

Pests, Beneficials, Disorders and Diseases in Cucurbits: Field Identification Guide

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NSW Department of Primary
Industries (NSW DPI)

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VG07015

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VG07015

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Purpose of the report: This report covers the activities undertaken during the period of the project, from July 2007 until April 2009. Activities include: the compilation of information, illustrations and photographs detailing diseases, pests, beneficials and disorders of cucurbits in Australia into a durable, waterproof field guide and distribution of this guide to all levy-paying cucurbit growers in Australia.

Report Completed: May 2009.

This project has been facilitated by NSW Department of Primary Industries and Horticulture Australia Limited (HAL) in partnership with AUSVEG and has been funded by the National Vegetable Research and Development Levy. The Australian Government provides matched funding for all HAL's R&D activities.

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MEDIA SUMMARY

The **key component of the project** VG07015 “Pests, Beneficials, Disorders and Diseases in Cucurbits: Field Identification Guide” is the publication of a practical field guide which will assist cucurbit growers with the identification of insects, diseases and disorders in their cucurbit crop. Cucurbits include: cucumbers, zucchinis, pumpkins, watermelons, cantaloupes, bitter melons, gourds and hairy melons. The guide is a compact, durable handbook suitable for use in the field and it has been distributed to levy paying cucurbit growers throughout Australia using the Vegetable Industry Development Officers’ network. The guide is a valuable resource for cucurbit growers as the contents are relevant to all crops in the cucurbit family. The **key outcome of project**, VG07015 is the receipt of the ute guide by all levy paying cucurbit growers in Australia.

The project, led by NSW Department of Primary Industries, involved consultation with scientists and industry experts from other states to prioritise a list of insects, diseases and disorders found in cucurbit crops. Vegetable specialists in major production locations also contributed information relevant to growing cucurbits in their areas. The 152 page guide, which is a compilation of scientific information and the industry specialists’ expertise, presents over 270 colour photographs, illustrations and text. Details are provided on a comprehensive list of organisms, nutritional and physiological disorders prevalent in cucurbit crops across Australia. Life cycles of insects, descriptions of problems, disease transmission, plant damage, prevention and control recommendations are included. **Industry significance of the project** is that the guide offers growers, consultants and field workers in the cucurbit industry a booklet with practical information to assist with the identification and management of the main cucurbit pests, beneficials, diseases and disorders found in Australia.

The **primary outcome of the project** is that all Australian levy paying cucurbit growers will receive the guide within 12 months of the project’s completion. Delivery of the guide will be facilitated through the Vegetable Industry Development Officer’s network. Cucurbit production in Australia is valued at \$394 million (ABS 2006). It is expected the use of the guide will improve identification of problems and this will result in more effective management practices, reduced losses from pests and diseases, improved IPM practices, reduced chemical use and improved cucurbit crop and fruit quality. This publication is an example of **practical application for the vegetable industry** from the National Vegetable Research and Development Levy.

TECHNICAL SUMMARY

An IPM audit of vegetables in 2006 (project VG05043) identified the need for a quick reference field guide for pests, beneficials, diseases and disorders for cucurbits. Cucurbits, which include crops such as cucumbers, zucchinis, pumpkins, watermelons, rockmelons, bitter melons, gourds and hairy melons are grown in many locations throughout Australia. The industry is valued at \$394 million (ABS, 2006). Although the cucurbit group is diverse, they have many pests, diseases and disorders in common. Specific problems occur in different geographical locations and climatic zones.

NSW Department of Primary Industries led a project which produced a comprehensive field guide addressing the most important problems affecting the production of cucurbit crops. The guide is a compact, waterproof handbook, suitable to carry in the ute and use in the field and will assist growers and consultants with the identification and management of cucurbit insects, diseases and disorders.

More than 270 full colour photographs of common pests, beneficials, diseases and disorders relevant to cucurbit production in Australia are in the guide. Scientists and industry specialists contributed information about identifying features, symptoms, life cycles, transmission and management options for each problem described in the 152 page booklet. The ute guide has been distributed to every levy paying cucurbit grower in Australia through the Vegetable Industry Development Officer's network ensuring its widespread utilization. It is expected the ute guide will assist field identification of problems, help reduce losses from pests and diseases, improve IPM practices and improve crop quality and yields. This quick reference field guide will be a valuable resource for cucurbit growers, advisory officers and crop consultants throughout Australia.

The project and publication of the field guide was funded by the NSW Department of Primary Industries and Horticulture Australia Limited (HAL) through the Horticulture and National Vegetable Research and Development Levy with matching funding from the Australian Federal Government.

