
New anamorph fungi with rhombic conidia from Mexican tropical forest litter

Gabriela Heredia^{1*}, Rosa Ma. Arias¹, Manuela Reyes¹ and Rafael Castañeda-Ruiz²

¹Instituto de Ecología A.C. Km. 2.5 Carretera Antigua Xalapa-Coatepec. Congregación El Haya No. 351 C.P. 91070. Xalapa, Ver. México

²Instituto de Investigaciones Fundamentales en Agricultura Tropical 'Alejandro Humboldt'. Calle 1 esq. 2 Santiago de las Vegas, Ciudad La Habana 10800 Cuba

Heredia, G., Arias, R.M., Reyes M. and Castañeda-Ruiz, R. (2002). New anamorph fungi with rhombic conidia from Mexican tropical forest litter. *Fungal Diversity* 11: 99-107.

Two anamorph fungi, collected on leaf litter from Mexico are proposed as new taxa. One of them, *Beltraniella fertilis*, is characterized by having branched conidiophores with fertile apices. The other species, *Pseudobeltrania macrospora*, is characterized by having much longer conidia than all known species of *Pseudobeltrania*. Descriptions and illustrations *in situ* are provided, as well as culture characteristics. A key to the species of the genus *Pseudobeltrania* is included.

Key words: anamorphic fungi, hyphomycetes, litter fungi, Mexican mycobiota.

Introduction

Anamorph fungi with rhombic or rostrate conidia are commonly encountered on tropical leaf litter. In Mexico there is certainly a considerable richness of these fungi, however few have been recorded (Heredia, 1994; Heredia and Mercado-Sierra, 1998; Heredia *et al.*, 2000). During our continuing survey of microfungi from leaf litter in tropical Mexico, two new fungi with rhombic conidia were recognized based upon their morphological characteristics *in situ*.

Leaf material was incubated in a damp chamber to induce sporulation. Permanent slides were prepared with alcohol polyvinyl. Monosporic isolates were obtained on yeast-malt extract agar (MEA), corn meal agar (CMA) and potato dextrose agar (PDA). Colony descriptions were made after seven days incubation at 25 C in the dark. Cultures and slides have been deposited in Mycothèque Université Catholique de Louvain (MUCL) and in the Instituto de Ecología (XAL).

* Corresponding author: Gabriela Heredia; e-mail: heredia@ecologia.edu.mx

Taxonomy

Beltraniella fertilis Heredia, Arias, Reyes & R.F. Castañeda, **sp. nov.**

(Figs. 1-6)

Coloniae amphigenae, plerumque hypophyllae, effusae, griseo brunneae. Mycelium plerumque in substrato immersum. *Setae* erectae, rectae, crassitunicatae, parce verrucosae, extra ad basis et apicem, in apicem acutum angustatae, atro-brunneae ad fundamentae, pallide ad apicem, $55-202 \times 5-6 \mu\text{m}$, ex cellulis basalibus brunneis, radiatim lobatis, oriundae, $10-15 \mu\text{m}$ diam. *Conidiophora* macronematosa, longa setiformia et brevis. Conidiophora setiformia solitariae vel aggregata minuta, rectae, septatae, verrucosae, aliquando ramosa ad apicem, atro-brunneae ad fundamentae et pallide ad apicem, usque ad $328 \times 5-6 \mu\text{m}$, ex cellulis basalibus lobatis, oriunda. Brevis conidiophora simplices vel multu ramosa, septata, levia, dilute brunnea vel hyalinae, tenuitunicata, inflata, $10-30 \times 4-7 \mu\text{m}$. *Cellulae conidiogenae* polyblasticae, terminales, clavatae vel cylindrical, inflatae, pallide-brunneae, $7-17 \times 4-5 \mu\text{m}$. *Cellulae separantes* oboviformes, tenuitunicatae, laeves, dilute brunneae vel hyalinae, denticulatae ad utrimque finis, $8-13 \times 4-6 \mu\text{m}$. *Conidia* exflare dirigere a cellulae conidogenae vel cellulae separantes, distales terminales liberes truncate, ad basim rostrata, levia, subhyalina vel dilute olivacea, in parte supra-aequatoriali cum fasci hyalina praedita, $19-22 \times 4-6 \mu\text{m}$. In follis emourtuis *Mangifera indica*.

