

STAHIELIELLA, A NEW GENUS OF HYPHOMYCETES FROM TROPICAL SOIL

J. H. VAN EMDEN

c/o Instituut voor Plantenziektenkundig Onderzoek, Wageningen

Staheliella Van Emden, *gen. nov.*

Hyphomycetes, Dematiaceae.

Coloniae albae vel griseae, deinde in partibus fertilibus atrobrunneae vel atrae. Mycelium submersum et aerium, e hyphis ramosis, septatis compositum. Conidiophora macronematica, erecta, plerumque simplicia, pigmentata, septata, iterum ad iterum per apicem proliferantia, verticillis catenarum dichotomarum conidiorum praedita. Conidia arthroconidia, schizogena, breviter cylindrica, pigmentata.

Species typica: *Staheliella nodosa* Van Emden.

Colonies white or grey with blackish brown to black sporulating areas. Mycelium submerged and aerial, composed of septate branched hyphae. Conidiophores erect, macronematous, pigmented, septate, elongating by proliferation through the apex, bearing verticils of dichotomously branched chains of arthroconidia. Conidia schizogenous, short cylindrical, pigmented. Etym.: The genus is named after Gerold Stahel, mycologist, active in Surinam from 1914 till 1950.

Staheliella nodosa Van Emden, *spec. nov.*

Coloniae in agar "potato carrot" aetate duarum hebdomadum 75 mm diametro, tomentosae, primum albae vel griseae, deinde in partibus fertilibus atrobrunneae vel atrae. Mycelium submersum et aerium, ab initio e hyphis funiculosi, pauciseptatis, tenuitunicatis, ramosis, anastomosantibus compositum, deinde praeterea e hyphis multiseptatis nonnunquam in cellulas cylindraceas divisas. Conidiophora et ex mycelio aereo et ex mycelio submerso oriunda, singula vel caespitosa, nonnunquam in partibus fertilissimis conferta, macronematica, vulgo simplicia, erecta usque ad 3 mm altitudine, tum multis verticillis catenarum conidiorum praedita, primum hyalina, deinde acropetaliter pigmentata, irregulariter septata, crassitunicata, iterum ad iterum per apicem proliferantia. Conidia arthroconidia, in catenis compluribus dichotome ramosis connexa, pigmentata, levia, breviter cylindrica, $4-7 \times 3.5-4.5 \mu\text{m}$, raro Y-formia, utrinque truncata.

Habitat in terra, Surinama.

Typus in herb. et cult. CBS 589.73

Colonies on potato carrot agar attaining a diameter of 75 mm in two weeks at 20°C, tomentose, initially white or grey, becoming brownish black to black in sporulating areas. Mycelium submerged and aerial, funiculose, hyaline or

pigmented, initially composed of thin-walled, kinky, branched, anastomosing hyphae, sparsely septate and varying from 1 to 7 μm in width; later also of straight, thick-walled, multiseptate hyphae showing a tendency to fragment into cylindrical elements. Conidiophores arising from aerial as well as from submerged hyphae, single or caespitose, in some colonies almost evenly distributed, in others concentrated in densely sporulating zones or patches, macrone-matous, erect, attaining a height of up to 3 mm and then bearing many verticils of conidial chains, mostly simple, often provided with a distinctively shaped footcell, nodose, initially hyaline, becoming pigmented from the base upward, 12–15 μm wide at the base attenuated to 8 μm at the apex, irregularly septate, thick-walled, smooth, elongating repeatedly by proliferation through the apex; each extension apically producing a verticil of basitonously, dichotomously branched fertile hyphae which fragment to form arthroconidia. Conidia 1-celled, pigmented, surrounded by a hyaline layer, smooth, short-cylindrical, $4\text{--}7 \times 3.5\text{--}4.5 \mu\text{m}$, at points of ramification Y-shaped, the truncate ends with a minute pore; terminal conidia apically rounded; germinating, without swelling, with one germ tube by lifting one of the truncate walls on one side. In intact conidiophores numerous verticils of conidial chains remain in position; if the conidiophore is mounted on a slide they are shed leaving almost imperceptible scars.

MORPHOLOGY

Young colonies show a fair amount of aerial mycelium. The first conidia are formed after a few days; they are almost hidden by the aerial mycelium except for those that are formed very high in the colony. After one week sporulation becomes more intense and is from then on concentrated along the edge of the colony.