INTRODUCTION

The project VG07015, “Pests, Beneficials, Disorders and Diseases in Cucurbits: Field Identification Guide” commenced in July 2007 in response to a vegetable IPM audit (VG05043) in 2006. The audit found there was no quick reference tool to help with the field identification of cucurbit crop production problems. Prior to the publication of this guide there were few Australian resources presenting information covering the range of problems affecting cucurbits nationally in the one book.

Consultations with scientists and advisors from all Australian cucurbit growing districts produced a list of pests, diseases and disorders which affect commercial cucurbit production. Many problems are common to all cucurbits, such as pumpkin beetles and powdery mildew. Some types of cucurbits have specific pests and diseases affecting them, and some pests and diseases occur only in certain climatic zones. The major pests, diseases and disorders affecting the variety of cucurbits grown in different climatic zones of Australia was listed to be researched.

Cucurbit production in Australia is valued at \$394 million (ABS, 2006) and includes crops such as cucumbers, zucchinis, pumpkins, watermelons, rockmelons, bitter melons, gourds and hairy melons. The significance of this project to the vegetable industry is the availability of a unique reference guide which has practical and comprehensive information about the major pests, diseases and disorders affecting cucurbit production in Australia. Photographs of affected plants and fruit, pests and beneficial insects, diseases and disorders and illustrated life cycles are included to assist identification of problems. Plant growth and fruit quality can be affected by different stages of insect’s life cycles – larva, pupa, nymph, or adult – and illustrated life cycles are displayed to inform growers of these stages.

This guide is similar to other ute guides published for lettuce, greenhouse vegetables and ornamentals produced in previous HAL funded projects. These guides along with scientific literature on pests, diseases, disorders and beneficials of cucurbits were reviewed when preparing this cucurbit publication. Using these reviews and consultation with vegetable scientists and advisors, appropriate details were then summarised to produce a concise information package covering problems relevant to cucurbit growing in Australia.

The publication of the field guide has positive implications for the cucurbit industry because it offers concise, easy to read information in one practical booklet. Descriptions, damage and source of diseases, disorders and pests, along with management techniques, are written clearly and simply. The guide is a non-technical publication providing sufficient information for identification of problems affecting cucurbit production. The value of this guide will be quicker, correct identification of pests, diseases, disorders and beneficials of cucurbits, and a quicker response to address problems affecting crop growth and fruit quality.

METHOD AND MATERIALS

Prior to the publication of this ute guide there was no complete pictorial field guide for Australian cucurbit growers to identify the pests, diseases and disorders present in their cucurbit crops. A review of vegetable and cucurbit growing reference material revealed limited and dated information that was generally related to specific problems for individual cucurbit crops, eg brown etch of pumpkins, angular leaf spot in cucumbers. The purpose of the project was to publish a field guide with information about a range of the main pest, disease and disorders that affect many of the different cucurbit crops across Australia.

Discussions were held with scientists and advisors from all cucurbit growing districts of Australia to ascertain the range and significance of problems commercial growers experience. From this an extensive list of pests, diseases and disorders relating to cucurbits was created. The list provided comprehensive details about a broad range of pests, diseases and disorders affecting the various cucurbits grown in different climatic zones of Australia. Cucurbits are affected by similar pests and diseases, such as pumpkin beetles and powdery mildew. Some types of cucurbits have specific pests and diseases affecting them, and some pests and diseases occur only in certain climatic zones.

During the first year of the project the separate chapters of the guide were drafted by scientists specialising in entomology, plant pathology and cucurbit production agronomy. Literature reviews were conducted to extract scientific details. Consultation with field officers and industry specialists in other states gained further practical information about growing problems, symptoms and field practices.

Images of affected plants and crops, pests, beneficial insects, diseases and disorders were collated from reference collections and individual's files. A database of images was established and photographers acknowledged for their contributions. An agreement with a scientific illustrator was signed for the completion of insect life cycle drawings. A collection of graphic and textual material was then provided to the illustrator for completion of the detailed drawings.

The Vegetable Industry Development Officers were then contacted to ascertain the number of levy paying cucurbit growers in each state which then allowed a print run number to be determined. Designer and editorial collaboration developed the publication to the printing stage in the final six months of the project. Written quotes from five commercial printers were sought and received. An agreement was signed with the printer, PrintNational, in March 2009 and the booklets were printed.

The waterproof, spirally bound, full colour books were then delivered to NSW Department of Primary Industries, Yanco Agricultural Institute. Arrangements were made to deliver the guides directly to growers or to Vegetable Industry Development Officers in each state, who then distributed them to growers.

