

“Snow” in KNP revisited - on the ecological significance of plant parasites



Introduction

- Ecological significance of parasitic fungi?

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PLAY SIGNIFICANT ECOLOGICAL ROLE!

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 - Invasive plant species
 - Evolutionary patterns: co-speciation

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- Direct proofs:
 - Effects of fungal parasites on population structure of natural host-disease systems (e.g. Burdon et al 1995)
 - Data from cultivated plants; virulence-resistance evolution; gene-for-gene hypothesis (Flor 1953)
 - Bio-control measures of alien invasive plant species with rust fungi, e.g. in South Africa (Morris 1997)

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 - Bio-control measures of alien invasive plant species with rust fungi, e.g. in South Africa (Morris 1997)
- **Impact of *Coniothyrium chevalieri* on *Zizyphus mucronata* in KNP: monitoring up-date**
- **Rust fungi: *Ravenelia* on *Acacia*: The “biodiversity problem”**

“Snow” in KNP - Symptoms I

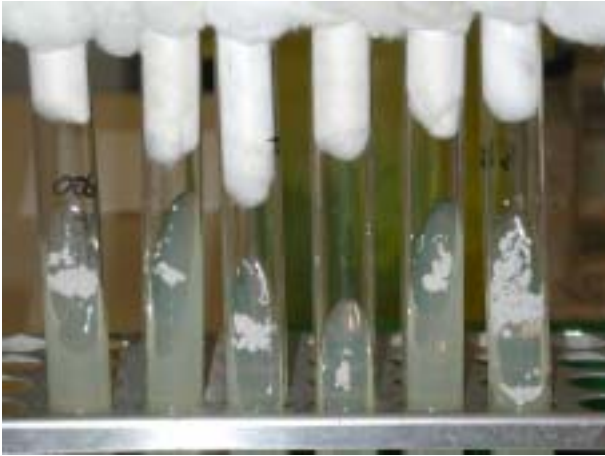


Symptoms II

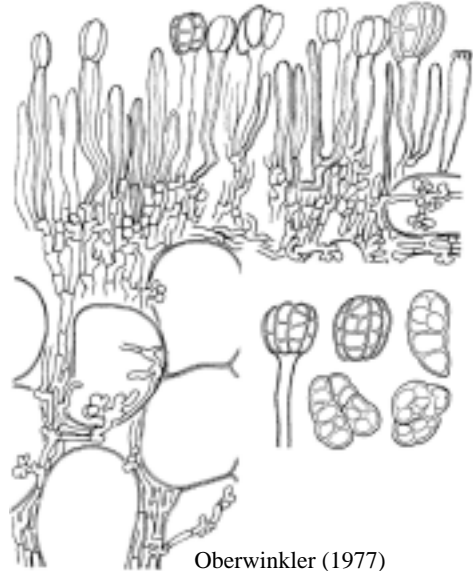
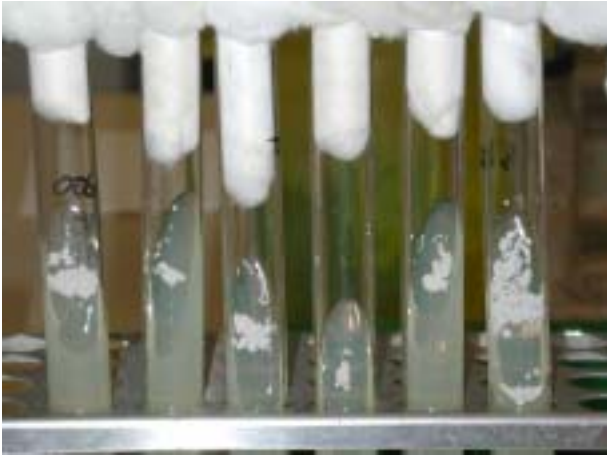


Causal agent?

