

Ultrastructural Description of Some Wood Degrading Fungi at Light Microscopic and Scanning Electron Microscopic Levels

Yang Soo Lee

Faculty of Forest Science, Chonbuk National University, Chonju, Chonbuk 561-756, Korea
(Received November 24, 2004; Accepted December 22, 2004)

전자현미경 수준에서의 목재부후균의 미세구조학적 고찰

이 양 수

전북대학교 농업생명과학대학 농업과학기술연구소

ABSTRACT

The genus of *Biscogniauxia*, well known wood degrading fungi, is a member of the Xylariales, which has woody to carbonaceous, brown to dark brown stromata. *Daldinia concentrica* and *Biscogniauxia* sp. isolated from heavily decayed hardwood, are precisely described under light microscopic and scanning electron microscopic level. *Daldinia concentrica* will be the first ultrastructural description in Korea. The unidentified species collected, having small size of ascospores $11.4 \times 15.6 \times 9.6 \times 12.0 \mu\text{m}$ with full germ slit, are taxonomically compared with similar species found in Korea.

Key words : Asci, Ascospores, *Biscogniauxia*, *D. concentrica*, Wood degrading fungi, Xylariales

INTRODUCTION

Biscogniauxia has long been known as *Nummularia* Tul. & C. Tul., until Miller (1961) placed in the section *Applanata* of *Hypoxylon*. *Biscogniauxia* are largely includes lignicolous taxa that were traditionally designated to *Nummularia* or *Hypoxylon* section *Applanata* (Miller, 1961; Pouzar, 1979). The current concept of *Biscogniauxia* was defined by Pouzar (1979) and resumed by Ju et al. (1998) The core genera, *Biscogniauxia*, *Hypoxylon*, *Nemania*, *Daldinia* and *Xylaria*, have a

world wide distribution (Lee, 1997). *Hypoxylon* Bull. ex. Fr. is one of the largest genera that cause severe wood degradation. These fungi are generally described as stromatic, having unitunicate asci which usually possess an amyloid apical apparatus and aseptate ascospores with a longitudinal germ slit (Rogers, 1979; Whalley, 1996).

The genus *Daldinia* Ces. & De Not. was named to honor Agostino Daldini (1817-1895), by Cesati and De Notaris (Crivelli et al., 1981). It is a small assemblage of perhaps 22 species. *Daldinia concentrica* (Bolton: Fr.) Ces. & De Not. is conspicuous because of its relatively

* Correspondence should be addressed to Dr. Yang Soo Lee, Faculty of Forest Science, Chonbuk National University, Chonju, Chonbuk 561-756, Korea. Ph.: (063) 270-2622, FAX: (063) 9740-2622, E-mail: yslee@chonbuk.ac.kr

large size (several cm in diameter and height) and its internal structure of alternating light colored and dark colored rings. Saccardo (1910) listed 24 sources of illustrations of *D. concentrica* it has been depicted many more times (Rogers et al., 1997). *Daldinia* species wall themselves off in host wood by forming irregular sac-like structures and their structures are composed of conspicuous dark hyphae. In wood cuts, sections of these sacs appear as brown to black lines—often called zone lines—or sheets (Rogers, 1997).

MATERIALS AND METHODS

1. Fungal isolates

Collections were restricted to decayed broken branch and decayed stem of hardwood. 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 light microscope

Observation on the size, shape, colour of stroma, ascumata and ostioles were made under light microscopy. 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 ascumata. Melzer's reagent 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 \times 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 (cir. 5 mm) ascumata were cut vertically and horizontally with a razor-blade from fresh materials 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).

RESULTS AND DISCUSSION

1. *Daldinia concentrica* (Bolt.) Cesati & Denotaris, Schema Classif. d. Sferiacei 4 : 197 (1863)

Stromata hemispherical, globose to pulvinate, 2.0~12 \times 2.0~10 cm and 1.0~8.0 cm high, scattered or aggregated, solitary or usually confluent and deformed by natural pressure, flattened, broad and somewhat incurved at the base, mostly sessile, rarely stipitate. Exterior smooth surface, reddish brown to dark brown, becoming black and shiny, very carbonaceous. Interior densely fibrous, conspicuously concentrically zoned, persistent lighter zones brown, two or three times broader than the dark zones, the dark zones brown to black. Ascumata usually monostichous, rarely polystichous, cylindrical ovoid to calviform closely packed, completely immersed in the stroma, 0.5~1.5 \times 0.2~0.5 μ m. Ostiole inconspicuous to slightly protuberant. Ascospores uniseriate, inequilaterally ellipsoid, round at both ends, 14.0~16.0 \times 6.0~9.0 μ m, light brown to brown, with germ slit.

Known habitat : on dead branches, especially *Fraxinus*, *Ulex*, *Betula*, *Quercus*, *Abies* and other many kind of hardwood.

