TRYPETHELIUM FLAVOPIGMENTOSUM (LICHENIZED ASCOMYCOTA: TRYPETHELIACEAE), A NEW LICHEN SPECIES FROM MT. PALHI, DINAGAT ISLANDS, PHILIPPINES

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ABSTRACT

During our continued expeditions in the Dinagat Islands, southern Philippines, a new species, **Trypethelium flavopigmentosum** Taer & Aptroot, was discovered and is herein described. It closely resembles *T. luteolucidum* in the thallus and pseudostromata reacting UV+ yellow, the presence of lichexanthone, and the inspersed hamathecium. However, *T. flavopigmentosum* is distinguished by its prominent yellow pigment at the surface of the pseudostromata, inside with an additional yellow dusty granular pigment, and a smaller, 9–10-septate ascospore, 41–61 × 9–13 µm. This discovery represents the first documented lichen species from Mt. Palhi, and further emphasizes the exceptional biodiversity supported by the ultramafic forest ecosystems. Given increasing anthropogenic pressures, these findings underscore the urgent need for legislative protection and strengthened conservation management of the Dinagat Islands.

KEY WORDS: Mindanao, Philippine lichens, pyrenolichens, taxonomy, tropical lichens

RESUMEN

Durante nuestras continuas expediciones en las Islas Dinagat, en el sur de Filipinas, se descubrió una nueva especie, **Trypethelium flavopigmentosum** Taer y Aptroot, que se describe aquí. Se parece mucho a *T. luteolucidum* en el talo y pseudostromas que reaccionan UV+ amarillo, la presencia de lichexantona y el hamatecio disperso. Sin embargo, *T. flavopigmentosum* se distingue por su pigmento amarillo prominente en la superficie de los pseudostromas, con un pigmento amarillo polvoriento adicional en el interior, y por poseer ascosporas más pequeñas, de 9–10 septos, 41–61 × 9–13 µm. Este descubrimiento representa la primera especie de líquen documentada del Monte Palhi y enfatiza aún más la biodiversidad excepcional que sostienen los ecosistemas de bosques ultramáficos. Dadas las crecientes presiones antropogénicas, estos hallazgos subrayan la necesidad urgente de protección legislativa y una gestión de conservación reforzada en las Islas Dinagat.

INTRODUCTION

Trypethelium Spreng. (Sprengel 1804: 350) is a tropical, corticolous, pyrenocarpous genus of lichenized fungi, and represents the type of the family Trypetheliaceae Zenker. The genus currently comprises 20 accepted species (Aptroot 2021), with high diversity typically confined to lowland to montane tropical forest habitats, often thriving in semi-exposed to exposed areas (Aptroot et al. 2016a; Aptroot & Lücking 2016; Aptroot et al. 2021).

This genus is distinctly characterized by its pseudostromatic ascomata, typically with yellow to orange pigments, with multiseptate ascospores, rather thin distosepta, and more or less rectangular walls (Harris 1995; Aptroot & Lücking 2016). Members of *Trypethelium* can be confused with the sister genus *Viridothelium* Lücking, M.P. Nelsen & Aptroot; however, the latter has typically immersed-erumpent, rarely pseudostromatic ascomata, and pigments are absent (Aptroot & Lücking 2016). *Marcelaria* Aptroot and *Bathelium* Ach.

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are other similar genera, but *Marcelaria* has sessile ascomata covered by bright red to (orange–) yellow pigments and muriform ascospores (Aptroot et al. 2013; Nelsen et al. 2014; Lücking et al. 2016a), whereas *Bathelium* has distinct, brown-black pseudostromata and ascospores with thin septa (Aptroot & Lücking 2016).