RESULTS

A ute guide for the identification of pests, diseases, beneficial insects and disorders in cucurbits has been published. Details for the National Library of Australia Cataloguing-in-publication entry are as follows:

- Title: Pests, beneficials, diseases and disorders in cucurbits:
field identification guide /Tony Napier...[*et al*];
editors Valerie Draper, Tony Napier.
- Edition: 1st ed.
- ISBN: 9780734719607 (pbk.)
- Notes: Includes index.
- Subjects: Cucurbitaceae – Diseases and pests – Australia
– Identification.
Cucurbitaceae – Diseases and pests – Australia
– Handbooks, manuals, etc.
- Contributors: Napier, Tony
Draper, Valerie.
NSW Dept of Primary Industries
- Dewey Number: 635.69

The compact field identification guide is printed in full colour on waterproof paper making it suitable for use in the field. More than 270 full colour photographs of pests, beneficials, diseases and disorders were collated from reference material and industry specialists' collections across Australia. These were then compiled with the associated technical information about each pest, beneficial, disease and disorder into a 152 page booklet. Scientists and industry specialists contributed information on pest and disease symptoms; plant and crop damage; insect and disease life cycles and relevant field management practices.

The field identification guide is being being sent to every levy paying cucurbit grower in Australia through the Vegetable Industry Development Officer's network. Officers from each state were contacted to determine their preferred method for distributing the guides. There were some differences between states on preferred methods of distribution which are summarized below:

New South Wales

We liaised with Alison Anderson, N.S.W. Vegetable Industry Development Officer, who preferred to provide us with printed labels from her database. We have sent out 355 field identification guides to all known levy paying cucurbit growers in N.S.W.

Western Australia

We liaised with Georgia Thomas, W.A. Vegetable Industry Development Officer, who preferred to have the field identification guides sent to her in bulk so she could then forward them on to all known levy paying cucurbit growers in W.A. Georgia was sent 200 field identification guides with pre-paid postage satchels for her to distribute to W.A. growers.

South Australia

We initially liaised with Melissa Fraser, S.A. Vegetable Industry Development Officer, and then her replacement, Jim Kelly who preferred to provide printed labels from his database. We have directly sent out 190 field identification guides to all known levy paying cucurbit growers in S.A.

Victoria

We liaised with Katie Fisher, Victorian Vegetable Industry Development Officer, who provided printed labels from the IDO database and Sally-Ann Henderson, Victorian DPI. Extra copies were also provided to be distributed through the Victorian DPI network. A total of 200 copies of the field identification guide have been sent through the Victorian Vegetable Industry Development Officer network and Victorian DPI network to be distributed.

Northern Territory

We liaised with Cathy Saunders, N.T. Horticultural Association, who preferred to have the field identification guides sent to her so she could forward them on to all known levy paying cucurbit growers in N.T. Cathy was sent 30 field identification guides with pre-paid postage satchels for her to distribute.

Tasmania

We liaised with Roger Orr, Tasmanian Vegetable Industry Development Officer, who preferred to have the field identification guides sent to him so he could forward them on to all known levy paying cucurbit growers in Tasmania. Roger was sent 40 field identification guides with pre-paid postage satchels for him to distribute.

Queensland

We liaised with Brad wells from Horticulture Australia Limited because the Vegetable Industry Development Officer position in Queensland was vacant. After discussions with Brad Wells and Rachel Mackenzie from growcom, it was determined there was no current database that could distinguish between levy and non-levy paying cucurbit growers in Queensland. It was decided that we needed to send a fax and/or a letter to all cucurbit growers in Queensland asking if they were a levy paying cucurbit grower and if they wanted a free copy of the Field Identification Guide. The fax and letters were sent via the main three vegetable grower organizations in Queensland including Growcom, Bundaberg Fruit and Vegetable Growers association and Bowen District Growers Association. A fax-back sheet was sent to growers so they could supply their contact details to receive their free copy of the field identification guide. The field identification guides are being sent out to all growers in Queensland who fax us back and state they are a levy paying cucurbit grower and want a free copy of the ute guide.

DISCUSSION

The publication “Pests, Beneficials, Disorders and Diseases in Cucurbits: Field Identification Guide” has collated information about cucurbits pests, diseases and disorders and their management into one practical field guide. The distribution of the guide to all levy paying cucurbit growers in Australia is the major achievement of the project as it makes the information available in one publication. The initial project outcome was for “all Australian levy paying cucurbit growers (on the Vegetable Industry Development Officer’s contact list) to receive the ute guide within 12 months of project completion.” It is predicted that growers will be in receipt of the guide earlier than stated with the majority of levy paying cucurbit grower’s receiving them by mail during May 2009. Queensland levy paying cucurbit growers will receive their free copy after replying to a fax-back letter supplying their contact details for postage.

