# *TULOSTOMA* PERSOON (GASTEROMYCETES) FROM THE CERRADO REGION, STATE OF SÃO PAULO, BRAZIL [1]

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Recebido em 12/12/00. Aceito em 02/05/01.

**RESUMO –** (*Tulostoma* Persoon (Gasteromycetes) em região de cerrado, Estado de São Paulo, Brasil). Algumas espécies de *Tulostoma* foram coletadas em solo arenoso e madeira em decomposição em região de cerrado do Estado de São Paulo, sendo identificadas três espécies: *Tulostoma beccarianum* Bresad., *T. brumale* Pers.: Pers. e *T. exasperatum* Mont. *Tulostoma brumale* é registrada pela primeira vez para o Brasil.

**Palavras-chave –** Tulostomatales, Tulostomataceae, taxonomia, cerrado

**ABSTRACT –** (*Tulostoma* Persoon (Gasteromycetes) from the cerrado region, State of São Paulo, Brazil). *Tulostoma* species were collected on sandy soil and decaying wood in the cerrado region. Three species were identified: *Tulostoma beccarianum* Bresad., *T. brumale* Pers.: Pers. and *T. exasperatum* Mont. *Tulostoma brumale* represent first record from Brazil.

**Key words –** Tulostomatales, Tulostomataceae, taxonomy, cerrado

## Introduction

Continuing with our aim to gain a better knowledge of the diversity of gasteroid mycota which inhabit the cerrado region and due to a scant species insufficiently reported, we present highlights a few of the
more unusual gasteroid fungi collected in this type of vegetation.

The genus *Tulostoma* was proposed by Persoon (1801) and it is characterized by a stipe inserted in a socket at the base of the subglobose endoperidium which opens by a small and apical mouth. Only another genus, named *Schizostoma* has a stipe of this nature. From *Schizostoma* however, *Tulostoma* differs by having a well-developed mouth and septate capillitium threads.

According to Wright (1987) this group has a worldwide distribution with a common presence to warm and sandy places. Currently, 79 species are considered in this group (Hawksworth et al., 1995). From Brazil at present, there are but few studies on *Tulostoma* species and only *T. berteroanum* Lév., *T. cyclosporum* Lloyd, *T. exasperatum*, *T. pygmaeum* Lloyd, *T. rickii*

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Key to the species

1 Sporocarp warty; exoperidium hyphal ..... *Tulostoma exasperatum*

1' Sporocarp not warty; exoperidium membranous ..... 2

2 Sporocarp small (6-7mm wide);
mouth tubular; basidiospores 3,5-4mm in diameter ..... *T. brumale*

2' Sporocarp large (12-18mm wide);
mouth fibrillose; basidiospores 4-5mm in diameter ..... *T. beccarianum*

Lloyd, *T. rufum* Lloyd and *T. verrucosum* Morgan were given (Lloyd, 1906; Rick, 1961; Bononi et al., 1984).

## Material and methods

Specimens of *Tulostoma* were collected on February/1999 to October/2000, mainly in the rainy seasons, in the Estação Ecológica de Jataí, located in an area of 4.532,18 ha, at 21°33'-21°37'S and 48°45'-48°51'W; Estação Ecológica de Itirapina, in an area of 2.300,00 ha, at 22°28'-22°30S and 48°17'-48°19'W and Reserva Biológica de Moji Guaçu, located in an area of 343, 42 ha, at 22°15'-22°16'S and 47°08'-47°-12'W, all in State of São Paulo. Climatic conditions are of the AW type according to the Köppen System.

Hand-cut sections of dried material were mounted in Melzer's reagent, 5% KOH, water or cotton blue for microscopical examination (Singer, 1986). Permanent slides were made using PVL resin (Alcohol Polyvinilic and Lactophenol), according to Trappe & Schenck (1982). The mycorrhizal observations were accomplished based on the methods mentioned by Schenck (1982). Color terms in parenthesis are those of Kornerup & Wanscher (1978). The material was deposited in the Herbarium of the Instituto de Botânica, Seção de Micologia e Liquenologia (SP), abbreviated according to the Index Herbariorum (Holmgren et al., 1990).

