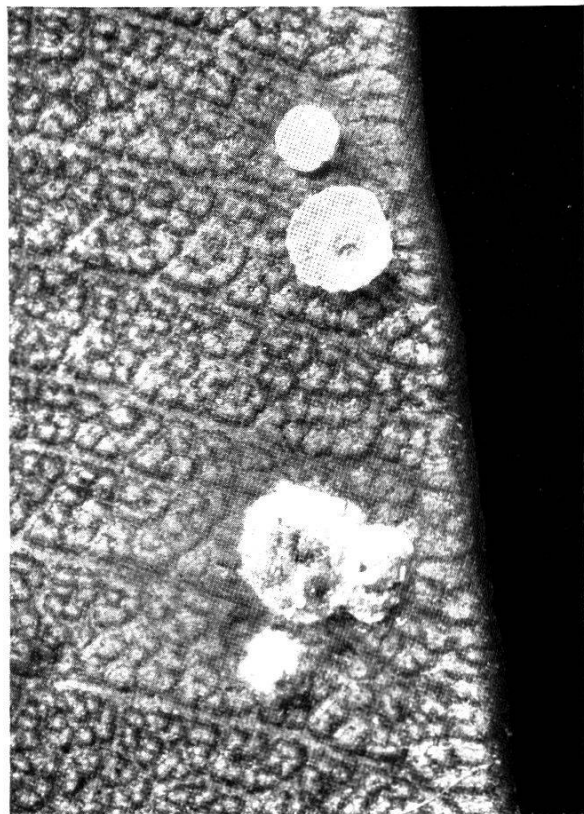
Planococcus citri Risso
Citrus mealybug.

HOMOPTERA; Pseudococcidae

Yellowish-brown to orange-red, elliptical mealybug, 3 mm long, covered with a white, mealy, waxy secretion. The marginal waxy appendages are short. The eggs are wrapped up in a loose waxy web. The forewings of the male are hyaline, iridescent blue, longer than the body. There are two halteres on the metathorax. The caudal filaments are very long. The male is about 1-1.5 mm long. The female larva has 4 moults, the male 5. They attack shoots, leaves and fruits (near the stalk) and transmit virus diseases. Several generations.

Distribution: widespread in all Citrus growing areas.

00, 349, 386
23, 692, 779
873



Lemons preferred. Fruits wrinkled and stunted.

fruits

Aspidiotus hederac Vall.
Oleander scale.

HOMOPTERA; *Diaspididae*

531

Scale of adult female subcircular, flat to moderately convex, yellowish-white to greyish-white, 1.5-2.5 mm in size. The yellow exuviae are central. The female body under the scale is pear-shaped to subcircular, lemon-yellow. Several generations. *A. hederac* also attacks olives.

Distribution: Mediterranean region and Tropics and Subtropics



Leaves and fruits beset with dark round scales, areas around the scales discoloured. Skin of fruits, when heavily attacked, mottled and partly decayed.

Chrysomphalus dictyospermi Morg.
Dictyospermum scale.

HOMOPTERA; *Diaspididae*

532

Flat, round, reddish-brown scales, about 2 mm in size. The dark brown larval exuviae are in the centre. The female body under the scale is yellow, pear-shaped. Several generations.

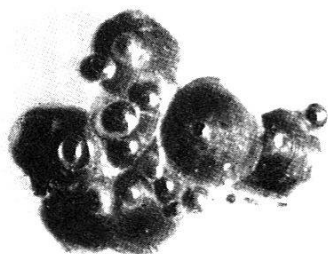
Distribution: Mediterranean region, South America

fruits

Leaves turn yellow, become brittle and fall off. Fruits beset with scales, misshapen and mottled. Reluctant growth of trees.

Chrysomphalus ficus Ashm.
Florida red scale.

HOMOPTERA; *Diaspididae*



533

570

Scale of the adult female circular, convex and brownish-black, 1.8-2.2 mm in diameter. The exuviae are brown to crimson, central or slightly excentric and about 0.6 mm in diameter. The female body under the scale is pale yellow, flat and broad, pear-shaped. Several overlapping generations a year.

Distribution: widespread

Fruits and leaves infested with dark, spherical scales, flecked with light dots. Fruits often wrinkled and misshapen.

Chrysomphalus pinnulifer Mask.
Black scale.

