

Final Report

Lychee pest and disease field guide

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Department of Agriculture and Fisheries, Queensland

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Lychee pest and disease field guide LY19001

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Summary

During the period 2002 to 2008, the HAL funded “Unlocking Lychee Research” project led by DAF produced a “Field Guide to Lychee; insect and mite pests, natural enemies and diseases and disorders”. The field friendly, waterproof booklet was distributed widely to growers as part of the Unlocking Lychee Research project. The field guide was a valued industry resource and well utilised by growers. Existing printed stocks of the guide are no longer available to new industry participants and the electronic copy was no longer compatible with current publishing software. The industry requested a new edition of the guide to ensure that existing and new growers can identify the major pests and diseases they are likely to encounter in their orchards. The development of a new guide was also seen as an opportunity to increase the profile of beneficial enemies of lychee pests and biological control options as well as highlighting the major exotic pest threats the industry members should be aware of. The project team reedited the guide, added new pictures for identification purposes, updated the scientific names where appropriate and added the new sections as described above. The project produced 400 hard copies of the seventy eight page guide for distribution to lychee levy paying producers. The guide was developed to be web compatible and accessible on the HI and or ALGA website.

The project outcomes are:

- a resource that assists growers and industry service personnel to identify and manage lychee pests and diseases that will empower lychee growers to undertake effective pest and disease monitoring and management in their orchards and encourage industry “best practice” management.
- a digitally compatible version of the Lychee pest and disease guide to be hosted on the HI and ALGA websites.

Keywords

Lychee; Field Guide; Insect; mites; pests; natural enemies; diseases; disorders; biological pest control; exotic threats.

Introduction

The lychee industry is focused on producing a high quality product for both the domestic and export markets. Lychees are produced from the Atherton Tablelands (far northern Queensland) to Coffs Harbour (mid north coast NSW). The wide geographical and environmental spread of the industry allows fresh fruit production for five months from November to March. Management of pests and diseases is essential to ensure productivity and fruit quality. New growers and experienced growers require a ready reference guide to aid the rapid identification of insects and diseases so that the correct management options are deployed.

During the period 2002 to 2008, the HAL funded “Unlocking Lychee Research” project led by DAF produced a “Field Guide to Lychee; insect and mite pests, natural enemies and diseases and disorders. The field friendly, waterproof booklet was distributed widely to growers as part of the Unlocking Lychee Research project. The field guide was reported by industry to be a useful industry resource and was well utilised by growers. Existing printed stocks of the guide are no longer available to new industry participants and the electronic copy is no longer compatible with current publishing software. The industry requested a new edition of the guide to ensure that existing and new growers can identify the major pests and diseases they are likely to encounter in their orchards.

The new Lychee Field Guide was developed in association with the Australian Lychee Growers Association who liaised with growers to identify the pests and diseases of concern and the layout of the booklet. The development of a new guide was also seen as an opportunity to increase the profile of beneficial enemies of lychee pests and biological control options. The new guide also highlights the major exotic pest threats industry members should be aware of.

The project team reedited the old guide, added new pictures for identification purposes, updated the scientific names where appropriate and added the new sections as described above. The project produced 400 hard copies of the guide for distribution to lychee levy paying producers. The guide was developed to be web compatible and accessible on the HI and ALGA websites.

The dynamics of pest and diseases and their control and impact are changing in response to new producing regions, new biological control options and climate change, the project team suggest that the guide is reviewed every five years to maintain its scientific integrity.

Methodology

The project design and output are directed at Australian lychee industry grower/producers to ensure they have access to a guide to common pests and diseases of lychee. The ability to identify pest and disease problems or beneficial insects allows the orchardist to implement appropriate control strategies in compliance with APVMA registered and permitted chemicals or for specific pests, biological control options. The inclusion of an exotic pest section in the new guide will allow growers to respond quickly should there be an incursion.

The contents and layout of the new guide was developed in association with key producers via telephone and electronic forms of communication (email and Zoom meetings). Responses were sought from key growers on the pests and diseases included in the old guides and confirmation of their relevance and the potential addition of new pests or diseases that should be added to the guide.

