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COMMON PESTS OF SUMMER FRUIT IN WESTERN AUSTRALIA



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By Members of the Deciduous Fruits Project

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CONTENTS

	Page
Aphids	3
Lightbrown apple moth	4
Carpophilus (driedfruit beetles)	5
European earwig	6
Heliothis	7
Mediterranean fruit fly	8
Bryobia mite	9
Fruit-tree pinhole borer	10
Rutherglen bug	11
Scales	12
Spring beetle	14
Cherry slug and pear slug	15
Snails	16
Thrips	17
Two-spotted mite	18
Weevils	19
Wingless grasshopper	21
References	22
Spray Diary	23

APHIDS (*Aphididae*)

There are several species of aphids in Western Australia associated with summer fruit. These include green peach aphid (*Myzus persicae*), black peach aphid (*Brachycaudus persicae*).

Pest size:	Adult from 1 to 3mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	Several generations per year
Similar to:	Other aphid species

Damage

Large populations of aphids can cause leaf yellowing or distortion and stunting of buds. They exude large quantities of sticky honeydew that often turns black with sooty mould. Damage to buds and blossoms may reduce fruit set. Aphids will also attack new fruit and leaves causing them to fall. Damaged leaves become twisted and blackened. Young laterals twist and cease to grow reducing the fruiting wood for the following year. Severe aphid damage to a young tree can result in permanent distortion to the framework of the tree.

Description



Green Peach Aphid, adult and nymphs
© Dept. of Primary Industries Queensland

There are green, yellow, brown, red and black aphids. All are pear shaped with long legs and antennae. They have a pair of tubular cornicles projecting from the rear end of their body that distinguishes them from all other insects. Adult

aphids are generally wingless but most species have a winged form when populations are high. They are soft bodied and have needle like sap-sucking mouthparts. They usually feed in dense clusters on leaves and stems. Aphids are slow moving and do not disperse rapidly when disturbed

Life history

Aphids give birth to live young and populations can increase rapidly if food is plentiful. They can become reproducing adults in less than two weeks. Aphids do not have a dormant phase and there are several generations in a year. They are most abundant during late winter and spring. Winged aphids can fly over short distances but are transported mainly by wind currents over long distances.

Control

- Predators such as ladybird, lacewing and hoverfly larvae can rapidly reduce a moderately sized aphid population.
- Regularly monitoring leaves will provide an early indication of infestation and the presence of natural enemies.
- Some species of small wasps lay their eggs inside aphids. A larva hatches and develops by consuming the aphid. It spins a cocoon inside the host, pupates and emerges as an adult. The parasitised aphid appears bloated and turns a pale gold or bronze colour. It is known as a mummy.
- Predators and parasites should be encouraged by the use of aphicides (such as pirimicarb) which are less harmful to beneficial agents.
- In humid weather, whole colonies of aphids can be killed by fungal pathogens. Aphids killed by fungal disease turn reddish brown and have a furry, shrivelled texture.
- If chemical control becomes necessary, registered chemicals include; carbaryl, diazinon, dimethoate, imidacloprid, maldison, methamidophos, methomyl, parathion-methyl, petroleum oil, pymetrozine and pirimicarb.

LIGHTBROWN APPLE MOTH

(*Epiphyas postvittana*)

Lightbrown apple moth (LBAM) is native to Australia and is a pest of a number of horticultural crops. In summer fruit the larvae can often be seen in the centre of fruit clusters which they stick together with web to provide protection.

Pest size:	Larvae up to 20mm - Adult 10mm long with 18mm wingspan
Importance:	Minor but can be major in some seasons and some areas
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	About 3 generations commencing in spring
Similar to:	Heliothis (native budworm)

Damage

The caterpillar chews and skeletonises leaves of summer fruit usually low down in the centre of the tree. Damaged leaves look ragged and are often in webbed clusters. LBAM caterpillars also feed on the surface of ripening fruit where fruits are touching or in contact with leaves. Gumming occurs on damaged summer fruits and injured areas callous over or allow entry of rotting organisms.

Description



LBAM larva

© Natural Resources and Environment Victoria



LBAM adult female

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Adult females can lay up to 30 flat green and yellow eggs that are glued together in a raft. Newly hatched larvae are pale yellow and mature larvae are light green with a pale brown head. The larvae are very active and grow up to 20mm long. The moth has a wingspan of about 18mm and is yellowish brown. The forewings are slightly darker towards the tips which gives the moth a tent like appearance when at rest. Pupae are 10mm long, brown and usually found in the loose webbing of the shelters.

Life history

The eggs are usually laid as an egg mass or a raft on the upper surface of leaves, stems or fruit. After emerging, the larva builds a shelter by rolling a leaf lengthways and webbing its edges together. Leaves may also be webbed together or joined to fruit. The larvae feed within these shelters and act vigorously when disturbed.

Control

Azinphos methyl, *Bacillus thuringiensis*, carbaryl, fenthion, parathion-methyl, permethrin and chlorpyrifos products are registered for the control of LBAM on summer fruit in WA.

CARPOPHILUS (driedfruit beetles)

Carpophilus, commonly known as driedfruit beetles, are a worldwide pest of both pre- and post-harvested fruits and grains. Adults are known carriers of the fungal disease brown rot.

