

## Two new species of *Spadicoides* from Brunei and Hong Kong

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**Abstract:** *Spadicoides hodgkissa* sp. nov. and *Spadicoides arengae* sp. nov., recorded from submerged decaying wood in Hong Kong and from decaying palm fronds in Brunei, are described and illustrated. *Spadicoides hodgkissa* is characterized by versicolored, obovoid conidia with up to 2 septa, including a distal distoseptum and a proximal euseptum, while *Spadicoides arengae* is characterized by unicellular, ellipsoidal conidia with verruculose walls that are relatively large. Eight genera, including *Dendrographium*, *Helminthosporium*, *Luzfridiella*, *Paliphora*, *Polyschema*, *Polytretophora*, *Porosubramania*, and *Weufia*, have the same conidiogenesis as *Spadicoides*. A key to these genera is provided.

**Key Words:** freshwater fungi, palm fungi, polytretic conidiogenesis, taxonomy, tropical fungi

### INTRODUCTION

In a continuing study of freshwater (Ho et al 1999a, Hyde et al 1999) and palm fungi (Yanna et al 2000) in the tropics, an undescribed dematiaceous hyphomycete was found on wood baits of *Pinus massoniana* Lamb. submerged in a small stream in Hong Kong and another on decaying fronds of *Arenga undulatifolia* Becc. in Brunei. These fungi produce macronematous, mononematous conidiophores, polytretic, integrated conidiogenous cells, and acropleurogenous, solitary, obovoid to ellipsoidal conidia. Critical examination of the morphological characters suggested placement in the genus *Spadicoides*.

The genus *Spadicoides* was erected by Hughes (1958) to accommodate a single species, *S. bina* (Corda) S. Hughes. Taxa producing conidia with solitary or catenate conidia on branched or unbranched co-

nidiophores were included in *Spadicoides* or *Diplococcium*. The catenation of conidia is considered taxonomically more important than the branching of conidiophores, and thus the generic description of *Spadicoides* was emended to include taxa producing solitary conidia on branched or unbranched conidiophores, whereas *Diplococcium* includes taxa producing catenate conidia (Sinclair et al 1985). The teleomorph of *Spadicoides* is unknown.

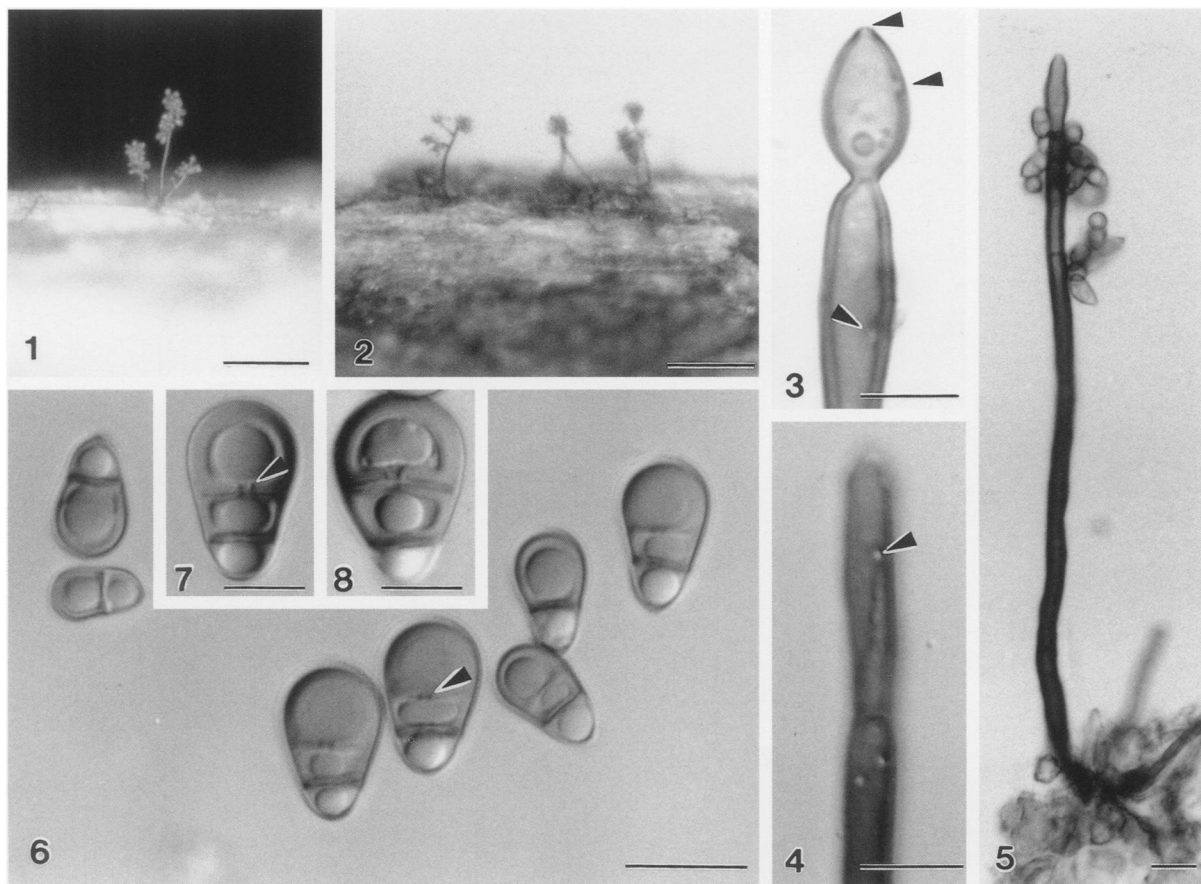
The species of *Spadicoides* collected in Hong Kong and Brunei differ from the described species and are therefore described as new.

