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Studies on Taxonomy and Distribution of the Laboulbeniales collected in Korea (species from Cheonnam Province)

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한국에서 채집된 Laboulbenia 균류의 분류와 분포에 관하여 (전남지역을 중심으로)

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ABSTRACT: Among a large number of insects collected by the authors in 1991, thirteen species under five genera of Laboulbeniales have been obtained from sourthern regions of Korea; *Chitonomyces chinensis* on *Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Chitonomyces melanurus* on *Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Chitonomyces paradoxus* on *Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Dichomyces furcifer* on *Philonthus amicus* (*Staphylinidae, Coleoptera*), *Dichomyces homalotae* on *Atheta* sp. (*Staphylinidae, Coleoptera*), *Laboulbenia acupalpi* on *Acupalpus inoratus* (*Carabidae, Coleoptera*), *Laboulbenia flagellata on Anisodactylus tricuspidatus* (*Carabidiae, Coleoptera*), *Laboulbenia proliferans* on *Chlaenius naeviger* (*Carabidae, Coleoptera*), *Laboulbenia tachys* on *Tachys laetificus* (*Carabidae, Coleoptera*), *Laboulbenia vulgaris* on *Bembidion scopulinum* (*Carabidae, Coleoptera*), *Rickia ancylopi* on *Ancylopus melanocephalus* (*Endomychidae, Coleoptera*), *Zodiomyces subseriatus* on *Helochares lentus* (*Hydrophilidae, Coleoptera*), and *Zodiomyces vorticellarius* on *Helochares lentus* (*Hydrophilidae, Coleoptera*). Among these species, three species and a genus *Zodiomyces* (*L. proliferans, Z. subseriatus and Z. vorticellarius*) are newly reported to the flora of southern Korean region.

KEYWORDS: *Chitonomyces, Dichomyces, Laboulbenia, Rickia, Zodiomyces, Laboulbeniales.*

Laboulbeniales is a highly specialized fungus group in the Ascomycetes. All species of this fungus group are known as an obligate exoparasites on *Arthropoda,* especially of insects, with exception being a number of species found on mites and milipedes. They are minute, mostly less than one milimeter long, and like hairs or bristles of the insects own. This fungus group classified in the order Laboulbeniales, at present, was apparently first noticed by two French entomologists, A. Laboulbéne and A. Rouget, in the 1840's, but was not described formerly. Members of the Laboulbeniales are widely distributed in the world and include approximately 2,000 known species under 133 genera (Terada, 1991), although the richest flora are found in the tropical regions. The taxonomical system of Laboulbeniales was first established by Thaxter (1908) and partly revise have been added in this moments.

Concering the Asian Laboulbeniales, a considerable number of species are included in Thaxter's monograph. Kishida (1929) described a new species, *Dimeromyces japonicus* Kishida, based on specimens collected on a mite which was parasite on a beetle, Kurosa (1952) reported the occurence of the genus *Laboulbenia* on a breeded staphylinid insect. Ishikawa (1966) reported five species from Japan. Sugiyama (1973) reported 58 species and one variety belonging to 16 genera from Japan. He published the floristic studies on the Labulbe-

niales in various regions of Asia including Papua New Guinea (1977a, 1977b, 1978a, 1978b, 1978c, 1979a, 1979b, 1981a, 1981b, 1981c, 1982a, 1982b, 1982c, 1982d, 1982e, 1983d, 1985a, 1985b, 1985c, 1985d, 1985e, 1985f, 1986, 1987) Terada (1976, 1977, 1978, 1980, 1981, 1991) reported the studies on the Laboulbeniales of Taiwan and Japan.

The Author also reported the studies on this fungus group in a few regions of Asia including Korea. (1981, 1982a, 1982b, 1982c, 1983, 1984a, 1984b, 1984c, 1986a, 1986b, 1986c, 1990, 1991) According to his monograph, the Laboulbeniales included 461 species under 64 genera in Asia (1986). Among these species and genera, 7 species and one genus were new to world.

Materials and Methods

Many thousands of insects were collected and observed, to examine the parasitization of Laboulbeniales. The rates of parasitized insects by this fungus were variable, depending on insect group and on the collection localites, but in average they were lower than 2 percent per population. Borneo, China, Formosa, Japan, Thailand. The fungi on the surface of the insects were removed by a thin needle and mounted by a refined Berlese's fluid (neoshigaral) for preparation. The preparation were preserved in the incubation box set at 50℃ for 3 or 4 days to make the materials recovered in original shape. The specimens were observed under microscopy. All specimens examineed were preserved in Dept. of Biology, College of Education, Chosun University.

Description of the species

Genus *Chitonomyces* Peyritsch, 1873

Key to the species of the genus *Chitonomyces*

1. Receptacle opaque and blackish the distal portion ····· *Chitonomyces melanurus*
1. Receptacle hyaline yellowish the distal portion
   2. Perithecial projection partly opaque and blackish; perithecium proper united with the receptacle on the lateral side, basal portion of the receptacle blackened ····· ····· *Chitonomyces chinensis*
   2. Perithecial projection hyaline or yellowish, concolorous with the perithecial venter; thallus hatchet-shaped, stout, perithecial projection stout, conical, on the tip of the perithecium ····· *Chitonomyces paradoxus*

1. ***Chitonomyces chinensis*** Thaxter, *Mem. Amer. Acad. Arts Sci.* 14: 405 (1924); 15: 517 (1926); Sugiyama, *Trans. Mycol. Soc. Japan* 18: 157 (1977); Sugiyama & Hayama, *Trans. Mycol. Soc. Japan* 22: 189 (1981); Sugiyama & Phanichapol, *Nat. Hist. Bull. Siam Soc.* 32: 52 (1984); Sugiyama & Nagasawa, *Trans. Mycol. Japan* 26: 4 (1985); Lee & Kim. *Korean Mycol* 18: 2 (1990).