Pest size: Larvae 5mm and adults 3mm long

Importance: Low to moderate for direct fruit damage; high as a carrier of brown rot disease

Distribution: All of WA

Varieties attacked: All

Seasonal history: 3 to 5 generations per year

Similar to: Other small beetles but Carpophilus has short wing covers

Damage

Carpophilus will attack fruit as they ripen. They are particularly attracted to fruit that has split stones or cracks, but they will attack sound fruit. The beetles burrow into fruit, normally at the stem end, or enter through previously damaged areas caused by stone splitting or cracking. Spores of the brown rot fungus are carried on the insect's body and infect fruit as the beetles move about in the orchard.

Description



Adult Carpophilus beetle

Adult Carpophilus can be black brown or mottled and are only about 3mm long when mature. Adults have wings and can fly well and have distinctive club shaped antennae. The larvae reach about 5mm when fully developed and have a yellowish body with a brown head.

Life history

Adult females lay eggs in rotting and damaged fruit on the orchard floor. Larvae grow in the decaying organic matter and fruit on the orchard floor until they are mature. Then they emerge and pupate in the ground. Adults attack fruit in late spring and summer. Carpophilus over-winter as adults under tree bark, in tree cracks or in mummified fruit.

Control

Good orchard hygiene is the best way to control Carpophilus. By removing all rotting and mummified fruit from the orchard there is little food available for the pest to breed. This pest has a wide food source, so hygiene needs to be maintained for other fruit types such as pomefruit, citrus and figs that may be within flying distance of a summer fruit orchard.

- Carbaryl is registered as a ground spray and can be used to treat fruit on the ground.
- Bifenthrin and fipronil can be used for one application per season

EUROPEAN EARWIG

(*Forficula auricularia*)

European earwigs are a recent discovery in Western Australia. They are nocturnal and feed on a variety of pests such as aphids, mites and nematodes as well as algae, fungi and decaying plant material. However, they can also damage flowers, shoots, leaves and fruit of summer fruit trees, canola, vineyards and a range of vegetables

Pest size:	Adults 12 to 20mm
Importance:	Minor in most areas
Distribution:	South-West of WA
Varieties attacked:	All
Seasonal history:	2 to 3 generations
Similar to:	Native Earwig species

Damage

European earwigs chew holes in leaves. Damage to fruit sometimes is shallow and irregular

Description



European earwigs, adult male (left) and female (right)

The body is glossy dark brown with pale yellow legs, pincers and 'shoulders'. Early stages are similar in shape to adults but are smaller and paler. Eggs are smooth, white, oval shaped and are approximately 1mm long and 0.8mm wide but become brown and kidney shaped before hatching.

Life history

Eggs are laid in tunnels in the topsoil and take 2-3 weeks to hatch. The adult stage is reached in 9 to 10 weeks at 25°C. Adults have wings but rarely fly. Mating occurs soon after adult development with the first eggs being laid in 11 days. Hatching occurs in 2-3 weeks.

Control

European earwigs are difficult to control with contact insecticides. Control methods include:

- Chlorpyrifos: mixed with vegetable oil and used in cracked wheat or sorghum bait.
- Carbaryl: applied as a residual spray.
- Pyrethrins as a contact spray when pests are active
- Traps, flat boards or rolled newspapers placed beneath trees can be used to either trap or monitor earwigs. The traps can be placed in a sealed black plastic bag in the sun for a day to kill the earwigs.
- Birds such as chickens, bantams and guinea fowl help reduce numbers

HELIOTHIS (*Helicoverpa* spp.)

The two species of *Heliothis*, the native budworm (*H. punctigera*) and the cotton bollworm, corn earworm or tomato grub (*H. armigera*) are almost identical in appearance. In summer, both *Heliothis* species are found in summer fruit orchards in the south of the State.

Pest size:	Caterpillars up to 40mm - Adult 20mm long with 40mm wingspan
Importance:	Minor but can be major in some seasons.
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	Up to 10 generations in warm areas.
Similar to:	Young larvae are similar to lightbrown apple moth

Damage

Heliothis are mainly a problem on the growing tips of young trees. Their greatest threat is from late spring to mid summer. Caterpillars feed on flowers, new shoots and newly set fruit causing flower fruit drop and holes in fruit. On young trees caterpillars often chew out the growing point of leaders so extra training is required later.

Description



Heliothis larva



Heliothis adults
Helicoverpa armigera (left)
and *Helicoverpa punctigera* (right)

Heliothis eggs are dome shaped, white and 0.5mm in diameter. The caterpillars are shades of orange, brown and green and usually have tufts of hair and dark and light stripes along the body. But these features are not as obvious on lighter coloured grubs. Adult moths grow to about 20mm in length and are pale brown, with a distinctive dark patch on the end of the second wing pair.

Life history

Heliothis moths lay small white eggs on fruit or soft growth tips. Caterpillars emerge in about a week and feed for about three weeks before pupating in the soil. The pupal stage lasts only a few days in summer.