### TAXONOMY

***Spadicoides hodgkissa*** W. H. Ho, Yanna et K. D. Hyde, sp. nov. FIGS. 1–12

Coloniae effusae, atro-brunneae, pilosae. Mycelium partim in substrato immersum, ex hyphis pallide brunneis, septatis, laebus, ramosis, 3–4  $\mu\text{m}$  crassis compositum. Conidiophora macronemata, mononemata, erecta, solitaria, non ramosa, recta vel leniter flexuosa, laevia, crassitunicata, multiseptata, 60–120  $\times$  3.5–4  $\mu\text{m}$ , ad basim 4.5–6  $\mu\text{m}$  lata, atro-brunnea, apicem versus pallidiora. Cellulae conidiogenae polytreticae, in conidiophoris incorporatae, terminales et intercalares. Conidia acropleurogena, solitaria, versicoloria, obovoidea, guttulate, unicellularia (5  $\times$  3  $\mu\text{m}$ ), 1-euseptatae vel 2-septatae (9–13  $\times$  5–8  $\mu\text{m}$ ); cellulae distalia crassitunicatae, olivaceae brunneae; cellulae basilare tenuitunicatae, pallide brunneae vel hyalinae, cum hilo.

*Colonies* on decaying wood effuse, dark brown, hairy (FIGS. 1, 2, 9). *Mycelium* partly immersed in the substrata, composed of pale brown, septate, smooth-walled, branched hyphae, 3–4  $\mu\text{m}$  wide. *Conidiophores* macronematous, mononematous, erect, solitary, unbranched, dark brown, paler towards the apex, straight or slightly flexuous, smooth, thick-walled, multiseptate, 60–120  $\times$  3.5–4  $\mu\text{m}$  ( $\bar{x}$  = 82  $\times$  3.8  $\mu\text{m}$ ,  $n$  = 25), occasionally swollen at the apex, slightly swollen, 4.5–6  $\mu\text{m}$  at the base (FIGS. 3–5, 10). *Conidiogenous cells* polytretic, integrated, terminal and intercalary, with pale colored pores remaining at the conidiogenous loci (FIGS. 3, 4, 11). *Conidia* acropleurogenous, solitary, versicolored, obovoid, smooth, guttulate, unicellular (5  $\times$  3  $\mu\text{m}$ ), 1-euseptate or 2-septate (9–13  $\times$  5–8  $\mu\text{m}$ ;  $\bar{x}$  = 11.8  $\times$  7  $\mu\text{m}$ ,  $n$  = 25) comprising a proximal euseptum and a distal distoseptum (FIGS. 6–8, 12); *distal distosepta* possess a con-



