

Basidiospore Development and Fine Structure in *Rhodophyllus muraii* var. *albus*

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흰꼭지외대버섯의 담자포자의 발생과 미세구조

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Abstract

Apexes of basidia in *Rhodophyllus muraii* var. *albus* are divided into four sections or depressed in the center. A spore is formed by inflation of the apex of the sterigma. The apex of the sterigma is swollen and changed from a papilla through a peinsform and a club into a globeform. Six spots of globose spore are regularly or irregularly depressed with hilum axes. Finally the spores come cuboid.

KEYWORDS : basidiospore, *Rhodophyllus muraii* var. *albus*, basidium, sterigma, hilum, cuboid.

The fine structure and the basidial development of higher fungi has been studied by workers(2,4,6,7,17,18). The developmental structure and mature basidiospore have been studied with electronic microscope(3,5,8,9,10, 11,12,13,14,20).

Spore development of the genus *Russula* has been studied in several other hymenomycetes taxa hypothesis, which attempt to describe general aspects of basidiospore structure and development in the genus *Russula*(1).

These studies were on meiosis in basidia and structure of sporal wall. But they didn't contain the genus *Rhodophyllus*.

Spoores of the genus *Rhodophyllus* are multi-angular and they have five kinds of form, which are isodiametric, heterodiametric, nodulose cuboid and cruciformis.

A hypothesis was presented on spore formation of the *Rhodophyllus* which was made angle(15,16).

This study investigates in detail the structure and development of the spore in the *Rhodophyllus muraii* var. *albus* with scanning electronic microscope and reevaluates the existing hypothesis of spore development in the *Rhodophyllus*.

Materials and Methods

Carpophores of *Rhodophyllus muraii* var. *albus* were collected at Mt. Manduck near Chonju city on July 29, 1989 and dried under the sun and in the shade.

The fragments of lamellae of fresh carpophores were fixed 2.5% paraformaldehyde–glutaldehyde (pH 7.2). These were washed with phosphate buffer (pH 7.2). They were fixed 2% osmium tetroxide (O_5O_4) again and were washed with phosphate buffer (pH 7.2). These were dehydrated with acetone series and dried for 24 hours naturally. These materials were 150 Å of Au–coating with Ion Coater (Eiko, IB–3) and scanning electronic microscope (ISI–SS40) was used for observation.

Results and Discussions

Apexes of basidia in the *Rhodophyllus muraii* var. *albus* are developed into two ways, one of which is divided into four sections by ranges and the other is depressed in the center. Basidiospores initial are formed by inflation of the apexes of the sterigmata (19).

Spore formation in basidia divided into four sections by ranges: The sterigmata are developed in the center of each section, which is wrinkled and rough (Fig. 1–B). The parailum with hilum are differentiated (Fig. 2–B, 3–B). This is the coincidence of hilum formation in sporal development initial of the *Russula* (1). The bases of the sterigmata are bulbous (Fig. 2–C, 3–C). The basidia are $9.0 \times 9.0 \mu\text{m}$ (Fig. 1) and margins are $0.6–1.7 \mu\text{m}$ wide (Fig. 1–D). The sterigmata are $0.6 \times 0.8 \mu\text{m}$ (Fig. 1) and each section is $3.0–3.5 \times 4.0–4.4 \mu\text{m}$ (Fig. 1) and ranges are $0.4–0.8 \mu\text{m}$ wide (Fig. 1–C). The acute apex of sterigma is swollen into a papilla (fig. 1–A). The papilla of sterigma is swollen and elongated to a club (Fig. 2–A). When the apexes of sterigmata become clavate, the surface of a club is smooth (Fig. 2–A, 3–A). The clubs are $3.0–3.3 \times 3.5–5.0 \mu\text{m}$ (Fig. 2). The spore of the club grows in volume to a subglobe and then a globe. The subglobose spores are $3.5 \times 4.5 \mu\text{m}$ (Fig. 3).

The surfaces of globose spores are regularly (Fig. 5,5) or irregularly (Fig. 4) depressed at six spots with hilum axes. then the spores are $5.3 \times 5.7 \mu\text{m}$ (Fig. 6). The basidium is dish–shaped (Fig. 4–C), but its margin is undulate. In case the surface of spore is deeply depressed, it doesn't get depressed, but in case it is low depressed, it gets depressed successively.

Although quadrangle of spore is shown flat, its center is depressed (13,14,15).

Spore formation in basidia depressed in the center: The apexes of basidia are depressed and the sterigmata are developed on the margin of the basidia at four spots at intervals regularly (Fig. 7). The margin varies irregularly (Fig. 7,8,9,10). So the sterigmata are irregularly shown in outline. The apexes of the sterigmata are swollen into penisforms. Also parahilum with hilum is formed (Fig. 8–B). This is the coincidence to that of the *Russula* (1).

Initial developmental apexes of sterigmata are rough (Fig. 7–A). When they are swollen and elongated to clubs, the surfaces of the clubs are smooth (Fig. 8–A, 9–A, 10–A). The penisforms of sterigmata are $0.5–0.7 \times 0.7–0.8 \mu\text{m}$ (Fig. 1) and the clubs are $1.2–1.4 \times 1.5–2.2 \mu\text{m}$. They grow in volume from clubs (Fig. 8,9) to subglobes (Fig. 10), which are $3.5–3.7 \times 5.2–5.3 \mu\text{m}$ and then they grow into globes (Fig. 12).

When the globose spore becomes $5.7 \times 6.3 \mu\text{m}$, the surface of the spore is gradually and successively depressed at six spots with hilum axes (Fig. 12). The hila are $0.2–0.5 \mu\text{m}$ wide (Fig. 11–A).

