Plectania melastoma(アカサビクロチャワンタケ-新称)の日本における発生

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The occurrence of *Plectania melastoma* (Pezizales, Sarcosomataceae) in Japan*

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Abstract

The first documented record of *Plectania melastoma* from Japan has been presented here, based on a specimen collected from Kyoto Prefecture (Japan). *P. melastoma* was observed during spring (from end of April to early May) in a *Cryptomeria japonica* artificial forest, growing on *C. japonica* dead sticks and needle litter on the forest floor. The characteristics of the Japanese specimen agreed well with those of *P. melastoma* reported in the European and North American literature with respect to its small, shortly stipitate apothecia that were reddish orange to reddish brown on the outside, large elliptic-fusiform ascospores [19.2–25.8 × 9.6–12.6 μm, length-breadth ratio (Q) 1.8–2.4], and the wine-colored purple pigments released by the hyphae present on the outer surface of the apothecia in an aqueous solution of KOH. For comparison purposes, a full description of the specimen collected from Japan has been included along with the photographs of apothecia, taken in the natural habitat of the fungus, and of other salient microstructures. In addition, the present status of members of the genus *Plectania* in Japan has been briefly discussed.

Key words: **ascomycetes, biogeography, *Cryptomeria japonica*, discomycetes.**

In the month of April, during a macrofungal survey, one of us (TN) encountered a small cup fungus that grew on dead sticks and needle litter of *Cryptomeria japonica* (L. f.) D. Don found on the floor of the *C. japonica* artificial forest (Figs. 1–3). The fungus was characterized by having an apothecium colored reddish-orange to reddish-brown in the outer surface which contrasts with an almost black hymenium, rather tough consistency, and a very short or rudimentary stipe attached to the substrate with a blackish tomentum. In addition to the on-field digital images of the apothecia, fresh apothecia were collected from the same location and examined in further detail. After consulting relevant literature (Dennis, 1978; Hansen and Kunudsen, 2000; Otani, 1973, 1980; Rifai, 1968; Seaver, 1928), this Japanese cup fungus was identified as the type species of the genus *Plectania, P. melastoma* (Sowerby: Fr.) Fuckel.

Plectania melastoma has been previously recorded from Japan (Katumoto, 2010), however, this record was based on a paper presented by Pfister (1997). Pfister suggested that *Peziza japonica* Berk. & M. A. Curtis [synonym, *Plectania japonica* (Berk. & M. A. Curtis) Sacc.], described from a specimen collected

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"on roots, Japan" (in the protologue of Berkeley and Curtis, 1860) and "on roots upon hillsides" [from Tokunoshima (Japan) on April 30, 1855] (Pfister, 1997), was identical to *P. melastoma* based on his study of the type specimen. He stated that "*Peziza japonica* agrees in all respects with *Plectania melastoma* (Sow. ex Fr.) Fuckel and should be considered a synonym". He did not provide any further morphological characteristics of the type specimen apart from the short descriptions provided by Berkeley and Curtis (1860) in the protologue, and by Saccardo in Sylloge Fungorum (1889) (where spore data was added as "sporidiis ellipsoideis, hyalinis, levibus, 22× 11"). Therefore, a full description of the recently collected specimen from Kyoto Prefecture (Japan) has been presented here.

In the macroscopic description, the color codes given in parentheses are from Kornerup and Wanscher (1967). Microscopic examinations were based on both fresh and dried specimen using cotton blue and KOH (2.5% aqueous solution). Water mounts were prepared for observing pigmentation and all the other measurements, unless otherwise stated. The examined specimen was deposited in the herbarium of the Tottori Mycological Institute (TMI), Tottori, Japan.

Plectania melastoma (Sowerby: Fr.) Fuckel, Jahrb. Nass. Vereins Naturk. **23–24**: 324, 1870. (Figs. 1–5)

Basionym: *Peziza melastoma* Sowerby, Col. fig. Engl. fungi **2**: 64, t. 149, 1799; sanctioning: Fries, Syst. mycol. **2**: 80, 1822.

