

Three new graminicolous species of *Curvularia* (anamorphic fungi) from Queensland, Australia

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Abstract. Three new species of *Curvularia*, *C. bothriochloae* sp. nov., *C. micrairae* sp. nov. and *C. queenslandica* sp. nov., isolated from grass hosts in Queensland are described, illustrated and compared with closely related species.

Introduction

About 38 graminicolous *Curvularia* species have been described (Sivanesan 1987; Morgan-Jones 1988; Boerema and Hamers 1989; Alcorn 1990, 1991, 1998). Eleven species among them are known to have conidia with a distinctly protuberant hilum (Sivanesan 1987). In this paper, one species with a distinctly protuberant hilum, another species with a slightly protuberant hilum and a third species with an inserted hilum could not be matched in conidial morphology, size and septation with any of the known species of *Curvularia*. Three new graminicolous species are described, illustrated and compared with species of similar conidial morphology.

Methods

Observations and measurements were made of fungal structures taken from dried cultures and mounted in lactophenol. Photomicrographs were taken with a digital camera (Leica DC 200 with IM 1000 Multifocus Module). Living cultures are deposited in the Plant Pathology Herbarium (BRIP), Queensland Department of Primary Industries.

Media and fungal growth conditions

Tap water agar (TWA) + wheat straw was used as a growth medium. Mature conidia were formed between 7 and 10 days when plates were exposed to a near-ultraviolet light source on 12 h diurnal cycle at room temperatures of 20–30°C.

Taxonomy

Curvularia bothriochloae Sivan., Alcorn & R.G.Shivas, sp. nov. (Fig. 1a, b)

Etymology: based on *Bothriochloa*, the name of the host genus.

Teleomorph: unknown.

Coloniae in agaro 'TWA + wheat straw' brunneae vel atrobrunneae, floccosae. Hyphae pallide brunneae, ramosae, septatae, laeves, usque ad 7.5 µm crassae. *Conidiophora* singularia, gregaria, simplicia, recta vel curvata, supra geniculata, septata, pallide brunnea vel brunnea, versus apicem pallidiora, variabilia amplitudine, 360–425 × 3–6 µm. *Cellulae conidiogenae* polyblasticae, sympodiales, in conidiophoris incorporatae, terminales, interdum intercalares, cicatricatae. *Conidia* acropleurogena, 3-septata, recta vel curvata, ad cellulam tertiam ab infimo paulo latiore, maiorem, cellulis extimis subhyalinis vel pallide brunneis, cellulis intermedii pallide brunneis vel atrobrunneis, 30–47 × 15–25 µm, hilo distincte protrudente ex cellula basilari, germinatio bipolaris.

Holotypus: Australia, Queensland, Goondiwindi, on leaves of *Bothriochloa bladhii* (Retz.) S.T.Blake, J.L. Alcorn 77135, 12.v.1977, BRIP12522.

Colonies in TWA + wheat straw brown to dark brown, floccose. Hyphae pale brown, branched, septate, smooth, up to 7.5 µm thick. *Conidiophores* single or grouped, unbranched, straight to flexuous, geniculate above, septate, pale brown to brown, apex paler, variable in length, 360–425 × 3–6 µm. *Conidiogenous cells* polyblastic, sympodial, terminal, sometimes intercalary, cicatrized. *Conidia* acropleurogenous, 3-septate, straight to curved at the slightly wider, larger third cell from the base, end cells subhyaline to pale brown, intermediate cells pale brown to dark brown, 30–47 × 15–25 µm, hilum distinctly protuberant from the basal cell. Germination of conidia is bipolar.

Other specimen examined: Australia, Qld, Yelarbon: isolated from leaves of *Dichanthium sericeum* (R.Br.) A.Camus, J.L. Alcorn 77125b, 11.v.1977, BRIP 12512.



Fig. 1. *Curvularia bothriochloae* (holotype). (a) Conidiophores, scale bar = 100 µm. (b) Conidia, scale bar = 10 µm.

Table 1. Comparison of conidial sizes in closely related *Curvularia* species

Species	Conidial size (µm)
<i>C. akaii</i>	24–34 × 8–14
<i>C. akaiiensis</i>	22.5–27.5 × 7.5–15.5
<i>C. bothriochloae</i>	30–47 × 15–25
<i>C. gudauskasii</i>	27–29 × 15–19

Notes

This species has conidia similar in shape and septation to those of *C. akaii* Tsuda & Ueyama (1985), *C. akaiiensis* Sivan. (1987) and *C. gudauskasii* Morgan-Jones & G.W.Karr (1976) but the conidia are significantly longer and wider than in these three species. Comparison of conidial measurements is given in Table 1. *C. akaii* and *C. akaiiensis* are also known to have a *Cochliobolus* teleomorph (Sivanesan 1987). *C. bothriochloae* is presumably heterothallic as no teleomorph was formed in single-spore cultures. Other *Curvularia* species reported on *Bothriochloa* and *Dichanthium*, respectively, are *C. andropogonis* (Zimm.) Boedijn and *C. robusta* Kilp. & Luttr. (Sivanesan 1987) and both these species have larger conidia than *C. bothriochloae*. *C. bothriochloae* is associated with leaf and leaf-sheath spotting on its hosts.

