

# Study on the ice nucleation activity of fungal spores (Ascomycota and Basidiomycota)

B. G. Pummer (1), L. Atanasova (2), H. Bauer (3), J. Bernardi (4), I. S. Druzhinina (2), H. Grothe (1)



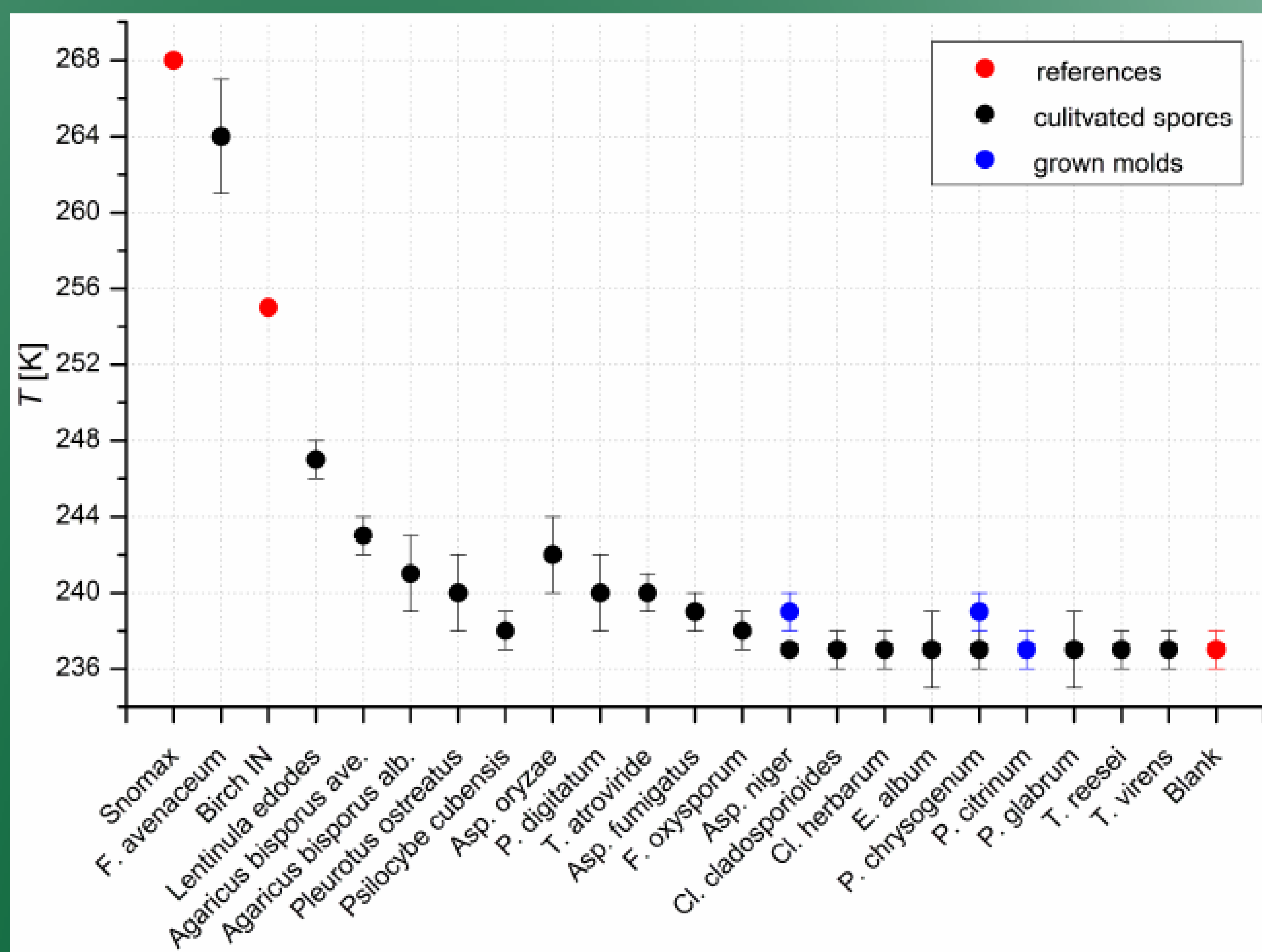
- 1) Inst. of Material Chemistry, Vienna University of Technology, Austria
- 2) Inst. of Chemical Engineering, Vienna University of Technology, Austria
- 3) Inst. of Chemical Technologies and Analytics, Vienna University of Technology, Austria
- 4) Service Center for Electron Microscopy, Vienna University of Technology, Austria

The ice nucleation activity of different fungal spores was measured in the oil immersion mode in a cryo-microscopic setup (see right picture; Pummer et al.). Most Ascomycota samples were taken from fungal databases and cultivated on PDA agar, but some moulds were naturally grown on food (bread, carrot, lemon, tomato). For the first time ever, the IN of Basidiomycota was measured in this study.

