

## *Neosartorya sublevispora*, a new species of soil-borne Eurotiales

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Accepted for publication 22 July 1999

A new species of *Neosartorya*, *N. sublevispora* (anam. *Aspergillus sublevisporus*), is described and photographed. The species is characterized by non-ostiolate ascomata covered loosely with a pale yellowish hyphal envelope, lenticular ascospores with two low equatorial crests, and subglobose to ellipsoidal, microtuberculate conidia. The ornamentation of ascospores, which is composed of two closely appressed crests and small even-sized echines on their convex surfaces, particularly serves to distinguish this species from other recognized species. A revised key to all accepted species of the genus is provided.

Key Words—Eurotiales; *Neosartorya sublevispora*; soil fungus.

During an exploratory survey of soil-borne ascomycetes as producers of metabolites useful to the pharmaceutical industry, an unusual isolate belonging to the genus *Neosartorya* was encountered. The isolate is characterized by the pale yellow pigmentation of loose hyphae which envelop its non-ostiolate ascomata, and by its lenticular ascospores with two, closely appressed, very low equatorial crests and faintly roughened convex surfaces. The following new species is proposed to accommodate it.

Since our previous paper showing a key to species of the genus (Yaguchi et al., 1994b), four species of *Neosartorya*, viz. *N. botucatensis* Horie, Miyaji et Nishimura (Horie et al., 1995a), *N. delicata* Kong (Kong, 1997), *N. paulistensis* Horie, Miyaji et Nishimura (Horie et al., 1995a), and *N. udagawae* Horie, Miyaji et Nishimura (Horie et al., 1995b), have been reported. Therefore, a revised key to all accepted species of the genus is provided.

### Taxonomy

*Neosartorya sublevispora* Someya, Yaguchi et Udagawa, sp. nov. Fig. 1

Coloniae in agar Czapekii (CzA) plus minusve restrictae, floccosae, planae, albae; ascomata tarde formantes; conidiogenesis nulla; reversum incoloratum. Coloniae in agar “Czapek-yeast extract (CYA)” effusae, velutinae vel floccosae, radiatim sulcatae, ex coacto mycelio basali crasso constantes, abundantibus ascomatibus formantes, primum albae, deinde dilute flavae vel primulinae; conidiogenesis nulla vel persparsa; reversum aurantiacum vel ochraceum. Coloniae in agar maltoso (MEA) effusae, primum velutinae vel floccosae, mox

numerosis ascomatibus formantes, granulares, ex coacto mycelio basali compacto constantes, dilute flavo-albae; conidiogenesis nulla vel persparsa; reversum dilute flavum vel bubalinum. Coloniae in agar “M40Y” ad 37°C effusae, fere planae, tenues, floccosae; ascomata nulla; conidiogenesis abundans, griseo-viridis vel griseo-olivacea; reversum dilute luteum.

Ascomata non ostiolata, superficialia, dispersa vel confluentia, alba, globosa vel subglobosa, 85–200 µm diam, hyphis flavescensibus laxe involuta; peridium tenue, membranaceum, “textura angularis,” multi-stratum; stratum externum ex cellulis hyalinis angularibus 3–10 µm latis compositum. Asci octospori, singulares, pyriformes vel globosi vel subglobosi, 10–12.5 × 7.5–10 µm, evanescentes. Ascospores hyalinae, unicellulares, lenticulares, 4.8–6.5 × 3.5–4 µm (cristis exclusis 4–4.8 µm longae), duabus cristis aequatorialibus arte appressis usque 0.8 µm latis praeditae, micro-tuberculatis convexis ornatae. Status anamorphus: *Aspergillus sublevisporus*.

Holotypus: PF 1207; colonia exsiccata in cultura ex solo, Kanagawa, in Japonia, Aug. 1998, a A. Someya isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: Latin, *sub*-=almost, *levi*-=smooth and *spora*=spores, referring to the ascospore ornamentation.