Syn.: *Peziza japonica* Berk. & M.A. Curtis, Proc. Amer. Acad. Arts & Sci. **4**: 127, 1860 [1858] [according to Pfister (1997)] ; *Plectania japonica* (Berk. & M.A. Curtis) Sacc., Syll. Fung. **8**: 163, 1889.

For other synonyms see Species Fungorum (http://www.speciesfungorum.org/)

Apothcia (Figs. 1–3) solitary or more often gregarious, up to 15 mm wide and 10 mm high, cupulate, very shortly stipitate or nearly sessile, stipes up to 4 mm long and 3 mm wide, arising from a blackish tomentum which extends to the substrate. Disc permanently concave, up to 7 mm in depth, nearly black, smooth. Margin circular, incurved, narrowly (<1 mm) sterile, denticulate when young, becoming obscurely so or nearly entire with age. Context whitish, tough-fleshy, no gelatinous layer present. Receptacle surface minutely downy, fine granular, color reddish orange (between 7B8 and 7C8) to bright brownish orange [7C8 (copper red)] at first, and remaining so until late or becoming reddish brown to brown [7D8 (burnt sienna) to 7D7 (brick red), or 7E8 (henna color)] upon aging or in the weathered specimens, often showing blackish background color through a fibrillose covering (Figs. 1 and 3).

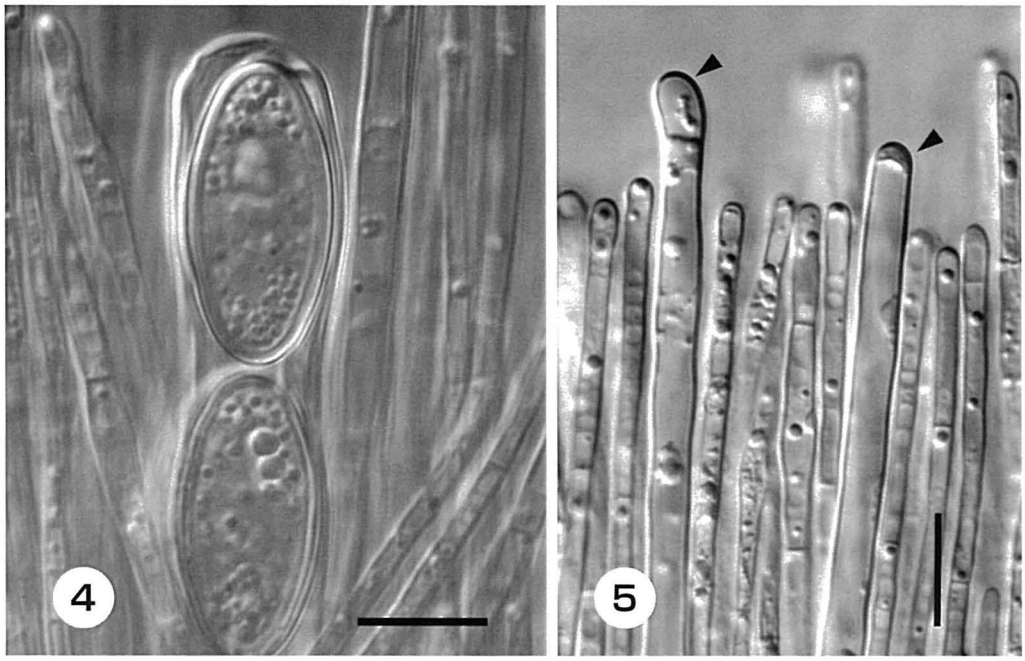
Ascospores (Fig. 4) 19.2–25.8 × 9.6–12.6 μm (n= 40: mean, 22.4 ± 1.5 × 10.6 ± 0.7μm), length-breadth ratio (Q) =1.8–2.4 (n=40: mean, 2.1 ± 0.1) in water, elliptic-fusiform, smooth or fine verrucose (rarely), hyaline, thin- to moderately thick-walled, with granular content, cyanophilous in the thin outermost layer. Asci mostly around 400 μm long, up to 450 μm or somewhat longer at times, spore portion 170–200 μm long, 12–15 μm in width, 8-spored, operculate, cylindrical, tapering below into a slender flexuous base, curved near tip, thick-walled (up to 1.2 μm thick). Paraphyses of two types (Fig. 5) present: (1) ordinal (filiform, frequently septate, branched 2–3 or more times below the center, 1.8–3 μm wide), and (2) the broader, so called hymenial hairs (narrowly cylindrical, aseptate or rarely with one to two septa near the base, not (?) branched, (3–) 3.6–4.2 μm wide; both types of paraphyses have a simple, rounded tip, little or somewhat beyond the length of asci, appear as a brownish (darker brownish apically) mass in water, discolor to olivaceous brown in KOH solution, walls thin but firm. Subhymenium composed of a textura epidermoidea-like tissue, pale brown, hyphae densely interwoven, 1.8–4.8 μm wide. Medullary excipulum of textura intricata, element hyphae narrowly cylindrical, 1.8–4.8 μm wide, moderately branching; walls hyaline, somewhat thickened, and with a glassy shine (as observed in the

