

## *Neosartorya takakii*, a new species from soil in Brazil

Yoshikazu Horie<sup>1)</sup>, Paride Abliz<sup>2)</sup>, Kazutaka Fukushima<sup>3)</sup>, Kaoru Okada<sup>4)</sup> and Norma B. Gusmão<sup>5)</sup>

<sup>1)</sup> Natural History Museum and Institute, Chiba, 955–2, Aoba-cho, Chuo-ku, Chiba-shi 260–8682, Japan

<sup>2)</sup> Department of Dermatology, First Hospital, Xinjiang Medical University, No. 1 Xinyi Street, District 830003, Urumuqi, Xinjiang, China

<sup>3)</sup> Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University, 1–8–1, Inohana, Chuo-ku, Chiba-shi 260–8673, Japan

<sup>4)</sup> Universidade Católica de Pernambuco, Recife, Pernambuco, Brazil

<sup>5)</sup> Laboratório de Imunopatologia Keizo Asami, Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil

Accepted for publication 27 November 2000

Among the isolates from soil of grassland in Roraima State, Brazil, a new species of *Neosartorya*, *N. takakii* is described and illustrated. *Neosartorya takakii* differs from the other known species of the genus in having lenticular ascospores with two distinct equatorial crests and with roughly circularly arranged projections on the convex walls. A comparative SEM view of ascospores from six related *Neosartorya* species is also provided.

Key Words—*Aspergillus takakii*; Brazil; *Neosartorya takakii*; soil fungus.

In a survey of pathogenic and mycotoxin-producing fungi in Brazil that has continued since 1991, uncommon isolates of *Neosartorya* have been collected from Brazilian soil. One isolate, 98-BR-350, is characterized by production of lenticular ascospores with two distinct equatorial crests and roughly circular by arranged projections on the convex walls. The isolate proved to be sufficiently different from all described species of *Neosartorya* (Horie et al., 1992, 1995a, b; Kong, 1997; Kwon-Chung and Kim, 1974; Kozakiewicz, 1989; Malloch and Cain, 1972; Peterson, 1992; Raper and Fennell, 1965; Samson et al., 1990; Someya et al., 1999; Takada and Udagawa, 1985; Udagawa and Takada, 1985; Udagawa et al., 1991, 1993; Yaguchi et al., 1994).

The type specimen studied and living culture derived from the type are deposited at the Natural History Museum and Institute Chiba (CBM).

***Neosartorya takakii*** Horie, Abliz & Fukushima, sp. nov. Figs. 1–6

Coloniae in agar maltoso celeriter crescentes, dilute flavae vel laete flavae, granulares; cleistothecia abundantia; conidiogenesis limitata; reversum laete flavum.

Cleistothecia alba vel flavo-alba, globosa vel subglobosa, 230–530  $\mu\text{m}$  diam, cum hyphis aeriis laxae intricatis circumdata; peridium tenue, membranaceum, ex cellulis angularibus 3–12.5  $\mu\text{m}$  diam compositum. Asci octospori, globosi vel subglobosi vel ovoidei, 11–13(–14)  $\times$  10–12.5  $\mu\text{m}$ , evanescentes. Ascosporae hyalinae vel dilute flavo-brunneae, late lenticulares, praeter crista 4–5  $\times$  4–4.5  $\mu\text{m}$ , duabus cristis aequatorialibus late disjunctis usque 1.5  $\mu\text{m}$  latis praeditae; superficies convexae cum costatis annularibus et microtuberculis ornatae. Status anamorphus: *Aspergillus*

*takakii*.

Holotypus: CBM-FA-884, colonia exsiccata in cultura ex solo, Gaoiur pe Gubo Srerall Tepegriu, Roraima, in Brasilia, 21 Nov. 1998, a Y. Horie isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: named in memory of Prof. G. M. Campos Takaki, Universidade Católica de Pernambuco, Recife, Pernambuco state, Brazil, an eminent myco-chemist.

Anamorphosis: *Aspergillus takakii* Horie, Abliz & Fukushima, st. anam. nov.

