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Thamnostylum piriforme (Bain)Von Arx & Upadhyay, a New Record from Venezuela, South America

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Abstract

On the basis a study of coprophilous fungi from Zulia State, Venezuela, a *Thamnidiaceae* (Mucorales) *Zygomycota* with sporangiosphores arising directly from substrate mycelium or from stolons, simpodially branched, the primary axis and its branches bearing a sporangium terminally or ending a sterile spine cluster of sporangiola arising from fertile vesicles; axis usually giving rise to one or more additional clusters of few to many sporangiola subglobose to obpyriform, their pedicels dichotomously branched at the base. Sporangiospores alike in sporangia and sporangiola, ovoid to ellipsoid, light gray to steel blue. Columella avoid to short cylindrical hyaline to olivaceous, vesicles typically stalked, arising singly or more commonly. Colony becoming olivaceous or blackish.

Key words: *Thamnidiaceae*, *Thamnostylum piriforme,* sporophores, sporangia, vesicle.

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Thamnostylum piriforme (Bain)Von Arx & Upadhyay, un nuevo registro de Venezuela, Sur América

Resumen

Basado en un estudio de hongos coprofílicos en el estado Zulia, Venezuela, un *Zygomycota Thamnidiaceae* (Mucorales), con esporóforo simple creciendo directamente del micelio como substrato o de estolones, simpodialmente ramificado. El eje primario y sus ramas finalizando en un esporangio terminal o en racimo estéril espinoso, compuesto de un racimo de esporangiolos creciendo de vesículas fértiles. Del eje a menudo crecen uno o más racimos adicionales con pocos esporangios subglobosos a obpiriformes. Sus pedicelas dicotomicas son ramificados en la base. Las esporangiosporas parecidas al esporangio y las esporangiolas son ovoides a elipsoidales, gris claro a azul acero. La columela ovoide a cilíndrica corta, hialina a olivacea. Vesícula típicamente pedicelada, crece sola o en conjunto. Las colonias llegan a ser olivaceas o negras. La especie fue identificada como *Thamnostylum piriforme*, la cual representa un nuevo registro para Venezuela.

Palabras clave: *Thamnidiaceae*, *Thamnostylum piriforme,* esporóforos, esporangios, vesícula.

Introduction

Members of the Thamniadia*ceae* are reported within the Mucorales by Lendner in 1908 [16], on which the sporophore produces sporangia of two types: a) a large, terminal, columellate, multispored sporangium having a deliquescent wall and b) a small, few-spored, caducaus sporangiole that sometimes lacks a columella and has a distinct but persistent wall. This delimitation of the family is still the basis of most modern concepts of the Thamnidiaceae [2, 3, 4, 6]. Benny [2] has the concept of the Thamnidiaceae that is not fundamentally different from that of Lendner [16].

Thamnostylum piriforme (Bain) Von Arx & Upadhyay is one of the most common species in the genus and in the family. It occurs most commonly on dung but is occasionally found in soil or others organic debris. Thamnostylum originally was classified in the Choanephoraceae but soon was shifted to the Thamnidiaceae [5, 7, 8, 9]. Generic limits of Helicostylum narrowed when species having apophysate sporangia and sporangiola, as well as stolones and rizoids, were transferred to Thamnostylum, Helicostylum taxa differs from those of Thamnostylum in having nonapophysate sporangia and sporangiola and in producing sporangiosphores that arise directly from the substrate. He recognizes four species in the genus: *T. piriforme, T. repens, T. lucknowense*, and *T. nigricans*.

T. piriforme has been reported and illustrated as H. piriforme numerous times in the past [1, 2]. It grows and sporulates readily in culture. The substrate mycelium giving rise to sporophores bearing sporangia or sporangiola or both followed by stolons that contact the walls of the growth chamber developing tufts of rhizoids, and form sporophores. The sporophoral axis typicaly arises from the stolons a short distance from the rhizoidal complex [9, 10]. When there was found this and other species of Thamnostylum in moist chamber cultures of dung or other debris, it was often an isolated sporophore with its subtending rhizoids developing some distance from the point of origen of a stolon that attracts the attention to the fungus.

Isolates vary greatly in the production of primary sporangia, some forming these in abundance, others only rarely [3, 9].

The objective of this paper was to introduce and present a description of a new species of Thamnostylum in Venezuela.