Figs. 1–3. Apothecia of *Plectania melastoma* in different developmental stages in its natural habitat (TMI-26361.) Figure 2 shows the granulose-powdery surface of a receptacle in a mature apothecium, while Figure 3 shows the nearly smooth, matted fibrillose surface of a receptacle in weathered apothecia. Photo courtesy, T. Nakanishi (April 23, 2017).

water mounts), slightly gelatinized at times, loosely interwoven in a hyaline gelatinous matrix, but forming a compact, brown-tinted layer (thickness, 50–65 µm) beneath the subhymenium. Ectal excipulum of textura angularis, approximately 60–80 µm thick, element cells mainly polyhedral (sometimes subglobose), 8–19.2× 6.4–17.6 µm, moderately thick-walled, walls pigmented dark brown (in water) or olivaceous black (in KOH solution). Hyphae on the receptacle surface dark brown, thick-walled [up to 1.2 (–3.2) µm], 6.4–8 µm wide, sinuous or straight, infrequently septate, mostly simple, rarely bearing a short branch, smooth, often encrusted with reddish orange to reddish brownish granules that quickly dissolve in KOH solution and release wine-colored purple pigments.

Specimen examined: on dead *Cryptomeria japonica* sticks and needle litter on the floor of the *C. japonica* artificial forest, Kyotanba-cho, Funai-gun, Kyoto Prefecuture, Japan, from April 23 to May 1, 2017, Coll. by Tamako Nakanishi, EN 17-04 (TMI-26361)

Remarks: This Japanese cup fungus can be safely identified as *P. melastoma* (Dennis, 1978; Dissing et al., 2000; Glejdura et al., 2011, Rifai, 1968; Seaver, 1928 under the name *Bulgaria melastoma*; Spooner, 2002), having small, tough-fleshy apothecia with fine granular, bright reddish orange to reddish brown outer surfaces; occurring on dead coniferous debris (habitat); possessing large elliptic-fusiform ascospores measuring 19.2–25.8× 9.6–12.6 µm and Q= 1.8-24; and



Figs. 4 and 5. Microelements of *Plectania melastoma* in a water mount. TMI-26361. Figure 4 indicates ascospores in an ascus. Note the granular contents present in the spores. Figure 5 represents the apical portion of paraphyses. Note the presence of two types of paraphyses, the broader (indicated by arrow heads) and narrower ones. (Scale bar, 10 μm)

having reddish orange to reddish brown granular encrustations (on the hyphae of the receptacle surface) that quickly solubilize in an aqueous KOH solution and release wine-colored purple pigments

In Japan, this species has been known only under the name "*P. japonica*", which was identical to *P. melastoma* as suggested by Pfister (1997) based on his study of the type specimen of *P. japonica*. However, no concrete records of the occurrence of *P. melastoma* in Japan have been presented since Pfister (1997). Apart from *P. japonica*, three species from this genus have been reported from Japan by Otani (1973, 1980) namely, *P. nannfeldtii* Korf from Hokkaido, *P. modesta* Otani (a new species) also from Hokkaido, and *P. platensis* (Speg.) Rifai from Chiba Prefecure. Of these *P. platensis* is now considered as a synonym for *P. rhytidia* (Berk.) Nannf. & Korf (Carbone et al., 2010; Carbone et al., 2015).