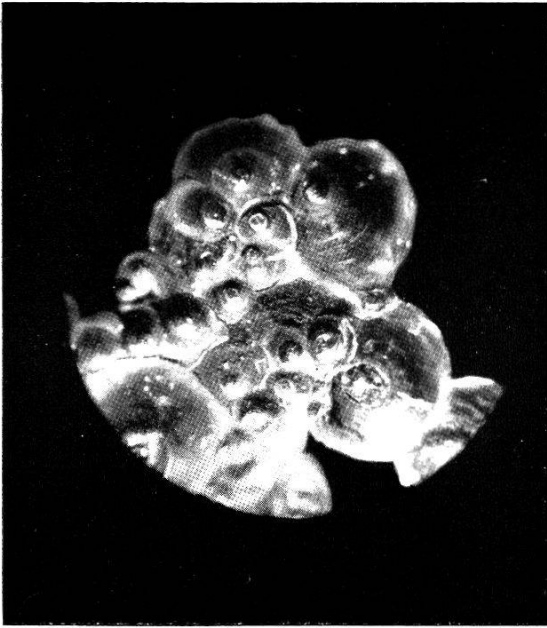
HOMOPTERA; *Diaspididae*



534

Scale of adult females: reddish-brown to brown, almost spherical, flattened towards the edge, 1.8-2.2 mm in diameter. The exuviae are brown to grey, the first often lighter than the second. The body of the females under the scale is pear-shaped and lemon-coloured.

Distribution: widespread throughout the Tropics and Subtropics and the Mediterranean region



Leaves turn yellow, become brittle and fall off. Fruits mottled and shrivelled. Shoots and twigs withered. All plant parts except roots infested with scales. Lemons preferred.

fruits

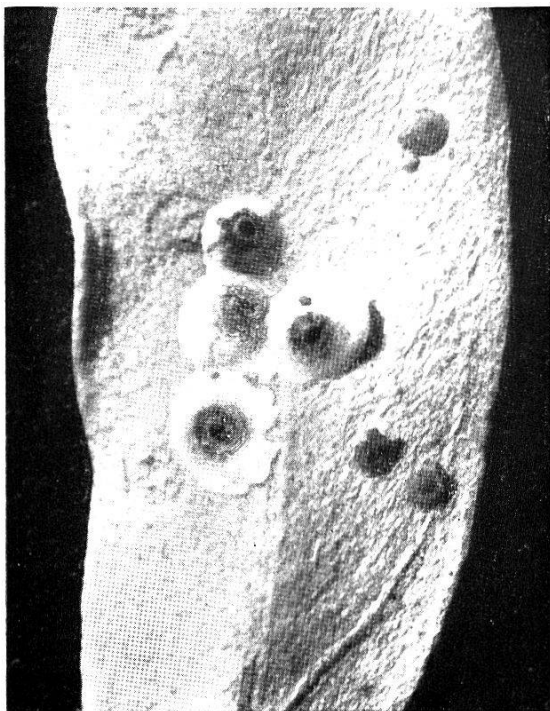
Aonidiella aurantii Mask.
California red scale.

HOMOPTERA; *Diaspididae*

535

Scale of the adult female circular, flattened, almost transparent, pale yellowish-grey or pale ochrous or reddish, 1.6-2.1 mm in diameter. The exuviae are borne centrally; they total 0.2-0.9 mm in diameter. Scale of the male pupa 1-1.3 mm long and 0.5-0.6 mm broad, reddish-brown. The female body under the scale is pear-shaped, pale yellow to orange-red. The cephalothorax is very large, the rear end expanding into a lobe. The red female insect shows through the thin scale. Several, up to 5, generations a year.

Distribution: Mediterranean region, Africa, India, Far East, Australia, Southern U.S.A., South America



Leaves and fruits beset with round, pale scales. Malformation and discoloration of infested portions of plants.

Selenaspidus articulatus Morg.
West Indian red scale.

HOMOPTERA; *Diaspididae*

536

550

Round, whitish-grey scales, 2 mm in diameter, with reddish-brown, central or ex-centric exuviae. The body of the female under the scale is pear-shaped, pale yellow, with distinct grooves on the sides.

Distribution: widespread throughout the Tropics and Subtropics

fruits

Fruits and leaves with small black spots.

Parlatoria ziziphi Luc.
Citrus parlatoria.

HOMOPTERA; *Diaspididae*

537



Scale of adult females flat, black, consisting mostly of exuviae. The posterior end bears a pale greyish-brown appendage, 1.5-2 mm long. The female body under the scale is egg-shaped, pale purplish with a lateral, round protuberance.