FIGS. 1–8. *Spadicoides hodgkissa* (from HOLOTYPE). 1, 2. Colonies on woody substrata. 3. Apex of a conidiophore with pale colored pores. 4. Conidiogenous locus in conidiogenous cell. 5. Conidiophore attached to remains of substratum. 6–8. Conidia with 1 or 2 septa. Note the distal septa are distoseptate with a conspicuous central pore surrounded by a pigmented ring (arrowed). Scale bars: 1, 2 = 100  $\mu\text{m}$ , 3, 4, 7, 8 = 5  $\mu\text{m}$ , 5, 6 = 10  $\mu\text{m}$ .

spicuous central pore which is surrounded by a pigmented ring, appearing as dolipores in side view; *distal cells* thick-walled, olivaceous brown; *basal cells* thin-walled, very pale brown or hyaline, with a small hilum at the base.

*Etymology.* In honor of Prof. Sir I. John Hodgkiss who has promoted ecological and biodiversity studies in Hong Kong since 1968.

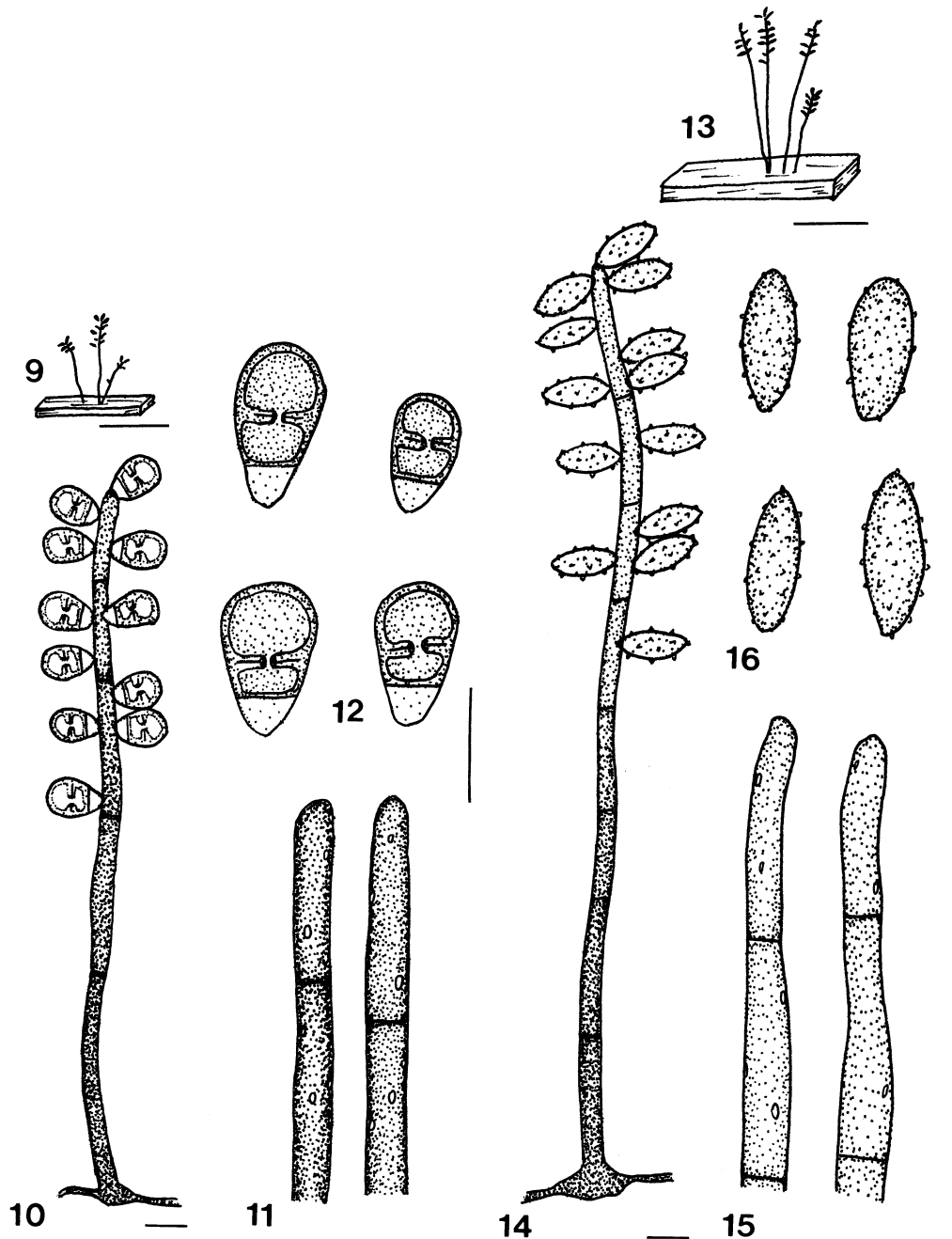
*Material examined.* CHINA. HONG KONG: Tai Po Kau Forest Stream, wood baits of *Pinus massoniana*, 28 Jun 1997, W. H. Ho WH307 [HKU(M) 6155, HOLOTYPE]; 29 Dec 1996, W. H. Ho & S. Y. Ho [HKU(M) 5965].