Host species: *Laccophilus difficilis.*

Specimens examined: Piadong, Kwangsangu, Kwangju Great City, October, 20, 1991, L-Y-0578 and 0579; Sangju, Namhae, Kyeong Nam, October, 5, 1989, L-Y-0587 and 0588: Jinweon, Jangsung, Cheonnam, Nobember, 3, 1991, L-Y-0593, 0594 and 0595.

This species is characterized by a dark-yellowish color and hornshaped, strongly curved apical projection of the perithecial venter. It is similar to *C. paradoxus* in general shape. Although these two species are distinguished in that the perithecial projection of *C. chinensis* is distinctly blackish and strongly curved, whereas the projection of C. *paradoxus* is straight and yellowish, concolorous with the perithecium venter. Specimens collected from the posterior margin of the right and left elytron of the host insect.

2. ***Chitonomyces melanurus*** Peyritsch, Sitzugsber. *Kaiserl. Acad. Wissensch. Math-Naturwissench. Klasse.* 68: 251 (1873); Thaxter, *Mem. Amer. Acad. Arts Sci.* 12: 289 (1986); 14: 4055 (1924); Spegazzini, *An. Mus. Nac. Hist. Nat. Buenos-Aires* 27: 47 (1915); Siemaszko, *Polskie. Pismo. Entomol.* 12: 122 (1983); Sugiyama, *Ginkgoana* 2: 24 (1973); *Trans. Mycol. Soc. Japan* 18: 158 (1977); Sugiyama & Hayama, *Trans. Mycol. Soc. Japan* 22: 192 (1981); Sugiyama & Nagasawa, *Trans. Mycol. Soc. Japan* 26: 9 (1985); Lee & Kim, *Korean Mycol* 19: 2 (1990).

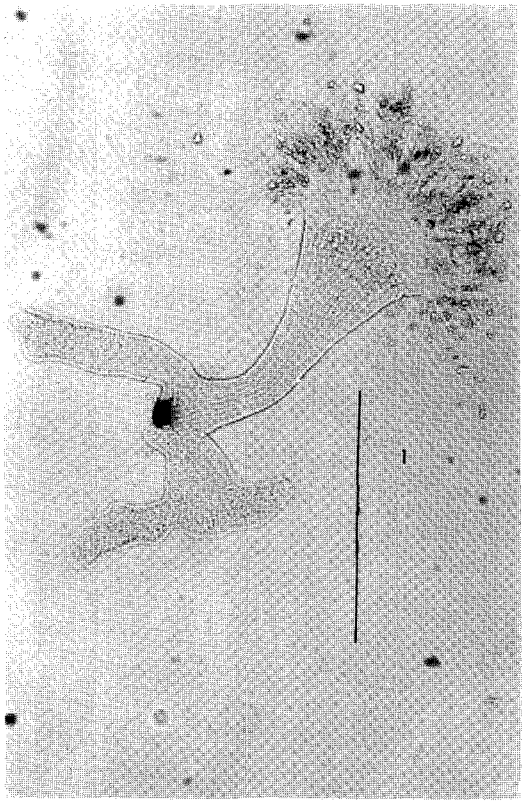

Fig 1. *Zodiomyces vorticellarius* Thaxter on *Helochares lentus* Sharp (*Hydrophilidae, Coleoptera*). Scales: 10 μm.

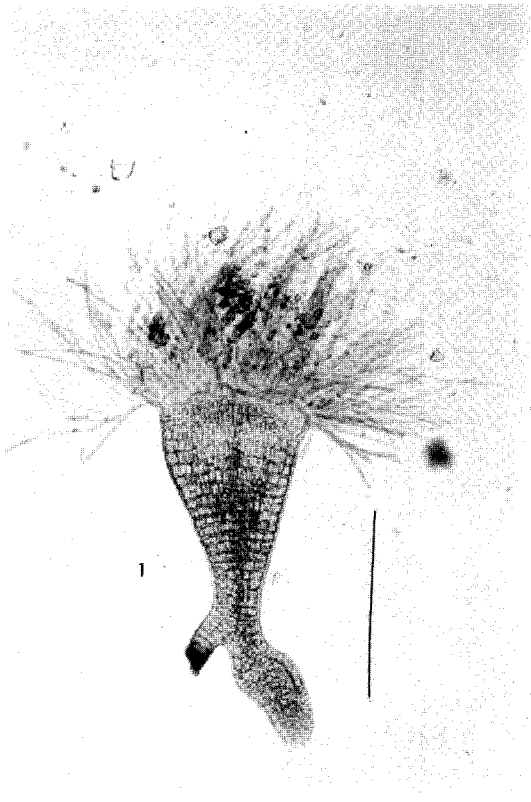

Fig 2. *Zodiomyces subseriatus* Thaxter on *Helochares lentus* Sharp (*Hydrophilidae, Coleoptera*). Scales: 10 μm.