Capitula conidica radiantia. Conidiophora ex hyphis aeriis vel mycelio basali orientia; stipites hyalini vel dilute flavo-brunnei, usque 425  $\mu\text{m}$  longi, ad medium 4–5  $\mu\text{m}$  crassi, leves; vesiculae hemisphaericae vel ampulliformes, 8–17  $\mu\text{m}$  diam. Aspergilla uniseriaria; phialides hyalinae, 5–7  $\times$  1.5–3  $\mu\text{m}$ . Conidia hyalina vel dilute griseo-viridia, globosa vel subglobosa, laevia, 2–3  $\mu\text{m}$  diam.

Status teleomorphus: *Neosartorya takakii*.

Holotypus: CBM-FA-884, loc. cit.

Colonies on malt extract agar (MYA) spreading broadly, attaining a diam of 85 mm within 14 d at 25°C or within 7 d at 37°C, pale yellow (4A3, after Kornerup and Wanscher, 1978) to light yellow (4A4), with a thin, often submerged vegetative mycelium, granular in appearance due to the very abundant production of cleistothecia, loosely overgrown by aerial hyphae; conidiophores few in number; reverse light yellow (4A4 to 4A5).

Cleistothecia superficial, scattered, white to yellowish white, globose to subglobose, 230–530  $\mu\text{m}$  in diam, surrounded by a loose covering of aerial hyphae. Cleistothecial peridium hyaline to pale yellowish brown,