Known distribution : Canada, America, Europe, Siberia, China, Japan, Korea, Australia, Egypt, England.

Selected description and illustration : Child (1932), Dennis (1961), Thind & Dargan (1978), Whalley & Walting (1982).



Fig. 1. Light microscope micrographs of *Daldinia concentrica* Fr. a) ascospore (bar: 7 μ m) b) stromata with very carbonaceous and smooth (bar: 2.5 cm) c) cross section on stromata having concentric zones (arrowed) (bar: 1,000 μ m) d) ascoma (bar: 200 μ m).

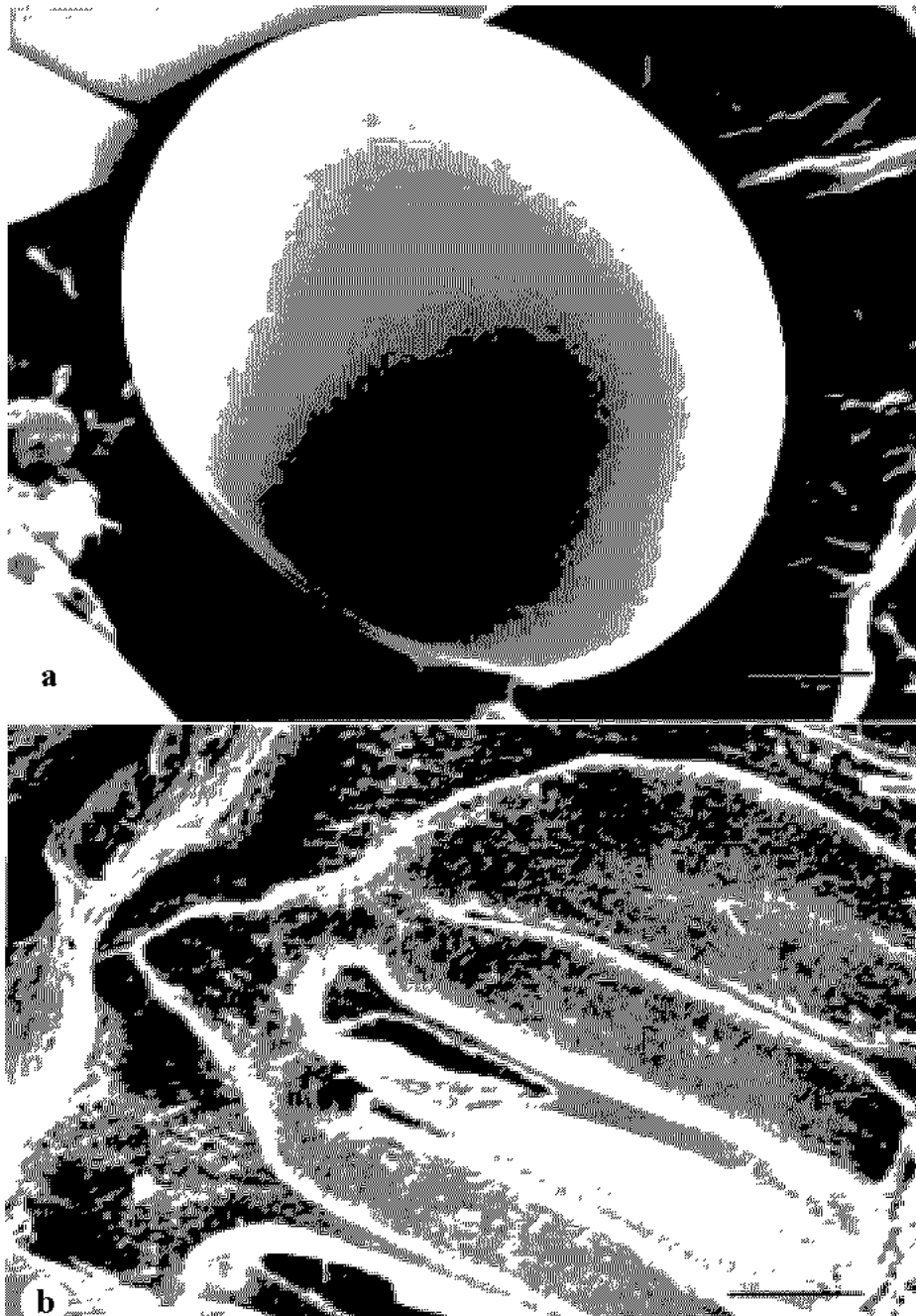


Fig. 2. Scanning electron micrographs of *Biscogniauxia* sp. a) ascospore round in shape (bar: 2 μ m), b) longitudinal section of stroma with polystichous ascomata. Ascomata long and thin walled (bars: 200 μ m)

Specimen collected : Byunsan National Park in Korea (Fig. 1).

