

Section 4 Overview of Erysiphales

第四节 白粉菌概述

詹刚明



植物保护学院

College of Plant Protection



Powdery mildews (白粉病)





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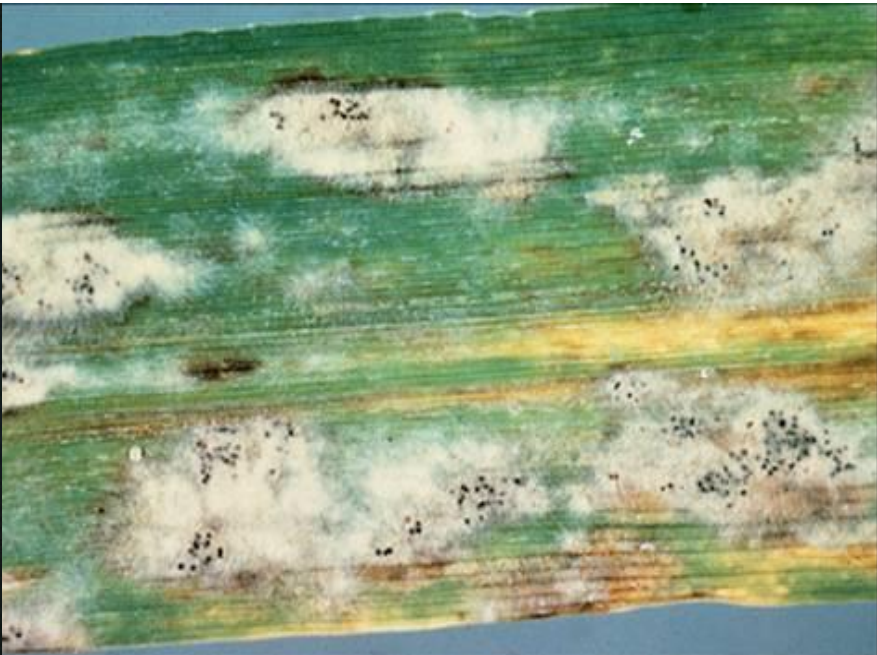
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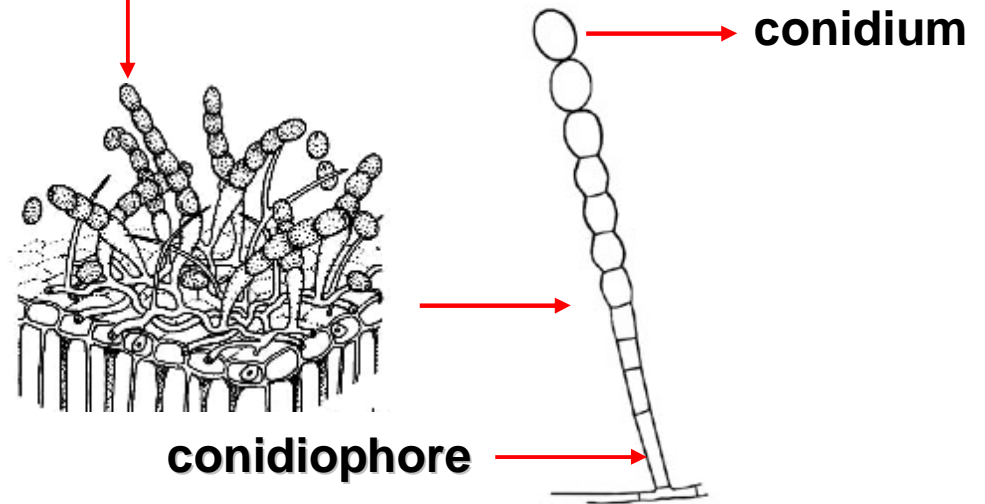
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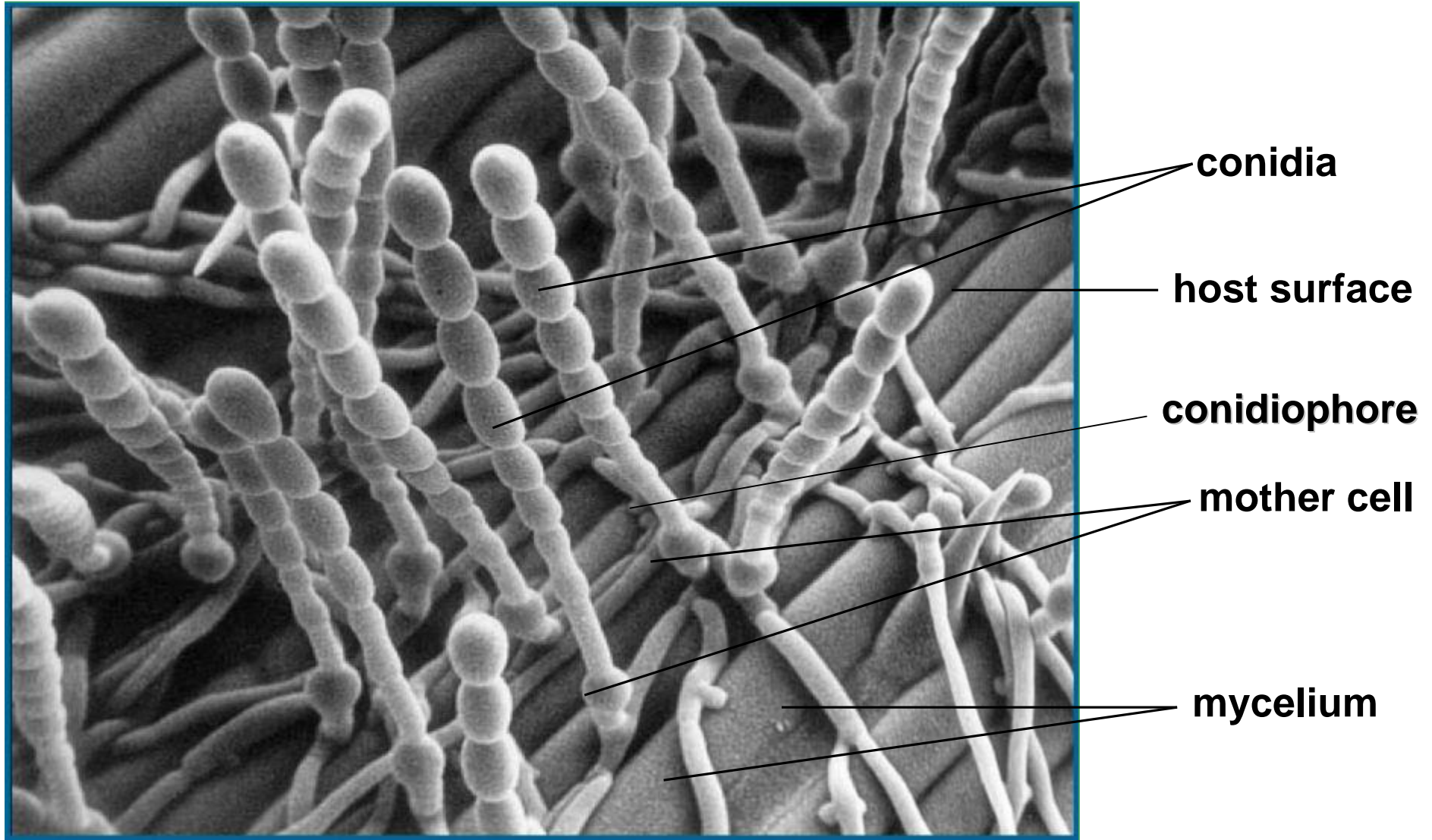
2.2 Classification based on molecular data