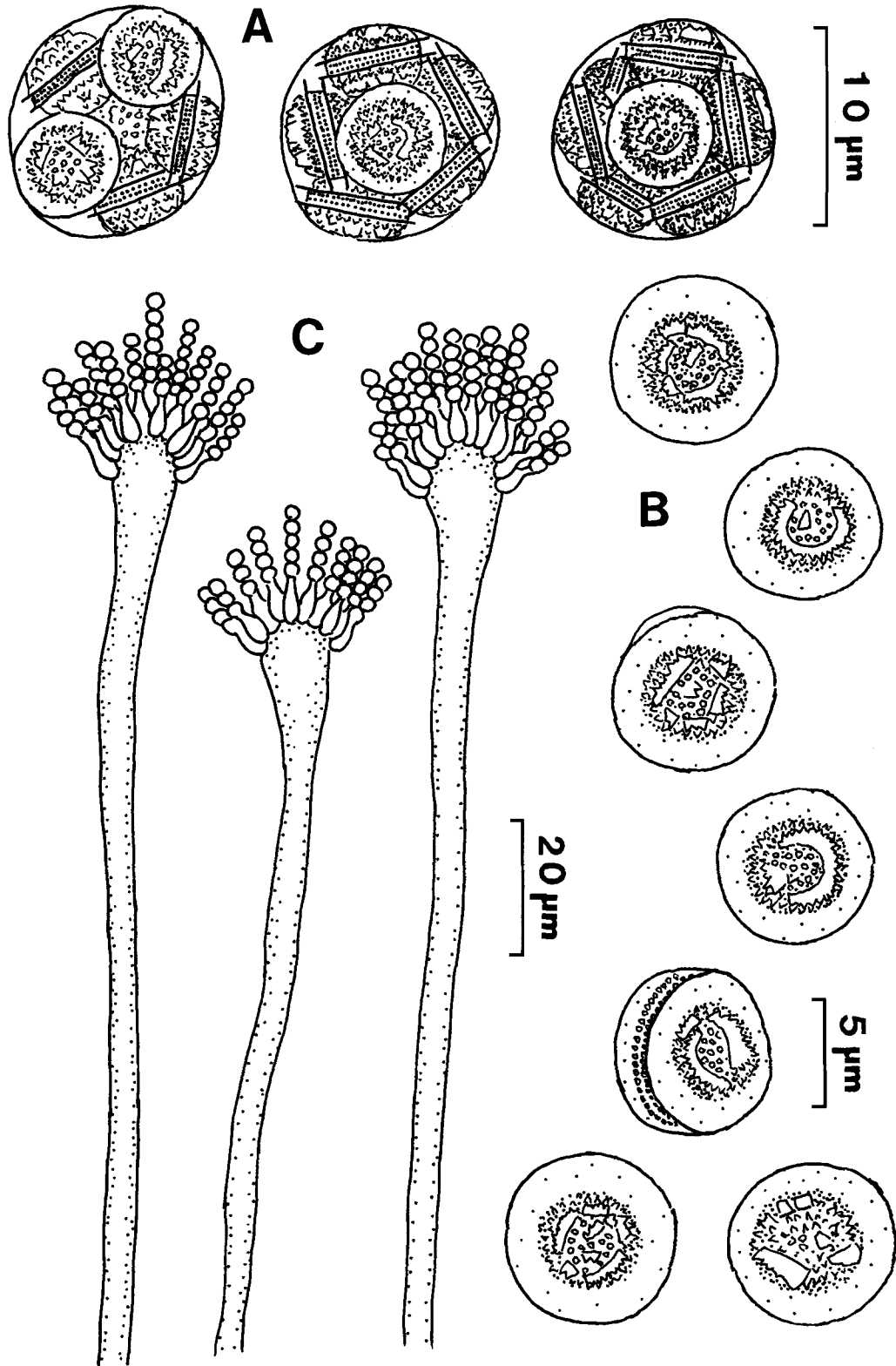
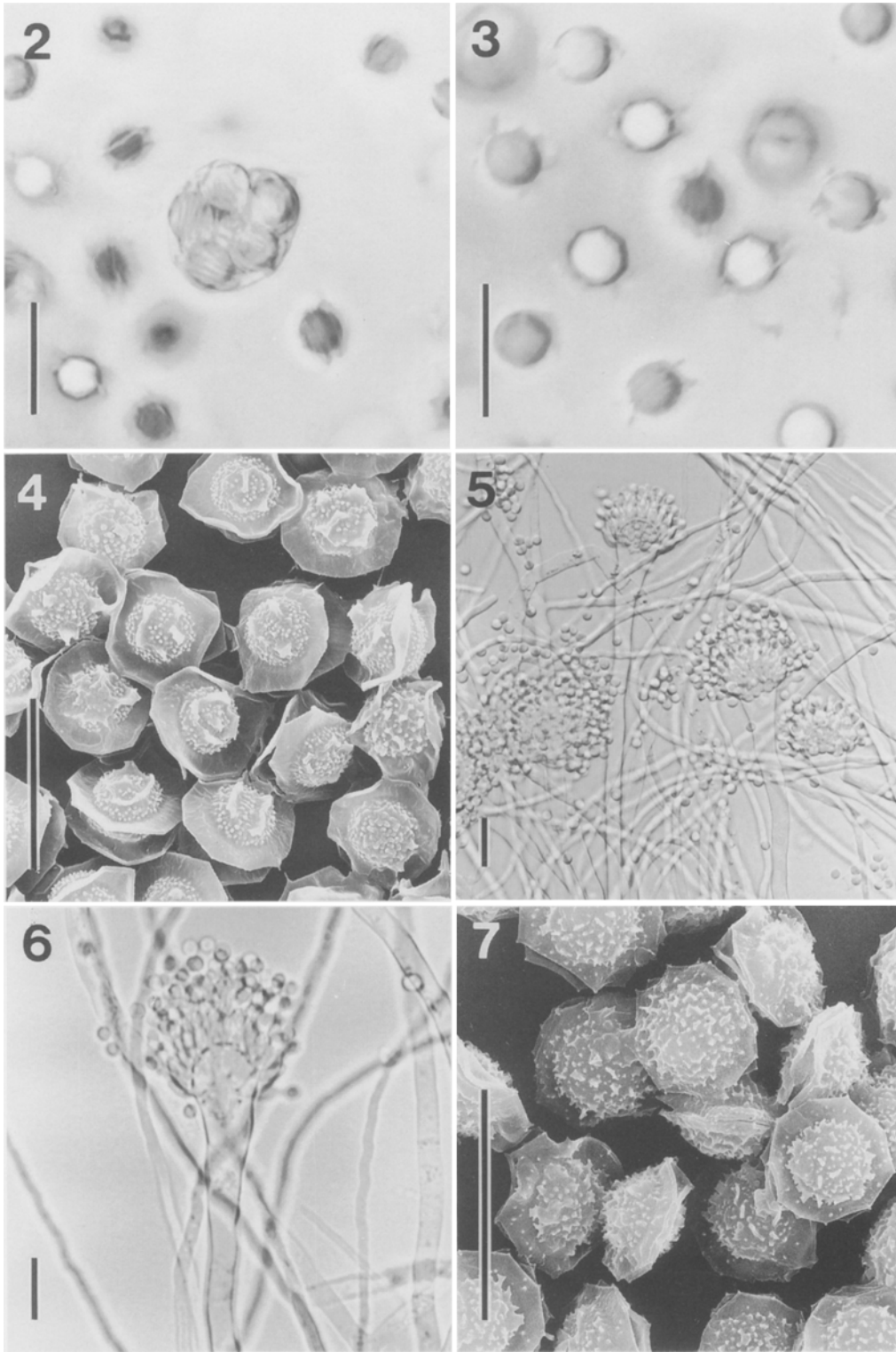