Holotype: MÉXICO, Veracruz 'La Mancha' Municipio Actopan, $96^{\circ}22'$ W, $19^{\circ}36'$ N, on dead leaves of *Mangifera indica*, 13 Apr. 1996, M. Reyes and R.M. Arias, (CB712XAL) isotype (3210-43211 MUCL).

Colonies amphigenous but predominantly hypophyllous, effuse, olive-brown. Mycelium mostly immersed in the substratum. *Setae* erect, straight, single or in small groups, thick-walled, sparsely verrucose although smooth at the base and the apex, tapering to an acutely pointed apex, dark chestnut-brown, paler at the apex, $55-202 \times 5-6 \mu\text{m}$ wide at the base, arising from a brown swollen, radially lobed basal cell, $10-15 \mu\text{m}$ diam. *Conidiophores* macronematous, long setiform and short; long conidiophores single or in small groups, straight, septate, verrucose, thick-walled, branched at the apical region, dark brown at the base and paler at the apex, up to $328 \times 5-6 \mu\text{m}$, arising from a lobed basal cell. Short conidiophores simple or several times branched, septate, smooth-walled, subhyaline to hyaline, thin-walled, $10-30 \times 4-7 \mu\text{m}$. *Conidiogenous cells* polyblastic, terminal, clavate to cylindrical, inflated, bearing several terminal or subterminal denticles, pale brown, $7-17 \times 4-5 \mu\text{m}$. *Separating cells* obovoid, thin-walled, smooth, hyaline to sub-hyaline, 1-denticulate at each end, $8-13 \times 4-6 \mu\text{m}$. *Conidia* arise directly from conidiogenous cells or from separating cells, distal free end truncate, proximal end rostrate, smooth, sub-hyaline to pale olivaceous with a hyaline transverse band above the equatorial zone, $19-22 \times 4-6 \mu\text{m}$.

Cultural characteristics. After seven day-old at 25 C, colonies on MEA attaining a diam. of 55-65 mm, greyish-white to brown-greyish, floccose, consisting of a dense mycelial felt, with some cottony aerial mycelium,

margins entire, reverse yellow. Conidiogenesis was not detected in seven day-old colonies. After two months colonies formed fertile, branched conidiophores, setae and abundant conidia.

After seven day-old at 25 C, colonies on CMA attaining a diam. of 40-54 mm, hyaline, consisting of a very sparse mycelial felt, most of the hyphae submerged in the medium, reverse uncolored. Seven day-old colonies produced conidiophores in groups spreading in the medium, conidiogenesis and setae were profuse after a week.

After seven day-old at 25 C, colonies on PDA attaining a diam. of 58-60 mm, brown-greyish, central area with whitish patches, somewhat floccose, abundant mycelial felt, margins entire, reverse yellow becoming brown. Conidiogenesis abundant after three weeks, producing highly branched conidiophores, separating cells infrequent.

Notes: CABI Bioscience database of Fungal Names (Funindex) includes for the genus *Beltraniella* Subramanian about 18 species. A key of the genus is provided by Castañeda-Ruiz *et al.* (1996). Only *B. japonica* Matsushima (1975) and *B. aethiopica* Bhat and Sutton (1985) have conidiophores branched with fertile apices. Table 1 compares the morphology of the new species to that of *B. aethiopica* and *B. japonica*.

