Unravelling the diversity and distribution of the soybean rust fungus *Phakopsora pachyrhizi* in East Africa

Harun Muthuri Murithi

Thesis committee

Promotor
Prof. Dr Bart P.H.J. Thomma
Professor of Phytopathology
Wageningen University & Research

Co-promotors
Dr Matthieu H.A.J. Joosten
Associate professor, Laboratory of Phytopathology
Wageningen University & Research

Dr Hendrikus Peter van Esse
Group Leader of The 2Blades Group
The Sainsbury Laboratory, Norwich, UK

Dr George Mahuku
Senior Plant Pathologist
International Institute of Tropical Agriculture, Dar es Salaam, Tanzania

Other members
Prof. Dr Ken Giller, Wageningen University & Research
Dr Rients Niks, Wageningen University & Research
Dr Vivianne Vleeshouwers, Wageningen University & Research
Dr Theo van der Lee, Wageningen University & Research

This research was conducted under the auspices of the Graduate School Experimental Plant Sciences (EPS).

Unravelling the diversity and distribution of the soybean rust fungus *Phakopsora pachyrhizi* in East Africa

Harun Muthuri Murithi

Thesis

submitted in fulfilment of the requirements for the degree of doctor

at Wageningen University

by the authority of the Rector Magnificus,

Prof. Dr A. P. J. Mol,

in the presence of the

Thesis Committee appointed by the Academic Board

to be defended in public

on Monday February 25, 2019

at 1.30 p.m. in the Aula.

Harun Muthuri Murithi

Unravelling the diversity and distribution of the soybean rust fungus *Phakopsora pachyrhizi* in East Africa, 194 pages.

PhD thesis, Wageningen University, Wageningen, The Netherlands (2019)

With references, with a summary in English

ISBN: 978-94-6343-422-5

DOI: 10.18174/469366

Table of Contents

CHAPTER 1 General introduction 7

CHAPTER 2 Soybean production in eastern and southern Africa and threat of yield loss due to soybean rust caused by *Phakopsora pachyrhizi* 29

CHAPTER 3 Virulence diversity of *Phakopsora pachyrhizi* isolates from East Africa compared to a geographically diverse collection 61

CHAPTER 4 Diversity and distribution of pathotypes of the soybean rust fungus *Phakopsora pachyrhizi* in East Africa 85

CHAPTER 5 Evaluation of soybean accessions for resistance against soybean rust in East Africa..... 111

CHAPTER 6 Comparative transcriptome analysis of *Phakopsora pachyrhizi* isolates to predict candidate avirulence effectors 137

CHAPTER 7 General discussion 165

Summary..... 183

Acknowledgments..... 187

About the Author 191

List of Publications 193