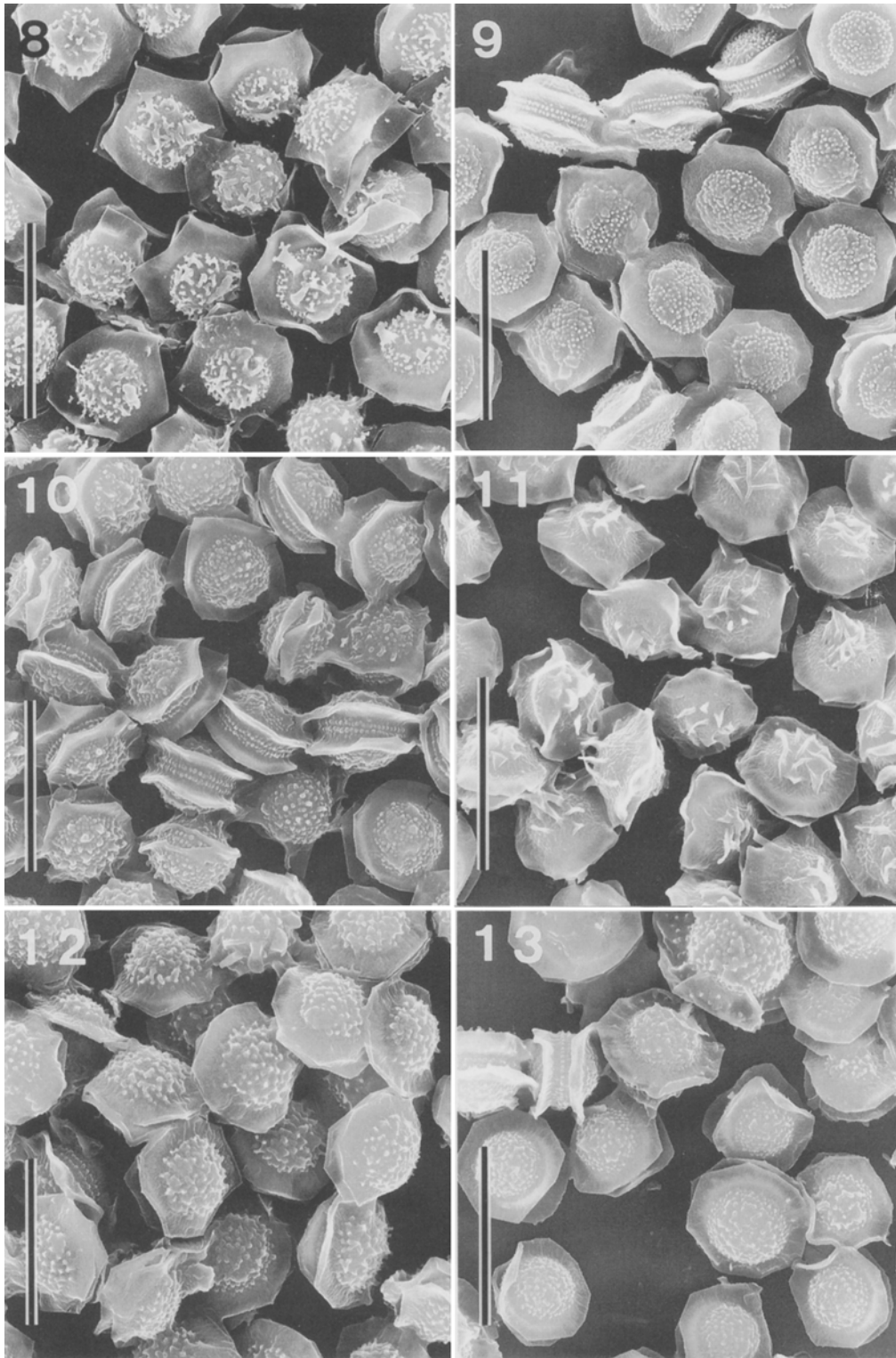


