

## A Note on *Nitschkia confertula*

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(Received June 10, 2002)

**A fungus that grew over bed-logs of shiitake (*Lentinula edodes*) and caused damage was isolated from mushroom-growing farms. The fungus produced extensive mat-like dark subiculum with ascomata in it and was identified as *Nitschkia confertula*. This is the first report in Korea and morphological characteristics are fully described.**

**KEYWORDS:** Fungicolous fungi, Sordariales

*Nitschkia*, widely known as saprobic, fungicolous or lichenicolous fungus, can be easily distinguished by its ascomatal habitat on subiculum, 'Munk Pore' perforation in peridium, and 'Quellkörper' structure in ascoma. The genus is categorized as a member of Nitschkiaceae of Sordariales (Kirk *et al.*, 2001). In his study on Coronophorales, Nannfeldt (1975a, b) re-evaluated cleistothecial ascomycetes with munk pores and quellkörpers, and accepted 22 species of *Nitschkia*. Since then, some new species have been introduced into the genus: *N. salvadorae* on leaves of *Salvadora oleoides* from Pakistan (Petraik and Ahmad, 1954), *N. molnarii* (Funk, 1979), *N. variabilis* (Romeo and Samuels, 1991) from Argentina on decorticated wood of *Eucalyptus viminalis*, seven Indian species with a variety of spores in colour and size by Subramanian and Sekar (1990), and *N. phaeospora* on unknown rotten wood from Taiwan by Hsieh *et al.* (1998). Currently a total of 33 species are enrolled in the genus from all around the world and on various substrates, mostly on wood.

However, there has been no record of the species in Korea until now. In April 2000 a fungus causing damage to bed-logs of shiitake (*Lentinula edodes*) was reported at many mushroom-growing farms. This notorious fungus was recognized by its thick and dark mat-like subiculum covering the surface of bed-logs and identified as *N. confertula*. Since this is the first report of the species in Korea along with a newly reported characteristic of ascospores, the fungus is illustrated and described in full relating to its morphological characteristics.

Symptomatic bed-logs of shiitake were collected from the mushroom-growing farm in Gyeonggi-do in 2000, brought to the institute, and periodically checked by second author. Observations, measurements and photography of characteristic features were made from structures mounted in lactophenol. The 95% confidence intervals

were derived from 30 observations, whenever possible, to determine the range of variation in size of structures, with the extremes given in parentheses. Sections of ascomata were made on a Leica CM1100 Cryotome and mounted with Jung tissue freezing medium<sup>TM</sup>. Scanning electron microscopic image was taken on HITACHI S-3500N. Photographic images were taken with Nikon Digital Camera DXM 1200 on a Nikon Eclipse E600 light microscope or a Nikon SMZ800 dissecting microscope. Herbarium specimens are lodged at KFRI (Korean Forest Research Institute).