1.1 Morphology

Erect (直立), hyaline (透明) conidiophores (分生孢子梗) are usually formed on superficial mycelium (表生菌丝)
One-celled, hyaline, thin-walled conidia (分生孢子) are produced in basipetal (向基的) chains

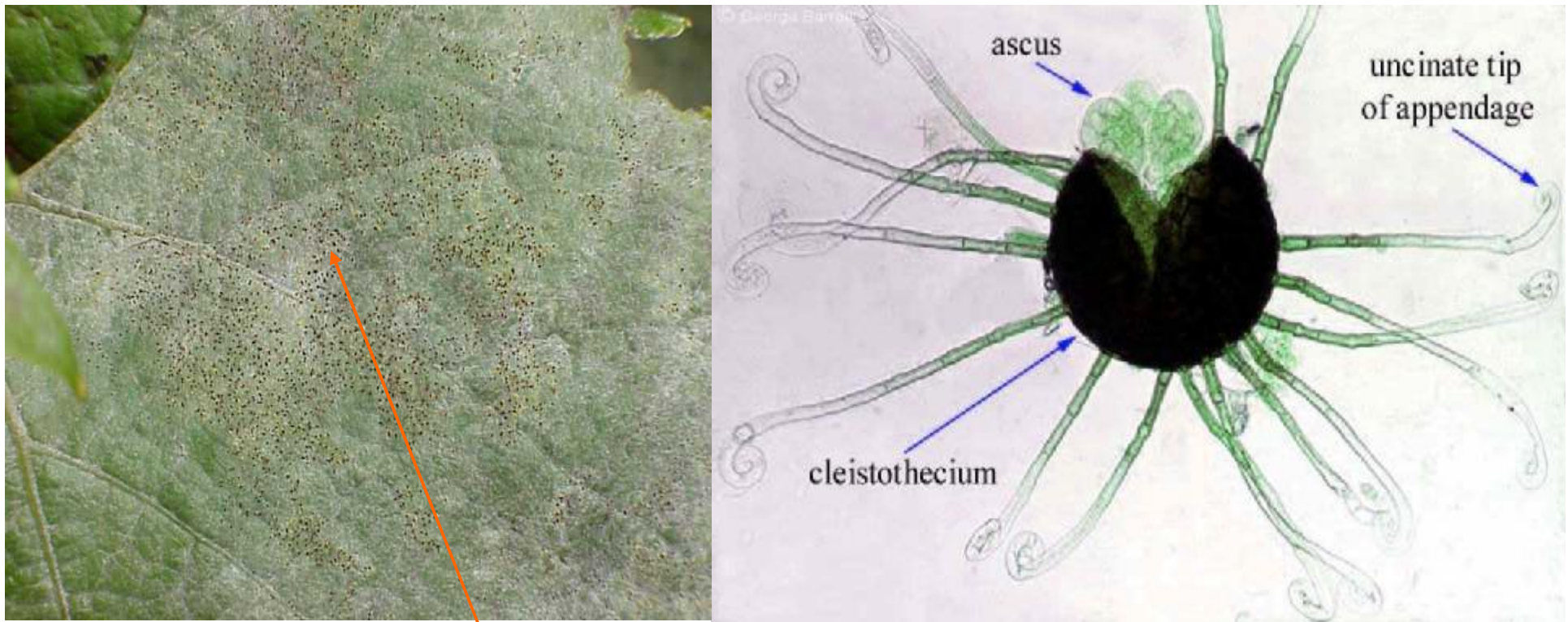




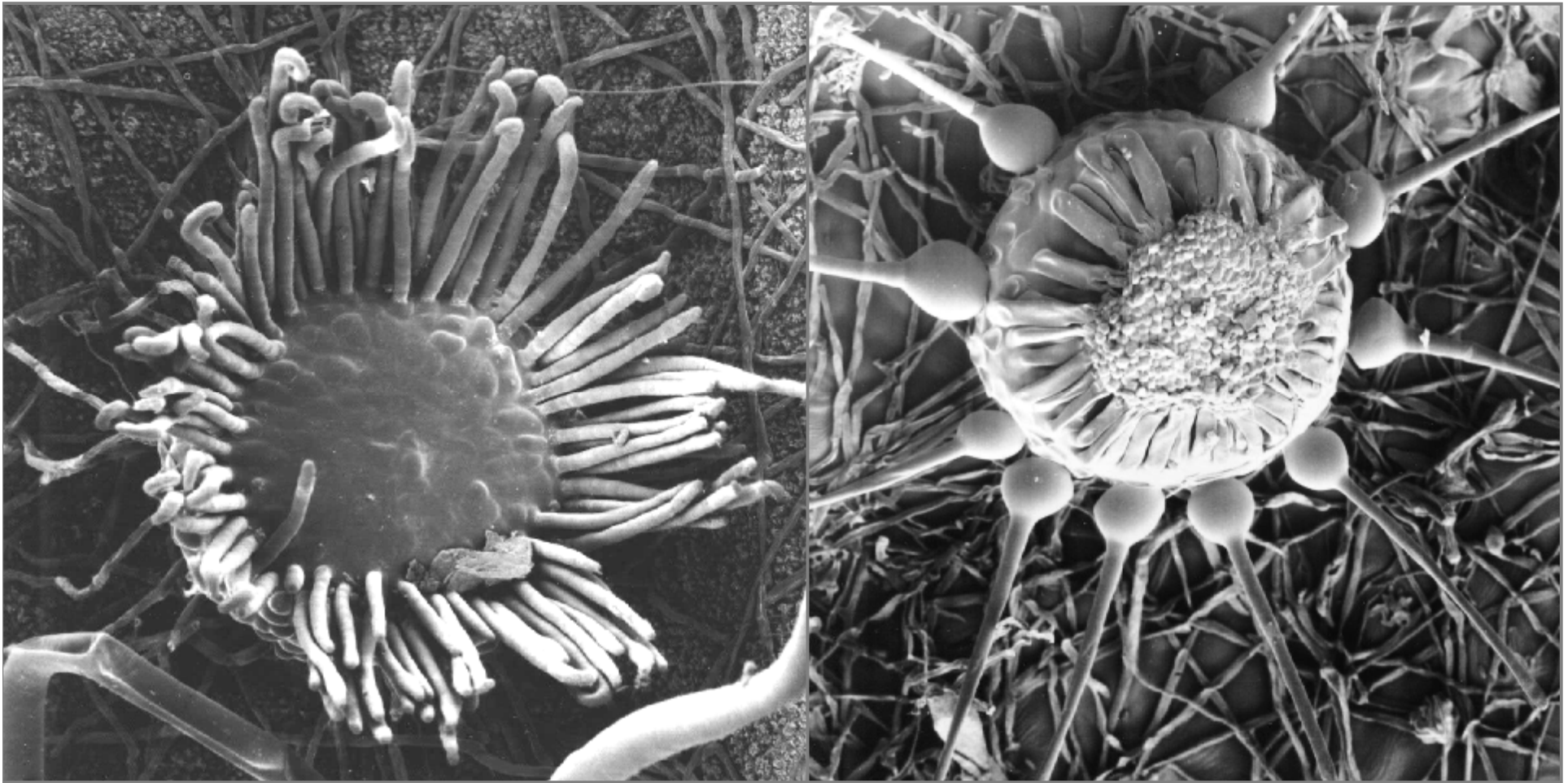