Curvularia micrairae Sivan., Alcorn & R.G.Shivas, sp. nov. (Fig. 2a, b)

Etymology: based on *Micraira*, the name of the host genus.

Teleomorph: unknown.

Coloniae in agar ‘TWA + wheat straw’ brunneae, floccosae. Hyphae pallide brunneae, ramosae, septatae, laeves, 4–7.5 µm crassae. *Conidiophora* singularia vel gregaria, interdum orientia a stromate parvo immerso, simplicia, recta vel curvata, supra geniculata, septata, pallide brunnea, variabilia longitudine, 220–500 × 9–15 µm. *Cellulae conidiogenae* polyblasticae, sympodiales, in conidiophoris incorporatae, terminales, interdum intercalares, cicatricatae. *Conidia* acropleurogena, recta, clavata, 3-septata, pallide brunnea, laevia praeter cellulam basalum quae est verruculosa, cellula tertia ab infimo paulo longior et latior quam cellulae ceterae, cellula apicalis apice complanata, concoloria, 34–38 × 13–17 µm. *Stromata* in cultura formata, atra, fere, cylindrica sed latitudine aliquantum irregularia, simplicia vel ramosa, usque ad 3200 µm alta × 380 µm, conidiophora et setas ferentia.

Holotypus: Australia, Queensland, Mount Ngungun National Park, on leaves of *Micraira subulifolia* F.Muell., J.L. Alcorn 9071, 19.v.1990, BRIP 17068a.



Fig. 2. *Curvularia micrairae* (holotype). (a) Conidiophore, scale bar = 100 µm. (b) Conidia, scale bar = 10 µm.

Colonies in TWA + wheat straw brown, floccose. Hyphae pale brown, branched, septate, smooth, 4–7.5 µm thick. *Conidiophores* single or in small groups, sometimes arising from a small immersed stroma, unbranched, straight to flexuous, geniculate above, pale brown, septate, variable in length, 220–500 × 9–15 µm. *Conidiogenous cells* polyblastic, sympodial, incorporated in the conidiophores, terminal, sometimes intercalary, cicatrized. *Conidia* acropleurogenous, 3-septate, straight, clavate, pale brown, concolorous, smooth except for the basal cell which is verruculose, 34–38 × 13–17 µm, third cell from the base slightly longer and wider than the other cells, apical cell with a flattened apex. *Stromata* formed in culture, black, more or less cylindrical, somewhat irregular in width, simple or branched, up to 3200 µm high × 380 µm wide, bearing conidiophores and setae.

Notes

This species resembles *C. clavata* Jain (Sivanesan 1987) in its clavate, 3-septate conidia but the conidia of *C. micrairae* are significantly larger than those of *C. clavata* that measure 17–29 × 7–13 µm. No species of *Curvularia* has been reported on *Micraira*. *C. micrairae* was associated with leaf tip dieback and leaf spot of *Micraira*. The species is presumably heterothallic as no teleomorph was formed in single-spore cultures.

Curvularia queenslandica Sivan., Alcorn & R.G.Shivas, sp. nov. (Fig. 3a–c)

Etymology: based on place of collection.

Teleomorph: unknown.

Coloniae in agar 'TWA + wheat straw' brunneae vel atrobrunneae, floccosae. Hyphae pallide brunneae, ramosae,

septatae, laeves, 2–4.5 µm crassae. *Conidiophora* singularia, simplicia, recta, supra geniculata, septata, brunnea vel atrobrunnea, concoloria, 94–200 × 7.5–9.5 µm. *Cellulae conidiogena*e polyblasticae, sympodiales, in conidiophoris incorporatae, terminales, interdum intercalares, cicatricatae. *Conidia* cylindrica vel cylindrico-fusiformia, acropleurogena, 4–6-septata, plerumque 5-septata, recta vel plerumque curvata ad plerumque cellulam tertiam ab infimo longiorem et latiore, fortasse haec cellula postea septum secundum pariet, aliae cellulae aequalis vel fere dense septatae, cellulis minoribus extremis atrobrunnea, concoloria, 50–78 × 11.5–21 µm. *Stromata* in cultura formata. Germinatio bipolaris.

Holotypus: Australia, Queensland, Severnlea, on leaves of *Eragrostis brownii* (Kunth) Nees ex Steud., *J.L. Alcorn 7737c*, 28.ii.1977, BRIP 12100.

