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Valsaria and the *Valsariales*

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Abstract

More than 100 recent collections of *Valsaria sensu lato* mostly from Europe were used to elucidate the species composition within the genus. Multigene phylogeny based on SSU, LSU, ITS, *rpb2* and *tef1* sequences revealed a monophyletic group of ten species within the *Dothideomycetes*, belonging to three morphologically similar genera. This group could not be accommodated in any known family and are thus classified in the new family *Valsariaceae* and the new order *Valsariales.* The genus *Valsaria sensu stricto* comprises *V. insitiva*, *V. robiniae*, *V. rudis*, *V. spartii*, *V. lopadostomoides* sp. nov. and *V. neotropica* sp. nov., which are phylogenetically well-defined, but morphologically nearly indistinguishable species. The new monotypic genus *Bambusaria* is introduced to accommodate *Valsaria bambusae. Munkovalsaria rubra* and *Valsaria fulvopruinata* are combined in *Myrmaecium*, a genus traditionally treated as a synonym of *Valsaria*, which comprises three species, with *M. rubricosum* as its generic type. This work is presented as a basis for additional species to be detected in future.

Keywords

Ascomycota; *Dothideomycetes*; Multigene phylogenetic analysis; Pyrenomycetes

Introduction

Little has been published about the genus *Valsaria* apart from the protologues of numerous species epithets and some collection records. Ju et al. (1996) examined numerous specimens and synonymized most names with the type species *V. insitiva*. They sketched the taxonomic history of the genus and accepted and provided a key to four species. Included were species of *Myrmaecium* Fuckel, which had been traditionally treated as a synonym of *Valsaria.* The taxonomic position of *Valsaria* had been controversial. The majority of fungal taxonomists agreed that the hamathecium consists of true, apically free paraphyses, a true ascomatal wall

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distinct from the surrounding pseudostroma and unitunicate asci (see e.g. Barr 1978, 1990; Glawe 1985; Huhndorf 1992), and Kirk et al. (2008) listed the genus as belonging in *Diaporthales* (*Sordariomycetes*). Among others Ju et al. (1996) recognized that the asci of *Valsaria*, although not obviously fissitunicate, are bitunicate and therefore considered *Valsaria* among the *Dothideomycetes* (as Loculoascomycetes). The combination of the above mentioned characters is however not known in any group of this class (Hyde et al. 2013).

Ju et al. (1996) described the asexual morph of *V. bambusae*. A detailed study of asexual morphs of a *Valsaria* from *Gleditsia* (identified as *V. insitiva* by the author but probably a different species as judged from the fabaceous host and the rather small ascospore size) was presented by Glawe (1985). He determined that *Valsaria* produces four asexual morphs, 1) yeast-like, conidia produced by budding of ascospores and conidia, 2) hyphomycetous, conidia produced from percurrently proliferating conidiogenous loci, 3) arthrospores, produced by disarticulation of hyphae and 4) pycnidial, with phialidic conidiogenesis. He compared the hyphomycetous state with genera such as *Aureobasidium*, *Candida* and *Exophiala*, while Ju et al. (1996) interpreted it as hormonema-like. Glawe (1985) confirmed Wehmeyer’s (1923) view that the pycnidial state, characterized by multiloculate conidiomata, phialidic conidiogenous cells and hyaline and oval conidia, can be ascribed to *Cytosporella*.

In this study, we investigated the species diversity of *Valsaria sensu lato* in Europe, augmented with isolates obtained from some specimens collected on other continents. Phylogenetic relationships of the three resulting genera are determined, confirming the taxonomic placement in the class *Dothideomycetes* as had been suggested by Ju et al. (1996). A new family and order are introduced to accommodate valsaria-like taxa which comprise fungi with a unique set of morphological characters.

Materials and methods

Isolates and specimens

Isolates used in this study originated from single ascospores, rarely conidia of fresh specimens or older specimens, which still contained living ascospores. Strain numbers and NCBI GenBank accession numbers of gene sequences used to compute the phylogenetic trees are listed in Table 1. Strain acronyms starting with V are used here for both specimens and strains. Representative isolates have been deposited at the CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands (CBS) or the culture collection of Mae Fah Luang University (MFLUCC). Details of the specimens used for morphological studies are listed in the Taxonomy section under the respective descriptions. Herbarium or fungarium acronyms are according to Thiers (2014). Freshly collected specimens have been deposited in the Herbarium of the Institute of Botany, University of Vienna (WU) or the Mae Fah Luang University Herbarium (MFLU). Other specimens are housed in private fungaria; specimens labelled with JF in the fungarium of J. Fournier, those with JDR in the fungarium of J. D. Rogers; those with W.J. have been incorporated in WU.

Culture preparation, growth rate determination and phenotype analysis

Cultures were prepared and maintained as described previously (Jaklitsch et al. 2014; Chomnunti et al. 2014). For determination of growth rates and asexual morph morphology in culture, 90 mm diam Petri dishes containing MEA (2% w/v malt extract, 2 % w/v agar-agar; Merck, Darmstadt, Germany), were centrally inoculated and incubated at 22–25 °C under alternating 12 h cool daylight and 12 h darkness. For inoculations strains were reconstituted from −80 °C, thus fresh cultures may grow faster than given in the species descriptions. Microscopic observations were made in de-ionised water or 3% KOH, asexual morphic data generally determined in 3 % KOH; Congo Red and blue Waterman ink (Fig. 9k) were used for staining of ascal apical rings. Morphological analyses of microscopic characters were carried out as described earlier (Jaklitsch 2009). Data were gathered using a Nikon Coolpix 995, Coolpix 4500, Nikon DS-U2 or Canon 550D digital camera and measured by using the NIS Elements D v. 3.0 software or the Tarosoft (R) Image Frame Work program. Methods of microscopy included stereomicroscopy using an Olympus SZ 60, Nikon SMZ 1500 or Zeiss Stereo Discovery V8 and Nomarski differential interference contrast (DIC) using the compound microscope Nikon Eclipse E600 or Nikon Eclipse 80i. For certain images of stromata the stacking software Zerene Stacker version 1.04 (Zerene Systems LLC, Richland, WA, USA) was used. Measurements are reported as maxima and minima in parentheses and the mean plus and minus the standard deviation of a number of measurements given in parentheses. The colour term rosy denotes a range of pale pinkish colours. Substellate and inversely stellate as used in the description of ectostromatic structures are deviations from star-shaped; inversely stellate is equivalent to the shape of a circular cake radially cut into slices, i.e. the slices become broader with distance from the centre.

DNA extraction and sequencing methods

The extraction of genomic DNA was performed as reported previously (Voglmayr and Jaklitsch 2011; Jaklitsch et al. 2012) using the DNeasy Plant Mini Kit (QIAgen GmbH, Hilden, Germany), the Biospin Fungus Genomic DNA Extraction Kit (BioFlux®) or the modified CTAB method of Riethmüller et al. (2002). Five loci were amplified and sequenced: the complete internally transcribed spacer region (ITS1-5.8S-ITS2) and a ca. 0.9–1.3 kb fragment of the large subunit nuclear ribosomal DNA (nuLSU rDNA), amplified and sequenced as a single fragment with primers V9G (de Hoog and Gerrits van den Ende 1998) and LR5 (Vilgalys and Hester 1990), or as two separate fragments with primers ITS5 and ITS4 (White et al. 1990), and LROR (Vilgalys and Hester 1990) and LR5; a ca. 1.7–3.2 or 1.1 kb fragment of the small subunit nuclear ribosomal DNA (nSSU rDNA), amplified and sequenced with primers SL1 (Landvik et al. 1997) and NS24mod (Voglmayr and Jaklitsch 2011) or NS1 and NS4 (White et al. 1990), a ca. 1.2 kb fragment of the RNA polymerase II subunit 2 (*rpb2*) with primers fRPB2-5f and fRPB2-7cr (Liu et al. 1999); and a ca. 1.3 kb fragment of the translation elongation factor 1-alpha (*tef1*) with primers EF1-728F (Carbone and Kohn 1999) and TEF1LLErev (Jaklitsch et al. 2005). PCR products were purified using an enzymatic PCR cleanup (Werle et al. 1994) as described in Voglmayr and Jaklitsch (2008). DNA was cycle-sequenced using the ABI PRISM Big Dye Terminator Cycle Sequencing Ready Reaction Kit v. 3.1 (Applied Biosystems, Warrington, U.K.) with the same primers as in PCR and an automated DNA sequencer (3730xl Genetic Analyzer, Applied Biosystems); in addition, internal primers ITS4 and LR3 (Vilgalys and Hester 1990) were used for sequencing the partial nuSSU–complete ITS–partial nuLSU rDNA region, and nssu1088 and nssu1088R (Kauff and Lutzoni 2002) for sequencing of the nuSSU rDNA region.

Analysis of sequence data

All alignments were produced with the server version of MAFFT (www.ebi.ac.uk/Tools/mafft), checked and refined using BioEdit version v. 7.0.4.1 (Hall 1999). To investigate the phylogenetic relationships of *Valsaria* spp. within the *Ascomycota*, in particular the previously assumed affiliation with the *Diaporthales*, nuLSU rDNA sequences of all species sequenced in the present study were alignend with those of selected *Sordariomycetes* (from *Calosphaeriales, Diaporthales* and *Xylariales*) and *Dothideomycetes* (representatives from all orders recognised by Hyde et al. 2013 and Wijayawardene et al. 2014), resulting in a matrix of 1344 nucleotide positions. Subsequently, to reveal the phylogenetic position within *Dothideomycetes*, sequences of one representative isolate for each *Valsariaceae* species sequenced in the current study were aligned to the combined multigene (LSU, SSU, *rpb2, tef1*) matrix of Hyde et al. (2013). The resulting combined four-gene sequence matrix contained 424 taxa and 4645 alignment positions (1428, 1101, 1154 and 962 characters from LSU, SSU, *rpb2* and *tef1*, respectively). *Schismatomma decolorans* (*Roccellaceae, Arthoniomycetes*) was selected as outgroup taxon as in Hyde et al. (2013). For the detailed investigation of phylogenetic relationships between the species of *Bambusaria, Myrmaecium* and *Valsaria*, a combined four-gene matrix of ITS, LSU, *rpb2* and *tef1* was produced and analysed. *Bambusaria bambusae* was selected as outgroup according to the results of the LSU tree. The resulting combined sequence matrix contained 4466 alignment positions (2018 from ITS-LSU, 1207 from *rpb2* and 1241 from *tef1*).

Maximum parsimony (MP) analysis of the LSU matrix was performed with PAUP v. 4.0 b10 (Swofford 2002), using 1000 replicates of heuristic search with random addition of sequences and subsequent TBR branch swapping (MULTREES option in effect, steepest descent option not in effect). All molecular characters were unordered and given equal weight; analyses were performed with gaps treated as missing data. The COLLAPSE command was set to MINBRLEN. For the phylogenetic analysis of the combined matrix of *Dothideomycetes* and *Valsariaceae*, a parsimony ratchet approach was implemented. For this, ratchet nexus files were produced using PRAP 2.0b3 (Müller 2004), with the following settings: 1000 ratchet replicates, weight 2 and 25 % weighted characters. Subsequently, the matrices were analysed with PAUP. For the analysis of *Valsariaceae*, the resulting best trees were then reloaded into PAUP and used as starting trees for further tree search with TBR branch swapping and the same settings given above. For all three matrices, bootstrap analyses with 1000 replicates were performed in the same way, but using 5 rounds of random sequence addition and subsequent branch swapping during each bootstrap replicate; in addition, each replicate was limited to 1 million rearrangements.

Maximum likelihood (ML) analyses were performed with RAxML (Stamatakis 2006) as implemented in raxmlGUI 1.3 (Silvestro and Michalak 2012), using the ML+rapid bootstrap setting and the GTRGAMMA substitution model with 1000 bootstrap replicates. For the combined analyses, substitution model parameters were calculated separately for the different gene regions.

Results

Molecular phylogeny

All phylogenetic analyses support the *Valsariales* as a monophylum within *Dothideomycetes*, but the closest relatives of the order could not be revealed due to lack of backbone support. Highly supported is also the split of *Valsaria* into three distinct genera (*Bambusaria*, *Myrmaecium* and *Valsaria*), as well as the placement of *Munkovalsaria rubra* within *Myrmaecium.*

Of the 1344 characters of the LSU matrix, 424 were parsimony informative. MP analyses revealed three MP trees with a score of 2484, one of which is shown as Fig. 1. The three MP trees differed slightly in the positions of *Myrmaecium rubrum* and *Valsaria neotropica.* The phylogenetic analyses placed *Valsariaceae* within *Dothideomycetes* with maximum support. Within *Valsariaceae* three genera, *Bambusaria, Myrmaecium* and *Valsaria*, are highly supported, but the sister group relationship of *Bambusaria* to the other two genera receives only medium (MP) or no (ML) bootstrap support.

Of the 4645 characters included in the combined four-gene matrix of *Dothideomycetes*, 2345 were parsimony informative. The parsimony ratchet revealed 82 trees of score 40833 (not shown). Figure 2 shows the best tree (lnL = –180369.8567) revealed by RAxML; to enable an easier overview, all lineages except *Valsariales* were collapsed to ordinal level; for details on the various orders see Hyde et al. (2013). The status of *Valsariales* as a distinct order is highly supported. Within the *Valsariaceae* clade, the three genera *Bambusaria, Myrmaecium* and *Valsaria* are again highly supported, but *Bambusaria* does not occupy a basal position. However, in the MP trees obtained by the parsimony ratchet, *Bambusaria* is placed in a basal position as in the LSU analysis with 76 % MP bootstrap support (data not shown).

Of the 4466 characters included in the combined matrix of *Valsariaceae*, 1110 were parsimony informative. MP heuristic search on the 96 best trees obtained in the parsimony ratchet analysis revealed 1022 MP trees with a score of 2362, one of which is shown as Fig. 3. All MP trees were identical except for minor topological differences within the same species (data not shown). The three genera *Bambusaria, Myrmaecium* and *Valsaria* as well as the various species received maximum support, except for *V. spartii* which receives maximum support in ML but medium support (79 %) in MP analyses. Within *Valsaria*, six genetically distinct species were revealed, which all would have previously been classified as *V. insitiva*. Remarkably, within *V. spartii* two highly supported subclades were present. It is notable that in all accessions of *V. lopadostomoides, V. robiniae* and *V. spartii* sequenced, except one (V26) of *V. spartii*, a homologous species-specific insertion of ca. 400 bp was present at the 3’ end of the LSU fragment. In *V. spartii* two distinct alleles of this insertion were present according to the two subclades of the phylogenetic analyses (Fig. 3).

Phenotype, cultures

Detailed descriptions of sexual morphs, cultures and asexual morphs are given for each genus and species in the Taxonomy section. Besides molecular data there are hardly any useful morphological characters for species distinction within *Valsaria*, but macroscopic appearance of cultures (Fig. 4) and growth rates are however more or less diagnostic, although in some instances predominantly conidia are formed by budding of ascospores, with little hyphal growth, which ceases quickly. Differences in culture appearance involve colour, abundance and organization of aerial hyphae and zonation, but also secondary changes due to the formation of pycnidia. In species of *Myrmaecium* the mycelium covers a centrally inoculated 90 mm Petri dish at room temperature within a week, *Bambusaria* grows only slightly slower. In contrast, growth in *Valsaria* is considerably slower, ranging from 3 mm colony radius in *V. rudis* to 20 mm in *V. robiniae* and *V. neotropica* after a week. The most closely related species can also be distinguished by the amount of arthroconidia formed, being inconspicuous in *V. robiniae* and abundant in *V. spartii*.

Ecology and distribution

Stromata of *Valsariaceae* generally occur in little to moderately decayed bark. In Europe, the only continent where we collected specimens extensively, species of *Valsaria* occur in warmer regions, predominantly in Southern Europe, particularly the (Sub-)Mediterranean. The dominant and common species of the Mediterranean is *V. spartii*; other species such as *V. insitiva, V. lopadostomoides, V. robiniae* and *V. rudis* are uncommon or rare in this region. In other European regions the genus occurs in areas favoured by a warm climate such as wine-growing areas or regions influenced by the Gulf Stream, as 10 records (possibly including *Myrmaecium*) are evidenced in the Checklist of the British Mycological Society (FRDBI 2015). Although infrequently, it occurs also in southern Sweden (Eriksson 2014). The genus is absent or rare in areas with severe winters. This may be extrapolated to other continents: Schweinitz (1822) already described taxa of *Valsaria* in North America, and Ellis and Everhart (1892) listed 23 species. Barr et al. (1996) gave an account of taxa described by J. B. Ellis and detected additional names that belong to *Valsaria* or *Myrmaecium. Valsaria* appears to be uncommon or understudied in tropical regions. *Bambusaria bambusae*, as described below, is host-specific for *Bambusoideae* and is presently only known from India and Thailand. Members of the genus *Myrmaecium* have a worldwide distribution and typically occur on sun-exposed, corticated logs and branches of coniferous and broadleaf trees.

Taxonomy

Valsariales Jaklitsch, K.D. Hyde & Voglmayr, ***ord. nov.***

MycoBank MB 811900

Type family: *Valsariaceae* Jaklitsch, K.D. Hyde & Voglmayr

Saprobic in bark or on culms of bamboo. *Sexual morph: Ascomata* perithecioid, immersed in eu- or pseudostromata. *Ostiole* periphysate. *Hamathecium* of true paraphyses. *Asci* bitunicate, usually without obvious fissitunicate dehiscence. *Ascospores* dark brown, bicellular, budding in artificial culture. *Asexual morphs* in nature coelomycetous, in culture hyphomycetous and/or coelomycetous.

Valsariaceae Jaklitsch, K.D. Hyde & Voglmayr, ***fam. nov.***

MycoBank MB 811901

Type genus: *Valsaria* Ces. & De Not.

Saprobic in bark or on culms of bamboo. *Sexual morph*: *Ascomata* perithecioid, clustered, immersed in immersed, erumpent to superficial eu- or pseudostromata, usually monostichous in valsoid or diatrypoid configuration, upright or oblique, with several ostiolar necks fusing into one. *Ostiole* periphysate. *Hamathecium* of true, apically free paraphyses. *Asci* cylindrical, bitunicate, usually without obvious fissitunicate dehiscence, (4–)6–8-spored, with short pedicel and an inconspicuous non-amyloid apical ring often staining in Congo Red, persistently attached to the ascogenous hyphae at maturity. *Ascospores* ellipsoid to subfusiform, dark brown, 2-celled, with a dark, usually non-constricted or scarcely constricted septum, budding in artificial culture, with surface ornamentation. *Asexual morphs* in nature coelomycetous, in culture hyphomycetous or coelomycetous. *Conidia* produced on phialides, minute pegs or by budding of ascospores and conidia, 1-celled, hyaline, smooth.

Valsaria Ces. & De Not., Comm. Soc. crittog. Ital. 1: 205 (1863).

Type species: *Valsaria insitiva* (Tode : Fr.) Ces. & De Not.

Sexual morph: *Stromata* pseudostromatic, immersed-erumpent from bark to superficial on wood, scattered or gregarious to coalescing into variable clusters; pustular, broadly conical or subglobose; enclosed on top and/or at the sides by a black pseudoparenchymatous crust spreading around the base and blackening the wood surface between adjacent stromata. Stroma surface usually irregularly tubercular, sometimes cerebriform. *Ectostroma* frequently forming substellate or inversely stellate structures around the inconspicuous ostiolar openings, consisting of 3–5 greyish, olivaceous brown to dull black, sharply delimited tubercular segments with a depressed centre; sometimes reduced or absent and replaced by a smooth cupulate surface partly roughened by the ostiolar papillae; the tissue just beneath the black crust pseudoparenchymatous, a soft greyish to brown *textura angularis* of small and thin-walled cells; the tissue between ostiolar necks and at the stromatal base prosenchymatous, grey, soft, forming a *textura intricata* of hyaline to subhyaline, 2–4 μm wide hyphae, often mixed with bark cells; tissue between ascomata typically absent. *Ascomata* monostichously arranged in valsoid configuration, 4–12(–20) per individual cluster, vertically to obliquely arranged, subglobose to flask-shaped, typically laterally collapsed when dry; peridium 14–25 μm thick, consisting of pale brown flattened cells, turning darker towards the outside. *Ostiolar necks* long, cylindrical, converging and often fusing, i.e. ostiolar opening at the surface eventually containing necks of 1–3(–5) ascomata; ostiolar wall of pale brown, small, thin to moderately thick-walled angular cells; interior densely periphysate. *Ostiolar openings* usually inconspicuous at the surface, less commonly necks arising as stout but fragile, conical, more or less sulcate, shiny black columns.