Control

- There are several parasitic flies (tachinids) and wasps that attack *Heliothis* caterpillars. Small wasp parasites (trichogramma) of *Heliothis* eggs are commercially available. Predatory bugs and lacewing larvae can also reduce *Heliothis* numbers.
- The insecticides methomyl, maldison, pyrethrins, rotenone, and carbaryl are registered for the control of *Heliothis* on summer fruit.

MEDITERRANEAN FRUIT FLY **(Medfly) (*Ceratitis capitata*)**

The Medfly is a major pest of many fruit and vegetable crops worldwide. In Western Australia the main areas of infestation are from Carnarvon to Bunbury where it is one of the most significant insect pests of summer fruit. Without control they are capable of destroying entire fruit crops.

Pest size:	Larvae up to 8mm – Adult from 3 to 5mm
Importance:	Major in main infestation areas
Distribution:	Most horticultural areas in WA except Ord River Irrigation Area
Varieties attacked:	All
Seasonal history:	4 to 5 generations per year
Similar to:	Other fruit flies (e.g. Queensland Fruit fly)

Damage

Larvae tunnel into the pulp of fruit where their activity may cause the fruit to completely decompose. Fruit drop early and are completely unsaleable.

Description



Adult Medfly

Adult Medfly are slightly smaller than the common housefly. The body is usually yellow or light brown and the wings are mottled, with

black and white near the apex and brown bands extending to the wing tips. The abdomen is encircled with two light coloured rings, while the thorax (middle) has black patches surrounded by silver. Eggs are creamy white while larvae are white with a flat pointed head. Pupae are barrel shaped, brown and about 4mm long.

Life history

Adult females insert eggs in ripening fruit. One female can lay up to 1000 eggs. Larvae hatch in 2 to 4 days in summer and 20 days in winter. Maggots (larvae) quickly burrow into the fruit where they feed for between 14 to 16 days in summer and 25 to 45 days in winter. Larvae drop out of the fruit and burrow into the soil to pupate. Adults emerge between 12 to 50 days depending on temperature.

Control

Two main methods of chemical control are recommended. These can be used independently but are more effective when used together.

- Foilage baiting – maldison and trichlorfon are registered and can be used with a suitable lure such as protein hydrolysate, protein autolysate or sugar.
- Cover Spraying – dimethoate, trichlorfon and fenthion are currently registered for use as a cover spray.

BRYOBIA MITE

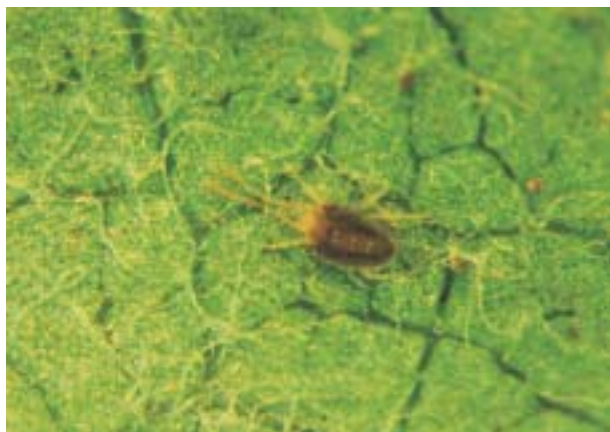
The presence of high numbers of bryobia mite is an indication of minor pesticide use as there are fewer natural enemies compared to two-spotted mite. These natural enemies would reduce the numbers of two-spotted mite, but not control bryobia mite. Like two-spotted mite, bryobia mite can cause significant damage to fruit trees if their numbers get too high, eventually resulting in defoliation of the tree.

Pest size:	Adults 0.6mm – can just be seen by eye
Importance:	Major in some seasons
Distribution:	South-west of WA
Varieties attacked:	All
Seasonal history:	Many generations per year
Similar to:	Other mites such as two-spotted mite and predatory mites

Damage

The mites feed on the leaves by piercing cells and sucking the sap. They feed at night on the upper leaf surface, returning to sheltered areas by day. Feeding sites appear stippled, paler than surrounding undamaged areas. Feeding by bryobia mites does not result in the leaf bronzing associated with two-spotted mite attack. Leaves that are attacked have reduced photosynthetic ability and with many leaves attacked, trees become weakened.

Description



Bryobia mite adult

The eggs are smooth, spherical and red. The eggs hatch to produce red six legged mites, which moult to eight legged nymphs. All adults are females and are grey-red, with orange legs. They are oval in shape and somewhat flattened on top with a flanged edge. Adults are about 0.6mm long, with the front pair of legs longer than the others and held out in front of the head like antennae. Bryobia mites do not make webbing.

Life history

Bryobia mite over-winters as eggs in protected situations such as rough bark and the crotch of trees. Overwintering eggs are often laid in masses. Adult females can lay up to 30 eggs which are normally laid singly during the season, on the lower leaf surface. The eggs hatch in spring, so unlike two-spotted mite, infestation of trees can occur much sooner after bud burst. The life cycle can be completed in 3 weeks to a month depending on temperature. There are many generations in a year.

Hot, dry conditions suit infestations of bryobia mite. The predatory insects and mites that attack two-spotted mite are not very effective in reducing bryobia mite numbers.