Mindanao in the southern Philippines is a megadiverse island, and a critical refuge to several endemic and threatened species (Amoroso 2000; Agduma et al. 2023). Among the provinces is the Dinagat Islands, a satellite island situated at the northeastern section, famous for its marine (Cañizares & Seronay 2016; Boquet 2017; Brown et al. 2018) and ultramafic ecosystems (Franco et al. 1993; Lillo et al. 2019). Mt. Palhi (also known as *Babaeng Bukid*) is one of the ultramafic mountains of the province, with the highest peak at 770 m (FPE 2026). It encompasses several barangays belonging to the Municipality of Libjo, located southeast near the coastline of the Dinagat Islands. Forest formations present on this mountain include pygmy forest over ultramafic soil on the summit (locally known as Bonsai forest), forest over limestone (Lillo et al. 2019), lowland tropical rainforest, and coastal mangroves at its base (Lillo & Fernando 2017).

Despite its ecological significance, it is prone to mining activities and slash-and-burn (*kaingin*) farming activities, which pose irreversible threats to the native biodiversity. In 2020, Dinagat Islands contained approximately 53,000 ha of natural forest (65% of its land area), of which 120 ha were lost in 2024 alone (GFW 2024). Although Mt. Palhi has been designated as a local conservation area by the local government units and the Department of Environment and Natural Resources (DENR); it lacks formal protection under the National Integrated Protected Areas System (NIPAS). Unlike Mt. Redondo, the natural vegetation is relatively intact on Mt. Palhi. However, biodiversity data are scarce, and a recent search on Google Scholar yielded no relevant biodiversity publications.

During a field survey conducted in 2024, a corticolous lichen specimen identified in the field as *Trypethelium* sp. was collected on Mt. Palhi. Detailed morpho-anatomical and chemical examination revealed unique phenotypic characters distinct from any currently described species within the genus. The specimen is therefore described here as a new species under the morphological species concept. This discovery raises the total number of known *Trypethelium* species to 21. As this specimen was collected during limited field sampling, dedicated surveys of Mt. Palhi would likely yield additional undescribed species. This discovery contributes to the growing body of evidence that the Philippine ultramafic landscapes support previously undocumented lichen diversity and underscores the urgent need for continued taxonomic exploration, biodiversity assessment, and conservation efforts in the Dinagat Islands and across the Philippine archipelago.

MATERIALS AND METHODS

Morpho-anatomical characters were examined using a LEICA M165C Stereo Microscope and a Leica DM500 compound microscope at the Botanical Research Institute of Texas (BRIT), Texas, U.S.A. Hand-cut sections and squash preparations of the ascomata and thalli were mounted and examined in water, in a 10% potassium hydroxide solution (K), and in Lugol's iodine solution (I). All measurements are given in water. Thallus and pseudostromata were observed under UV light. Thin-layer chromatography was carried out using solvent C, following Orange et al. (2010). Voucher specimens were dried and will be deposited in the Philippine National Herbarium (PNH) with duplicates in the Central Mindanao University Herbarium (CMUH) and BRIT.

TAXONOMIC ACCOUNT

Trypethelium flavopigmentosum Taer & Aptroot, **sp. nov.** (**Fig. 1**). TYPE: PHILIPPINES. Mindanao Island: Caraga Region, Dinagat Islands, Municipality of Libjo, Barangay Bayanihan, Sitio Maytubig, Mt. Palhi (locally known as *Babaeng Bukid*), 10°11′19″N, 125°38′27″E, 201 m, fragmented lowland forest over ultramafic soil, corticolous, 26 Mar 2024, *E.C. Taer* 546 (HOLOTYPE: PNH; ISOTYPE: CMUH).

MycoBank No.: MB 864114

***Diagnosis*.—**Differs from other *Trypethelium* species in having 9–10-septate ascospores, solitary to loosely aggregated ascomata, a yellow pigment both inside and outside the pseudostromata, and a hamathecium heavily inspersed with hyaline oil globules.