## Results and Discussion

### Descriptions

***Tulostoma beccarianum*** Bresad. *in* Petri, Ann. Mycol. 2: 413-414, 1904.
Synonym: *T. simulans* Lloyd (According to Altés & Moreno, 1993). Fig. 1

Sporocarps subglobose, 10-12mm high, 12-15mm wide. Exoperidium grey brown (KW-5D3), consisting of a thin membranous layer. Endoperidium composed of hyphae pale brown, 2-4 µm diam; mouth fibrillose, about 1mm diam. Stipe woody, brown (KW-6D6), cylindrical, 1,5-2 cm. tall., longitudinally striate. Gleba brown (KW-6D5), ferruginous; capillitium hyphae thick-walled, hyaline, branched, septate, 5-6 µm diam.; basidiospores globose, verrucose, 4-5µm diam.
Material examined: **BRAZIL, São Paulo**: Município Luís Antônio, Estação Ecológica de Jataí, 11/II/1999, I. G. Baseia *377* (SP307518); Município de Itirapina, Estação Ecológica de Itirapina, 06/IV/1999, I. G. Baseia *549* (SP307519).
Additional material examined: (donated to SP Herbarium): **USA, Iowa**: 18/II/1920, det. G. W. Martin (SP 42762), identified as *T. simulans* Lloyd.
Habitat: In groups on sandy soil of 'cerradão', at the base of *Drimys brasiliensis* Miers and *Xylopia aromatica* Lam.

Distribution: Israel (Binyamini & Wright, 1986), Brazil (Rick, 1961), Mexico (Pardavé, 1991).
Remarks: According to Altés & Moreno (1993), as Bresadola's epithet is older than Lloyd's, *T. beccarianum* has priority following the article 11 of ICBN, in spite that *T. simulans* is better known and its epithet has been more commonly used (Binyamini & Wright, 1986; Pardavé, 1991). The basidiomata of this species were found aggregated with roots of *Kielmeyera coriacea* and *Xylopia aromatica* exhibiting ectomycorrhizal association observed through the microscopic analysis and by the presence of the mantle and Hartig's net. This is the first record of *Tulostoma beccarianum* from the State of São Paulo.

