Tuber guzmanii, a New Truffle from Southern México

James M. Trappe & Efrèn Cázares

Department of Forest Science, Oregon State University, Corvallis, Oregon 97331-5257, USA

Address all correspondence to James Trappe, Department of Forest Science, Oregon State University, Corvallis, OR 97331-5752, USA; trappej@onid.orst.edu

ABSTRACT: An undescribed *Tuber* species was collected in Morelos between México City and Cuernavaca in a subtropical *Pinus-Quercus* forest. This new species *Tuber guzmanii* Trappe and Cázares is named in honor of Prof. Gastón Guzmán for his outstanding contributions to knowledge of Mexican fungi, his pioneering interest in hypogeous fungi, and his monographic work on the genera *Psilocybe* and *Scleroderma*. *T. guzmanii* is only the fifth *Tuber* species to be reported from México.

KEY WORDS: Ascomycota, Pezizales, Tuberaceae, hypogeous fungi, *Quercus*, *Pinus*, mycorrhizal fungi

INTRODUCTION

The diverse ectomycorrhizal forest types in México, ranging from tropical to subalpine, are little explored but undoubtedly rich in hypogeous fungi. A few dozen species have been reported (Lumholtz 1902; Gándara, 1930; García-Romero et al., 1970; Guzmán, 1971; Hosford and Trappe, 1971; Trappe and Guzmán, 1971; Trappe, 1974; Trappe et al., 1979, 1996; Chacón and Guzmán 1983; Garza, et al., 1985; Cázares et al., 1992; Trappe and Cázares, 2000). The truffle genus *Tuber*, abundantly represented in the United States, is probably common but poorly known in México.

The first notice of a Mexican *Tuber* sp. was by Gándara (1930), who cited an unidentified species from Zacatlán, Puebla but apparently did not preserve a specimen. The published reports of the genus in México are presented in Table 1, including the new species we describe here, *T. guzmanii*.

MATERIALS AND METHODS

Notes on fresh characters of all collections were recorded the day of collection, then the specimens were dried with a portable electric forced-air, food dehydrator at 30°C. Pieces of selected specimens were immersed in vials of FAA. For microscopy, sections were cut with a razor blade from dried ascomata and mounted on slides in water, 5% KOH, and Melzer's reagent. Pieces preserved in FAA were embedded in paraffin, sectioned to a thickness of approximately 10 µm on a sliding microtome, mounted on slides, and stained with safranine-fast green. Digital photomicrographs were taken of selected tissues. Collections were deposited in the Mycological Collection of the Instituto de Ecología, Xalapa, México (XAL), the National Herbarium of the Universidad Nacional Autónoma de México, México City (MEXU), and the Mycological Collections of the Herbarium, Oregon State University, Corvallis (OSC).

Spore, ascus, and peridial cell measurements are given as length × width; spore dimensions exclude the spore ornamentation.

RESULTS

Tuber guzmanii Trappe et Cázares sp. nov. [Figs. 1(a), 1(b), 2(a), 2(b), 3, 4]

Ascomata subglobosa vel irregularia, 10-30 mm lata, firma. Peridium 100–160 µm crassum, laeve, sulcisque depressionibus inconspicuis, maturitate obscure olivaceobrunneum, pseudoparenchymatum variabile cellulis 4–20 × 4–15 µm.

1521-9437/06 $35.00

Table 1. Reports of *Tuber* Species from México

Tuber species	Locality (State)	References
T. gardneri Gilkey (as *T. murinum*)	Coahuila, México, Morelos, Nuevo León	Trappe and Guzmán, 1971; Cázares et al., 1992
T. guzmanii Trappe et Cázares	Morelos	This paper
T. ivonii Butters (as *T. rufum* var. *nitidum* or *T. candidum*)	México, Nuevo León, Tamaulipas	Garza et al. 1985; Cázares et al., 1992; Trappe and Cázares, 2000
T. maculatum Vittad	Nuevo León	Cázares et al., 1992
T. separans Gilkey	Nuevo León	Cázares et al., 1992
Tuber sp.	Puebla	Gándara, 1930
Tuber sp.	Veracruz	Trappe, 1974