The fungus

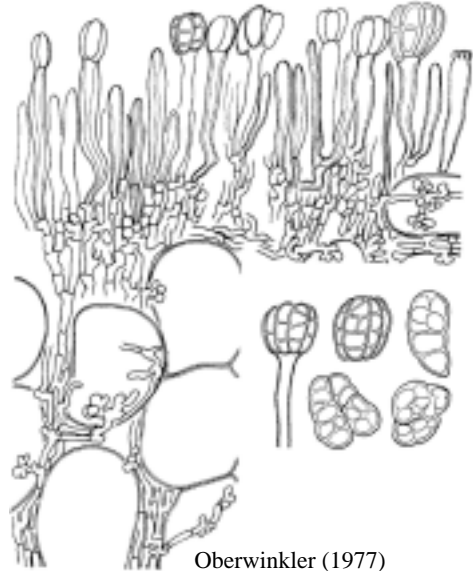
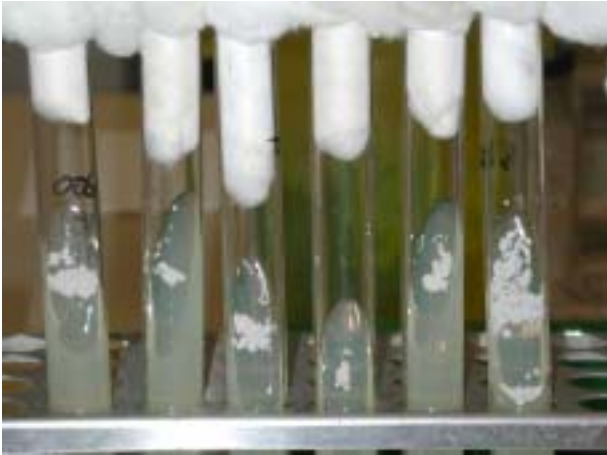


The fungus

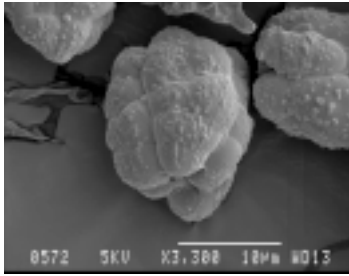
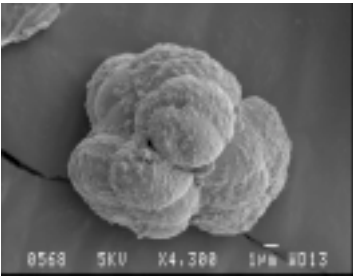
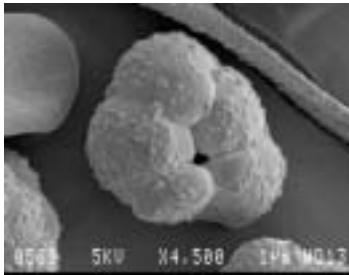
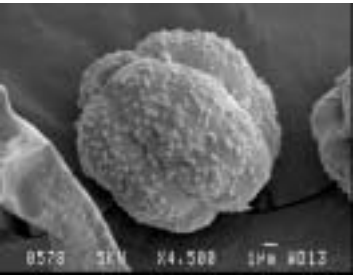


Oberwinkler (1977)

The fungus



Oberwinkler (1977)

