한국전자현미경학회지 제 29 권 제 3호 1999
Korean J. Electron Microscopy 29(3), 275~280(1999)

First Description of Wood Decay Fungi, *Hypoxylon moriforme*, in Korea

Yang Soo Lee*
Pulp and Paper Research Center, Korea Research Institute of Chemical Technology,
Yusong P. O. Box 107, Taejon 305-600, Korea
(Received March 5, 1999)

ABSTRACT

The genus of *Hypoxylon*, well known wood degrading fungi, is a member of the Xylariales, which has woody to carbonaceous, brown to dark brown stromata. *Hypoxylon moriforme*, which was isolated from heavily decayed hardwood, is fairly described by electron microscope. The isolation of *H. moriforme* will be the first record and the first description in Korea. The species collected, having small size of ascospores 7.5~9.0×2.5~4.0 μm and asci 75~130×3~5 μm, are taxonomically compared with *H. truncatum*, which is well known as a popular species in Northeast Asia. And *H. bovei* and *H. annulatum*, which are the tropic to subtropic species and also compared with other temperate species of *H. moriforme*.

Key words : Xylariales, *H. moriforme*, Wood degrading fungi, Ascospores, Asci

INTRODUCTION

Hypoxylon Bull. ex. Fr. is one of the largest genera and have a worldwide distribution in Xylariaceae that cause severe wood degradation (Rogers, 1979). However, it is not well represented in Korea. Although there are much reports of members of the family from Papua New Guinea (Vander Ghcht, 1992, 1994; Vander Veken, 1992), Indonesia (Rogers et al., 1987), Thailand (Whalley et al., 1995), Malaysia (Whalley et al., 1994), only few researches have been carried on taxonomical study in Northeast Asia (Abe, 1986a, b, c; Abe and Liu, 1995). Even though most of *Hypoxylon* species has been well known wood inhabitants, many of them are weak parasites (Whalley, 1996; Lee, 1997). Recently Lee (1997) reported H. moriforme and 6 other species without description from South Korea. The species collected, having small size of ascospores 7.5~9.0×2.5~4.0 μm and asci 75~130×3~5 μm, are taxonomically compared with *H. truncatum* (Schwein: Fr.) J.H. Miller which is well known as a popular species in Northeast Asia. The isolation of *H. moriforme*, which was isolated during raining season from Taejon, the Temperate zone, will be the first record and the first description in Korea. With the present collection and its new record further research should be focused in diversity and ecological aspect of ascomycete wood degrading fungi.

* Correspondence should be addressed to Dr. Yang Soo Lee, Pulp and Paper Research Center, Korea Research Institute of Chemical Technology, P.O. Box 107, Yusong, Taejon, 305-606, Korea. Ph: (0652) 270-2588, FAX: (0652) 270-2592.

MATERIALS AND METHODS

1. Fungal isolates

Collections were carried out at Yusong in Korea, mostly during the raining season of June to July, 1998. The collections were restricted to decayed broken branch and decayed stem of *Quercus* sp. Collected materials were placed in sterile plastic bags for transport to the laboratory. Samples were gently blow to remove any adhering surface contaminants such as soil particles.

2. Preparation for bright field microscope

Observations on the size, shape, colour of stroma, ascomata and ostioles were made. Fresh samples were used for observation ascospores and asci. To observe ascospores, asci, and other microscopical characters squash slides were made from the hymenial layer of ascomata. Melzer's reagent (100 g chloral hydrate, 5 g potassium iodine, 5 g iodine, 100 ml distilled water) was used to stain the apical apparatus of the ascus. The measurements based on samples of 20 fully mature ascospores are presented in length variation x width variation. Using an acetone extract under a stereo microscope checked the colour of the stroma. The light microscopy (Vickers Ser. M17158, United Kingdom) had been used for the analyses of ascospores.

3. Preparation for scanning electron microscope

Air dried specimens were used in most cases. Small cubes of stroma (about 5 mm) ascomata were cut vertically and horizontally with a razor - blade from fresh material or cut frozen stroma. For the analyses with the scanning electron microscope, the specimens were dehydrated with critical point drier and were stuck on tape affixed to an aluminum stub and coated with gold by ion sputtering, and then examined. For micro-structural analyses of ascospores, asci and stroma, the scanning electron microscope (JEOL JSM -T330A) had been used.

RESULTS AND DISCUSSION

1. TAXONOMY

Hypoxylon moriforme Henn., Bot. Jahrb. Syst. 23: 287. 1896.

Hypoxylon effusum Nits. var. *viridarii* Sacc., Bull. Orto Bot. Regia Univ. Napoli 6: 47. 1921.

Hypoxylon heveae Joly, Bull. Soc. Mycol. France 81: 275. 1965.

