

SOIL FUNGI FROM NORTH-EAST AND NORTH BRAZIL—VIII

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(With Plate 7 and two Text-figures)

*Hesseltinella*, a new genus of the Thamniaceae is described with a single species, *H. vesiculosa*, isolated from Brazilian soil. Main characters of the new genus are branchlets, radiating from swellings of the sporangiophore and terminating in secondary swellings bearing single sporangiola.

Further Mucorales isolated for the first time from Brazilian soils are: *Absidia pseudocylindrospora*, *A. cylindrospora*, *A. corymbifera*, *A. cuneospora*, *A. blakesleeana*, *Choanephora circinans*, *C. infundibulifera*, *Cunninghamella elegans* (syn.: *C. batistae* Upadhyay & Ramos), *C. phaeospora*, and *Mortierella hyalina*.

In continuation of the previous studies on soil fungi from the North-east and North of Brazil a new genus, *Hesseltinella*, is erected to accommodate a new species. The genus and its type species, *H. vesiculosa* Upadhyay, are described, and some interesting Mucorales isolated for the first time from Brazilian soils are mentioned. Methods and materials used are those described in the first paper of this series (Warcup, 1950; Batista & Upadhyay, 1965).

***Hesseltinella*** Upadhyay, *gen. nov.*

Hyphae hyalinae vel subhyalinae; sporangiophora erecta, simplicia vel aetate ramosa, una vel compluribus intumescentiis apicalibus vel intercalaribus vel lateralibus praedita, e quibus ramuli secundarii undique radiantes oriuntur; ramuli secundarii vesiculis egrediuntur e quibus sporangiola singula pediculo portata oriuntur; sporangiola globosa, pariete spinulis radiantibus oblecto, multas sporas hyalinas levesque ferentia. Sporangia collumellata absunt.

Ad Mucorales, Thamniaceas spectat.

Species typica: *H. vesiculosa* Upadhyay.

Hyphae hyaline or subhyaline, branched; sporangiophores erect, simple or branched when old, with 1 or a small number of apical, lateral or intercalary swellings. Secondary branches radiating from these swellings bearing apically a secondary swelling; sporangiola borne singly on a short apical stalk arising from the secondary swelling, globose, with spiny wall, containing a large number of one-celled, hyaline, smooth sporangiospores; columellate sporangia absent.

Type species: *H. vesiculosa* Upadhyay.

***Hesseltinella vesiculosa*** Upadhyay, *sp. nov.*—Fig. 1, Pl. 7, figs. 1-3

Coloniae tarde crescunt, 5-6 cm in diam. 8 diebus 25° C; primum albae vel subochraceae, deinde media colonia olivaceo-brunneae vel obscure griseae, margine subochraceo; reverso

pallide olivaceo vel olivaceo. Stolones hyalini, leves vel rugulosi,  $2.5-7 \mu$  in diam.; rhizoidea parca vel nulla; sporangiophora hyphis submersis vel stolonibus assurgentia, simplicia vel ramosa vel aetate dichotoma, levia vel rugulosa, nonnumquam sub intumescentiis septata, longitudine variabili,  $5-21 \mu$  in diam. (plerumque  $9-12 \mu$ ); una vel complures intumescantiae terminales, intercalares vel laterales; ramuli ex intumescentiis radiantes fere simplices,  $10.5-50 \times 2.5-4.5 \mu$ , raro ramosi et longiores,  $3-7 \mu$  in diam., hyalini, leves; vesiculae terminales hemisphaericae vel urniformes, leves,  $6-11 \mu$  in diam., pediculum  $2-4.5 \mu$  longitudine ferunt qui sporangiola procreat; sporangiola globosa, hyalina vel luteola vel brunnea,  $9-27 \mu$  in diam., maturitate disjuncta et deliquescentia, pariete perlucido, spinis tenuibus, ad  $12 \mu$  longis obtecto; sporangiosporae oblongae, fusiformes, lunatae vel reniformes, tenues, leves, hyalinae,  $3.5-10 \times 1.5-3.5 \mu$  (plerumque  $6-7 \mu$ ) longae. Chlamydo-sporae absunt, zygosporae ignotae.

Typus CBS 197.68 (in herb. et coll.), isolatus e solo arenoso oryza culta, Maranhão, Brasilia, Oct. 1967.