The caespitose habit of the conidiophores (*fig. 1 e, plate 1, b, d*) becomes evident in older cultures and was found to be more pronounced on malt agar than on potato carrot agar; this also applies to the formation of rhizoid-like structures. The impression is gained that these are in fact conidiophores originating from submerged hyphae and failing to grow away from the substrate.

The conidiophores often show a distinctively shaped foot cell (*fig. 1 d*). If the foot cell is well below the agar surface it remains hyaline; also the submerged part of the conidiophore is less pigmented than the part exposed to the air. The conidiophore wall consists of several layers (*fig. 1 k*), the outer one almost hyaline, the next heavily pigmented and brittle. When proliferation sets in this layer bursts and a completely hyaline extension emerges (*fig. 1 g*). This extension remains hyaline until the fertile hyphae have become fully developed and septate.

The number of whorls of arthroconidial chains on undisturbed conidiophores may be up to 25; in most colonies, however, the whorls become smaller after about a dozen have been produced and after about 16 whorls the apex of the conidiophore fails to sporulate and continues growth as a hyaline hypha.

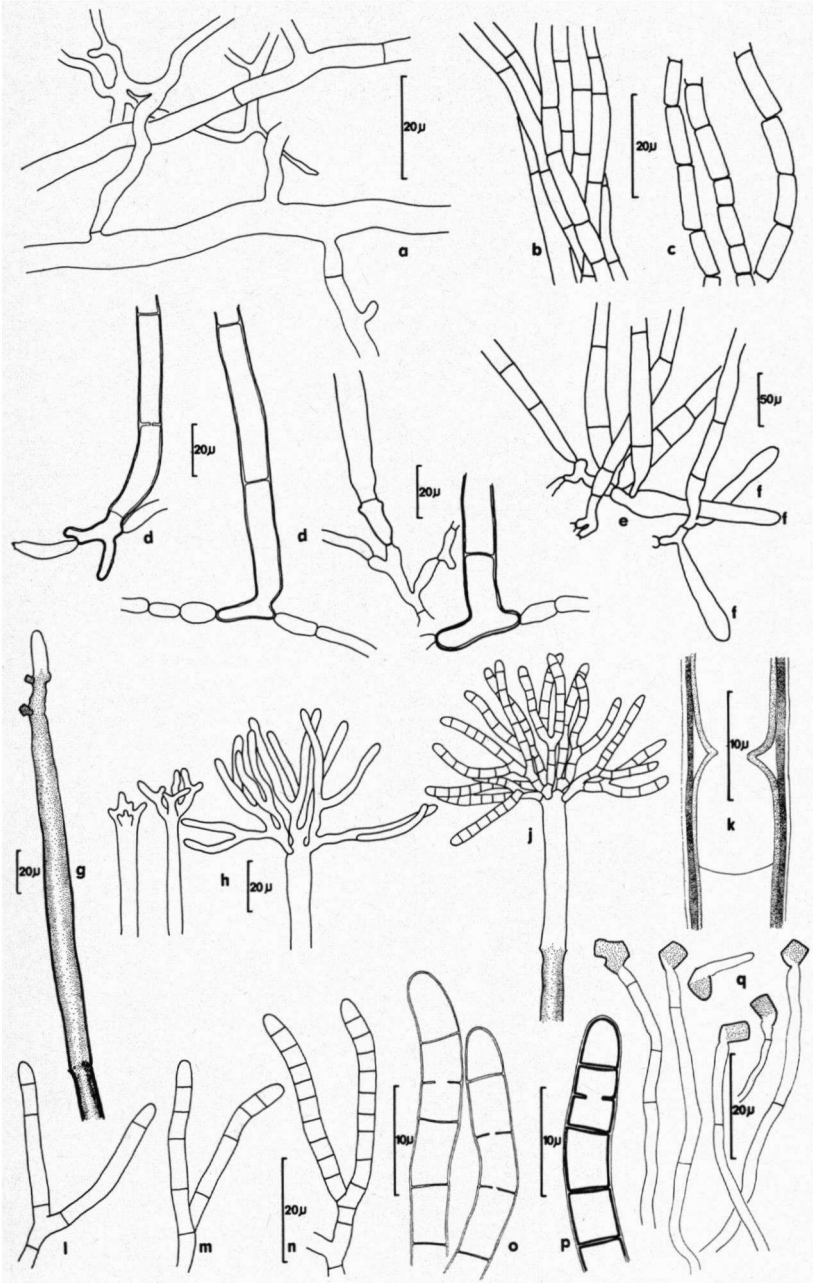


Fig. 1. *Staheliella nodosa*, a. sparsely septate mycelium in young colony; b. closely septate hyphae in older colony; c. fragmenting hyphae; d. conidiophores with foot cell; e. caespitose conidiophores; f. rhizoid-like structures; g. conidiophore with two proliferations; h. stages in the development of a verticil of arthroconidial chains, aseptate; i. verticil with septation completed; j. verticil with septation completed; l-p. stages in septation of fertile hyphae; q. germinating conidia.

