

# Macadamia problem solver & bug identifier

Reprint – information current in 2003



## REPRINT INFORMATION – PLEASE READ!

For updated information please call 13 25 23 or visit the website [www.deedi.qld.gov.au](http://www.deedi.qld.gov.au)

This publication has been reprinted as a digital book without any changes to the content published in 2003. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research:

- Chemical recommendations—check with an agronomist or Infopest [www.infopest.qld.gov.au](http://www.infopest.qld.gov.au)
- Financial information—costs and returns listed in this publication are out of date. Please contact an adviser or industry body to assist with identifying more current figures.
- Varieties—new varieties are likely to be available and some older varieties may no longer be recommended. Check with an agronomist, call the Business Information Centre on 13 25 23, visit our website [www.deedi.qld.gov.au](http://www.deedi.qld.gov.au) or contact the industry body.
- Contacts—many of the contact details may have changed and there could be several new contacts available. The industry organisation may be able to assist you to find the information or services you require.
- Organisation names—most government agencies referred to in this publication have had name changes. Contact the Business Information Centre on 13 25 23 or the industry organisation to find out the current name and contact details for these agencies.
- Additional information—many other sources of information are now available for each crop. Contact an agronomist, Business Information Centre on 13 25 23 or the industry organisation for other suggested reading.

Even with these limitations we believe this information kit provides important and valuable information for intending and existing growers.

**This publication was last revised in 2003. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.**

This information has been made available to assist users to identify issues involved in macadamia production. This information is not to be used or relied upon by users for any purpose which may expose the user or any other person to loss or damage. Users should conduct their own inquiries and rely on their own independent professional advice.

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained in this publication.



Queensland Government



Meat ant damage to leaves



Kretzschmaria disease in root. Note the thin black lines (arrowed), which bound the areas of decayed wood

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## Meat ant damage

**Cause:** Leaf cutting damage by the meat ant *Iridomyrmex purpureus*.

**Identification:** The ants eat uneven, irregular patches out of the leaves. Generally occurs only in drier areas. Note that grasshoppers can cause similar damage.

**Treatment:** The problem is uncommon, and treatment is usually not warranted.

**Prevention:** The problem is generally not serious enough to warrant preventative measures, although monitoring of ant activity and ant nest location may be advisable.

## Kretzschmaria root and trunk disease

**Cause:** The fungus *Kretzschmaria cetrarioides*.

**Identification:** Affected trees are unthrifty and decline slowly, similar to tree decline and trunk canker disease. Infected roots have areas of white wood decay bounded by black zone lines, visible when the bark is removed or sectioned. The black line pattern may also be visible in the heartwood of the trunk. The disease is mainly a problem in wetter areas.

**Treatment:** There is no available treatment.

**Prevention:** The disease is generally a minor problem, and specific preventative measures are not warranted. On newly cleared ground, ensure all tree stumps and major roots are removed before planting. Avoid wounding trunks during orchard operations.

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Severely damaged flower racemes



Eggs on the buds and on the bud stalks



A larva feeding amongst the flower buds of a raceme (actual size about 12 mm long)



Adult moth at rest on a flower (actual size about 7 mm long)

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## Macadamia flower caterpillar damage

**Cause:** Macadamia flower caterpillar *Cryptoblabes hemigypsa*.

**Identification:** Larvae of the flower caterpillar feed on the flower racemes, usually when the flowers are in the bud stage (before the individual flowers have opened). The larvae festoon the raceme with webbing, faeces and the remains of damaged buds. Infestations have the potential to completely destroy all buds on a raceme.

Adult moths are grey, 6 to 7 mm long and with a 14 to 18 mm wingspan. Note that the moths are nocturnal and are generally active only during the first four hours after dusk. Eggs laid on the buds or raceme stalk are white to pale yellow and up to 0.5 mm across (less than half the size of a pinhead). Larvae on hatching are yellow, and less than 1 mm long. As they develop, they become progressively darker and variable in colour from light green to slate grey and when fully grown are up to 12 mm long.

