MULTICIENCIAS, Vol. 7, Nº 2, 2007 (176 - 180)
ISSN 1317-2255 / Dep. legal pp. 200002FA828

Mycotypha indica P.M. Kirk & Benny, in turkey dung, a new record for Venezuela

Adolfredo E. Delgado Ávila[1], Lilia M. Urdaneta García[1] y Albino J. Piñeiro Chávez[1]

[1] *Departamento Fitosanitario. Facultad de Agronomía. Universidad del Zulia. Apartado 526. Maracaibo ZU 4005. Venezuela. E-mail: lmurdaneta@luz.edu.ve, urdane@cantv.net, lisbeth_delgado@hotmail.com*

Abstract

On the basis of a study of coprophilous fungi from Zulia state, Venezuela, a Mycotyphaceae (Mucorales) Zygomycota with umbranched sporophores at first, often secondarily branched; more or less erect, up to 3-4 mm high, 6-8 μm diam; hyaline at first, becoming pale blush gray, non-septate distally below the fertile vesicle. It is variable in length, ovoid to long-cylindrical minutely roughened; without sporangiola, rounded at apex, sporangiola dimorphic and borne in the outer row, are obvoid sporangiospores of similar size and shape to the sporangiola. Substrate hyphae branched, no septate at first, becoming irregularly septate, giving rise to hyaline, globose, yeast-like budding cells, occasional cell segments forming chlamydospores. Zygospores abundant, formed on aerial hyphae near surface of substrate; globose to subglobose, suspensors opposed, anisogamus, smooth, hyaline to pale gray. Homothallic. Colonias on Meye medium of 4-6 cm diam, in 10-12 days at 22-24°C; turf dense, more or less zonate, mouse gray color. The species was identified as *Mycotypha indica,* in turkey dung, which represents a new record from Venezuela.

Key words: *Mycotypha*, turkey dung, fertile vesicle, sporangiola, homothallic.

Recibido: 28-11-2005 / Aceptado: 05-06-2007

Mycotypha indica P.M. Kirk & Benny, en Heces de Pavo, un Nuevo Registro para Venezuela

Resumen

Basado en un estudio de hongos coprofílicos en el estado Zulia, Venezuela, un Zygomycota Mycotyphaceae con esporóforos simples al principio, a menudo ramificado secundariamente; más o menos erecto, mayor de 3-4 mm de alto, siendo de color gris azulado claro, no septado debajo de la vesícula fértil. Ésta es variable en longitud, ovoide a cilíndrica, minuciosamente corrugada; sin esporangiola redondeada en la punta, esporangiola dimórfica y nacida en la fila externa, ovoide. Las esporangiósporas son de igual tamaño y forma que la esporangiola, la hifa sustrato es ramificada, no septado al comienzo, siendo irregularmente septado, dando un crecimiento hialino, globoso. Las células apicales son parecidas a las levaduras, células segmentadas ocasionalmente forman clamidósporas. Zygosporas abundantes, formadas en hifas aéreas cerca de la superficie del sustrato, globosas a subglobosas, células suspensoras opuestas, anisogamus, lisas, hialinas a gris claro. Homotálico. Colonias en el medio de cultivo Meye de 4-6 cm de diámetro en 10-12 días a 22-24 ºC; densas más o menos zonadas, de color gris ratón. La especie fue identificada como *Mycotypha indica* un nuevo registro en heces de pavo para Venezuela.

Palabras clave: *Mycotypha*, heces de pavo, vesícula fértil, esporangiola, homotálico.

Introduction

Mycotypha was introduced by Fenner [22] for a single species, *M. microspora* Fenner, and placed in the tribe *Cephalideae* of the Mucoraceae. According to the system of Gaumann in 1928 [17, 25, 31] omitted *Mycotypha* from their respective treatments of the Mucorales and while Bessey [11] placed Mycotypha in the Choanephoraceae [21] referred it to the Cunninghamellaceae [3, 4, 5, 6, 7, 8]. This later treatment was followed by Benny and Benjamin [3]; Benny [10] and Ellis and Hesseline [21]. Young [29], however, clearly demostrated that *Mycotypha* should be transferred to the *Thamnidiaceae* [5, 7, 8, 9]. Benny and Benjamin [3] transferred *Cokeromyces poitrasii* R. K. Benjamin [2] to *Mycotypha* because it showed closer affinities to *M. microspora* and *M. africana* than to the type species to Cokeromyces, *C. recuwatus* [3, 10] introducing two new species of Mycotypha, *M. indica* and *Benjaminiella multipora.*

The inclusion of Mycotypha in the Mucorales was questioned by Wolf [30] and Boedijin, [12] until the Zygomycetous affinities of the genus were confirmed with the description of a second species, *M. africana* Nova K & Baeking, morphologically similar to *M. microspora* but forming Zygospores while that *M. indica* produces umbraches sporophores homotallic [3].