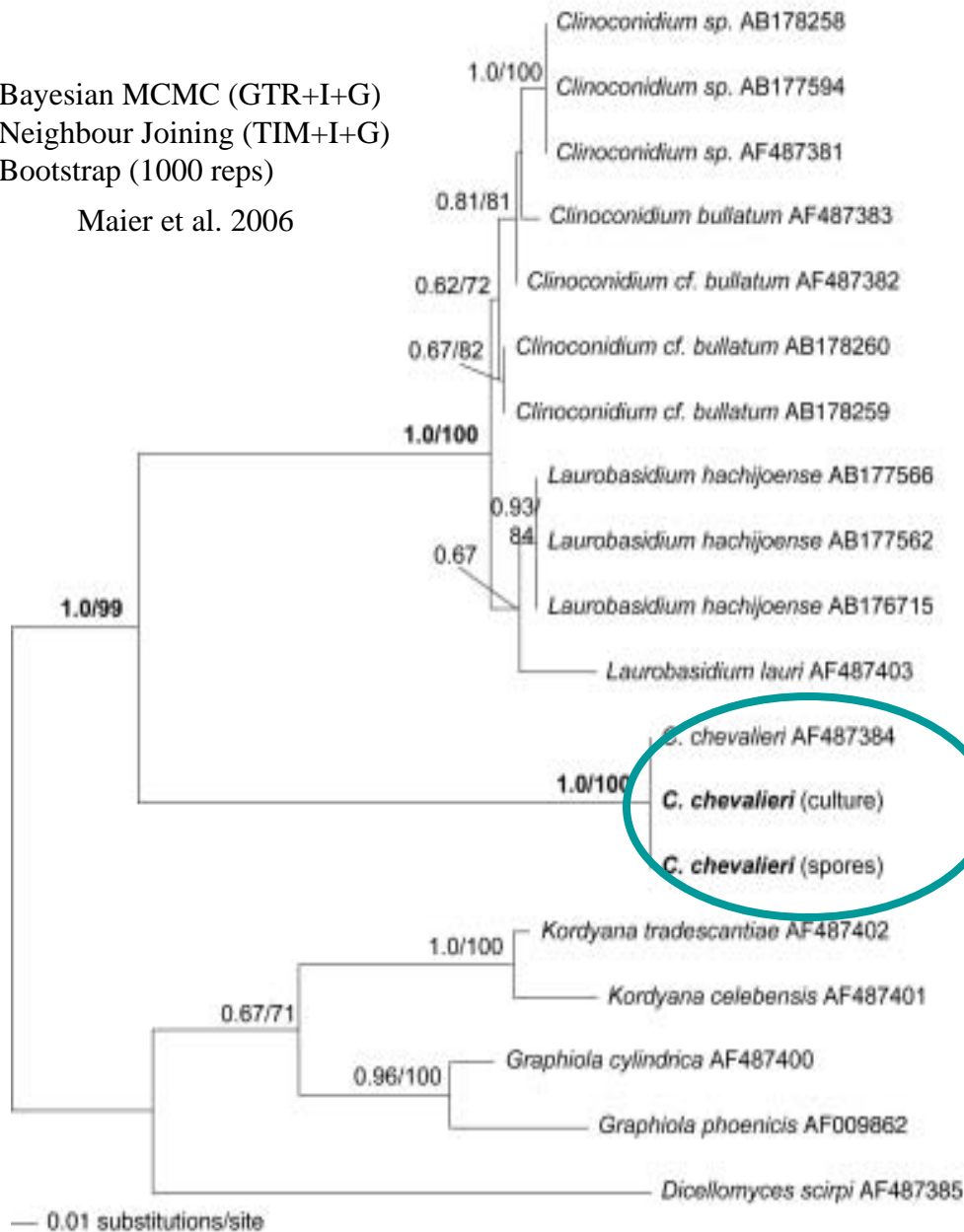


Symptoms +
micromorphology =
Coniodictyum chevalieri

Cryptobasidiaceae-Phylogeny

Bayesian MCMC (GTR+I+G)
Neighbour Joining (TIM+I+G)
Bootstrap (1000 reps)