Paraphyses numerous, simple, unbranched, tapering upwards, apically free, 1.5–6 μm wide. *Asci* bitunicate but without obvious fissitunicate dehiscence, cylindrical, containing (4–)6–8 uniseriate ascospores; with a short pedicel and a thick apex containing an ocular chamber and a more or less pulvinate ring staining in Congo Red. *Ascospores* ellipsoid, dark brown, 2-celled, with a dark central, non-constricted to distinctly constricted septum thicker than the wall; with finely tuberculate, dotted or reticulate surface ornamentation.

Asexual morph on natural substrates: when present, interpretable as multiloculate pycnidia.

Locules present at upper levels of young sexual stromata, or stromata exclusively containing irregularly arranged locules or meandering paths. Walls of locules lined by dense palisades of phialides in variable whorls on short cylindrical, few-celled hyaline conidiophores. *Phialides* lageniform to cylindrical, straight to sinuous, often inequilateral; conidia also formed on aphanophialides (lateral pegs on or below phialides producing conidia). Conidia numerous, oblong, allantoid, ellipsoid or bullet-shaped, rarely subglobose, 1-celled, hyaline, smooth, with inconspicuous guttules and indistinct or truncate scar.

Cultures and asexual morphs: Ascospores germinating within 24 h with germ tubes and budding, producing conidia. Growth on MEA slow, agar of a centrally inoculated 90 mm Petri dish becoming entirely covered after (2–)3–4 weeks or growth ceasing before this period. *Conidiation* effuse. Conidia forming by budding of ascospores and conidia, and on minute pegs, more rarely solitary phialides produced by fertile, cylindrical or botryose, sparingly branched hyphae not differentiated as well-defined conidiophores. *Conidia* very variable in size and shape, 1-celled, hyaline, often truncate at the lower end, smooth, with minute guttules, budding. *Arthroconidia* when formed, produced by disarticulation of more or less botryose hyphae, cylindrical to subglobose, 1–3-celled, smooth, hyaline, with numerous guttules. *Pycnidia* when present usually formed after ca. 2 weeks, more or less immersed in the agar to erumpent, solitary or grouped, globose or conical, variably covered by white or brownish mycelium, black, firm, multiloculate, with a pseudoparenchymatous peridium of large, thick-walled, more or less globose, olive cells. Phialides lining the inner side of the pycnidial wall, densely packed in variable whorls in palisades on short cylindrical, slightly inflated, 1–3 celled, hyaline conidiophores and on peridial cells. *Phialides* lageniform, cylindrical or conical, straight, curved or sigmoid, hyaline, often with a broad collarette. *Conidia* 1-celled, emitted in hyaline, pale pinkish, pale brownish or olive drops, minute, oblong, bullet-shaped to ellipsoid, sometimes subglobose, hyaline, smooth, often with truncate scar and small guttules.

Notes: The inversely stellate ectostromatic structure seems to be specific for *Valsaria* and other relatives in the family *Valsariaceae*. In *Valsaria* the ascomata are more or less basal and usually little hypostroma is present below them. Asci are usually 6–8 spored, 4-spored asci occur in incompletely developed ascomata. The ascal apical ring is usually invisible in KOH, and in Congo Red after KOH-treatment it often does not become pigmented or it becomes pigmented but often also strongly enlarged vertically. Ascospores may often become distorted and swollen in 3 % KOH. In some isolates predominantly budding conidia are formed and hyphal growth is much reduced and soon ceases.

Valsaria insitiva (Tode : Fr.) Ces. & De Not., Comm. Soc. crittog. Ital. 1: 205 (1863). (Figs. 4 a, i, 5, 6 a–o)

Basionym: *Sphaeria insitiva* Tode , Fung. Mecklenb. sel. 2: 36 (1791); Tode : Fr., Syst. Mycol. II: 366 (1823)

Synonyms: see Discussion.

Facesoffungi number: 00607

Sexual morph: *Stromata* pseudostromatic, immersed-erumpent, mostly gregarious to coalescing into clusters ranging from narrowly elongate and up to 13×2.5 mm to irregularly shaped and up to 15×8 mm; pustular, lenticular to broadly conical or subglobose with flattened base, (0.3–)0.7–1.5(–1.8) mm high, 0.8–1.7mm diam, enclosed on top and/or at the sides by a black, 20–50 μm thick pseudoparenchymatous crust, blackening the wood surface between adjacent stromata. *Ectostroma* forming 0.4–1.3 mm broad and 0.2–1 mm high sub- or inversely stellate structures of 3–5 grey, brown to black segments around the ostiolar openings; tissue beneath the black crust pseudoparenchymatous; basal pseudostromatic tissue prosenchymatous, grey, of hyaline, 2–4 μm wide hyphae, mixed with bark cells. *Ostiolar openings* inconspicuous, less commonly necks arising as conical, sulcate, 0.4–0.7 mm high, black papillae. *Ascomata* 0.25–0.45 mm high, 0.18–0.4 mm diam, monostichously arranged in valsoid configuration, 5–8(–12) per individual cluster, vertical to oblique, subglobose to flask-shaped, laterally collapsed when dry; peridium 14–25 μm thick, pseudoparenchymatous, brown. *Ostiolar necks* long, cylindrical, converging and often fusing, i.e. the ostiolar opening containing 1–3(–5) necks; interior periphysate. *Paraphyses* numerous, simple, unbranched, tapering upwards, apically free, 1.5–5 μm wide. *Asci* (96–)106–143(–158)×(10–)11–14(–18.5) μm (*n*=30), bitunicate but without obvious fissitunicate dehiscence, cylindrical, containing 6–8 uniseriate ascospores; stipe short, truncate; apex containing an ocular chamber and a pulvinate ring (3.8–)4.5–6.0(–6.3)×(2.0–)2.5–3.5(–3.8) μm (*n*=30), staining in Congo Red. *Ascospores* (12–)15–20(–22)×(6.5–)7.5–9.8(–11.7) μm, l/w=(1.6–)1.8–2.2(–2.4) (*n*=130), ellipsoid, dark brown, 2-celled, with a dark central, not or hardly constricted septum thicker than the wall; surface finely tuberculate.

Asexual morph on natural substrates: Upper levels of young stromata containing irregular locules filled with hyaline tissue. Walls of locules lined by dense palisades of phialides in variable whorls on short cylindrical, few-celled hyaline conidiophores. *Phialides* (5.8–)7.3–10.0(–12.0)×(1.8–)2.0–3.0(–3.8) μm, l/w (2.4–)2.9–3.9(–4.6) (*n*=37), lageniform. *Conidia* (2.2–)2.7–3.7(–4.3)×(1.0–)1.3–1.7(–2.0) μm, l/w (1.5–)1.7–2.4(–2.9) (*n*=45), oblong to cylindrical, rarely subglobose, 1-celled, hyaline, smooth, with few guttules; also formed on aphanophialides.

Cultures and asexual morphs: Ascospores germinating within 24 h with conidia or with conidia and germ hyphae mixed (Fig. 6f). Hyphal growth slow, *on CMD* colony radius 18–24 mm after 15–17 days at 22 °C; colony flat, often irregularly lobate, first white, turning dilute grey-brown after 2 weeks; odour indistinct, sometimes slightly musty or fruity. Conidia spreading in masses from the centre, oblong, allantoid or ellipsoid, 1-celled, hyaline, smooth. Growth on PDA (Merck) as on MEA or slightly faster. *On MEA* colony radius ca. 4–5 mm after 3 days, 9–14 mm after 7 days, 20 mm after 14 days, 30 mm after 21 day, 35 mm after 28 days; plate often (nearly) covered after 1 month. *Colony* often with irregular outline, lobate, first white, soon turning greyish, dark brown to black, slightly floccose by whitish aerial hyphae; reverse dark grey to nearly black; odour indistinct. Mycelium often ceasing growth before covering the plate; sometimes brown diffusing pigment present, with crystals in the agar. Conidia formed within 24 h after inoculation by budding and on 3–7(–9.5) µm wide, more or less botryose hyaline hyphae on minute pegs, rarely on solitary terminal ellipsoid phialides ca. 7–10×3.5–5 µm, with short-cylindrical apex, arising laterally on hyphae. No differentiated conidiophores formed. *Conidia* (3.5–)5.3–11.3(–17.2)×(1.7–)2.0–4.0(–6.3) µm, l/w (1.7–)2.3–3.6(–4.2) (*n*=55), cylindrical, allantoid or ellipsoid, hyaline, smooth, with minute guttules; budding. After ca. 2 weeks black multiloculate pycnidia formed. *Pycnidia* 0.3–0.7 mm diam, globose, variably surrounded by white mycelium; wall pseudoparenchymatous, of large, thick-walled, globose to clavate, olive cells, giving rise to short, cylindrical to globose hyaline cells. *Phialides* (6.6–)7.5–11.0(–12.7)×(2.2–)2.5–3.5(–5.0) µm, l/w (2.1–)2.6–3.8(–4.6) (*n*=30), produced by the latter in variable whorls, more or less parallel, densely packed in palisades, narrow, lageniform, cylindrical or conical, with broad collarette. *Conidia* (2.4–)2.7–4.0(–5.6)×(1.3–)1.5–2.0(–3.0) µm, l/w (1.2–)1.6–2.3(–2.9) (*n*=50), ejected from pycnidia in hyaline, pale pinkish to pale brownish drops, minute, oblong, to bullet shaped to ellipsoid, sometimes subglobose, 1-celled, hyaline, smooth, lower end often truncate.

Ecology and distribution: *Valsaria insitiva* typically occurs on *Vitis*, but also on several unrelated hosts, in Europe with a primarily submediterranean distribution.

Types: **Neotype**: ITALY, vines of *Vitis*, 1837, De Notaris (RO, **neotype** of *Sphaeria insitiva*, designated by Ju et al. 1996 (as „epitype“)).

Epitype: CROATIA, Istria, 2 km south-west of Buje, on *Vitis vinifera*, 16 May 2010, W. Jaklitsch & H. Voglmayr (WU 33462, **epitype** of *Sphaeria insitiva* **here designated**; ex-epitype culture CBS 127882, VV; ex-epitype sequences KP687980 (SSU), KP687886 (ITS-LSU), KP687959 (*rpb2*), KP688054 (*tef1*)).

Background: Tode’s (1791) *Sphaeria insitiva* from *Vitis* resembles a species of *Diatrypaceae*, judging from his description and illustration, but in absence of microscopic data this is uncertain. As no material of Tode is extant, Ju et al. (1996) selected a specimen of De Notaris from *Vitis* (RO) as epitype of *Sphaeria insitiva*, in order to rescue both the generic name *Valsaria* and the epithet *insitiva*. However, according to Eriksson and Hawksworth (1997) this is a neotype. The epitypification of *Sphaeria insitiva* and thus of *Valsaria insitiva* here is necessary to fix the name of the type species, which is member of a morphologically difficult complex, with a specimen, a preserved culture and molecular data.

Other material examined: AUSTRIA, Niederösterreich, Hippersdorf, on *Vitis vinifera*, 15 November 2014, W. Jaklitsch (WU 33427; culture V35); Mühlleiten, on *Acer campestre*, soc. *Thyronectria rhodochlora*, 23 March 2013, H. Voglmayr (WU 33454; culture VAC); Vienna, 19th district, Oberer Reisenbergweg, on *Fallopia baldschuanica*, 7 October 2001, W.

Jaklitsch W.J. 1836 (WU 33469); 21st district, Ignaz Köck-Strasse, on *Robinia pseudoacacia*, 15 September 2013, W. Jaklitsch (WU 33459; culture VIR2); 22nd district, Donaupark, on *Spiraea* sp., 30 November 2013, W. Jaklitsch (WU 33467; culture V8). CROATIA, Istria, Golaš, on *Acer monspessulanum*, 18 October 2010, W. Jaklitsch (WU 33453; culture CBS 139056=VA). FRANCE, Ariege, Le Mas d'Azil, on *Ficus carica*, 8 August 2013, A. Gardiennet AG13153 (WU 33455; culture VAF); Rimont, on *Ficus carica*, 22 December 2010, J. Fournier 10185 (WU 33460; culture VJF); Rimont, Las Muros, on *Cornus sanguinea*, 22 January 1996, J. Fournier 96007 (WU 33468; culture V33); Saint Girons, in a private garden, on *Wisteria sinensis*, 17 March 2012, J. Fournier 12034 (WU 33465; culture VW); Guadeloupe, Gourbeyre, Marina Riviére Sens, track to Houelmont, on corticated twigs, 9 August 2011, C. Lechat CLLGUAD 11014 (WU 33461; culture VL). GREECE, Corfu, Dassia, at the hotel Fiori, on *Cercis siliquastrum*, 24 April 2012, H. Voglmayr & W. Jaklitsch (WU 33456; culture VCE); Gouvia, Danilia, on *Paliurus spina-christi*, 20 April 2012, W. Jaklitsch & H. Voglmayr (WU 33458; culture VIP); Crete, Kakopetros, on *Vitis vinifera*, 25 November 2011, W. Jaklitsch (WU 33464; culture VV2). ITALY, Lazio, Province of Viterbo, Norchia, on *Cytisus scoparius*, 14 October 2013, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33466; culture V5); Veneto, Fontanafredda, on *Vitis vinifera*, 23 October 2011, W. Jaklitsch & H. Voglmayr (WU 33463; culture VV1). TAIW AN, Tainan City, Ssu-tsao, behind Ta-chung Temple, on unidentified twigs, 24 February 2001, Y.-M. Ju & H.-M. Hsieh 90022401 (WU 33457; part in HAST; culture CBS 139061= VIJ).

Notes: *Valsaria insitiva*, the type species of *Valsaria*, is primarily defined by its occurrence on *Vitis*, and DNA data from four isolates of specimens collected on this host in Austria, Croatia, Greece and Italy are identical. The species however occurs also on several other unrelated hosts, sometimes also on *Fabaceae*, e.g. *Cercis, Cytisus, Robinia* and *Wisteria*, a family on which *Valsaria robiniae* and *V. spartii* are much more common.

Valsaria lopadostomoides Jaklitsch & Voglmayr, ***sp. nov.***

MycoBank MB 811902, Facesoffungi number: FoF 00608, Figs. 4 b, c, j, 6 p–v, 7

Etymology: referring to the resemblance of its stroma with species of *Lopadostoma*.

Stromata pseudostromatic, erumpent from bark, scattered or coalescing into clusters up to 5×4 mm; pustular to subglobose with flattened base, 1.2–1.4 mm high, 1.7–2.5 mm diam, enclosed on top and/or at the sides by a black, 20–50 μm thick pseudoparenchymatous crust. *Ectostroma* typically forming 0.5–0.9 mm broad and 0.15–0.25 mm high sub- or inversely stellate structures consisting of 3–5 greyish, brown to black segments; the tissue beneath the black crust pseudoparenchymatous; the tissue at the stromatal base prosenchymatous, grey, of hyaline hyphae mixed with bark cells. *Ostiolar openings* inconspicuous. *Ascomata* 0.25–0.45 mm high, 0.18–0.4 mm diam, arranged in valsoid configuration, 8–12 per individual cluster, vertical to oblique, subglobose or flask-shaped, typically laterally collapsed when dry; peridium of brown flattened cells. *Ostiolar necks* long, cylindrical, converging and often fusing; interior periphysate. *Paraphyses* unbranched, tapering upwards, apically free, 1.5–5.5 μm wide. *Asci* (112–)115–128(–136)×(10.2–)11.0–13.7(–15.5) μm (n=25), cylindrical, bitunicate, containing 6–8 uniseriate ascospores; stipe short, truncate, without a crozier; apex containing a small ocular chamber and a pulvinate ring (4.5–)4.8–5.8(–6.3) µm wide, (1.7–)2.3–3.2(–3.5) µm high (*n*=15), slightly refractive in water, in Congo Red pulvinate, broadly conical or cap-like, staining red. *Ascospores* (13.0–)14.5–16.7(–18.6)×(8.0–)8.5–9.3(–9.8) µm, l/w (1.4–)1.6–1.9(–2.2) (*n*=51), ellipsoid, 2-celled, dark brown, with a dark central, not or hardly constricted septum thicker than the wall; surface ornamentation variable, distinctly warted, reticulate or spotted, with 1 large guttule per cell. No asexual morph observed on the natural substrate.

Cultures and asexual morph: *On MEA* colony radius ca. 4 mm after 3 days, 10 mm after 7 days, 21 mm after 14 days, 32 mm after 21 days, 40 mm after 28 days; plate (nearly) entirely covered after 1 month. *Colony* circular, with a whitish mat of aerial mycelium, partly sulphur yellow hyphae with yellow exudates spreading from the plug, surface turning dull yellow to olive, reverse yellowish, turning grey-green to black; odour indistinct to slightly unpleasant. *Conidiation* effuse; no pycnidia formed within a month. Conidia accumulating in large hyaline to yellow masses and small hyaline to greyish drops, formed by budding and on minute pegs, rarely on solitary phialides ca. 8–16×3–5 µm on 2–5 µm wide hyphae with branches often at right angles. *Conidia* (3.4–)5.0–9.0(–12.7)×(1.5–)2.0–3.7(–5.7) µm, l/w (1.5–)1.9–3.3(–4.2) (*n*=64; after 10–14 days), very variable, cylindrical, allantoid or ellipsoid, 1-celled, smooth, budding. *Arthroconidia* uncommon, e.g. 11.5×4.7 µm. On PDA virtually not growing, yellow diffusing pigment produced.

Ecology and distribution: In bark of *Quercus ilex*; only known from the type locality in Corfu, Greece.

Type: GREECE, Corfu, Kanakades, on *Quercus ilex*, soc. *Cryptovalsa* cf. *protracta*, 20 April 2012, H. Voglmayr & W. Jaklitsch (WU 33470, **holotype**; ex-holotype culture CBS 139062=VIQ; ex-holotype sequences KP687972 (SSU), KP687868 (ITS-LSU), KP687943 (*rpb2*), KP688037 (*tef1*)).

Notes: This taxon is based on a single, mostly overmature specimen collected as a species of *Lopadostoma.* The species seems to be rare and may be specific for *Quercus ilex* and related evergreen oaks.

Valsaria neotropica Jaklitsch, J. Fourn. & Voglmayr, ***sp. nov.***

MycoBank MB 811903, Facesoffungi number: FoF 00609, Figs. 4 d, e, k, 8, 10 a–i

Etymology: referring to its detection on the neotropical island Martinique.

Stromata pseudostromatic, erumpent from bark, scattered, rarely aggegating to groups of 2–3; pustular, conical to subglobose with flattened base, 0.75–1 mm high, 0.8–1.7 mm diam, enclosed on top and/or at the sides by a black, 20–50 µm thick pseudoparenchymatous crust. *Ectostroma* often forming 0.4–0.6 mm broad and 0.1–0.2 mm high sub- or inversely stellate structures of 3–5 greyish, brown to black, tubercular segments; tissue beneath the crust pseudoparenchymatous; tissue between the ostiolar necks and at the stromatal base prosenchymatous, grey, soft, mixed with bark cells. *Ostiolar openings* inconspicuous at the surface or indistinctly papillate. *Ascomata* arranged in valsoid configuration, 5–8(–12) per individual cluster, monostichous, subglobose to flask-shaped, 0.25–0.45 mm high, 0.18–0.4 mm diam, typically laterally collapsed when dry; peridium 14–25 µm thick, of pale brown compressed cells. *Ostiolar necks* long, cylindrical, converging and often fusing; interior periphysate. *Paraphyses* numerous, unbranched, tapering upwards, apically free, 1.5–6 µm wide. *Asci* (102–)108–148(–175)×10.5–14(–16) µm (*n* = 24), bitunicate but without obvious fissituncate dehiscence, cylindrical, containing 6–8 uniseriate ascospores; apex containing an ocular chamber and a short-cylindrical to barrel-shaped ring (4.2–)4.7–5.8(–6.2) µm wide, (1.8–)2.3–3.8(–4.2) µm high (*n*=15), staining in Congo Red. *Ascospores* (17.7–)19.0–22.5(–27.8)×(7.7–)8.3–10.7(–13.7) µm, l/w (1.6–)2.0–2.4(–2.8) (*n*=138), ellipsoid, 2-celled, dark brown, with a dark, thick, central, not or hardly constricted septum; surface finely tuberculate. No asexual morph observed on the natural substrate.