**Treatment:** First make sure that the infestation is serious enough to warrant treatment. More than 90% of racemes need to be infested (60% after August) to make treatment necessary. Where necessary, spray with an appropriate registered insecticide.

**Prevention:** Regularly monitor flowers, particularly in 'hot spots', so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.



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Typical symptoms showing complete destruction of a raceme (unaffected raceme at bottom for comparison)



Close-up of an early infection site showing the blighting of individual buds. Note the grey mould growing on the rachis (central raceme stalk)

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## Raceme blight (grey blight, blossom blight)

**Cause:** The fungus *Botrytis cinerea*.

**Identification:** The fungus is active during periods of showery weather in a temperature range of from 10° to 20°C. It colonises decaying petals within the flowers but can also directly infect flower buds and bud stalks. Infected tissues become brown to dark brown in colour and a grey fuzzy mould growth develops on this tissue. Complete destruction of the raceme can occur where conditions are favourable for the development of the fungus.

**Treatment:** Treatment is generally not warranted, except on occasions in cooler wetter areas such as northern New South Wales. In general, a high proportion of bud and flower damage can be tolerated without causing yield loss. This is because only a small percentage of the many flowers on a raceme need to be maintained to produce an acceptable yield of mature nuts. Where treatment is necessary, spray with an appropriate registered fungicide.

**Prevention:** As the disease is almost totally related to weather conditions, there is little in the way of preventative measures. The only recommendations are to avoid overcrowding by careful planning of orchard density, and hedging (side pruning) and skirting to improve air movement throughout the orchard.

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Typical bronze discolouration of racemes



A range of damaged racemes (three unaffected racemes at bottom for comparison)



Close-up of adult thrips (highly magnified – actual size less than 1.5 mm long)

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## Flower thrips damage

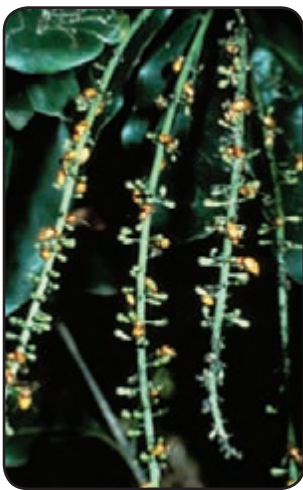
**Cause:** Flower thrips (*Scirtothrips* sp.).

**Identification:** Flower thrips are tiny insects with rasping and sucking mouth parts, which can severely damage flowers, particularly in dry seasons. Feeding causes brown or bronze discolouration and death of flower buds. Adult thrips are tiny (actual size less than 1.5 mm) and not readily visible to the naked eye. Thrips may also affect leaves and nuts – see symptoms on pages 16 and 128.

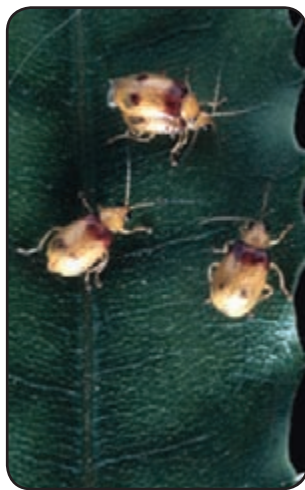
**Treatment:** First make sure damage is serious enough to warrant treatment. A pest consultant can rate the damage and provide advice on treatment. Where necessary, spray with an appropriate registered insecticide. Spray only affected trees and trees in their immediate vicinity ('hot spots'). These are areas within the orchard where the pest is usually found each year. Heavy infestations are often reduced significantly following heavy rain – in these situations, spraying may not be necessary.

