

**Fungi on Grasses and Sedges:  
*Paratetraploa exappendiculata* gen. et sp. nov., *Petrakia*  
*paracochinensis* sp. nov. and *Spadicoides versiseptatis*  
sp. nov. (dematiaceous hyphomycetes)**

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**Abstract** – Three new dematiaceous hyphomycetes are described, based on collections of decaying grass and sedge samples in Hong Kong. *Paratetraploa exappendiculata* gen. and sp. nov. has semi-macronematous conidiophores and *Tetraploa*-like conidia, which lack an apical appendage, but have conspicuous punctate wall ornamentation. *Petrakia paracochinensis* sp. nov. resembles *Piricauda cochinensis* in having conidia which are similar in size and shape. *Spadicoides versiseptatis* sp. nov. is a distinctive species in having both pseudosepta and eusepta in each conidium.

**Taxonomy / saprobes / *Dictyosporium* / *Tetraploa* / *Piricauda* / Mai Po Marshes**

## INTRODUCTION

Studies on the fungal diversity on grasses and sedges in Hong Kong have been carried out with plants that grow in brackish water (Poon & Hyde, 1998; Wong *et al.*, 1998), freshwater (Wong, M.K.M. *et al.*, 1999, 2000) and terrestrial habitats (Wang *et al.*, 2000; Wong & Hyde, 2001a, b). During a study of the saprobic fungi on the sedge *Schoenoplectus litoralis* (L. Schroder) Palla (Wong and Hyde, 2001b) in a freshwater marsh, an interesting hyphomycete was discovered. This taxon had dark brown, punctate, thick-walled conidia, composed of four columns of cells, each column comprising 3-6 cells. The irregularly branched conidiophores were distinctive in their variability in width, wall ornamentation (punctate or smooth), and form of proliferation (simple or catenate). This taxon could not be placed in any existing genus and therefore *Paratetraploa* gen. nov. is introduced to accommodate it.

Species of *Spadicoides* and *Petrakia* were also collected from terrestrial samples of *Miscanthus floridulus* (Labill) Warb and *Saccharum arundinaceum* Retz. The *Spadicoides* species was distinctive within the genus in having a pseu-

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doseptum at the distal end of each conidium. The *Petrakia* species had markedly large conidia which resembled those of *Piricauda cochiniensis* (Subram.) M.B. Ellis in both size and shape. These two hyphomycete taxa do not key to any existing species, and are therefore described as new in this paper. Both fungi are illustrated with interference light micrographs, and *Paratetraploa exappendiculata* is also illustrated with scanning electron micrographs. A line-drawing of *Petakia paracochiniensis* is provided to supplement the micrographs of the conidiophores and to illustrate the appendage septation.

## MATERIALS AND METHODS

Decaying culms of each grass and sedge were collected from various locations in Hong Kong and cut to a standardised length (20 cm). Samples were placed into individual polythene "zip-locked bags", returned to the laboratory, and incubated at room temperature (~23 °C) together with moist tissue to encourage fungal fruiting bodies to develop. The samples were periodically examined with a dissecting microscope. For measurement fungi were mounted in water. Cryoscanning electron microscopy (Cryo-SEM) was used to examine wall ornamentation on the conidia and conidiophores of *Paratetraploa exappendiculata*. The fungi were fixed and prepared according to the methods detailed by Wong, S.W. *et al.* (1999).

## TAXONOMIC PART

### *Paratetraploa* M.K.M. Wong and K.D. Hyde, gen. nov.

*Coloniae effusae, nigrae, pilosae. Mycelium in substrato superficiales. Conidiophora semimacronematosa, euseptata, brunneae, ramosa, flexuosa, ex hyphis punctatus et crassitunicatus, vel laevis et leptodermus. Conidia pleurogena, solitaria, muriformia, atro-brunna, euseptata, crassitunicata, punctata, cum sulcula inter cellularis columna.*

