

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

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 We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research: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
- Financial information—costs and returns listed in this publication are out of date.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 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

Macadamia problem solver & bug identifier

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Inquiries should be addressed to the Director-General, Primary Industries Building, 80 Ann Street, Brisbane 4000.

Disclaimer

This field guide is distributed by the Department of Primary Industries as an information source only. The information contained in the guide and other material incorporated by reference is provided solely on the basis that readers will be responsible for making their own assessment of the content and seek professional advice. Readers must note that the information contained in this guide has been developed for growers in Queensland and New South Wales, Australia and the Department of Primary Industries and its collaborators give no warranty that the information is suitable for conditions outside those states.

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- *Insect pests of macadamias in Queensland*, David Ironside, Department of Primary Industries, Queensland;
- *Diseases of fruit crops*, Denis Persley (ed), Department of Primary Industries, Queensland;
- *Diseases & disorders of macadamias*, Ross Fitzell, NSW Agriculture;
- *Insect pests of fruit and vegetables* (second edition), G.A. Swaine, D.A. Ironside and R.J. Corcoran (eds), Department of Primary Industries, Queensland;
- *Plant nutrient disorders 2 – Tropical fruit and nut crops*, R.G. Weir and G.C. Cresswell, NSW Agriculture;
- *Managing insects & mites in horticultural crops*, Elaine Brough, Rod Elder and Colin Beavis, Department of Primary Industries, Queensland.

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Photographs

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Using this guide

Correct and prompt identification of problems in the macadamia orchard is a key requirement of good crop management. In the case of bugs (insects and mites – both pests and beneficials), it is an essential requirement of integrated pest management (IPM). This field guide endeavours to make it easy for you to do both.

The guide is divided into four sections, colour-coded on the edge of the pages to make it easy for you to locate the relevant section:

Leaf, branch and trunk problems



Contains symptoms of 43 likely causes of problems with leaves, branches and trunks, together with notes on cause, identification, treatment and prevention

Flower problems



Contains symptoms of 13 likely causes of problems with flowers, together with notes on cause, identification, treatment and prevention

Nut problems



Contains symptoms of 31 likely causes of problems with nuts, together with notes on cause, identification, treatment and prevention

Bug identifier



Contains 100 photographs of insect pests and beneficials likely to be encountered in the orchard, including egg, nymph or larval, and adult stages, a size scale and other notes.

There are a few different ways in which you can locate the information you need:

1. The 'quick-flick approach'. If you have a problem you need to diagnose, or a bug you need to identify, go to the relevant section, and quickly flick through the pages of that section until you find your answer.
2. The 'scientific approach'. If you have a problem you need to diagnose, go to page 1 of the guide and use the symptom key to locate the pages of possible causes. If you have a bug (or bug stage) to identify, go to page 154 of the guide and use the bug groups to locate the pages of possible culprits.
3. The 'library approach'. If you know broadly which problem or bug you are searching for, go to the index at the back of the guide, where all problems and bugs are listed under scientific and common names.

WARNING!

There are some limitations in using this guide, including:

- Although we have attempted to include all the common (and some not-so-common) problems and bugs, there will always be some things that you may find, which are not covered in this guide.
- Although we have selected photographs to show the most typical symptoms for each problem, symptoms may vary from those illustrated. Specialist advice may be necessary to confirm diagnosis.

- Some of the bugs and bug eggs are very small (less than 1 mm long), and are difficult to see with the naked eye. We recommend that you use a x10 hand lens for proper examination.
- We do not intend that the guide be used as the only tool in reaching key management decisions. We always recommend that you seek independent advice before making these decisions. Pest consultants and general macadamia consultants are available in all major production areas, and we recommend that you use these services where available. A listing of consultants is contained in the companion Growing Guide – the *Macadamia Grower's Handbook*.
- Because chemical registrations change frequently, these are not included in the guide. A full list of chemicals registered for macadamias is contained in the companion Growing Guide – the *Macadamia Grower's Handbook*.