All project objectives and milestones have been met. This includes an extension of four months to collect additional photos and information for the completion of the guide which was granted.

- **Milestone 101:**
Description: Agreement signed, voluntary contributions (if required) received and IP arrangements in place.
Achievement Criteria: Agreement signed and returned to Horticulture Australia Ltd
Comment: Agreement for project VG07015 with Horticulture Australia Ltd. was signed (1/8/07) and returned to Horticulture Australia Ltd.
- **Milestone 102:**
Description: All images collected and contracts signed with illustrator and printer.
Achievement Criteria: A data base of images needed for the production of a cucurbit ute guide has been established and all images has been collected and collated ready for use. An agreement signed with an illustrator to complete all necessary illustrations for ute guide.
Comment: Chapters of the guide written by scientists specialising in entomology, plant pathology and cucurbit production. Literature reviews conducted. Consultation with field officers in other states to refine list and attain local information. Established database of images showing affected plants, crops, insect pests and beneficial insects collected from the main cucurbit growing areas in Australia. An agreement with a scientific illustrator was signed for the completion of insect life cycle drawings.
- **Milestone 103:**
Description: Ute guide made available to all cucurbit growers on the vegetable industry databases.
Achievement Criteria: A ute guide covering pests, diseases, beneficial insects and disorders published. Guide printed in full colour on water proof paper for use in the field. Ute guide delivered to all cucurbit growers on the vegetable industry databases. An agreement signed with a printer to print ute guide. Acknowledgement of HAL joint Copyright ownership be made. Also funding acknowledgement statement as per HAL guidelines needs to be included.
Comment: PrintNational printed and delivered 2500 copies of gloss cello glazed, waterproof, spiral bound, 152 page ute guide to Yanco Agricultural Institute. Books distributed to all levy paying cucurbit growers in Australia via the Vegetable Industry Development Officer’s network. Copies of books sent to Australian National Library, NSW DPI, HAL and collaborators in other states. Acknowledgement of HAL joint

copyright ownership. Acknowledgement of funding statement as per HAL guidelines included: “This project has been facilitated by Horticulture Australia Limited (HAL) in partnership with AUSVEG and has been funded by the National Vegetable Research and Development Levy. The Australian Government provides matched funding for all HAL’s R & D activities”.

- **Milestone 190:**

Description: Final report received by Horticulture Australia Ltd

Achievement Criteria: All necessary reports complying with Horticulture Australia's requirements received and approved by Horticulture Australia Ltd

Comment: Final report sent to HAL and approved by HAL.

TECHNOLOGY TRANSFER

Promotion and distribution of the guide has been assisted by Vegetable Industry Development Officers in each state. This approach will achieve national coverage of the cucurbit industry and provide growers and field consultants with a comprehensive technical resource to assist the field identification of problems affecting cucurbit crops. Field officers, consultants and researchers will also be useful in gaining feedback about the guide and its usefulness in field situations.

Publicity through various media and events has also raised awareness about the project and the field guide. The following articles and presentations have communicated information about the project;

Draper, V. and Napier, T (2008). New pest & disease guide for cucurbits. *WA Grower Vegelink. Vol. 41* (4) December 2008 p.22.

Draper, V. and Napier, T (2009) Poster presentation at National Vegetable Expo Werribee, May 2009.

Kelly, J. (2009). Field identification guide for pests, diseases, beneficials and disorders in cucurbits. *Vegelink: South Australia. Autumn/09.*

Napier, T. (2009) Oral presentation at Australian Vegetable Industry Conference, Melbourne, May 2009

Napier, T. and Draper, V. (2009) Poster presentation at Australian Vegetable Industry Conference, Melbourne, May 2009

Napier, T. and Draper, V. (2009) Poster presentation at Werribee Vegetable Field Trial Demonstrations, Werribee, May 2009

Thompson, J. (2009). Cucurbit pest guide available soon. *Vegetables Australia Volume 4.6* May/June 2009 p.38.

RECOMMENDATIONS

The major outcome of this project was the publication and distribution of a field guide “Pests, Beneficials, Disorders and Diseases in Cucurbits: Field Identification Guide” to levy paying cucurbit growers in Australia. The guide will assist growers with field identification and management of cucurbit pests and diseases, integrated pest management practices and nutritional and disorder management.

Recommendations for further research include a more comprehensive book incorporating all the pests, diseases and disorders affecting every cucurbit in Australia, and similar ute guides for other vegetables. Also for this ute guide it is recommended to:

- Continue to raise awareness of the booklet through media articles and websites.
- Encourage reference to, and use of, the booklets at cucurbit and vegetable growers field days, workshops, conferences and field events.
- Conversion of the booklet into CD and website formats.

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