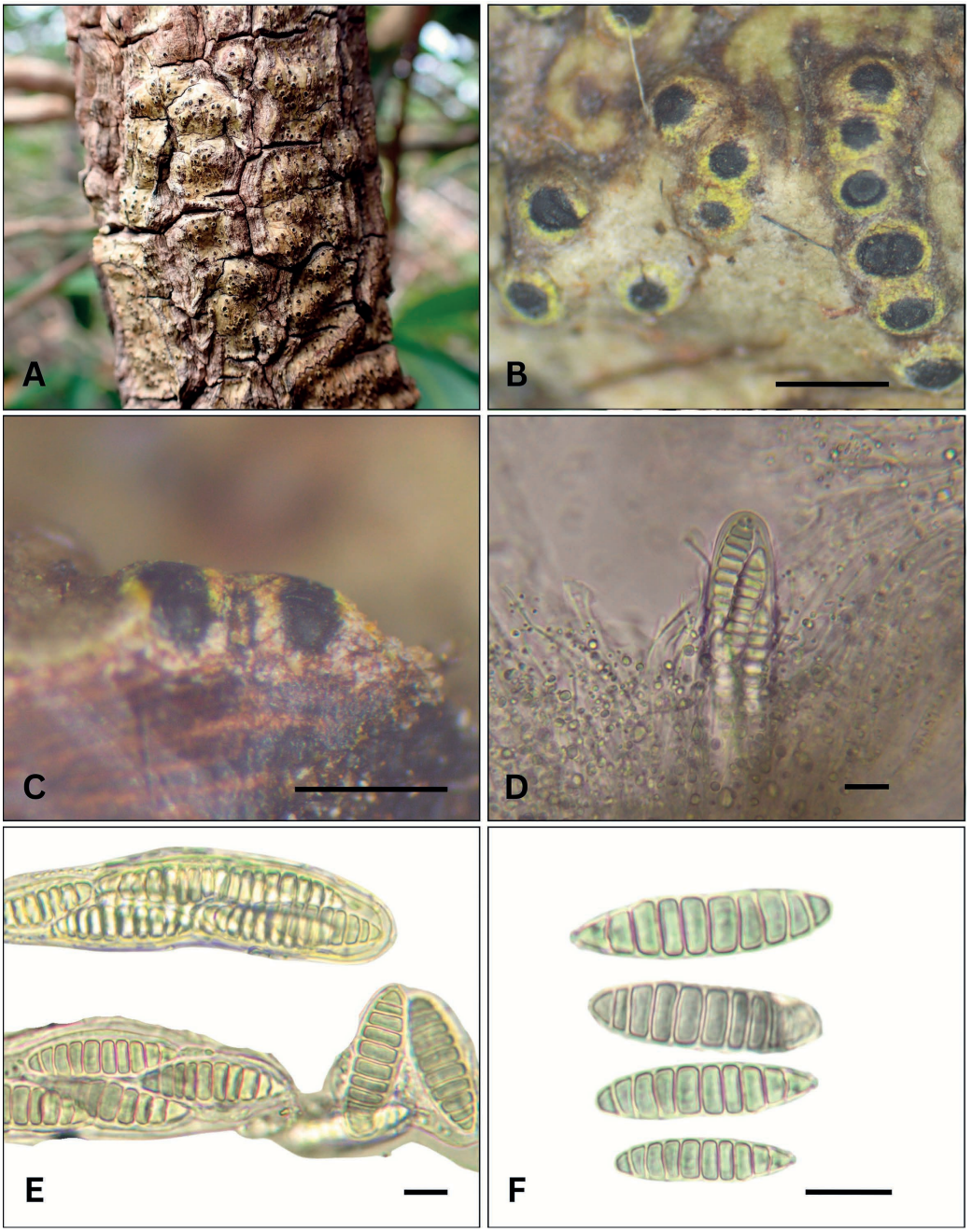


Fig. 1. *Trypethelium flavopigmentosum* (holotype): **A.** habit of thallus and ascomata. **B.** pseudostromata with yellow pigment. **C.** section of ascomata with an additional yellow dusty granular pigment. **D.** hamathecium heavily inspersed with oil globules. **E.** asci with ascospores. **F.** ascospores. Scales: B & C = 1 mm; D–F = 20 µm