Maier et al. 2006



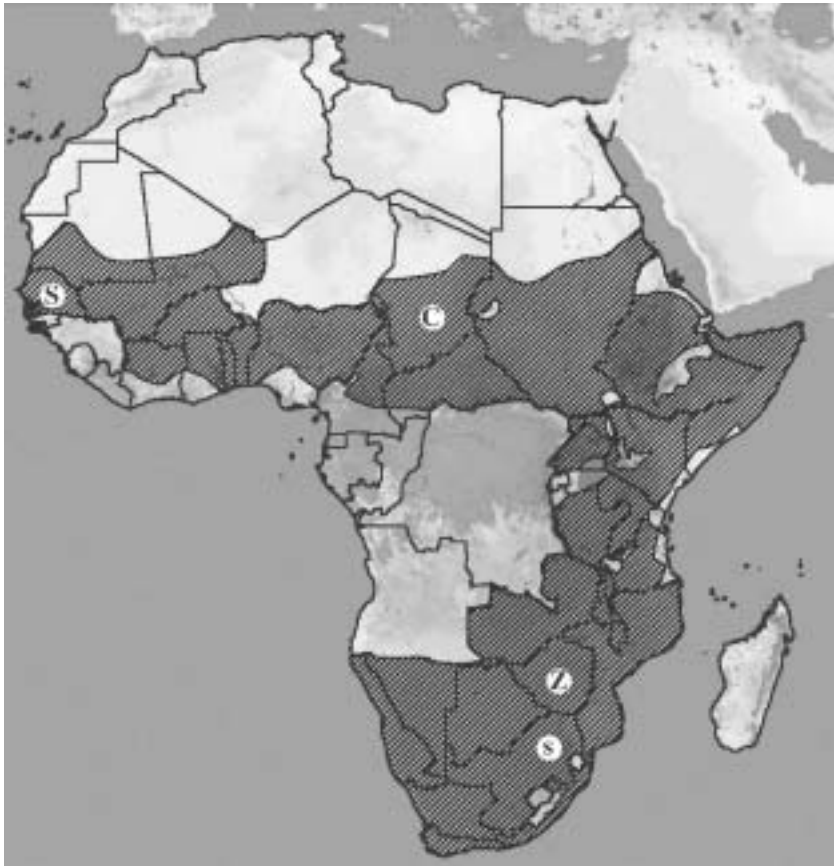
Parasitic on *Lauraceae* in
(sub-)tropical forests outside
Africa

Only known from *Zizyphus
mucronata* (*Rhamnaceae*) in
African savannas

- monotypic genus

**“Nothing” known about the ecology
of this group of basidiomycetes**

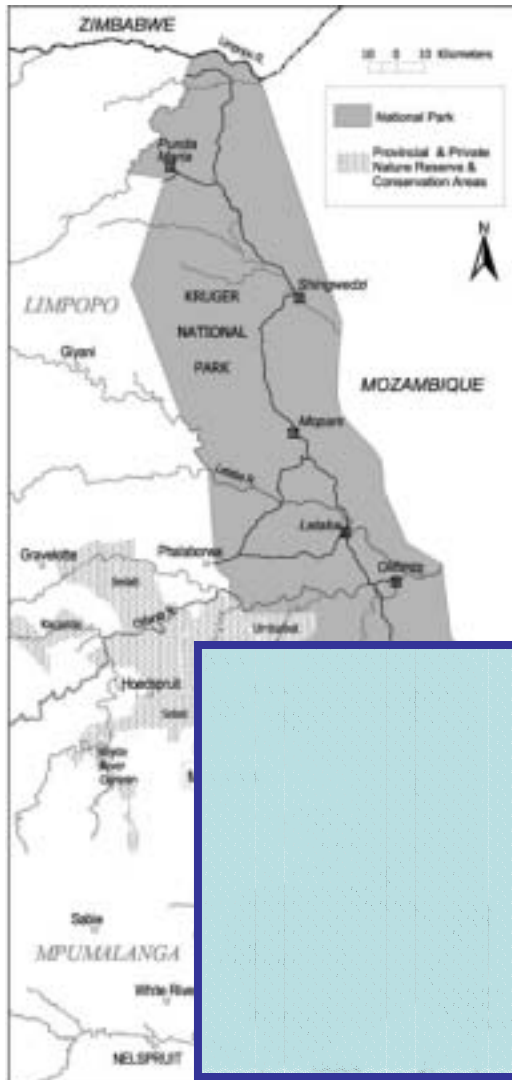
Distribution of host and parasite in Africa



1. Chad 1909
2. South Africa 1910
3. Senegal 1953 “very rare but enigmatic fungus”

But Doidge (1950):
several collections from
South Africa and
Zimbabwe 1910-1938

Disease distribution in KNP



Disease prevalence:
100% in 2 ha reference plots

Distribution? Rain fall?
no clear answer so far!