Anamorphosis: *Aspergillus sublevisporus* Someya, Yaguchi et Udagawa, stat. anam. nov.

Capitula conidica brevi-columnares vel radiata, pallide griseo-virides. Conidiophora ex mycelio basali vel hyphis aeriis ascendunt; stipites 50–240 × 2–5 µm, incrassati, leves, hyalini vel obscure virides, stricti vel aliquantum sinuosi, aseptati vel septati; vesiculae ampulliformes, clavatae vel spatulatae, 6–16 µm diam.

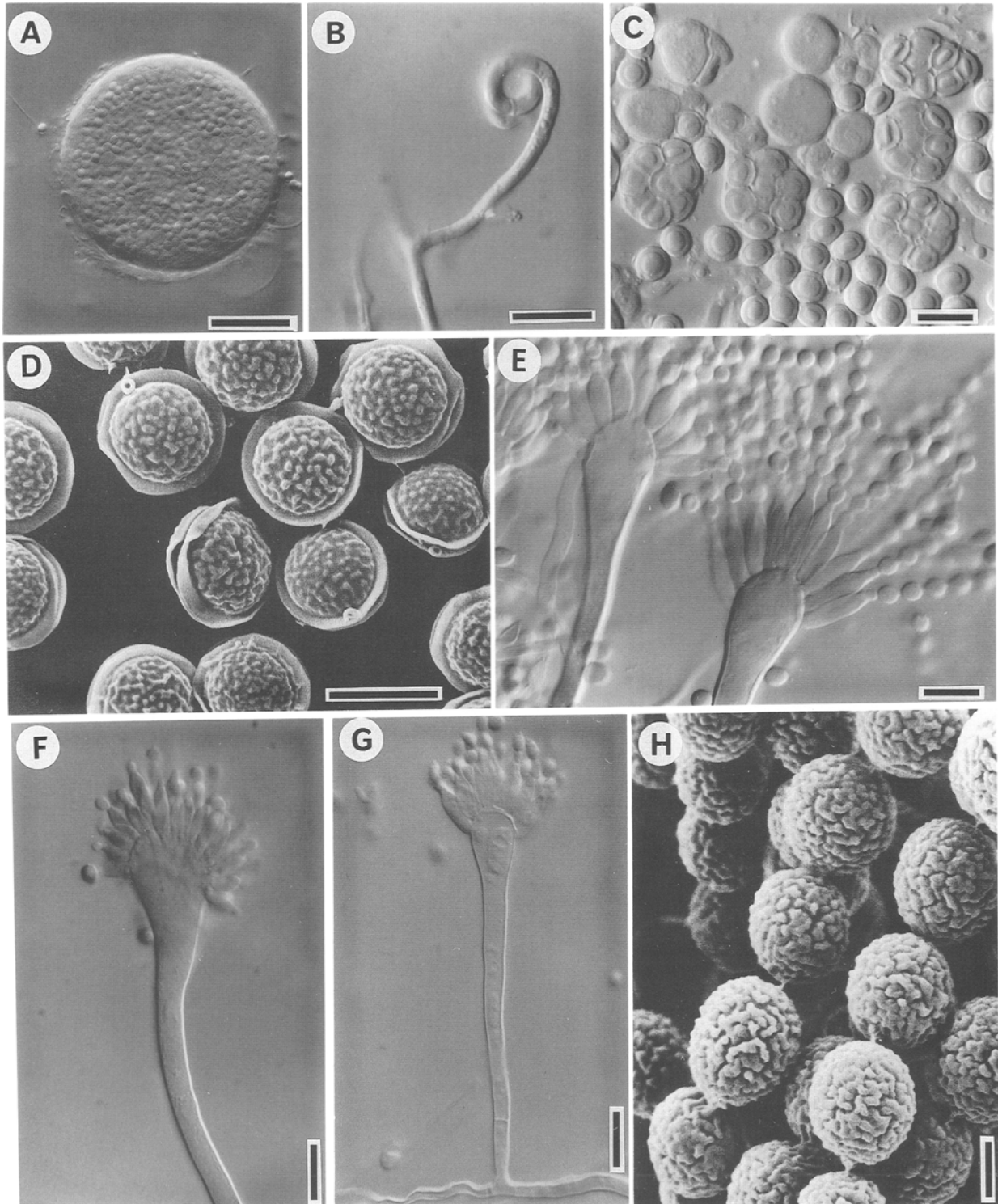


Fig. 1. *Neosartorya sublevispora*, PF 1207.