Description.—*Thallus* crustose, corticolous, with corticiform layer ca. ≤50 µm thick, olive green to light brown, continuous, smooth to somewhat bullate, without black prothallus. *Ascomata* globose, ca. 0.2 mm in diam., solitary to loosely aggregated, immersed in pseudostromata. *Pseudostromata* with a surface similar to the thallus, distinctly raised above the thallus surface, irregular in outline, sides almost vertical, ca. 0.3–0.8 mm wide and 0.2–0.3 mm high, concolorous with the thallus to cream-colored border and black ostiolar area with yellow pigment, inside with an additional yellow dusty granular pigment without bark tissue. *Wall* carbonized, ≤20 µm wide. *Ostioles* apical, separate, not flattened, convex, reddish-brown. *Hamathecium* heavily inspersed with hyaline oil globules, ≤0.8 µm wide. *Asci* 8-spored. *Ascospores* hyaline, I–, 9–10-septate, ellipsoid to fusiform, 41–61 × 9–13 µm (n = 54), ends rounded, lumina less rectangular, not surrounded by a gelatinous layer.

Pycnidia not observed.

Chemistry.—*Thallus* surface K+ dark yellow to orange, UV+ dark yellow; *Pseudostromata* surface K+ orange red, UV+ yellow, granular yellow pigment inside pseudostromata K+ orange. TLC: lichexanthone.

Etymology.—The specific epithet refers to the pseudostromata bearing a yellow pigment.

Distribution and habitat.—So far, the species is known only from the Philippines, where it was found on semi-exposed bark of forest over ultramafic soil in Mt. Palhi (locally known as *Babaeng Bukid*), in the Province of Dinagat Islands, Mindanao (Fig. 2).

Taxonomic notes.—*Trypethelium flavopigmentosum* is characterized by solitary to loosely aggregated ascomata immersed in pseudostromata which are concolorous with the thallus to cream-colored, with yellow pigment outside and additional yellow dusty granular pigment inside, a heavily inspersed hamathecium with hyaline, ≤0.8 µm wide oil globules, 9–10-septate ascospores, and lichexanthone (thallus surface UV+ dark yellow and pseudostromata UV+ yellow). The new species is close to *T. luteolucidum* Aptroot, Mendonça & M. Cáceres from Brazil (Aptroot et al. 2016b) in having the thallus and pseudostromata reacting UV+ yellow, with lichexanthone, and an inspersed hamathecium, but differs in having smaller, 9–10-septate ascospores, 41–61 × 9–13 µm, and pseudostromata with yellow dusty granular pigment (*vs.* 11–21-septate, 60–110 × 12–15 µm, lacks dusty granular pigment for *T. luteolucidum*). An additional species that has been reported with UV+ yellow, lichexanthone in both the thallus and pseudostromata is *T. tomilense* Lücking, Moncada & M. Gut., from Colombia (Lücking et al. 2016b), but it differs from the new species because of the clear hamathecium, papilliform ostioles and larger ascospores. Moreover, the new species may superficially resemble *Astrothelium aenascens* Aptroot from Papua New Guinea (Aptroot et al. 2016a) in terms of ascomata and pseudostromata, but the new species differs in having a yellow pigment (*vs.* an orange pigment in *A. aenascens*), and in having multiseptate ascospores with slightly thickened distosepta, lumina less rectangular (*vs.* ascospores 3-septate, with distinctly thickened distosepta, and astrothelioid lumina in *A. aenascens*).

Additional specimen examined.—**PHILIPPINES. Mindanao Island:** Caraga Region, Dinagat Islands, Municipality of Libjo, Barangay Bayanihan, Sitio Maytubig, Mt. Palhi (locally known as *Babaeng Bukid*), 10°11′17″N, 125°38′34″E, 182 m, fragmented lowland forest over ultramafic soil, corticolous, 26 Mar 2024, *E.C. Taer* 552 (PARATYPES: BRIT, CMUH).

DECLARATION OF COMPETING INTEREST

The authors declare no competing interests.