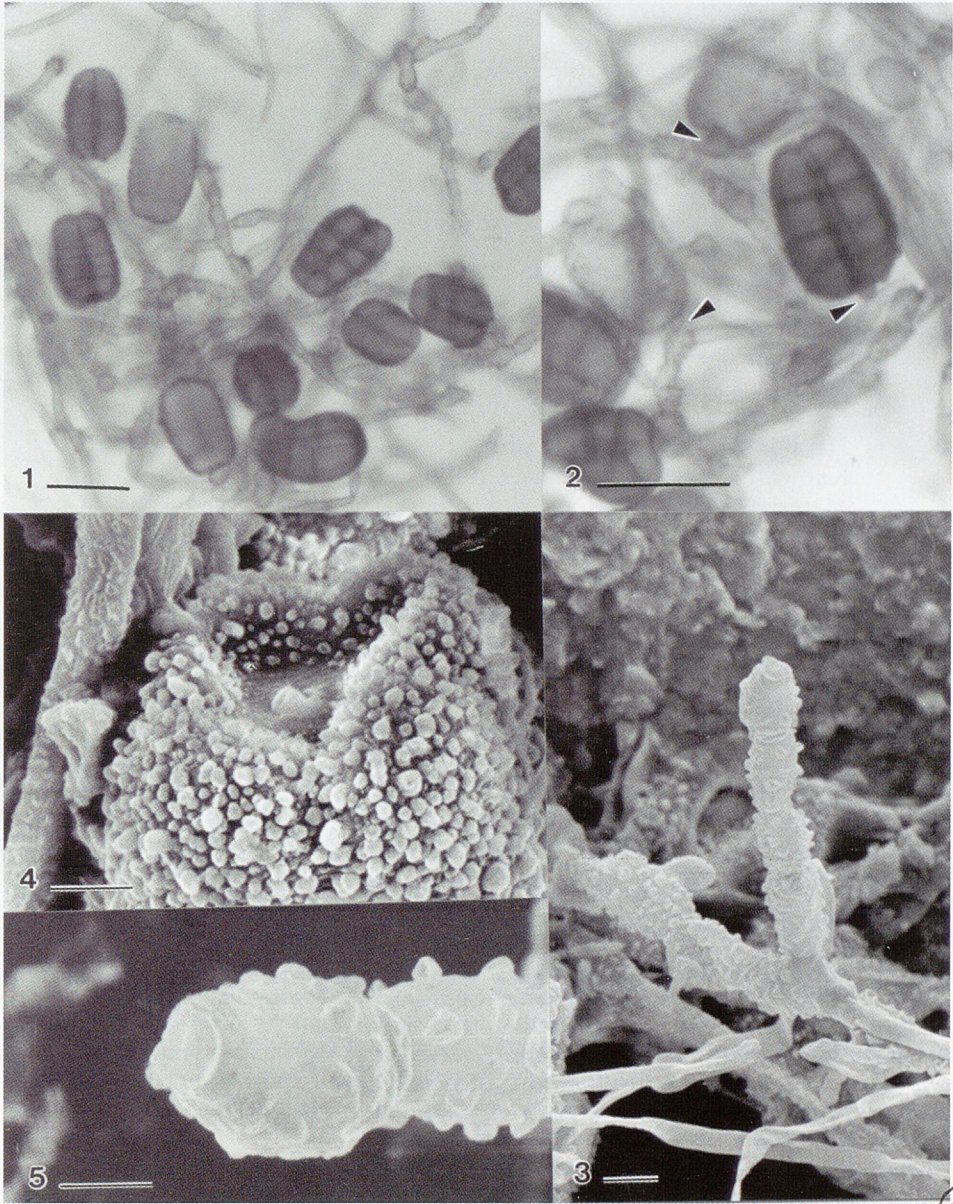
Colonies on natural substratum black, scattered, fluffy. Mycelium superficial. Stromata not developed. Setae none. Hyphopodia absent. Conidiophores semi-macronematous, euseptate, brown, branched, flexuous, composed of punctate and thick-walled, or smooth and thin-walled hyphae. Conidia pleurogenous, holoblastic, solitary, dry, muriform, dark brown, euseptate, thick-walled, punctate; in mature conidia there are shallow furrows between columns of cells which develop independently. Conidial secession schizolytic.