***Oidium anamorph* (粉孢属 无性型)**



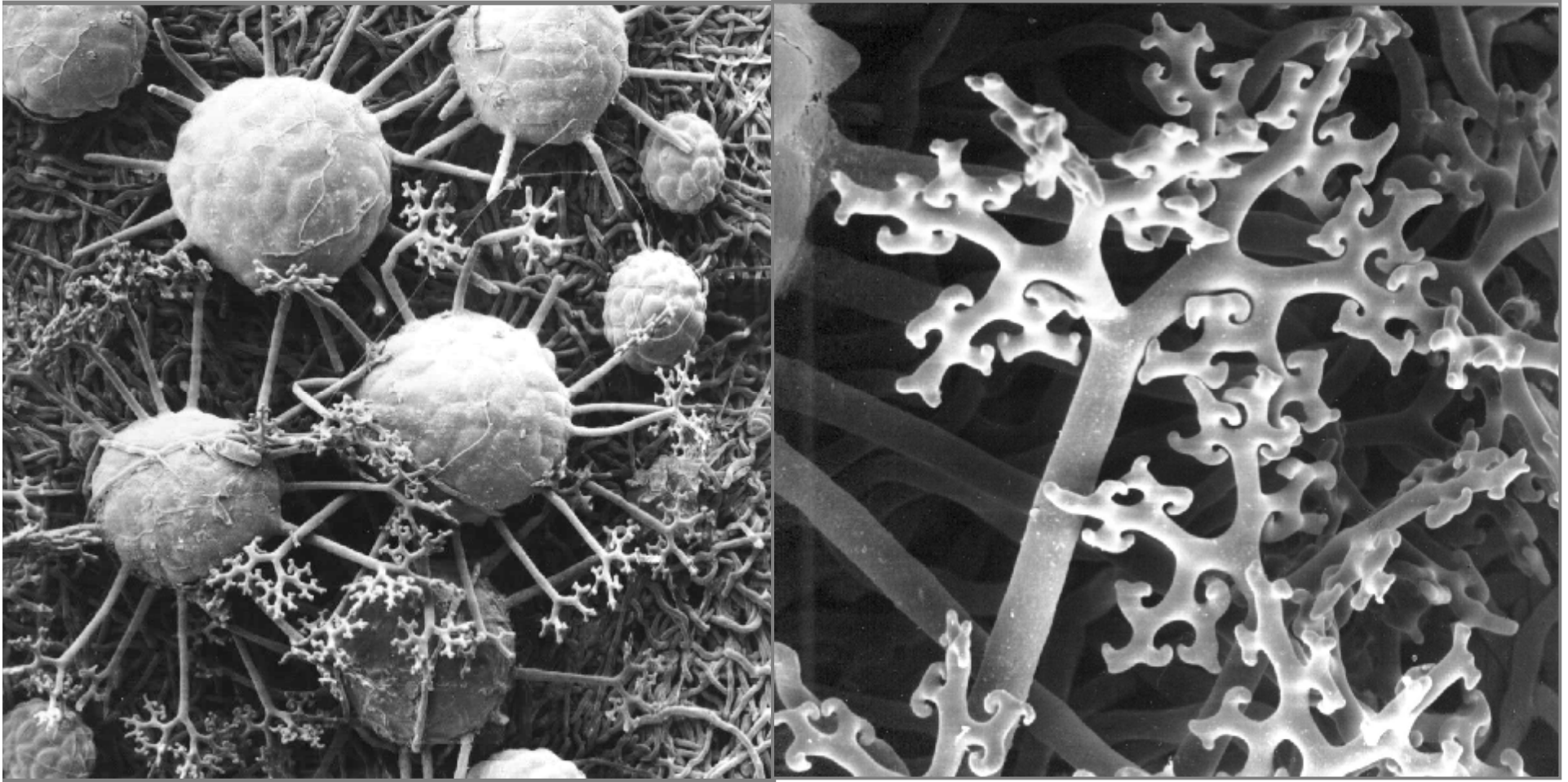
1.1 Morphology



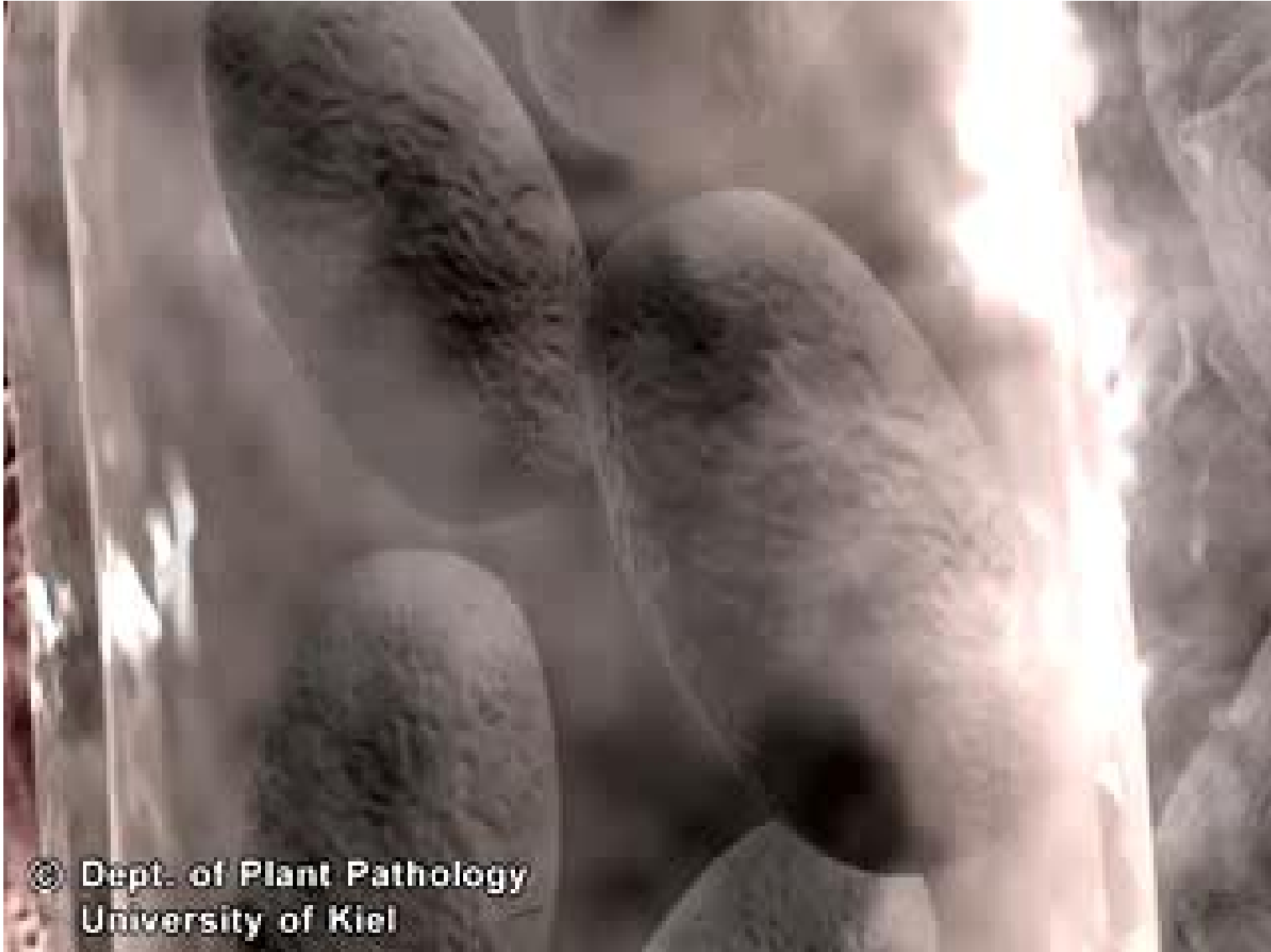
Cleistothecium (闭囊壳)



Cleistothecium, appendages morphology



Cleistothecium, appendages morphology



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1.2 Nutritional type (营养型)

Biotroph (活体营养型)