Stromata: hemispherical, glomerate, or sometime effused-pulvinate, usually confluent, having perithecial mounds inconspicuous to 1/3 ~ 1/2 exposed, 0.5 ~ 3 cm diameter × 0.5 ~ 2 mm thickness; Surface of stroma dark brown to blackish with ages and condition of dry; **Ascomata**: spherical, 0.5 ~ 1.0 mm diameter (Fig. 1a); Ostioles very papillate with 80 ~ 110 μm, encircled with a typical truncatum-type disc 0.2 ~ 0.4 mm diam (Fig. 1a); Asci 8-ascospores, 75 ~ 140 mm total length × 3 ~ 5 mm width, the spore-bearing parts 55 ~ 75 mm long, the stipes 30 ~ 65 mm long, with apical apparatus ring bluing with Melzer's iodine reagent, discoid, 0.5 ~ 1 mm high × 1.5 ~ 2 mm width; **Ascospores**: uniseriate, inequilaterally ellipsoid, smooth, brown to dark brown, with narrowly to broadly rounded ends, 7.5 ~ 9.0 × 2.5 ~ 4.0 μm, with straight germ slit spore-length; perispore of at least some spores dehiscent in 10% KOH, smooth; epispore smooth (Fig. 1b).

Anatomy: sometime matrix hyphae observed on surface of stroma (Fig. 1c). Ascomata - bearing part seems to be a two layer, inner layer becoming narrow, thin - walled texture prismatica; outer layer very thick - walled texture prismatica to matrix.

Specimen examined: 100 Jang-Dong, Yusong-Gu, Daejon, South Korea; secondly forest; on heavily decayed broken and dead wood of *Quercus* sp..

Reference material examined: Mt. Gungi-san, Dakgin Experimental Forest of Chonbuk National

University, Chonju, Chonbuk, Korea; secondly forest; on unidentified hardwood.

Hypoxylon Bull. ex. Fr. is world-wide in distribution being well represented members in the tropic and the subtropic zone (Abe & Liu, 1995; Lee, 1997) and the temperate zone (Lee, 1997). For identification of taxa, Miller (1961) and Rogers et al. (1997) suggested that there should be two or three sectors under the genus *Hypoxylon*. In morphological taxonomical key the genus *Hypoxylon* is consisted of three sections, *Hypoxylon*, Annulata and Applanata, by Miller (1961) or two sections, *Hypoxylon* and Annulata by Rogers et al. (1997). Before Rogers et al. (1997) suggested two section Miller's three sections had been used as sections under the genus *Hypoxylon*. These two sections are primarily differentiated by the presence or absence of a layer of carbonaceous stromatal tissue enclosing perithecia (Rogers et al., 1997). Therefore, based on some of taxonomical characteristics, such as perispore and annulate disc, the section under genus have being provided additionally for identification. For example, when the perispore of ascospores is dehiscent and when the ostiolar discs are present, they also provide additional characters for divide these into two sections (Rogers et al., 1997). The present collection could be enclosed under the section of Annulata, having truncatum-type of annular disc (Table 1).

Since *H. moriforme* was firstly collected and recorded by Henn in 1896 (Lee, 1997), it has been confused and misidentified into *H. truncatum, H. bovei* var. microspora, *H. annulatum* and others (Miller, 1961; Rogers et al., 1997). This collection has shown that only few characters can be characteristics to separate these confusable species. *H. moriforme* is characterized by having very acute papillata, truncatum-type annulata disc, small size of ascospores and asci compare to *H. truncatum, H. bovei* and *H. annulatum* (Table 1). This collection was separated with *H. bovei* (bovei-type of annular disc) in truncatum-type of annular disc, *H. annulatum* (coarsely conical-papillate shape and 4.5~6 μm width of asci) in very papillate and 3~5 μm width of asci, *H. truncatum* (9~12 μm length of ascospores and 90~140×6~7 μm width of asci) in smaller size of ascospores and asci (Table 1).

Hypoxylon has been well known one of the largest genera and a world wide distribution in Xylariaceae that cause severe wood degradation (Rogers, 1979). However, it is not well represented in Korea. Recently Lee (1997) reported few species of *Hypoxylon* without full description and compared the diversity to Japan and China. Quite a few common and expected taxa were not recorded, although 7 species were recording Korea (Lee & Hong, 1985; Lee, 1988; Lee, 1990; Park & Lee, 1991; Jung, 1993; Lee, 1997). The diversity of *Hypoxylon* was not higher than neighbouring countries, Japan, China, Hong Kong, Taiwan, in literatures (Abe, 1986a, b, c; Abe & Liu, 1995; Ju & Tzean, 1985). New record of *H. moriforme* give more attention to mycologist for isolation and wood decay ascomycetes and diversity of wood decay fungi in Korea

Table 1. The comparison of morphological characteristics between *H. moriforme* and others