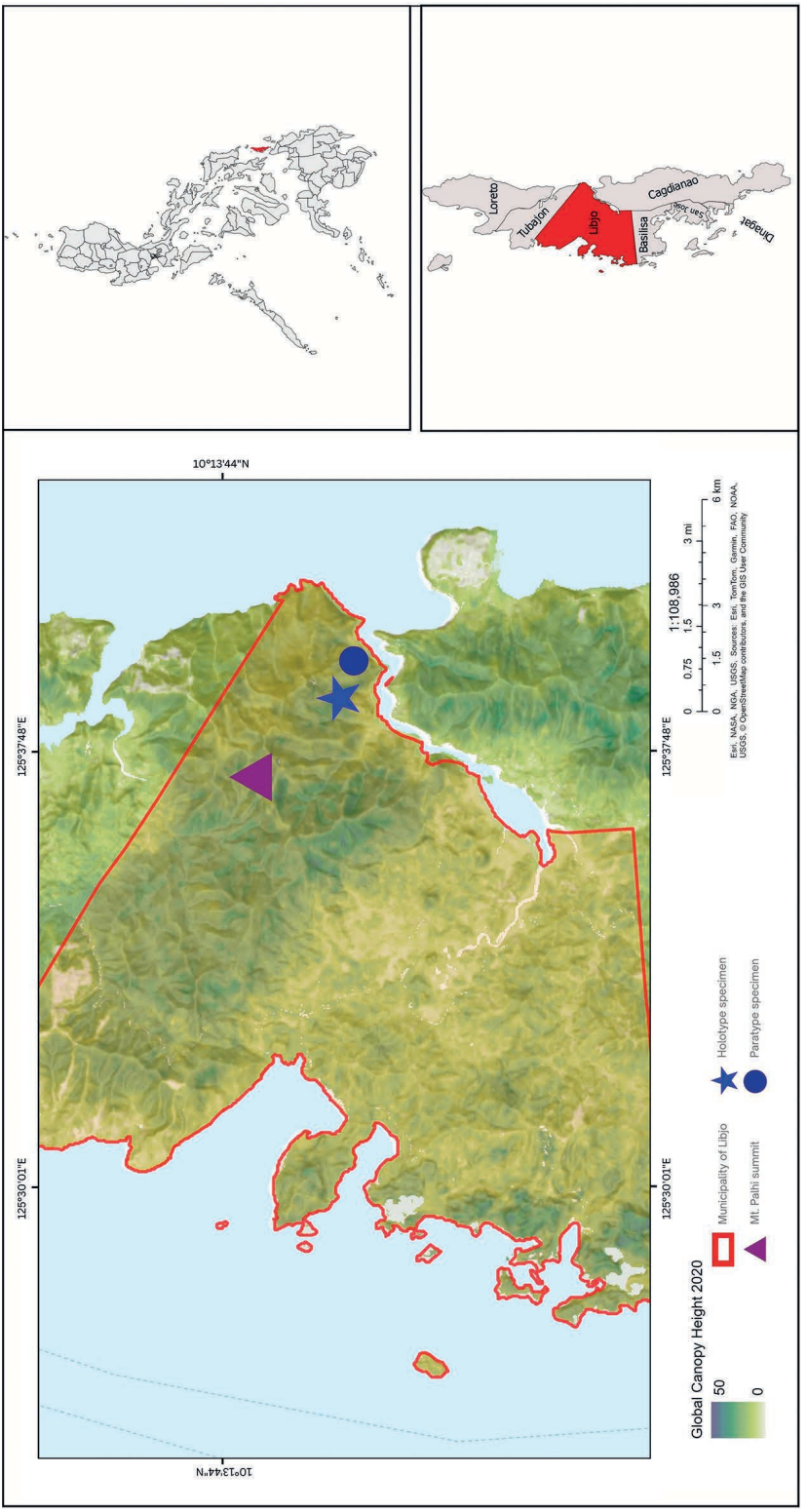


Fig. 2. Map showing the distribution of *Trypethelium flavopigmentosum* with its holotype locality indicated by a blue star.

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