The editorial team interacted closely with DAF entomologists and pathologists to ensure the integrity of scientific names for insects, mites, diseases, natural enemies and exotic threats. Replacement photographic images were accessed where required. The guide layout was reorganised and colour coordinated with different sections displayed with differing background colours to enable rapid identification of different sections.

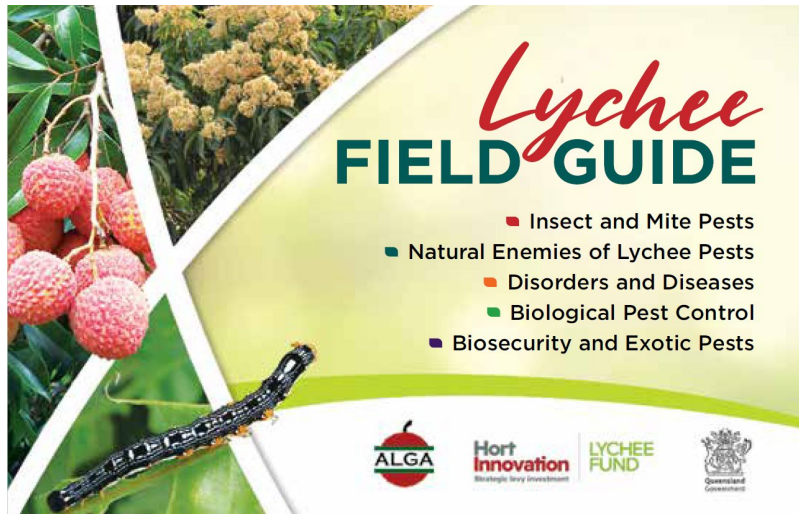
Drafts of the guide were forwarded to the key growers for editorial comments on two separate occasions. The editors responded to all comments to ensure the guide met grower as well as professional requirements. A draft was also provided to HI for comment and approval prior to publication.

Once the guide is published it will be highlighted in the October issue of the industry magazine “Living Lychee” and posted to all growers on the levy payers mailing list managed by ALGA.

Outputs

Example pages from the guide are displayed, they include; front Cover, contents page, insect and mite pests, natural enemies of lychee pests, disorders and diseases, biological pest control and biosecurity and exotic pests. The full guide is provided separately as a pdf document.

Front cover



Contents

<

Insect and Mite Pests example

LITCHI ERINOSE MITE

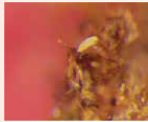
Aceria litchii

Description

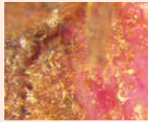
- Mites are not visible by eye.
- Live on the underside of leaves amongst the erineae (velvety growth) which is produced as a reaction to saliva injected during feeding.
- Mites move to new flush (leaf, flowers and fruit).
- Mites move to surface of erineae when leaves/panicles are picked and left to dry.

Distribution

- Throughout all lychee growing districts.



Eriophyd mite



Eriophyids on fruit erineae



Erinea on young flush



Erinose mite symptoms on underside of leaf



Erinea on lychee fruit

Damage

- Reddish-brown velvety growth on underside of leaves. Leaves become distorted.
- Flowers are brown and fuzzy.
- Erinea may also occur on fruit.

Action level

- Mite seasonal cycle is tied to flushing activity.
- Control when erineose mite damage is evident on 20 trees widely spaced throughout the crop. Time sprays to leaf flushing.
- The presence of erineose mites can be determined by placing symptomatic leaves or fruit samples within a paper-bag and checking for their presence 24 hours later. Live mites, if present, will be visible on the surface of the leaves or erineae under a strong magnifying lens (x 20) or microscope.

Natural Enemies of Lychee Pests

PREDATORY MITE

Amblyseius sp. and *Phytoseiulus* sp.

Description

- There are a number of predatory mites with varying appearances however most are tear drop or pear shaped. Some are more circular.
- Many common predatory mites are a little bit larger than two-spotted mite. They can often be seen without magnification although a x10 magnifier assists greatly. Some predatory mites are relatively large (even up to about 5mm).
- Predatory mites are generally faster moving than the pest mites they feed on.
- Eggs of predatory mites are generally larger than that of spider mites and may be spherical to ovoid. Spider mite eggs are almost always spherical and white.

