# *Utharomyces epallocaulus* Boedijn. ex Kirk & Benny. A NEW RECORD FROM VENEZUELA

## *Utharomyces epallocaulus* Boedijn. ex Kirk & Benny. Un Nuevo Registro de Venezuela

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**ABSTRACT**

On the basis of a study of coprophilous fungi from Zulia state, Venezuela, a Pilobolaceae (Mucorales) Zygomycota with simple sporangiosphores positively phototropic, arising from terminal or intercalary, subglobose, to ovoid trophocysts formed within the agar, at first erect, later decumbent, was isolated from rat and mouse dung. The sporangia is initially globose and white, and at maturity it is somewhat subglobose and black, echinulate. The subsporangial stalk has little or no pigmentation at this stage. At maturity, the wall of the subsporangial stalk is thickened and pigmented, dark brown near the sporangium but becoming paler toward the vesicle. The sporangiospores are globose to subglobose and ornamental. The specie was identified as *Utharomyces epallocaulus*, which represents a new record for Venezuela.

**Key words:** Pilobalaceae, *Utharomyces epallocaulus,* sporangiosphores, trophocyst, phototropic.

**RESUMEN**

Basado en un estudio de hongos coprofílicos en el estado Zulia, Venezuela, un *Zygomycota Pilobolaceae* con esporangióforos simple y fototropismo positivo, creciendo de un trofoquiste terminal o intercalado, subgloboso a ovoide formado en el agar, al comienzo erecto, luego decumbente, fue aislado de heces de rata y ratones. El esporangio inicialmente globoso y blanco, al madurar es subgloboso y negro, equinulado. El talo subesporangial es corto y no pigmentado en esta etapa. Al madurar la pared del talo subesporangial es delgada y pigmentada, marrón oscura cerca del esporangio, pero pálido hacia la vesícula. Las esporangiosporas son globosas a subglobosas y ornamentales. Esta especie fue identificada como *Utharomyces epallocaulus*, el cual representa un nuevo registro para Venezuela.

**Palabras clave:** Pilobolaceae, *Utharomyces epallocaulus*, esporangióforos, trofoquiste y fototropismo.

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## INTRODUCTION

Members of the *Pilobolaceae*, are reported within the Mucorales by Benjamin [1, 2], Benny [3] and Ellis [12], they are considered to be saprofic and they are found on dung, and various features indicating a high degree of adaptation to the substrate appear to have evolved. The three genera of ***Pilobolaceae*** comprise a distinct series: *Pilaira* Van Tiegem, ***Utharomyces*** Boedijn, whose method of asexual reproduction is apparently intermediate between the other two genera; and **Pilobolus** Tode ex Fr. The simple, initially short, positively phototrophic sporangiosphore arises from a trophocyst produced at the surface of on dung [13]. After elongation of the sporangiosphore, a vesicle develops a short distance below the mature sporangium by dilation. The subsporangial vesicle is broad, ellipsoid with a thin, fragile wall after subsporangial vesicle formation the wall of the short piece of sporangiosphore subtending the sporangium, the subsporangial stalk becomes thickened and pigmented. Dehiscence occurs, on contact of the sporangium and subsporangial vesicle with any object, by fracture of the subsporangial vesicle. The sporangium, held erect on the subsporangial stalk. Spore release occurs when the sporangial wall breaks [13]. Boedijn collected this species in Java from the dung of herbivores and rats.

The genus *Utharomyces* comprises only two specie. *U. epallocaulus* Boedijn ex P.M. Kirk & Benny and *U. indicus* Wallace & Dickinson [17].

The objective of this paper was to present a description and the introduction of a new species from rat and mouse dung 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 June 2000 to may 2001, 250 animal dung samples were collected to determine the appearance of coprophilous fungi. The sample dung was proceed from domestic and wild animals. Those were rat (*Rattus norvegicus*) and mouse (*Mus musculus*). The sample dung that appeared to be relatively recent and unweathered was collected, intermittently of the period mentioned above, into clean receptacles and usually set to incubate within a day or four days of collection. If samples could not be incubated shortly after collection, they were gently air-dried stored in paper envelopes until incubation [1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 16]. All of the isolates studied here were obtained from dung collection were isolated according to Benjamin. In the laboratory each dung was placed in a moist chamber. If the dung is very dry on collection it should be moistened. But if made to wet, fungal growth was inhibited at room temperature (22-24°C) [14]. After 7-10 days yielded numerous sporangios. The fungus was routinely cultured on malt agar media at 22 -24°C under ambient laboratory lighting, during 10 days [14].