Obligate parasites (专性寄生)

Can not be cultured on artificial media

(人工培养基)

Most species are host specific (寄主专化性)



1.3 Vegetative form

Mycelium (菌丝体)
superficial
branched, well-
developed, septate
(分隔), contains
uninucleate cell

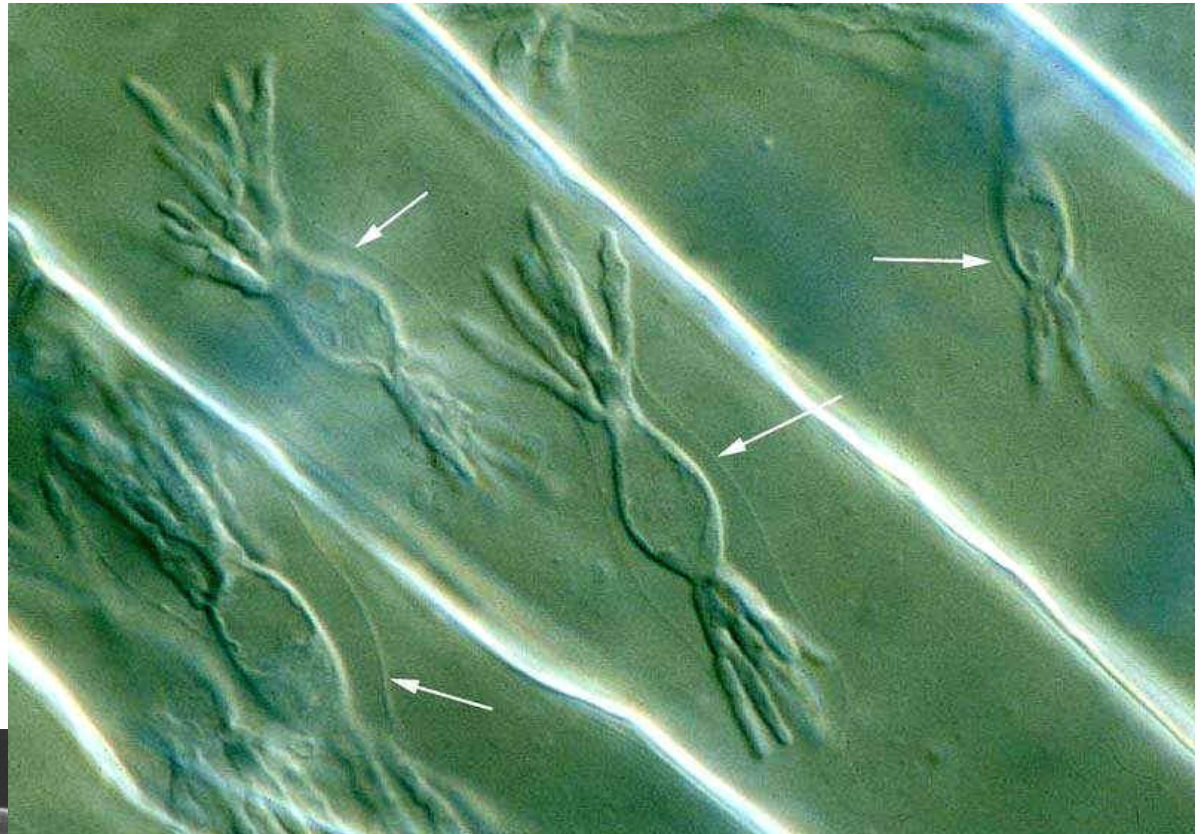
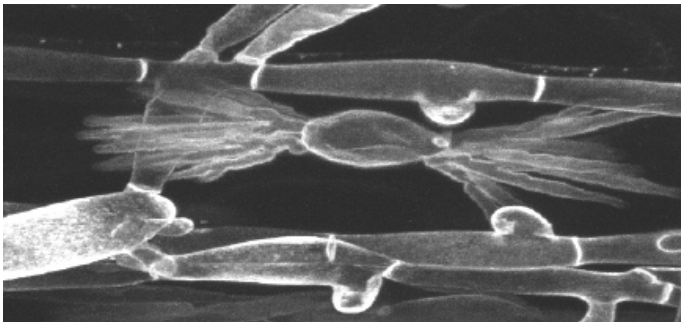