Etymology: Latin *Para* in reference to the resemblance with *Tetraploa*.

Type species (here designated): *Paratetraploa exappendiculata* M.K.M. Wong, T.K. Goh & K.D. Hyde.

*Paratetraploa exappendiculata* M.K.M. Wong, T.K. Goh & K.D. Hyde, sp. nov. (Figs 1-5)

*Mycelium in gramen superficiales. Conidiophora semi-macronematosa, irregulariter ramosa, nigra, con hypha biformie: punctata hypha 5-6 µm lata, cras-*



Figs. 1-5. *Paratetraploa exappendiculata* (from holotype): 1-2. Interference contrast micrographs. 1: Colony of conidia. 2: Conidiogenous cells (arrowed). 3-5. Scanning electron micrographs. 3: Narrow smooth-walled and thicker punctate hyphae. Note the punctate conidiophores with constrictions. 4: Detached conidium. Note the basal frill and the punctate wall ornamentation. 5: Conidiogenous cell. Note the scar of spore dehiscence. (Scale bars: 1-2 = 20  $\mu$ m; 3 = 5  $\mu$ m; 4-5 = 2  $\mu$ m).

*situnicata*, *ad septa constrictae*; *laevis* hypha 3.5-4  $\mu\text{m}$  *lata*, *glabrotunicata*, *ad septa non-constrictae*. *Cellulae conidiogenae intercalariae, holoblasticae, monoblasticae, sub-inflata*. *Conidia* 24-29  $\times$  14-19  $\mu\text{m}$ , *irregulariter ellipsoidea, tetra-columnariae, per-columna 2-(5)-septata, ad septa non-constrictae, atrobrunneae, crassitunicata, punctata*.

Mycelium superficial on the grass surface, fluffy. Conidiophores semi-macronematous, irregularly branched, flexuous, dark brown to black, composed of two types of mycelia : punctate hyphae 5-6  $\mu\text{m}$  wide, thick-walled, inflated, constricted at the septa, mostly conidia-bearing; smooth-walled hyphae 3.5-4  $\mu\text{m}$  wide, thin-walled, not constricted at the septa. Conidiogenous cells integrated, intercalary, holoblastic, monoblastic, slightly inflated, shortly protruding to produce conidia. Conidia 24-29  $\times$  14-19  $\mu\text{m}$ , solitary, irregularly ellipsoidal, composed of four columns of cells, each column 2-(5)-septate, not constricted at the septa, dark brown at maturity, thick-walled, punctate, basal frill inconspicuous under interference contrast microscopy, ca. 0.5  $\mu\text{m}$  in diameter, conidiogenesis schizolytic.

Etymology: Latin *exappendiculata* in reference to the absence of appendages, when compared to *Tetraploa*.

Habitat: Saprobic on grass in submerged region of freshwater marsh.

Known host: *Schoenoplectus litoralis*.

Material examined: Hong Kong, New Territories, Mai Po Marshes, Gei Wai number 9, on standing decaying submerged culms of *Schoenoplectus litoralis*, September 1999, M.K.M. Wong (HKU(M) 12646, holotype-here designated).