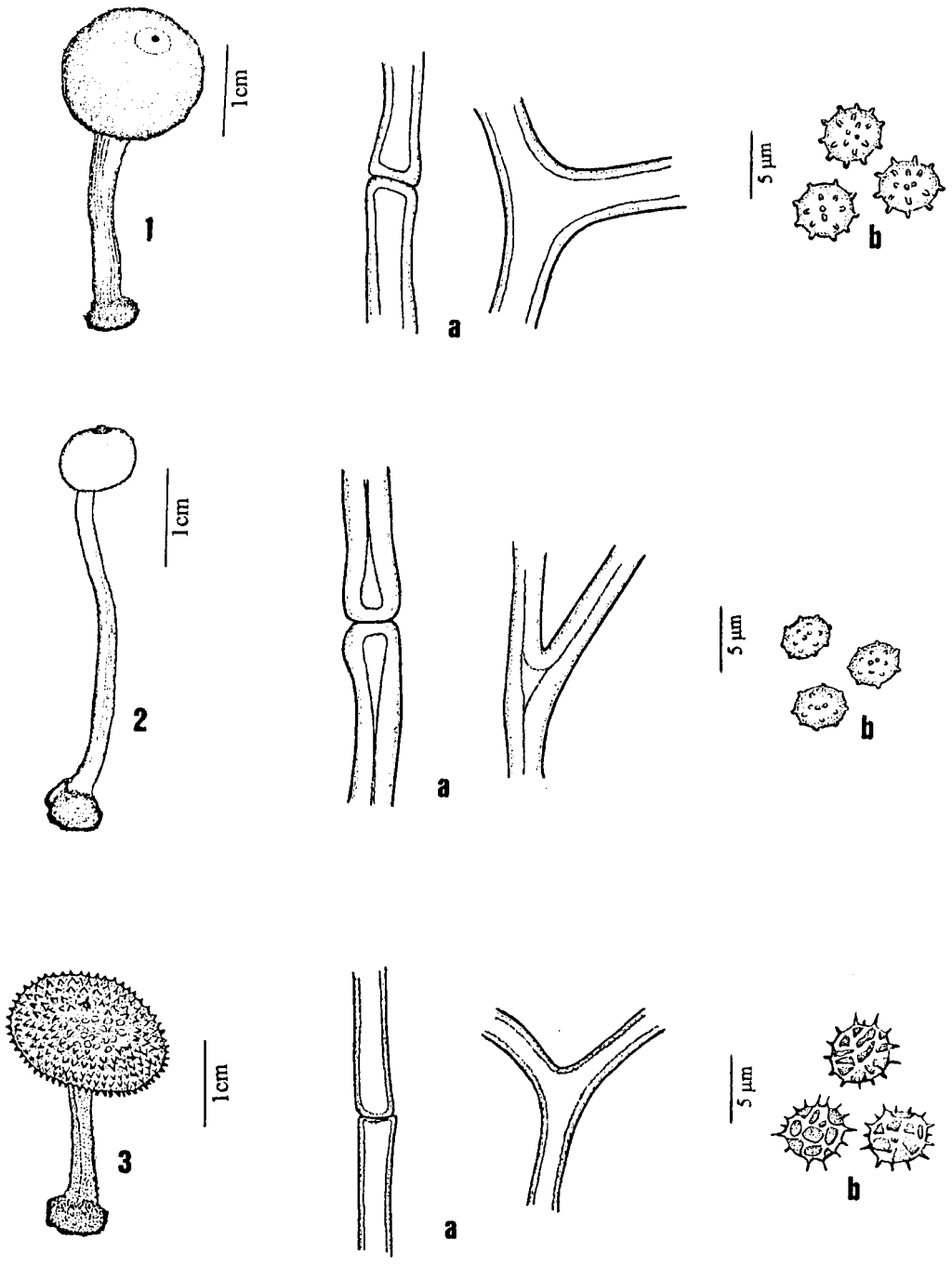
***Tulostoma brumale*** Pers.: Pers., Syn. Meth. Fung.: 139, 1801. Synonym: *T. mammosum* Fr., Syst. Mycol. 3: 42, 1829 (According to Wright, 1987). Fig. 2

Sporocarps subglobose, 5-6mm high, 6-7mm wide. Exoperidium reddish brown (KW-9E5), formed by a thin membranous layer. Endoperidium hyphae 2-3 µm diam; mouth tubular, about 1mm diam., forming a small tube-like projection, with a darker field around base of the mouth. Stipe woody, reddish brown (KW-9E4), cylindrical, 3-4 cm. tall. Gleba reddish brown (KW-9E5), pulverulent; capillitium hyaline , branched, septate, 3-4 µm diam.; basidiospores globose, verrucose, 3,5-4 µm diam.
Material examined: **BRAZIL, São Paulo**: Município Luís Antônio, Estação Ecológica de Jataí,, 17/II/1999, I. G. Baseia *328* (SP307520).
Additional material examined (donated to SP Herbarium): **FRANCE, Manche**: dunes of Vauville, 28/III/1937, det. P. Heim (SP107391) identified as *T. mammosum* Fr. ex Micheli.
Habitat: Solitary on sandy soil of 'cerradão', at the base of *Emmotum nitens* (Benth.) Miers.
Distribution: South Africa (Bottomley, 1948), Australia and New Zealand (Cunningham, 1944), German (Fischer, 1933), North America (Smith, 1951), Belgique (Demoulin, 1968), Russia (Sossin, 1973), China (Liu, 1984), France (Moyersoen & Demoulin, 1996), Finland (Haeggström, 1997)
Remarks: *Tulostoma brumale* is characterized by the small size of the smooth endoperidium with a tubular and usually darker mouth and reddish color of the basidiomata. Our specimens also presented a long stipe (3-4 cm). According to Liu (1984), the spore mass of this species is anti-inflammatory and hemostatic.