Note: Nomenclatural updates are followed by names used in original reports indicated in parentheses

Gleba maturitate obscure purpureobrunnea, venis albis marmorata. Sporae brunneae, subglobosae vel anguste ellipsoideae, 27–68 × 22–50 µm, reticulo alveolato 2-4 µm alto ornatae. Asci 1–4 spori, diversiformes, 50–90 × 30–60 µm, globosi, ellipsoidei, subangulares, pyriformes, obovoides vel clavati caulem excludens; caulis destitutus vel parvus vel usque ad 60 × 8 µm; parietes ascorum juventute tenues, maturitate usque ad 5 µm crassi. Typus hic designatus: Trappe 3474.

Ascomata subglobose to irregular stereothecia 10–30 mm broad, firm. ***Peridium*** smooth but with inconspicuous depressions and furrows, pallid in youth, becoming yellowish brown and by maturity dark olive brown; veins emerging from the gleba through the peridium at the peridial furrows and patches white to off-white. ***Gleba*** gray in youth, becoming dark purplish brown at maturity, marbled with narrow to relatively broad, white to off-white veins that emerge through the peridium to the ascomatal surface. ***Odor*** faint, resembling that of fresh, green beans. ***Taste*** not recorded.

Peridium 100–160 µm thick; outer layer 40–50 µm thick, a variable pseudoparenchyma of more or less isodiametric to ellipsoid cells 4–20 × 4–15 µm, zones of mostly small cells interspersed with zones of the larger cells, the cell walls ± 1 µm thick and light brown [Figs. 1(a), 1(b)]; inner layer abruptly differentiated from the outer layer, 60–110 µm thick, of interwoven to periclinal, thin-walled, hyaline hyphae 2–4 (–6) µm broad. ***Gleba*** with a trama of interwoven, thin-walled, hyaline hyphae similar to those of the inner peridium, many of the cells inflated 1–2 µm broader than at the septa, occasional cells inflated up to 15 µm; sterile veins of similar hyphae except generally more or less parallel.

Spores golden brown at maturity, subglobose to narrowly ellipsoid, 27-68 × 22-50 µm excluding ornamentation, Q = (length/width ratio) 1.1–1.9 [Figs. 2(a) and 2(b)]; spores in 1-spored asci 46–68 × 30–50 µm, in 2-spored asci 35–54 × 24–43 µm, in 3-spored asci 27–42 × 22–30 µm, in 4-spored asci 27–40 × 22–29 µm; ornamentation an alveolate reticulum 2–4 µm tall, with (6–) 9–13 (–15) regularly to irregularly shaped meshes along the spore length, the most strongly pigmented spores often showing an optical artifact of a fine reticulum in optical cross section; spore walls 3–5 µm thick. ***Asci*** 1–4 spored, diversiform, 50–90 × 30–60 µm excluding the stem, globose to ellipsoid, subangular, pyriform, obovoid or clavate; stem lacking or small (5 × 5 µm) to large (up to 20 × 10 or 62 × 8 µm) (Fig. 3); ascus walls thin in youth, by maturity in water or KOH thickened up to 5 µm and refractive (Fig. 4), sometimes appearing to be 2-layered.

Etymology. In honor of our good friend and eminent Mexican mycologist, Prof. Gastón Guzmán, who pioneered and strongly encouraged study of hypogeous fungi of México.

Habitat, distribution, and season. Subtropical *Quercus* and *Pinus-Quercus* forests in Morelos; September.