Conclusions (2005)



- *Coniodictyum* is not as rare as believed earlier
- First report of epidemic spread
 - > Important disease of buffalo thorn

Conclusions (2005)



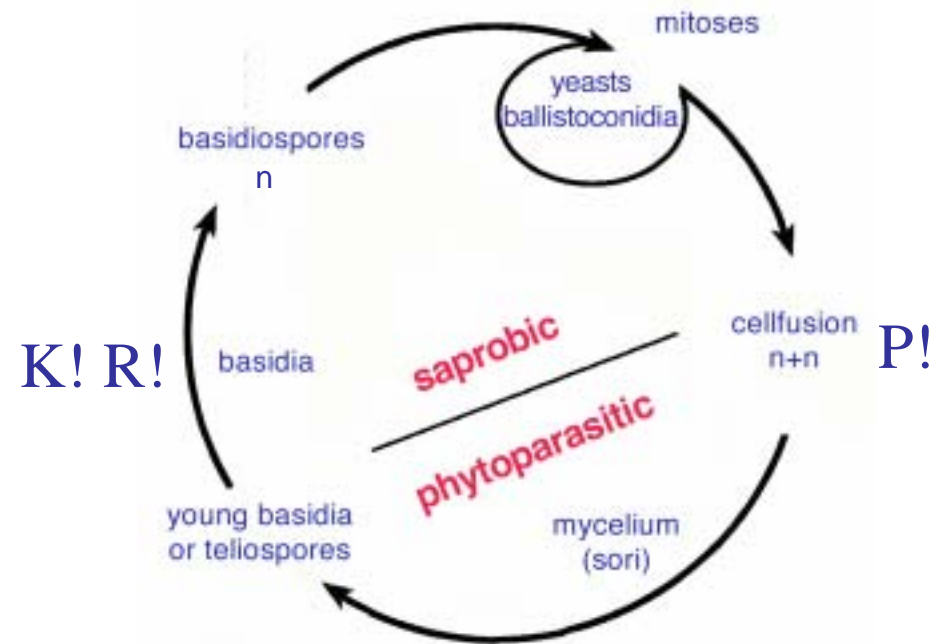
- *Coniodictyum* is not as rare as believed earlier
- First report of epidemic spread
 - > Important disease of buffalo thorn
- Prediction 1: No threat to buffalo thorn trees in KNP and Africa, because indigenous disease
- Prediction 2: Will have impact on population structure of *Z. mucronata*

Fluctuations of *Coniodictyum* in KNP

- 2004: Epidemic (end of March - August)
- 2005: Hardly any infections (=> no infection studies possible) Prediction 1 was right!
- Trees had recovered! Only heavily infected branches dead. Prediction 2 was wrong!?
- 2006: 14 March: Young infections on fruits
 - Effects on recruitment of trees?
 - Effects on fruit eaters?