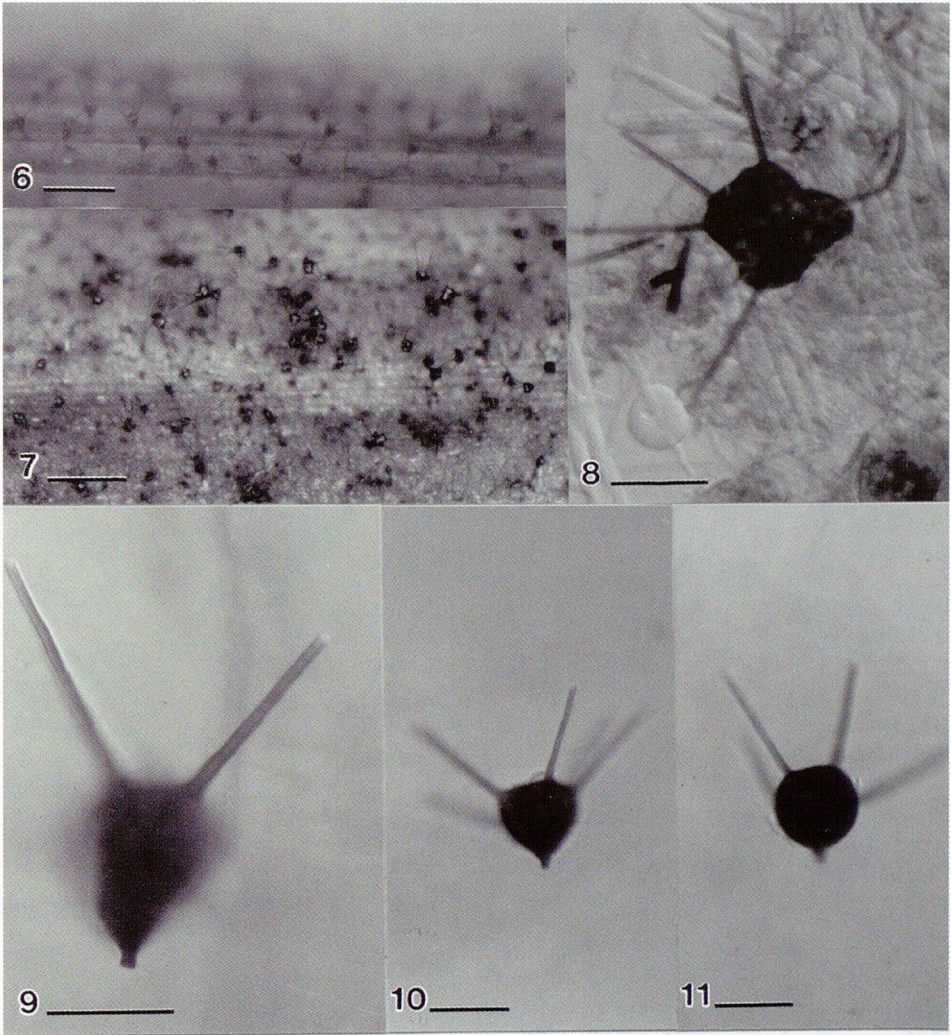
*Paratetraploa exappendiculata* shares similarities with *Dictyosporium* and *Tetraploa* species in having columns of cells. In *Dictyosporium* species, however, complete conidia consist of columns of cells developing on a basal cell. The new taxon resembles *Tetraploa* in having punctate conidial wall ornamentations and conidia with shallow furrows between 4 rows of cells which develop independently. However, the conidial arms of *Tetraploa* are appressed at the lower portions only (Ho *et al.*, 2000), with separating arms at the apex which terminate in elongate appendages. In *Paratetraploa*, conidia are bipolar and laterally symmetrical and are distinctive in lacking terminal appendages. This collection also has two hyphal types, including wider, thick-walled, punctate hyphae, with constrictions at the septa, and narrower, thin-walled, smooth-walled vegetative hypha (Fig. 3).

***Petrakia paracochinensis*** M.K.M. Wong, T.K. Goh & K.D. Hyde, sp. nov. (Figs 6-20)

*Coloniae in gramen effusae. Conidiophora macronematosa, momonematosa, singulariter, erecta, non-ramosa, non-septata, 40-70  $\times$  5-6  $\mu\text{m}$ , laevis, atrobrunneae, crassitunicata. Cellulae conidiogenae, monoblasticae, terminales. Conidia obovoida ad subglobose, muriforme, 50-60 diam., laevis, atro-brunneae, crassitunicata, ad conidia 3-5 appendicis, biseptatis, pallide brunneus, 60-62  $\times$  3-4  $\mu\text{m}$ , cellulae basilaris sub-elongata et truncata basis.*

Colonies on grass surface scattered. Conidiophores macronematous, mononematous, straight, erect, solitary, not branched, non-septate, 40-70  $\times$  5-6  $\mu\text{m}$ , smooth-walled, dark brown, thick-walled. Conidiogenous cells monoblastic, terminal, integrated. Conidia obovoid to subglobose, muriform, 50-60  $\mu\text{m}$  in diameter, smooth-walled, dark brown, thick-walled, with 3-5-biseptate appendages, basal cell slightly protruding at the truncate base; 60-62  $\times$  3-4  $\mu\text{m}$ , pale brown, tapering to a rounded apex.