The fruiting 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 drawings were made, with the aid of a camara lucida of material mounted in either KOH or in distilled water. All measurements (20-30 replicates) were made on material mounted in distilled water [5, 6, 7, 10, 13, 14, 17]. Living cultures of the fungus are deposited in the culture collection and dried cultures of those isolates deposited in herbarium of the Departamento Fitosanitario, Facultad de Agronomia, Universidad del Zulia, Maracaibo, Venezuela (HERZU).

## RESULTS

During the study, numerous sporangios of a Pilobolaceae fungus were found growing on rat and mouse dung. A description of this material is given bellow.

### *Utharomyces epallocaulus* Boedijn ex Kirk & Benny

Colonies developing rapidily on 2% malt agar, completely filling the Petri dish (8.5 cm) in 10 days at 22°C, turf composed entirely of sporangiosphores, aerial mycelium absent. Sporangiosphores positively phototropic, arising from terminal or intercalary, subglobose to ovoid trophocysts formed within the agar, at first erect and ascending, later decumbent, 10-18 µm de diam. Sporangia initially globose and white, at maturily somewhat hemispherical and black by refleted light, echinulate, 75-165 x 60-140 µm. after sporangiosphore elongation and sporangium maturity a ovoid, thin-walled vesicle, 90-165 µm diam. The subsporangial stalk, FIG. 1. the portion of the sporangiosphore between the subsporangial vesicle and the sporangium, 45-120 µm in length, columelae dolabriform, globose, thin-walled and readily collapsing, 22-55 x 15-35 µm in the upper part, 16-22 x 12-18 µm in the lower part. Sporangiospores doliform, verruculose in centre of the polar surfaces and circular band laterally, subhialine, grey in mass, 6.5-8 µm diam. FIG. 2.

Isolated from rat and mouse dung collected at Maracaibo county, Zulia state, Venezuela.

## DISCUSSION

Still other species of Utharomyces are known to produce mammals disease, *U. epallocaulus* cause zygomycosis in animals [2, 13] and occurs as a contaminant of stored meat [2].

As with most coprophilous Zygomycota, the biology of *U. epallocaulus* is highly understood [11, 12, 13] Kirk and Benny stated that the fungus which appears to be widely distributed in the tropics and subtropics and is most commonly isolated from rodent dung. Howewer, it was been reported from Africa, Bahamas, Ghana, India, Indonesia, Mexico, Republic of China and U.S.A [11, 13]. This represents the first report of *U. epallocaulus* for Venezuela.

Based on these observations, sporangio development took 7-10 days [15] contrasting with the 5-8 days in moist chamber indicated by Kirk. Such variations may reflect differences in the age and conditions of the materials sampled. The early development of *U. epallocaulus* is essentially the same as that described for species of Pilobolus [13]. The sporangiosphore is produced only from a trophocyst, the formation of which is light induced. The development of the trophocyst begins near the growing edge of the colony.