Control

- Monitoring bryobia mite populations is essential to avoid unnecessary spraying and to apply sprays at the correct time.
- Biological control with naturally occurring beneficials provides minor mortality
- Note hot spots and apply oil during winter to kill over-wintering eggs
- Insecticides containing azinphos methyl, miticides containing dicofol and spraying oils are registered for use against bryobia mite as foliar sprays.

FRUIT-TREE PINHOLE BORER

(Ambrosia beetle, *Xyleborus saxeseni*)

The fruit-tree pinhole borer is a native insect that does not usually attack healthy trees. They are known to cause damage to trees suffering stress from waterlogging, drought or disease. Mated females bore tunnels through the bark and into sapwood and heartwood. The adults and larvae feed on the yeast-like ambrosia fungi that grow on the faeces of larvae and on the tunnel walls.

Pest size:	Adults 2.5mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	3 generations per year
Similar to:	Other small beetles

Damage

Tunnelling by borer larvae and adults can cause fungal infections in summer fruit trees. The beetles bore into the trunk leaving fragile spines of frass which stick out of the trunk like tooth picks. The foliage of declining trees becomes yellow, followed by rapid leaf browning and tree death. Apricots and plums are the most susceptible trees.

Description



Adult fruit-tree pinhole borer

Xyleborus saxeseni

© Natural Resources and Environment, Victoria



Pinhole borer damage

© Natural Resources and Environment, Victoria

Adult fruit-tree pinhole borers are about 2.5mm long, cylindrical, dark brown with yellowish body hairs and a short head that appears to tuck into the thorax.

Life history

Females emerge after winter and lay eggs on the sides of tunnels. When larvae hatch they bore into the surrounding wood. Adults can emerge in 2 months under favourable conditions and there can be up to three generations in a year. Pinhole borers overwinter as mature larvae or as newly emerged adults.

Females generally fly at temperatures above 21°C. Most beetles emerge on warm days following a cool period.

Control

There are no chemicals registered for the control of fruit tree pinhole borer on summer fruit. Maintaining tree health is the best preventative measure.

RUTHERGLEN BUG (*Nysius vinitor*)

The Rutherglen bug is a native insect widely distributed throughout Australia. It has a wide range of hosts including many vegetable and fruit crops and weeds. Damage occurs mainly in summer when weed hosts have dried off.

Pest size:	Adults 4 to 5mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	3 to 5 generations per year
Similar to:	Small flies

Damage

As weeds dry off in hot weather Rutherglen bugs move in swarms and settle in thick clusters on summer fruit. They suck the sap from fruit and young foliage. This causes thin strings of clear gum to hang down from green fruit, which shrivel, and do not mature. Damaged sections of near ripe fruit become dry, leathery and look green in comparison to the rest of the crop. Young foliage wilts rapidly. Plant material will turn grey with the bug's excrement.

Description



Adult Rutherglen bug and nymphs

Rutherglen bug eggs are about 1mm long and cream, changing to amber as they mature. Female adults are about 4 to 5mm long, grey-brown with prominent black eyes and a narrow body. The males are slightly smaller and darker. Both sexes have typical bug wings that crossover and are flat when at rest. The wings are silvery in colour. All stages of Rutherglen bug have a foul smell.

Life history

Eggs, usually in clusters of six, are laid in the flower heads of weeds or in ground litter. The initial eggs in early spring come from females that have overwintered in weeds and plant litter. Females can lay up to 400 eggs that hatch into nymphs after about a week. The life cycle from egg to adult takes about 4 weeks. When the weeds dry off or are removed in late spring swarms of adults and nymphs move onto fruit trees. They are most numerous in dry spring weather following a wet winter.

Control

- Weather plays an important role in controlling Rutherglen bug populations. Heavy rain in spring can significantly reduce numbers. Warm humid conditions, promote the development of fungal pathogens that may destroy many bugs.
- Good weed control removes breeding areas and kills overwintering adults. Rutherglen bugs do not breed in cover crops. Leguminous crops planted between rows of trees can reduce overwintering and breeding sites.
- Some chemical products containing maldison, trichlorfon, dimethoate, pyrethrins, piperonyl butoxide and trichlorfon are registered for the control of Rutherglen bug on summer fruit.

SCALES

'San Jose', 'frosted', 'soft brown' and 'red' are some common scale pests of summer fruit. Scales are sap-sucking insects which are categorised as either hard or soft. The outer covering of a soft scale is more integrated with its body than that of a hard scale which can be easily lifted to expose the insect beneath.