Host species: *Laccophilus difficilis.*

Specimens examined: Piadong, Kwangsangu, Kwangju Great City, October, 20 1991, L-Y-0573 and 0574: Gurim, Youngamgun, Cheonnam, October, 8, 1989, L-Y-0580; Sangju, Namhae, Kyeongnam, L-Y-0587; Jinweon, Jangsung, Cheonnam, Nobember, 3, 1991, L-Y-0596, 0597, 0598 and 0599; Kumcheon, Naju, Cheonnam, October, 19, 1991, L-Y-0514 and 0515; Doam, Kangjin, Cheonnam, October, 14, 1991, L-Y-0553.

This species is the type species of the genus. It is characterized by the strongly curved, blackish termination of its receptacle and two subterminal projections on its perithecium. This species is similar to *C. intermedius, C. javanicus, C. helicofer* and *C. japanensis* in its general appearance, but is distinguishable from the former two species by the strongly curved termination of its receptacle, and from *C. helicofer* by the wholly opaque termination of its receptacle. This fungus also is distinguished from *C. japanensis* by the short anterior projection of its perithecium which does not exeed the top of the perithecium.

3. ***Chitonomyces paradoxus*** (Peyr.) Thaxter, *Proc. Amer. Acad. Arts Sci.* 27: 32 (1892); *Mem, Amer. Acad. Arts Sci.* 14: 406 (1924); Picard, *Bull. Soc. Mycol. France* 29; 515 (1931); Spegazzini, *Am. Mus. Nac. Hist. Nat. Buenos Aires* 27: 47 (1915); Sugiyama, *Ginkgoana* 2: 24 (1973); Sugiyama & Phanichapol, *Nat. Bull. Siam Soc.* 31: 63 (1984); Sugiyama & Nagasawa, *Trans. Mycol. Soc. Japan* 26: 9 (1985); *Heimatomyces paradoxus* Peyritsch, Sitzungsber. *Kaiserl. Acad. Wissensch. Mah-Naturwissensch, Klasse* 68: 251 (1873); Lee & Kim, *Korean Mycol* 18 (1): 3 (1990).

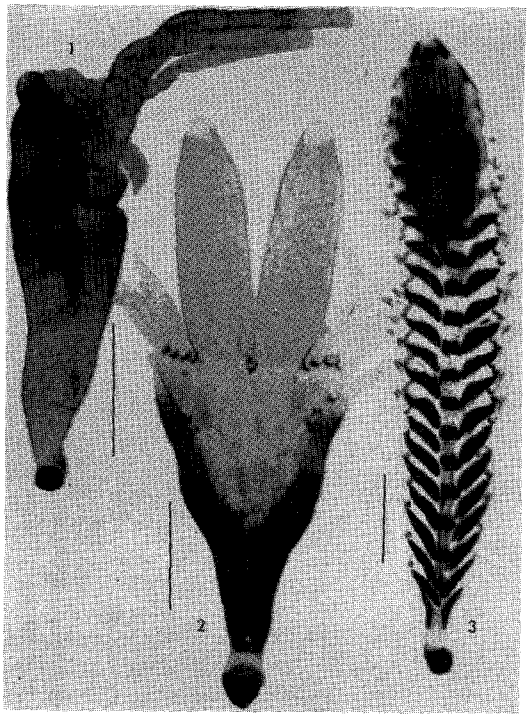

Fig 3. 1. *Laboulbenia acupalpi* Spegazzini on *Acupalpus inoratus* Bates (*Carabidae, Coleoptera*). 2. *Dichomyces furcifer* Thaxter on *Philonthus amicus* Sharp (*Staphylinidae, Coleoptera*). 3. *Rickia ancylopi* Thaxter on *Ancylopus melanocephalus* Oliver (*Endomychidae, Coleoptera*). Scales: 20 μm.

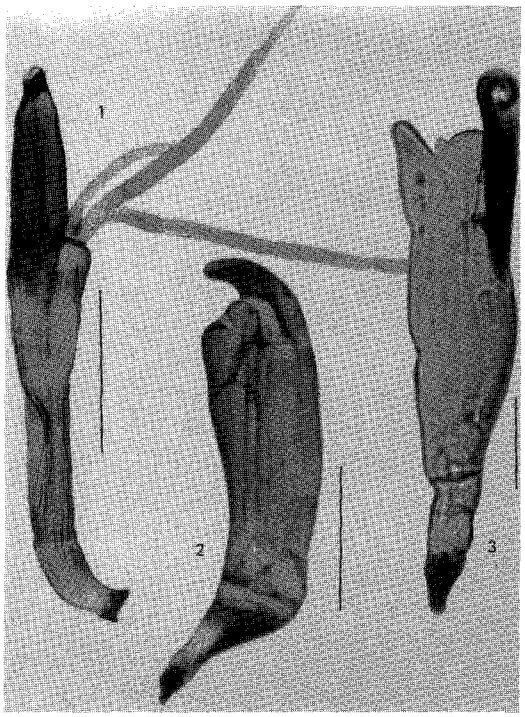

Fig 4. 1. *Laboulbenia flagellata* Peyritsch on *Anisodactylus tricuspidatus* Morawitz (*Carabidae, Coleoptera*). 2. *Chitonomyces paradoxus* (Peyritsch) Thaxter on *Laccophillus difficilis* Sharp (*Dytiscidae, Coleoptera*). 3. *Chitonomyces melanurus* Peytritsch on *Laccophillus difficilis* Sharp (*Dytiscidae, Coleoptera*). Scales: **20** μm.

Host species: *Laccophilus difficilis.*

Specimens examined: Doam, Kangjin, Cheonnam, October, 14, 1991, L-Y-0545, 0546, 0547, 0548, 0549, 0550, 0551, 0552 and 0554; Piadong Kwangsangu, Kwangju Great City, October, 20, 1991, L-Y-0575, 0576, and 0577.

