

## *Goidanichiella sphaerospora*, the world's second record

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A specimen of *Goidanichiella sphaerospora* was found in *Pinus sylvestris* forest soil in Międzychód, northwestern Poland (52.601, 15.889883), in October 2009. This is the world's second record of *G. sphaerospora*. Bimorphic conidial heads and conidia are reported for the first time. *Goidanichiella sphaerospora* forms *Aspergillus*- and *Penicillium*-like conidial heads. Conidia formed at +24°C are oval to ellipsoidal, often apiculate, smooth, rather thick-walled, hyaline, with one oil drop inside, 3-4 × 2-3 µm. Additional ellipsoidal to cylindrical, thin-walled, 4-6.5 (-8) × 2-3.0 µm conidia are formed only after incubation for at least 7 days at +4°C in darkness.

**Key words:** *Goidanichiella sphaerospora*, morphology, taxonomy

### INTRODUCTION

During a study of biodiversity in fungal communities in forest soils treated with different methods of post-harvest utilization of wood debris and pre-planting preparation of soil, *Goidanichiella sphaerospora* Matsushima was identified on the basis of its morphology *in vitro*. The fungus produced numerous, characteristic, brown-pigmented conidiophores which ended mostly with *Aspergillus*-like radiate, fertile conidial heads. Conidia were cohering in glistening white slimy globule heads.

Four species of *Goidanichiella* G.L. Barron ex W. Gams are currently known: *G. barronii* W. Gams, Steiman & Seigle-Murandi, *G. cylindrospora* D.W. Li & G.H. Zhao, *G. fusiformis* K.D. Hyde, Yanna, Pinnoi & E.B.G. Jones and *G. sphaerospora* (Barron 1968; Matsushima 1975; Gams et al. 1990, 2009; Hyde et al. 2002; Li, Zhao 2007). *Goidanichiella sphaerospora* has previously been found only once, in forest soil in Hokkaido, Japan, by Matsushima (1975).

The aim of this paper is: (i) to present the world's second record of *G. sphaerospora*, (ii) to report newly observed morphological characteristics (Figs 1–8).

