
Gnomoniopsis smithogilvyi

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Gnomoniopsis smithogilvyi L.A. Shuttleworth, E.C.Y. Liew & D.I. Guest, *sp. nov.*

Etymology. Named after New Zealand Plant Pathologist, Dr Harvey Smith, and the Australian chestnut grower, David Ogilvy, for their contribution to our understanding of the pathogen, and its epidemiology (Ogilvy 1998, Smith & Ogilvy 2008).

Diseased kernels with pale, medium and dark brown lesions occurring on endosperm and embryo of the chestnut. Lesions occur as spotting, or with a clear margin at the stylar end, hilum end, sides of the kernel, or a combination of these. Perithecia in Australia occur on overwintered dead burrs and branches of *Castanea sativa* and *C. crenata* × *C. sativa* hybrids. They are observed on chestnut varieties Decoppi Marone, Purton's Pride and Red Spanish. *Perithecia* abundant, without stroma, semi or fully immersed in host tissue, solitary or in groups up to 25, black, globose to subglobose, mostly convex when dry, sometimes concave at sides or apex, (101.5–)238.7(–409.5) µm high (SD = 55, n = 60), (96.5–)242(–410.5) µm diam (SD = 60, n = 68); solitary neck, central, straight or curved, sometimes flexuous, shorter or longer than perithecial diameter, apex sometimes translucent, necks sometimes absent, (113–)223(–399) µm long (SD = 70.5, n = 69), (18.5–)38.5(–55) µm diam at base (SD = 6.5, n = 62), (19.5–)30.5(–56.5) µm diam at apex (SD = 5.2, n = 101). *Asci* hyaline, unitunicate, inoperculate, obovoid to cylindrical, (20.5–)31(–37.5) µm long (SD = 3.5, n = 79), (4–)5(–6.5) µm diam (SD = 0.5, n = 79), with visible apical ring 1–2 µm wide, containing eight, biseriate ascospores. *Ascospores* hyaline, 1-septate, pyriform, straight or slightly curved, ends rounded, broader at distal end, (4–)7(–12) µm long (SD = 1.5, n = 101), (1–)2(–3) µm diam (SD = 0.5, n = 101), length-to-width ratio (l : w) = 3.5, medianly 1-septate, constricted at septum; distal cell with 2–multiple guttules, and basal cell with 1–multiple guttules, appendages absent. Germinating ascospores produced the anamorph in culture.

Anamorph culture characters fast growing, attaining 85 mm after 8–13 d at 25 °C (mean 11 d, n = 3). *Mycelia* flat and transparent on malt extract agar (MEA), woolly to felty and dense on malt yeast agar (MYA) and potato-dextrose agar (PDA), margins diffuse to irregular on MEA, regular on MYA and PDA, developing in concentric circles particularly on MYA and PDA, colour on MEA bronze (5E5) (Kornerup & Wanscher 1978), on MYA grey (5B1) and beaver (5F4), on PDA grey (5B1) and hair brown (5E4). Reverse colours similar to surface. *Conidiomata* produced in all cultures, abundant, black to brownish grey (7F2), globose to subglobose, both erumpent and immersed in media oozing conidia of varying colours. On MEA (69–)245.5(–449.5) µm high (SD = 99, n = 30), (67.5–)255(–477.5) µm wide (SD = 105, n = 30), height-to-width ratio (h : w) = 1, with greyish orange (5B3) conidia. On MYA conidiomata (102–)288.5 (–535.5) µm high (SD = 124.5, n = 30), (108.5–)305.5(–616.5) µm wide (SD = 152, n = 30), h : w = 1, with light orange (6A4) conidia. On PDA conidiomata (84.5–)203.5(–488.5) µm high (SD = 90.5, n = 30), (69.5–)217.5(–471) µm wide (SD = 93.5, n = 30), h : w = 1, with pale orange (6A3) conidia. *Conidia* hyaline, oval, obovoid, fusoid, pyriform, straight or curved, allantoid, multi-guttulate, without appendages, on MEA (6–)8(–9.5) µm long (SD = 0.5, n = 76), (2–)2.5(–4) µm wide (SD = 0.4, n = 76), l : w = 3, on MYA (5.5–)6.5(–7.5) µm long (SD = 0.5, n = 76), (2–)3(–3.5) µm wide (SD = 0.5, n = 76), l : w = 2.5, on PDA (6.5–)7.5(–9.5) µm long (SD = 0.5, n = 76), (2–)3(–4) µm wide (SD = 0.5, n = 76), l : w = 2.5.