**Prevention:** Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.

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Beetle infestation of flower racemes



Close-up of adult beetles (actual size about 4 mm long)



Result of beetle feeding showing the complete destruction of racemes (unaffected racemes at top for comparison)

## Redshouldered leaf beetle damage

**Cause:** Feeding by swarms of the redshouldered leaf beetle (or Monolepta beetle) *Monolepta australis*.

**Identification:** Beetles may completely destroy the young racemes, eating flowers and desiccating others by removing the surface layers. Adult beetles are light yellow in colour with a cherry coloured band across the base of the wing covers and a similarly coloured spot in the middle of each wing cover. Beetles are generally about 4 mm long. The beetles occur sporadically in plague numbers at various times of the year but are most common after rain in spring and summer. Swarms can invade orchards and cause serious damage within 2 to 3 days. Often individual trees or small groups of trees are heavily infested while adjacent trees are largely beetle-free. The problem is more serious in districts where there are large areas of kikuyu or similar pastures. Cadagi gum (*Eucalyptus torelliana*) is particularly attractive to the beetles and can be used as an early indicator of beetle activity. The beetles may also affect leaves – see symptoms on page 22.

**Treatment:** Spray only trees with beetle swarms and trees in their immediate vicinity with an appropriate registered insecticide.

**Prevention:** Monitor orchards carefully, particularly after rain in spring and early summer, so the problem can be treated before it gets out of hand. Be particularly vigilant in orchards adjacent to kikuyu pastures.



Damage to racemes at the bud stage. Note the angled bending of the raceme stalk



Damage to racemes at the flowering stage (unaffected raceme at right)



Field symptom showing complete destruction of racemes

## Feltid coccid damage

**Cause:** The macadamia felted coccid *Eriococcus ironsidei*.

**Identification:** Insect feeding has two main effects: distortion of the rachis (central stalk) of the flower raceme (a good indicator of infestation), and browning and death of the individual flowers on the raceme. Severe damage may also result in the flower stalks being shortened in length, giving the raceme a 'bunched' appearance. Coccids are small (up to 1 mm across) and white to grey in the adult stage. See page 12 for close-ups of the insect stages. The insect gains its name from the felty covering of the adults and pupae. Felted coccid may also affect leaves, branches and nuts – see symptoms on page 12.

**Treatment:** Spray affected trees with an appropriate registered insecticide. Spray only affected trees and trees in their immediate vicinity. Seek specialist advice from a macadamia pest consultant as frequent use of some chemicals destroys the natural enemies and may encourage build-up of the pest.

**Prevention:** As the pest is generally introduced into an orchard on budwood or nursery plants, carefully inspect all such materials for the pest. If detected, disinfect before use. Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.



Water stress damage

## Water stress damage

**Cause:** Shortage of soil moisture at flowering.

**Identification:** Flowers are stunted, brown in colour and fail to open. In some cases, the flower buds may split open. The problem is most likely on very sandy soils when irrigation fails during a dry season.

**Treatment:** There is no treatment once symptoms occur.

**Prevention:** Ensure an appropriate irrigation schedule is maintained, particularly in hot dry weather. The only way to ensure appropriate amounts of water are applied is to use a soil moisture monitoring system such as capacitance probes or tensiometers. The flowering, nut growth and oil accumulation stages are the most vulnerable to moisture stress.

## Desiccant herbicide spray damage

**Cause:** Damage from desiccant herbicide accidentally applied to flower racemes. Desiccant herbicides include paraquat, diquat and paraquat/diquat mixtures.

**Identification:** Flowers become brown and desiccated. Damage generally occurs only on the lower racemes closest to the herbicide spray path.

**Treatment:** No treatment is possible.

**Prevention:** Follow preventative measures for desiccant herbicide spray damage on page 43.



Desiccant herbicide spray damage



Broad mite damage to racemes (unaffected raceme at bottom for comparison)

## Broad mite damage

**Cause:** The broad mite *Polyphagotarsonemus latus*.

**Identification:** Affected flowers are brown and shrivelled. Damage generally occurs in isolated trees. The mites are extremely small – less than 0.3 mm long – and are not visible with the naked eye. See page 18 for a close-up. The mite also affects leaves and nuts – see symptoms on page 18 and 130.