Cultures and asexual morphs: *On MEA* colony radius ca. 6 mm after 3 days, 12–20 mm after 7 days, 27 mm after 14 days, 38 mm after 21 day, >40 mm after 28 days; plate (nearly) entirely covered after 3–4 weeks. *Colony* whitish, pale brownish to greyish, pinkish in the centre, covered by a mat of white, condensed aerial hyphae. Reverse first yellowish, turning grey to black in spots or zones. Odour indistinct to slightly unpleasant. *Conidiation* first effuse; conidial masses colourless, yellowish to pinkish in the centre, spreading. Fertile (aerial) hyphae slightly narrower than vegetative hyphae, 2–5(–7.5) µm wide, sparingly branched, often at right angles. *Conidia* (3.5–)4.5–10.2(–16.7)×(1.5–)1.8–2.7(–3.3) µm, l/w (1.9–)2.4–4.1(–5.9) (*n*=60), formed by budding and on minute pegs, cylindrical to slightly allantoid, less commonly ellipsoid, 1-celled, hyaline, smooth, with minute guttules. After ca. 2 weeks *arthroconidia* numerous, cylindrical to subglobose, (7.3–)9.5–20.0(–28.5)×(3.7–)5.0–8.5(–9.8) µm, l/w (1.0–)1.3–3.5(–6.0) (*n*=25), 1–3-celled, smooth, hyaline, with numerous guttules. *Pycnidia* appearing after 2–3 weeks, immersed in the agar, covered by aerial hyphae, solitary or incorporated in dense groups of up to 5 with 0.6–1.8 mm diam, black, firm, with olive peridium. *Phialides* (7.7–)9.0–13.0(–15.0)×(1.7–)2.0–2.8(–3.2) µm, l/w (2.9–)3.6–5.7(–7) (*n*=26), lageniform to cylindrical, straight, curved or sigmoid, hyaline, lining pycnidial locules in palisades on short cylindrical, slightly inflated, hyaline to olive cells. *Conidia* (2.3–)2.5–3.5(–3.8)×(1.3–)1.5–1.7(–1.8) µm, l/w (1.4–)1.6–2.1(–2.4) (*n*=35), emitted in olive drops, ellipsoid-oblong, 1-celled, hyaline, smooth, with truncate scar and 1–2 guttules. On PDA growth faster than on MEA, plate entirely covered after 2–3 weeks, colony dull brown.

Ecology and distribution: host identity unknown; only known from the type locality in Martinique.

Type: FRANCE, Martinique, Case Pilote, trail to Morne Venté, on unidentified twig, 25 August 2010, J. Fournier (WU 33471, **holotype**; ex-holotype culture CBS 139064= VJM, ex-holotype sequences KP687974 (SSU), KP687874 (ITS-LSU), KP687948 (*rpb2*), KP688042 (*tef1*)).

Notes: This species is based on a single specimen, for the most part comprising immature small stromata that are rarely coalescing, with a well-defined ectostroma and non-papillate ostiolar necks; many asci are 4-spored. DNA data set *V. neotropica* clearly apart from all other species of *Valsaria*. The growth rate of *V. neotropica* nearly approaches that of *V. robiniae*. Aerial hyphae are much denser than in other species. Arthroconidia are nearly as common as in *V. spartii*.

Valsaria robiniae (Schwein.) Cooke, Grevillea 13: 37 (1884).

Basionym: *Sphaeria robiniae* Schwein., Schr. naturf. Ges. Leipzig 1: 33 (1822); Schwein. : Fr., Syst. Mycol. II: 352 (1823). Facesoffungi number: FoF 00610, Figs. 4 f, l, 9, 10 j–y

Stromata pseudostromatic, erumpent from bark, scattered or mostly coalescing into linear rows or clusters up to 4.5×2.5 mm; pustular, lenticular to broadly conical or subglobose with flattened base, (0.5–)0.7–1 (–1.3) mm high, 0.7–1.2(–1.7) mm diam, enclosed on top and/or at the sides by a black, 20–50 μm thick pseudoparenchymatous crust, blackening the wood surface between adjacent stromata. *Ectostroma* forming 0.3–1 mm broad and 0.2–0.3 mm high sub- or inversely stellate structures of 3–5 greyish, brown to black segments with a depressed centre; tissue beneath the black crust pseudoparenchymatous; tissue at the stromatal base prosenchymatous, grey, soft, often mixed with bark cells. *Ostiolar openings* inconspicuous at the surface, less commonly ostiolar necks arising as conical, sulcate, 0.2–0.7 mm high, black papillae. *Ascomata* 0.25–0.45 mm high, 0.2–0.4 mm diam, monostichously arranged in valsoid configuration, 4–10 per individual cluster, vertical to oblique, subglobose to flask-shaped, typically laterally collapsed when dry; peridium 14–25 μm thick, of pale brown flattened cells. *Ostiolar necks* long, cylindrical, converging and often fusing; interior periphysate. *Paraphyses* simple, apically free, 1.5–4.5 μm wide, tapering upwards to 1.5–2 μm. *Asci* (116–)127–144(–155)×(10.3–)11.7–14.5(–16.0) μm (n=33), bitunicate but without obvious fissituncate dehiscence, cylindrical, containing (4–)6–8 uniseriate ascospores; base with croziers; apex with an ocular chamber and a pulvinate to barrel-shaped ring (4.8–)5.0–6.2(–7.5) μm wide, (2.3–)2.7–3.7 μm high (n=15), staining in Congo Red. *Ascospores* (15.3–)17.5–21.0(–25.5)×(8.0–)8.8–10.5(–11.7) μm, l/w (1.6–)1.8–2.2(–2.6) (n=130), ellipsoid, 2-celled, dark brown, with a dark, thick, central, non-constricted to distinctly constricted septum; ends broadly rounded; surface warted to reticulate.

Asexual morph on natural substrates: Upper levels of young stromata above ascomata or the entire stroma containing irregular locules. Phialides densely arranged in palisades lining the walls of the locules on short cylindrical conidiophores arising from thin-walled, olive to black stroma cells <10 μm diam. *Phialides* (6.7–)8.3–11.5(–14.0)×(2.0–)2.2–2.8(–3.2) μm, l/w (2.2–)3.2–4.9(–5.9) (n=33), lageniform to cylindrical; 2–4 μm long phanerophialides common. *Conidia* (2.5–)2.7–3.7(–4.5)×(1.3–)1.4–1.7(–2.0) μm, l/w (1.5–)1.8–2.3(–2.7) (n=35), oblong, ellipsoid or bullet-shaped, 1-celled, hyaline, smooth, with inconspicuous guttules and indistinct or truncate scar.

Cultures and asexual morphs: *On MEA* colony radius ca. 6 mm after 3 days, 17 mm after 7 days, 35 mm after 14 days, >40 mm after 21 days; plate entirely covered after 2–3 weeks. *Colony* irregular, whitish, greyish to dull brown, zonate, with whitish margin and whitish, slightly floccose surface; sometimes brown pigment diffusing into the agar. Reverse dull brown, often with reddish or yellowish tint. Odour indistinct to yeast-like. In some isolates predominantly budding conidia formed, hyphal growth much reduced and soon ceasing. *Conidiation* first effuse; colourless to brown conidial masses forming around the plug. Conidia mostly formed on pegs and by budding, rarely by lageniform phialides ca. 8–10×3–5 μm, arising from hyphae sparingly branched at right angles. *Conidia* (4.3–)5.2–10.0(–14.8) ×(1.8–)2.0–3.5(–4.2) μm, l/w (1.9–)2.0–3.6(–5.6) (*n*=35), variable in size and shape, cylindrical, oblong to ellipsoid, 1-celled, hyaline, smooth. *Arthroconidia* ca. 8–14(–28)×4–11 μm, formed after ca. 10 days on slightly botryose hyphae, inconspicuous, 1–2 celled. *Pycnidia* formed after ca. 2 weeks, often in radial rows, immersed in agar, ca. 0.8–1.2 mm diam, conical, multiloculate, black, surface whitish to greyish due to aerial hyphae, apex black, ca. 0.3–0.5 mm diam. Conidia ejected in hyaline drops. Short cylindrical, 1–3 celled, hyaline conidiophores arising from large olive cells on walls of the locules. *Phialides* (5.3–)7.0–10.8(–13.5)×(2.0–)2.3–3.0(–3.2) μm, l/w (2.1–)2.6–4.2(–5.5) (*n*=38), lageniform, formed in palisades on the conidiophores. *Conidia* (2.2–)2.5–3.5(–4.3)×(1.4–)1.5–1.7(–2.0) μm, l/w (1.2–)1.5–2.2(–2.7) (*n*=35), minute, oblong to subglobose, 1-celled, hyaline, smooth, with truncate lower end. On PDA growth as on MEA or slightly faster; also pycnidia formed, immersed in agar.

Ecology and distribution: In bark of *Robinia* and related fabaceous hosts; known from Europe (Austria, Croatia, Hungary, Italy, Slovenia) and North America (North Carolina, Pennsylvania) in temperate to submediterranean climates.

Types: USA, Pennsylvania, Bethlehem and North Carolina, Salem, Syn. 1233, decorticated wood (PH00077157, **lectotype** of *Sphaeria robiniae*, **here designated**); Schweinitz Collection 1233, no place and date given (BPI 800813, **isolectotype**; from the Shear Study Collection Types & Rarities Series I).

Reference specimen: ITALY, Galzignano, Turri, on *Robinia pseudoacacia*, 23 October 2011, W. Jaklitsch & H. Voglmayr (WU 33478; culture CBS 139063=VIR1), reference sequences KP687973 (SSU) KP687870 (ITS-LSU), KP687945 (*rpb2*), KP688039 (*tef1*).

Other material examined: AUSTRIA, Niederösterreich, Marchfeldkanalweg, near Gerasdorf, on *Colutea arborescens*, 5 September 2009, W. Jaklitsch & O. Sükösd VCol1 (WU 33476); Vienna, 21st district, Marchfeldkanalweg, near Jedlersdorferstraße, on *Colutea arborescens*, 5 September 2009, W. Jaklitsch & O. Sükösd (WU 33475; culture CBS 125583= VCol); Marchfeldkanalweg near Stammersdorf, on *Caragana arborescens*, 5 June 2010, W. Jaklitsch & O. Sükösd (WU 33474; culture CBS 128015 = VCA); Stammersdorf, at the chuch, grid square, on *Colutea arborescens*, 6 May 2001, W. Jaklitsch W.J. 1752 (WU 33481). CROATIA, Istria, SE Rovinj, coastal area, on *Hippocrepis emerus*, 24 June 2012, W. Jaklitsch & O. Sükösd (WU 33482); Opatija, at Ičići, on *Hippocrepis emerus*, 15 May 2010, W. Jaklitsch (WU 33473; culture VC1). HUNG ARY, between Besenyötelek and Kömló, 47°41’16.6” N, 20°25’51” E, 100 m, on *Amorpha fruticosa*, 31 May 2014, W. Jaklitsch & H. Voglmayr (WU 33480; culture V30); south of Eger, 47°51’15’ N, 20°22’0’ E, 235 m, on *Amorpha fruticosa*, 30 May 2014, W. Jaklitsch & H. Voglmayr (WU 33479; culture V29). ITALY, Veneto, between Bastia and Rovolon, on *Robinia pseudoacacia*, 22 October 2011, W. Jaklitsch & H. Voglmayr (WU 33477; culture VIR). SLOVENIA, Podnanos, Nanos, mountain road, on *Hippocrepis emerus*, 4 July 2007, W. Jaklitsch (WU 33472; culture CBS 121890=VC).

Notes: *Valsaria robiniae* was described from the eastern USA by Schweinitz. Lectotypification was necessary, because there are two collections of *Sphaeria robiniae* in PH. We have no recent material of this species from North America, therefore it is not certain, whether European material corresponds definitely to American material. For this reason we do not epitypify *V. robiniae*, but designate our collection WU 33478 from Italy as a reference specimen of *V. robiniae* until it can be recollected in North America. In Europe the species is predominantly found on *Robinia* and related hosts in temperate and submediterranean regions. Growth of *V. robiniae* is the fastest of all *Valsaria* species treated here. Furthermore, colony zonation seems to be diagnostic.

Valsaria rudis (P. Karst. & Har.) Theiss. & Syd., Ann. mycol. 12: 273 (1914).

Basionym: *Dothidea rudis* P. Karst. & Har., J. Bot., Paris 3: 206 (1889); Facesoffungi number: FoF 00611, Figs. 4 g, m, 11, 13 a–d

Stromata pseudostromatic, erumpent from bark, scattered or gregarious to coalescing into variable clusters 3–6×2.5–3.5 mm; pustular, broadly conical or subglobose with flattened base, 1.2–1.7 mm high, 1.2–2.5 mm diam, enclosed on top and/or at the sides by a black, 20–50 μm thick pseudoparenchymatous crust blackening the wood surface between adjacent stromata. *Ectostroma* forming (0.2–)0.6–1.2(–1.6) mm broad and 0.15–0.4 mm high inversely stellate structures of 3–5 greyish, olivaceous to black tubercular segments; often highly reduced or absent and replaced by a smooth cupulate surface partly roughened by the ostiolar papillae; the tissue beneath the black crust pseudoparenchymatous; tissue at the stromatal base prosenchymatous, grey, of narrow hyaline hyphae mixed with bark cells. *Ostiolar openings* inconspicuous at the surface, less commonly necks arising as low and cruciform or conical, sulcate, 0.12–0.4 mm high, black papillae. *Ascomata* 0.3–0.6 mm high, 0.2–0.5 mm diam, monostichously arranged in valsoid configuration, 5–12(–20) per individual cluster, vertical to oblique, subglobose to flask-shaped, typically laterally collapsed when dry; peridium of pale brown flattened cells. *Ostiolar necks* long, cylindrical, converging or fusing; interior periphysate. *Paraphyses* simple, apically free, 1.5–4.5 μm wide, tapering upwards. *Asci* (100–)112–132(–146)×(9.8–)11.0–14.2(–16.0) μm (*n*= 40), cylindrical, containing 6–8 uniseriate ascospores, bitunicate; fissitunicate dehiscence sometimes apparent in the lower third; apex containing an ocular chamber and a pulvinate apical ring (4.3–)4.8–6.5(–7.5) μm wide, (1.4–)2.0–3.6(–4.6) μm high (*n*=41), staining in Congo Red, sometimes slightly refractive in water. *Ascospores* (13.5–)15.8–18.0(–19.5)× (6.8–)8.0–9.2(–10.0) μm, l/w (1.5–)1.8–2.1(–2.7) (*n*=100), ellipsoid, ellipsoid, 2-celled, ellipsoid, with a dark, thick, central, not to distinctly constricted septum; surface finely warted to reticulate.

Asexual morph on natural substrates: Ostiolar levels of young stromata sometimes containing irregular locules. Phialides densely arranged in palisades lining the walls of the locules on short cylindrical conidiophores. *Phialides* (7.0–)7.3–9.8(–11.7)×2.3–2.7(–3.0) μm, l/w 2.8–3.9(–4.4) (*n*=8), lageniform. *Conidia* (3.8–)4.5–5.2(–5.7)×(1.1–)1.5–2.2(–2.2) µm, l/w 2.1–3.3(–4.4) (*n*=27), cylindrical, oblong, rarely allantoid, 1-celled, hyaline, smooth, with inconspicuous guttules; scar indistinct.

Cultures and asexual morphs: Growth slow on all media, *on CMD* colony often remaining white for several weeks, turning diffusely olive-greenish, conidial masses colourless to yellowish. *On MEA* colony radius 1–2 mm after 3 days, 3–7 mm after 7 days, 7–12 mm after 14 days, 13–15 mm after 21 days. *Colony* irregular, lobate, usually remaining whitish to yellowish up to 2 weeks, turning grey with yellow tones, brown or dull yellow with grey spots. Yellow spots caused by conidial masses spreading from the centre. At 15 °C colony turning dark green and forming dull yellow pigment in the agar. Reverse yellowish grey to black. Odour indistinct to slightly yeast-like. *Conidiation* on MEA effuse. Minute pegs on short erect, filiform to slightly botryose hyphae forming variable, oblong, cylindrical, allantoid or ellipsoid *conidia* (4.5–)5.5–8.5(–10.5)×(1.5–)2.0–3.5(–4.7) µm, l/w (1.9–)2.2–3.2(–4.1) (*n*=35), 1-celled, hyaline, smooth, budding. On PDA nearly not growing, colony radius 3–4 mm after 10 days.

Ecology and distribution: In bark of deciduous *Quercus* spp.; known from Europe (Austria, Croatia, France, Greece, Italy, Switzerland).

Types: **Lectotype**: FRANCE, on *Quercus* sp. (*Q. petraea* or *Q. robur*), date unknown, (H, herb. Karsten 3713, **lectotype** of *Dothidea rudis* **here designated**).

Epitype: AUSTRIA, Niederösterreich, Pfaffstätten, on *Quercus pubescens*, 15 April 2012, H. Voglmayr (WU 33485, **epitype** of *Dothidea rudis* **here designated**; MBT200958; ex-epitype culture CBS 139066=VQP; exepitype sequences KP687976 (SSU), KP687879 (ITS-LSU), KP687953 (*rpb2*), KP688047 (*tef1*)).

Other material examined: AUSTRIA, Burgenland, Mattersburg, Starenbühl/Rosaliengebirge, grid square 8264/3, on *Quercus petraea*, 1 October 2001, W. Jaklitsch W.J. 1819 (WU 33490); Niederösterreich, Krems, Egelsee, on *Quercus petraea*, soc. *Valsa* sp., 27 October 2013, W. Jaklitsch & H. Voglmayr (WU 33487; culture V7). Steiermark, Hartberg, Buchberg, near animal park Herberstein, 15°48'27"E, 47°13'08"N, grid square 8760/4, on *Quercus petraea*, 2 March 2013, G. Friebes (WU 33488; culture V31); Wundschuh, Kaiserwald, at the Seerestaurant, grid square 9058/4, on *Quercus petraea*, 10 September 2002, W. Jaklitsch W.J. 1998 (WU 33491); Vienna, 22nd district, Lobau, Panozzalacke, grid square 7865/1, on *Quercus robur*, 5 April 2003, W. Jaklitsch W.J. 2073 (WU 33492). CROATIA, Istria, Rovinj, ca. 3 km south-east of Kukoletovica, on *Quercus cerris*, 18 May 2012, H. Voglmayr (WU 33483; culture VQC). GREECE, Corfu, Aharavi, opposite the Hydropolis Water Park, on *Quercus macrolepis*, 24 April 2012, W. Jaklitsch & H. Voglmayr (WU 33484; culture CBS 139065=VQM). ITALY, Lazio, Bolsena Lake, Lungolago di Gradoli, San Magno, from the restaurant Il Purgatorio to the road to road SS312, on *Quercus cerris*, 13 October 2013, H. Voglmayr, W. Jaklitsch & W. Gams (WU 33486; culture V3). SWITZERLAND, Valais, Les Follateyres, on *Quercus* sp., 31.9.1982, F. Rappaz (WU 33489).

Notes: Designation of a lectotype was necessary, as several parts of the original collection are present in several herbaria, and the material in H is labelled as syntype. Ascospore size in the lectotype is smaller than given in the protologue (Karsten and Hariot 1889), which was already noted by Petrak and Sydow (1923), but it fits perfectly to all specimens recently collected from *Quercus* spp. *Valsaria rudis* is apparently specific for deciduous species of *Quercus.* An ectostroma is often lacking, leaving cupulate ostiolar discs on the stroma surface. Growth of *V. rudis* is the slowest of all studied species of *Valsaria*. As in the other *Quercus*-inhabiting species, *V. lopadostomoides*, no pycnidial asexual morph was detected in cultures of *V. rudis.* We designate an epitype to stabilize the name, because the species is regarded as cryptic and cannot be reliably identified by morphology alone; it cannot be ruled out that the plurivorous *V. insitiva* might occur on *Quercus*.

Valsaria spartii Maubl., Bull. Soc. mycol. Fr. 21: 88 (1905).