Fig. 1. *Neosartorya takakii*. A. Asci. B. Ascospores. C. Aspergilla.



Figs. 2–6. *Neosartorya takakii*. 2. Ascus. 3. Ascospores. 4. A SEM micrograph of ascospores. 5, 6, Aspergilli. Fig. 7. *Neosartorya aureola*. A SEM micrograph of ascospores. All scales: 10  $\mu\text{m}$ .



Figs. 8–13. SEM micrographs of *Neosartorya* ascospores. 8. *N. botucatensis*. 9. *N. glabra*. 10. *N. paulistensis*. 11. *N. pseudo-fischeri*. 12. *N. spinosa*. 13. *N. stramenia*. All scales: 10  $\mu$ m.

thin, membranaceous, consisting of angular, 3–12.5  $\mu\text{m}$  diam cells. Asci 8-spored, globose or subglobose to ovoid, 11–13(–14)  $\times$  10–12.5  $\mu\text{m}$ , evanescent at maturity. Ascospores hyaline to pale yellowish brown, broadly lenticular, spore body 4–5  $\times$  4–4.5  $\mu\text{m}$ , provided with two widely separated equatorial crests which are up to 1.5  $\mu\text{m}$  wide and sometimes irregularly dissected in a stellate shape and with convex surfaces bearing roughly circularly arranged projections and microtuberculate ornamentation.

Specimen examined: CBM-FA-884 (holotype), a dried culture of an isolate from soil in a grassland, Gaoiur pe Gubo Srerai Tepegriu, Roraima state, Brazil, collected and developed in the Natural History Museum and Institute, Chiba, Japan, by Horie, 21. Nov. 1998 (isolate number 98-BR-350).

Mycelium composed of hyaline, branched, septate, smooth-walled hyphae. Conidial heads small, grayish green, radiate, 25–80  $\mu\text{m}$  in diam. Conidiophores arising from aerial hyphae or the basal mycelium, hyaline to pale yellowish brown, smooth, up to 425  $\mu\text{m}$  long, 4–5  $\mu\text{m}$  wide at the middle; vesicles hyaline, hemispherical to flask-shaped, 8–17  $\mu\text{m}$  in diam. Aspergilla uniseriate; phialides hyaline, 5–7  $\times$  1.5–3  $\mu\text{m}$ , covering the upper half of the vesicle. Conidia hyaline to pale grayish green, globose to subglobose, smooth, 2–3  $\mu\text{m}$  in diam.

Colonies on Czapek agar spreading broadly, attaining a diam of 80–85 mm in 14 d at 25°C, white to yellowish white (1A2), consisting of a thin mycelial felt, producing abundant cleistothecia in a dense layer on the mycelial felt; conidiophores few in number; reverse pale yellow (4A3) to light yellow (4A4).

Colonies on Czapek agar with 70% sucrose spreading broadly, attaining a diam of 70–80 mm in 14 d at 25°C, white to yellowish white (1A2), consisting of a thin mycelial felt; floccose in appearance; cleistothecia few in number; conidiogenesis abundant; reverse white to yellowish white (2A2).

The ascospores of this species is characterized by two widely separated equatorial crests and an ornamentation pattern of roughly circularly arranged projections and microtubercles on the convex surfaces. They are somewhat similar to those of *N. aureola* (Fennell & Raper) Malloch & Cain, *N. botucatensis* Horie, Miyaji & Nishimura, *N. glabra* (Fennell & Raper) Kozak., *N. paulistensis* Horie, Miyaji & Nishimura, *N. spinosa* (Raper & Fennell) Kozak., and *N. stramenia* (R. Novak & Raper) Malloch & Cain (Figs. 7–10, 12, 13), but the convex surfaces of ascospores of those species have only a simple pattern of tuberculate to spinose ornamentation. The ascospore walls of *N. pseudofischeri* S. W. Peterson are ornamented with raised flaps of tissue resembling triangular projections or long ridge lines (Fig. 11). Therefore, *N. pseudofischeri* ascospores are more similar to those of this species than the others, but the projections are not arranged in a roughly circular appearance.