The most important character of this species is the formation of a hornshaped projection on the perithecium. This fungus is closely allied to *C. chinensis,* but is distinguished by the straight habit of its perithecial terminal projection.

Genus *Dichomyces* Thaxter, 1895

Key to the species of *Dichomyces*

1. Thallus with two perithecial receptacle without projection on the fourth layer ··· *D. furcifer*
1. Thallus with only one perithecium, receptacle with a distinct projection on either side of the fourth layer ····· *D. homalotae*

4. ***Dichomyces furcifer*** Thaxter, *Proc. Amer. Acad. Arts Sci.* 28: 184 (1893); *Mem. Amer. Acad. Arts Sci.* 12: 282 (1896); 13: 250 (1908); Spegazzini, *An. Mus. Nac. Hist. Nat. Buenos Aires* 23: 183 (1912); 26: 453 (1915); 513 (1977); Sugiyama, *Ginkgoana* 2: 28 (1973); Sugiyama & Shazawa, *Trans. Mycol. Soc. Japan* 18: 272 (1977); Lee, *Korean Mycol* 9: 182 (1981); Lee, *Kor. J. Plant Tax.* 16: 125 (1986).

Host Species: *Philonthus amicus* Sharp.

Specimens examined: Gumcheon, Naju, Cheonnam, October, 27, 1991, L-Y-0555.

The main feature of this species is the narrow fourth layer of the the receptacle and constant formation of two perithecia.

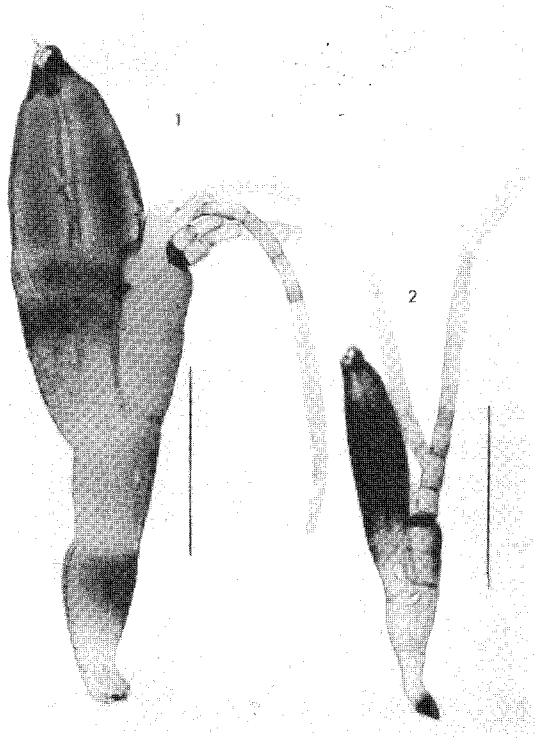

Fig 5. 1. *Laboulbenia proliferans* Thaxter on *Chlaenius naeviger* Morawitz (*Carabidae, Coleoptera*). 2. *Laboulbenia vulgaris* Peyritsch on *Bembidion scopulinum* Kirby (*Carabidae, Coleoptera*). Scales: 20 μm.

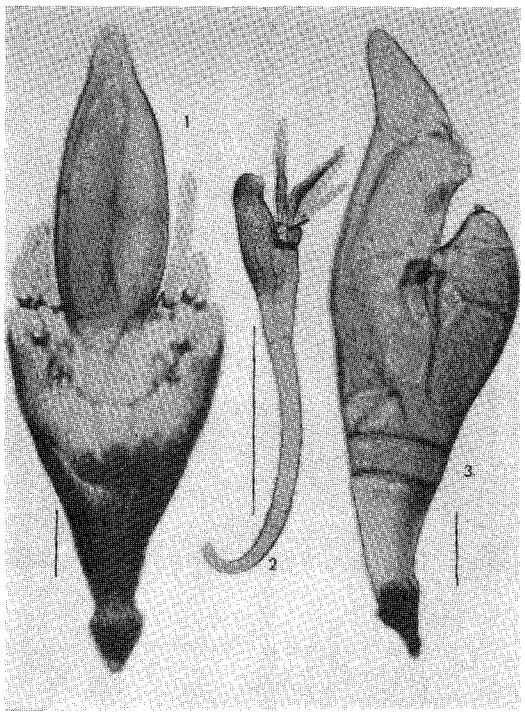

Fig 6. 1. *Dichomyces homalotae* Thaxter on *Atheta* sp. (*Staphylinidae, Coleoptera*). 2. *Laboulbenia tachys* Thaxter on *Tachys laetificus* Bates (*Carabidae, Coleoptera*). 3. *Chitonomyces chinensis* Thaxter on *Laccophillus difficilis* Sharp (*Dytiscidae, Coleoptera*). Scales: 20 μm.

5. ***Dichomyces homalotae*** Thaxter, *Proc. Amer. Acad. Arts Sci.* 37: 29 (1901); Spegazzini, *An. Mus. Nac. Hist. Nat. Buenos Aires* 23: 184 (1912); 27: 50 (1915); 29: 513 (1917); Lee, *Kor. J. Plant Tax.* 16: 30 (1986).

Host species: *Aleocharinae* sp.

Specimens examined: Yongdang, Kuryee, Cheonnam, October, 21, 1991, L-Y-0530 and 0531.