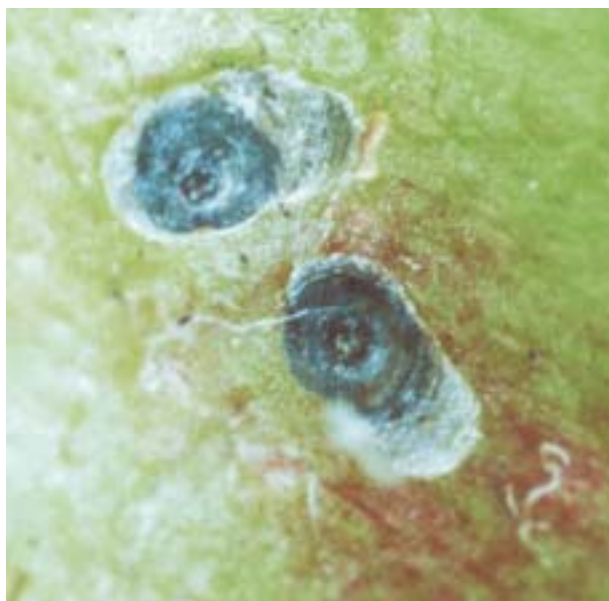
Pest size:	Varies depending on species - 2 to 4mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	1 to 2 generations per year
Similar to:	No other pests

Damage

Summer fruit trees with a heavy infestation of **hard scales** often appear water stressed. The leaves turn yellow and fall, twigs and limbs die and the bark cracks exuding gum. Secondary fungal infection can result. Crawlers can cause a halo-like red discolouration on fruit and a bright red mark under the bark of tender wood.

Soft scales rarely kill trees but can reduce tree vigour. The main problem is that they produce honeydew on leaves and fruit that encourages the growth of black sooty mould and attracts ants.

Description



San Jose scale adult

San Jose Scale (*Quadraspidiotus perniciosus*)

Immature male and female scales (crawlers) are yellow and appear identical. After they moult the body of the male starts to elongate and they become crawlers. When the crawlers feed they secrete a white waxy material that eventually turns black. At this stage the insect moults. At the first stage of nymph they are uniformly dark colour without irregularities. Adult scales are dark grey to black, circular and have a raised central 'nipple'. The body under the shell is yellow. Mature females are about 2mm in diameter. Males moult four times, after which they emerge as winged, yellow adults.

Frosted Scale (*Eulecanium prunosum*)



Frosted scale adults

Young scales emerge from eggs. Fully-grown scales are oval and flattened, 2 to 5mm long by 3mm wide. They have a tough brown skin, which is covered with white, powdery wax.

Soft Brown Scale (*Coccus hesperidum*)



Soft Brown Scale adult



Soft Brown Scale adult and crawlers

Female soft brown scales lay a few eggs at a time during summer. Mature scales are 2 to 4mm long, flat and usually pale yellowish brown tinged with green.

Red Scale (*Aonidiella aurantii*)



Red scale adult

The female gives birth to living young. The scale cover of the female is hard, circular, about 1.5mm across and dull, red-brown. The male scale is small, grey and narrower than the female. They are rarely seen. A mature male has a single pair of wings and a tufted 'tail'. It leaves its covering at about 8 weeks of age.

Life history

Most soft scales have one generation each year whereas most hard scales have several. Soft brown scales are an exception. Some scales can develop eggs without fertilisation (parthenogenesis) and female scales may either

lay eggs or give birth to living young. Others mate when the adult male emerges from its covering. Eggs are hidden under the female's cover.

They hatch into tiny yellow crawlers with well-developed legs and antennae. Crawlers may spend a brief time under the female after birth, particularly if the weather is cold. Crawlers disperse by walking, wind, people or birds. Some walk from the tree butt to the upper limbs depending on the surface, temperature and humidity. Often they settle near or beneath the parent scale. Eventually the scale settles, moults, inserts its mouth parts into plant tissue and draws its legs underneath. The wax-like covering is then produced. Some soft scale species move again in autumn to a position where they can overwinter. Many scales may be found under loose bark where they are well protected.

Hard scales usually settle down after a day or two while soft scales remain mobile for longer. Adult female scales are immobile and have a characteristic scale cover. Adult males are minute and winged. They resemble tiny parasitic wasps. They only live for a few hours, do not feed and are seldom seen. Adults are spread mainly by the transport of infested trees, fruit and packing.

Control

- Check summer fruit trees in winter when there are no leaves. Hard scales overwinter mainly as first stage nymphs and adult females. Soft scales usually overwinter as second stage nymphs. During the growing season trunks should be inspected for ants which may indicate a soft scale infestation.
- If chemical control is required, use winter spraying oil combined with azinphos-methyl, diazinon, methidathion, or chlorpyrifos. The spray should be applied during dormancy up to early budswell.

SPRING BEETLES (*Melolonthinae spp.*)

Pest size:	Adults 5 to 10mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	Several generations per year
Similar to:	No other pest

Description



Spring Beetle adult

Spring beetles are native insects that usually breed in bush areas. The larvae are typical of cockchafers with strong forelegs and a curled 'C-shaped' body. The last abdominal segments of mature larvae are grey-black. Adult Spring beetles can range in length from 3 to 10mm. Their wing covers can be black, brown, bronze or shiny blue-green. They have well-developed legs that enable them to cling to the tops of young trees. Their hind legs can be seen protruding beyond the abdomen. Spring beetles are strong fliers over short distances and appear in swarms during warm weather following rain.

Damage

Spring beetles can seriously affect summer fruit yield by chewing young growing shoots, leaves and flowers in spring and early summer. This pest is usually only active for two to three weeks.

Life history

The eggs are laid on the ground and the young larvae live on the roots of plants. The larvae pupate in soil cells and emerge in spring as adults when rain softens the soil. The adults swarm and cluster on foliage. Most adults are active either at dusk or at night.