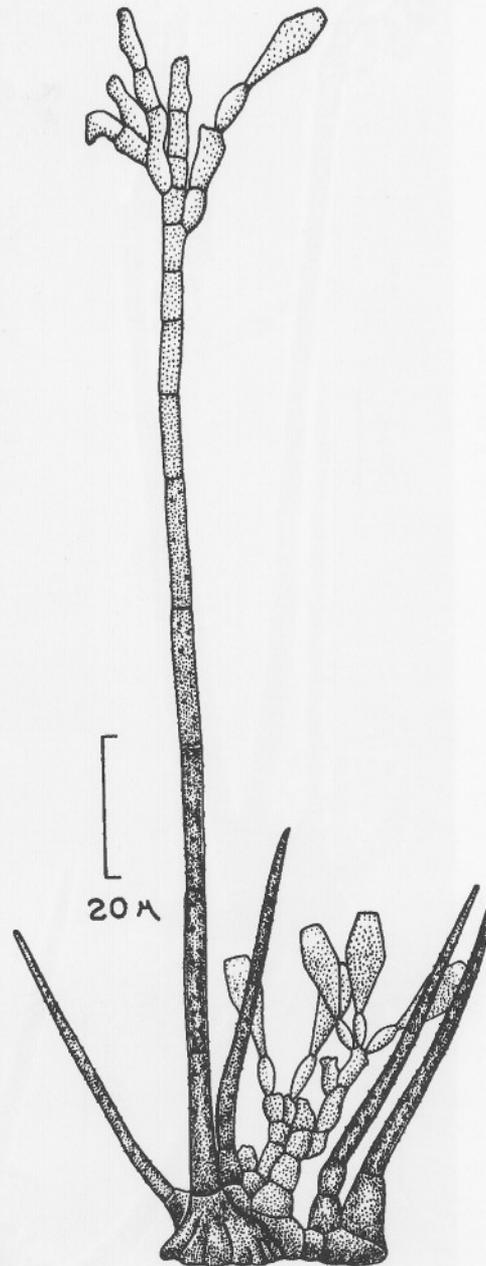
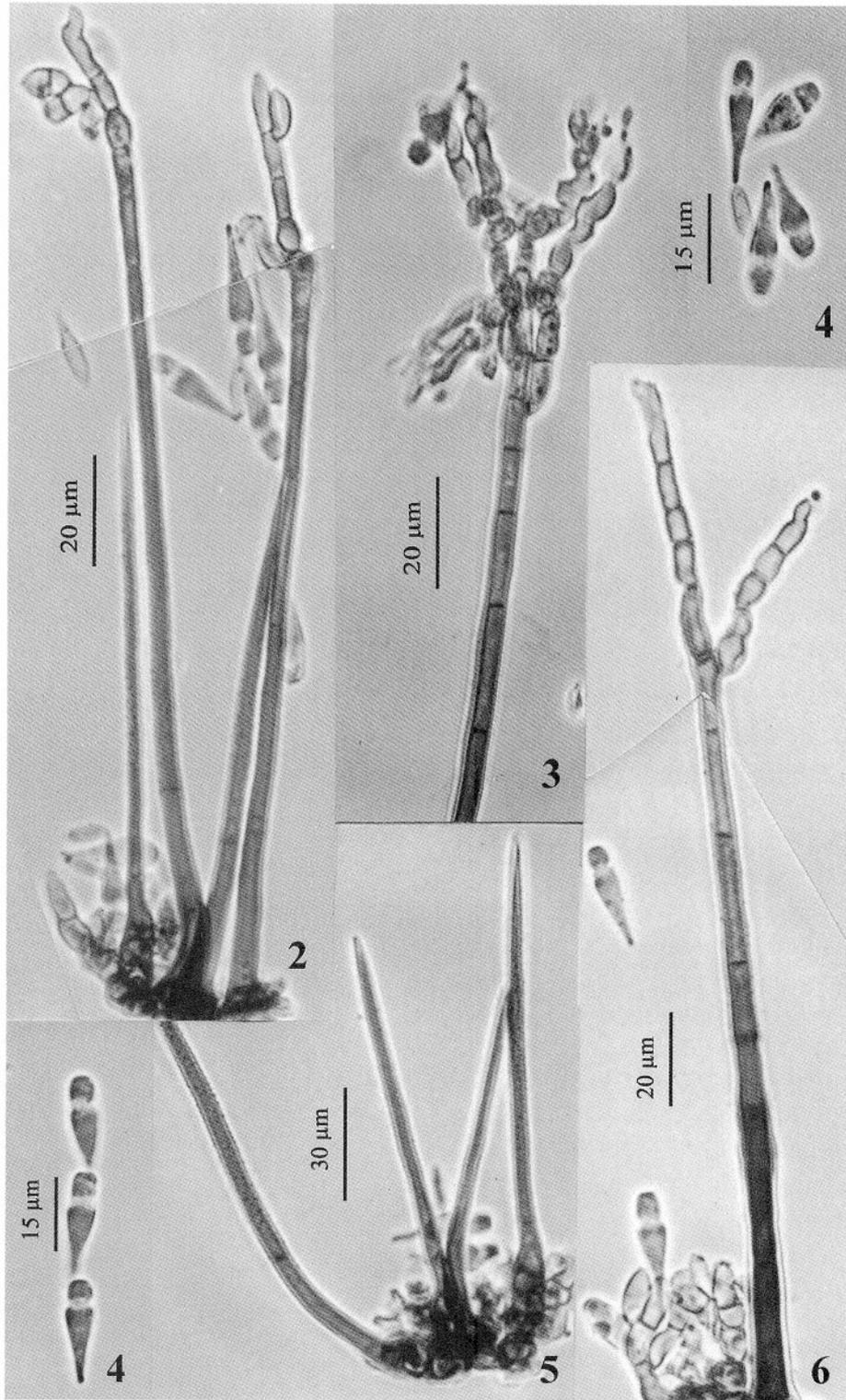