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1.3 Vegetative form

They obtain nutrients from the plant by sending haustoria (吸器) into the epidermal cells of the plant organs



haustoria

1.4 Reproduction

Asexual reproduction (无性繁殖)

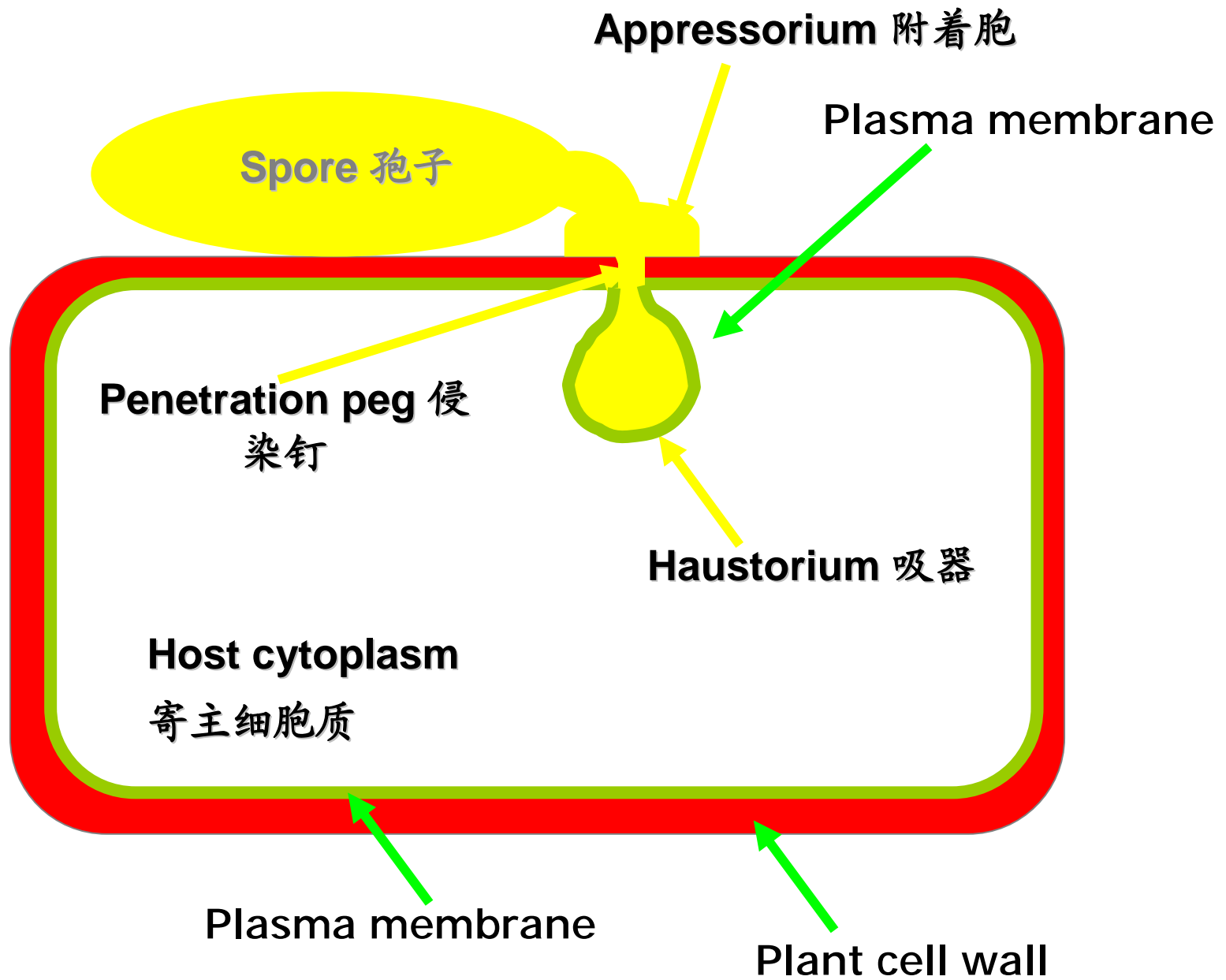
- One colony can produce > 30,000 conidia
- Conidia Wind - dispersed
- Germination involves **germ tube** (芽管), **appressorium** (附着胞) and **penetration peg** (侵染钉) formation
- **Apex** (顶端) of penetration peg enlarges to form **haustorium**



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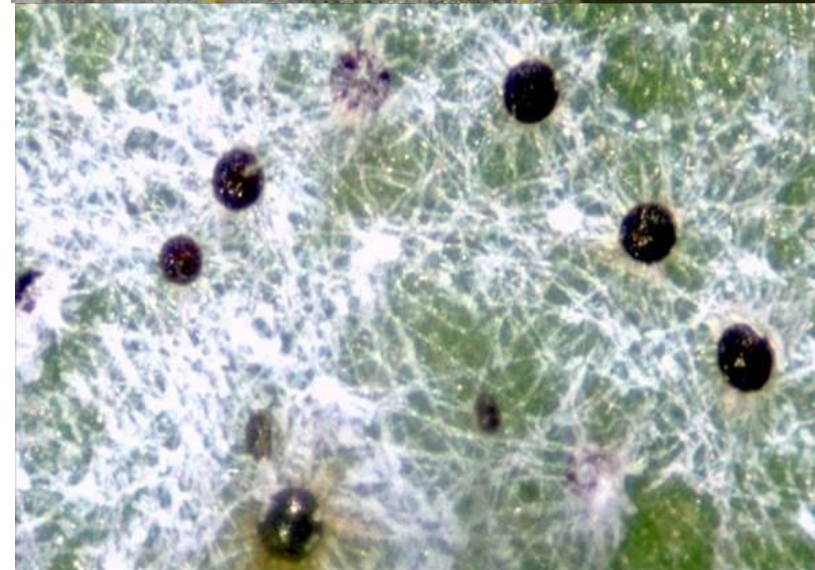


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Sexual reproduction (有性生殖)

- **Cleistothecia** (闭囊壳) formed on superficial mycelium in late summer / early fall



- **Ascus** (子囊)
 - Globose to pyriform (梨形的)
 - One to numerous asci/cleistothecium
 - **Ascospores** (子囊孢子) hyaline, one-celled, ovoid
 - 8 ascospores/ascus