A. Ascoma. B. Ascomatal initial. C. Asci. D. Ascospores (SEM). E. Aspergilla and conidia. F, G. Aspergilla. H. Conidia (SEM). Scale bars: A = 50  $\mu\text{m}$ ; B = 10  $\mu\text{m}$ ; C–G = 5  $\mu\text{m}$ ; H = 1  $\mu\text{m}$ .

*Aspergilla uniseriata*; phialides (5–)6–12(–14) × 2.5–3  $\mu\text{m}$ , cylindrical, in summa 1/2 vesicula insidentes. Conidia hyalina, subglobose vel ellipsoidea, 2.5–4(–4.5) × 2–3.5  $\mu\text{m}$ , microtuberculata. Status teleomorphus: *Neosartorya sublevispora*.

Holotypus: PF 1207, loc. cit.

Colonies on CzA growing more or less restrictedly, attaining a diam of 21–26 mm in 7 d and 34–38 mm in 14 d at 25°C, floccose, plane, consisting of a thin basal felt and a loose, cottony aerial mycelium, white; ascumatal initials scattered; conidiogenesis lacking; reverse uncolored.

Colonies on CYA growing rapidly, attaining a diam of 42–47 mm in 7 d and 55–57 mm in 14 d at 25°C, velvety to floccose, radially sulcate, consisting of a thick basal felt enmeshing and obscuring abundant small ascumata, at first white, later becoming Pale Yellow (M. 2A3, after Kornerup and Wanscher, 1978) or Primrose (Rayner, 1970); conidiogenesis lacking or very sparse; margins more or less irregular, abrupt; exudate pale yellow and limited to small droplets; reverse Brownish Orange (M. 5C6) or Ochreous (R).

Colonies on MEA growing rapidly, attaining a diam of 33–39 mm in 7 d and 60–64 mm in 14 d at 25°C, at first velvety to floccose, soon becoming granular due to the development of abundant ascumata throughout the colony, plane, consisting of a compact basal felt and a loose, flocculent aerial mycelium, faintly Yellowish White (M. 1A2); conidiogenesis lacking or very sparse; margins more or less irregular; exudate small, clear, scattered; reverse Pale Yellow (M. 4A3) or Buff (R).

Colonies on oatmeal agar (OA) spreading broadly, attaining a diam of 42–47 mm in 7 d and 80 mm or more in 14 d at 25°C, granular in appearance due to the production of numerous ascumata on the mycelial felt, plane, thin, Yellowish White (M. 2A2) in central area; conidiogenesis lacking or very sparse; margins thin, submerged, entire; exudate abundant, clear, in large drops; reverse uncolored to Pale Yellow (M. 3A3) or Straw (R).

Colonies on M40Y agar spreading broadly, attaining a diam of 47–52 mm in 7 d at 37°C, almost plane, consisting of a thin layer of white flocculent mycelium enmeshing abundant conidial heads, Greyish Green (M. 26D3) or Grey Olivaceous (R), later becoming felty and more or less wrinkled; ascumata lacking; margins broad, largely submerged; reverse Pale Yellow (M. 3A3) or Pale Luteous (R).