Fig. 1. *Beltraniella fertilis* from natural substratum (dead leaves of mango).



Figs. 2-6. *Beltraniella fertilis* from natural substratum (Figs. 2-5) and culture (Fig. 6). 2. Long conidiophores and short setae. 3. Conidiophores branched at the apex. 4. Separating cell and conidia. 5. Setae. 6. Conidiophores and conidia from a 10 day-old corn meal agar culture.

Table 1. Comparative morphology of *Beltraniella aethiopica*, *B. fertilis* and *B. japonica*.

	<i>B. aethiopica</i> (Bhat and Sutton, 1985)	<i>B. fertilis</i> (This paper)	<i>B. japonica</i> (Matsushima, 1975)
Setae	Absent	Present	Absent
Conidiophores	Up to 460 × 4-6 µm	Up to 328 × 5-6 µm	125-300 × 3-5 µm
Apical branches	Short branches of 2-3 cells, 7-5 µm long	Short and long branches up to 50 µm long	Simple and with several branches
Separating cells	Absent	Present	Absent
Conidia	15-21 × 6-8.5 µm with a defined hyaline transverse band	18-22 × 4-6 µm with a defined hyaline transverse band	14-20 × 7-10 µm without a hyaline transverse band

The absence of setae in *Beltraniella japonica* and *B. aethiopica* and their wider conidia distinguishes them from the new species. The conidial dimensions of *B. fertilis* were: mean length 20 ± 1.0 (100), mode 19; mean width 5 ± 0.5 (100), mode 5.

The shape of the short conidiophores and setae of the new species resemble *Beltraniella portoricensis* (F. Stevens) Pirozynski and Patil (1970), but the absence of branched conidiophores with fertile apices in *B. portoricensis* as well as the conidia size ($20-23 \times 6.5-8 \mu\text{m}$) distinguish both species.