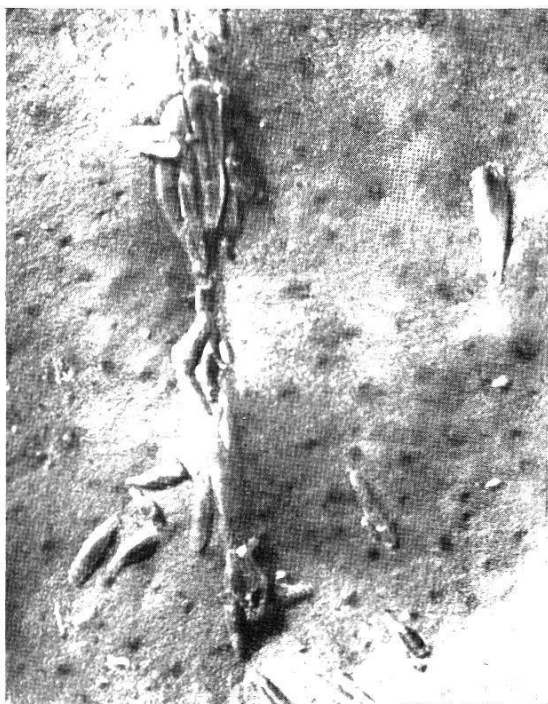
Distribution: widespread wherever Citrus trees are grown

Ligneous shoots, leaves and fruits infested with long, straight or slightly curled scales. Leaves with discoloured, leathery patches, falling off. Fruits also mottled with pale patches.

Lepidosaphes gloverii Pack.
Long scale.

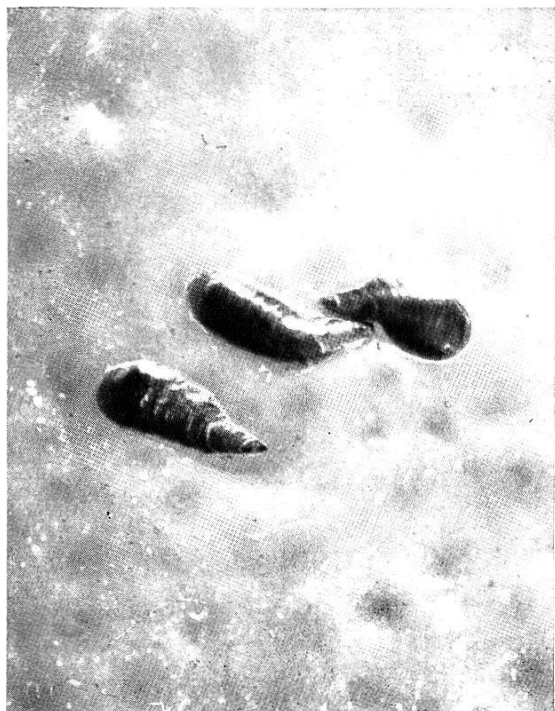
HOMOPTERA; *Diaspididae*

538



Scale of adult females long and narrow, straight or curved, brownish-yellow to brownish, 2.5-3.5 mm long, with yellowish-brown exuviae at the front end. The scales of the male pupa are 1.5 mm long, straight, pale yellowish-brown with white, flattened edges. The body of the female under the scale is elongate, about as broad at the rear as at the front end.

Distribution: widespread throughout the Tropics and Subtropics and the Mediterranean region



Shoots, leaves and fruits beset with mussel-shaped scales. Leaves curl up, become misshapen and fall off. Fruits become mottled and stop growing. Shoots wither.

fruits

Lepidosaphes beckii Newm.
Purple scale.

HOMOPTERA; *Diaspididae*

539

Scales of the adult female are brown, mussel-shaped, elongate, curved, narrow in front and broadened behind, 3-3.5 mm in size. The larval exuviae are reddish-brown to yellowish-brown, borne at the front end; both exuviae total about 1.5 mm in length. The female body under the scale is elongate, about 1.5 mm long, yellowish-white. 2-3 generations a year.

Distribution: practically wherever Citrus fruits are grown (Africa, U.S.A., Central and South America, Indonesia).



Leaves, fruits and shoots covered with mussel-shaped scales.

Unaspis
ganonensis Kuw.
Yanon scale.

HOMOPTERA;
Diaspididae

540

Scale of adult females dark brown, elongate mussel-shaped, about 3 mm long. The yellow exuviae are at the front end. The female body under the scale is fairly elongate, pear-shaped, yellow to reddish-yellow.

Distribution: China, Japan

fruits **Leaves dull and slightly curled up. Fruits pale, mottled white and eventually rusty-red to brown, hardened. Market value of fruits reduced; growth of fruits and foliage checked.**

Phyllocoptruta oleivorus Ashm.

Citrus rust mite.

ACARINA; *Tetranychus*

541 Yellow to yellowish-brown mite, about 1 mm long, elongate lancet-shaped, about 3 times longer than broad. The cephalothorax is smooth, the abdomen striated. The eggs are laid in clusters on the leaves or fruits. The larvae become adult within about 8 days. Both larvae and adults burrow into the superficial tissue of leaves and fruits and cause a russeted appearance. Peak in June/July. Development period of one generation: 8-12 days. Several generations.

Distribution: Africa, Japan, Australia, U.S.A., Central and South America