***Spadicoides arengae* W. H. Ho, Yanna et K. D. Hyde, sp. nov.** FIGS. 13–18

Coloniae effusae, atro-brunneae, pilosae. Mycelium partim in substrato immersum, ex hyphis pallide brunneis, septatis, laevibus, ramosis, 2–3.5  $\mu\text{m}$  crassis compositum. Conidiophora macronemata, mononemata, erecta, solitaria, non ramosa, brunnea, apicem versus pallidiora, recta vel leniter flexuosa, laevia, tenuitunicata, multiseptata, 210–400

$\times$  3.5–4  $\mu\text{m}$ , ad basim 5–6  $\mu\text{m}$  lata. Cellulae conidiogenae polytreticae, in conidiophoris incorporatae, terminales et intercalares. Conidia acropleurogena, solitaria, unicellularia, ellipsoidea, 11–18  $\times$  4–6  $\mu\text{m}$ , pallide brunneae, aguttulatae, verruculosae, cum hilo.

*Colonies* on decaying palm frond effuse, dark brown, hairy (FIG. 13). *Mycelium* partly immersed in the substrata, composed of pale brown, septate, smooth-walled, branched hyphae, 2–3.5  $\mu\text{m}$  wide. *Conidiophores* macronematous, mononematous, erect, solitary, unbranched, brown, paler towards the apex, straight or slightly flexuous, smooth, thin-walled, multiseptate, 210–400  $\times$  3.5–4  $\mu\text{m}$  ( $\bar{x}$  = 312  $\times$  3.7  $\mu\text{m}$ , n = 25), slightly swollen, 5–6  $\mu\text{m}$  at the base (FIGS. 14, 17). *Conidiogenous cells* polytretic, integrated, terminal and intercalary, with pale colored pores remaining at the conidiogenous loci after conidial secession (FIGS. 15, 18). *Conidia* acropleurogenous, solitary, unicellular, ellipsoidal, 11–18  $\times$  4–6  $\mu\text{m}$  ( $\bar{x}$  = 15.2  $\times$  5.6  $\mu\text{m}$ , n = 25), very pale brown, non-guttulate, wall verruculose, with a small hilum at the base (FIGS. 16, 19).