Ascumata non-ostiolate, superficial, scattered or confluent in small clusters, white, globose to subglobose, 85–200  $\mu\text{m}$  in diam, covered loosely with yellowish hyphal strands, maturing within 14 d at 25°C; peridium 4–10  $\mu\text{m}$  thick, thin, membranaceous, "textura angularis," consisting of several layers of flattened cells; outer layer consisting of hyaline, thin-walled angular cells measuring 3–10  $\mu\text{m}$  in diam. Ascumatal initials developing as short lateral branches of hyphae with curled tips measuring 7.5–14  $\mu\text{m}$  in diam. Asci borne singly, hyaline, 8-spored, at first pyriform, then becoming globose to subglobose, 10–12.5 × 7.5–10  $\mu\text{m}$ , evanescent at maturity. Ascospores hyaline, one-celled, lenticular, 4.8–6.5 × 3.5

–4  $\mu\text{m}$  including crests, spore body 4–4.8  $\mu\text{m}$  long, provided with two equatorial crests which are closely appressed and very low up to 0.8  $\mu\text{m}$  wide; convex surfaces faintly roughened under the LM and regularly microtuberculate under the SEM.

Conidial heads short columnar to radiate, light grayish green. Conidiophores arising from the basal mycelium or aerial hyphae; stipes in the former case long, 200–240 × 3–5  $\mu\text{m}$ , in the latter case shorter, 50–135 × 2–3(–4)  $\mu\text{m}$ , with walls thick and smooth, hyaline to faintly dull green, straight or somewhat sinuous, aseptate or a few septate; vesicles flask-shaped, clavate or spatulate, 6–16  $\mu\text{m}$  in diam, hyaline to pigmented. *Aspergilla uniseriata*; phialides (5–)6–12(–14) × 2.5–3  $\mu\text{m}$ , cylindrical, hyaline to pigmented, covering the upper half of the vesicle. Conidia hyaline, subglobose to ellipsoidal, 2.5–4(–4.5) × 2–3.5  $\mu\text{m}$ , microtuberculate under the SEM, in short chains up to 60  $\mu\text{m}$  long.

Holotype: PF 1207, in dried culture isolated from soil, in Yokohama City, Kanagawa Pref., Japan, August 1998, by A. Someya. The specimen studied is preserved in the Natural History Museum and Institute, Chiba (CBM), Japan.

*Neosartorya sublevispora* is most similar to *Neosartorya glabra* (Fennell et Raper) Kozakiewicz, which also produces ascospores covered with small even-sized echines and microtuberculate conidia (Kozakiewicz, 1989; Samson et al., 1990; Horie, 1992). Ascospores of *N. glabra* are provided with two widely separated equatorial crests, while those of *N. sublevispora* are provided with closely appressed and very low ones. Furthermore, ascumata of *N. sublevispora* differ distinctly in the pale yellowish pigmentation of the loose aerial hyphae, which characteristically envelop the ascumata in some members of *Neosartorya*. This latter character is also shared by *N. botucatensis* and *N. paulistensis* (Horie et al., 1995a), yet their ascospores are different, those of two known species bearing much more prominent equatorial crests than do those of *N. sublevispora*. In addition, the convex ascospore wall of *N. botucatensis* is microaculeate and often echinulate with a long spine, and that of *N. paulistensis* is irregularly roughened by verruculose and small triangular projections.

In three species, *N. fischeri* (Wehmer) Malloch et Cain, *N. hiratsukae* Udagawa, Tsubouchi et Horie, and *N. tatenoi* Horie et al., ascospores are characterized by two closely appressed and very low equatorial crests (Raper and Fennell, 1965; Udagawa et al., 1991; Horie et al., 1992), and in this respect, the new species resembles them. However, *N. sublevispora* obviously differs from these species in the ascospore wall ornamentation, because it lacks anastomosing ridges on the convex wall.

The ascumatal pigmentation of *N. stramenia* (Novak et Raper) Malloch et Cain is somewhat suggestive of *N. sublevispora*. It is easily distinguished from the new species in its slow growth habits on CzA and CYA, smaller ascumata (50–175  $\mu\text{m}$  in diam), larger ascospores (6.5–7.5 × 4–5  $\mu\text{m}$  incl. crests) with two well separated equatorial crests, and globose conidia (Raper and Fennell, 1965; Yaguchi et al., 1994a).