Control

There are no chemical treatments registered for the control of spring beetles on summer fruit trees. Ploughing pasture or weeds in early winter to destroy the habitat of larvae may be beneficial in some situations.

CHERRY SLUG AND PEAR SLUG

(*Caliroa cerasi*)

Pest size:	Larvae 5 to 10mm
Importance:	Minor
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	Several generations per year
Similar to:	No other pests

Description



Pear slug larva on leaf and characteristic feeding injury.

The cherry and pear slug larva is the immature stage of a sawfly wasp. The slug shaped larvae are about 10mm long and are covered with a dark green slime that may lighten in colour with age. The head end of the pear slug is distinctively broader than its tapering tail. The larvae develop into glossy black wasps, 6 to 8mm long with two pairs of wings.

Damage

The larvae eat the upper surface of leaves causing a lacy, skeletonised injury in the area between the main veins. The chewed areas on leaves turn brown and heavily damaged leaves fall prematurely. They can defoliate an entire tree. Damage occurs in warmer areas in November to December and in cooler areas from January to February.

Life history

Cherry slugs over-winter underground as pupae. The adults emerge in late spring, mate and lay eggs in slits they cut in the leaf. The larvae emerge from early summer to autumn. They feed on leaves and reach maximum size in about 3 weeks after which they pupate in the ground. The adult wasps emerge from the pupae. Two generations occur in a year.

Control

- Cherry and pear slugs are often controlled, as a result of measures taken against heliothis caterpillars and other pests on summer fruit trees.
- Some product brands of azinphos methyl, carbaryl, mancozeb, piperonyl butoxide and pyrethrins are registered for use on summer fruit against cherry and pear slug.

SNAILS

Two pest species of snails in Western Australia are the common garden snail (CGS) and small pointed snail (SPS).

Pest size:	Mature snails - CGS – 30mm shell diameter; SPS – 10mm shell length.
Importance:	CGS – moderate; SPS – minor.
Distribution:	South-west WA
Varieties attacked:	All.
Seasonal history:	1 to 2 generations per year
Similar to:	Other snail species

Damage

The snails are associated with minor leaf feeding, very occasionally feeding on fruit, blocking mini-sprinklers and fouling of fruit by faeces, or snails present on fruit as a contaminant.

Description



Small pointed snail

The small pointed snail is smaller than common garden snail with shell length around 10mm. Snails are paler, with grey and brown markings on the shell. These snails also feed at night and become inactive during summer. They feed on leaves, but are more likely to be a problem because of their presence on fruit rather than feeding damage.



Common garden snail

The common garden snails are large with a shell diameter of around 30mm when mature. The shell has brown and black bands. They usually occur in shady, moist situations and are inactive during the day and less active during the hot dry summer. They feed at night and usually on leaves, but occasionally damage young fruit.

Life history

After spending the summer in a dormant state, the autumn rains trigger activity. The snails lay their eggs in the soil. The young snails first feed on decaying organic matter. Through winter, the snails feed on inter-row plants and after break of dormancy may move into trees to feed.

Control

- Good hygiene on the orchard floor by removing debris, mowing and preventing rank growth of weeds and inter-row cover crops helps to prevent a snail build up.
- Dry barriers such as sawdust and ash act as barriers to slow the movement of snails.
- Applying lime and copper sulphate act as barriers also.
- Copper sheeting is repellent to snails and when used as a trunk band will help prevent snails entering the tree canopy.
- Birds such as ducks, chickens and guinea fowl will reduce snail numbers.
- Baits containing the active ingredients' methiocarb and metaldehyde are registered for use on snails. For best effect, baits should be applied in autumn after rains promote snail activity and before breeding has commenced. When applied in spring, ground floor vegetation is more prolific making the baits less easily found. If applying bait at this time, mow beforehand. Baits are not as effective against small pointed snail.
- Sprays containing copper silicate may be used as a trunk barrier.

THRIPS

There are several thrips species that are commonly associated with summer fruit in Western Australia. However, the plague thrips (*thrips imaginis*) has the most economic significance.

Pest size:	Adults up to 1mm
Importance:	Moderate to high
Distribution:	All of WA
Varieties attacked:	All fruit
Seasonal history:	Several generations per year

Damage

Nymphs feed on the surface of small immature fruit often under the drying calyx or flower. The scars left by their feeding enlarge as the fruit grows and can cause deformity. Thrips can also cause silvering of the fruit prior to ripening. Terminal shoots can be damaged and stop growing. A few dead leaves attached to the terminal and buds growing just back from it give the branch a bushy appearance, are symptoms of thrips damage.

Description

Thrips eggs are cigar shaped, tiny and difficult to see without magnification. There are two pale wingless nymph stages and inactive pre-pupae that have wing buds.

Adult thrips are minute, narrow insects about 1mm long with two pairs of long slender wings fringed with delicate hairs. The wings are not easily seen. Thrips can be yellow, yellowish brown, brown or black depending on the species or their habitat.