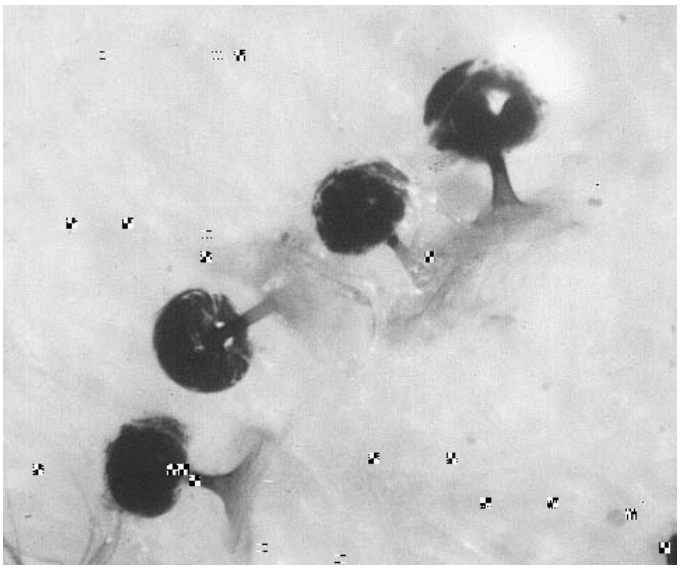

**FIGURA 1. *Utharomyces epallocaulus* VEL. A, SPORANGIA AFTER DEHISCENCE 6X.**

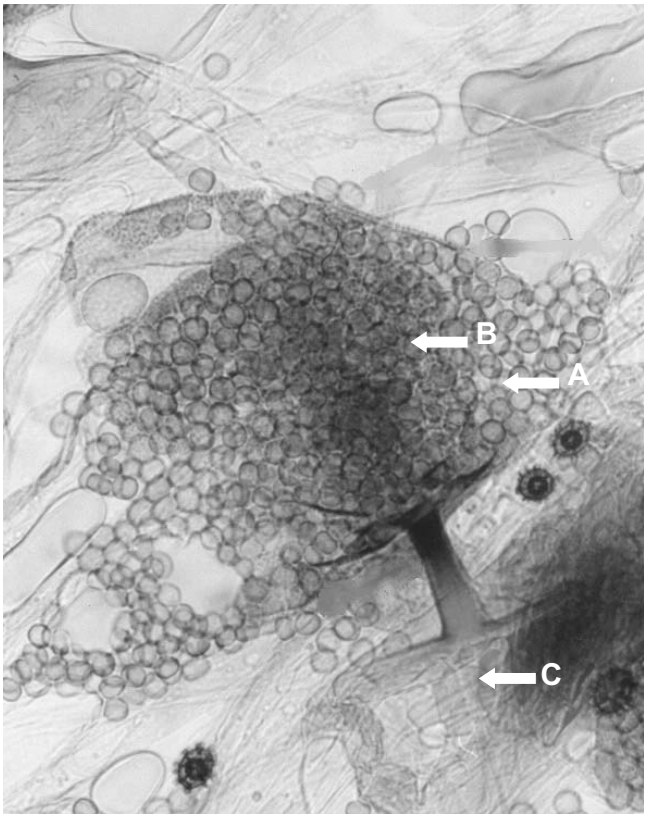


**FIGURA 2. Morphology of *Utharomyces epallocaulus* VEL. A. MATURE SPORANGIUM. B. SPORANGIOSPORE. C. SUBSPORANGIAL STALK (NOTE DARKENING OF SUBSPORANGIAL STALK) 40X.**

The sporangiosphore may have drops of condensed water on it after becoming aerial and sporangium initiation may now commence. The sporangium is initiated as an enlargement of the sporangiosphore apex. The vesicle formed enlarges and the cytoplasm becomes more granular [13]. Later, when the sporangium has assumed its mature appearance it is somewhat hemispherial, the sporangial wall is very dark brown to black by transmitted light and is encrusted with spines. The subsporangial vesicle forms in the sporangiosphore as a result of its gradual dilation. The subsporangial stalk has little or no pigmentation at this stage, at maturity the wall is pigmented, dark brown near the sporangium but becoming paler toward the vesicle. The sporangiosphore, subsporangial vesicle and subsporangial stalk are not encrusted, except the latter apically and therefore are wettable. The doliform sporangiospores are released only after mechanical breakdown of the sporangial wall. The columella is dolabriform [1, 2, 4, 5, 6]. Boedijn described the sporangiospores as globose to subglobose and smooth. However, using modern lighy microscopes with high resolution optics the sporangiospores appear doliform and ornamental, in the form of shallow verrucae, occupy a circular area in the centre of each polar surface and a narrow band laterally. Those observations have been confirmed by Kirk and Benny using scanning electron microscopy. A similar phenomenon has been observed when slides were prepared from the cultures of *U. epallocaulus* studied here.