	H. morforme (Rogers, Ju & Adams, 1997)	*H. truncatum* (Miller, 1961)	*H. bovei* (Miller, 1961)	*H. annulatum* (Rogers, Ju & Adams,1997)	*H. moriforme* (present collection)
Type of annual disc	truncatum-type	truncatum-type	bovei-type	truncatum-type	truncatum-type
Shape of papillata	papillate	acutely papillate	finely papillate	coarsely conical -papillate	very papillate
Size of ascospore	6~9×2.5~4 μm	9~12×3~4 μm	11~15×6~7 μm	7.5~10.5(-11)× 3.5~5(-6) μm	7.5~9.0×2.5~4.0 μm
Size of Asci	7~140×3.5~5 μm	90~140×6~7 μm	130~170×8~9 μm	110~130×4.5~6 μm	75~130×3~5 μm

and its neighbouring countries.

REFERENCES

Abe Y: Notes on some common Xylariaceous and Diatrypaceous fungi on hardwood in Japan. I. Bull For For & Prod Res Inst 339 : 1-21, 1986a.

Abe Y: Notes on some common Xylariaceous and Diatrypaceous fungi on hardwood in Japan. II. *Hypoxylon hypomitum* and its small spored variety. Trans Mycol Soc Japan 27 : 51-56, 1986b.

Abe Y: Materials for the fungus flora of Japan. Trans Mycol Soc Japan 27 : 143-146, 1986c.

Abe Y, Liu Z: An annotated list of xylariaceous and diatrypaceous fungi collected from Mt. Fengyanshan and Mt. Baishanzu, Zhejiang Prov. in East China. Bull Nat Sci Mus, Tokyo, Ser. B. 21 : 75-86, 1995.

Ju YM, Tzean SS: Investigation of Xylariaceae in Taiwan. I. The telemorph of *Hypoxylon*. Trans Mycol Soc ROC 1 : 103-128, 1985.

Jung HS: Floral studies on Korean wood - rooting fungi (1) - on the flora of ascomycetes and jelly fungi. Kor J Myocology 21 : 51-63, 1993.

Lee JY: Coloured Korean mushrooms. Academy Press, Seoul, pp. 337-338, 1988.

Lee JY, Hong HS: An illustrated book of Korean animal and Korean flora. 28 : 199-204, 1985.

Lee TS: The full list of recorded mushrooms in Korea. Kor J Mycol 18 : 233-259, 1990.

Lee YS: The biology of xylariaceous fungi and their role in wood decay. Ph.D thesis, University of Portsmouth, 1997.

Miller JH: A monograph of the world species of *Hypoxylon*. Athens, University of Geogia Press, USA, 1961.

Park WH, Lee HD: Wild fungi of Korea in colour, Kyohak Pub. Co., Ltd., pp. 460-464, 1991.

Rogers JD: The xylariaceae: systematic, biological and evolutionary aspects. Mycologia 71 : 1-42, 1979.

Rogers JD, Callen BE, Samuels GJ: The xylariaceae of the rain forests of North Sulawesi (Indonesia). Mycotaxon 31 : 113-172, 1987.

Rogers JD, Ju YM: A Revision of the Genus *Hypoxylon*. Mycologia Memoir of the Mycological Society of America, No. 20, 1996.

Vander Gucht T: Contribution towards a revision of the genera *Camillea* and *Biscogniauxia* (Xylariaceae, Ascomycetes) from Papua New Guinea. Mycotaxon 45 : 259-273, 1992.

Vander Gucht T: Xylariaceae in Papua New Guinea - identification keys. Science in New Guinea 20 : 85-98, 1994.

Vander Gucht T, Vander Veken: Contribution towards a revision of the genus *Hypoxylon* s. str. (Xylariaceae, Ascomycetes) from Papua New Guinea. Mycotaxon 44 : 275-299, 1992.

Whalley AJS: The Xylariaceae way of life. Mycological Research 100 : 897-922, 1996.

Whalley AJS, Jones EBG, Alias AC: The Xylariaceae (Ascomycetes) of mangroves in Malaysia and South East Asia. Nova Hedwigia 59 : 207-218, 1994.