Materials and Methods

Collection and incubation of the samples

During a study of coprophilous fungi in 17 Municipalities of Zulia State, Venezuela, conducted from June 2000 to May 2001, 250 animal dung samples were collected to determine the appearance of coprophilous fungi. The dung samples came from domestic and wild animal. In this case, the samples came from domestic rabbits (*Sylvilagus spp*). The dung samples that appeared to be relatively recent and unweathered were collected, intermittently of the period mentioned above, into clean receptacles and usually set to incubated within a day or four of collection. If samples could not be incubated shortly after collection they were gently air-dried stored in paper envelope until incubation [1, 2, 8, 9, 11, 12, 17, 18, 19]. All of the studied isolates were obtained from a dung collection and isolated according to Benny and Benjamin [3]. In the laboratory, each dung sample was placed in a moist chamber and if the dung was very dry on collection it should be moistened. But if made to wet, fungal growth was inhibited at room temperature (22-24°C) [17] yielding after 7-10 days numerous sporangia. Culture methods were not used because they are not practical to accurately identify most Thamnidiaceae, and recording was limited to the characteristic coprophils that were readily observable with a stereoscopic binocular microscope with a 4 –12 magnification [10, 11, 12, 13, 14, 15, 17].

The sporangia bodies were removed and mounted in water and studied with a light microscope. Samples were normally kept for 2-5 weeks, with observations continuing as long as new fungi continued to be observed. All photographs were taken with the aid of an automatic camera with material mounted in either KOH (1%) or in distilled water. All measurements (20-30 replicates) were made on material mounted in distilled water [2, 3, 4, 7, 8, 9, 17, 18]. Living cultures of the fungus were deposited in a culture collection and dried cultures of those isolates were deposited in the herbarium of the Departamento Fitosanitario, Facultad de Agronomía, Universidad del Zulia, Maracaibo, Venezuela (HERZU).

Results

During the study numerous sporangia of a Thamnidiaceae fungus were found growing on rabbit dung. A description of this material is given bellow:

Thamnostylum piriforme (Bain)Von Arx & Upadhyay

= *Helicostylum piriforme* (Bain) Migula, Kryptogamen Fl.

= *Thamnidium piriforme* (Bain) Migula, Kryptogamen Fl.

Colony becoming olivaceous or blackish. Sporangiosphores arising directly from substrate mycelium or from stolons 16-20 μm in diam, simple or sympodially branched, hyaline at first, olivaceous to brownish in age. The primary axis and its branches bearing a sporangium terminally or ending in a sterile spine subtended by a more or less globoid cluster of sporangiola arising from fertile vesicles; axis usually giving rise to one or more additional cluster of few to many sporangiola. Primary sporangia subglobose 120-150 μm in diam, dark olive to dark brown; wall hyaline, columella ovoid to short cylindrical, 45-100 x 25-70 μm, hyaline to olivaceous, with basal collar. Fertile vesicles typically stalked, rising singly; more or less elongate the long axis perpedicular to the axis of the sporophore. Heads of sporangiola 80-200 μm in diam, sporangiola subglobose to obpyriform, 12-18 μm in diam, light gray to steel blue, olivaceous to brownish in age; wall hyaline, smooth, columella hemispherical, up to 15 μm in diam; sporangiosphores alike in sporangia and sporangiola, ovoid to ellipsoid 5.5-7.5 x 4-5.5 μm (Figure 1) isolated from rabbit dung collected at Maracaibo city, Zulia State, Venezuela, South America.

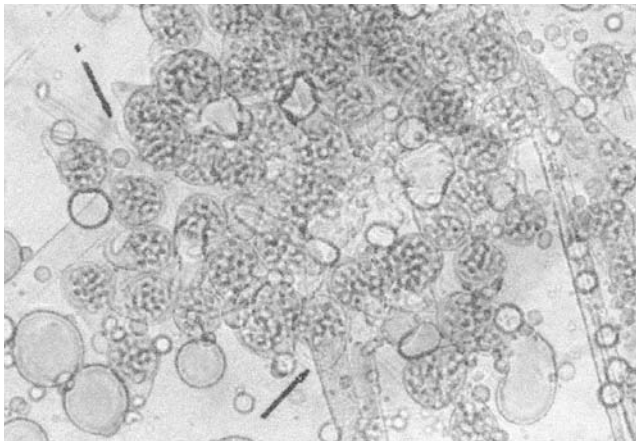
Discussion

Although other species of *Thamnostylum are* known to produce mammals disease, *T. piriforme* causes zygomycosis in animals [10, 13] and also occurs as a contaminant of stored meat [13].