This species was collected only from Korea in Asian region. The present species is readily distinguished from other species of the genus in having solitary perithecium which is suffused with reddish brown.

Genus *Laboulbenia montagne* et Robin, 1853.

Key to the species of *Laboulbenia*

1. The fourth layer of the receptacle composed of more than three cells ····· *L. proliferans*
1. The fourth layer of the receptacle composed two cells
2. Posterior branch of the receptacle dichotomus ····· *L. flagellata*
2. Posterior branch of the receptacle long and simple
3. Perithecium with two transverse series of small roundish prominences on the middle portion ····· *L. acupalpi*
3. Perithecium without two transverse series of small roundish prominences on the middle portion
4. Perithecium wholly opaque ····· ····· *L. vulgaris*
4. Perithecium not blackened near the apex ····· *L. tachys*

6. ***Laboulbenia acupalpi*** Spegazzni, *An. Mus. Nac. Hist. Nat. Buenos Aires* 26: 458 (1915); *ibid.* 29: 617 (1917); Balazuc, *Bull. Soc. linn. Lyon* 42: 12

(1974); Rossi, *Giorn. Bot. Ital.* 109: 73 (1975); Sugiyama, *Journ. Jap. Bot.* 53 (9): 284 (1978); Majewski, *Acta. Mycol.* 17: 145 (1980); Lee, *Natural Science Reserch, Institute of Natural Science Chosun University* 6: 33 (1983); Lee *et al, Kor. J. Plant Tax.* 16 (2): 132 (1986).

Host species: *Acupalpus inoratus* Bates.

Specimens examined: Jukyoung, Tanyang, Chungbuk, Nobember 5, 1991, L-Y-0601, 0602 and 0603.

This fungus was found only on genus *Acupalpus* in Europe and East-Northern Asia. It is characterized by the two transverse series of small roundish prominences on middle portion of the perithecium.

7. ***Laboulbenia flagellta*** Peyritsch, Sitzungsber. *Kaiserl. Akad. Wissensch. Math-Naturwissensch. Klasse* 68: 247 (1873); Thaxter, *Laboulbenia elongata, Proc. Amer. Acad. Arts Sci.* 24: 10 (1890); Spegazzini, *Redia* 10: 50 (1914); *An. Mus. Nac. Hist. Nat. Buenos Aires:* 623 (1917); Balazuc, Livre du Cinquantenaire de l'Institute de Speleologie' Emile Racovitza, *Bucarest*: 469 (1971); *Bull Soc. Iinn. Lyon* 43 (2): 59 (1974); *Ibid.* 51; 13 (1982); Sugiyama, *Trans. Mycol. Soc Japan* 13: 261 (1972); *Ginkgoana* 2: 51 (1973); Lee, *Korean Mycol* 9 (4): 184 (1981); Lee, *Kor. J. Plant Tax.* 16 (2): 48 (1986).

Host species: *Agonum buchanani Hope, Harpalus* sp. (1) *Harpalus* sp. (2) and *Pterostichus microcephalus* Motschulsky.

Specimens examined: Gunseo Youngam Cheonnam, Nobember 18, 1991, L-Y-0589, 0590 and 0591.

The present species is closely related to *L. pterostichi* Thaxter but differs in the following features: 1) The posterior branch of receptacle is usually branched first on the basal cell in *L. pterostichi,* while it is branched at the second cell in *L. flagellata.* 2) The anterior branch of receptacle produces terminal antheridia in *L. pterostichi,* while they form lateral antheridia in *L. flagellata.*

8. ***Laboulbenia proliferans*** Thaxter, *Proc. Acad. Arts Sci.* 28: 168 (1893); *Amer. Acad. Arts Sci.* 12: 348 (1896); 13: 331 (1908); Sugiyama, *Ginkgoana* 2: 60 (1973).

Total length to the top of perithecium 377-465 μm, thickest portion of the plant 90-127 μm thick. Receptacles olive-colored; basal portion consisting of five layers, 44-59 μm in diameter, 284-328 μm long, layers, one celled except the fourth layer; the first and second layers forming a slender stalk, tapering twoards the base, producing a blackish foot at the basal end, often strongly curved posteriorly; the first layer 34 μm thick at the distal end, 98-108 μm long; the second layer 34-44 μm thick, 98 μm long; the third layer 34-39 μm thick, 50-60 μm long; the fourth composed of 4 transversely arranged cells, extending obliquely at the anterior end to form a projection, 44-49 μm thick, 59-64 μm long; the fifth layer flat, blackish, 20-39 μm thick, 5-7.5 μm long; distal portion of the receptacle composed of two hyaline filamentous branches, branches simple or dichotomus. Appendages hyaline, filamentous, simple, similar to the branches of the receptacle, produced distally on the cells of the extended portion of the fourth layer of the receptacle, 250-318 μm long. Peritheicia proper hyaline, elliptical, blackened near the apex, free from the receptacle on lateral side except basal small portion, 54-93 μm in diameter, 225-274 μm long; stalk formed near the distal end of the second layer of the receptacle, completely united to the third and fourth layers of the receptacle, composed of a long basal cell and a few distal and tansversely arranged small cells, 49-63 μm thick, 88-112 μm long. Antheridia hyaline, cylindrical, formed at the terminations of short branchlets produced at basal portion of the anterior branch of the receptacle.

Host species: *Chlaenius naeviger.*

Specimens examined: Haegumkang Nambu KeojeGun Kyeongnam, June 4, 1991, L-Y-0483, 0484 and 0485.