Ascus and ascospores



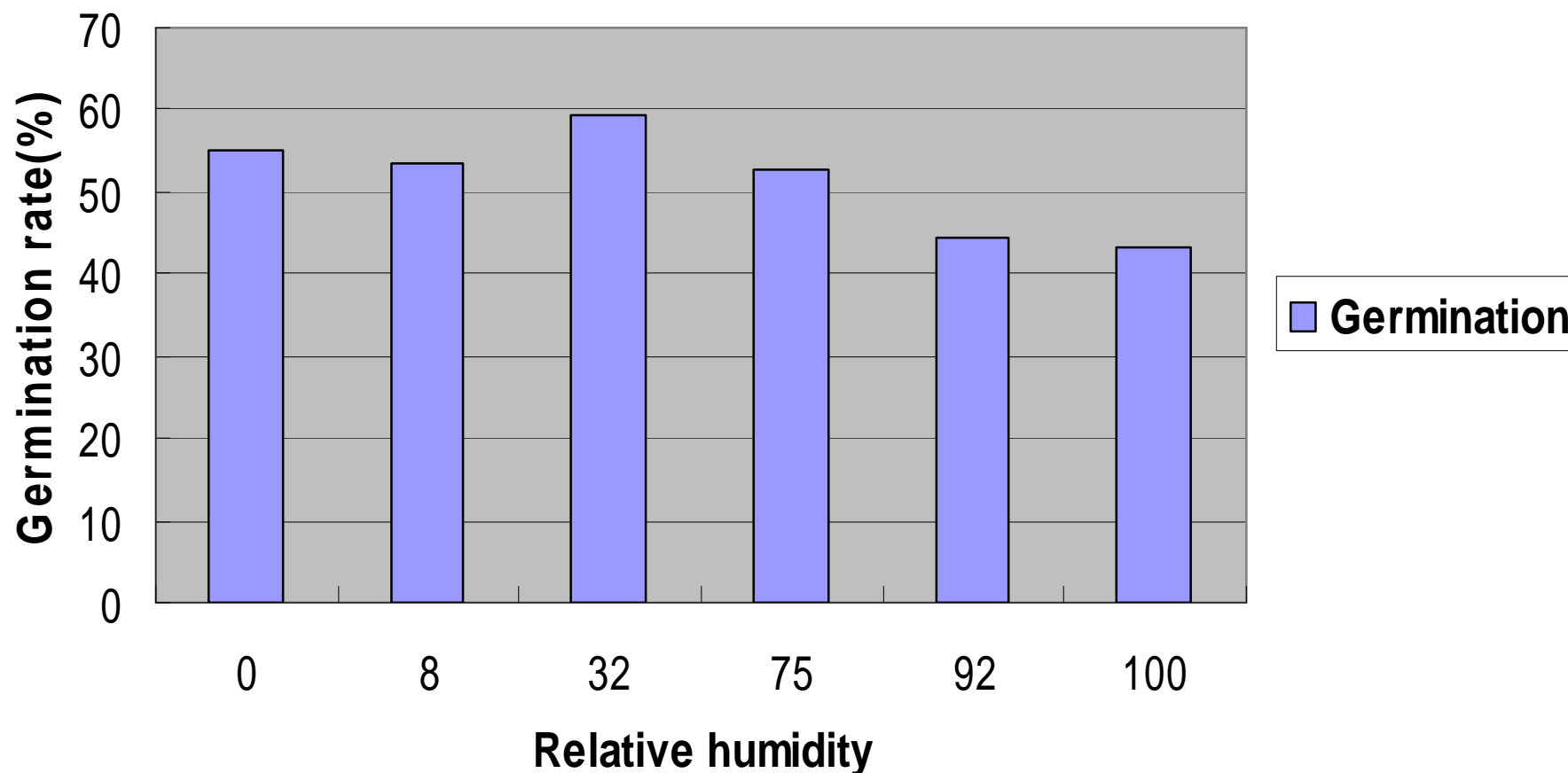
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1.5 Pathogenic characteristics (致病特点)

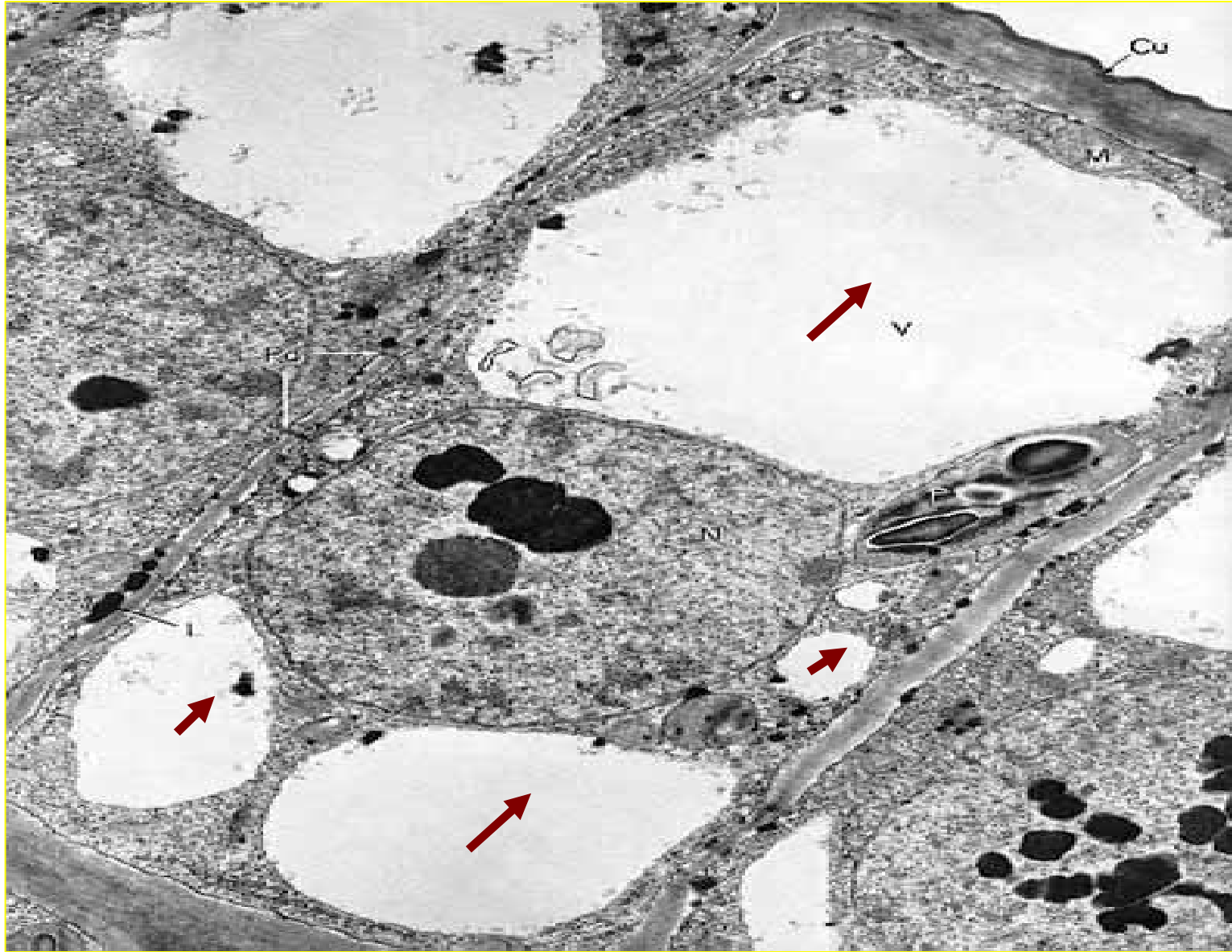
- a. Powdery mildews infect leaves, young shoots (枝) and stems, buds (芽), flowers, and young fruit.
- b. Powdery mildews seldom kill their hosts but utilize their nutrients, reduce photosynthesis (光合作用), increase respiration and transpiration (蒸腾), impair growth, and reduce yields (减产).
- c. Powdery mildew fungi, cause serious diseases in cool or warm, **humid** areas, are even more common and severe in warm, **dry** climates.