**Treatment:** As the problem is generally well controlled by sprays for other pests, specific treatment is rarely required.

**Prevention:** Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.

## Frost damage

**Cause:** Damage from freezing temperatures (below 0°C).

**Identification:** Flowers in the lower part of the tree brown and die rapidly after a cold spell. Flowers in higher parts of the tree generally remain unaffected. Damage usually occurs in the lowest lying part of the orchard, where the cold air pools. Younger trees are more prone to damage.

**Treatment:** There is no treatment. Some varieties may flower again after damage.

**Prevention:** Wind machines including helicopters have been used in extreme cases. Avoid planting macadamias in areas subject to regular frosts.



Frost damage



Hairyline blue butterfly eggs on flower buds (actual size of eggs about 1 mm across)



Hairyline blue butterfly larvae feeding on flower buds (actual size of larvae up to 10 mm long)

## Hairyline blue butterfly caterpillar damage

**Cause:** Larvae of the hairyline blue butterfly *Erysichton lineata lineata*.

**Identification:** Single circular white eggs are laid on the flower buds. Larvae are up to 10 mm long, light green to yellow and slug-like. The larvae destroy the flowers by eating a neat, round hole in the bulbous end of the bud.

**Treatment:** Specific treatment for this pest is rarely necessary, as sprays applied for other pests generally keep it in check. Where necessary, spray affected trees with an appropriate registered insecticide.

**Prevention:** Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.



Flower looper – magnified (actual size up to 15 mm long)

## Flower looper damage

**Cause:** Larvae of the flower looper *Gymnoscelis subrufata*.

**Identification:** The larvae feed on the flower buds, mainly on the bulbous ends of the buds. Larvae are up to 15 mm long and light green in colour, with brown, wedge-shaped marks along the body.

**Treatment:** Specific treatment for this pest is rarely necessary, as sprays applied for other pests generally keep it in check. Where necessary, sprays registered for macadamia flower caterpillar are generally effective against flower looper.

**Prevention:** Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.



Typical damage to buds. Note adult and nymph bugs (actual size of adult 3 to 4 mm long)



Close-up of adult bug – highly magnified (actual size 3 to 4 mm long)

## Lace bug damage

**Cause:** Feeding by the lace bug *Ulonemia* sp.

**Identification:** The bugs suck the sap from flower buds, causing them to desiccate and wither. Most of the damage occurs on basal parts of the bud, leaving the bulbous end relatively unaffected. Damage is more severe in elevated areas. Adult bugs are winged, light to dark brown and 3 to 4 mm long. Nymphs are wingless, oval in shape and yellow to reddish brown in colour.

**Treatment:** Specific treatment for this pest is rarely necessary, as sprays applied for other pests will generally keep it in check. Where necessary, spray affected trees with an appropriate registered insecticide.

**Prevention:** Regularly monitor trees so that the problem can be treated before it gets out of hand. Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.



Typical infestation of flowers – aphids magnified (actual size 2 mm long)



Close-up of aphids on young flower buds. A larva of the lacewing, a major predator of aphids, is shown (actual size of larva 6 to 8 mm long)

## Aphid infestation

**Cause:** The black citrus aphid *Toxoptera citricida*.

**Identification notes:** Aphids typically infest young shoots and flowers where they feed on the succulent new growth. The feeding (sap sucking) damage can cause yellowing and death of flower buds. Black sooty mould often grows on the honeydew secretions of the aphids. In many cases, ants tend the aphids for the honeydew secretions. Aphids are black, soft-bodied, and up to 2 mm long. Infestations are most common in the cooler months of winter and early spring. Aphids may also infest leaves – see symptoms on page 20.

**Treatment:** Treatment is rarely necessary as natural enemies generally provide adequate control. Serious outbreaks are generally the result of frequent use of disruptive chemicals for other pests. Where necessary, spray with an appropriate registered insecticide.

**Prevention:** Use an integrated pest management (IPM) approach, which includes the use of less disruptive insecticides with minimal impact on beneficial insects.