

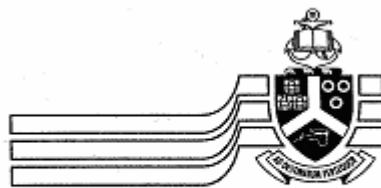
**MODELLING THE DISTRIBUTION OF CITRUS
BLACK SPOT CAUSED BY *GUIGNARDIA CITRICARPA* KIELY**

by

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Submitted in partial fulfilment of the requirements for the degree Doctor of
Philosophy (Environmental Management)

In the faculty of Natural and Agricultural Sciences



University of Pretoria
Universiteit van Pretoria

November 2005

This thesis is dedicated to John Ross Wilson

Modelling the distribution of Citrus Black Spot caused by *Guignardia citricarpa* Kiely

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Degree: Doctor of Philosophy (Environmental Management)

Abstract

Citrus is a valuable fruit crop in world trade. Citrus Black Spot (CBS), caused by *Guignardia citricarpa* Kiely, is a fungal disease of citrus. It occurs in many citrus producing countries including parts of Australia and South Africa, but it does not occur in the countries of the European Union (EU) or the United States of America (USA). To prevent the introduction of CBS, the EU and the USA have phytosanitary regulations that restrict the import of citrus fruit from areas where CBS is found.

This study uses two bioclimatic modelling approaches — CLIMEX and response surface modelling — to predict which areas have climates suitable for CBS to establish. The work focuses on the citrus growing areas of South Africa and Europe, but other parts of the world are also considered. As CBS is dependent on citrus, geographical areas of global citrus production are also mapped, and models are used to predict which areas of South Africa have climates suitable for citrus cultivation under current and future climates. The potential impacts of climate change on CBS distribution in South Africa are also estimated.

Results indicate that under current and future climates many areas in South Africa where citrus is not currently grown have a climate suitable for citrus cultivation, but most of these areas are also climatically favourable for CBS. Of the current citrus producing areas in South Africa, only the Northern and Western Cape Provinces are predicted to be unsuitable for CBS. Under climate change scenarios, some citrus production areas of Western Cape are predicted to become suitable for CBS, but the greater part of the Northern Cape will remain climatically unsuitable for the establishment of CBS in future.

The climates of several CBS-free citrus producing areas around the world, such as Mexico, and Florida and Texas (USA) are suitable for CBS. However, European climate is unfavourable for CBS establishment, and provided importing countries comply to minimum standards, phytosanitary restrictions on the import of fruit from CBS infected areas may be unnecessary.

This study is the first of its kind in citriculture, and in South Africa it is one of the few studies that investigates the effects of climate change on the potential distribution of a plant pathogen.

Bioclimatic modelling was found to be a very useful means to combine complex data in order to make predictions relevant to Pest Risk Assessments.

Declaration

I, the undersigned, hereby declare that this thesis, submitted for the degree of Doctor of Philosophy (Environmental Management), is my own and original work except where acknowledged. This work has not been submitted for a degree at any other tertiary institution.

Ida Paul

Disclaimer

This thesis consists of a series of chapters that have been prepared for submission to, or publication in, a range of scientific journals. As a result overlap may occur to secure publishable entities.

Acknowledgements

SOLI DEO GLORIA

I extend my sincere gratitude to the people and institutions that made this thesis possible. In particular I would like to thank my supervisors; Albert van Jaarsveld (University of Stellenbosch) for leading by example and for his support; and Lise Korsten (University of Pretoria) for her assistance and vision.

I thank the National Research Foundation in South Africa, the Commonwealth Scholarship Commission in the United Kingdom, Citrus Research International, the University of Pretoria and the Ernst and Ethel Eriksen Trust for funding.

Several people played a key role in the execution of this project. In particular I would like to thank the following individuals:

- Brian Huntley, University of Durham, United Kingdom, for assistance and encouragement with the response surface modelling;
- Yvonne Collingham, University of Durham, United Kingdom, for her continued support and technical assistance with the response surface modelling;
- Patricia Barkley, Formerly New South Wales Agriculture, Camden, Australia, for her invaluable assistance towards obtaining the Australian data;
- Graham Barry, Citrus Research International, for his assistance in obtaining data for citrus growing regions both in South Africa and world-wide and also for his valuable advice;
- Gunter Maywald and Bob Sutherst (CSIRO Entomology, Brisbane, Australia) for their support with the CLIMEX modelling.

Then my sincere appreciation to the following individuals who assisted me greatly in obtaining data relating to Citrus Black Spot: Vaughan Hattingh, Hennie le Roux, Tian Schutte (Citrus Research International), Fanus Swart (QMS Agriscience), J.M. Kotzé, Dassie Smit and Chris Kellerman (Private Consultants). I also thank J.P. Wahl (Outspan International) who verified information on the citrus growing areas around the world.

Many thanks to the staff and students at the Departments of Geography and of Microbiology and Plant Pathology (University of Pretoria), in particular Marinda Dobson, Ingrid Booyesen, Jane Olwoch, Daleen Muller, Leylani Grobler, Veloshinie Govender, Trish Beart, Gina Swart and Mariette Truter for their friendship, encouragement, and support. I also thank the Ecology and Environmental Biology group, School of Biological and Biomedical Sciences, University of Durham (UK), for loads of fresh coffee, friendship and support.

Over the course of this study I have interacted with citrus researchers from many different countries who have supplied me with information on both citrus and the occurrences of CBS within their countries. I wish to thank all of those people for their time and assistance.

Special thanks go to my parents, Donald and Magda Paul, my brother, Ludwig, my twin sister, Naomi, my grand parents, Frans and Anna du Toit, Johan Saunders, Ross and Margaret Wilson, and to all of my friends and family for their interest, support and love.

Finally, I extend my warmest thanks to my life-partner, John Wilson, for edits, technical assistance, advice, friendship, encouragement and love.

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