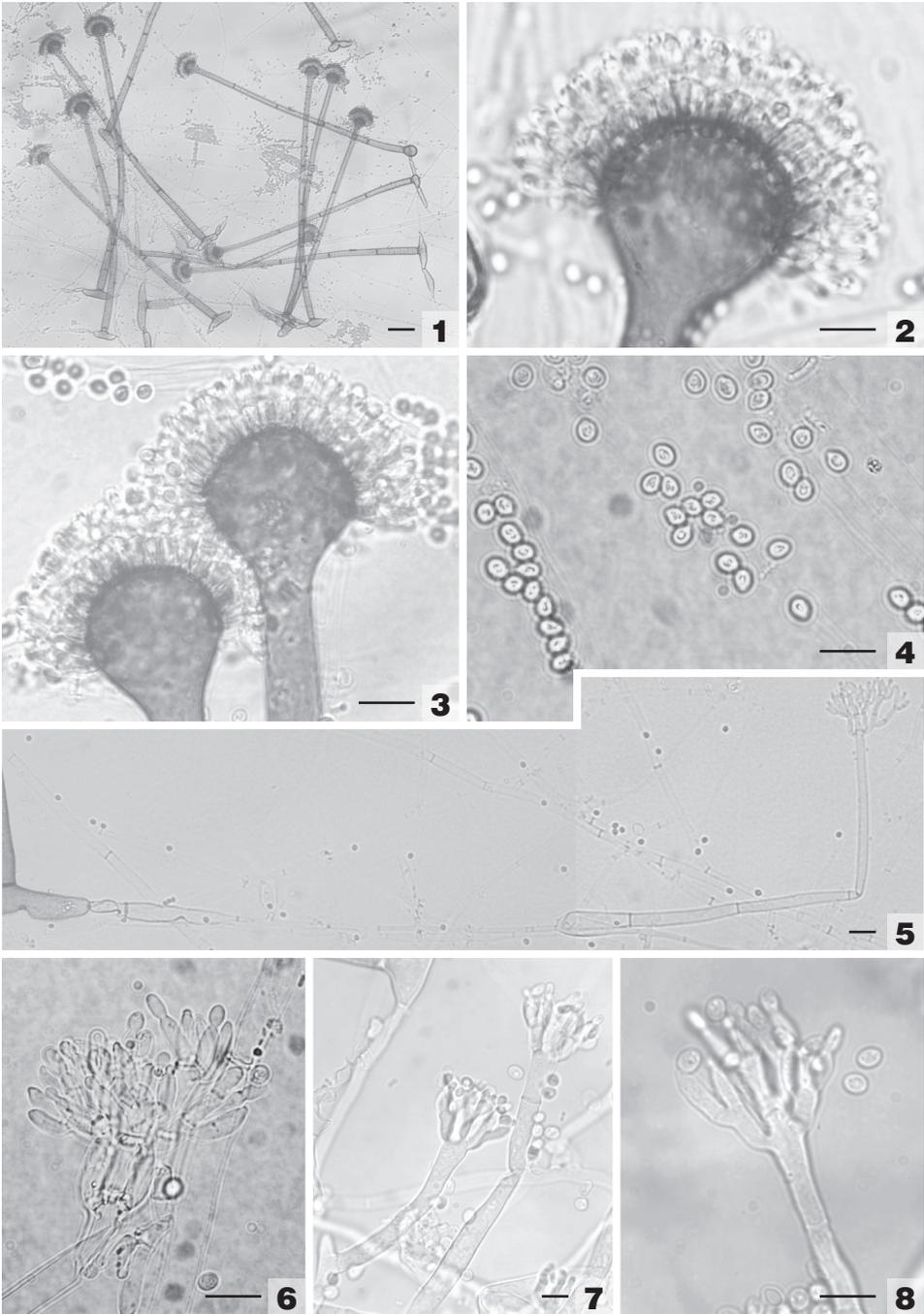
## MATERIALS AND METHODS

The fungus was isolated using the soil plate method (Warcup 1950). Conidiophores and conidia of the fungus grown on potato dextrose agar (PDA; 20 g Difco PDA, 20 g agar in 1 L of distilled water) and synthetic nutrient agar (SNA; 1 g  $\text{KH}_2\text{PO}_4$ , 1 g  $\text{KNO}_3$ , 0.5 g  $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$ , 0.5 g KCl, 0.2 g glucose, 0.2 g sucrose, 20 g agar, 1 L distilled water) were mounted in water. Microscopic observations were made using Nomarski differential interference contrast optics.

## RESULTS

A single specimen of *G. sphaerospora* was found in *P. sylvestris* forest soil in Międzychód, northwestern Poland (52.601, 15.889883), in October 2009. The soil had been deep ploughed in 2005, when the 10-15 cm deep, humus-rich soil layer was inverted. The post-harvest wood debris had remained on the soil surface since 2005, usually between rows along which 6-year-old *P. sylvestris* trees were planted.

The isolate of *G. sphaerospora* on PDA formed a thin colony, at first hyaline, later greyish, particularly in the centre, spreading broadly, with daily radial increments of 13-15 mm at 24°C. Conidiophores were numerous, scattered, erect, pale brown, with 4 (-5) septa (including the one at the base), 150-400 (-550)  $\mu\text{m}$  high, 15-20  $\mu\text{m}$  diameter at the base, tapering to 8-10  $\mu\text{m}$  diameter near the tip, supported by a swollen, more or less cylindrical, horizontal, brown cell, about 60-70  $\times$  8-15  $\mu\text{m}$ , present in the subtending hypha. Most conidiophores ended with *Aspergillus*-like, biseriolate conidial heads. Their vesicles, often with a slight constriction below the inflation, were up to 40  $\mu\text{m}$  diameter, fertile usually only in the upper part, bearing a series of moderately divergent or strictly parallel metulae. Each metula was bearing 3-5 appressed tapering phialides. Metulae of the *Aspergillus*-like conidial heads were cylindrical to obconical, subhyaline, (4.8-) 6-7  $\times$  3.6-4.8  $\mu\text{m}$ . Phialides were cylindrical to conical, hyaline, 4.8-7.2  $\times$  2.4-3.6  $\mu\text{m}$ . Rarely, more often on PDA, conidiophores that were usually shorter and always hyaline with *Penicillium*-like conidial heads appeared. They had none or less pronounced vesicles and 4-10 parallel metulae, each bearing 2-5 phialides. Conidia, oval to ellipsoidal, often apiculate, smooth, rather thick-walled, hyaline, with one oil drop inside, 3-4  $\times$  2-3  $\mu\text{m}$ , were formed on both the *Aspergillus*- and *Penicillium*-like conidial heads on SNA and PDA at 24°C. Ellipsoidal to cylindrical, thin-walled, 4-6.5 (-8)  $\times$  2-3.0  $\mu\text{m}$  conidia were formed after incubation for at least 7 days at +4°C in darkness. Minimum, optimum and maximum temperatures for growth were 10°C, 25°C and 35°C. The fungus was deposited in CABI Bioscience, UK Centre (IMI 398538) and Centraalbureau voor Schimmelfcultures, Utrecht, the Netherlands (CBS 127247). The ITS1/2 DNA sequence is in European Nucleotide Archive under EMBL No FR681846.