All attempts to obtain zygospores of *U. epallocaulus* have been unsuccessful. This difficulty in obtaining zygospores is typical of others members of the *Pilobolaceae*.

After comparison of the Venezuelan material with species described by others [11, 12, 13, 15], it was identified as *U. epallocaulus.*

## CONCLUSIONS

A new genus for Venezuela, *Utharomyces*, with its species *U. epallocaulus*, is described here, in accordance with this study. When Boedijn described *Utharomyces* he correctly placed it in the Pilobolaceae together with *Pilaira* and *Pilobolus*. His description and very good figures of the type species, *U. epallocaulus,* leave no doubt as to the essential characteristics of this interesting fungus. The only significant observations of Kirk had to add to Boedijn were sporangiospore form and ornamentation.

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## BIBLIOGRAPHIC REFERENCES

[1] BENJAMIN, R.K. The merosporangiferous Mucorales. **Aliso** 5: 321-433. 1959.

[2] BENJAMIN, R.K. Zygomycetes and their spores, In the Whole Fungus (ed W. B. Kendrick), 573-621, Ottawa: National Museum of Natural Sciences and the Kananaskis Foundation. 1979.

[3] BENNY, G.L. A taxonomic revision of the Thamnidiaceae (Mucorales). Doctoral Dissertation, Claremont Graduate School, Claremont, California, U.S.A. 252 pp. 1978.

[4] BOEDIJN, K.B. Notes on the Mucorales of Indonesia, **Sydowia** 12, 321-362. 1959.

[5] DELGADO, A.; PIÑEIRO, A. Avance Preliminar de Clasificación Taxonómica Hongos Coprofílicos. Maracaibo, Venezuela. **XV Congreso Nacional de Fitopatología**. 23-27 noviembre. 50 pp. 1997.

[6] DELGADO, A.; PIÑEIRO, A. Avance de estudios taxonómicos de la micobiota en diferentes hábitats de estado Zulia, Venezuela. Maracaibo, Venezuela. **Resumen XV Congreso de Fitopatología**. 23-27 noviembre. 50 pp. 1997.

[7] DELGADO, A,; KIMBROUGH J.W.; HANLIN R.T. Zygopleurage zygospora, a new record from Venezuela. **Mycotaxon**. LXXV (3): 257-263. U.S.A. 2000.

[8] DELGADO, A.; PIÑEIRO A.; URDANETA L. Estudios taxonómicos de hongos Coprofílicos de la División Ascomicota (Clase: Pirenomicetes) del estado Zulia, Venezuela. **Rev. Cient. FCV-LUZ**, XI(3): 247-255. 2001.

[9] DELGADO, A.; PIÑEIRO A.; URDANETA L. Hongos Coprofílicos del estado Zulia, Venezuela. Clases: Plectomicetes y Discomicetes. **Rev. Cient. FCV-LUZ**, XI(4): 297-305. 2001.

[10] DENNIS, R.W.G. Fungus Flora of Venezuela and Adjacent Countries. **New Bulletin Addional** Series III. London. 531 p. 1973.

[11] DRING, V.J. *Utharomyces epallocaulus*: Boedijn in Ghana, **Sydowia** 14: 285-287.1960.

[12] ELLIS, J.J.; C.W. Hesseltine. Two new families of Mucorales. **Mycologia**. 66: 87-95. 1974.

[13] KIRK, P.M.; BENNY, G.L. The genus Utharomyces Boedijn (Pilobolaceae: Zygomycetes). **Trans. Br. Mycol, Soc**. 75 (1): 123-131. GREAT BRITAIN. 1980.

[14] RICHARDSON, M. Diversity and occurrence of Coprophilous fungi. **Mycol. Res.** 105(4):387-402. U.K. 2001.

[15] SCHIPPER, M.A.; SAMSON, R.A. Miscellaneous notes on Mucoraceae. **Mycotaxon**. I: 475-491. 1994.

[16] STEVENS, R.B. (ed). Mycology Guidebook. Seattle. University of Washington. 1974.

[17] WALLACE, B.; DICKINSON, C.H. Peat microfungi in three habitats in the Florida Everglades. **Mycologia**. 70: 1151-1163.1978.