= *Valsaria ceratoniae* Crous & M.J. Wingf., Fungal Planet, no. 11–21: 15: [2] (2007)

Facesoffungi number: FoF 00612, Figs. 4 h, n, 12, 13 e–v

Stromata pseudostromatic, erumpent from bark, mostly gregarious or coalescing into clusters ranging from narrowly elongate up to 4.7×1.5 mm to irregularly shaped, sometimes superficial, massive and up to 11×6.5 mm; pustular, broadly conical to subglobose with flattened base, (0.4–)0.6–1.0(–2.0) mm high, with individual ascomatal clusters 0.7–1.2(–1.5) mm diam, enclosed on top and/or at the sides by a black, 20–50 μm thick pseudoparenchymatous crust blackening the wood surface between adjacent stromata. *Ectostroma* typically irregularly tubercular or amorphous or forming 0.3–1 mm wide and 0.15–0.3 mm high, sub-or inversely stellate structures of 3–5 greyish, brown to dull black segments; tissue beneath the black crust pseudoparenchymatous; tissue at the stromatal base prosenchymatous, grey, soft, often mixed with bark cells. *Ostiolar openings* inconspicuous at the surface, less commonly necks arising as conical, more or less sulcate, 0.1–0.8 mm high, black necks. *Ascomata* 0.2–0.8 mm high, 0.2–0.5 mm diam, monostichously arranged in valsoid configuration, 5–10(–15) per individual cluster, vertical to oblique, subglobose to flask-shaped, typically laterally collapsed when dry; peridium of pale brown flattened cells. *Ostiolar necks* long, cylindrical, converging and often fusing; interior periphysate. *Paraphyses* numerous, unbranched, apically free, 1.5–4.5 μm wide from top to base. *Asci* (105–)113–138(–146)×(10.8–)11.5–13.5(–15.0) μm(n=25), cylindrical, containing 6–8 uniseriate ascospores, bitunicate without obvious fissituncate dehiscence; apex with ocular chamber and a pulvinate apical ring (3.8–)4.5–6.3(–7.3) μm wide, (1.7–)2.3–3.5(–4.3) μm high (n = 20), staining in Congo Red. *Ascospores* (14.3–)16.3–20.2(–23.7)×(7.7–)8.5–10(–11) μm, l/w (1.6–)1.8–2.2(–2.6) (n=100), ellipsoid, 2-celled, dark brown, very variable, plump with constricted septum or slender and inequilateral, with a dark, thick, central, nonconstricted septum; surface finely warted or reticulate; ends acute or broadly rounded.

Asexual morph on natural substrates: Locules forming at ostiolar levels of stromata that contain immature ascomata, or stromata containing irregularly arranged locules exclusively. Interior of locules white when dry, glassy to gelatinous when wet; walls lined by dense palisades of short cylindrical, hyaline conidiophores with densely packed, terminal whorls of phialides. *Phialides* (6.8–)7.7–11.0(–12.5)×(1.8–)2.0–3.0(–3.7) μm, l/w (2.5–)2.9–4.3(–5.5) (n=36), lageniform, straight to sinuous, often inequilateral, with narrow or broad collarette;

also aphanophialides producing conidia. *Conidia* (2.5–)3.0–3.7(–4.0)×(1.2–)1.5–2.0(–2.2) µm, l/w (1.4–)1.6–2.2(–3.1) (*n*=50), oblong to ellipsoid, 1-celled, hyaline, smooth; 1 end often truncate.

Cultures and asexual morphs: *On CMD* colony entirely covering a 90 mm plate after 3–4 weeks, typically homogeneous, round, often containing hyperbranching mycelium, surface turning (olivaceous-) brown to black. Odour indistinct. Conidiation effuse and after several weeks in immersed to superficial pycnidia. *On MEA* colony radius 4–5 mm after 3 days, 8–16 mm after 7 days, 18–26 mm after 14 days, 28–39 mm after 21 days; plate entirely covered after 3–4 weeks. *Colony* irregular, often lobate, not zonate, surface whitish to greyish or light brownish, sometimes with yellow tones, with whitish, slightly floccose mat of aerial hyphae and whitish margin, darkening to dull brown. Reverse brown, with whitish to yellowish margin. Odour indistinct, yeast- or bakery-like. In some isolates growth soon ceasing; mycelium releasing brown pigment into the agar. *Conidiation* first effuse. Conidial masses spreading from the centre, forming pale drops. Conidia formed on minute pegs, rarely on lageniform phialides (e.g. 14×6.5 µm) produced on filiform aerial hyphae with scarce, often right-angled branching. *Conidia* (4.3–)5.0– 8.3(–10.4)×(1.8–)2.2–3.5(–4.5) µm, l/w (1.3–)1.7–3.1(–4.1) (*n*=35), oblong to reniform, 1-celled, hyaline, often truncate at the lower end, smooth. After few days hyphae becoming botryose and chain-like and frequently disarticulating into thick-walled, subglobose 1–2-celled *arthroconidia* 6–10(–18)×4–9 µm; the latter sometimes producing conidia. *Pycnidia* usually appearing within 2 weeks, mostly 0.3–0.5 mm diam, black, multiloculate, for the most part remaining immersed in the agar and covered by whitish to brownish aerial hyphae, releasing conidia as large hyaline to pinkish, later pale brown drops. Locules containing typical palisades of short cylindrical, hyaline, smooth or warted conidiophores with phialides in variable clusters. *Phialides* (4.5–)7.3–11.5(–13.3)×(1.5–)2.0–3.0(–4.0) µm, l/w (2.4–)2.9–4.5(–5.8) (*n*=50), cylindrical or lageniform, straight, curved or sigmoid; also formed in whorls on large olive, warted globose wall cells; also aphanophialides producing conidia. *Conidia* (2.3–)2.8–4.3(–6.4)×(1.3–)1.6–1.9(–2.1) µm, l/w (1.4–)1.7–2.5(–3.6) (*n*= 50), oblong, 1-celled, hyaline, smooth. On PDA growth and appearance as on MEA.

Ecology and distribution: In bark of *Robinia* and related fabaceous hosts; known from Europe (France, Greece, Italy, Spain), common in the Mediterranean.

Types: **Holotype:** FRANCE, Loire-Inferieure, Pornic, on *Spartium junceum*, A. Maublanc, April 1904 (PC0167077!, **holotype** of *Valsaria spartii*).

Epitype: ITALY, Lazio, Province of Viterbo, Montalto di Castro, Vulci, on *Spartium junceum*, 15 October 2013, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33505, **epitype** of *Valsaria spartii*, here designated; MBT200959; ex-epitype culture CBS 139070=V6; ex-epitype sequences KP687964 (SSU), KP687843 (ITS-LSU), KP687919 (*rpb2*), KP688013 (*tef1*)).

Other material examined: FRANCE, Dép. Aude, Saint Papoul, on *Spiraea* sp., 23 February 2011, J. Fournier (WU 33498; culture VIS); Haute Garonne, Avignonet, Le Mares, on *Spartium junceum*, 1 May 2003, J. Fournier JF 03060 (WU 33527). GREECE, Corfu, Castellani, on *Calicotome villosa*, 21 April 2012, W. Jaklitsch & H. Voglmayr (WU 33495; culture VCV); Episkepsis, on *Melia azedarach*, 24 April 2012, W. Jaklitsch & H. Voglmayr (WU 33499; culture VMA); Crete, near Askifou, on *Acer sempervirens*, 26 November 2011, W. Jaklitsch (WU 33493; culture VA2); near Voleones, east from the Amari Dam Reservoir, on *Spartium junceum*, 14 October 2014, W. Jaklitsch (WU 33526); Rhodes (old town castle), on *Ceratonia siliqua*, 1 June 2006, P.W. Crous & M.J. Wingfield CPC 13245 (CBS H-19925, **holotype of *V. ceratoniae;*** ex-type CBS 121714=VCBS; only culture sequenced). ITALY, Lazio, Bolsena Lake, Lungolago di Gradoli, San Magno, between the restaurant Il Purgatorio and the road SS312, on *Cytisus sessilifolius*, 13 October 2013, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33504; cultures V4, V4a); Bolsena Lake, Monte Bisenzio, on *Fraxinus ornus*, 13 October 2013, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33503; culture V2); ibidem, on *Robinia pseudoacacia*, 13 October 2013, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33502; culture V1); Riserva Monte Casoli di Bomarzo, on *Cytisus scoparius*, 30 July 2009, W. Jaklitsch, H. Voglmayr & W. Gams (WU 33494; culture CBS 125584=VCS). SPAIN, Andalucia, Cádiz, Alcalá de los Gazules, on *Acacia saligna*, 1 April 2014, W. Jaklitsch (WU 33509; culture V12); south of Alcalá de los Gazules, at the service road parallel to the motorway A381, on *Teline linifolia*, 6 April 2014, W. Jaklitsch (WU 33519; culture V22), ibidem, on *Acacia saligna*, 6 April 2014, W. Jaklitsch (WU 33520; culture V23); at the A381 exit to Benalup, on *Spartium junceum*, 6 April 2014, W. Jaklitsch (WU 33521; culture V24); Castaño del Robledo, on *Cytisus striatus*, 8 April 2014, W. Jaklitsch (WU 33522; culture V25); north of Castellar de la Frontera, on *Cytisus baeticus*, 5 April 2014, W. Jaklitsch (WU 33517; culture V20); Puerto Galis, on *Retama monosperma*, 2 April 2014, W. Jaklitsch (WU 33510; culture V13); La Cañada Real Tesoro, on *Retama sphaerocarpa*, 3 April 2014, W. Jaklitsch (WU 33512; culture V15); Los Pescadores (between San Pablo de Buceite and Gaucín), on *Anagyris foetida*, 3 April 2014, W. Jaklitsch (WU 33513; culture V16); ibidem, on *Retama sphaerocarpa*, 22 March 2011, W. Jaklitsch & H. Voglmayr VR1 (WU 33501); Santuario de la Señora de los Santos, on *Retama sphaerocarpa*, 1 April 2014, W. Jaklitsch (WU 33508; culture V11); La Sauceda, lower part of the walking path to Aljibe, on *Teline linifolia*, 4 April 2014, W. Jaklitsch (WU 33516; culture V19); at km 26 between La Sauceda and Puerto Galis, on *Calicotome villosa*, 2 April 2014, W. Jaklitsch (WU 33511; culture V14); ibidem, on *Ulex parviflorus*, 4 April 2014, W. Jaklitsch (WU 33515; culture V18); Montes de Jimena, on *Teline monspessulana*, 4 April 2014, W. Jaklitsch (WU 33514; culture V17); Punta Palomas, on *Retama monosperma*, 5 April 2014, W. Jaklitsch (WU 33518; culture V21); Granada, Guájar Alto, 36°51′13.7″ N, 3°37′50.3″ W, 540 m, on *Ononis speciosa*, 16 May 2014, S. Tello & W. Jaklitsch (WU 33525; culture V28); southwest of Montefrío, 37°17′24″ N, 4°4′46″ W, elev. 660 m, soc. *Diaporthe* sp., on *Spartium junceum*, 11 May 2014, W. Jaklitsch (WU 33523; culture V26); Jaén, Castillo de Locubin, 37°30′50.6″ N, 3°58′3″ W, elev. 790 m, on *Genista cinerea*, 11 May 2014, W. Jaklitsch (WU 33524; culture V27); Málaga, Cortes de la Frontera, on *Retama sphaerocarpa*, 22 June 2010, W. Jaklitsch & O. Sükösd (WU 33500; culture CBS 128016=VR); Asturias, above Villar de Vildas, on *Genista florida*, 6 June 2013, W. Jaklitsch & H. Voglmayr (WU 33496; culture VG); Canarias, La Palma, near El Paso, on *Chamaecytisus proliferus*, 30 December 2003, P. Karasch (WU 33528); Tenerife, Teno Alto, on *Chamaecytisus proliferus*, 15 December 2013, W. Jaklitsch (WU 33506; culture V9); La Esperanza, on *Spartium junceum*, 19 December 2013, W. Jaklitsch (WU 33507; culture CBS

139071 =V10); Islas Baleares, Mallorca, Algaida, Cas Brau, on *Ceratonia siliqua*, soc. *Cryptovalsa* sp., 21 November 2010, W. Jaklitsch (WU 33497; culture CBS 139060=VIC).

Notes: The epithet *spartii* is the oldest for a *Valsaria* occurring on *Spartium*. We stabilize the name by epitypification with a specimen from *Spartium Valsaria spartii* is the most common species of *Valsaria*, especially in the Mediterranean and occurs besides *Spartium* on a very wide range of *Fabaceae* but also other, unrelated hosts. *Valsaria spartii* has often very well-developed pseudostromatic tissues, which results in a striking similarity with species of *Diaporthe (Diaporthales*). In cultures of this species arthroconidia are most commonly and prominently formed, whereas fertile hyphae of *V. insitiva* are much narrower and do not produce arthroconidia. Formation of arthroconidia by the closely related *V. robiniae* is inconspicuous.

Myrmaecium Nitschke ex Fuckel, Jb. Nassau. Ver. Naturk. 23–24: 227 (1870); non *Myrmaecium* Sacc., Michelia 2: 138 (1880).

= *Phaeocreopsis* Sacc. & Syd. apud Lindau in Engl. & Prant., Nat. Pflanzenfam. Nachtr., p 541 (1900)

= *Hypoxylonopsis* Henn., Hedwigia 43: 256 (1904)

Type species: *Myrmaecium rubricosum* Fuckel, Jb. nassau. Ver. Naturk. 23–24: 227 (1870) [1869–70]

Stromata eu- or pseudostromatic, immersed, erumpent to superficial on bark, rarely decorticated wood, scattered or aggregated, pulvinate, labiate or ring-like, or conical to subglobose, 0.5–4 mm diam, or fusing to compound stromata up to 15×8 mm, 0.5–8 mm high. *Ectostroma* inconspicuous and continuous or conspicuous and slightly to strongly emerging above the bark surface; surface flat, concave or convex, continuous to coarsely cracked around the slightly projecting black ostiolar necks, reddish, brick-coloured, yellow-brown, dull olive brown or reddish to cinnamon brown, or dark reddish to black, sometimes covered by bright yellow to orange flakes or scurf, sometimes forming substellate or inversely stellate structures. Pigments usually extractable with KOH, purple or pink in KOH, vinaceous, yellow to greenish in lactic acid. Ecto- and entostroma above ascomata pseudoparenchymatous. *Entostroma* at lower levels soft-textured, greyish brown, yellowish brown, tan or off-white, prosenchymatous or plectenchymatous, of loose or densely intertwined hyaline to reddish brown or red thin-walled hyphae. Black marginal zones lacking. Rarely a cottony hyphal mat present at the base of stromata, developing between the bark and the wood, pale brown or purplish, sometimes staining wood or bark purple to violaceous. *Ascomata* (0.1–)0.2–0.5 mm diam, arranged monostichously at near basal position or in the stroma middle, sometimes immediately below the outer crust, in valsoid or diatrypoid configuration, flaskshaped to subglobose, with 2-layered peridium of flattened brown (external layer) and hyaline (internal layer) cells. *Ostiolar necks* short and discrete or up to ca. 1 mm long and convergent to fusing, black, interior periphysate. *Paraphyses* numerous, filiform, unbranched, apically free, 1.5–5.5 μm wide, attenuated towards the apex, ends sometimes slightly swollen. *Asci* 74–141×10–19 μm, numerous, cylindrical, oblong to subclavate, bitunicate, with or without obvious fissitunicate opening, containing

4–8 (often obliquely) uniseriate, sometimes partly biseriate ascospores; with a short stipe, a small ocular chamber, a thin or thick apex with or without a thin, inconspicuous, 2.5–7 µm wide, 1.2–4.5 µm high apical ring, weakly refractive in water, staining weakly in Congo Red, esp. after KOH pretreatment. *Ascospores* 12–20×6–10, ellipsoid, 2-celled, dark brown, symmetrical or inequilateral, septum usually thicker than the wall, not or slightly constricted at the septum, with reticulate or labyrinthine surface ornamentation.

Asexual morph on natural substrates lacking or formed in stromata as locules at ostiolar levels above immature ascomata. *Phialides* densely packed, lageniform to cylindrical, with broad collarette. *Conidia* oblong or bullet-shaped, 1-celled, hyaline, orange to orange-brown in mass.

Culture characterists: Growth on MEA fast, centrally inoculated 90 mm plates usually entirely covered by mycelium within 1 week. Odour of colonies indistinct or strongly chemical, cresol-like. *Conidiation* effuse. *Conidia* 3–16×1–5 µm, ellipsoid, oblong to allantoid, 1-celled, hyaline, budding; formed by budding, on minute pegs and scant lageniform phialides. Sometimes fertile sexual stromata or solitary ascomata produced in culture.

Myrmaecium rubricosum (Fr. : Fr.) Fuckel, Jb. Nassau. Ver. Naturk. 23–24: 227 (1870).

Basionym: *Sphaeria rubricosa* Fr., Elench. fung. 2: 63 (1828)

≡ *Hypoxylon rubricosum* (Fr. : Fr.) Fr., Summa Veg. Scand. 2: 384 (1849)

≡ *Melogramma rubricosum* (Fr. : Fr.) Tul. & C. Tul., Sel. Fung. Carp. 2: 84 (1863)

= *Hypoxylon walterianum* Berk. & Ravenel, in Ravenel, Fung. Carol. Exs. Fasc. IV, no. 35. (1855)

= *Myrmaecium durissimum* Fuckel, Jb. Nassau. Ver. Naturk. 23–24: 228 (1870)

≡ *Valsaria durissima* (Fuckel) Sacc., Syll. Fung. I: 748 (1882)

≡ *Pseudovalsa durissima* (Fuckel) Cooke, Grevillea 14: 55 (1885)

= *Hypoxylon gemmatum* Berk. & Ravenel, in Berk., Grevillea 4: 50 (1875)

≡ *Melogramma gemmata* (Berk. & Ravenel) Cooke. Grevillea 13: 103 (1885)

≡ *Valsaria gemmata* (Berk. & Ravenel) Ellis & Everh., N. Amer. Pyren., p. 562 (1892)

= *Melogramma cinnamomi* Ces., Atti Accad. Sci. Fis. 8: 19 (1879)

≡ *Valsaria cinnamomi* (Ces.) Sacc., Syll. Fung. I: 748 (1882)

≡ *Valsonectria cinnamomi* (Ces.) Huhndorf, Mycologia 84: 642 (1992)

= *Melogramma eucalypti* Kalchbr. & Cooke, Grevillea 9: 31 (1880)

≡ *Valsaria eucalypti* (Kalchbr. & Cooke) Sacc., Syll. Fung. I: 746 (1882)

= *Valsaria purpurea* Peck, Bull. Torrey Bot. Club 11:28 (1884)

= *Valsaria hypoxyloides* Ellis & Everh., J. Mycol. 7: 131 (1892)

≡ *Valsonectria hypoxyloides* (Ellis & Everh.) M.E. Barr, Mycotaxon 39: 137 (1990)

= *Valsaria pseudohypoxylon* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 6 : 276 (1898)

= *Hypocreopsis hypoxyloides* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 6: 291 (1898)

≡ *Phaeocreopsis hypoxyloides* (Speg.) Sacc. & Syd., Syll. Fung. XVI: 592 (1902)

= *Myrmaecium hypoxyloides* Rehm, Hedwigia 40: 148 (1901)

= *Hypoxylonopsis hurae* Henn., Hedwigia 43: 256 (1904)

≡ *Valsaria hurae* (Henn.) Höhn., Sitzungsber. Kaiserl. Akad. Wiss. Wien, Math.-Nalurwiss. Cl., Abt. 1, 119: 924 (1910)

= *Valsaria hypoxyloides* Rehm, in Theiss., Ann. Mycol. 10: 12 (1912)

= *Valsaria rehmiana* Teng, Sinensia 4: 391 (1934)

= *Hypoxylonopsis rehmiana* (Teng) Teng, Chung-kuo Ti Chenchun [Fungi of China], p. 761 (1963); as *Hypoxylopsis*

= *Valsonectria reticulata* Loeffler & E. Müll., Ber. Schweiz. Bot. Ges. 71: 413 (1961)

= *Valsaria mundkurina* Muderji & Kapoor, Ceská Mykol. 23: 258 (1969)

= *Valsaria reticulata* Kar & Maity, Indian Phytopathol. 32: 425 (1979)

(synonyms taken from Ju et al. 1996).