This species is unique in having the fourth layer of the receptacle composed of many cells. The formation of long appendages by the cells of the fourth layer of the receptacle is also charecetristic of species.

균체의 기부에서 자낭각 끝까지 전체 길이 377-

465 μm, 균체의 가장 넓은 폭 90-127 μm.

탁은 오리브색갈을 띠며 기부는 5층으로 이루어졌고 길이는 284-328 μm, 폭은 44-59 μm이다. 층들은 4번째 층을 제외하고 하나의 세포로 되어 있다; 첫층과 두째층은 구부러진 줄기를 형성하고, 기부를 향하여 뾰쪽하게 되고 기부끝에 검으스름한 족부를 형성한다. 4번 층은 횡적으로 배열된 4개의 세포로 구성되었고, 돌출부 형성으로 앞끝 부분에서 비스듬하게 퍼져있다. 5번 층은 검고 편평하며, 탁의 말단 부분은 2개의 투명한 실과 같은 가지들로 구성되었고, 이들은 단순하거나 가지쳐 있다.

부속체들은 투명, 실과 같고, 단순하며 탁의 가지들과 비슷하고 탁의 4번째 층의 편평한 부분의 세포들에서 말단으로 발생되었고, 길이는 250-318 μm이다. 자낭각 자체는 투명, 타원형, 정단 근처는 검으스름하고, 기부 부분의 약간을 제외하고 측면에서 볼 때 탁과 분리되어 있고 길이 225-274 μm 이다. 자낭각 줄기는 탁의 2번 층 말단 끝 근처에서 형성되었고, 3번 층과 4번 층에 완전하게 결합되었으며, 횡적으로 배열된 작은 세포들과 하나의 길다란 기부세포, 소수의 말단세포로 구성되었고, 길이는 88-112 μm, 두께 49-63 μm이다. 장정기는 투명하고 원통형이며 탁의 앞가지의 기부부분에 발생된 짧은 가지들의 정단에 형성되었다. 이 종의 특징은 많은 세포들로 구성된 탁의 4번 층이며 그위에 긴 부속체를 형성하는 것이다.

9. ***Laboulbenia tachys*** Thaxter, *Amer. Acad. Arts Sci.* 38 (1902); Spegazzini, *An. Mus. Nac. Hist. Nat. Buenos Aires* 29: 642 (1917); Sugiyama, *Ginkgoana* 2: 65 (1973); *Journ. Jap. Bot.* 53: 155 (1978); Lee *et al, Korean Mycol* 10 (1): 3 (1982); Sugiyama & Phanichapol, *Nat. Hist. Bull. Siam Soc.* 31 (2) : 81 (1984); Lee & Sugiyama, *Trans. Mycol. Soc. Japan* 25: 253 (1984); Lee, *Kor. J. Plant Tax.* 16 (2): 142 (1986).

Host species: *Thachys laetificus* and *T. fuscicauda.*

Specimens examined: Wangkog, Naju, Cheonnam, October, 19, 1991, L-Y-0512 and 0513.

This species is very unique in having perithecia without black portion near the apex and the conical basal cell of the posterior branch of the receptacle.

10. ***Laboulbenia vulgaris*** Peyristch, Stizungsber. *Kaiserl. Wissensch. Math-naturwissensch. Klasse* 68: (1873); Thaxter, *Proc. Amer. Acad. Arts Sci.* 27: 44 (1892); *Mem. Amer. Acad. Arts Sci.* 12, 318 (1892); 13: 335 (1908); Spegazzini, *An. Mus. Nac. Hist. Nat. Buenos Aires* 23: 72 (1912); 27: 62 (1915); Redia 10: 42 (1914): Siemaszko, *Poliskie Pismo Entomol.* 6: 197 (1928); Middelhoek, *Nederl. Kruidk. Arch.* 56: 249 (1949); Balazuc, Livre du Cinquantenaire de I' Institute de Speleologie ' Emile Racovitza', *Bucarest*: 473 (1971); *Bull. Soc. Iinn, Lyon* 43: 310 (1974); 51: 22 (1982): Balazuc, Espadaler & Girbal, *Collnea. Bot.* 13 (2): 413 (1982); Sugiyama, *Ginkgana* 2: 66 (1973); Rossi, Quaderni Speleologia, Cirolo Speleologico Romano 3: 3 (1978); Terada, *Trans. Mycol. Soc. Japan* 19: 59 (1978); Lee, *Korean Mycol.* 9 (4): 184 (1981); *Kor. J. Plant Tax.* 16 (2): 143 (1986).

Host species: *Bembidion oxiglima* and *B. scopulinum.*

Specimens examined: Tanyang, Chungbuk, October 16, 1991, L-Y-0505, and 508.

The main character of this species is the blackish perithecium and blackish portion of the receptacle.

Genus *Rickia* Cavara, 1899

11. ***Rickia ancylopi*** Thaxter, *Proc. Amer. Acad. Arts Sci.* 52: 40 (1916); *Mem. Amer. Acad. Arts Sci.* 15: 452 (1926); Sugiyama, *Ginkgoana* 2: 75 (1973); Terada, *Trans. Mycol. Soc. Japan* 19: 60 (1978); Lee, *Korean Mycol* 9: 185 (1981); *Kor. J. Plant Tax.* 16 (2): 146 (1986).

Host species: *Ancylopus melanocephalus* Oliver.

Specimens examined: Kumcheon, Naju Cheonnam, October 27, 1991, L-Y-0556, 0557, 0558, 0559 and 0560; October 13, 1989, Sununsa, Kochang CheonBuk, L-Y-0568 and 0569.