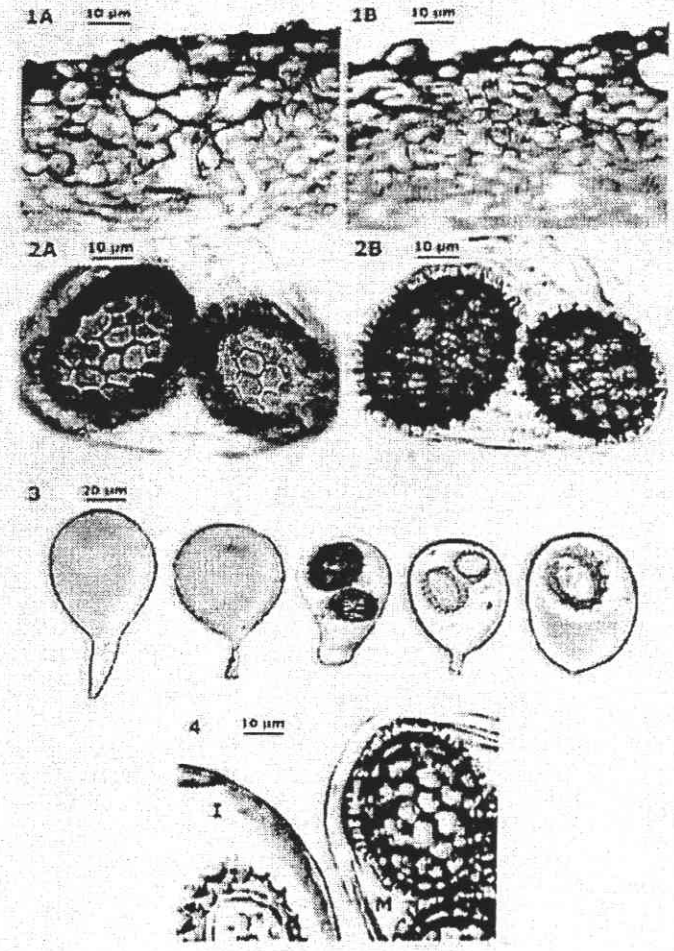
Collections examined. HOLOTYPE HERE DESIGNATED: MEXICO—Morelos: 10 km N. of Cuernavaca along Carretera Vieja Cuernavaca-México, *J. Trappe 3474*, 12 Sep 1972 (holotype XAL, isotypes MEXU and OSC 111942). PARATYPES: MEXICO—Morelos: north of Cuer-

navaca near big hairpin curve on Carretera Nueva Cuernavaca-Mexico, *J. Trappe 3480*, 12 Sep 1972 (XAL) and *3481*, (XAL, MEXU, OSC 111943).

DISCUSSION

Tuber guzmanii is unique for its greatly diverse asci of varying shapes, absence to presence of variably sized ascus stems, and ascus walls that become strikingly thickened at maturity. It has an unusually large range of spore sizes and shapes (subglobose to narrowly ellipsoid), in this character resembling *Tuber besseyi* Gilkey, a denizen of northern forests of the eastern United States and Canada. Two of the collections of *T. guzmanii* had a large number of ascomata produced from an apparent single colony. Since the subtropical pine-oak forests are extensive in southern Mexico, we expect that *T. guzmanii* will prove to have a wide distribution.

Five named species of the genus *Tuber* are now reported from Mexico (Table 1). We have little doubt that the country contains many more waiting to be found.



FIGURES 1–4. *Tuber guzmanii*. 1: Sections from a single peridium: (a) With large, inflated cells. (b) With small cells. 2: Spores: (a) Focused on spore surface. (b) Optical cross section, showing the optical artifact of an apparent fine reticulum. 3: Range of ascus shapes and variable stem development. 4: Immature, thin-walled ascus (I) and mature, thick-walled ascus (M).

ACKNOWLEDGMENTS

Trappe's participation in these studies was funded in part by the American Philosophical Society, The Society of the Sigma Xi, and the U.S. Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon. Prof. G. Guzmán generously arranged collecting trips for Trappe in México. We thank the herbaria of the Instituto de Ecologia, Xalapa, the Universidad Nacional Autónoma de México, México City, and Oregon State University, for accessioning the holotype and paratypes.

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