Facesoffungi number: FoF 00613, Figs. 4 o, p, 14, 16 a-h

Stromata eustromatic, erumpent-superficial on bark, rarely decorticated wood, scattered or aggregated in groups, pulvinate with flattened to slightly convex surface, 0.7–4×0.5–1.4 mm, or coalescent forming compound stromata up to 15 × 8 mm long, 0.7–8.3 mm high, with variable, sometimes constricted and more or less cylindrical base; upper fertile part emerging above the ruptured periderm, often with slightly revolute margins, surface and sides brick red when dry, soft textured, smooth, becoming cracked, roughened by the more or less projecting black ostiolar necks; surface of lower parts in bark tissue or wood gradually turning blackish downward. *Uppermost stromatic layer* 40–80 µm thick, pseudoparenchymatous, of small thin-walled cells with pigmented contents releasing pink to purple pigments in 3–10 % KOH and ammonia, vinaceous in lactic acid. *Entostroma* below this layer and the ascomata soft-textured, grey to tan, solid to loosely fibrous, plectenchymatous, composed of densely intertwined, hyaline to reddish brown, thin-walled, 4–11 µm wide hyphae; cottony pale brown or purplish to violaceous subiculum sometimes present at the base of stromata between bark and wood; sometimes bark or wood also stained purple. *Ascomata* 0.2–0.4 mm high×0.15–0.35 mm diam, immersed beneath the upper outer crust in a single layer in diatrypoid configuration, flask-shaped to subglobose; peridium 15–25 µm thick, composed of flattened cells, dark brown in an outer layer, hyaline in an inner layer. *Ostiolar necks* usually separate, not fusing, 70–580 µm long, black, smooth, round-ended, often unevenly distributed on the stromatal surface, 80–170 µm wide including walls, flush or projecting to 40–170 µm above the surface, periphysate. *Paraphyses* 1.5–5.0 µm wide, unbranched, apically free. *Asci* (74–)83–102(–118)×(10.3–)11.5–14.5(–16.2) µm (*n*=30), usually plump, oblong to cylindrical, bitunicate, containing 4–8 (often obliquely) uniseriate, sometimes partly biseriate ascospores; without obvious fissitunicate dehiscence but sometimes exotunica breaking in the lower third, with a short stipe and crozier and a thin, inconspicuous apical ring (2.5–)3.5–5.8(–6.8) µm wide, (1.3–)1.7–3.2(–4.5) µm high (*n*=21), weakly refractive in water, staining weakly in Congo Red, slightly more intensely after KOH pretreatment. *Ascospores* (12.2–)14.0–16.3(–18.0)×(6.8–)7.5–8.5(–9.0) µm, l/w (1.5–)1.7–2.1(–2.4) (*n*=80), ellipsoid, 2-celled, medium to dark brown, with a central, not distinctly thickened and nonconstricted septum, with distinct reticulate surface ornamentation. No asexual morph detected on natural substrates.

Cultures, asexual morph and sexual morph in culture: On MEA colony radius 15–19 mm after 3 days, 32–34 mm after 5 days; centrally inoculated 90 mm plates entirely or nearly entirely covered by mycelium within 1 week. *Colony* circular, pale pinkish, orange or reddish, slightly floccose or fluffy by white aerial hyphae (turning partly violaceous in 3 % KOH), not zonate, without radial texture. Reverse rosy with yellowish tint and brown dots. Bright yellow pigment diffusing into the agar in aged cultures. Odour indistinct. *Effuse conidiation* only present around the inoculation plug in initial cultures. Conidia formed by budding and on minute pegs and scant lageniform phialides ca. 7–15×3.5–5 µm arising from little branched, long filiform hyphae. *Conidia* (4.5–)4.7–10.7(–16.0)×(1.8–)2.0–3.0(–3.7) µm, l/w (2.0–)2.3–3.4(–4.3) (*n*=23), oblong to allantoid, rarely ellipsoid, 1-celled, hyaline, smooth, with minute guttules, budding. *Stromata* appearing after ca. 10 days as black dots in the colony centre, growing and becoming fertile after ca. 2 months; up to 11×8 mm and 3 mm high, irregular, consisting of variously shaped, more or less black segments and partly covered by whitish to reddish-brownish mycelium. Stromatic tissue pseudoparenchymatous, dark red, releasing red pigment in 3 % KOH. *Ascomata* with long black cylindrical ostiolar necks, apically free paraphyses and fissitunicate, cylindrical asci with 8 uniseriate *ascospores* 13–16×7.5–9 µm.

On PDA growth slow (colony radius e.g. 18 mm after 14 days); colony irregular, velvety, dark reddish brown, thick and dense; ascomata formed; odour pleasant, bakery-like.

Ecology and distribution: on sun-exposed, corticated logs and branches of coniferous and broadleaf trees; worldwide, but uncommon. Sometimes co-occurring with *M. fulvopruinatum*.

Types: **Lectotype:** FRANCE, Angers, date unknown, J.P. Guépin (L9118162 (L), **lectotype** of *Sphaeria rubricosa*, designated by Ju et al. (1996); PC0167074!, **isolectotype**). Guépin was cited by Fries 1828, Elench. Fung. II: 63.

Other material examined: AUSTRIA, Kärnten, Obermieger, roadside, grid square 9452/1, on corticated logs of *Picea abies*, 4 January 2004, W. Jaklitsch W.J. 2494 (WU 33449; culture CBS 139069=VRM); St. Margareten im Rosental, Schwarzgupf, grid square 9452/4, on corticated logs of *Abies alba*, 24 October 1998, W. Jaklitsch W.J. 1247 (WU 33452); Steiermark, Eibiswald, near Radlpaß, grid square 9357/1, on logs of *Picea abies*, 16 September 1996, W. Jaklitsch W.J. 940 (WU 33451). CHILE, locality and date not indicated (PC0167073; as *Hypoxylon rubricosum*). CROATIA, Istria, ca. 1,5 km south of Bale, on sun-exposed cut branches of *Quercus pubescens*, 18 May 2012, H. Voglmayr (WU 33450, culture CBS 139068 =VRP). FRANCE, Dept. Landes, Tartas, Souprosse, on *Quercus robur*, 8 April 1996, F. Candoussau 4869-E434, as *Phaeocreopsis hypoxyloides* (JDR; culture VRJ); Vienne, on *Populus* sp., date unknown (PC0167075; as *Hypoxylon rubricosum);* Martinique, Saint Esprit, edge of Bois La Charles, on bark, 20 August 2013, J. Fournier MJF 13328 (WU 33447; culture CBS 139067 = VRF); French Guyana, locality and date not indicated, F.R. Leprieur 237 (PC0167072; as *Hypoxylon rubricosum);* Mayotte, Saziley, 12°57,98′ S 45°11,07′ E, on corticated wood, 5 April 2014, M. Pélissier, MP 2014–133 (JF). THAILAND, Chiang Mai Province, Mae Teang District, Bahn Pha Deng, Mushroom Research Centre, 19°01′615″ N, 98°41′884″ E, 900 m, on bark of *Lithocarpus* sp., 12 June 2005, JF-TH 12–01 (JF). USA, Hawaiian Islands, Maui, Hana Highway, on twigs, 5 August 2005, Y.-M. Ju & H.-M. Hsieh 94080504 (WU 33448; culture VRJ1; part in HAST).

Notes: *Myrmaecium rubricosum* is a distinctive species and in the order *Valsariales* being the only one which produces massive superficial eustromata. *Myrmaecium fulvopruinatum* differs in many respects from *M. rubricosum* and forms smaller stromata and is more variable in stromatal and ascomatal characters. Asci of *M. rubricosum* are rather plump and oblong, shorter than in *Valsaria* spp. and remarkably stable in water. The isolectotype contains several typical stromata to 4 mm long and 2.5 mm high, glued on paper. In several specimens from the tropics (e.g. specimens from Hawaii, Martinique and Mayotte) the bark is stained purple by the fungus. Contrary to *M. fulvopruinatum* and *M. rubrum* no cresol is formed in MEA cultures of *M. rubricosum*.

Myrmaecium fulvopruinatum (Berk.) Jaklitsch & Voglmayr, ***comb nov.***

Basionym: *Sphaeria fulvopruinata* Berk., London J. Bot. (Hooker) 4: 312 (1845)

≡ *Valsaria fulvopruinata* (Berk.) Sacc., Syll. fung. 1: 747 (1882)

= *Valsaria decorticans* (Kunze ex Ces. & De Not.) Bagl., Ces. & De Not., Erb. Crittog. Ital., ser. l. fasc. 26, no. 1280. (1865); non (Fr.: Fr.) Ces. & De Not. (1863)

= *Valsaria kunzeana* De Not., Comm. Soc. Crittog. Ital. 2: 482 (1867)

= *Valsaria exasperans* (W.R. Gerard) Sacc., Syll. Fung. 2: 55 (1883)

= *Myrmaecium quadratum* (Schwein. ex Berk.) Rehm, Ascomyc. no. 325 (1876)

= *Valsaria quadrata* (Schwein. ex Berk.) Sacc., Syll. Fung. 1: 745. (1882)

= *Myrmaecium abietinum* Niessl, Hedwigia 13: 42 (1874) See Ju et al. (1996) for additional synonyms.

MycoBankMB 811904, Facesoffungi number: FoF 00614, Figs. 4 q, r, 15, 16 i–w

Stromata eustromatic, immersed-erumpent, causing small bumps in bark, subpulvinate, labiate or ring-like, often longish, with often concave or flattened, less commonly slightly convex surface, separate, 0.8–4×0.2–2.5 mm, aggregated in linear rows or coalescent forming compound stromata up to 7 mm long and 1–2.6 mm high. *Ectostroma* often partly covered by bright yellow to orange flakes or scurf composed of amorphous granules or acicular crystals, scarcely emerging above the ruptured periderm, yellow-brown, dull olive brown or reddish- to cinnamon brown, typically coarsely cracked around the ostiolar necks and frequently forming sub- or inversely stellate structures; stroma base flattened, sometimes fringed by yellow or pale purple mycelium. *Uppermost stromatic layer* 40–90 μm thick, pseudoparenchymatous, of small thin-walled cells with pigmented contents releasing pink to purple pigments in 3–10 % KOH and ammonia, yellow to greenish yellow in lactic acid, replaced at sides and the base by a blackish layer 30–45 μm thick composed of plectenchymatous to pseudoparenchymatous cells almost opaque externally, gradually less pigmented inwardly. *Entostroma* below this layer soft-textured, greyish brown, dull brown or tan, darker around ascomata and just beneath the surface, frequently tan to off-white below the ascomata, solid to loosely fibrous, plectenchymatous, composed of densely intertwined, hyaline to reddish brown, thin-walled, minutely incrusted, 4.5–8 μm wide hyphae; pale brown or purplish cottony subiculum sometimes present at the base of stromata between bark and wood. *Ascomata* 0.2–0.5 mm high, 0.2–0.4 mm diam, arranged monostichously in valsoid groups of 5–10 at near basal position or in the stroma middle, less commonly in diatrypoid configuration just below the stroma surface, flask-shaped to subglobose; peridium 18–28 μm thick, composed of a thin outer layer of flattened dark brown cells and an inner layer of flattened hyaline cells. *Ostiolar necks* converging into a common neck, less commonly separate, 250–700(–1100) μm long, (90–)170–230 μm diam, black, smooth; apices at the surface usually with distinct circular outline, flush with the stroma surface or projecting to ca. 120 μm; periphysate. *Paraphyses* filiform, unbranched, apically free, to ca. 150 μm long, 1.5–4.5(–5.5) μm wide, attenuated upwards, often slightly enlarged at the tip. *Asci* (97–)107–130(–141)×(11.5–)13.0–16.5(–19.0) (n=35), numerous, cylindrical to subclavate, containing (4–)6–8 (often obliquely) uniseriate or partly biseriate ascospores, unstable in water, more stable in KOH, bitunicate, fissitunicate (mostly in the middle), with croziers, small ocular chamber, thick apex; apical ring absent or thin, inversely trapezoid and faintly reddish in Congo Red after KOH pretreatment, 3.0–3.5(–3.7) μm wide, (1.2–)1.5–2.5(–2.8) μm high (n = 8). *Ascospores* (14.2–)16.5–19.2(–20.5)×(7.8–)8.5–9.7(–10.5) μm, l/w (1.7–)1.8–2.1(–2.3) (n=101), ellipsoid, 2-celled, dark brown to black, plump or attenuated towards apices with 1 large drop per cell and densely reticulate surface ornamentation.

Asexual morph on natural substrates: Immature stromata often with a dark and gelatinous flat central surface, containing conidiomata as irregular, labyrinthine locules at ostiolar levels above immature ascomata; interior of locules hyaline to orange or brown, walls lined by palisades of densely clustered, lageniform to cylindrical, often basally curved *phialides* (6.8–)8.5–12.0(– 15.5)×(1.9–)2.4–3.0(–3.3) µm, l/w (2.8–)3.1–4.7(–6.5) (*n*=78), with broad collarette, originating from large brown incrusted cells 8–15 µm diam and hyaline cylindrical cells. *Conidia* (2.5–)2.8–3.7(–5.0)×(1.5–)1.7–2.0(–2.2) µm, l/w (1.2–)1.5–2.0(–3.0) (*n*=71), oblong to bullet-shaped or subglobose, 1-celled, hyaline, orange-brown in mass, with rounded upper and truncate lower end.

Cultures and asexual morph: On MEA colony radius 14–19 mm after 3 days, 26–33 mm after 5 days; centrally inoculated 90 mm plates entirely or nearly entirely covered by mycelium within 1 week; growth sometimes ceasing earlier. *Colony* zonate, surface and aerial hyphae with distinct macroscopically visible radial arrangement; aerial hyphae forming white radial streaks; first white, soon turning yellowish to pale orange or rosy to yellow-brown. *Odour* pungent, cresol-like. *Conidiation* effuse; yellowish to rosy conidial masses of spreading from the plug. Conidia formed by budding and on minute pegs and solitary, terminal, lageniform, oblong or ellipsoid to saccate, straight, curved or sigmoid *phialides* (6.5–)7.0–13.3(–21.0)×(2.5–)3.3–4.8(–5.8) µm, l/w (1.5–)1.9–3.1(–3.7) (*n*=30), arising from hyaline, short, erect conidiophores spreading from the centre. *Conidiophores* simple, filiform, with infrequent paired or unpaired branching; branches often at right angles, 1- to several-celled, rarely with secondary branching, 2.5–6.5 µm wide. *Conidia* (3.0–)4.3–8.0(–10.8)×(1.5–)2.0–3.5(–4.8) µm, l/w (1.5–)1.8–2.8(–4.1) (n = 65), very variable, ellipsoid, oblong, less commonly allantoid, 1-celled, hyaline, smooth, with indistinct or truncate scar; budding. No pycnidia or sexual stromata formed. On PDA as on MEA, but growth slower and colony without distinct radial structure and zonation. On CMD growth slower than on MEA, but more conidia formed.

Ecology and distribution: on sun-exposed, corticated logs and branches of coniferous and broadleaf trees; worldwide, but uncommon. Sometimes co-occurring with *M. rubricosum*.

Type: **Holotype:** USA, Ohio, in bark of *Platanus occidentalis*, T.G. Lea, ex herb. M.J. Berkeley (K(M) 193954!, **holotype** of *Sphaeria fulvopruinata*).

Epitype: USA, Massachusetts, Conway, Baptist Hill, on *Fagus grandifolia*, 5 December 1982, M.E. Barr 6905 (as *Valsaria exasperans*) (NY!, **epitype** of *Sphaeria fulvopruinata* **here designated;** ex-epitype culture CBS 139058=VFJ; ex-epitype sequences KP687968 (SSU), KP687861 (ITS-LSU), KP687936 (*rpb2*), KP688030 (*tef1*)).

Other material examined: AUSTRIA, Burgenland, Oberpullendorf, on *Quercus cerris*, 2 October 2010, W. Jaklitsch & O. Sükösd (WU 33438; culture CBS 139059= VFQ); Kärnten, St. Margareten im Rosental, Wograda, grid square 9452/3, on *Picea abies*, 17 May 1996, W. Jaklitsch (WU 33440; culture WJ 870); St. Margareten im Rosental, Schwarzgupf, grid square 9452/4, on logs of *Fagus sylvatica* and *Abies alba*, 24 October 1998, W. Jaklitsch W.J. 1246 (WU 33443); Niederösterreich, Weidlingbach, on logs of *Fagus sylvatica*, 21 August 2010, W. Jaklitsch (WU 33433; culture CBS 139057=VF); ibidem, on logs of *Picea* *abies*, 31 August 2014, W. Jaklitsch PWB (WU 33439); Berndorf, Steinhof, Großer Geyergraben, on logs of *Fagus sylvatica*, 25 October 2014, H. Voglmayr & I. Greilhuber (WU); Oberösterreich, St. Willibald, Aichet, on *Fraxinus excelsior* and *Alnus glutinosa*, 11 December 2011, H. Voglmayr (WU 33434; culture VF1); Steiermark, Graz-Umgebung, St. Oswald bei Plankenwarth, opposite Schloss Plankenwarth, on *Fagus sylvatica*, 16 January 2015, I. Wendelin, comm. G. Friebes (GJO 73406); Hartberg, on *Betula pendula*, 2 October 2010, H. Voglmayr (WU 33436; culture VFB); Voitsberg, at the railway station, on a fence made of corticated trunks of *Abies alba*, Rabenhorst Fungi Europaei 1718 (L0819039!, **lectotype** of *Myrmaecium abietinum*, here designated); Vienna, 19th district, Hermannskogel, near Fischerhaus, grid square 7763/2, on *Ulmus* sp., 13 October 1996, W. Jaklitsch W.J. 984 (WU 33441); Kahlenberg, grid square 7763/2, on *Fagus sylvatica*, 30 August 1998, W. Jaklitsch W.J. 1190 (WU 33442); ibidem, on *Fagus sylvatica*, 8 November 1998, W. Jaklitsch W.J. 1276 (WU 33444); ibidem, on *Aesculus hippocastaneum*, 19 October 2014, W. Jaklitsch & H. Voglmayr (WU 33432; culture VFA); 23rd district, Maurer Wald, grid square 7863/1, on *Carpinus betulus*, 4 November 2000, W. Jaklitsch W.J. 1692 (WU 33445). CZECH REPUBLIC, Hranice, Höllenschlucht at Podhorn, on *Fagus sylvatica*, 20 August 1912, F. Petrak, Flora Bohemiae et Moraviae Exsiccata 47 (L0819031!, as *Valsaria rubricosa* f. *fagi);* Hranice, on *Fagus sylvatica*, September 1912, F. Petrak (L0819033! and L0819034!, as *Valsaria rubricosa*); Hranice, Hrabuvka, on hardwood trunks (possibly *Carpinus betulus* or *Fagus sylvatica*), August 1940, F. Petrak, Reliquiae Petrakianae 1694 (L0819035!, as *V. rubricosa*). FRANCE, Rhóne, Sain Bel, in bark of *Alnus glutinosa*, November 1881, J. Therry 6514, C. Roumeguere. Fungi Gallici Exsiccati 2190 (L0819036!, as *Valsaria rubricosa* f. *alni-glutinosi*); Rhóne, Lyon, in bark of *Prunus cerasus*, ?spring 1881, J. Therry, de Thuemen, Mycotheca universalis 2261 (L0819037!, as *Valsaria rubricosa*). GERM any, Bayern, Knetzgau, close to Mariaburghausen, left roadside heading from Knetzgau to Haßfurt, grid square 5929/3, on logs of *Fagus sylvatica*, 29 August 2006, W. Jaklitsch & H. Voglmayr W.J. 2964 (WU 33446). SPAIN, Basque Country, Álava, Ziorraga, on logs of *Fagus sylvatica*, 1 November 2010, W. Jaklitsch VF2 (WU 33435). TAIWAN, Taichung County, Ho-ping, Pi-lu Creek, on unidentified twigs, 20 August 2006, J.-R. Guu 95082003 (HAST; part as WU 33437; culture VFJ1).

Notes: *Myrmaecium fulvopruinatum* was originally described from the USA. The residual material of the holotype is however immature, therefore we epitypify *Sphaeria fulvopruinata* with a specimen from the USA. According to Ju et al. (1996) this taxon is common in the eastern USA, but according to our experience it is also common in Europe. Remarkably most European mycologists misidentified *M. fulvopruinatum* as *M. rubricosum* and most European varieties and forms of *V. rubricosa* are *M. fulvopruinatum. Myrmaecium abietinum* is a synonym of *M. fulvopruinatum*, not of *M. rubricosum* as previously assumed (e.g. with a ? by Ju et al. 1996). *Myrmaecium fulvopruinatum* is the only species of *Valsariales*, where fissitunicate opening of asci can be seen rather regularly, and it is the only species forming rather well-defined conidiophores. Apart from surface colours and the substellate structures *M. fulvopruinatum* is also more variable in the stromata, which do not become superficial, with ascomata usually in valsoid but rarely in diatrypoid configuration. Ascospores are slightly wider than in *M. rubricosum*, and asci are unstable in water contrary to *M. rubricosum. Myrmaecium fulvopruinatum* shares the ability to produce cresol in cultures with *M. rubrum*. In the strain we studied on MEA we only observed the effuse hyphomycetous asexual morph, in contrast to Ju et al. (1996), who detected a pycnidial asexual morph in a different strain on oatmeal agar.