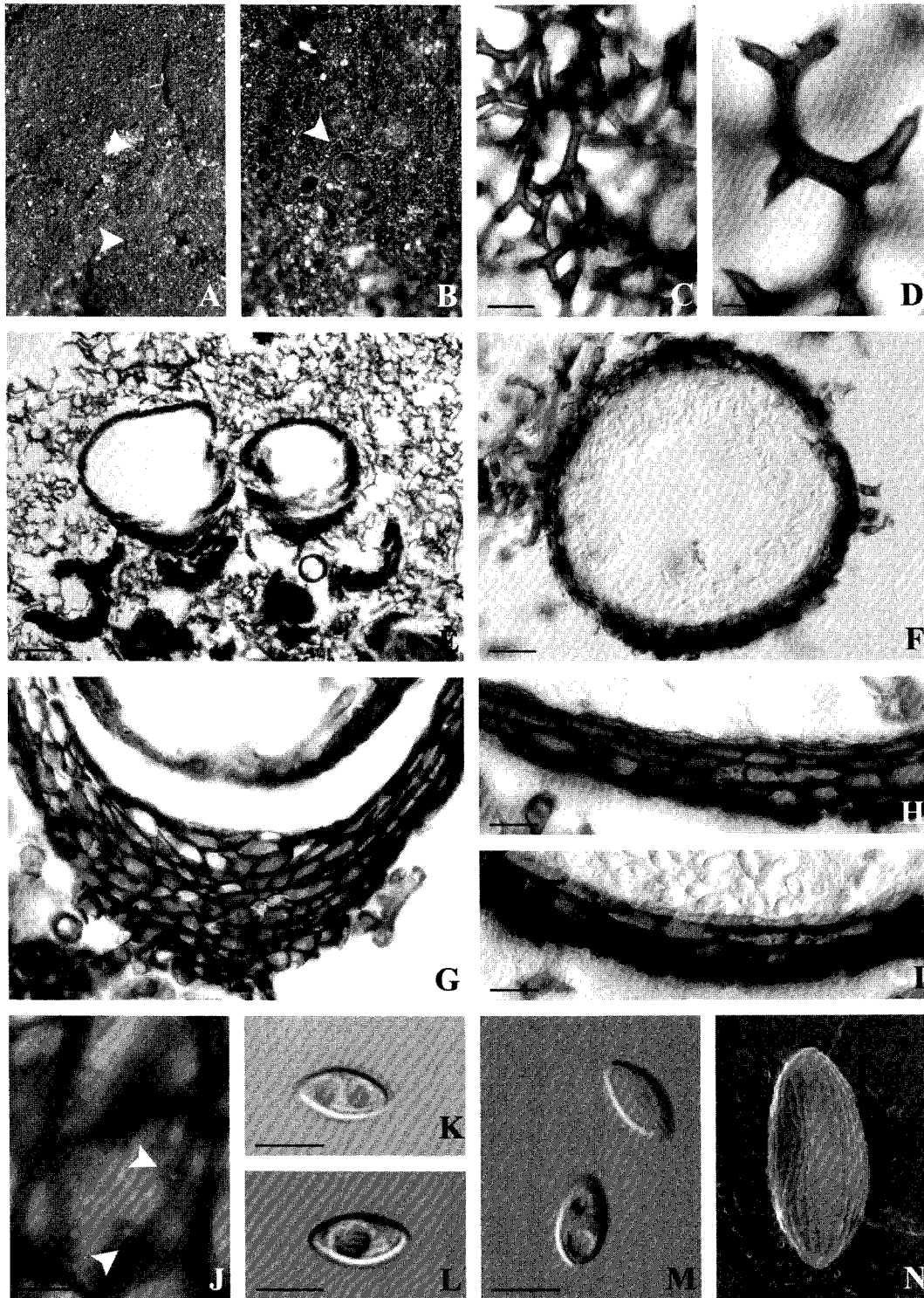
### Taxonomy

*Nitschkia confertula* (Schwein.) Nannf., *Svensk bot. Tidsskr.* **69**: 59. 1975.

*Subicula* reticulate, abundant, consisted of (4-)5-6(-8)  $\mu\text{m}$  thick hyphae septate, dichotomously branched with spiny protrude at ends, dark brown, thick-walled, smooth (Figs. 1A~1D). *Ascomata* cleistothecoid, sunken in a thick subiculum, gregarious or scattered, dark brown to black, glabrous, coriaceous, globose, collabent when dried, 300~400  $\mu\text{m}$  diam., nonostiolate, with an apical quellkörper composed of hyaline, inconspicuous, thin-walled, gelatinous cells (Figs. 1E, 1F, 2A). *Peridium* pseudoparenchymatous, textura angularis, (10-)13-15(-17.5)  $\mu\text{m}$  wide, with munk pores 1  $\mu\text{m}$  diam., consisting of 2 layers, outer layer dark brown, thick-walled, at times extremely thick at the base, (50-)52-58(-62.5)  $\mu\text{m}$  wide, inner layers hyaline, thin-walled (Figs. 1G~1I) *Asci* unitunicate, biseriolate, pedicellate, elliptical to clavate, evanescent, octosporous, no apical apparatus, (30-)34-38(-47.5)  $\times$  (5-)5.5-6.5(-10)  $\mu\text{m}$  (Fig. 2B). *Paraphyses* absent. *Ascospores* aseptate, ellipsoidal to fusiform, equilateral, longitudinally striated, hyaline, becoming light brown at maturity, 2 large confluent drops, (6-)8-8.5(-12)  $\times$  (3-)4(-4.5)  $\mu\text{m}$  (avg. 8.2  $\times$  3.8  $\mu\text{m}$ ) (Figs. 1K~1N).