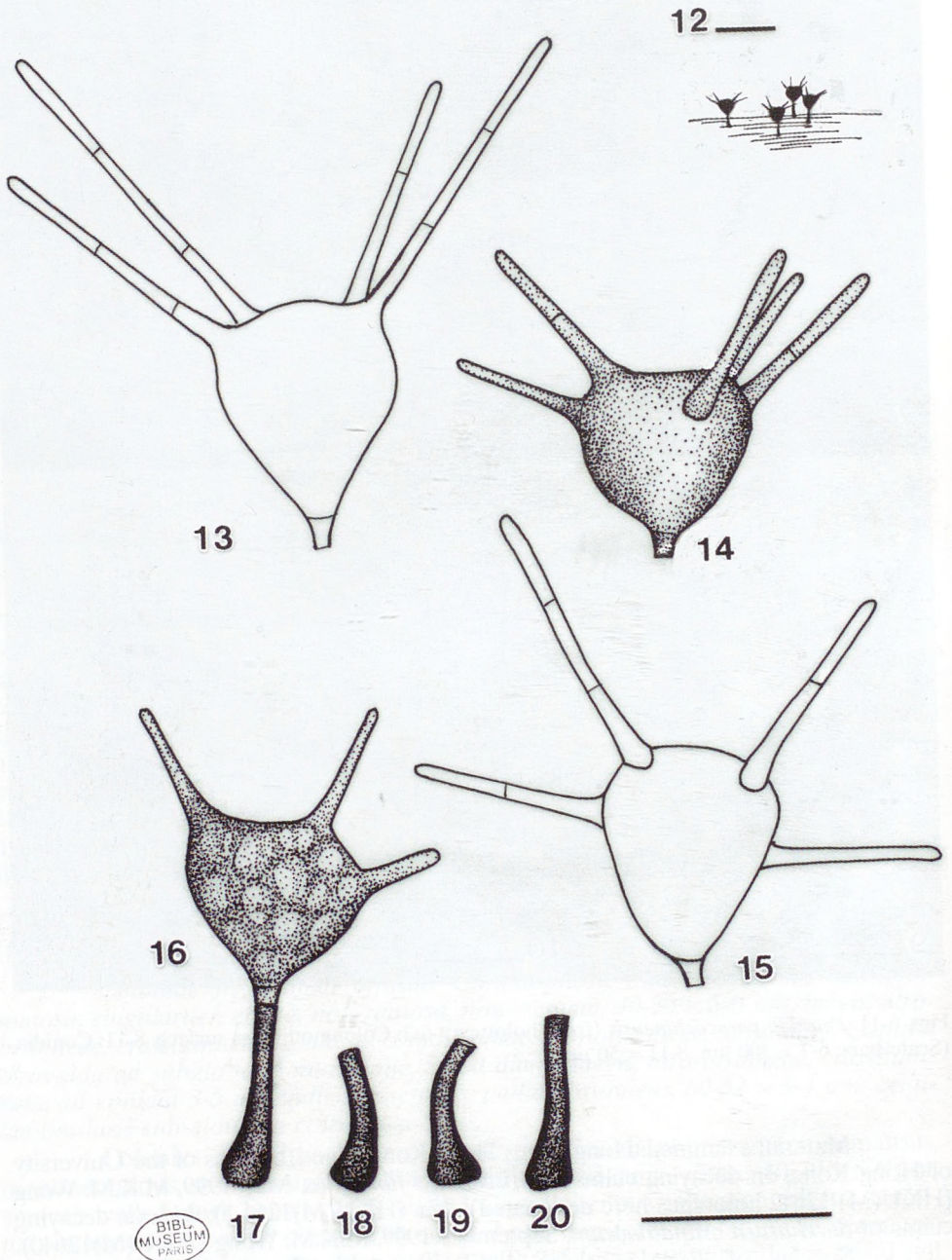
Etymology: Latin *para* in reference to the resemblance of the conidia to those of *Piricauda cochinensis*.