Myrmaecium rubrum (Aptroot et al.) Jaklitsch & Voglmayr, ***comb nov.***

Basionym: *Munkovalsaria rubra* Aptroot, Aa & Petrini, in Aptroot, Nova Hedw. 60: 349 (1995)

MycoBank MB 811905, Facesoffungi number: FoF 00615, Fig. 17

Stromata pseudostromatic, immersed, conical to subglobose, up to ca. 1 mm high and wide at the base, appearing at the host surface as dark reddish-violaceous to black, smooth or irregularly tubercular dots 0.2–0.8(–1.2) mm diam, containing 1 or few inconspicuous to slightly papillate black ostioles. Stromatic tissue above ascomata dark red to black, purple in 3 % KOH, pseudoparenchymatous; cell walls red and brown, inhomogenously pigmented; pseudostromatic tissue at ascomatal levels prosenchymatous, yellow-brown, of hyaline hyphae, but red in the immediate vicinity of ascomata. No black marginal zone apparent. *Ascomata* 0.13–0.3 mm high and 0.1–0.2 mm wide, basal, monostichous, up to ca. 10 densely clustered in valsoid configuration, globose to pyriform; peridium brown, 2-layered, pseudoparenchymatous. *Ostiolar necks* long, convergent or fusing. *Paraphyses* numerous, unbranched, apically free, 2–5 μm wide, ends sometimes slightly widened. *Asci* (83–)96–115×(10.5–)10.7–12.7(–13.2) μm (n = 8), cylindrical, bitunicate without obvious fissitunicate dehiscence, containing 8 (obliquely) uniseriate ascospores; apex thin, no ring visible in Congo Red. *Ascospores* (11.7–)12.8–15.2(–18.7)×(6.0–)6.7–8.2(–9.5) μm, l/w (1.6–)1.7–2.1(–2.6) (n=81), ellipsoid, 2-celled, dark brown to black, symmetrical or inequilateral, septum much thicker than the wall, not or slightly constricted at the septum, with delicately labyrinthine ornamentation.

Culture, asexual morph and sexual morph in culture (based on a dry culture contained in the holotype and information from the protologue (Aptroot 1995): *Culture* on CMA with orange-red aerial mycelium and red diffusing pigment in the medium, with a *strong odour* of m-cresol. *Conidiophores* irregularly branched, 3–5 μm wide, with mostly intercalary phialides. *Conidia* 4–5×1–2 μm, long ellipsoid, 1-celled, hyaline, with a broad hilum and a rounded tip. *Sexual stromata* or solitary ascomata forming on *Lupinus* stalks on CMA. Stromata up to 6 mm long, compact, hard, black inside; surface covered by yellow- to orange-brown hyphae; ascomata basal. Stroma cortex red, pseudoparenchymatous, reddish brown to purple in 3 % KOH, but no pigment dissolved; residual stromatic tissue of hyaline hyphae in gel matrix. *Ascomata* containing paraphyses and mature asci with ascospores as in stromata from natural substrates.

Ecology and distribution: in bark of *Ulmus minor*, also reported from *Citrus*, *Quercus* and, according to Aptroot (1995), also isolated from lichens in South Africa.

Type: Italy, near Bari, on bark of *Ulmus minor*, S. Frisullo, 1986 (as *Didymosphaeria* sp.; CBS H-5584, **holotype!**; CBS 345.86, ex-type culture).

Notes: The description above is based on the somewhat depauperate holotype, which may not exhibit the whole natural variation of the species. Microscopic features in stromata from nature and artificial culture are identical, and measurements were thus combined. Basically the fungus produces reduced *Valsaria*-like stromata with partly red stromatic tissues. *Myrmaecium rubrum* shares red colours and stroma formation in culture with *M. rubricosum*, but production of cresol in culture with *M. fulvopruinatum*. Ascospores of *M. rubrum* are larger than given in the protologue and there is no statistical difference in this respect between stromata formed in culture and those formed in nature. The asexual morph description is reproduced from Aptroot (1995). According to the author growth of the fungus is fast and its asexual morph resembles *Lecythophora*. The GenBank sequences of *M. rubrum* used here are from strain CBS 109505 (isolated from *Quercus* sp.). ITS and LSU sequences of this strain are identical with those of the ex-type strain CBS 345.86 (G. Verkley, pers. comm.).

Bambusaria Jaklitsch, D.Q. Dai, K.D. Hyde & Voglmayr, ***gen. nov.***

MycoBank MB 811906

Etymology: For a *Valsaria* occurring on *Bambusoideae*.

Type species: ***Bambusaria bambusae*** (J.N. Kapoor & H.S. Gill) Jaklitsch, D.Q. Dai, K.D. Hyde & Voglmayr

Stromata eustromatic, immersed, erumpent to superficial, globose to irregular, black, with rugose surface, KOH$^-$, internally dark brown, pseudoparenchymatous. *Ascomata* immersed in the stromata in valsoid configuration, monostichous, globose to pyriform; peridium pseudoparenchymatous, of subhyaline to pale brownish compressed cells. *Ostioles* periphysate, necks separately emerging or fusing. *Paraphyses* unbranched, tapering upwards, apically free. *Asci* cylindrical, bitunicate without obvious fissitunicate dehiscence, with a short stipe, containing 8 uniseriate ascospores; apex containing an ocular chamber and a pulvinate ring staining in Congo Red. *Ascospores* ellipsoid to broadly fusiform or biconoid, brown, 1-septate, not or slightly constricted at the septum, longitudinally ribbed.

Asexual morph on natural substrates: Multiloculate conidiomata resembling stromata, immersed-erumpent, globose to irregular, black, with rugose surface, pseudoparenchymatous. Locules with a dark brown, pseudoparenchymatous wall, internally lined by dense palisades of lageniform phialides. Conidia oblong, 1-celled, hyaline, smooth.

Asexual morphs in culture: *Conidiation* on MEA effuse, hyphomycetous; on OA also in pycnidia.

Ecology and distribution: the monotypic genus is only known from *Bambusoideae* in India and Thailand.

Bambusaria bambusae (J.N. Kapoor & H.S. Gill) Jaklitsch, D.Q. Dai, K.D. Hyde & Voglmayr, ***comb nov.***

Basionym: ***Valsaria bambusae*** J.N. Kapoor & H.S. Gill, Indian Phytopath. 14: 152 (1962) [1961]

MycoBankMB811907, Facesoffungi number: FoF 00616, Figs. 4 s, t, 18, 19

Stromata immersed, erumpent to superficial, globose, subglobose or irregular, 0.5–2 mm diam, 0.4–1.5 mm high, solitary to gregarious, often confluent into linear rows or irregular clusters, externally surrounded by a black warted, ca. 10–80 µm thick crust; *ectostroma* often sub- or inversely stellate; internally dark brown, entirely pseudoparenchymatous, of nearly black, thin- to moderately thick-walled cells to 17 µm diam; without KOH-extractable pigments. *Ascomata* immersed in the stromata in valsoid configuration, monostichous, globose to flask-shaped, 0.2–0.45 mm wide, 0.3–0.8 µm high. Peridium 9–15 µm wide, composed of subhyaline to pale brown compressed cells. *Ostiolar necks* 150–350 µm long and 100–250 µm diam at the top, separately emerging or several fusing into one, often slightly projecting above the stroma surface and sulcate, black; interior periphysate. *Paraphyses* unbranched, tapering upwards, apically free, 1.5–9 µm wide. *Asci* cylindrical, (126–)134–156×13.5–16.8 µm ($n = 25$), bitunicate without obvious fissitunicate dehiscence, with a short stipe, containing 8 uniseriate ascospores; apex containing an ocular chamber and a pulvinate ring 2.0–8.5×(3.0–)4.0–5.5(–6.2) µm (n=20), staining in Congo Red. *Ascospores* ellipsoid to broadly fusiform or double rhomboid, (15.5–)18.5–22.7(–28.5)×(7.7–)9.0–11.0(–12.2) µm, l/w (1.5–)1.8–2.3(–3.1) (n=185), medium to dark brown, 1-septate, not or slightly constricted at the septum, rounded or acute at both ends, with sinuous longitudinal ribs partially anastomosing and forming labyrinthine to coarsely reticulate ornamentation.

Asexual morph on natural substrates: Stromata resembling sexual stromata, globose, conical to irregular, black, soft, with a black warted superficial crust, pseudoparenchymatous entostroma, multiloculate. *Locules* with a pale brown, 9–20 µm wide wall of compressed cells, internally lined by dense palisades of lageniform phialides. *Conidia* oblong, (2.5–)3.0–3.8(–4.0)×(1.0–)1.3–1.7(–2.0) µm, l/w (1.8–)2.3–3.0(–3.2) (n=40), 1-celled, straight, hyaline, obtuse at both ends, smooth.

Cultures and asexual morph: *On MEA* colony radius 9–11 mm after 3 days, 25–32 mm after 5 days, 35–40 mm after 7 days; centrally inoculated 90 mm plates entirely covered by mycelium after 10–14 days. *Colony* circular with irregular margin, covered by a white mat of aerial hyphae; reverse turning yellowish from the centre after 5–7 days. Odour indistinct. *Conidiation* effuse, *conidia* appearing after ca. 2 weeks, formed by budding and on minute pegs on filiform, little branched fertile hyphae, (5.6–)6.5–9.5(–10.8)×(2.5–)3.0–5.5(–6.7) µm, l/w (1.2–)1.5–2.6(–3.8) (n=100), 1-celled, ellipsoid to subglobose, hyaline, smooth, straight or curved, with minute guttules. *On PDA* colony radius ca. 22 mm after 2 weeks, with irregular margin, flat, white, cottony; reverse turning orange to orange-brown from the centre. *Conidiation* effuse.

Types: INDIA, Bombay, Dharwar, on culms of *Bambusa* sp., May 1915, G.S. Kulkami, (HCIO 26844, **holotype!**; microscope slides IMl 180328 in K: **isotype**).

Reference specimen: THAILAND, Chiang Rai Prov., Mae Kon subdistrict, Horticulture Research Centre, on dead culms of *Thyrsostachys siamensis*, 5 October 2012, D.Q. Dai DDQ00253 (MFLU 15–0050; culture from ascospores: MFLUCC 12–0851); reference sequences KP687812 (ITS-LSU), KP687890 (*rpb2*), KP687982 (*tef1*).

Other material examined: INDIA, Assam, Research centre Burnihat, on culms of bamboo, 30 April 1979, H.K. Baisya 45 (IMI 238159; K); Maharashtra, Dhule Dist., Ranipur, on culms of *Dendrocalamus strictus*, 30 November 1988. M.R. Ujjainkar & S.D. Deoray (IMI 333847 at K; culture studied by Ju et al. 1996); no locality given, on culms of bamboo, 25 October 1974, K.S. Panwar (IMI 189339, IMI 189341 at K). All as *Valsaria bambusae*. THAILAND, Chiang Rai Prov., Mae Kon subdistrict, Horticulture Research Centre, on dead culms of *Thyrsostachys siamensis*, asexual morph, 5 October 2012, D.Q. Dai DDQ00254 (MFLU 15–0051; culture from conidia: MFLUCC 15–0001 =CBS 139763).

Notes: The material in the holotype is depauperate and effete, but the isotype contains sections comprising stromatic tissue, ascomata and typical striate ascospores, and also an asexual morphic stroma. Ju et al. (1996) reported that ascospore ornamentation varies from longitudinally ribbed to reticulate. This is correct, but even when reticulate, the aspect of the ascospores is longitudinally ribbed or striate, with striae appearing sinuous. This aspect and the occurrence on bamboos are considered sufficient for identification of the fungus. As our sources of molecular data are from a different country (Thailand, versus India) and a different host genus (*Thyrsostachys* versus *Bambusa*) than the type material, we presently cannot exclude that the cited specimens represent a species complex. We designate the specimen MFLU 15–0050 as reference specimen until fresh material from India becomes available. The pycnidial asexual morph reported by Ju et al. (1996) was not seen in the strains studied here. This may be a consequence of a different culture medium used.

Key to genera and species:

Note: Species of *Valsaria* can only be determined with certainty using gene sequences, except for *V. lopadostomoides* and *V. rudis*, which are regarded as host-specific for *Quercus*.

1. Stromata with shades of red or yellow-brown to cinnamon, often showing ionomidotic reaction (KOH-extractable pigments), growth in culture fast ***Myrmaecium*** 2

1. Stromata black, without bright colours or ionomidotic reaction, growth in culture slow 4

2. Stromata conspicuous, eustromatic, releasing purple pigment in KOH 3

2. Stromata inconspicuous, pseudostromatic, on *Citrus*, *Quercus* or *Ulmus*, rare *M. rubrum*

3. Stroma erumpent-superficial, large, surface red, producing sexual stromata in culture *M. rubricosum*

3. Stromata immersed-erumpent, yellow-brown to cinnamon, often with yellow scurf, not producing sexual stromata in culture *M. fulvopruinatum*

4. Eustromatic, ascospores longitudinally ribbed, on bamboos ***Bambusaria bambusae***

4. Pseudostromatic, ascospores with verruculose or delicately reticulate ornamentation, in bark, not on bamboos ***Valsaria*** 5

5. On *Quercus* spp. 6

5. On other hosts 7

6. On evergreen oaks, e.g. *Quercus ilex* *V. lopadostomoides*

6. On deciduous oaks, e.g. *Quercus cerris, Q. petraea* *V. rudis*

7. On unknown hosts in the Neotropics *V. neotropica*

7. Known from warmer regions of Europe (and North America) 8

8. On *Vitis* and predominantly non-fabaceous hosts *V. insitiva*

8. Predominantly on fabaceous hosts 9

9. On *Amorpha, Caragana, Colutea, Hippocrepis* and *Robinia* in Central Europe and submediterranean regions, and the eastern USA; arthroconidia in culture inconspicuous *V. robiniae*

9. On various species of woody *Fabaceae*, less commonly on other hosts such as *Acer sempervirens*, *Spiraea*, *Melia*, *Fraxinus*; arthroconidia in culture conspicuous and abundant; common in the (Sub-)Mediterranean *V. spartii*

Discussion

We studied the genus *Valsaria* as formerly conceived. The morphology of sexual morphs, the coelomycetous asexual morph in nature, the hormonema-like hyphomycetous and the cytosporella-like pycnidial asexual morphs in culture as described by Glawe (1985) and Ju et al. (1996) have been confirmed in this study. We did not find an asexual morph in nature in *Valsaria lopadostomoides* and *V. neotropica*, but both species are based on a single specimen. In cultures of *Myrmaecium fulvopruinatum* and *Bambusaria bambusae* we did not detect a pycnidial asexual morph, although they were described by Ju et al. (1996), but this may depend on the different medium used or perhaps the strain studied. Also the quercicolous species *V. lopadostomoides* and *V. rudis* did not form pycnidia in culture. Colonies of the latter species propagate very slowly and become covered by large masses of conidia.

Ascospores of *Valsaria* and even more those of *Myrmaecium* are extremely durable, as Ju et al. (1996) obtained a culture from a 12 year old specimen (VFJ=CBS 139058) of *M. fulvopruinatum* and we obtained a culture from a nearly 11 year old specimen of *M. rubricosum* (VRM). These findings correlate with the occurrence of *Myrmaecium* spp. on sunexposed logs and of other representatives of the *Valsariales* in warm climates with extended periods of drought. In times of global warming it seems justified to expect that these fungi will enlarge their distribution area. An indication in this direction may be the observation that species of *Valsaria* have become more common in warmer parts of Austria, esp. around Vienna, although this may also be a consequence of increased planting of ornamental shrubs belonging to the *Fabaceae*.

Apart from the combination of true paraphyses and bitunicate asci budding of ascospores is remarkable. This property is shared with several genera from different unrelated taxonomic groups. Examples are *Oevstedalia* Ertz & Diederich (*Pezizomycotina*, uncertain position), *Rhamphoria* (uncertain position *[Annulatascaceae* s.l.], *Sordariomycetes), Thyronectria (Nectriaceae, Hypocreales;* see Jaklitsch and Voglmayr 2014), *Tympanis (Tympanidaceae, Phacidiales*) or *Thyridium*. The latter genus (as discussed by Ju et al. 1996) has much in common with *Valsaria*, as it has ascomata arranged in valsoid fashion in pseudostromata, ascopores that germinate by budding off conidia or producing germ hyphae and coelo- and hyphomycetous asexual morphs. Asci of *Thyridium vestitum* look bitunicate, therefore the fungus was classified in *Fenestella* (e.g. by Munk 1957), but phylogenetically the genus belongs to a distinct family, *Thyridiaceae*, in the *Sordariomycetes* (Jaklitsch and Voglmayr 2014).

Our phylogenetic study has shown that a widely conceived concept of *Valsaria* cannot be upheld, and *Myrmaecium* represents a distinct genus as well as *V. bambusae*, which we transfer to the new genus *Bambusaria*. The hitherto morphologically conceived *Valsaria insitiva* is split into six distinct species, which barely differ in morphological traits. Infraspecific genetic variation in the *Valsariaceae* is relatively low, and isolates of *M. rubricosum* from specimens collected in Europe, Hawaii and Martinique clearly grouped into a monophylum, European and North American isolates of *M. fulvopruinatum* are clearly one species and strains of *V. insitiva* from specimens collected in Guadeloupe and Taiwan clearly formed a clade with those from Europe.

However, the detection of *V. neotropica* from Martinique as a distinct species but with a morphology that is scarcely different from *V. insitiva*, but also the recognition of *V. robiniae*, *V. rudis* and *V. spartii*, which had been synonymized by Ju et al. (1996) with *V. insitiva*, as distinct species, question the synonymy of other epithets. After removal of a few incorrect names 182 names of *Myrmaecium* and *Valsaria* can be found in Index Fungorum (http://www.indexfungorum.org/Names/Names.asp). Most fungi described in *Myrmaecium* have hyaline ascospores and thus do not belong to the genus, few are dubious or probable synonyms. Owing to distinct morphology and genetic stability recognition of synonyms in *Myrmaecium* is much easier than in *Valsaria*, and 19 epithets of *Valsaria* have been relegated to *Myrmaecium* by Ju et al. (1996) under *V. rubricosa* and *V. fulvopruinata*. Many epithets of *Valsaria* have been recognized as synonyms of other fungi, most notably *Pseudovalsaria* (Spooner 1986; Untereiner et al. 2013), *Endoxylina* (Ju et al. 1996; Untereiner et al. 2013) or *Rousso7#x00EB;lla* (Ju et al. 1996), and several other pyrenomycetous genera. Ju et al. (1996) studied all type specimens and other herbarium material available to them and synonymized numerous names with *V. insitiva*. The recognition of *V. robiniae*, *V. rudis* and *V. spartii* as distinct species, however, makes it difficult to determine, which names are synonyms of which species, as they cannot be distinguished by morphology, complicated by the fact that none of the species detected here have sharply defined host preferences, except for the two *Quercus-specific* ones. Twenty-three described names are forms or varieties and thus not relevant at the species level. Others are dubious and in effect 30–40 epithets require re-assessment, the vast majority of which were described from Africa, Asia and North and South America. Additional species may be recognized based on molecular phylogeny, and already published epithets may apply to some, and this can only be ascertained via re-collection in the original regions on the original hosts.

Some species may deserve comments, as they were treated in more recent times. Barr (1989) combined *Didymosphaeria sphaerophora* Ellis & Everh. in *Valsaria*. Her concept of *Valsaria* was a genus encompassing taxa with unitunicate asci. Whether or not this fungus, which is only known from the type specimen collected on *Agave* in Mexico and has striate ascospores, is a member of *Valsariaceae* remains to be assessed. Spooner (1986) combined *Pseudothyridaria insitiva* Petr. in *Valsaria*. Ju et al. (1996), however, accepted *Pseudothyridaria* because of the presence of pseudoparaphyses. This fungus, described from *Aesculus*, has to be recollected for determination of DNA data. Spooner (1986) also recognized that *V. foedans* does not belong to *Valsaria* and described the new genus *Pseudovalsaria* for it, a genus of the Boliniales; see Untereiner et al. (2013) for a recent treatment, phylogenetic placement and synonyms. Kale (1970) summarized *Valsaria* in India. He listed four species including *Bambusaria bambusae* (as *V. bambusae); V. indica* was considered to be a synonym of *V. insitiva*.