*Specimen examined:* Korea: Gyeonggi-do, Hwasung-

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**Fig. 1.** *Nitschkia confertula* (KFRI-IS-N001). A. Ascomata ruptured by quellkörper (arrowheads), B. Collabent ascoma embedded in subiculum (arrowhead). C, D. Hyphal element of subiculum with spiny protrude at ends. E. Section through subiculum showing embedded ascomata with thick peridium at the base. F. Glabrous cleistothecioid ascoma. G. Thick peridium of the basal part of ascoma. H, I. Peridium. J. Munk pores in peridium (arrowheads). K-N. Ascospores with longitudinal striation. Scale bars: C, F, G = 25  $\mu\text{m}$ , D, E, H-J = 10  $\mu\text{m}$ , K-M = 5  $\mu\text{m}$ , N = 2.5  $\mu\text{m}$ .

city, on bed-logs of shiitake, *Lentinula edodes* (Berk.) Pegler, or at times associated with *Hypoxylon truncatum* (Schwein.) J. H. Mill. occurring on bed-logs of shiitake.

April. 2000, Kim, K.-H.

*Notes:* *Nitschkia* is a heterogeneous group in a sense of ascospores, of which its colour varies from hyaline to

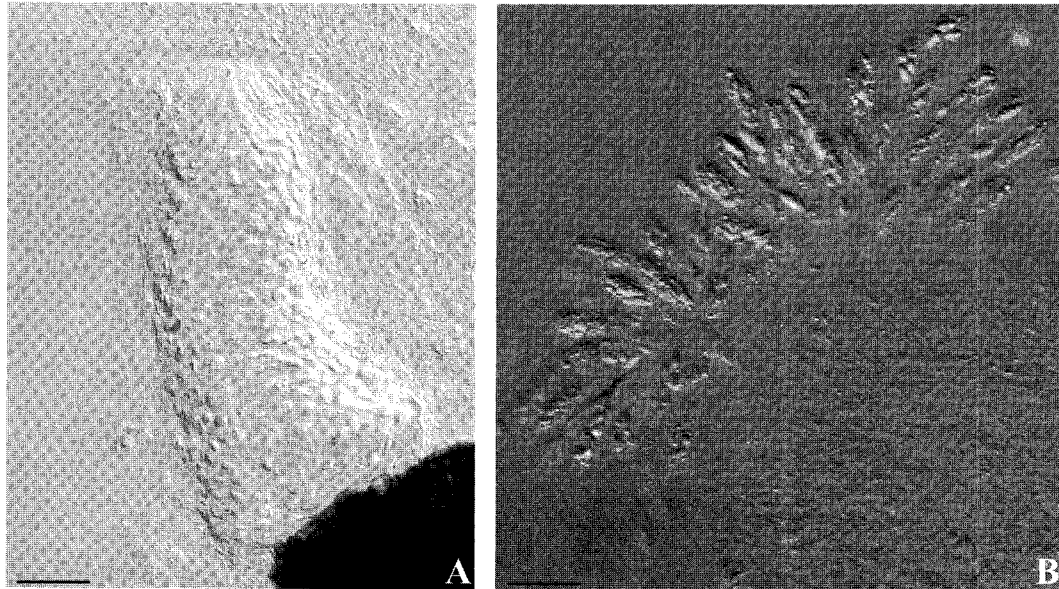


Fig. 2. *Nitschkia confertula*. A. Quellkörper. B. Asci. Scale bar : 25  $\mu$ m.

dark brown, septation from nothing to several, numbers in a ascus from 4 to numerous, however, no ornamentation was consistently reported except for some Indian species with the description of faintly striated ascospores (Subramanian and Sekar, 1990). While working with the current species in 400 $\times$  magnification, weak striation on the surface of ascospores was observed, and through 1000 $\times$  magnification and SEM observation the presence of striation became clear. This characteristic was missing from the original description and it may have been overlooked (Nannfeldt, 1975b). The current species is very much same with the earlier description of *N. confertula* except for the striation on ascospores and its habitation. The peridial thickness at the bottom of ascomata was so distinctly noticed through cross section, which is about 4 times thicker than the sides.

Similar symptom has been reported on bed-logs of shiitake in Japan in 1970s. But the symptom was diagnosed to be caused by *Trichoderma harzianum*, anamorphic state of *Hypocrea nigricans*, along with *H. schweinitzii* and *H. muroiana* (Matsuo, 1980). On the same bed-logs where *N. confertula* was found were other saprobic but infamous fungi, *Diatrype stigma* and *Hypoxylon truncatum*. *N. confertula* is generally known to occur with the association of

*Hypoxylon rubiginosum*. However, in this study *N. confertula* was sometimes happened to be associated with *H. truncatum*.

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