Figs 1–8. *Goidanichiella sphaerospora*. 1. Conidiophores. 2, 3. *Aspergillus*-like radiate, fertile, biseriate conidial heads. 4. Oval to ellipsoidal, often apiculate conidia. 5–8. *Penicillium*-like fertile, biseriate conidial heads. Scale bars for Fig. 1= 50  $\mu\text{m}$ , for Figs 2–4, 6–8 = 10  $\mu\text{m}$  and for Fig. 5=25  $\mu\text{m}$ .

## DISCUSSION

There are only two *Goidanichiella* species with biseriate vesicles, viz. *G. barronii* and *G. sphaerospora*. The latter was separated from *G. barronii* on the basis of: (i) width of conidiophores, which in *G. barronii* are (6-)8-13  $\mu\text{m}$  near the base and 4-7.5  $\mu\text{m}$  near the tip, (ii) size of metulae and phialides, which in *G. barronii* are 6.5-11  $\times$  2-3.5  $\mu\text{m}$  and 7.5-10  $\times$  1.5-2.5  $\mu\text{m}$ , respectively, (iii) formation of monomorphic conidia at 24°C in a day-night cycle, (iv) formation of bimorphic conidia only at 4°C in darkness. The ellipsoidal to cylindrical, thin-walled, 4-6.5 (-8)  $\times$  2-3.0  $\mu\text{m}$  conidia, formed only at low temperature and in darkness, resembled the similar allantoid, thin-walled, 4-6.5(-7)  $\times$  1.4-2.0  $\mu\text{m}$  conidia produced on conidiophores with less pronounced vesicles by *G. barronii* (Gams et al. 1990).

Our isolate of *G. sphaerospora* differed from the original isolate described by Matsushima (1975) in: (i) formation of more slender metulae and phialides of the *Aspergillus*-like conidial heads, (ii) longer persistence of conidial structures which do not collapse after maturity, (iii) absence of globose conidia reported by Matsushima (1975), (iv) formation of larger, ellipsoidal to cylindrical conidia at low temperature and in darkness.

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*Goidanichiella sphaerospora*, drugie stanowisko na świecie

## Streszczenie

*Goidanichiella sphaerospora* znaleziono w glebie leśnej, w młodniku *Pinus sylvestris*, w Międzychodzie (Polska północna, 52.601, 15.889883), w październiku 2009. Jest to drugie stanowisko tego grzyba na świecie. Poprzednio grzyba stwierdzono w glebie leśnej w Japonii. Grzyb tworzy zarodniki konidialne na bimorficznych konidioforach przypominających konidiofory *Aspergillus* i *Penicillium*. Występują dwa rodzaje zarodników. W temperaturze 24°C, na PDA i SNA, tworzą się konidia, które są owalne do eliptycznych, ostro zakończony u podstawy, gładkie, grubościennie, hialinowe, z jedną kroplą wewnątrz, 3-4  $\times$  2-3  $\mu\text{m}$ . W temperaturze 4°C, przy braku światła, tworzą się dodatkowe konidia, które są eliptyczne do cylindrycznych, cienkościennie, 4-6,5 (-8)  $\times$  2-3,0  $\mu\text{m}$ .