



Universiteit
Leiden

The Netherlands

**Genetic and environmental factors determining
heterogeneity in preservation stress resistance of
Aspergillus niger conidia**

Seekles, S.J.

Citation

Seekles, S. J. (2022, January 18). *Genetic and environmental factors determining heterogeneity in preservation stress resistance of Aspergillus niger conidia*. Retrieved from <https://hdl.handle.net/1887/3250007>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3250007>

Note: To cite this publication please use the final published version (if applicable).

**Genetic and environmental factors
determining heterogeneity in
preservation stress resistance of
Aspergillus niger conidia**

Sjoerd J. Seekles

ISBN: 978-94-6458-018-1

Author: Sjoerd Johan Seekles

Cover & Layout design: Raden Lerika Ratri Noorshanti, Hadiastri Kusumawardhani

Printing: Ridderprint B.V., Netherlands | www.ridderprint.nl

This work is financed by Topsector Agri & Food project “Heterogeneity in spores of food spoilage fungi” (project number AF-15507). The studies presented in this thesis were performed within the framework of TiFN.

Copyright © S. J. Seekles, 2021. All rights reserved.

**Genetic and environmental factors determining
heterogeneity in preservation stress resistance of
Aspergillus niger conidia**

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op dinsdag 18 Januari 2022
klokke 11.15 uur

door
Sjoerd Johan Seekles
geboren te Alkmaar
in 1993

Promotors: Dr. A. F. J. Ram

Prof. dr. P. J. Punt

Promotiecommissie: Prof. dr. J. H. de Winde

Prof. dr. G. P. van Wezel

Prof. dr. D. Claessen

Prof. dr. S. Brul

Prof. dr. V. Meyer

Dr. D. E. Rozen

Table of Contents

CHAPTER 1 Introduction	9
Introduction	11
Scope and outline of this thesis	19
References	22
 CHAPTER 2	 29
Natural variation and the role of Zn₂Cys₆ transcription factors SdrA, WarA and WarB in sorbic acid resistance of <i>Aspergillus niger</i>	
Abstract	30
Introduction	31
Results	35
Discussion	42
Material and Methods	45
References	49
Additional files	52
 CHAPTER 3	 65
Interkingdom microbial variability in heat resistance	
Abstract	66
Introduction	67
Results	68
Discussion	74
Experimental Procedures	78
References	82
Additional files	87

CHAPTER 4	91
Genome sequencing of the neotype strain CBS 554.65 reveals the MAT1-2 locus of <i>Aspergillus niger</i>	
Abstract	92
Background	93
Materials and methods	94
Results and discussion	98
Conclusions	115
References	116
List of additional files	122
 CHAPTER 5	 125
Genome sequences of 24 <i>Aspergillus niger sensu stricto</i> strains to study heterokaryon compatibility and sexual reproduction	
Abstract	126
Introduction	127
Materials and Methods	131
Results	140
Discussion	150
References	153
Additional files	160
 CHAPTER 6	 167
Preservation stress resistance of melanin deficient conidia from <i>Paecilomyces variotii</i> and <i>Penicillium roqueforti</i> mutants generated via CRISPR/Cas9 genome editing	
Abstract	168
Introduction	169
Results	172
Conclusions	186
Materials and Methods	188
References	192
Additional files	196

CHAPTER 7 **205**

Dissecting the pivotal role of mannitol and trehalose as compatible solutes in heat resistance of conidia, germination, and population heterogeneity in the filamentous fungus *Aspergillus niger*

Abstract	206
Introduction	207
Results	211
Discussion	226
Materials and Methods	230
References	239
Additional files	243

CHAPTER 8 **257**

The impact of cultivation temperature on the transcriptome, proteome and heat resistance of *Aspergillus niger* conidia

Introduction	259
Results	261
Discussion	269
Materials and Methods	272
References	281
Additional Files	287

CHAPTER 9 Discussion **299**

Discussion	300
Conclusion	309
References	310

Summary **315**

Samenvatting **321**

Curriculum vitae **327**

Publication list **329**