Thrips adult (black) and nymphs

Life history

Each female lays 20 to 40 eggs in the upper leaves, buds and flowers, and are opaque through to golden yellow in colour. They feed on leaves and flowers and may pupate in soil. Newly emerged adults are active within 24 hours and can survive for 90 days. Thrips usually over-winter as adults in weeds in the orchard floor. If these sites are disturbed or become dry in spring then the thrips migrate to flowering trees and plants. Here they lay eggs in the soft parts of the host plant such as the shoots, buds and flowers.

Distribution

Thrips occur throughout the State and are easily spread over long distances by wind currents or transportation with horticultural produce.

Control

- Orchard hygiene, weed control and the removal of prunings will reduce sites that harbour thrips.
- Monitor the orchard for thrips as soon as flowering commences. Nymphs are difficult to see without magnification. Adults are easier to see and dislodge by slapping a cluster of flowers onto a white tray or ice-cream container. Flowers may need to be dissected to find nymphs.
- Alternatively flowers can be dropped into methylated spirits (or 60% pure alcohol). Both nymphs and adults will quickly emerge from the flowers.
- Sticky traps are also very effective for monitoring the presence of thrips in an orchard.
- If spraying is necessary, methomyl, tau-fluvalinate and dimethoate are registered for the control of thrips on certain summer fruit crops.

TWO-SPOTTED MITE

(*Tetranychus urticae*)

Two-spotted mites are also known as spider mites or red spider mites. They can cause significant damage to fruit trees if their numbers get too high, eventually defoliating the tree.

Pest size:	Adults 0.5mm – can just be seen by eye
Importance:	Major in some seasons
Distribution:	All of WA
Varieties attacked:	All
Seasonal history:	10 to 20 generations per year
Similar to:	Bryobia mite, predatory mites and fungus mites

Damage

The mites usually feed on the underside of leaves by piercing cells and sucking the sap. On peach trees two-spotted mite commonly feeds on the upper leaf surface. Initial symptoms appear as a light speckle on the leaves. This progresses to grey or yellow mottling and in more severe cases leaf bronzing occurs. Leaf margins may be rolled. Heavy infestations can result in leaf drop that exposes the fruit and branches to sunburn. Fruit may be undersized and uneven in colour and the tree will ultimately lose vigour.

Description



Two-spotted mite adult and egg

Two-spotted mite eggs are tiny, spherical and translucent at first changing to yellow. The first juvenile stage or larva is six-legged and almost colourless at hatching but soon turns greenish brown. The second juvenile stage or nymph has eight legs. Adults are about 0.5mm long and are yellowish-green with a large, dark mark on each side of the abdomen. The females are pear-shaped. The mites become reddish-orange without spots in cooler autumn and winter months prior to over-wintering. Males are smaller than females.

Life history

Adult females can lay up to 70 eggs which are normally laid on the underside of leaves in tangled webbing which helps the mites move around. The eggs hatch in 6 to 10 days depending on the temperature. The life cycle can be completed in 15 to 22 days with many generations in a year. The females over-winter in cooler months in the crotch of a tree, under leaf litter or bark at the base of a tree. Over-wintering mites may also gather under branch junctions or cracks and holes in the tree. Activity resumes in spring when mites move onto nearby weeds or pasture around the base of the tree. If conditions are warm in early spring the two-spotted mites may cause considerable damage. They migrate to the spurs and laterals and feed on the immature blossoms and leaves. Two-spotted mite infestations are worse in hot, dry and dusty conditions.

Control

- Monitoring two-spotted mite populations is essential to avoid needlessly wasting chemical and to get the best from natural predators such as ladybird (*Stethorus sp.*), lacewings, predatory thrips and predatory mites.
- Biological control using commercially produced predatory mites is carried out in the other states.
- Several chemical products are registered for the control of two-spotted mites on summer fruit. Some have specific registration for a particular fruit type so it is important to refer to the product label before use. Chlorfenapyr, clofentezine, dicofol, dimethoate, fenbutatin oxide, hexythiozox, petroleum oil, propargite, pyridaben, tebufenpyrad, and tetradifon are active ingredients used in products registered for use against two-spotted mite.

WEEVILS

There are three species of weevils in Western Australia associated with summer fruit – garden weevil (GW), apple weevil (AW) and Fuller’s rose weevil (FRW). Whitefringed weevil also occurs in summer fruit orchards but is a minor pest. Vegetable weevil may occur also, but is not a pest.

Pest size:	Adult 8mm
Importance:	GW – major; AW – moderate; FRW - moderate
Distribution:	South-west WA
Varieties attacked:	All, but importance differs; GW in nectarines and cherries; AW in cherries; FRW in plums and apricots
Seasonal history:	1 generation per year
Similar to:	Other weevil species

Damage

The soil born larval stage feeds on tree roots and may affect tree health, especially young trees. Adults of all the weevil species scallop leaves. Garden weevil feeds on fruit causing scaring; apple weevil adults can ringbark stems near growing tips resulting in tip death and branching. They can also ringbark fruit stalks resulting in reduced fruit size. FRW adults lay eggs in mini-sprinklers, blocking them. The frass of FRW adults may foul fruit at the stalk end.