Next steps

- Life cycle?
 - Infectious stage?
 - Infection studies
 - Timing of infections?
- Ecology
 - Ecological conditions needed?
 - Ecological relevance?
 - Tree population
 - No increased mortality
 - Recruitment? Infected fruits



Life cycle of smuts

Ravenelia on Acacia

Host plants

- Legumes
 - Mainly *Acacias*
 - 12 *Ravenelias* on 13 *Acacias* reported previously (Doidge 1950)
 - 49 *Acacias* in RSA (Smit 2000)

 - Non-*Acacia* legumes
 - 12 *Ravenelias* on 8 other legumes reported previously

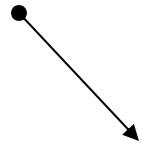


Acacia tortilis

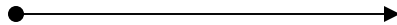


Ravenelia: life cycle and spore stages

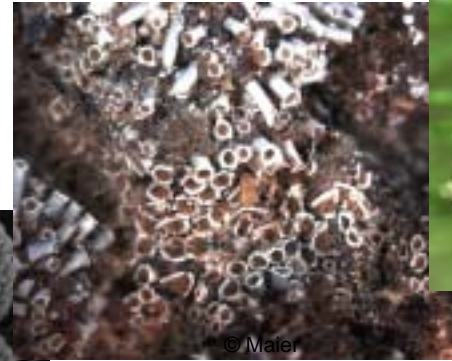
Insects !