Colonies on synthetic mucor-agar slow-growing, attaining a diam. of 5-6 cm in 8 days at  $25^{\circ} \text{C}$ , at first white to ochre-white, later on becoming Olive-Gray to Pale Smoke-Gray to Pale Olive-Buff<sup>1</sup> in the centre, and white or ochre-white at the margin; colony centre often depressed or even moist in appearance; colony reverse Pale-Olive to Olive-Buff or Deep Olive-Buff after 30 days, sometimes radially wrinkled; odour none; stolons hyaline, smooth to slightly roughened, sometimes septate;  $2.5-7 \mu$  in diam.; rhizoids poorly developed or absent; sporangiophores usually arising from substrate mycelium, sometimes from stolons, hyaline, smooth or slightly roughened, sometimes septate below the swellings, erect, with 1 or a small number of terminal, lateral, and intercalary swellings, terminating in a short blunt process projecting beyond the terminal swelling, simple or racemously branched or even dichotomously when old,  $5-21 \mu$  in diam. (typically  $9-12 \mu$ ); secondary branches radiating from the primary swelling of the sporangiophore,

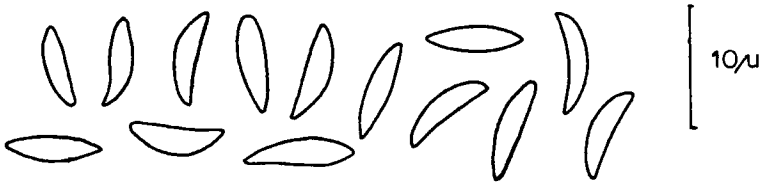


Fig. 1. *Hesseltinella vesiculosa*, sporangiospores.

usually simple,  $10.5-50 \times 2.5-4.5 \mu$ , occasionally branched and much longer,  $3-7 \mu$  in diam., hyaline, smooth, terminating into small secondary swellings which are hemispherical to urn-shaped, smooth-walled, hyaline,  $6-11 \mu$  in diam., apically bearing a single sporangiola on a short stalk; stalks  $2-4.5 \mu$  in length; sporangiola globose, hyaline to yellow-tinted or brown,  $9-27 \mu$  in diam., easily detached, persisting for a long time, deliquescing or breaking with considerable pressure when ripe, multispored; sporangiolar wall transparent, covered with up to  $12 \mu$  long slender spines; sporangiospores lunate, oblong to reniform, thin-walled, hyaline, smooth,  $3.5-10 \times 1.5-3.5 \mu$  (typically  $6-7 \mu$  in length); columellate sporangia, chlamydo-sporae, and zygosporae absent.

<sup>1</sup> Capitalized colour names refer to Ridgway (1912).

Isolated from soil of paddy fields in the states of Maranhão and Pernambuco (at Recife), October, 1967. Cultures are kept in the Mycotheca of IMUFPe, Recife, Brazil, the Commonwealth Mycological Institute, Kew, England, the Centraalbureau voor Schimmelcultures (CBS 197.68, type), Baarn, The Netherlands, and the N.R.R.L., Peoria, Illinois, U.S.A.

This fungus grows on a variety of media such as potato-dextrose-agar (PDA), synthetic-mucor-agar (SMA), carrot-agar (CA), Sabouraud-agar, malt-agar (MA), and hay-agar (HA), and the resulting colonies may display minor variations in growth-rate and fertility. On Czapek's agar, its growth is poor but sporulation is good. The fungus shows optimum growth at 28° C. But it also grows at a minimum temperature of 15° C and a maximum of 37° C.

The following observations were made on the morphological development of the sporangiophores, swellings, branches, and sporangiola. In young culture the sporangiophore usually forms a terminal swelling and terminates in a short sterile process (Pl. 7 figs. 1–3). From this swelling, branches, referred to as secondary branches in the above description, radiate, terminating again in an apical swelling, referred to as secondary swelling, which bears terminally a single sporangiole on a short stalk. However, the sporangiophore gradually forms a small number of lateral and intercalary swellings when older. The secondary branches radiating from these swellings may be simple or branched.