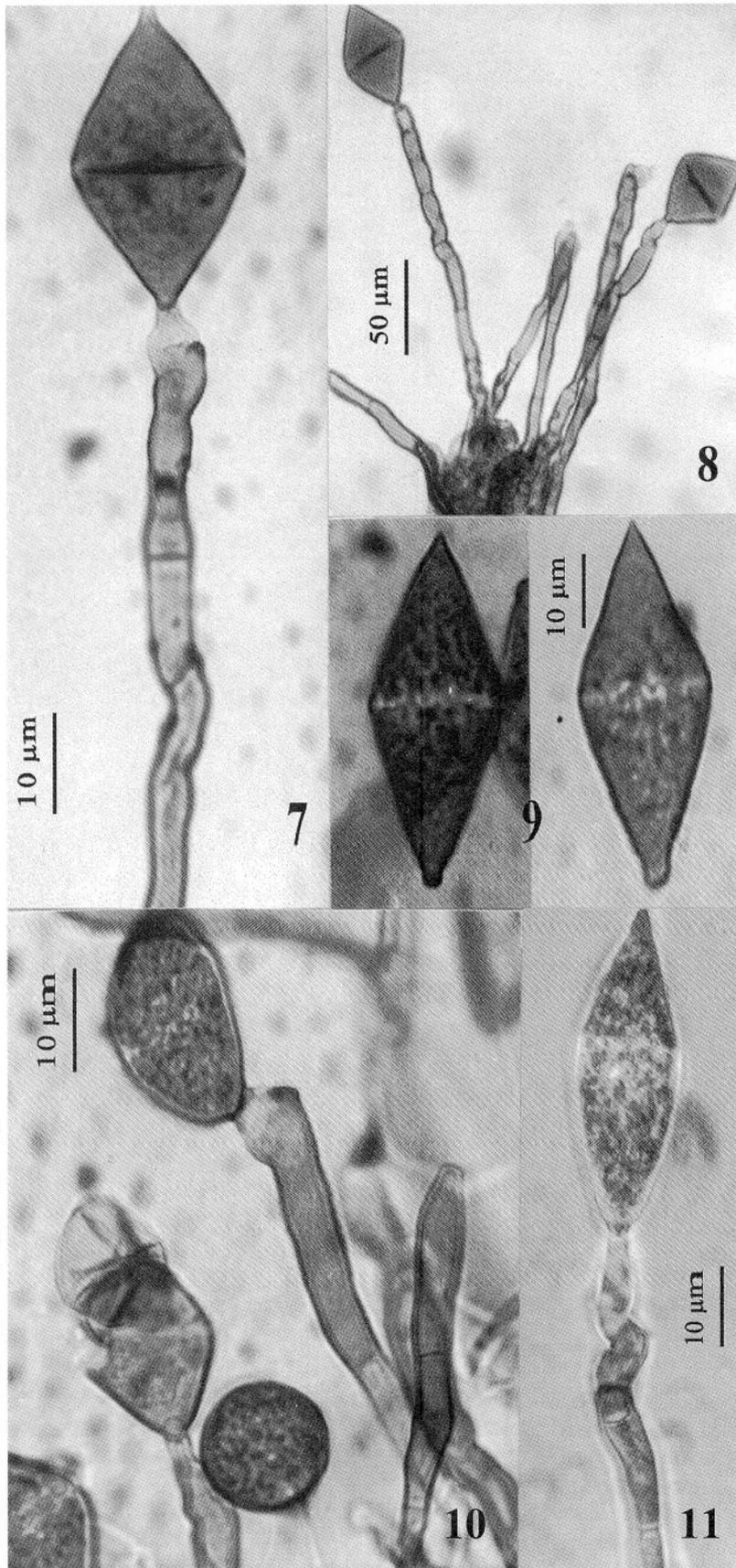
***Pseudobeltrania macrospora* Heredia, Arias, Reyes & Castañeda, sp. nov.**

(Figs. 7-11)

Coloniae hypophyllae, effusae, pilosae, pallide olivaceo-griseae. *Mycelium* immersum. *Conidiophora* macronematosa, solitaria vel 2-8 fasciculata, simplicia, septata, erecta, recta vel flexuoso-geniculata, luteo-brunnea vel brunnea, pallide ad apicem, usque ad $170 \times 5-6 \mu\text{m}$, ex cellulis basalibus radiatim lobatis, oriunda, 9-14 µm diam. *Cellulae conidiogenae* polyblasticae, terminales et intercalares, cylindricae vel clavatae, cylindricae, inflatae, tenuitunicatae, pallide-brunneae, $15-32 \times 6-7 \mu\text{m}$. *Conidia* holobastica, solitaria, primo pyriformia, hyalina, deinde rhomboidea, ad basim denticulata, ad apicem apiculata, pallide olivaceo-brunnea, levia, $36-45 \times 19-24 \mu\text{m}$, in parte aequatoriali cum fascia hyalina praedita. In follis emourtuis arboris latifoliae.