The dark slender receptacle with hyaline basal cells of appendage is characteristic to the present species. The present species appears to be closely related to *R. tessellata* Thaxter.

Genus *Zodiomyces* Thaxter, 1891

Key to the species of *Zodiomyces*

1. Receptacle with a single projection .... *Z. subseriatus*

1. Receptacle with a pair projections ····· ····· *Z. vorticellarius*

12. ***Zodiomyces subseriatus*** Thaxter, *Mem. Amer. Acad. Arts Sci.* 16: 331 (1931); Sugiyama, *Trans. Mycol. Soc. Japan* 22: 317 (1981); Sugiyama & Phanchapol, *Nat. Nat. Hist. Bull. Siam Soc.* 31: 84 (1984).

Thallus hyaline, yellowish, polyp-shaped, consisting of a recep- tacle, several perithecia and numerous appendages. Total length to the top of the receptacle 303-350 μm, the thickist portion 147-167 μm. Receptacle composed of stalk-like and disk-like portions; the stalk-like portions cylindrical, thickest at the distal end, gradually tapering towards the base, rounded basely, comprising about 30 superimposed layers of cells with each layer composed of numerous filamentous appendages and perithecia; the longest appendage 343 μm, forming a large vesicular projection at subbassal portion of lateral side; the projection cylindrical, thickist at about middle portion, rounded terminally, composed of numerous cells placed irregularly; the disk-like portion of receptacle similar to the stalk-portion in the cell arrangement, becoming thicker towards the distal end. Perithecium consisting of a stalk and perithecium proper; the stalk slender, composed of two superposed cells; perithecium proper ellipsoidal, more or less pointed distally, bearing two pairs of appendages, 40-50 μm long, 15 μm thick; a pair of appendages located beside the perithecial apex, obclavate, 50-55 μm long; another pair of appendages located at subapical portion, cylindrical, tapering towards the distal end, 38 μm long.

Host species: *Helochares lentus* Sharp.

Specimens examined: Namsumri Imhoi Jindo Cheonnam, October 24, 19 91, L-Y-0517, 0518 and 0519; Doam Kangjin Cheonnam, October 24, 1991, L-Y-0520, 0521 and 0522; Doduk, Goheung Cheonnam, October 23, 1991, L-Y-0523, 0524, 0525, 0526, 0527 and 0528.

The genus *Zodiomyces* includes only two species, *Z. subseriratus* and *Z. vorticellarius* Thaxter. The present species is characterized in having a single projection of the receptacle. The specimens found on the inferior surface of the abdomen of the hosts.

균체는 투명, 황갈색, 폴립형이며 하나의 탁과 여러개의 자낭각 그리고 수많은 부속체들로 이루어졌다. 탁의 끝부분까지 전체 길이 303-350 μm.

탁은 줄기 같은 부분과 접시 모양 같은 부분으로 구성되었다. 줄기같은 부분은 원통형이고, 말단 끝에서 가장 두껍고, 점차로 기부를 향하여 뾰쪽하고 둥글며, 각 층들로 이루어진 약 30개 내외의 세포의 겹쳐진 층들로 되어 있는 탁은 수많은 실과 같은 부속체와 자낭각들로 이루어졌고, 가장 긴 부속체 길이는 343 μm이다. 측면의 아기부 부분에 하나의 커다란 소낭상의 돌출부를 형성하고, 돌출부는 원통형, 중간 부분 정도에서 가장 두껍다. 그것은 정단은 둥글고, 불규칙적으로 배열된 수많은 세포들로 구성되었다. 탁의 접시같은 부분은 세포배열에서 줄기 부분과 비슷하고 말단 끝을 향하여 두꺼워진다.

자낭각은 자낭각 자체와 줄기로 이루어졌고, 줄기는 구부러지고 2개의 겹 쳐진 세포들로 구성되었으며, 자낭각 자체는 타원형, 다소 말단으로 뾰쪽하며, 2쌍의 부속체를 발생하고 있다. 길이 40-50 μm, 두께 15 μm. 한 쌍의 부속체는 자낭각 정단 부근에 위치하고 길이는 50-55 μm이다. 다른 한 쌍의 부속체는 아정단 부근에 위치하고 원통형, 말단 끝을 향하여 뾰쪽하고 길이는 38 μm이다. 이 종의 특징은 탁의 아기부 부분에 하나의 소낭상의 돌출부를 갖는 것이며 표본은 숙주의 배 안쪽 표면에서 채집되었다.

13. ***Zodiomyces vorticellarius*** Thaxter, *Proc. Amer. Acad. Arts Sci.* 24: 263 (1891); *Mem. Amer. Acad. Arts Sci.* 13 (6) : 444 (1908); *Mem. Amer. Acad. Arts Sci.* 16: 330 (1931).

Thallus hyaline, yellowish, polyp-shaped, consisting of a receptacle, several perithecia and numerous appendages. Total length to the top of the receptacle 401-420 μm, the thickest portion 191-215 μm. Receptacle composed of stalk-like and disk-like portions; the stalk-like portion, cylindrical, thickest at the distal end, gradually tapering toward the base, rounded basally, comprising about 33-35 superimposed layers of cells with each layer composed of numerous cells arranged in a transverse series, forming terminally numerous filamentous appendages and perithecia; apendages

245-350 μm, forming two large vesicular projection at subbasal portions of both side; the projections varied in forms, composed of numerous cells placed irregularly; the disk-like portion receptacle similar to the stalk-portion in the cell arrangement, becoming thicker towards the distal end. Perithecia consisting of a stalk and perithecium proper; the stalk slender, composed of two superposed cells; peritheciun proper ellipsoidal, more or less pointed distally, bearing two pairs of appendages, 50-60 μm long, 15-20 μm thick; a pair of appendages located beside the perithecial apex, obclavate, 50-60 μm long; another pair of appendages located at subapical portion, tapering towards the distal end, 35-45 μm long.