References for more information

More information on pests, diseases and disorders of macadamias can be obtained from the following publications:

- *Insect pests of macadamias in Queensland*, D.A. Ironside, Department of Primary Industries, Queensland (1981).
- *Diseases of fruit crops*, Denis Persley (ed), Department of Primary Industries, Queensland (1993).
- *Diseases & disorders of macadamias*, R.D. Fitzell, NSW Agriculture (1994).

- *The good bug book* (second edition), Richard Llewellyn (ed), Integrated Pest Management Pty Ltd (2002).
- *Plant nutrient disorders 2 – Tropical fruit and nut crops*, R.G. Weir and G.C. Cresswell, NSW Agriculture, Inkata Press (1995).
- *Managing insects & mites in horticultural crops*, Elaine Brough, Rod Elder and Colin Beavis, Department of Primary Industries, Queensland (1994).

Terms and concepts used

Abdomen.....	The posterior end of an insect body, containing the intestines and reproductive organs.
Action level.....	The level of a pest population at which control measures should be implemented.
Beneficial.....	A commercially produced or naturally occurring insect, mite, nematode, predator or parasite that will help control a pest.
Crawler.....	The first stage nymph of a scale insect or mealybug.
Fungicide.....	A chemical used to control a fungal disease.
Ectoparasite.....	Parasite living on the outside of its host.
Hedging.....	Pruning of tops and sides of the tree canopy.
Honeydew.....	A sugar-rich solution secreted by soft scales, aphids and some other sap-feeding insects.
Insecticide.....	Chemical used to control insect pests.
Integrated pest management (IPM).....	An approach to pest and disease management incorporating aspects of chemical, cultural, physical and biological methods to prevent pests and diseases from reaching damag-

Larva (plural larvae)..... An immature stage occurring between the egg and pupal stages for insects such as butterflies, moths, beetles, weevils, flies and wasps. The larva does not resemble the adult. Commonly known as grubs or caterpillars. Forms part of what is known as a complete life cycle.



Monitoring..... A process of systematically checking the tree (and fallen nuts) for pests and diseases, and recording progress, in order to make decisions on pest and disease management strategies.

Natural enemy..... A naturally occurring beneficial organism.

Nymph..... An immature stage occurring between the egg and adult stages for insects such as bugs, aphids and mites. The nymph is generally a smaller, wingless version of the adult. Forms part of what is known as an incomplete life cycle.



..... A plant or animal that lives in or on another organism (host), usually to the detriment of the host.

Predator.....	An organism that attacks and feeds on another organism (prey).
Pupa (plural pupae).....	An immobile stage occurring between the larval and adult stages for insects such as butterflies, moths, beetles, weevils, flies and wasps (see larva above).
Raceme.....	The compound macadamia flower consisting of a central stalk (rachis) carrying up to 200 individual flowers or flower buds ('bud' is the term applied to a flower before it opens; when it opens, it is referred to as a 'flower').
Skirting.....	Pruning of the skirt of the tree to keep it off the ground.
Sooty mould.....	A dark, fungal growth on honeydew secretions.
Spore.....	A tiny reproductive body produced by fungi.
Systemic chemical.....	A substance that is absorbed through the plant surface and translocated throughout the body of the plant.

Problem solver section

There are two ways for you to use this section to identify a particular problem.

1. General search – simply browse through the pages of the relevant plant part:

Leaf, branch and trunk problems..... page 4 

Flower problems..... page 80 

Nut problems..... page 102 

2. Targeted search – first find the relevant symptom in the list below and look at the most likely causes using the page references provided:

Spots on leaves/branches	Yellow leaves
Leafminer damage..... 8	Tree decline..... 4
Felted coccid damage..... 12	Trunk canker disease..... 6
Scale insects..... 14	Flower thrips damage..... 16
Aphids..... 20	Glyphosate damage..... 24
Cicada damage..... 34	Heat stress..... 38
Branch dieback disease..... 50	Nitrogen deficiency..... 40
Algal leaf spot..... 62	Armillaria root rot disease 48
Lichen infestation..... 62	Iron deficiency..... 54
Manganese toxicity..... 66	Magnesium deficiency..... 56
	Zinc deficiency..... 58
	Boron toxicity..... 60
	Manganese toxicity..... 66
	Cold weather damage..... 72
	Chimera..... 76