Description



Garden weevil adult



Apple weevil adult



Fuller's rose weevil adult

All weevil adults are about 8mm long and flightless. Garden weevil adults are both male and female, but all apple weevil and Fuller’s rose weevil adults are female. Garden weevil adults are grey-brown with a bulbous abdomen and a white band across the end of the abdomen. Apple weevil adults are dark brown. Fuller’s rose weevil adults are grey with yellow bands on the side just behind the head and across the abdomen.

Adults of GW and AW feed at night, while FRW adults can be found feeding during the day.

Eggs of the weevils are not easily found. Garden weevil adults lays egg masses in the soil, apple weevil adults lay eggs singly either on leaves or in the soil. These adults can burrow into soil and may lay eggs deeper than the other weevils. Fuller’s rose weevil lays yellow egg masses on leaves.



Whitefringed weevil adult

Larvae of garden weevil and apple weevil are legless with a brown head. Fuller's rose weevil larvae are legless with a white head.



Vegetable weevil adult

Life history

All three weevil species are considered to have only one generation per year.

Adults of GW emerge in early October and are most abundant in October to early December. Numbers decline after this, but some adults may be found through winter. The species is present mainly as larvae through winter.

Adults of AW and FRW emerge in late November / early December and are most abundant in December. Numbers decline after this, but some adults may be found through winter. The species are present mainly as larvae through winter.

Control

- Digging for larvae near the base of trees will provide an indication of weevil abundance and timing of adults' emergence.
- Regular monitoring by corrugated cardboard bands on tree butts and checking leaves for scalloping will provide an early indication of adult emergence.
- There are no major natural control agents of these weevils.
- GW and AW are controlled by well-timed butt drench with insecticide.
- FRW can be controlled with foliar spraying.
- Sticky trunk bands will exclude GW from the tree canopy, but have less effect on AW and FRW.
- Birds such as chickens and guinea fowl will reduce GW numbers, but have less effect on AW. Their effect on FRW is unknown, but considering that this weevil stays in the tree canopy more than the other weevils, birds would have little effect on FRW control.

WINGLESS GRASSHOPPER

Wingless grasshopper is a minor pest of summer fruit. Young orchards are most at risk from defoliation by this insect.

Pest size:	Adults are 13 to 18mm long
Importance:	Minor
Distribution:	South-west WA, especially the higher rainfall coastal areas.
Varieties attacked:	All
Seasonal history:	Usually 1 generation per year
Similar to:	Plague locust.

Damage

The grasshoppers are associated with leaf feeding, which is most likely to affect the vigour of young trees. Orchards adjacent to pasture are most at risk from damaging grasshopper populations.

Description



Wingless grasshopper adult

The cylindrical eggs are laid in clusters called pods at 1 to 2 cm deep. Each pod contains 10 to 15 eggs each. The eggs hatch and the newly emerged nymphs are the same shape as adults, but are the length of a match head and are dark grey. Nymphs undergo a number of moults to form adults that are 13 to 18mm long. Adults occasionally have wings.

Life history

Wingless grasshopper over-winters as eggs that are usually laid on sandy ridges. They require exposure to low temperatures before development prior to hatching. They hatch from September to November in response to increasing soil temperature. The duration over which hatching occurs can be prolonged due to different aspects of the egg beds and therefore soil temperature.

Nymphs hatching from the eggs take as little as 7 weeks before becoming adults. The small newly hatched nymphs are relatively immobile and rely on prostrate and rosette forming plants for food, for example, capeweed and flatweed. Later nymphal stages are more mobile and disperse from the site of hatching. Most develop into adults by late December.

At around 2 to 3 weeks after becoming adults, wingless grasshoppers mate and females start laying eggs. Females require green feed to achieve maximum reproductive potential.

Control

- Avoid having short open pastures that encourage egg laying.
- Experiments have been undertaken examining the effect of a fungal disease of wingless grasshopper.
- Monitor egg bed areas in September to apply insecticide against the relatively immobile and susceptible first instar nymphs. Hatching may occur over several weeks, repeat spraying may be necessary.
- For the more mobile later nymphal stages of wingless grasshoppers, commercially prepared bran based baits are available. The bait can be applied over the area inhabited by the hoppers, or as a barrier in front of dispersing nymphs. Baits only last for about 3 days, so repeat applications may be necessary.
- Insecticides are registered against wingless grasshoppers mainly for use in pasture. If this insect is a problem, apply insecticides to pasture before invasion of the orchard. Insecticides containing active ingredients, alpha-cypermethrin, carbaryl, chlorpyrifos and esfenvalerate are registered for use on pasture.

Other references

Carpophilus (driedfruit beetles) a pest of summer fruit Farmnote No.56/99
Control of Mediterranean Fruit Fly in Commercial Orchards. Bulletin No.4385, ISSN 1326-415X, Agdex 203/614 December 1999

Control of Mediterranean Fruit Fly in Backyards. Bulletin No.4565, ISSN 1326-415X, Agdex 203/614 November 2002

Pest snails and slugs of Western Australia. Farmnote No.112/94 Agriculture Western Australia

Wingless grasshoppers and their control Farmnote, 62/90 Agdex 622 Agriculture W.A., also available on AgWeb.

Product labels MUST be checked for details.

At the time of writing all chemicals mentioned were registered for use on Summer fruit in Western Australia