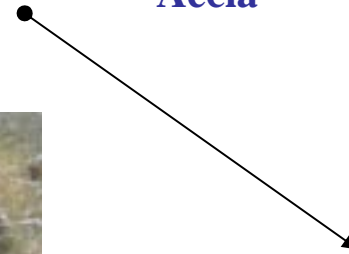
Spermogonia



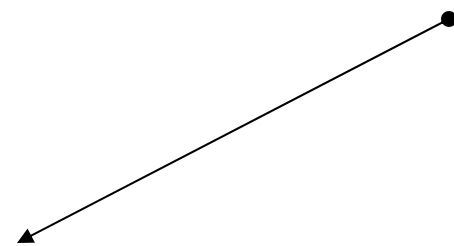
Aeciospores



Aecia

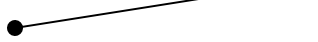


Urediniospores

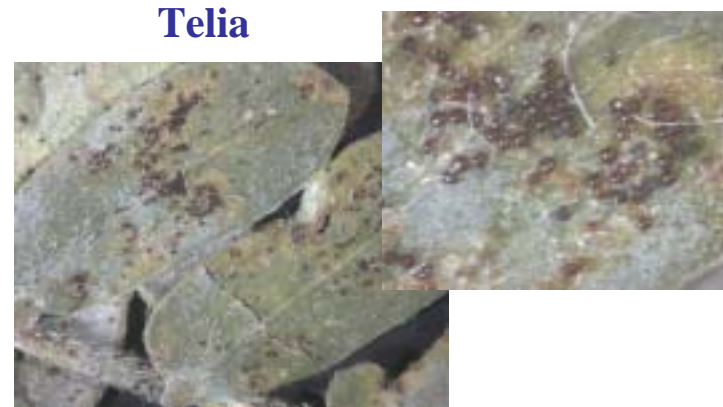


Teliospores

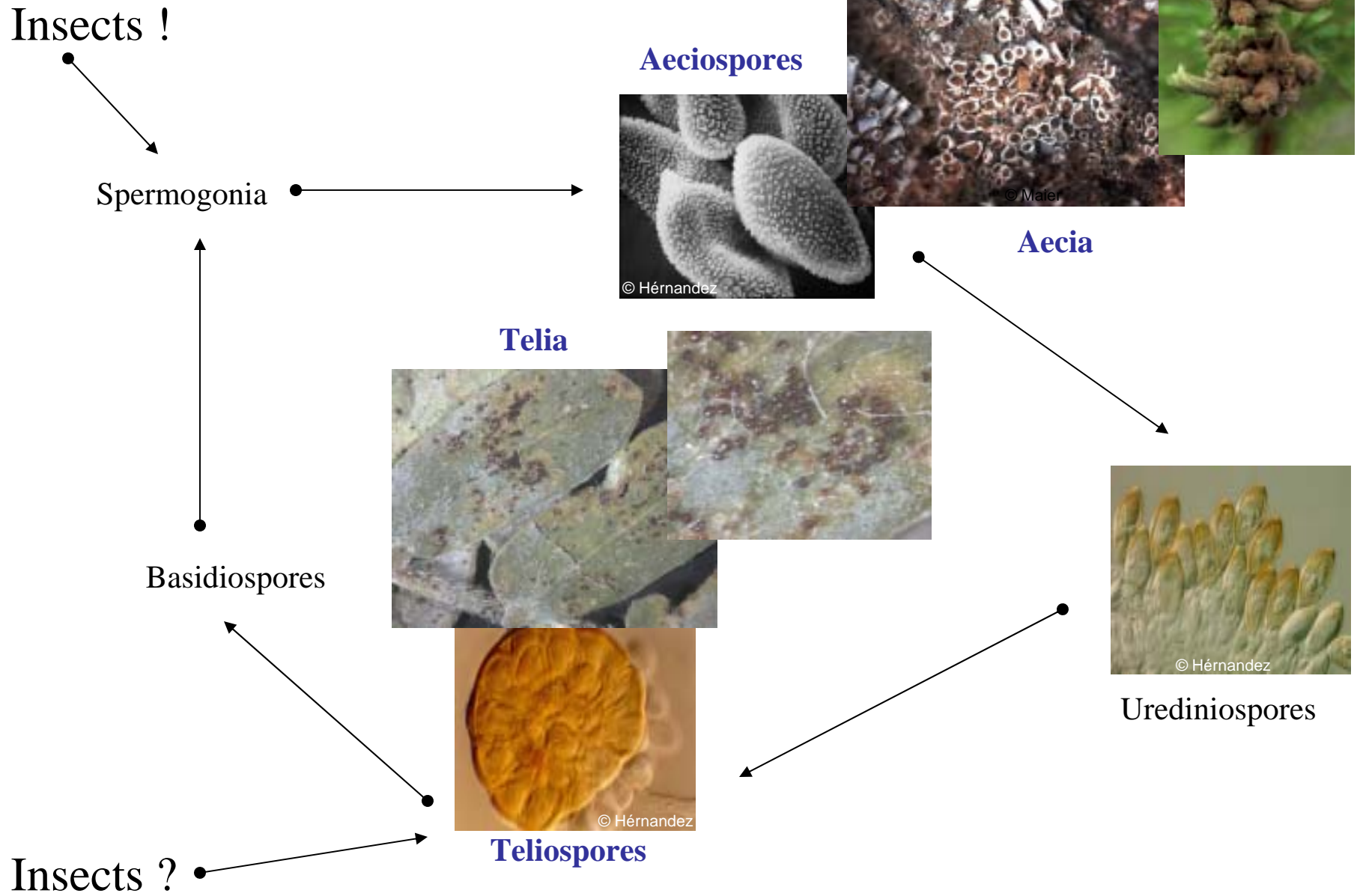
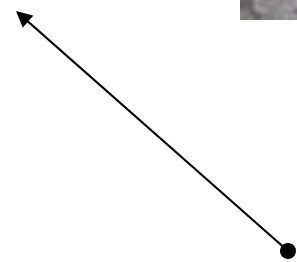
Insects ?



Basidiospores



Telia



New records of *Ravenelia* on *Acacia* in SA

A. ataxacantha

A. burkei

A. caffra

A. gerrardii

A. hebeclada

A. horrida

A. karroo

A. luederitzii

A. mellifera

A. nilotica

A. robusta

A. seyal

A. sieberiana

A. davyi

A. galpinii

A. grandicornuta

A. karoo

A. mapoch

A. natalitia

A. nigrescens

A. sp WFM

A. rubrodermis

A. Sekhukhuniensis

A. senegal vor leiorhachis

A. senegal

A. stefaniana

A. swazica

A. tortilis

7 / 13

15 new records

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Conclusions:

- very diverse group of parasites
- great evolutionary significance
- ecological significance?

Acknowledgements

- Thembi Khoza
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 - NRF
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