Holotype: MÉXICO, Veracruz, 'La Pitaya', Municipio Zoncuantla, 97°05' W, 19°20' N, on leaf litter, 2 June 2000, G. Heredia, M. Reyes and R.M. Arias (CB713 XAL).

Colonies hypophyllous, effuse, hairy, pale olive-brown. *Mycelium* immersed. *Conidiophores* macronematous, single, in pairs or groups of 2-8, simple, septate, erect, straight to somewhat flexuous, geniculate, pale brown to brown, paler at the apex, up to $170 \times 5-6 \mu\text{m}$, arising from a radially lobed



Figs. 7-11. *Pseudobeltrania macrospora*. 7, 8, 9. Conidiophores and conidia from natural substratum. Note the mature conidia with transverse hyaline bands. 10, 11. Immature conidia from a 10 day-old corn meal agar culture.

basal cell 9-14 μm diam. *Conidiogenous cells* polyblastic, terminal and intercalary, sympodial, cylindrical or clavate, denticulate, pale brown, 15-32 \times 6-7 μm . *Conidia* solitary, simple, at first pyriform, hyaline, becoming rhombic, denticulate at the base, apiculate at the apex, olivaceous brown, smooth, 36-45 μm long \times 19-24 μm wide, with a transverse hyaline band in the widest part.

Cultural characteristics. After seven day-old at 25 C, colonies on MEA attaining a diam. of 50-54 mm, brown-greyish, mycelium floccose, mostly immersed, margins entire, reverse yellow. After seven days, producing sparse conidiophores and limited conidia.

After seven day-old at 25 C, colonies on CMA attaining a diam. of 44-48 mm, hyaline with pinkish shadows, consisting of a very sparse mycelial felt, most of the hyphae submerged in the medium, reverse uncolored. Seven day-old colonies producing abundant conidia and conidiophores.

After seven day-old at 25 C, colonies on PDA attaining a diam. of 47-48 mm, brown-greyish, low and sparse, velvety, somewhat floccose, mycelial felt mostly superficial, margins entire, reverse light yellow becoming brown. Conidiogenesis absent.

Notes: Morphological characteristics display affinity with *Pseudobeltrania cedrelae* Henn. and *P. penzigii* Pirozynski (1972), except conidial dimensions which are substantially larger in the new species (36-45 \times 19-24 μm) compared to those of *P. cedrelae* (20-25 \times 10-13 μm) and *P. penzigii* (20-28 \times 10-15 μm). The conidial dimensions of *P. macrospora* were: mean length 41 ± 1.0 (100), mode 40; mean width 20.7 ± 0.5 (100), mode 20.

The generic characteristics of *Pseudobeltrania* are: conidiophores arising from radially lobed basal cells, simple or branched, bearing 1 or several large denticles apically, conidia arising as blown-out ends of conidiophores, continuous, smooth, biconic, denticulate at the base, apiculate above, pale olive brown with a transverse, hyaline band, separating cells absent (Pirozynski, 1963). Zucconi (1991) pointed out the presence of a transverse band as an important distinctive characteristic at the generic level.

CABI Bioscience database of Fungal Names (Funindex) includes the following species into the genus: *P. angamosensis* Matsush., *P. cedrelae* Henn. (type species), *P. cristaspora* (Matsush.) de Hoog, *P. chumrungensis* B. Sutton, *P. guerensis* Zucconi, *P. havanensis* Hol.-Jech., *P. penzigii* Piroz., *P. selenoides* (Matsush.) de Hoog and *P. summa* Matsush.

However, not all of these taxa fall within the generic description; conidia of *Pseudobeltrania chumrungensis*, *P. selenoides* and *P. cristaspora* (de Hoog, 1977) do not have a transverse hyaline band. Furthermore, conidia and

conidiogenous cells of *P. selenoides* are quite different; the conidia are selenoid with acute ends. Morphological characteristics of *P. chumrungensis* (Sutton, 1970), and *P. cristaspora* (de Hoog, 1977) resemble the genus *Hemibeltrania* more than *Pseudobeltrania*. Because type material of these two species was unavailable for examination, we abstain from making taxonomic changes.