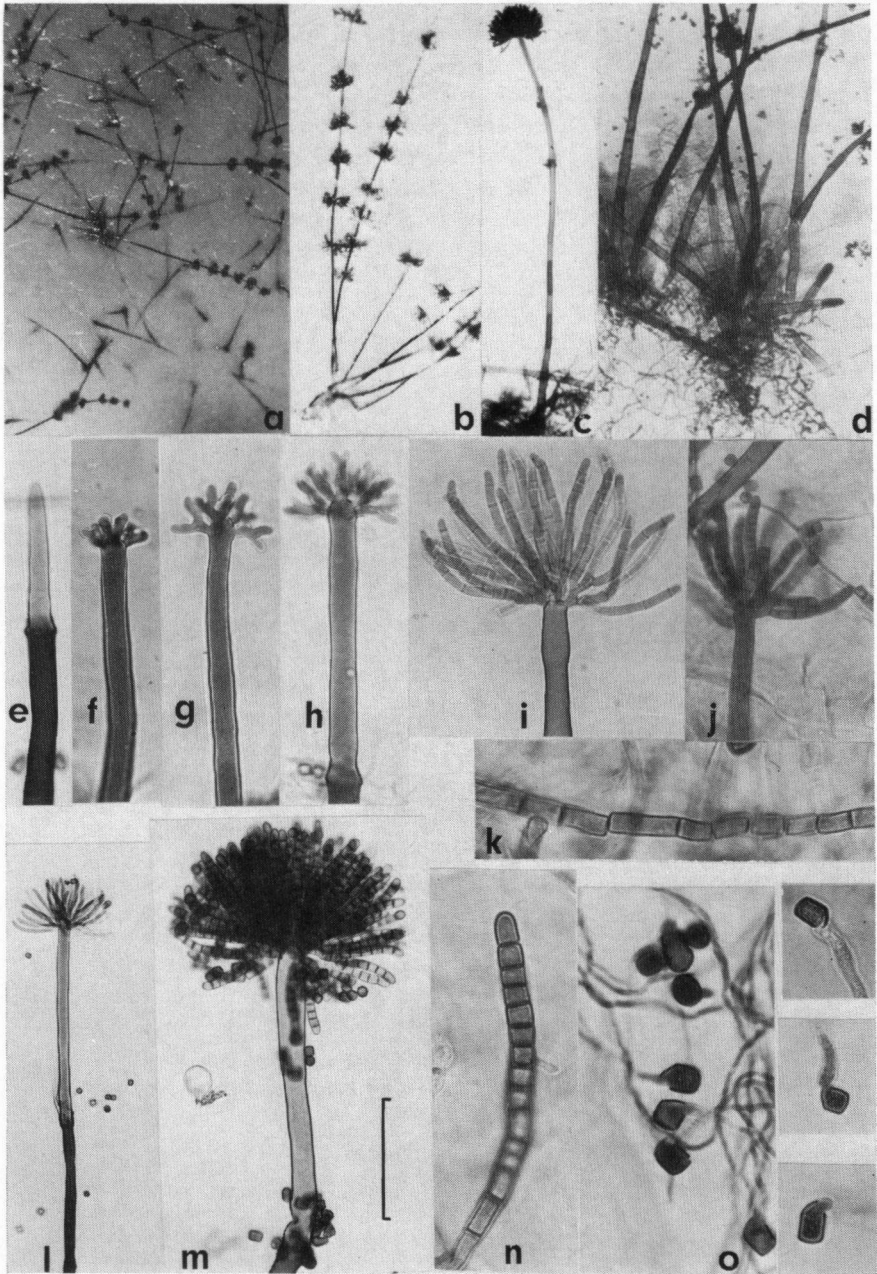


Plate 1. *Staheliella nodosa*, a, b, c. conidiophore habit; d. caespitose conidiophores with rhizoid-like structures; e. proliferation of conidiophore; f-j. stages in the development of verticil of arthroconidial chains; k. fragmenting hypha from submerged mycelium; l. hyaline proliferation with verticil; m. proliferation with mature verticil; n. fertile hyphae in the process of fragmentation; o. germinating conidia.
Measure indicates 20 μm in k, n, o; 40 μm in e-j, m; 100 μm in d, l.; 200 μm in c. and 500 μm in b.

Septation of the conidiophore is irregular and not connected with the proliferation. Sometimes a pore may be seen in the older, lower septa. From a structure that is interpreted as arrested septation (*fig. 1 k*), it is concluded that the process is one of annular growth beginning at the conidiophore wall.

All conidia are surrounded by an indistinct apparently solid, hyaline layer. This layer is also to be seen around the unfragmented hyphae; after fragmentation it surrounds the entire conidium. The pores in the truncate walls are not always distinguishable. The conidial wall seems to be a rigid encasement that opens like a box in order to allow the germ tube to emerge (*fig. 1 q, plate I o*).

MEDIA

The fungus grows well on potato carrot agar, cherry agar, hay extract agar and soil agar. On malt agar, PDA, PSA and oatmeal agar growth is erratic; if, however, these media are amended with yeast extract, growth is consistently good and sporulation dense.

ACIDITY

Between pH 4.5 and 5.5 acidity did not influence growth. At pH 6 growth is slow and at pH 7 there is hardly any growth at all.

LIGHT

Sporulation is promoted by light, although in total darkness the process is not entirely suppressed; most pronouncedly so on malt agar and least on potato carrot agar. Light also stimulates pigmentation. Colonies exposed to a normal diurnal rhythm complete one cycle of proliferation and sporulation during the period of darkness. During the period of light the cell walls thicken and become pigmented. This pattern was observed during the first week after sporulation had set in. In older cultures the simultaneity in the process of sporulation is less strict.