不同相对湿度下罌粟白粉菌分生孢子的萌发

Germination of conidia of poppy powdery mildew at different relative humidities



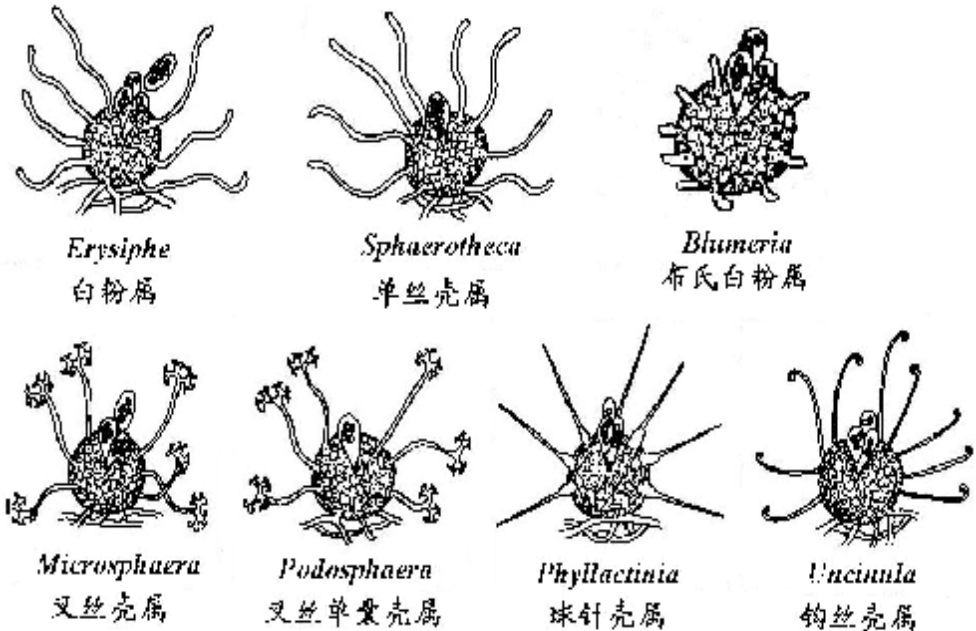
Note: Average of 3000 conidia
From Mycopathologia, 47: 253-260, 1972



Vacuoles (液泡)

2.1 Classification based on morphology

- Anamorph(无性型) has almost been neglected, teleomorph (有性型) as important taxonomic character
- Cleistothecial **appendages** (闭囊壳外附属丝)
- Number of **asci**/ascocarp (子囊果中子囊数)



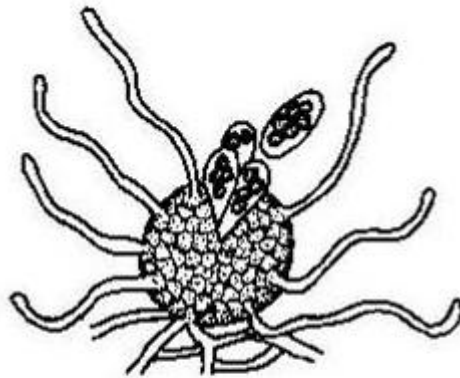
**Appendages
Undeveloped
(附属丝不发达)**



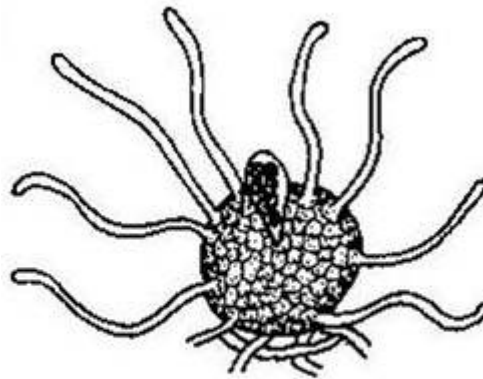
Blumeria
布氏白粉属



Mycelioid
(菌丝体状)