Benefit

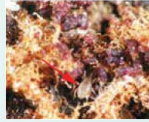
- Predatory mites feed on adult and immature stages of pest mites including litchi erinose mite and tea red spider mite.



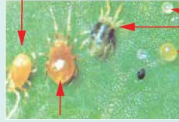
Phytoseiulus persimilis consuming a two-spotted mite



Amblyseius sp. mite



Phytoseiulus sp. mite on erinea



Amblyseius sp. nymph

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NATURAL ENEMIES OF LYCHEE PESTS

Disorders and Diseases

PEPPER SPOT

Colletotrichum gloeosporioides species complex

Description

- Black "pepper" like spots, pinhead and slightly larger in size, appearing on the outer surface (predominantly at the stem end) of green and colouring fruit.
- Spots are superficial and if severe could render the fruit unmarketable.
- Spots also occur on small stems, leaves and leaf petioles.

Distribution

- Found predominately in wetter coastal lychee growing areas.
- Commonly observed on mature fruit of the variety Kwai Mai Pink (B3 or Bosworth 3).

Causal agent

- Pepper spot is caused by fungi within the *Colletotrichum gloeosporioides* species complex. These fungi also cause the common postharvest disease, anthracnose.
- Spores of the fungus are spread by rain splash. Warm, wet weather favours the development of the disease.

Action

- Monitor for symptoms on small stems and petioles prior to flowering.
- Use appropriate field sprays of protectant fungicides:
 - one to two pre flowering fungicide applications, followed by an approved spray program from panicle emergence to harvest.
- Maintain good orchard hygiene:
 - remove dead limbs and mummified fruit from trees to reduce inoculum.
 - ensure marcotts are sourced from pepper spot free trees.



Pepper spot on young fruit



Pepper spot on mature fruit



Pepper spot symptoms on leaf petiole and leaf

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DISORDERS AND DISEASES

Biological Pest Control

BIOLOGICAL PEST CONTROL

What is it?

- Biological pest control is a method of controlling pests such as insects, mites, weeds and plant diseases using other organisms.
- Biological control is the management of a pest through the use of their natural enemies (biological control agent).
- A biological control agent is an organism such as an insect, fungus or virus.

Importance to pest control

- Consumers are increasingly valuing the idea of clean and green produce.
- Biological control options have an important part to play in managing pests.
- In Queensland a famous example of biological control was the introduction of the cactus moth *Cactoblastis cactorum* to control the spread of prickly pear. A less successful example is the introduction of the cane toad as a biological control agent for cane grub.
- Commercial providers of biological control agents provide solutions for aphids, fruitspotting bug, macadamia nutborer, mealybug, scale, soft brown scale and twospotted mites. The list of biological control agents continues to grow.

For more information see the web site hosted by the Association of Beneficial Producers Inc. (ABC Inc.) - <http://www.goodbugs.org.au/index.html>

Integrated Pest Management

- Uses many tools to manage pests; including cultural practices, pesticides, predators and parasites.
- USA Overview - <https://www.evergreen.ca/downloads/pdfs/Fruit-Tree-Pest-Management.pdf>
- IPEDM manual for custard apple - <https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/cul3001-custard-apple-ipdm-manual.pdf>

Links to commercial providers of biological pest control and pheromone lure traps for horticultural crops

- Biological Services - <https://biologicalservices.com.au/>
- BioResources Pty Ltd - <http://www.bioresources.com.au/>
- BioWorks Pty Ltd - <http://www.bioworksonline.com.au/>
- Bugs for Bugs - <http://www.bugsforbugs.com.au/>
- Ecogrow - <http://www.ecogrow.com.au/>
- Organic Crop Protectants (OCP) - <https://ocp.com.au/product/insect-tech-range/>



Adult moth



Larva in immature fruit



Pupal stage



Larva in mature fruit

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BIOLOGICAL PEST CONTROL

Exotic Pest Threats

LYCHEE FRUIT BORER

Conopomorpha sinensis

Description

- A moth related to *C. litchiella* (leafminer - refer page 18) whose larvae (caterpillars) bore through the pericarp (skin) of lychee and feed on the fruit.
- Mature larvae are 6-10mm long and brownish or green in colour, depending on diet.
- The moth can complete 4 to 5 generations during a lychee season.