Note : It is widely known as a cosmopolitan species of the genus *Daldinia*. The description of this fungus corresponds with the description by Child (1932), Dennis (1960) and Thind & Dargan (1978). Even though this species is cosmopolitan it has not been collected from South East Asia and Korea in this collection. This collection is differ from England species (Lee, 1997) in bigger size of stroma.

2. *Biscogniauxia glovospora* sp. nov.

Stroma erumpent through bark or decorticated wood, more or less highly elevated and cupulated, orbicular to elliptic, applanate to convex with discrete margin, dark brown to black, 0.7~2.2×0.3~0.8 cm diameter and 0.5~1.0 mm thick, with ostiole very finely papillate, internally shiny dark brown to shiny black and packed with ascomata. Texture, very carbonaceous. Asci and paraphysis not observed. Ascospores uniseriate, brown at maturity, 11.4~15.6×9.6~12.0 μm with full germ slit.

Known habitat : on Cherry wood

Known distribution : not found and listed. South Korea

Specimen collected : Mt. Gungi-san, Experimental Forest, Chonbuk National University, Chonju, Chonbuk, South Korea (Fig. 2).

Note : The genus *Biscogniauxia* has not been reported from South Korea although 11 Xylariaceous species have been recorded for South Korea (Lee, 1990; Jung, 1993). The fungus is characterised by having erumpent, more or less highly elevated to cupulated with orbicular to elliptic stroma, with very finely papillate and having 11.4~15.6×9.6~12.0 μm subglobose to almost globose ascospores, with full germ slit. The size and shape of ascospores of *Biscogniauxia glovospora* was found to differ from the other species of the genus *Biscogniauxia*. Another main character is the polystichous nature of ascomata, which usually has one or two, even more

ascomata with a common neck. This type of ascoma is not common in xylariaceous fungi. Even though this specie will be the new species, its generical analysis should be checked and confirmed.

REFERENCES

- Child M: The genus *Daldinia*. Ann Missouri Bot Gard 19 : 429-496, 1932.
- Crivelli P, Petrini L, Petrini O, Samuels GJ: A list of *Daldinia*'s fungus taxa deposited at the Museo Cantonale di Storia naturale in Lugano, TI (Switzerland). Sydowia 34 : 49-81, 1981.
- Dennis RWG: Xylarioideae and Thamnomycetoideae of Congo. Bull Jard Bot Etat 31 : 109-154, 1961.
- Ju YM, Rogers JD, San Martin A, Granmo A: The genus *Biscogniauxia*. Mycotaxon 66 : 1-98, 1998.
- Jung HS: Floral studies on Korean wood-rotting fungi (1). on the flora of ascomycetes and jelly fungi. Kor J Mycol 21 : 51-63, 1993. (Korean)
- Lee YS: The biology of xylariaceous fungi and their role in wood decay. Ph.D. Thesis, University of Portsmouth, England, 1997.
- Miller JH: A monograph of the world species of *Hypoxylon*. Univ Georgia Press, Athens, pp. 158, 1961.
- Pouzar Z: Notes on taxonomy and nomenclature of *Nummularia* (Pyrenomyces). Ceska Mykol 33 : 207-219, 1979.
- Rogers JD: The Xylariaceae: systematic, biological and evolutionary aspects. Mycologia 71 : 1-42, 1979.
- Rogers RD, Ju YM, Adams MJ: HOME OF THE XYLARIACEAE. <http://mycology.sinica.edu.tw/xylariaceae/default.asp>, 1997.
- Saccardo PA: Sylloge fungorum omnium hucusque cognitorum. XIX. Patavii. 1158 pp. 1910.
- Thind KS, Dargan JS: Xylariaceae of India. IV. The genus *Daldinia*. Kavaka 6 : 15-24, 1978.
- Whalley AJS: The xylariaceous way of life. Mycol Res 100 : 897-922, 1996.
- Whalley AJS, Watling R: *Daldinia concentrica* vs *Daldinia vernicosa*. Trans Brit Mycol Soc 74 : 399-406, 1980.

< 국문초록 >

*Biscogniauxia*속에 속한 대다수의 종들은 목재를 분해균으로 알려져 있으며, 목질내지는 탄소질이며 암갈색의 자좌를 가진 Xylariales에 속하여 있다. *Daldinia concentrica*와 *Biscogniauxia*에 속한 목재부후균이 심하게 부후

된 활엽수에서 분리되었으며 이는 광학현미경 및 전자현미경을 이용하여 고찰하였다. *Daldinia concentrica*는 국내 최초의 전자현미경을 이용한 미세구조학적 고찰이다. 또한, *Biscogniauxia*속 미동정 부후균은 11.4 15.6×9.6 12.0 μm 크기의 자낭포자를 가지고 있으며, 국내에서 발견된 비슷한 종들과 비교 분석하였다.