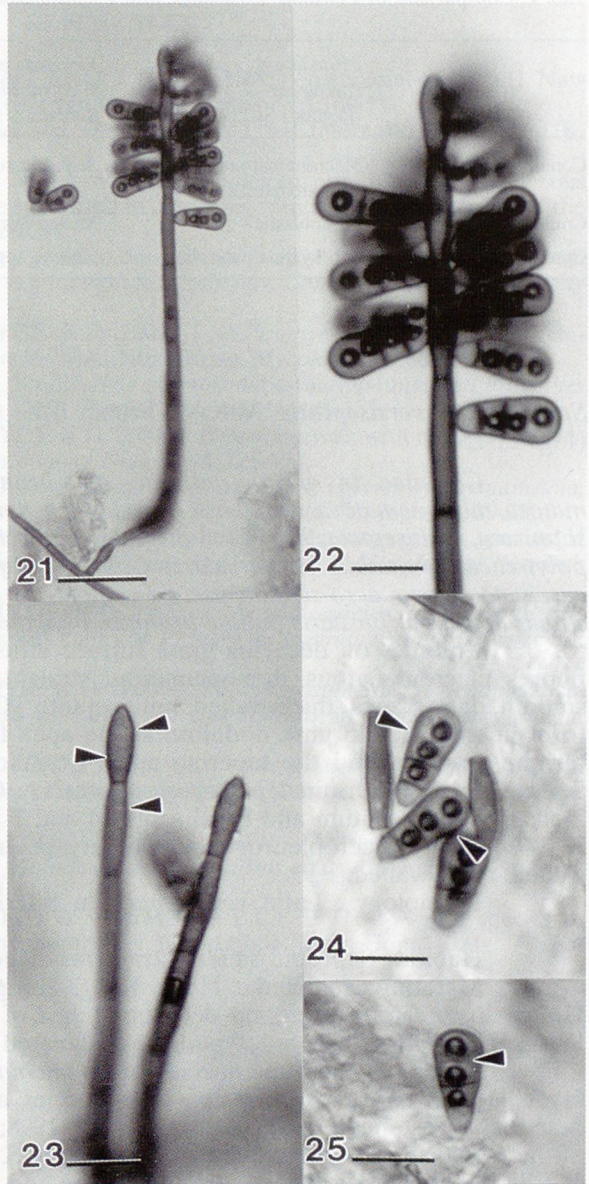
Figs. 6-11. *Petrakia paracochinensis* (from holotype). 6-7: Colony on grass surface. 8-11: Conidia. (Scale bars: 6-7 = 300  $\mu$ m; 8-11 = 50  $\mu$ m).

Material examined: Hong Kong, Hong Kong Island, campus of the University of Hong Kong, on decaying culms of *Miscanthus floridulus*, May 1999, M.K.M. Wong (HKU(M) 12642 holotypus-here designated); *ibid.* (HKU(M)1264 1); *ibid.*, on decaying culms of *Saccharum arundinaceum*, September 1999, M.K.M. Wong (HKU(M)12640).

Species of *Petrakia* share similarities with those of *Piricauda* and *Pseudopetrakia* in having solitary, dry, acrogenous conidia which are somewhat sub-spherical or irregular in shape. They differ however, in the form of the conidiophore, conidiogenous cells, and conidial outgrowths (Table 1). *Petrakia paracochinensis* resembles *Piricauda cochinensis* (Subram.) M.B. Ellis in having similar conidial



Figs. 12-20. Diagrammatic representation of *Petrakia paracochinensis* (from holotype). 12: Colony on grass. 13-16: Conidia. Note the pseudosepta in 16. 17-20: Conidiophores. (Scale bars: 12 = 120  $\mu$ m; lower bar 13-20 = 60  $\mu$ m).