The basidiomata of this species were found growing at the base of *Emmotum nitens* where mycorrhizal association was not detected. However, in our opinion this relationship cannot be totally rejected. The scarcity of the specimens turned further investigations difficult. This is the first record of *Tulostoma brumale* from Brazil.

***Tulostoma exasperatum*** Mont., Ann. Sci. Nat. (Bot.) II, 8: 362, 1837. Fig. 3

Sporocarp depressed globose, 8-10 mm high, 10-15 mm wide, composed of hyphae similar to the capillitium threads, but hyaline, covered by long pointed conical warts, 1-2mm long, dark brown (KW-5F3), deciduous on upper part leaving distinct yellowish white (KW-4A2) scars; mouth valvate, small (up to 1mm in diam.). Stipe woody, yellowish brown (KW-5F2), cylindrical, 1,5-2 cm. tall., almost yellowish white (KW-4A1). Gleba dark brown (KW-5F5), pulverulent; capillitium hyphae thin-walled, hyaline, septate with nodes, 2-3 µm diam.; basidiospores globose to subglobose, 6-7 µm diam., strongly warted, brown.
Material examined: **BRAZIL, São Paulo**: Município de Itirapina, Estação Ecológica de Itirapina, 02/II/1999, I. G. Baseia *324* (SP307521); Município de Moji Guaçu, Reserva Biológica de Moji Guaçu, 29/III/2000, I. G. Baseia *548* (SP307522); Município de Luis Antônio, Es-




**Figs. 1-3.** 1. ***Tulostoma beccarianum***, a. capillitium hyphae, b. basidiospores; 2. ***T. brumale***, a. capillitium hyphae, b. basidiospores; 3. ***T. exasperatum***, a. capillitium hyphae, b. basidiospores

tação Ecológica de Jataí, 18/X/2000, I. G. Baseia *864* (SP307592).

Additional material examined: (donated to SP Herbarium): **BRAZIL, São Paulo**: Município de São Paulo, Parque do Estado, 18/II/1920, det. M. E. K. Fidalgo, rev. D. M. Dring (SP98313); 01/X/1969, det. D. M. Dring (SP91511); **Paraíba**: Município de Cajazeiras, 25/V/1997, I. G. Baseia *204* (SP307510); **Pernambuco**: Município de Arcoverde, 01/VIII/1997, I. G. Baseia *217* (SP307509).

Habitat: In groups on decaying wood of the genus *Eugenia* sp., in gallery forest.

Distribution: Argentina (Spegazzini, 1927), Brazil (Lloyd, 1906; Rick, 1930; 1961; Bononi et al. 1984), Cuba (Saccardo, 1888; White, 1901), India (Long & Ahmad, 1947), Philippine Islands and United States of America (Long, 1947), Venezuela (Dennis, 1970).

Remarks: All of the *Tulostoma* species occurring on the ground, with the exception of two or three species which grow on decaying wood, like as *T. exasperatum*, characterized by exoperidium covered by long pointed conical warts and basidiospores very strongly warted.

This is a very marked species and widely distributed over the world in tropical and subtropical regions (Wright, 1987). In nature, this lignicolous species are efficient biological agents of recycling organic material.

Mycorrhizal association was not observed. However, this relationship cannot be totally rejected and requests more investigations.

## Acknowledgments

We acknowledge the financial support of the Coodernação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). Thank you to the Universidade de São Paulo (USP) and Instituto de Botânica (IBt), for the structural support and laboratory facilities.

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