Distribution

- China, Taiwan, India, Thailand and Vietnam.

Damage

- Fruit borer larvae penetrate and feed on lychee fruit generally at the stem end.
- Damaged fruit often falls from the tree.
- Fruit can have late infestations and the damage is not obvious at picking.

Action

Any suspicious symptoms or problems should be immediately reported to Biosecurity Australia via your local agronomist or DAF office.

Exotic Plant Pest Hotline: 1800 084 881
Qld Phone: 132523 or email: info@daf.qld.gov.au
NSW Phone: 1800 680 244 or email: biosecurity@dpi.nsw.gov.au



Adult moth



Larva in immature fruit



Pupal stage



Larva in mature fruit

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EXOTIC PEST THREATS

Outcomes

Project outputs include the following;

- A better informed industry, growers and associated agricultural suppliers, aware of pests and diseases affecting the production of lychee.
- The self-help pest and disease identification guide will assist industry participants to deal more effectively with pest and disease occurrences and lead to improved management in conjunction with integrated pest management strategies.
- The project method has highlighted gaps in our understanding of lychee pest and diseases in Australia and assisted in identification of research gaps for further investment consideration.
- Lychee growers and industry service personnel have increased awareness of potential biosecurity threats to the lychee industry
- The Lychee SIAP are informed of options for digital versions, e.g. mobile phone applications, of the Lychee pest and disease guide for consideration for future investment.

As a short term (6 month project) the outcomes are measureable, attainable, and realistic and time bound. The project methodology has been developed in a stepwise manner with each activity leading onto the next stage.

Monitoring and evaluation

<Insert content – approximately 1000 words. Discuss overall project performance, answering the Key Evaluation Questions (KEQs) determined as part of the project's M&E Plan. For more advice, refer to Attachment A3: Final Report guide>

The key evaluation questions relate to project effectiveness, relevance, process appropriateness and efficiency.

Effectiveness

- Has the project achieved its outcomes of producing a Lychee pest and disease guide? *YES!*

Relevance

- Is the project relevant to the industry and HIA? *YES, the industry requested the project and HIA produced a call for applications.*

Process Appropriateness

- Has industry been involved in the process? *Yes!*
- Has the engagement process been sufficient? *Yes!*

Efficiency

- Has the project been completed in the allocated timeframe? *No!*
- If not, were there any unexpected circumstances which added to the delay? *The project was slightly delayed, however the six month time frame was optimistic from the start for a project which required considerable interaction between industry, specialist entomologists and pathologists and the design and printing team. Further delays occurred due to travel restrictions imposed by the COVID-19 pandemic and the need to organise discussions and communications via electronic communication channels.*

Recommendations

The dynamics of pest and diseases and their control and impact are changing in response to new pests, new producing regions, new biological control options and climate change. The project team suggest that the guide is reviewed every five years to maintain its accuracy and relevance. Furthermore, the development of a phone or tablet compatible application would be ideal for new younger industry producers.

Refereed scientific publications

n/a

References

- Field Guide to lychee insect pests, beneficial insects, and disorders/diseases. P. Chay et al. (2004)
- Field Guide to lychee; insect pests, natural enemies, diseases and disorders. P. Chay et al. (2008)
- Lychee DPI Notes
- Lychee Information Kit (from the Agrilink Series), C. Menzel et al. (2002)
- Rambutan, Identification and Monitoring the Major Insects and Mites, D. Astridge
- (2004)
- Tropical Fruits Grower's Handbook and Problem Solver, P. Chay et al. (2005)

Intellectual property, commercialisation and confidentiality

No Project IP

Acknowledgements

This field guide has been funded by Hort Innovation using the lychee research and development levy and funds from the Australian Government. Hort Innovation is the grower-owned, not for profit research and development corporation for Australia's horticulture industry.

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Lychee growers who participated in the phone survey in relation to reviewing the contents of the guide and review of earlier draft of the new guide.

Andrew Manners (Principal Entomologist DAF) and Richard Piper (Senior Entomologist DAF), Lindy Coates (Senior Principal Plant Pathologist, DAF) and Massimo Bianco (Horticulturist, DAF).