Figs. 21-25. *Spadicoides versiseptatis* (from holotype). 21-22: Conidiophores. 23: Pores on conidiophore. 24-25: Conidia. Note the eusepta (lower 2-septa) and pseudoseptum (top septum — arrowed). (Scale bars: 21 = 20  $\mu$ m; 22-25 = 10  $\mu$ m).

form, shape and size. However, whereas *Petrakia* produces macronematous, erect conidiophores with holoblastic conidiogenesis, *Piricauda* produces micronematous conidiophores with enterotretic conidial succession (Ellis, 1976). *Petrakia paracochinensis* also differs from other species in the absence of pseudoparenchyma and the aggregate of conidiophores, and is thus described as a new species.

Tab. 1. Comparison of *Petrakia*, *Piricauda*, and *Pseudopetrakia* (Ellis, 1976)

	<i>Petrakia</i> e.g. <i>P. echinata</i> (Peglion) Syd. & P. Syd.	<i>Piricauda</i> e.g. <i>P. cochinesis</i> Subram.	<i>Pseudopetrakia</i> e.g. <i>P. kambakkamensis</i> (Subram.) M.B. Ellis
Conidiophores	Macronematous, mononematous	Semi-macronematous	Micro- or semi macronematous
Conidiogenous cells	Monoblastic	Monotretic	Monoblastic
Conidial outgrowths	Sub-hyaline projections	Septate appendages	Black spines at the apex

***Spadicoides versiseptatis*** M.K.M. Wong, T.K. Goh & K.D. Hyde, sp. nov.  
(Figs 21-25)

*Coloniae in gramen effusae, atro-brunneae. Conidiophora macrone-  
matosa, mononematosa, singulariter, erecta, non-ramosa, laevie, atro-brunneae, cras-  
situnicata, multiseptata, 90-125 × 3-3.5 µm, ad apicem tumida. Cellulae conidiogenae  
polytreticae, terminales et intercalares. Conidia 3-septata, basi-septum et mid-septum  
euseptata, versus acro-septum pseudo septata, 13-14 × 5.5-6 µm, acropleurogena,  
solitaria, cellular basilaris pallide brunnea, obovolda, laevie, crassitunicata.*

Colonies on decaying grass surface effuse, dark brown, hairy. Conidio-  
phores macronematous, mononematous, straight, erect, solitary, not branched,  
smooth, dark brown, thick-walled, multiseptate, 90-125 µm long more or less uni-  
form in width (3-3.5 µm), nodulose at the apex formed by a constriction at the  
terminal septum and the tapering apex. Conidiogenous cells polytretic (up to  
5 pores per cell), terminal, becoming intercalary. Conidia 3-septate, composed of  
2-eusepta (mid-septum and basal septum) and 1 pseudoseptum (apical septum),  
13-14 × 5.5-6 µm acropleurogenous, solitary, paler at the base, obovoid, smooth-  
walled, thick-walled.

Etymology : Latin *versi-septata* in reference to the different forms of  
septa.

Habitat : Saprobic on terrestrial grass. Known host: *Miscanthus floridulus*.

Material examined : Hong Kong, Hong Kong Island, campus of the  
University of Hong Kong, on decaying culms of *Miscanthus floridulus*, M.K.M.  
Wong (HKU(M) 12638, holotype-here designated).

Notes : Twenty-one species of *Spadicoides* were accepted by Goh and  
Hyde (1996), and since then two new species and one new variety has been  
described (Casteneda, 1997; Goh and Hyde, 1998; Zhou *et al.*, 1999). The conidia  
of the new taxon resemble those of *S. klotzschii* S. Hughes and *S. obovata* (Cooke  
& Ellis) S. Hughes in having a similar shape and number of septa. However, the  
conidial sizes are different, and the conidia of *S. versiseptata* are distinctive in hav-  
ing a pseudo septum, and lack a dark band.

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