The present fungus is a typical member of the Thamniaceae and appears to be related to genera such as *Helicostylum* Corda (Corda, 1840; Lythgoe, 1958), *Cokeromyces* Shanor (Shanor & al., 1950), and *Radiomyces* Embree (Embree, 1959). The genus *Helicostylum* differs by columellate terminal sporangia, and sporangiola borne directly at the apex of circinate branches instead of on secondary swellings. In *Cokeromyces*, the sporangiola are also borne directly on recurved secondary stalks. *Radiomyces* is closely related to the present fungus, the main difference being that the secondary swellings bear several sporangiola.

#### ABSIDIA PSEUDOCYLINDROSPORA Hesseltine & Ellis—Fig. 2

*Absidia pseudocylindrospora* Hesseltine & Ellis in *Mycologia* 53: 406. 1961.

More than 21 isolates from soils of paddy and sugar-cane fields in the states of Pernambuco, Paraíba, and Maranhão are in good agreement with cultural and morphological characters of *Absidia pseudocylindrospora*. In addition to the features of this species, as described by Hesseltine & Ellis (1961), the Brazilian strains commonly possess the following characters: (i) formation of swellings in the sporangiophores, (ii) branched sporangiophores sometimes arising from an apical swelling, (iii) occasional presence of subglobose or globose sporangiospores. However, most of the microscopic and cultural characters of our isolates are like those of *A. pseudocylindrospora* and they form zygosporangia with an opposite strain of that species (Hesseltine & Ellis, 1964); hence we refer our fungus to it.

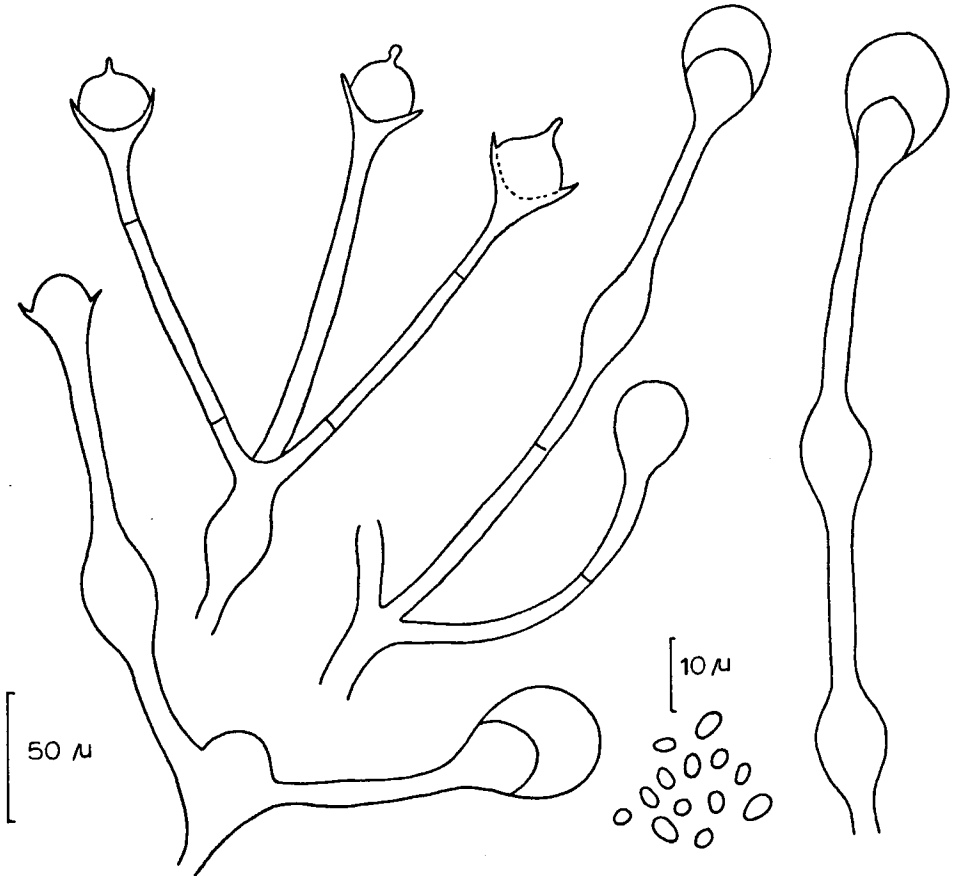


Fig. 2. *Absidia pseudocylindrospora*, branched and unbranched sporangiophores with swellings and sporangiospores.