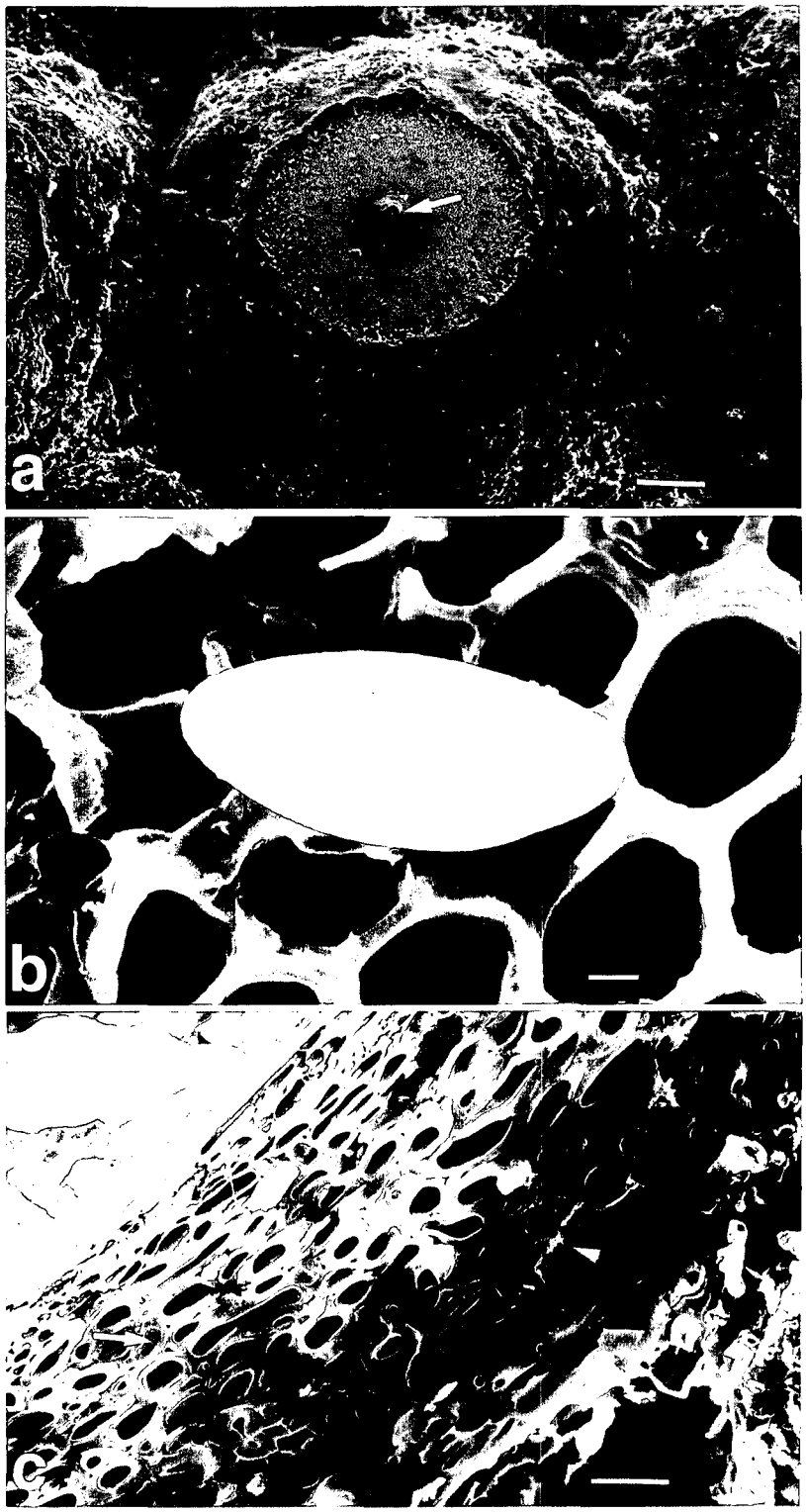
Whalley AJS, Hywel-Jones NL, Jones EBG, Whalley MA: A preliminary account of the genera *Biscogniauxia* and *Hypoxylon* in the Chanthaburi and Chon Buri province of South East Thailand. Sydowia 47 : 70-81, 1995.

<국문초록>

*Hypoxylon*속은 자낭각을 지닌 갈색이나 진한 갈색의 목질, 또는 탄소질의 자좌를 형성하며, 자낭균류의 대표적인 목재 부후균으로 분류된다. 부후된 목재에서 발견된 국내 미기록종인 본 *Hypoxylon moriforme*를 국내에서는 최초로 발견하여 국내의 새로운 기록종으로 보고한다. *Hypoxylon moriforme*는 광학현미경, 주사전자현미경을 이용하여 미세구조학적으로 기술하였다. *H. moriforme*는 7.5~9.0×2.5~4.0 μm의 작은 자낭포자와 75~130×3~5 μm의 자낭을 가지고 있으며, 동북아시아에서 매우 다양하며 근접한 *H. truncatum*, 열대 및 아열대 지방에서 발견되는 유사한 *H. bovei* 및 *H. annulatum*과 분류학적으로 비교, 동정하였다.

FIGURE LEGENDS

Fig. 1. a. *Hypoxylon* moriforme. Papillate ostiole (arrowed) and annular disc. bar: 100 μm. b. Ascospore smooth walled on oval to cubical small cell of annulate disc. bar: 1 μm. c. Cross section of ascosma wall, inner layer of small thick cell walls (allowed), and become thick and big cell wall toward outlayer. bar: 10 μm.


a
b
c