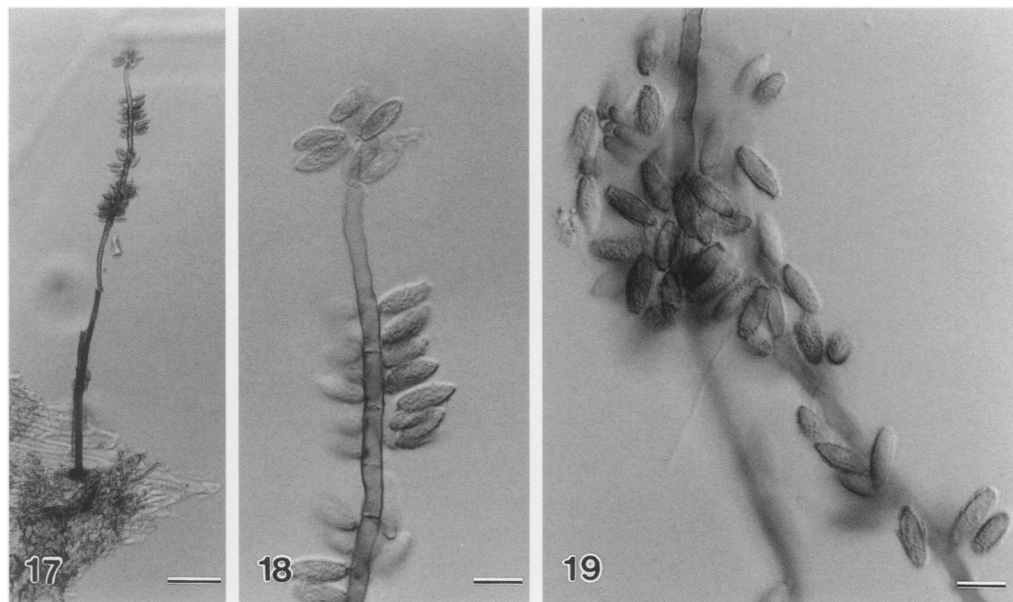
FIGS. 9–16. Schematic diagrams. 9–12. *Spadicoides hodgkissa*. 9. Colony on substratum. 10. Conidiophore. 11. Apex of conidiophores illustrating conidiogenous loci. 12. Conidia. 13–16. *S. arengae*. 13. Colony on substratum. 14. Conidiophore. 15. Apex of conidiophores illustrating conidiogenous loci. 16. Conidia. Scale bars: 9, 13 = 100  $\mu\text{m}$ , 10–12, 14–16 = 10  $\mu\text{m}$ .

*Etymology.* In reference to the host *Arenga undulatifolia*.

*Material examined.* BRUNEI DARUSSALAM. TEMBURONG: Batu Apoi Forest Reserve, The University of Brunei Darussalam Kuala Belalong Field Studies Centre (KBFSC), Baki Tributary, on decaying rachis of *Arenga undulatifolia*, 13 Dec 1998, Yanna (Yan75Ar, HOLOTYPE).

#### DISCUSSION

*Spadicoides* has been recently reviewed (Goh and Hyde 1996), where 31 species were discussed, of which 21 were accepted, 1 was transferred to *Hemicorynespora*, 6 were transferred to *Diplococcium*, 1 retained in its previous genus *Polytretophora*, and 2 remain doubtful. One new species and 1 variety were described thereafter, including *S. palmicola* Goh & K.



FIGS. 17–19. *Spadicoides arengae* (from HOLOTYPE). 17. Conidiophore attached to remains of substratum. 18. Apex of a conidiophore with conidia attached. 19. Conidia. Scale bars: 17 = 50  $\mu\text{m}$ , 18, 19 = 10  $\mu\text{m}$ .

D. Hyde and *S. obclavata* var. *heterocolorata* R. F. Castañeda, Guarro & Cano (Castañeda et al 1997, Goh and Hyde 1998). The later was elevated to species rank as *S. heterocolorata* (R. F. Castañeda, Guarro & Cano) Goh & K. D. Hyde (Goh and Hyde 1998).

*Spadicoides hodgkissa* is similar to *S. macrobovata* and *S. obovata* in producing 2-septate, obovoid conidia, and similar to *S. cordanoides*, *S. cubensis*, *S. curvularioides*, *S. heterocolorata*, *S. klotzschii*, *S. macrobovata*, *S. obclavata*, *S. obovata*, and *S. subramanianii* in producing versicolored conidia (Goh and Hyde 1996). *Spadicoides hodgkissa* is distinct in producing conidia, each with a proximal euseptum and a distal distoseptum. Other species of *Spadicoides* do not produce distoseptate conidia.