Recent molecular studies on Sarcosomataceae by Carbone et al. (2013), based on phylogenetic analyses using a combined data set of internal transcribed spacer (ITS) and 28S large subunit (LSU) sequences of nuclear rDNA, have indicated that the morphologically defined *Plectania* was a polyphyletic and heterogeneous assemblage and some species classified in the genus should be excluded. *P. nannfeldtii* was one such species and thus, was transferred to the genus *Donadinia* [synonymous with *D. nigrella* (Seaver) M. Carbone, Agnello & P. Alvarado]. On the other hand, *P. melastoma* and *P. rhytidia* (synonym, *P. platensis*) were retained in genus *Plectania*; however, the placement of the Japanese *P. modesta* in this genus remained unclear due to the lack of sequencing data (Carbone et al., 2015).

According to the literature, *P. melastoma* distributes in Europe (Dennis, 1978; Dissing, 2000; Glejdura et

al, 2011), North America (Lincoff, 1981; Maguire, 1982; Seaver, 1928 under the name *Bulgaria melastoma*), and also in Australia (Rifai, 1968); however, its occurrence seems to be rare and localized. In Asia, It has been reported from China and India (Xu, 2000).

Macromorphologically and ecologically, *P. melastoma* is very similar to *P. zugazae* Calonge & A. Garcia (Calonge et al., 2003) known from Spain (Calonge et al., 2003), Cyperus, and Greek (Carbone et al., 2015), but not from Japan. Both species could be easily confused with each other in the field. However, *P. zugazae* differs primarily in the form and size of ascospores, which are almost ellipsoid and somewhat shorter in length but wider compared to those of *P. melastoma* [18–22 × 12–14 μm (Calonge et al., 2003); (17.5–) 19–22 (–24) × (12–) 12.5–15 (–15.5) μm (Carbone et al., 2015)]. Consequently, the *P. melastoma* ascospores display a lower Q-value (1.45-1.6, Carbone et al., 2015). *Korfiella karnika* D.C. Pant & V.P. Tewari from India (Pant and Tewari, 1970) and Japan (Nagasawa, 2004), a member of Sarcosomataceae, may also be confused with this species due to the similarly in the color of apothecia; however, the apothecia are split (almost till the base) on one side and found on mossy rotting stump (at the type locality in India) and on dead bamboo stumps (in Japan).

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摘　　要

京都府船井郡京丹波町のスギ林内で採集された標本（4月～5月にかけて林内の落枝および腐植上に発生）に基づいて，*Plectania melastoma*（Sowerby: Fr.）Fuckel（チャワンタケ目，クロチャワンタケ科）の日本における発生を報告した．本菌は，小型（径 1–1.5 cm 位）でお椀状の，比較的丈夫な肉質の子嚢盤を落枝および腐植上に群生するが，子実層面が黒色であるのに対して子嚢盤の外表面が鮮やかな赤橙色～赤褐色を帯び，粉状を呈するのを著しい特徴とする．また，紡錘状楕円形の比較的大きな胞子（19.2–25.8 × 9.6–12.6 µm，長さ / 幅値（Q）= 1.8–2.4）をもち，子嚢盤外表面の菌糸を KOH 水溶液で処理するとワイン色の色素を溶出する特徴をもつ．日本では外観的特徴におい類似する *Korfiella karnika* D.C. Pant & V.P. Tewari（コフキクロチャワンタケ）と混同され易いが，同菌は子嚢盤が1側面で基部付近まで裂けることや竹の古い切り株に発生することなどで区別される．*P. melastoma* は *Plectania* 属の基準種で，文献によれば世界，主に北半球に広く分布するが，発生はまれで局地的のようである．日本においては従来本学名における報告はないが，アメリカの北太平洋探検調査隊（1853–1856）によって日本（徳之島、1855 年 4 月 30 日，根上）で採集され，英国の M. J. Berkeley and M. A. Curtis によって 1860 年に新種記載された *Peziza japonica* Berk. & M. A. Cutis（= *Plectania japonica*（Berk. & M. A. Cutis）Sacc.）は，そのタイプを調査した Pfister（1997）によれば，*P. melastoma* と同一種であるといわれている．本種にはまだ和名が無いので新たにアカサビクロチャワンタケと命名した．