Our results indicate that fungal ice nucleation is restricted to only few species, since most species show nearly the same median freezing temperature as pure water (see picture below).

We focused on species of ecological, economical and/or sanitary significance, like exponents of *Aspergillus*, *Penicillium*, *Cladosporium*, *Fusarium*, *Engyodontium*, *Trichoderma* and *Agaricomycetes*. Apart from strong IN of the IN-positive *F. avenaceum* and mediocre IN activity of *Lentinula edodes* (Shiitake), all samples were IN-negative.

Pummer BG et al. (2012): *Atmos. Chem. Phys.* 12, p.2541-2550



Systematics: Regnum Fungi

Subregnum Dikarya

Phylum Ascomycota

Class Eurotiomycetes (*Asp.*, *P.*, ...)

Class Dothideomycetes (*Cl.*, ...)

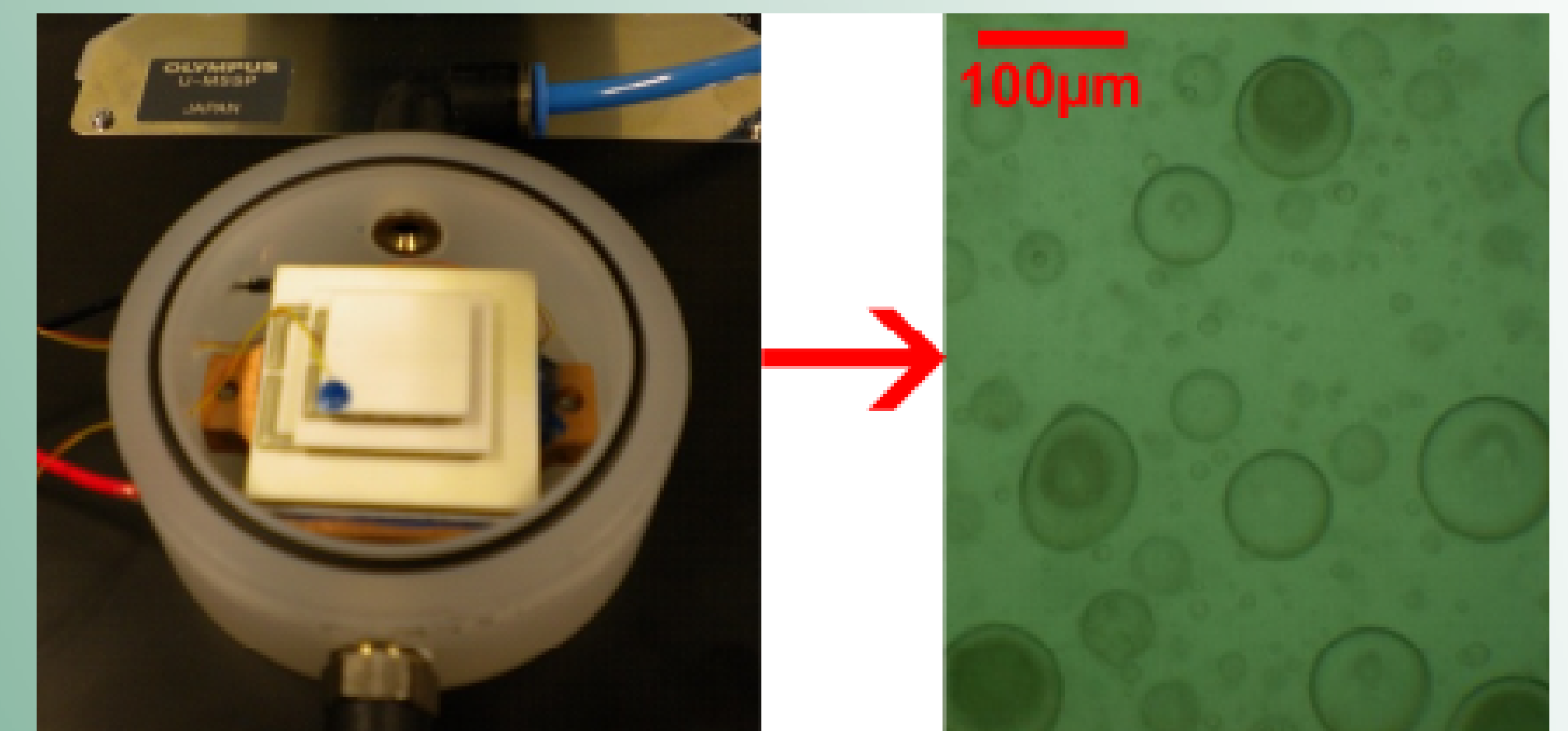
Class Sordariomycetes (*F.*, *E.*, *T.*, ...)

...

Phylum Basidiomycota

Class Agaricomycetes

...