Colonies in TWA + wheat straw brown to dark brown, floccose. Hyphae pale brown, branched, septate, smooth, 2–4.5 µm thick. *Conidiophores* single, unbranched, straight, geniculate above, septate, brown to dark brown, concolorous, 94–200 × 7.5–9.5 µm. *Conidiogenous cells* polyblastic, sympodial, incorporated in conidiophores, terminal, sometimes intercalary, cicatrized. *Conidia* cylindrical to cylindrical-fusiform, acropleurogenous, 4–6-septate, predominantly 5-septate, straight to mostly curved at the usually longer and wider third cell from the base and this cell may develop an additional septum later, other cells equal or fairly closely septate with smaller end cells, dark brown, concolorous, 50–78 × 11.5–21 µm, with a slightly protruding hilum. *Stromata* formed in culture. Germination of conidia is bipolar.

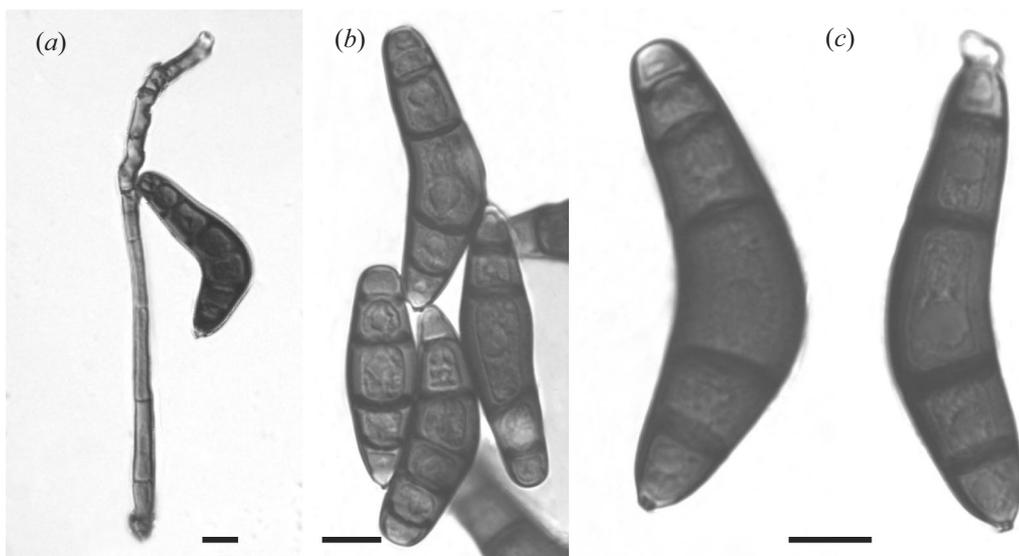


Fig. 3. *Curvularia queenslandica* (holotype). (a) Conidiophore and conidium, scale bar = 10 µm. (b, c) Conidia, scale bar = 10 µm.

Notes

In the number of septa in the conidia, this species is close to *C. inaequalis* (Shear) Boedijn and *C. oryzae-sativae* Sivan. (Sivanesan 1987). The conidia of *C. inaequalis* are 2–6-septate, predominantly 4-septate and measure 24–45 × 9–16 µm and in *C. oryzae-sativae* they are 3–8 (mostly 6–7)-septate and measure 22–40 × 9–11.5 µm. The hilum is not protuberant in *C. inaequalis* and is only slightly protuberant in *C. oryzae-sativae*. *C. queenslandica* is easily separable from these two species by its significantly longer and wider conidia. *C. eragrostidis* (Henn.) J.A.Meyer and *C. lunata* (Wakker) Boedijn are two other *Curvularia* species reported on *Eragrostis*. *C. queenslandica* is associated with leaf spots. This species is presumably heterothallic as no teleomorph was formed in single-spore cultures.

References

- Alcorn JL (1990) Additions to *Bipolaris*, *Cochliobolus* and *Curvularia*. *Mycotaxon* **39**, 361–392.
- Alcorn JL (1991) New combinations and synonymy in *Bipolaris* and *Curvularia*, and a new species of *Exserohilum*. *Mycotaxon* **41**, 329–343.
- Alcorn JL (1998) A new *Cochliobolus* species and its *Curvularia* anamorph. *Proceedings of the Royal Society of Queensland* **107**, 1–4.
- Boerema GH, Hamers MEC (1989) Check-list for scientific names of common parasitic fungi. Series 3b: fungi on bulbs: Amaryllidaceae and Iridaceae. *Netherlands Journal of Plant Pathology* **95** (Supplement 3), 1–32.
- Morgan-Jones G (1988) Notes on hyphomycetes LXI. *Curvularia bannonii* sp. nov., an undescribed leaf pathogen of *Jacquemontia tannifolia*. *Mycotaxon* **33**, 407–412.
- Morgan-Jones G, Karr Jr GW (1976) Notes on hyphomycetes. IX. A new species of *Curvularia*. *Mycotaxon* **3**, 559–563.
- Sivanesan A (1987) Graminicolous species of *Bipolaris*, *Curvularia*, *Drechslera*, *Exserohilum* and their teleomorphs. *Mycological Papers* **158**, 1–261.
- Tsuda M, Ueyama A (1985) Two new *Pseudocochliobolus* and a new species of *Curvularia*. *Transactions of the Mycological Society of Japan* **26**, 321–330.

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