Romagnesi (16,17) proposed that two prototypes of spore have different orgines. First, when the spore of

sterigma is oval, it becomes a cube with quadrangles. Second, when the spore of sterigma is clavate it becomes a cube with triangles.

But this study shows that the sproes of the sterigmata are swollen in length and then in volume to globes and that the surface of the globose spore is depressed at spots with hilum axes(Fig. 12). The spores are $6.0-6.7 \times 6.7-9.7 \mu\text{m}$ (Fig. 14,15) and the edges of spore are $1.0 \mu\text{m}$ wide(Fig. 15).

When the depression of the surface is over, the spore is cuboid(Fig. 13,14,15). At that time the spore is released from the hilum(Fig. 15-B) and the released spot is truncate(Fig. 5-B, 15-A).

According to these two ways of spore formation in *Rhodophylls muraii* var. *albus*, cuboid spores are formed by the forllowing process.

Sterigma is developed from apex on the basidia and its apex is swollen into a penisform. The papilla is changed from a panisform to a clavate spore. The clavate spore becomes globose spore and its surface is depressed at six spots with hilum axes. When the depression on the surface in globose spore is over, it becomes cuboid spore and it is released from hilum.

摘 要

흰꼭지외대버섯의 담자기(basidium)의 꼭대기는 4개의 구획으로 나누어 진것과 함입된 2종류가 있다. 담자포자(basidiospore)는 병자(sterigma)의 끝이 부풀어서 형성되는데 이병자의 끝이 발생초기에는 젓꼭지(papilla) 모양으로 부풀었따가 성기

(penisform) 및 방망이(club)형태로 부푼 다음에 마지막으로 구형(globe)으로 된다.

이 구형의 포자가 방출점(hilum)을 축(axes)으로 하여 표면의 6군데에서 함입이 일어나서 주사위 모양(cuboidform)이 되면 포자는 방출점에서 떨어진다.

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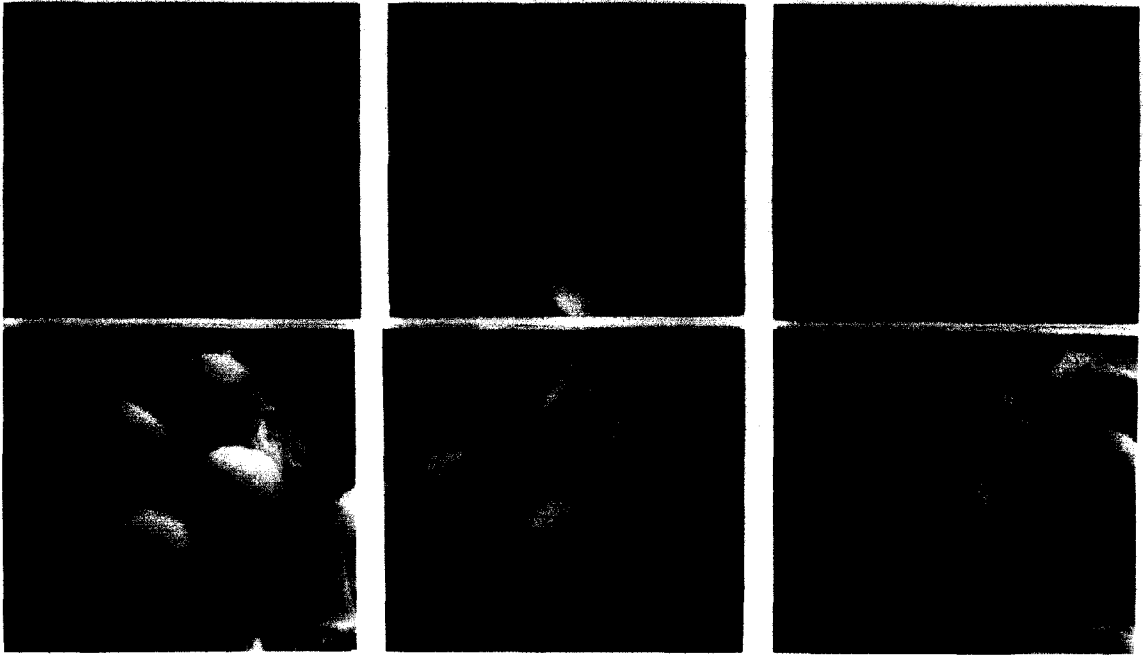


Fig. 1-6 : Electron micrographs of spore formation in basidia divided into four sections by ranges(bar : 5 μ m)

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|--------------------------------------------|---------------------------|
| 1-A. papilla of sterigma | 1-B. section |
| 1-C. range | 1-D. margin of basidium |
| 2-A. clavate spore on apex of sterigma | |
| 2-B. parahilum | 2-C. base of sterigma |
| 3-A. subglobose spore | 3-B. parahilum |
| 3-C. base of sterigma | |
| 4-A. globose spore of sterigma | 4-B. irregular depression |
| 4-C. basidium and margin of basidium | |
| 5-A. initial depression | |
| 5-B. truncate of spore released from hilum | |
| 6-A. regular depression | |



Fig. 7-15 : Electron micrographs of spore formation in basidia depressed in the center(Fig. 7-13) and the spores released from hilum(Fig. 14-15)

- 7-A. penisform of apex of sterigma 7-B. sterigma
8-A. clavate spore of sterigma 8-B. parahilum
9-A. clavate spore
10-A. subglobose spore
11-A. hila
12-A. regular depression on the surface of globose spore
13-A. cuboid spores when depression is over
14-A. spores released from hilum
15-A. edges of spore 15-B. truncate of sterigma released from hilum.