The annexed key includes only those species which have conidia with a distinctive, hyaline transverse band.

Key to species of *Pseudobeltrania*

- 1. Conidiophores branched or fasciculate2
- 1. Conidiophores simple.....3
- 2. Conidiophores branched at the apex, conidia pyriform with the distal end rounded or slightly truncated; 20-24.5 × 11-13 µm *P. guerensis* (Zucconi, 1991)
- 2. Conidiophores fasciculate, branched from the basal to the middle region, conidia rhombical or biconical; 18-26.5 × 12-14.5 µm *P. angamosensis* (Matsushima, 1995)
- 3. Conidia clavate, turbinate or obtriangular; 25-37 × 6.5-9 µm .*P. summa* (Matsushima, 1981)
- 3. Conidia rostrate, biconic or rhombical4
- 4. Conidia obtuse at the apex; 14-20 × 8-9.5 µm *P. havanensis* (Holubová-Jechová, 1987)
- 4. Conidia conical at the apex..... 5
- 5. Conidia not apiculate; 20-28 × 10-15 µm..... *P. penzigii* (Pirozynski, 1972)
- 5. Conidia apiculate.....6
- 6. Conidia 20-25 × 10-13 µm wide*P. cedrelae* (Hennings, 1902)
- 6. Conidia 36-45 × 19-24 µm *P. macrospora* (This paper)

Acknowledgements

Thanks are extended to Gerald Bills for suggestions, and critical reading of the manuscript.

References

Bhat, D.J. and Sutton, B.C. (1985). New and interesting hyphomycetes from Ethiopia. Transactions of the British Mycological Society 85: 107-122.

Castañeda-Ruiz R.F., Cano, J. and Guarro, J. (1996). Notes on conidial fungi. VII. Two new species of *Beltraniella* from Cuba. Mycotaxon 58: 243-251.

Hennings, P. (1902). Fungi S. Paulenses II. a cl. Puttemans collecti. Hedwigia 412: 310

Heredia, G. (1994). Hifomicetes dematiaceos en bosque mesófilo de montaña. Registros nuevos para México. Acta Botánica Mexicana 27: 15-32.

Heredia, G. and Mercado-Sierra, A. (1998). Tropical hyphomycetes of Mexico. III. Some species from the Calakmul Biosphere Reserve, Campeche. Mycotaxon 68: 137-143.

Fungal Diversity

- Heredia, G., Arias, R.M. and Reyes, M. (2000). Contribución al conocimiento de los hongos *Hyphomycetes* de México. *Acta Botánica Mexicana* 51: 39-51.
- Holubová-Jechová, V. (1987). Studies on hyphomycetes from Cuba V. Six new species of dematiaceous Hyphomycetes from Havana Province. *Ceska Mykologie* 41: 29-36.
- Hoog, G.S. de (1977). The Black Yeasts and allied hyphomycetes. *Studies in Mycology* 15: 199-200.
- Matsushima, T. (1975). *Icones Microfungorum a Matsushima Lectorum*. Published by the author, Kobe.
- Matsushima, T. (1981). *Matsushima Mycological Memoirs No. 2*. Published by the author, Kobe.
- Matsushima, T. (1995). *Matsushima Mycological Memoirs No. 8*. Published by the author, Kobe.
- Pirozynski, K.A. (1963). *Beltrania* and related genera. *Mycological Papers* 90: 1-37.
- Pirozynski, K.A. (1972). Microfungi of Tanzania. *Mycological Papers* 129: 1-64.
- Pirozynski, K.A. and Patil, S.D. (1970). Some setose hyphomycetes of leaf litter in South India. *Canadian Journal of Botany* 48: 567-581.
- Sutton, B.C. (1970). Two hyphomycetes new to Nepal. *Transactions of the British Mycological Society* 55: 504-506.
- Zucconi, L. (1991). *Pseudobeltrania guerenensis* sp. nov. from Ivory Coast forest litter. *Mycological Research* 95: 1017-1018.

(Received 24 April 2002; accepted 20 June 2002)