Key to species of *Neosartorya*

1. Heterothallic ..... 2  
 1. Homothallic ..... 4  
 2. Ascomata persistently white in color; ascospores with two equatorial crests and convex surfaces distinctly cerebriform; conidiophores smooth ..... *N. fennelliae*  
 2. Ascomata pale yellow to light yellow ..... 3  
 3. Ascospores with two equatorial crests and convex surfaces almost smooth; conidiophores conspicuously roughened ..... *N. spathulata*  
 3. Ascospores with two equatorial or several irregular crests and convex surfaces tuberculate; conidiophores smooth ..... *N. udagawae*  
 4. Ascospores showing distinct equatorial crests ..... 5  
 4. Ascospores without distinct equatorial crests ..... 19  
 5. Ascomata and enveloping hyphae white to cream or pale yellow in color ..... 6  
 5. Ascomata covered by pure yellow, golden, or orange-colored hyphae ..... 17  
 6. Ascospores with four equatorial crests and convex surfaces slightly reticulate or irregularly ridged ..... *N. quadricincta*  
 6. Ascospores showing two distinct equatorial crests ..... 7  
 7. Convex surfaces of ascospores reticulate ..... 8  
 7. Convex surfaces of ascospores otherwise ..... 11  
 8. Convex surfaces of ascospores obtusely and finely reticulate ..... *N. hiratsukae*  
 8. Convex surfaces distinctly and more largely reticulate ..... 9  
 9. Convex surfaces bearing anastomosing ridges to give a large and somewhat irregular reticulation ..... *N. fischeri*  
 9. Convex surfaces regularly microreticulate ..... 10  
 10. Vesicles hemispherical to flask-shaped ..... *N. tatenoi*  
 10. Vesicles ellipsoidal or nearly clavate ..... *N. delicata*  
 11. Ascospores with closely appressed and very low equatorial crests; convex surfaces microtuberculate ..... *N. sublevispora*  
 11. Ascospores with distinctly separated equatorial crests ..... 12  
 12. Convex surfaces of ascospores nearly smooth; equatorial crests widely separated ..... 13  
 12. Convex surfaces distinctly ornamented ..... 14  
 13. Ascospores hyaline,  $6.5\text{--}7.5 \times 4.5\text{--}5 \mu\text{m}$  ..... *N. glabra*  
 13. Ascospores often brown,  $7\text{--}9.5 \times 5\text{--}5.5 \mu\text{m}$  ..... *Neosartorya* sp. strain SUM 3156  
 14. Ascospores with less widely separated equatorial crests ..... 15  
 14. Ascospores with widely separated equatorial crests ..... 16  
 15. Convex surfaces of ascospores rough to distinctly spinulose ..... *N. spinosa*  
 15. Convex surfaces ornamented by roughly triangular flaps of tissue ..... *N. pseudofischeri*  
 16. Convex surfaces of ascospores microaculeate and often echinulate with long spines ..... *N. botucatensis*  
 16. Convex surfaces irregularly roughened by microverrucose and small triangular projections ..... *N. paulistensis*  
 17. Colonies on CzA at 25°C growing rapidly; ascomata large (mostly more than 200  $\mu\text{m}$  in diam); convex surfaces of ascospores echinulate ..... *N. aureola*  
 17. Colonies on CzA at 25°C growing restrictedly; ascomata small, less than 200  $\mu\text{m}$  in diam; convex surfaces verrucose ..... 18  
 18. Ascospores with prominent equatorial crests; ascomata pure yellow; conidia with microverrucose wall ..... *N. stramenia*  
 18. Ascospores with low equatorial crests; ascomata orange; conidia with lobate-reticulate wall ..... *N. aurata*  
 19. Ascospores with a very irregular ornamentation composed of several narrow ridges and triangular or verrucose projections ..... *N. primulina*  
 19. Ascospores ornamentation by several ridges, presenting ribbed or somewhat reticulate pattern ..... *N. multiplicata*

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