Cultures are deposited in the Mycotheca of IMUFPe, Recife, the Centraalbureau voor Schimmelcultures, Baarn (CBS 480.66), the Commonwealth Mycological Institute, Kew, and the N.R.R.L., Peoria.

This species had not yet been isolated outside the U.S.A. and Mexico (Hesseltine & Ellis, 1964).

#### ABSIDIA CYLINDROSPORA Hagem

*Absidia cylindrospora* Hagem in Skr. VidenskSelsk. Christiania, Mat.-natv. Kl. No. 7: 45. 1908.

*Absidia cylindrospora* was isolated as one of the most common species of the genus from soil in various states of the North-east and North of Brazil. It had been isolated from garden soil at Niteroi, state of Guanabara (Hesseltine & Ellis, 1964) but was as yet unknown from the North-east and North of Brazil.

ABSIDIA CORYMBIFERA (Cohn) Sacc. & Trotter

*Absidia corymbifera* (Cohn) Sacc. & Trotter, Syll. Fung. 21: 825. 1912.

More than 170 isolates from sandy soils are in good agreement with *Absidia corymbifera* in cultural and morphological characters, as described by Ellis & Hesseltine (1966). This species has a world-wide distribution but remained to be reported from the North-east and North of Brazil.

ABSIDIA CUNEOSPORA Orr & Plunkett

*Absidia cuneospora* Orr & Plunkett in Mycologia 51: 203. 1959.

This species was twice isolated from soils of paddy field and forest in the state of Maranhão, April, 1966. It had been reported only from soil in the western part of the United States of America so far.

ABSIDIA BLAKESLEEANA Lendner

*Absidia blakesleeana* Lendner in Bull. Soc. bot. Genève, II, 15: 148. 1923.

Two isolates, one from sandy soil in the state of Maranhão and another from chicken dung collected from the poultry of the Veterinary Department of the Rural Federal University of Pernambuco, agree in their cultural and morphological characters with *A. blakesleeana* according to the description given by Hesseltine & Ellis (1966).

CHOANEPHORA CIRCINANS (Naganishi & Kawakami) Hesseltine & Benjamin

*Choanephora circinans* (Naganishi & Kawakami) Hesseltine & Benjamin in Mycologia 49: 723. 1957.

Isolated from soils of paddy and sugar-cane cultivation in the states of Paraíba and Pernambuco. This is the first record of the species from Brazil.

CHOANEPHORA INFUNDIBULIFERA (Currey) Sacc.

*Choanephora infundibulifera* (Currey) Sacc., Syll. Fung. 9: 339. 1891.

This species was frequently isolated from various garden and forest soils in the state of Pernambuco.

## CUNNINGHAMELLA ELEGANS Lendner

*Cunninghamella elegans* Lendner in Bull. Herb. Boissier 7: 250. 1907.

This fungus was commonly isolated from sandy soils of forest and paddy fields in the states of Paraíba, Rio Grande do Norte, and Maranhão. All strains produced predominantly spherical to subspherical spores and unbranched or poorly branched conidiophores and therefore it was supposed to be a new species, deposited in C.B.S., Baarn, (CBS 481.66) as *Cunninghamella batistae* Upadhyay & Ramos (Samson, 1969). However, matings with *C. elegans* revealed its identity. This species was reported from soil at Recife, Pernambuco, by the present author (1967), but remained to be reported from the above states.

## CUNNINGHAMELLA PHAEOSPORA Boedijn

*Cunninghamella phaeospora* Boedijn in Sydowia 12: 348. 1958.

Isolated from soils at Recife (Pernambuco), Natal (Rio Grande do Norte) and in the state of Maranhão. After its isolation in Indonesia it had been only found in India (Rai & al., 1968), according to Samson (1969).

## MORTIERELLA HYALINA (Harz) W. Gams

*Mortierella hyalina* (Harz) W. Gams in Nova Hedwigia 18: 13. 1969.

It was twice isolated from soil at Garanhuns (Pernambuco) where the temperature remains rather low (approximately 15° C) during the months of June and July and these isolations were obtained in June, 1966. This is the first record of the species not only for Brazil but also for Latin America.

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## EXPLANATION OF PLATE 7

Figs. 1-3. *Hesseltinella vesiculosa*. — 1, 2. Typical sporangiophores with secondary branches radiating from primary swelling. — 3. Sporangiophore with a terminal and a lateral swelling. (All figs., 640 ×.)