Fungi are ubiquitous atmospheric bioaerosols. Consequently their impact on ice nucleation is of interest. Former studies found IN activity in some *Fusarium* and lichen species caused by a protein. Further studies showed that different fungal cultures of the same species can differ in their IN behaviour, respectively can turn off their IN activity during laboratory cultivation.

However, many important fungal species (e.g. the whole Basidiomycota phylum) have not been investigated up to now.

Kieft TL (1988): *Appl. Environ. Microbiol.* 54, p.1678-1681

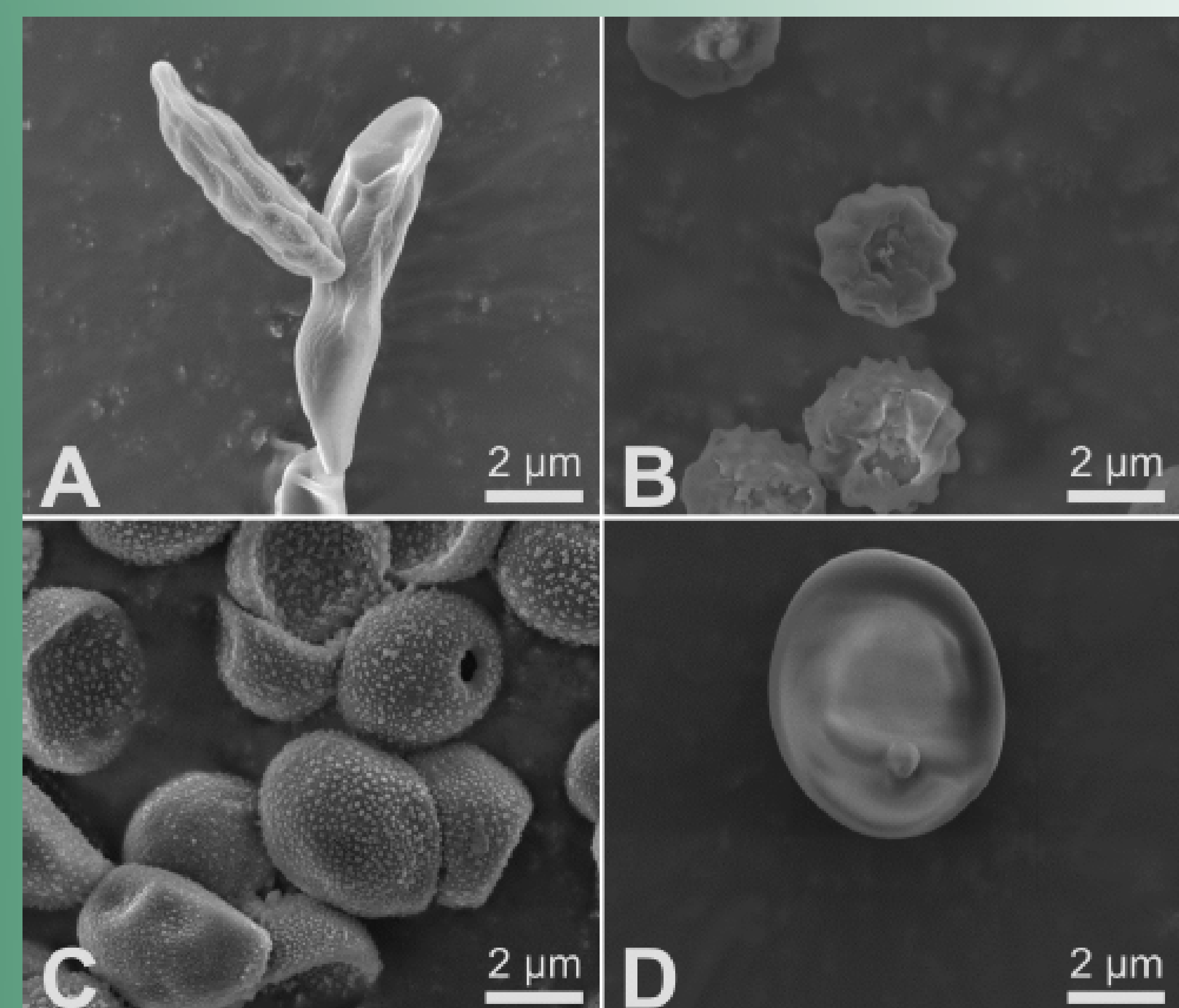
Kieft TL & Ruscelli T (1990): *J. Bacteriol.* 172, p.355-362

Pouleur S et al. (1992): *Appl. Environ. Microbiol.* 58, p.2960-2964

Richard C et al. (1996): *Phytoprotection* 77, p.83-92

Tsumuki 1995: *Ann. Phytopathol. Soc. Jpn.* 61, p.334-339

Below: Scanning electron microscopy pictures of some fungal spores.



We thank the rectorate of the Vienna University of Technology for financing the project, the OMV for sponsoring the microscope, Benigno Aquino for technical support with the fungal cultivation and Herbert Hafner for allocation of microbiological equipment.