Host species: *Helochares lentus* Sharp.

Specimens examined: Pogil gland, Wando, Cheonnam, September 21, (1990) L-Y-0474 and 0475; Imhoi, Jindo, Cheonnam, L-Y-0495, 0496, 0497, 0498, 0499 and 0500.

The present species is characterized in forming two large vesicular projections at subbasal portion of receptacle of both side. The specimens were found on the surface of the thorax and abdomen of the hosts. The genus *Zodiomyces* induces only two species, *Z. subseriatus* and *Z. vorticellarius* Thaxter. Although the former species was widely collected by Sugiyama *et al.* (1981, 1984) in serveral regions of Asia, the latter species was newly collected from Korean region in Asia.

균체는 투명, 황갈색 폴립형이며, 하나의 탁과 여러개의 자낭각 그리고 수많은 부속체들로 이루어져 있다. 탁의 끝까지 전체의 길이 401-420 μm, 가장 넓은 부분 191-215 μm. 탁은 줄기 같은 부분과 접시 모양 같은 부분들로 구성되었다. 줄기 같은 부분은 원통형이며, 말단 끝에서 가장 두껍고 기부를 향하여 점차 뾰족하고 둥글게 되었다. 횡열로 배열된 수많은 세포들로 구성된 각 층은 세포들의 33-35 μm 내외의 겹쳐진 층들을 포함하고 있으며, 정단으로 수많은 실과 같은 부속체와 자낭각들을 형성하고, 부속체들은 245-350 μm이며, 양쪽의 아기부 부분에 2개의 커다란 소낭상의 돌출 부분들을 형성하고, 돌출부는 형태에서 다양하고, 불규칙적으로 놓여진 수많은 세포들로 구성되었다. 접시 모양 같은 부분은 세포 배열에서 줄기 부분과 비슷하고, 말단 끝을 향하여 더 두꺼워진다. 자낭각은 줄기와 자낭각 자체로 이루어졌고, 줄기는 구부러지고 2개의 겹쳐진 세포들로 구성되었다. 자낭각 자체는 타원형, 다소 말단으로 뾰족하며, 두 쌍의 부속체를 발생하고 있다. 길이 50-60 μm, 두께 15-20 μm. 한 쌍의 부속체는 자낭각 정단 근처에 위치하고, 길이 50-60 μm, 다른 한쌍의 부속체 는 아정단 부분에 위치하며 말단 끝을 향하여 뾰족하고 길이는 35-45 μm이다. 이 종의 특징은 탁의 양쪽에 두개의 커다란 소낭상의 돌출부를 가지는 것이며 표본은 숙주의 가슴과 배 표면에서 채집되었다. *Zodiomyces*에는 오직 2종인 *Z. subseriatus* 와 *Z. vorticellarius*가 있다. 전자는 아시아의 여러지역에서 스기야마 등에 의하여 널리 채집되었으나, 후자는 아시아에서 한국에서 처음으로 채집되었다.

摘 要

라블베니아 균류는 곤충의 외부에 기생하는 자낭균류이다. 저자들은 이 균류의 연구를 위하여 우리나라의 각 지역에서 특히 전남지역을 중심으로 곤충들을 채집하여 그것들을 해부현미경 아래서 기생여부를 관찰하여 표본을 만들고 광학현미경을 통하여 동정한 결과 5속 13종을 얻었기에 다음과 같이 보고한다. *Chitonomyces chinensis* Thaxter on *Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Chitonomyces melanurus* Peytritsch on *Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Chitonomyces paradoxus* (*Peyritsch) Thaxter on Laccophillus difficilis* (*Dytiscidae, Coleoptera*), *Dichomyces furcifer* on *Philonthus amicus* (*Staphylinidae, Coleoptera*), *Dichomyces homalotae* Thaxter on *Atheta* sp. (*Staphylinidae, Coleoptera*), *Laboulbenia acupalpi* Spegazzini on *Acupalpus inoratus* (*Carabidae, Coleoptera*), *Laboulbenia proliferans* Thaxter on *Chlaenius naeviger* (*Carabidae, Coleoptera*), *Laboulbenia flagellata* on *Anisodactylus tricuspidatus* Morawitz (*Carabidae, Coleoptera*), *Laboulbenia tachys* Thaxter on *Tachys laetificus* (*Carabidae, Coleoptera*), *Laboulbenia vulgaris* Peyritsch on *Bembidion scopulinum* (*Carabidae, Coleoptera*), *Rickia ancylopi* Thaxter on *Ancylopus melanocephalus* (*Endomychidae, Coleoptera*), *Zodiomyces subseriatus* Thaxter on *Helochares lentus* (*Hydrophilidae, Coleoptera*), *Zodiomyces vorticellarius* Thaxter on *Helochares lentus* (*Hydrophilidae, Coleoptera*). 이들 속과 종들 중에서 *Zodiomyces*의

1속과 *L. proliferans* Thaxter, *Z. subserariatus* Thaxter, *Z. voruticellarius* Thaxter의 3종들은 우리나라에서 처음으로 기록되어진 것이다.

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