Species of *Myrmaecium* are known as sources of secondary metabolites. Volatile compounds are formed in culture by *M. fulvopruinatum* and *M. rubrum*, and for the latter the source of strong odour was identified as m-cresol (Aptroot 1995 and refs. therein). Pigments of *M. rubricosum* were identified as the two anthraquinones valsarin and 7-dichloroemodin by Bohman (1969) and Briggs et al. (1972), and Lam et al. (1972) synthesized these compounds.

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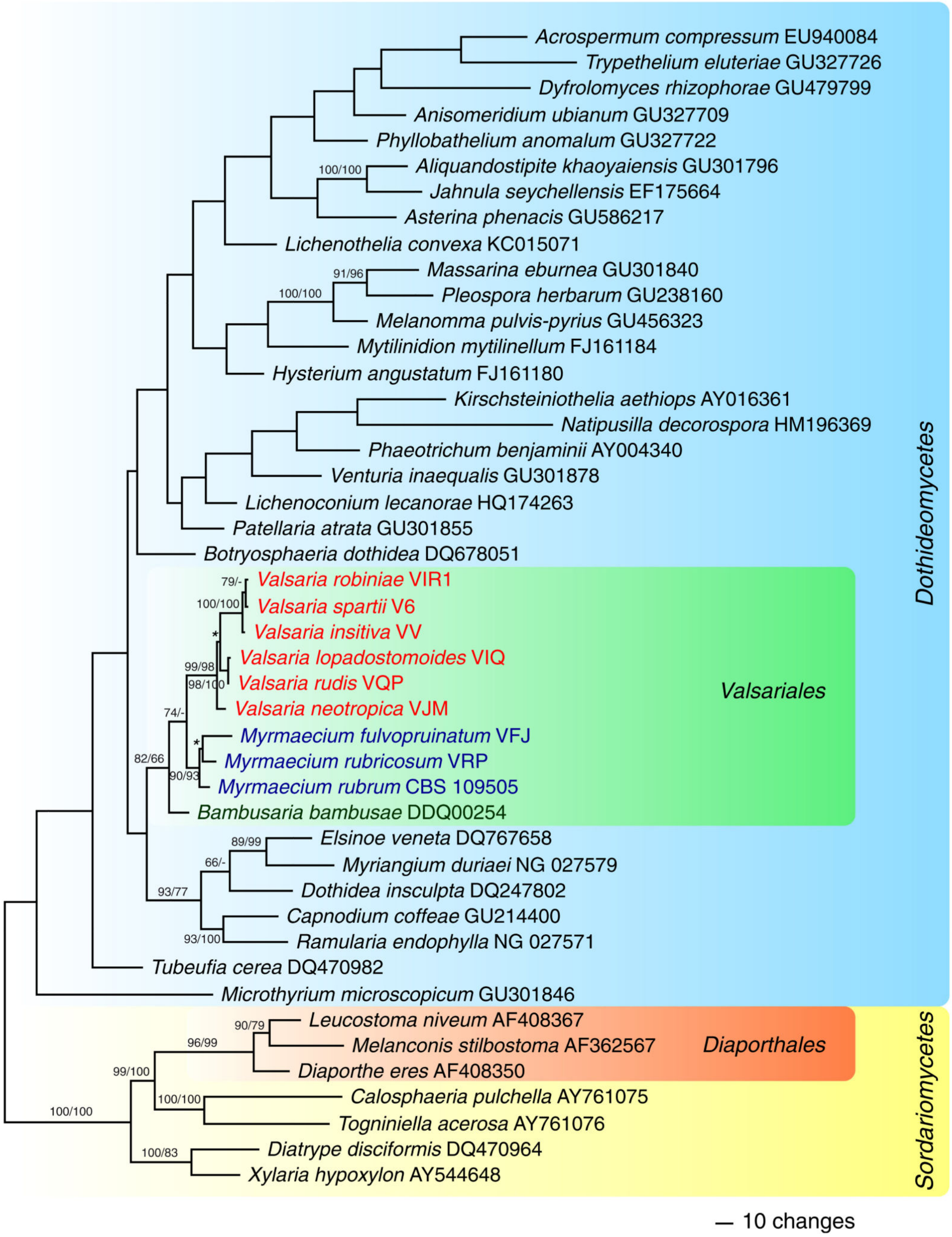

Fig. 1.

Phylogram showing one of three MP trees 2484 steps long revealed by PAUP from an analysis of the nuLSU rDNA matrix of selected *Sordariomycetes* and representatives of all accepted orders of *Dothideomycetes*, showing the phylogenetic position of *Bambusaria, Myrmaecium* and *Valsaria* (*Valsariaceae*, *Valsariales*) within *Dothideomycetes*. MP and ML bootstrap support above 60 % are given above or below the branches. GenBank accession numbers or strain/culture designations are given following the taxon names. Nodes marked by an asterisk (*) collapsed in the strict consensus of the three MP trees

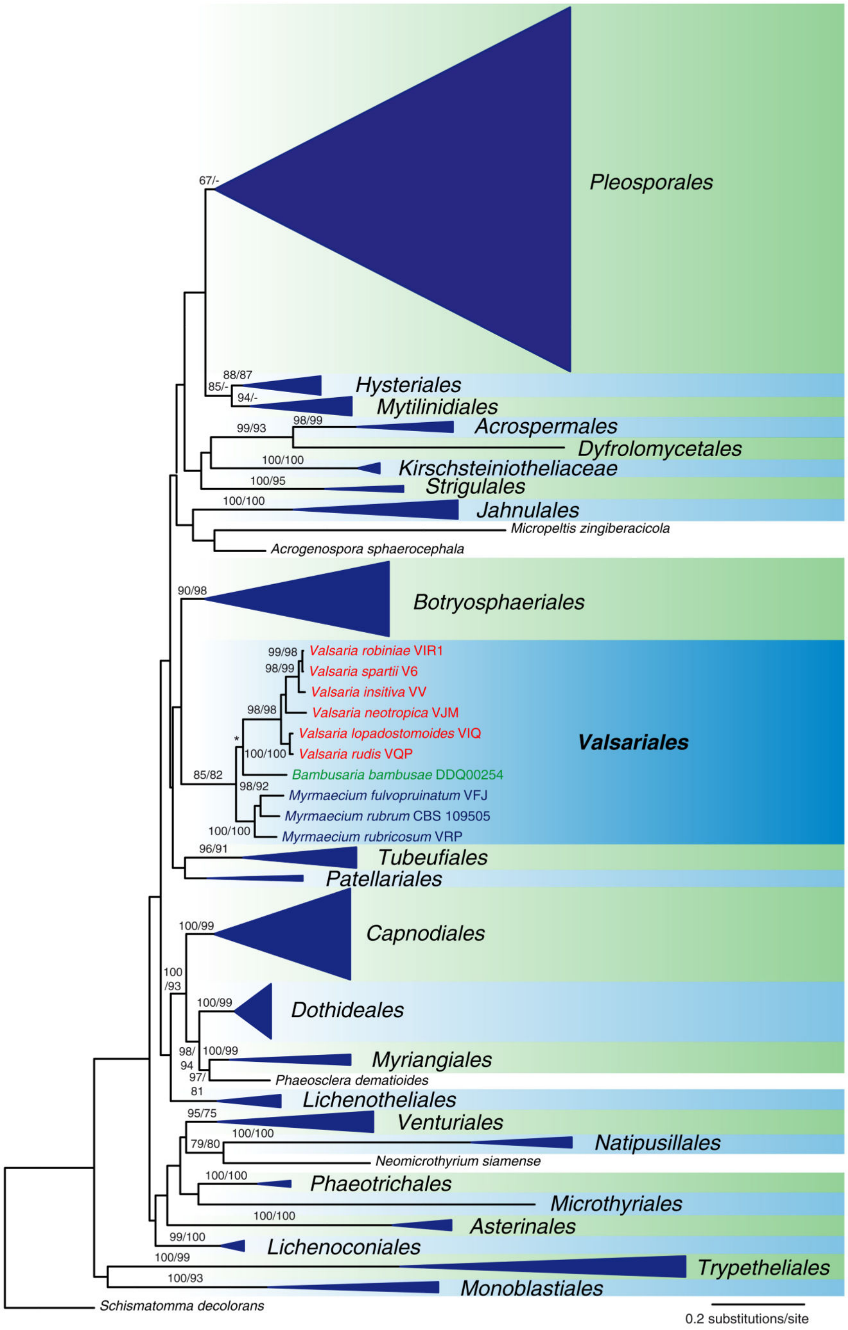

Fig. 2.

Simplified phylogram of the best maximum likelihood tree (lnL= –180369.8567) revealed by RAxML from an analysis of the combined multigene (LSU, SSU, *rpb2, tef1*) matrix of Hyde et al. (2013), containing 414 taxa of *Dothideomycetes* and the sequences of all species of *Bambusaria*, *Myrmaecium* and *Valsaria* (*Valsariaceae*, *Valsariales*) sequenced in the present study. Except for *Valsariales*, all lineages were collapsed to ordinal level. ML and MP bootstrap support above 70 % are given above or below the branches. The asterisk (*) denotes the node in conflict with the MP tree, where *Bambusaria* has a basal position in

Valsariales with 76 % MP bootstrap support. The tree was rooted with *Schismatomma decolorans* according to Hyde et al. (2013)

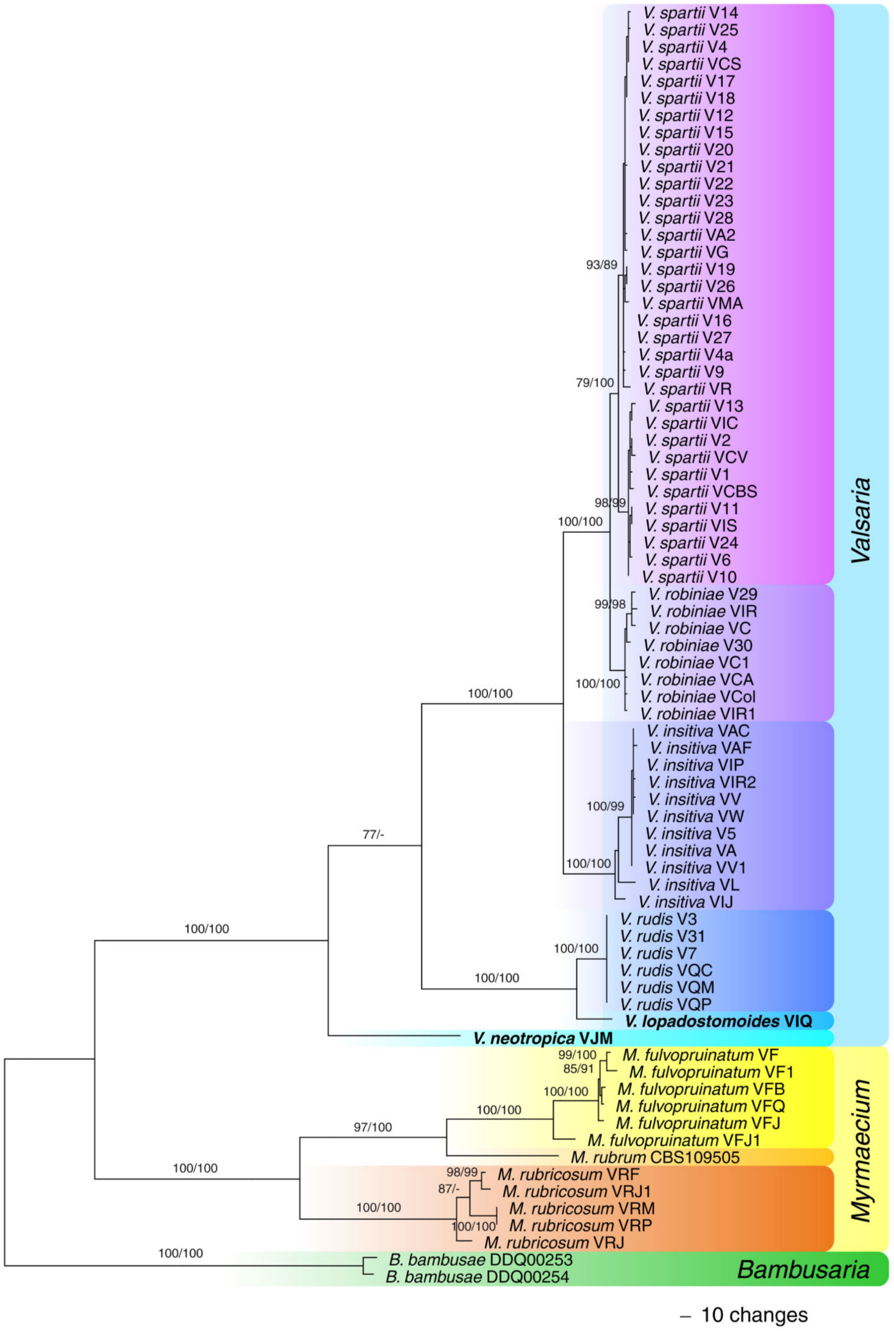

Fig. 3.

Phylogram showing one of 1022 MP trees 2362 steps long revealed by PAUP from an analysis of the combined four-gene (ITS, LSU, *rpb2*, *tef1*) matrix of *Bambusaria*, *Myrmaecium* and *Valsaria*. MP and ML bootstrap support above 70 % are given above or below the branches. Strain/culture designations are given following the taxon names; new species are marked in *bold*

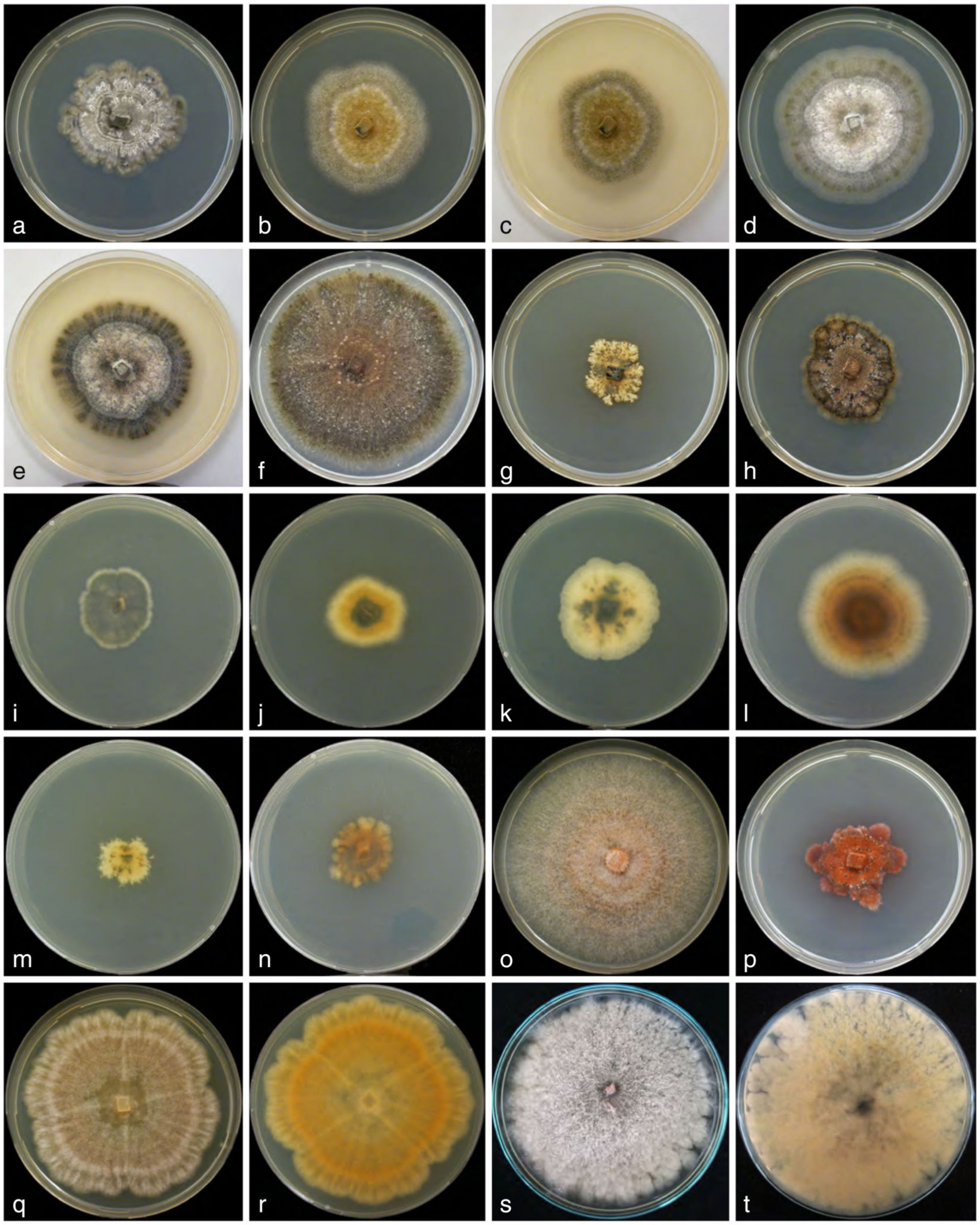

Fig. 4.

Cultures of *Valsariales* on MEA at 22–25 °C. **a**, **i** *Valsaria insitiva* VV **b**, **c**, **j** *V. lopadostomoides* VIQ. **d**, **e**, **k**. *V. neotropica* VJM. **f**, **l** *V. robiniae* VIR1. **g**, **m** *V. rudis* VQP. **h**, **n** *V. spartii* V6. **o**, **p**. *Myrmaecium rubricosum* VRP. (**p** on PDA). **q**, **r** *M. fulvopruinatum* VF. **s**, **t** *Bambusaria bambusae* DDQ00253. *a–h*, *o*, *p*, *q*, *s*. Surface view. *i–n*, *r*, *t*. Reverse. *a–h*. After 17 days. *i–n*. After 10 days. *o*, *q*, *r*. After 7 days. *p*, *s*, *t*. After 14 days

Fig. 5.