TEMPERATURE

The optimum temperature for growth is about 25°C; at 30° very little growth is made and at 37° conidia failed to germinate.

TAXONOMIC DISPOSITION

The colonies with the tall, rigid, caespitose conidiophores bearing verticils of arthroconidial chains and sometimes with rhizoid-like structures at their base are reminiscent of the merosporangiiferous Mucorales, especially of the genus *Piptocephalis*. However, the regularly septate hyphae and the early appearance of septa in the germ tubes of conidia lead to the conclusion that the fungus

should be placed in the Hyphomycetes, Dematiaceae.

It is to be compared with the genera *Sympodiella* Kendrick, *Amblyosporium* Fres., and *Oidiodendron* Robak. From *Sympodiella* it differs by the method of elongation of the conidiophore, which in that genus is sympodial; further by the dichotomously branched conidial chains and the pigmentation of the conidia. In *Amblyosporium* the fragmentation of the fertile hyphae is different, because only every second cell is transformed into a conidium, while the interposed cells degenerate. In *Oidiodendron* the conidia develop by basipetal fragmentation of the fertile hyphae and between contiguous conidia a connective is formed. In *Staheliella* fragmentation is more or less simultaneous; from the few instances of incomplete septation that could be found the impression is gained that the first septa divide the fertile hyphae into a few larger elements which become further subdivided before pigmentation sets in (*fig. 1 l, m, n*). The process of fragmentation is preceded by the formation of double crosswalls formed by annular growth beginning at the hyphal wall.

ACKNOWLEDGEMENTS

The author expresses his thanks to the director of the Instituut voor Plantenziektenkundig Onderzoek for providing laboratory facilities, further to Dr. J. A. von Arx and Dr. W. Gams for reading the manuscript and to the latter also for correcting the Latin diagnoses.