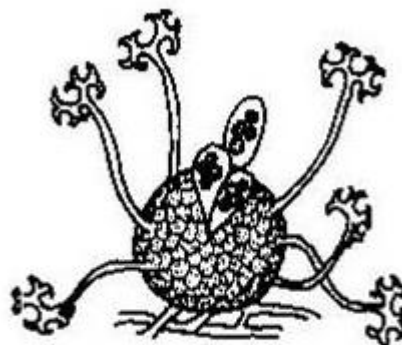
Erysiphe
白粉属



Sphaerotheca
单丝壳属

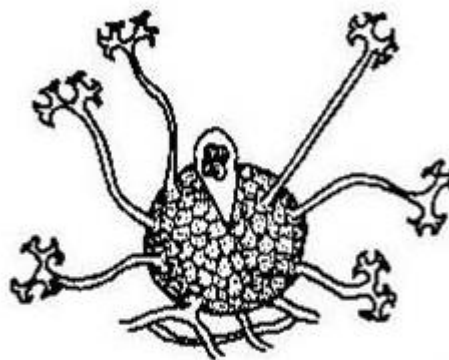


**With
dichotomously
branched tips**
(顶部
二叉状分枝)



Microsphaera

叉丝壳属

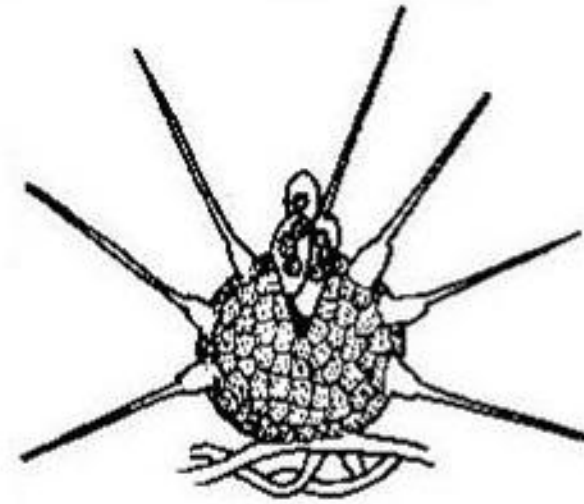


Podospaera

叉丝单囊壳属



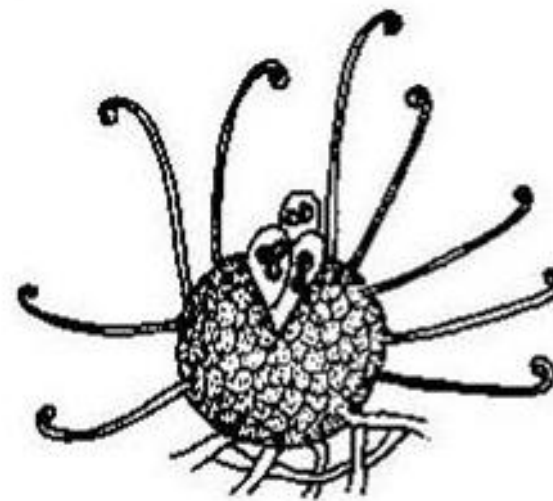
**Spear-like
with inflated
base (顶端矛
状基部膨大)**



Phyllactinia
球针壳属



With curled tips
(顶部卷曲)



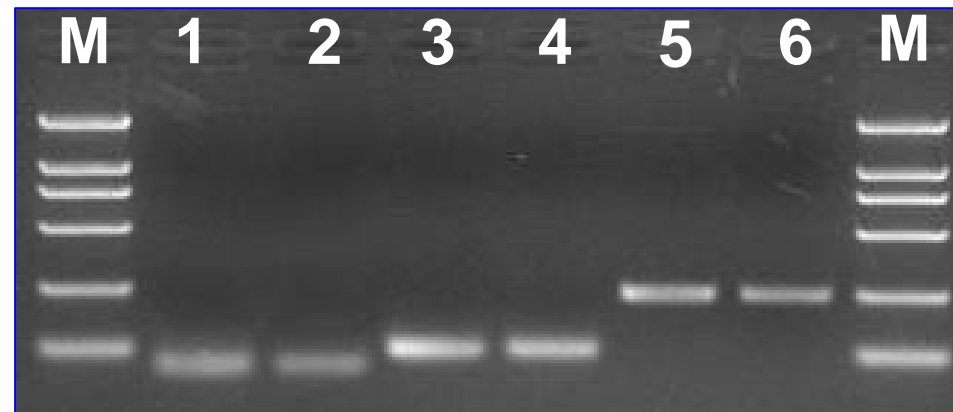
Uncinula
钩丝壳属

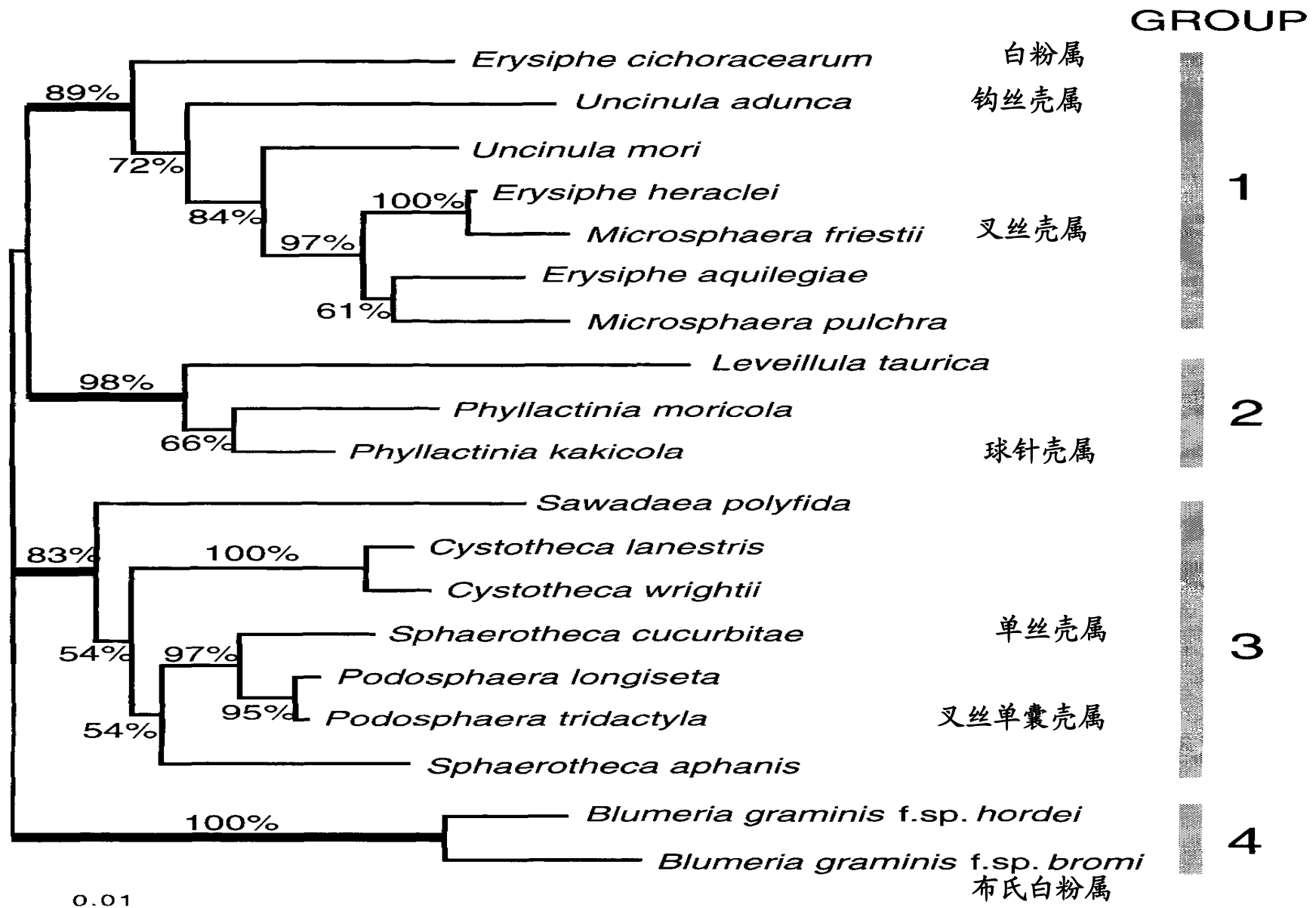


2.2 Classification based on molecular data

Phylogeny of powdery mildews fungi based on ITS rDNA sequences (基于ITS rDNA序列分析)

ITS, Internal transcribed spacer (转录间隔区)





**Grouping by the phylogenetic tree inferred from the ITS rDNA sequences
 From Mycoscience 39: 441-453,2010**

Questions

- 1. Why powdery mildew fungi can cause serious diseases in either humid areas or dry climates ?**
- 2. How to coordinate morphological and molecular taxonomy of Erysiphales?**