The purpose of this paper is to present a description and the introduction of a new record of the species *M. indica* P. M. Kirk & Benny for 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 February 2002 to February 2003, 250 animal dung samples were collected to determine the apperance of coprophilous fungi. The dung samples proceed of domestic and wild animal.

The dung samples that appeared to be relativaty recent and unweathered were collected, intermittently on the period mentioned above, into clean receptacles and usually set to incubated within one day or four after collection if samples could not be incubated shortly after collection.

They were gently air-dried stored in paper envelopes until incubation [1, 3, 11, 13, 14, 16, 17, 18, 19]. All of the isolates studied here that were obtained from the dung collection were isolated according to Benjamin and Stevens [2, 28]. In the laboratory each dung was placed in a moist chamber 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 [21, 22, 23]. After 7-10 days yielded numerous sporophores. The fungi were routinely cultured on Meye (Malt extract – Yeast extract agar) medium at 22 ªC under the ambient of laboratory, lighting it during 10-12 days [24, 26, 27, 28].

The fruiting bodies were removed and mounted in water and studied with a light microscope. Dung samples were normally kept for 2-5 weeks, with observations continuing as long as new fungi continued to be observed. All drawings were made with the aid of a camara lucida of material mounted in either KOH or distilled water. All measurements (20-30 replicates) were made on material mounted in distilled water [26, 27, 28, 29]. Living cultures of the fungi are deposited in the culture collection and dried cultures of those isolates deposited in herbarium of the Departamento Fitosanitario, Facultad de Agronomía, Universidad del Zulia, Maracaibo, Bolivarian Republic of Venezuela (HERZU).

Results

During the study numerous sporangios of a *Mycotyphaceae* fungus were found growing on turkey (*Meleagris gallopavo* L.) dung. A description of this material is given bellow:

***Mycotypha indica* P. M. Kirk & Benny**

Colonies developing rapidly on Meye medium of 4-6 cm diam, in 10-12 days at 22-24°C, turf dense more or less zonate, mouse gray color, becoming light drab to drab in age. Sporophores simple at first, often secondarily branched, more or less erect, up to 3-4 mm high, 6-8 μm diam.; hyaline at first, becoming pale bluish gray; non septate distally bellow. The fertile vesicle becoming irregularly multiseptate proximally; wall minutely roughened.

Fertile vesicle variable in length, ovoid to clavate, but short to long cylindrical, minutely roughened; 150-250 μm long, 18-22 μm diam without sporangiola; rounded at the apex; sporangiola dimorphic, forming two distinct layer over the surface of the fertile vesicle: (a) sporangiola with the outer layer broadly ellipsoid to obvoid, 4.5 x 6 x 3-4.5 μm, pale bluish gray, smooth, borne on more or less conical pedicelo ca. 2 μm long, 1.5 μm wide at the base, sporangiolum bearing remnant of pedicel ca. 1 μm long ; pedicellar base forming a conical, truncate to rounded denticle ca 1 μm high on the fertile vesicle, (b) sporangiola comprising inner layer globose to subglobose, 3-3.5, Av. 3.5 μm diam, pale bluish gray, smooth, borne on short, conical pedicels ca. 1 μm, ca 1 μm wide at the base. Sporangiospores of similar size and shape to the sporangiola. Substrate hyphae branched, non-septate at first, becoming irregularly septate; giving rise to hyaline, globose, yeast-like budding cells up to 45 μm diam, zygospores abundant, formed on aerial hyphae near surface of substrate, globose to subglobose, 50-75 μm, conical projections up to 9 μm high; gray homotallic (Figures 1 and 2).