Typus. Australia, New South Wales, Mullion Creek, 'Brittle Jacks' chestnut orchard, as a saprobe on dead burrs of *Castanea* sp., Dec. 2009, *L.A. Shuttleworth*, holotype CBS H-20623, isotype RBG 5586; ex-type culture CBS 130190 = RBG 5585, β-tubulin sequence GenBank JQ910639, ITS sequence GenBank JQ910642, LSU sequence GenBank JX069842, rpb2 sequence GenBank JQ910648, and tef1-α sequence GenBank JQ910645, MycoBank MB800259.

Notes — *Gnomoniopsis smithogilvyi* overwinters in its teleomorph form as a saprobe on dead burrs and branches of *Castanea* sp. (*Fagaceae*), and is isolated from rotten chestnut kernels, or as an endophyte from asymptomatic flowers, leaves and stems (Shuttleworth 2012). Species of *Gnomoniopsis* on *Castanea* are documented as endophytes and associated with rotten chestnuts and chestnut galls in Italy (Gentile et al. 2009, Tamietti et al. 2009, Magro et al. 2010, Vettraino et al. 2011), are documented in New Zealand (Sogonov et al. 2008), and have been isolated from chestnut blight cankers in India (Dar & Rai 2011). Multi-gene phylogenetic analyses using β-tubulin, ITS, rpb2 and tef1-α genes showed *G. smithogilvyi* is most closely related to *G. clavulata* (CBS 121255) and *G. paraclavulata* (CBS 123202) (Shuttleworth 2012). Key morphological differences between *G. smithogilvyi* and the other two species include the aggregation of perithecia in host tissue (*G. smithogilvyi* are single or in groups up to 25, *G. clavulata* and *G. paraclavulata* are recorded as single (Sogonov et al. 2008)), perithecia of *G. smithogilvyi* are larger (mean) height and width than the other two species and perithecia of *G. smithogilvyi* have longer necks, ascospores of *G. smithogilvyi* are smaller than the other two species and the position of the septum in the ascospores is different (*G. smithogilvyi* has a median septum, *G. clavulata* has a submedian septum (36 % of ascospore length), *G. paraclavulata* has a submedian septum (40 % of ascospore length); Walker et al. 2010). The three species share the same host range, occurring on members of *Fagaceae*. To date *G. clavulata* has been recorded on *Fagus sylvatica*, *Quercus* spp. (*Q. ilicifolia, Q. falcata, Q. marilandica, Q. nigra, Q. prinus, Q. rubra*) (Sogonov et al. 2008, Walker et al. 2010), *G. paraclavulata* has been recorded on *Q. alba* (Sogonov et al. 2008), and *G. smithogilvyi* has been recorded on *Castanea* sp., *C. sativa,* and *Q. ilex* (Sogonov et al. 2008, Shuttleworth 2012). Phylogenetic analysis of the ITS region grouped Australian ascospore isolates, chestnut rot isolates, and endophyte isolates in the same node as isolates from India, Italy, and New Zealand with 100 % maximum parsimony bootstrap and 1.00 Bayesian posterior probability. This indicates that species of *Gnomoniopsis* are present in these countries, and that *G. smithogilvyi* is likely one of them.

Colour illustrations. Chestnut orchard photo, Australia, Victoria, Benambra. Micrographs (top to bottom), dead burr; chestnut kernel with chestnut rot symptoms, perithecia immersed and erumpent in burr tissue; asci containing ascospores; anamorph culture isolate on PDA. Scale bars: 200, 10, 500 µm. All images L.A. Shuttleworth.

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