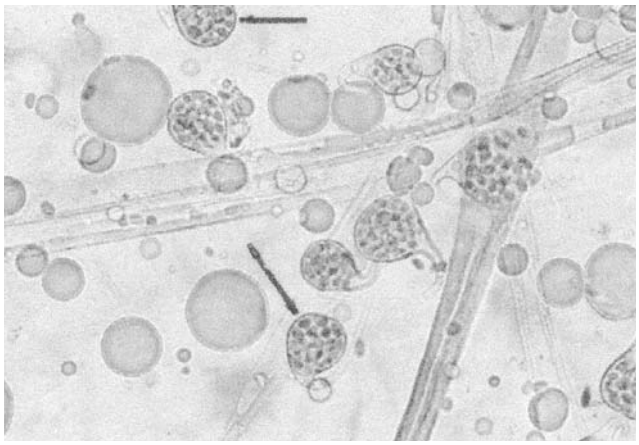
As with most coprophilous Zygomycota, the biology of *T. piriforme* is highly understood [1, 2, 4, 7, 8, 9, 10]. Benny and Benjamin [4] stated that the fungus which appears to be widely distributed is cosmopolitan and is most commonly isolated from rabbit dung. Howewer, it was been reported on dung of various animals from Africa, India, Mexico, Japan, Pakistan and U.S.A., and now from northern South America (Venezuela) [9, 10, 11, 17, 18, 19]. This represents the first report of *T. piriforme* to Venezuela.

Based on this observation, sporangium development took 7-10 days, that is similar with the 7 days in moist chamber indicated by Benny and Benjamin [3].

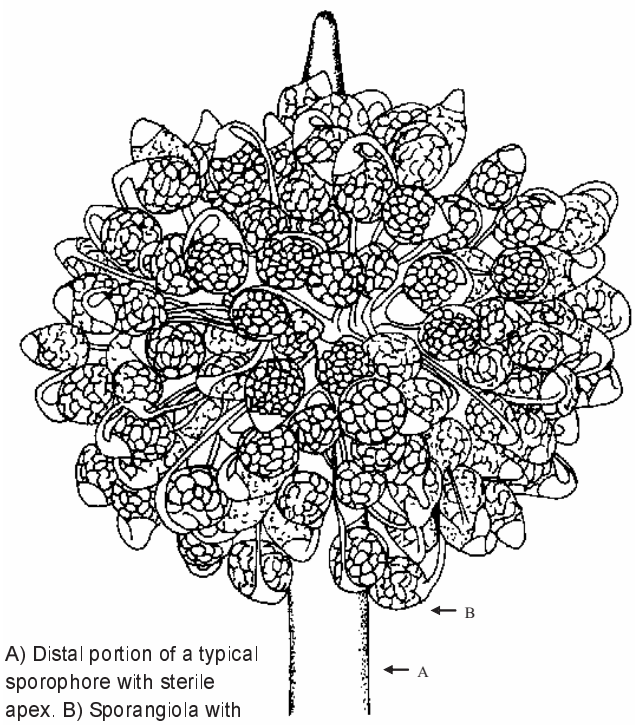
The *T. piriforme* is readily distinguished from other species of the genus like *T. rep*ens. It is strongly stoloniferous. The heads of sporangiola *of T. piriforme* and *T. r*epens are



Sporophore with sterile apex.



Sporangiola with sporangiospores. 40X.



A) Distal portion of a typical sporophore with sterile apex. B) Sporangiola with sporangiospores. X 5000.

Figura 1. Thamnostylum piriforme.

relatively much larger than those of *T. lucknowense* and *T. nigri*cans so that the glomerulate nature of the sporophore is a much more conspicuous feature of the former species than of the latter when their colonies are viewed with the unaided eye.

The sporangiola of *T. repens* do not arise from vesicles formed laterally on the sporophore, but in small, often more or less lax clusters developed on the branched terminus of the sporophore or its branches. In T. lucknowense each sporangiolar pedicel arises directy from vesicles and is rarely branched. Whereas in the pedicels are regularly two or more times branches near the base so that sporangiola are grouped in small fascicle on the vesicle [7, 8, 9].

Sporangiospores of *T. piriforme* are on the average from those of *T.lucknowense*, 6.5 x 4.5 μm, 5.5 x 3.3 μm. In age, the colony of T. lucknowense becomes buff to horney colored, never the dark olivaceous to blackish shades of the other species [9, 15, 17, 18, 19].

Conclusions

A new genus in Venezuela, *Thamnostylum*, with its specie *T. piriforme*, is described here, in accordance with this study. Von Arx Upadhyay established *Thamnostylum* for *Helicostylum piriforme* and *H. lucknowense* because the species differed from the type of the genus, *H. elegans*, in being stoloniferous, in having apophysate primary sporangia, and in producing usually pyriform sporangiola on more or less strongly reflexed pedicels arising in clusters from nodose enlargements of the sporangiophore. The sporophore of true *Helicostylum spp.* is more or less constricted immediately below the primary sporangium, and the sporangiola of species of this genus are always globose to subglobose and monopophysate. Upadhyay transferred *Helicostylum* repens *to Thamnostylum* on the basis of its original description in 1875. The fungus obtained in this study was classified as *Thamnostylum piriforme.*

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