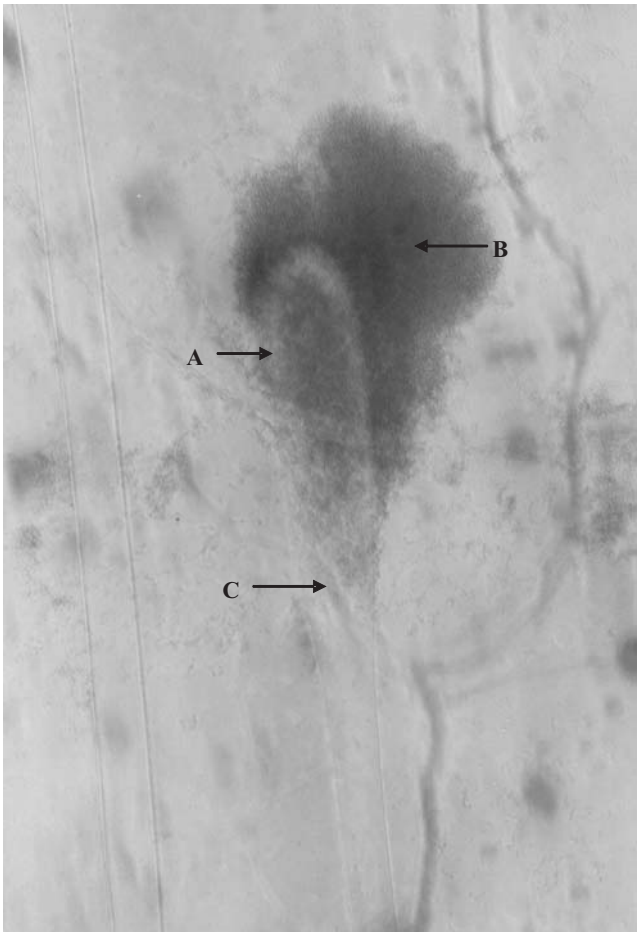

Figure 1. *Mycotypha indica* P. M. Kirk & Benny A) Fertile vesicle before sporangiolum dehiscence. B) Sporangiospores. C) Sporophore. 40X.

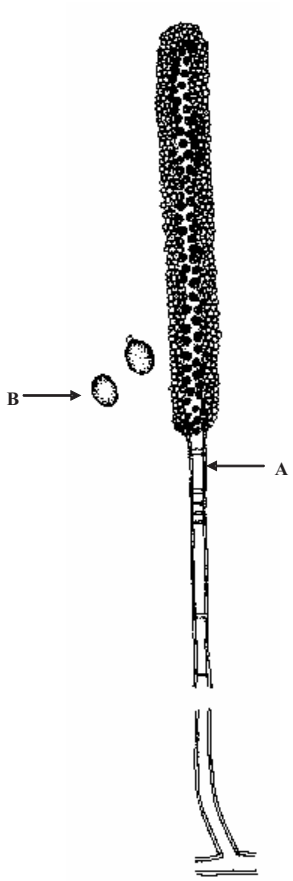

Figure 2. *Mycotypha indica* P.M. Kirk & Benny A) Septate upper part of sporophore and elongate fertile vesicle bearing sporangiola X500. B) Subglobose and obvoid sporangiola, two shown in optical section X1690.

Discussion

Although other species of Mycothypha are known to produce mammals disease, *M. indica* causes zygomycosis in animals [2, 9, 10] and occurs as a contaminant of stored meat [2].

As with the most coprophilous Zygomycota, the biology of *M. indica* is highly understood [1, 3, 6, 7, 8, 9, 20]. Benny et al. [5] stated that the fungus appears to be widely distributed in the tropics and subtropics and that is most commonly isolated from rodent dung. However, it was been reported from India, Mexico, Republic of China and U.S.A. [5]. This represents the first report of *M. indica* from Venezuela.

Based on these observations, sporophore and sporangiolum formation is excellent on Meye medium. Zygospore formation is optimal on Meye medium. There is a tendency for the isolate of *M. indica* studied to sector, no forming the anamorph which leaves the Zygospores exposed and this produced a dark blackish-brown colony. The colonies are slightly zonate when the anamorph is produced but zonation is lacking when only the zygospores are formed.

A brownish pigment was released into the agar when *M. indica* was grown on Meye medium at 25°C under a 12 hrs dark/12 hrs light cycle. *M. indica* can be readily distinguished from two previosly known species, *M. microspora* and *M. africana* because of differences in the shape of the external sporangiola, the location of adventitions septa in the sporophore, and the presence or absence of zygospores. The morphology of the external sporangiola readily distinguishes *M. indica* (sporangiola broadly ellipsoid to ovoid) from *M. africana* (sporangiola cylindrical with rounded ends). The position of sporophore septa and presence of zygospores distinguish *M. indica* (septa at sporophore base; zygosphores formed homothallic). They can be separated by use of the key [5, 7]. However, species of *Mycotypha* produce yeast-like cells on the surface of solid, nutrient rich, culture medium [5].

This appears to indicate that slightly anaerobic conditions are not required to induce the production of the yeast-like phase in these taxa. The *M. indica* produce a circumcised zone of weakness in the pedicel at a predetermined point and it is this zone of weakness which is responsible for the mechanism of sporangiolum sectionning. After comparison of the Venezuelan material with species described by others investigators[4, 5, 14, 15, 20] it was identified as *M. indica* P. M. Kirk & Benny.

Conclusions

A new genus for Venezuela, *Mycotypha*, with its species *M. indica*, is decribed here. A common characteristic to all species of *Mycotypha*, is their ability to form a yeast-like budding phase (hyphal dimorphism) on the surface of a variety of ordinary, solid, laboratory medium. Hyphal dimorphism can be readily induced by seeding to surface of an appropriate agar medium with mature sporangiola. The germinating sporangiospores immediately produce yeast-like budding cells that usually do not form the intermediate or mycelial phase until later in the growth cycle.

Acknowledgment

This study was carried out with the assistance of research grants provided to the senior author by CONDES, University of Zulia, Bolivarian Republic of Venezuela.

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