Acknowledgements—The authors thank Dr. Shun-ichi Udagawa, Nodai Research Institute, Tokyo University of Agriculture, for reading the manuscript and making helpful suggestions.

This work has been supported by Goho Life Sciences International Fund and the International Scientific Research Program of Ministry of Education, Culture, Sports, Science and Technology by a grant-in-aid for Scientific Research (Field Research).

#### Literature cited

- Horie, Y., Miyaji, M., Yokoyama, K., Udagawa, S. and Compos-Takaki, G. M. 1992. *Neosartorya tatenoi*, a new species from Brazilian soil. *Trans. Mycol. Soc. Japan* **33**: 395–399.
- Horie, Y., Miyaji, M., Nishimura, K., Franco, M. F. and Iabuki, K. R. C. 1995a. Two new species of *Neosartorya* from Brazilian soil. *Mycoscience* **36**: 159–165.
- Horie, Y., Miyaji, M., Nishimura, K., Franco, M. F. and Iabuki, K. R. C. 1995b. New and interesting species of *Neosartorya* from Brazilian soil. *Mycoscience* **36**: 199–204.
- Kong, H-Z. 1997. *Stachybotrys yunnanensis* sp. nov. and *Neosartorya delicata* sp. nov. isolated from Yunnan, China. *Mycotaxon* **62**: 427–433.
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd ed., Eyre Methuen, London.
- Kozakiewicz, Z. 1989. *Aspergillus* species on stored products. *Mycol. Pap.* **161**: 1–188.
- Kwon-Chung, K. J. and Kim, S. J. 1974. A second heterothallic *Aspergillus*. *Mycologia* **66**: 628–638.
- Malloch, D. and Cain, R. F. 1972. The Trichocomataceae: Ascomycetes with *Aspergillus*, *Paecilomyces*, and *Penicillium* imperfect states. *Can. J. Bot.* **50**: 2613–2628.
- Peterson, S. W. 1992. *Neosartorya pseudofischeri* sp. nov. and its relationship to other species in *Aspergillus* section *Fumigati*. *Mycol. Res.* **96**: 547–554.
- Raper, K. B. and Fennell, D. I. 1965. The genus *Aspergillus*, Williams and Wilkins, Baltimore.
- Samson, R. A., Nielsen, P. V. and Frisvad, J. C. 1990. The genus *Neosartorya*: Differentiation by scanning electron microscopy and mycotoxin profiles. In: *Modern concepts in Penicillium and Aspergillus classification*, (ed. by Samson, R. A. and Pitt, J. I.), pp. 455–467. Plenum Press, New York.
- Someya, A., Yaguchi, T. and Udagawa, S. 1999. *Neosartorya sublevispora*, a new species of soil-borne Eurotiales. *Mycoscience* **40**: 405–409.
- Takada, M. and Udagawa, S. 1985. A new species of heterothallic *Neosartorya*. *Mycotaxon* **24**: 395–402.
- Udagawa, S. and Takada, M. 1985. Contribution to our knowledge of *Aspergillus* teleomorphs: some taxonomic problems. In: *Advances in Penicillium and Aspergillus systematics*, (ed. by Samson, R. A. and Pitt, J. I.), pp. 429–435. Plenum Press, New York.
- Udagawa, S., Tsubouchi, H. and Horie, Y. 1991. *Neosartorya hiratsukae*, a new species of food-borne Ascomycetes. *Trans. Mycol. Soc. Japan* **32**: 23–29.
- Udagawa, S., Toyazaki, N. and Tsubouchi, H. 1993. *Neosartorya primulina*, a new species of food-borne ascomycetes. *Mycotaxon* **47**: 359–366.
- Yaguchi, T., Someya, A. and Udagawa, S. 1994. A new species of *Neosartorya* from Taiwan soil. *Mycoscience* **35**: 309–313.