In *Spadicoides hodgkissa*, the distal distoseptum of conidia has a conspicuous central pore, surrounded by a pigmented ring (FIGS. 7, 8). Ho (1998) listed 46 mitosporic fungi producing conidia with pigmented ring at the central septal pore, including 30 producing distoseptate conidia and 16 producing euseptate conidia. *Janetia curviapicis* Goh & K. D. Hyde is similar to *Spadicoides hodgkissa* in producing conidia with both types of septa, and the pigmented rings are restrictively found on the distosepta (Goh and Hyde

1996). This pigmented ring can be a generic feature [e.g., all species of *Canalisporium* possess this structure (Goh et al 1998)], or a specific feature [e.g., only some species of *Digitodesmium* possess this structure (Ho et al 1999b)].

*Spadicoides arengae* resembles *S. verrucosa* in producing unicellular conidia with verruculose wall, but differs in conidial size (11–18  $\times$  4–6  $\mu\text{m}$  vs 4–5.5  $\times$  2–3  $\mu\text{m}$ ). *Spadicoides afzeliae*, *S. aggregata*, *S. carpatica*, *S. cordanoides*, *S. curvularioides*, and *S. palmicola* also produce conidia with verruculose wall, but all have septate conidia. *Spadicoides arengae* resembles *S. atra* in producing unicellular ellipsoidal conidia, but differs in conidial size and wall ornamentation (Goh and Hyde 1996, 1998).

Eight other genera also produce solitary conidia from polytretic conidiogenous cells with several conidiogenous loci in each of the conidiogenous cells (Hawksworth et al 1995). A key to these genera and *Spadicoides* is presented.

Isolation of *Spadicoides hodgkissa* and *S. arengae* on water agar was attempted using single spore isolation technique (Choi et al 1999). The conidia of both species did not germinate after one month. Their teleomorphs are not known.

#### KEY TO *SPADICOIDES*-LIKE GENERA

1. Conidiophores synnematos, conidia pigmented and distoseptate . . . . . *Dendrographium* (Ellis 1971)
1. Conidiophores mononematous, conidia hyaline or pigmented, euseptate or distoseptate . . . . . 2
  2. Conidiophores in fascicles, conidia pigmented and euseptate . . . . . *Luzfridiella* (Castañeda and Kendrick 1991)
  2. Conidiophores solitary, conidia hyaline or pigmented, euseptate or distoseptate . . . . . 3
3. Conidiophores micronematous, conidia pigmented and euseptate . . . . . *Polyschema* (Upadhyay 1966)
3. Conidiophores macronematous, conidia hyaline or pigmented, euseptate or distoseptate . . . . . 4

4. Conidia with curved, pigmented basal cells and cylindro-truncate, hyaline apical cells . . . . . *Polytretophora* (= *Parahelminthosporium*)(Mercado Sierra 1983) 5
4. Conidia not as mentioned . . . . . 5
5. Conidia hyaline, euseptate . . . . . *Paliphora* (Sivanesan and Sutton 1985) 6
5. Conidia pigmented, euseptate or distoseptate . . . . . 6
6. Conidia distoseptate . . . . . 7
6. Conidia euseptate and with or without distosepta . . . . . 8
7. Conidiophores unbranched, conidia obclavate or rostrate . . . . . *Helminthosporium*(= *Helmisporium*, *Mydonotrichum*, *Oxysporium*)(Ellis 1961) 8
7. Conidiophores branched at the apex, conidia V-shaped . . . . . *Weufia* (= *Granmamycetes*)(Bhat and Sutton 1985) 8
8. Conidia euseptate, conidiogenous loci cicatrized . . . . . *Porosubramaniana* (Holubová-Jechová 1985)
8. Conidia euseptate or with both eusepta and distosepta, conidiogenous loci not cicatrized . . . . . *Spadicoides* (Hughes 1958)

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