Valsaria insitiva. **a** Ectostroma in face view. **b** Projecting ectostromatic structures. **c** Transverse section at the ostiolar level. **d**, **e** Transverse section at the ascomatal level (**d** immature). **f–i**. Vertical stroma sections (**f** compound stroma; **h** showing fused ostioles; **i** showing peridium and adjacent prosenchymatous stroma). **j–l** Asci. **m–p** Ascospores (**o**, **p**. showing surface ornamentation). **q** Apical rings and apically free paraphyses in *Congo red. Sources*: *a–d*, *h*. VV; *e*. VW; *f*, *l*. VA; *g*, *i*. VCE; *j*. VV2; *k*, *m*, *q*. V8; *n*, *o*. VV1; *p*. V5. *Scale* *bars*: *a*, *b*, *e*, *f*=0.5 mm. *c*, *g*=0.3 mm. *d*=0.7 mm. *h*=0.2 mm. *i*=30 µm. *j*–*l* =15 µm. *m*, *o*–*q*=7 µm. *n*= 10 µm

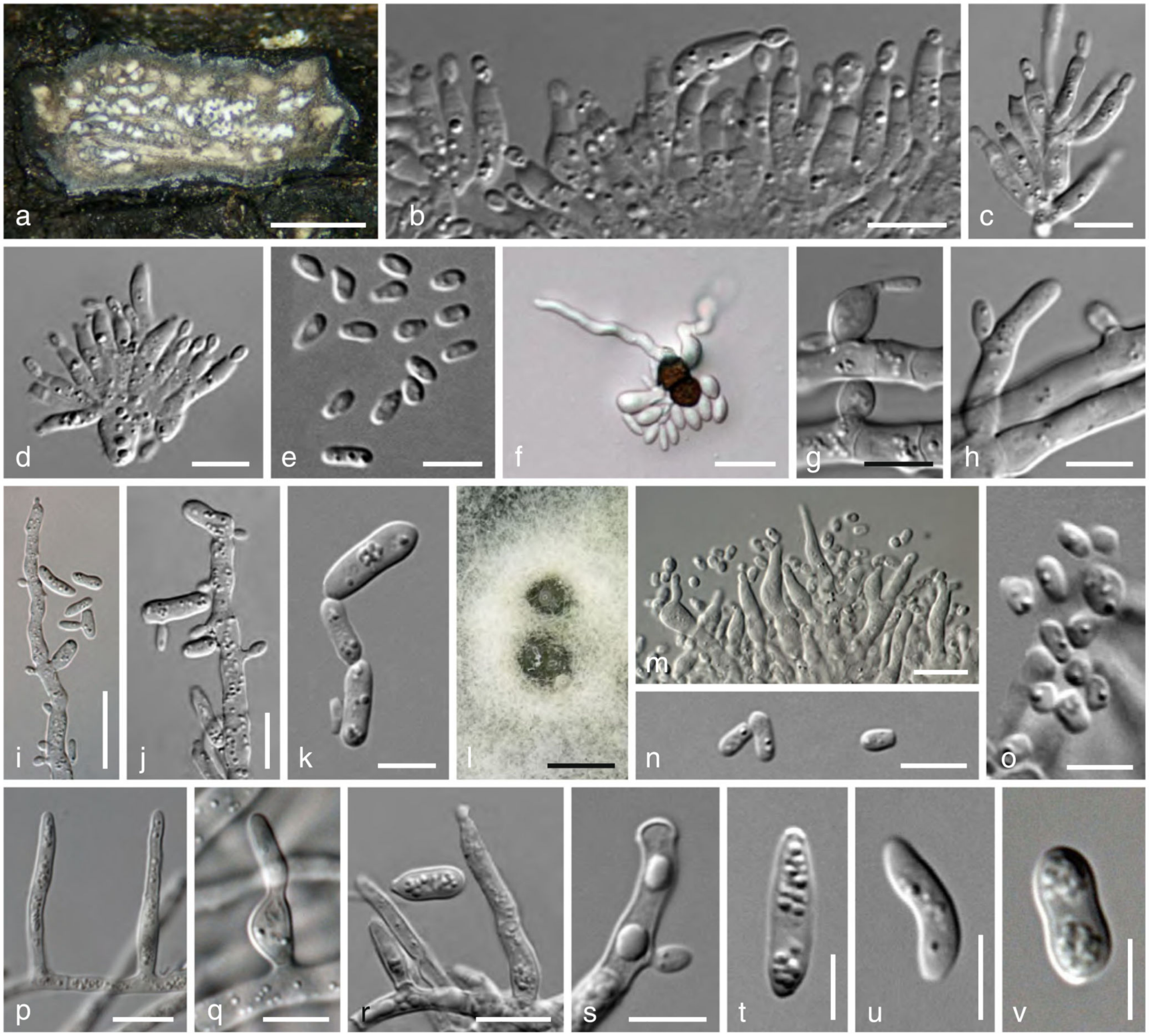

Fig. 6.

a–o *Valsaria insitiva.* **a–e** Asexual morph on natural host. **a** Stroma with locules in horizontal section. **b–d** Phialides. **e** Conidia. **f** Ascospore germination (CMD, after 18 h; note conidia and germ hyphae). **g–k** Effuse conidiation (MEA, 4–5 d). **g** Phialide. **h** Conidium formed on denticle. **l–o** Pycnidial conidiation (MEA, 15–18 d). **i**, **j** Fertile hyphae with denticles and pegs and conidia (partly budding). **k** Conidia. **p–v** *V. lopadostomoides* (VIQ). Effuse conidiation (MEA, 3–14 d). **p** Right-angled hyphal branching. **q**, **r** Phialides. **s** Conidium formed on denticle. **t–v** Conidia. *Sources*: *a–e*. VA. *f*. V35. *g–o*. VV. *Scale bars*: *a*=1 mm. *l*=0.5 mm. *b–d, g, h, k, n, q, s*=7 µm. *e, o, t–v*=5 µm. *f, i*= 20 µm. *j, m, p, r*=10 µm

Fig. 7.

Valsaria lopadostomoides VIQ. **a–c** Ectostroma in face view. **d** Transverse section at the ascomatal level. **e** Vertical stroma section. **f–h** Asci. **i**, **l–n**. Ascospores (*i*. immature; *i*, *n*. showing surface ornamentation). **j**, **k** Ascus apices (showing ring in *j*. water and *k*. *Congo red*). **o** Apically free paraphyses in *Congo red*. *Scale bars*: *a*= 1 mm. *b*, *d*=0.7 mm. *c*=0.4 mm. *e*=0.5 μm. *f–h*= 15 μm. *i*=5 μm. *j*, *m*, *n*=7 μm. *k*, *l*, *o*=10 μm

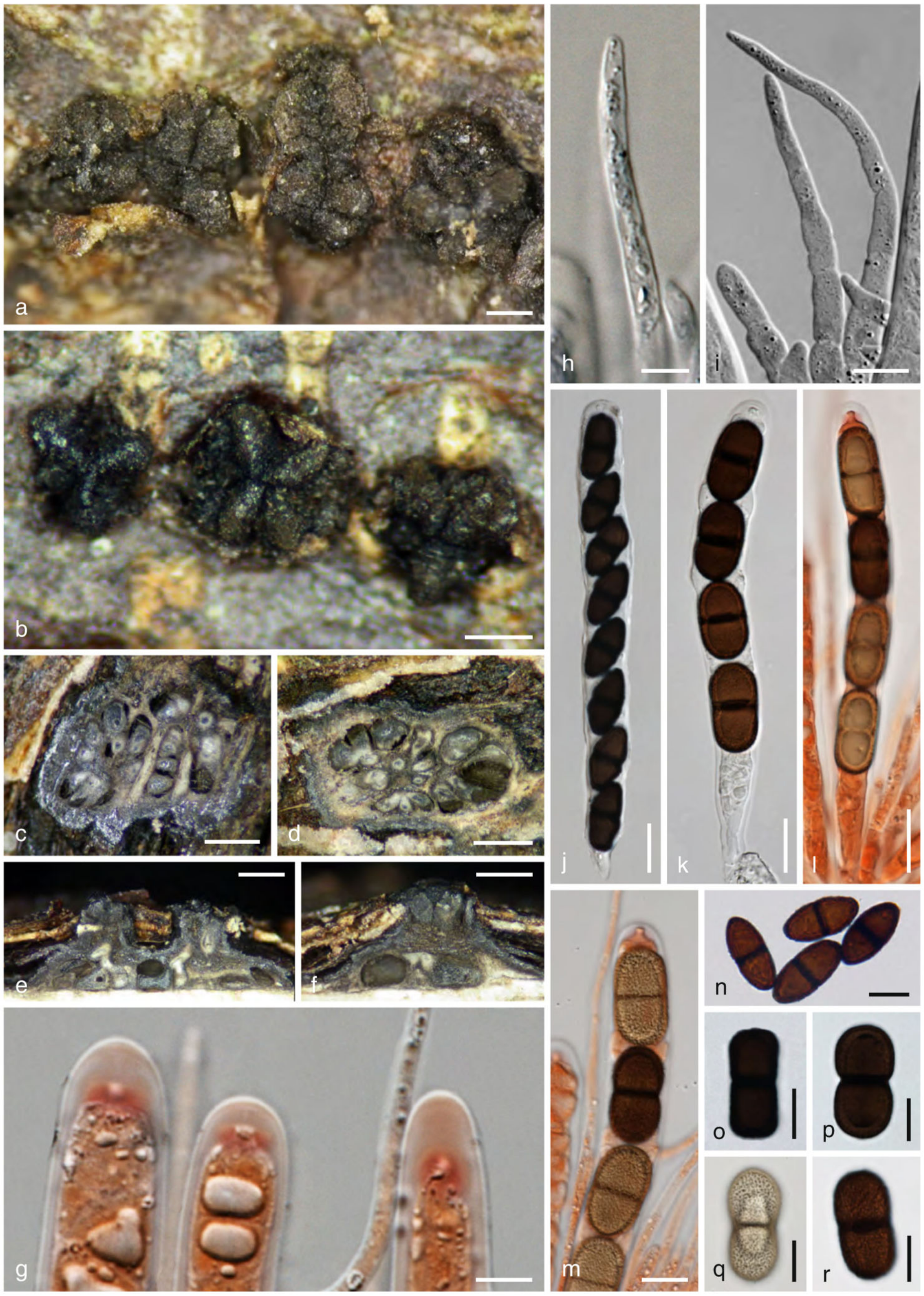

Fig. 8.

Valsaria neotropica VJM. **a**, **b** Ectostromata in face view. **c**, **d** Transverse section at the ostiolar and ascomatal levels. **e**, **f** Vertical stroma sections. **g** Apical rings in *Congo red*. **h**, **i** Apically free paraphyses. **j**–**l** Asci. **m**–**r** Ascospores (**m** in *Congo red*, mostly immature; **m**, **q** showing surface ornamentation). *Scale bars*: *a*, *b*=0.2 mm. *c*=0.4 mm. *d*–*f*= 0.5 mm. *g*=7 µm. *h*=5 µm. *i*, *m*–*r*=10 µm. *k*, *j*, *l*=15 µm

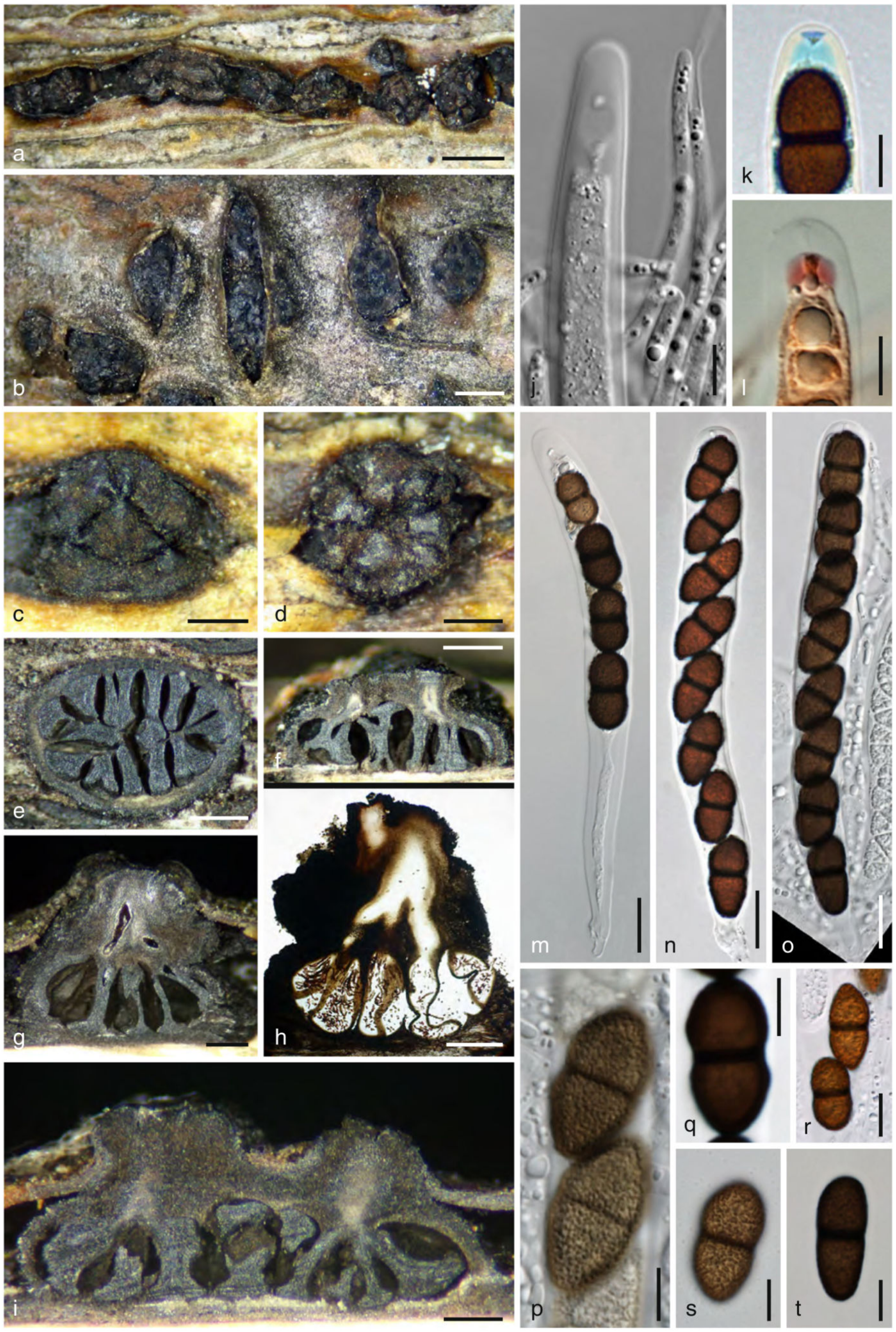

Fig. 9.

Valsaria robiniae. **a–d** Ectostromata in face view. **e** Transverse section at the ascomatal level. **f–i** Vertical stroma sections. **k** Apically free paraphysis and apex of immature ascus. **k, l**. Apical rings (*k*. in *blue* ink; *l*. in *Congo red*). **m–o** Asci. **p–t** Ascospores (**p, s** showing surface ornamentation). *Sources*: *a, d*. VC; *b*. VCA; *c, e, i, k*. V30; *f, j, m*. VIR1; *g, h, l, r*. VCol; *n–p, s, t*. V29; *q*. isolectotype BPI 800813. *Scale bars*: *a, b*=1 mm. *c, d, g–i*=0.3 mm. *e,f*=0.5 mm. *j–l, p, q, s, t*=7 µm. *m–o*=15 µm. *r*=10 µm

Fig. 10.

Asexual morphs. **a–i** *Valsaria neotropica* VJM. **a–d** Pycnidial conidiation (MEA, 17 d). **a** Pycnidia. **b**, **c** Phialides. **d** Conidia. **e–i** Effuse conidiation. **e–g** Conidia (MEA, 4–6 d). **h**, **i** Arthroconidia (3-celled in i; MEA, 14 d). **j–y** *V. robiniae* VIR1. **j–p** On natural host. **j** Stroma with locules in vertical section. **k–o** Phialides. **p** Conidia. **q–u** Effuse conidiation (MEA, 4 d). **q** Conidia formed on denticles and pegs. **r** Phialide. **s**, **t** Conidia (*t.* budding). **u** 2-celled arthroconidium. **v–y** Pycnidial conidiation (MEA, 17 d). **v** Pycnidia. **w**, **x** Phialides.

y Conidia. *Scale bars*: *a*=1 mm. *b*, *c*, *k*, *m*, *q*, *u*, *w*=10 µm. *d*, *h*, *n*–*p*, *s*= 5 µm. *e*–*g*=3 µm. *i*, *l*, *r*, *t*, *x*, *y*=7 µm. *j*, *v*=0.5 mm

Fig. 11.

Valsaria rudis. **a**–**f** Ectostromata in face view. **g**, **h** Transverse section at the ascomatal level. **i**, **j** Vertical stroma sections. **k** Apically free paraphysis. **l**, **m** Apical rings in *Congo red* (**m**. in face view). **n**–**p** Asci. **q**–**t** Ascospores (**q**, **r** showing surface ornamentation). *Sources*: *a, f, i, n, q, r*. VQM; *b, p*. lectotype; *c, g, t*. W.J. 1819; *d, e, h*. V7; *l, s*. VQC; *j, k, m, o*. VQP. *Scale bars*: *a*=0.7 mm. *b, d, f*=0.3 mm. *c, g–j*=0.5 mm. *e*=1 mm. *k, s, t*=10 μm. *l*=5 μm. *m*=3 μm. *n–p*=15 μm. *q, r*=7 μm

Fig. 12.

Valsaria spartii. **a–f** Ectostromata in face view. **g** Transverse section at the ostiolar level. **h, i** Transverse section at the ascomatal level. **j–l** Vertical stroma sections. **m, n** Apical rings in *Congo red*. **o–q** Asci. **r–v** Ascospores (**u, v** showing surface ornamentation; **u** immature; **v** note free paraphysis apex). *Sources: a*, l. V2; *b*, *c*, *k*, *m*, *o*, *t*. V6; *d*, *g*, *i*. V22; *e*. V15; *f*, *j*, *n*. VA2; *h*. V1; *p*, *r*. Kreta; *q*, *u*. VIC; *s*, *v*. holotype PC0167077. *Scale bars*: *a*, *f*, *h*, *i*=0.5 mm. *b*, *c*, *j*=1 mm. *d*, *e*, *g*, *k*= 0.3 mm. *l*=0.15 mm. *m, n, r*=10 μm. *o*–*q*=15 μm. *s*–*v*=7 μm

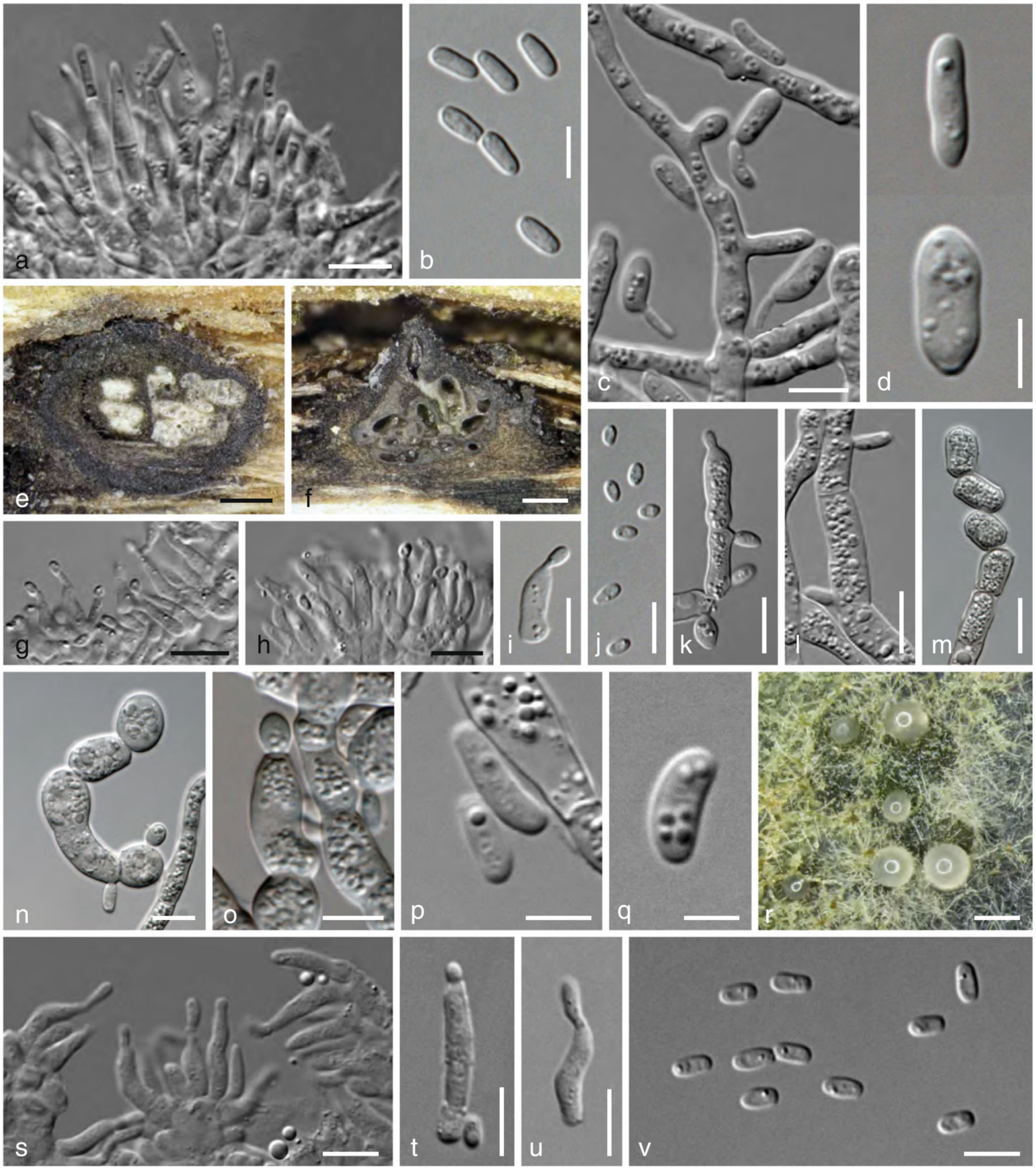

Fig. 13.

Asexual morphs. **a–d** *Valsaria rudis*. **a, b** From natural host. **a** Phialides. **b** Conidia. **c, d** Effuse conidiation (MEA, 11 d). **c** Fertile hyphae and budding conidia. **d** Conidia. **e–v** *V. spartii*. **e–j** On natural host. **e** Stroma with locules in horizontal section. **f** Stroma with locules in vertical section. **g–i** Phialides. **j**. Conidia. **k–q** Effuse conidiation (MEA, 4–5 d). **k, l, o** Conidia formed on phialides and pegs (note phialides in k and o). **m, n** Arthroconidia. **p, q** Conidia. **r–v** Pycnidial conidiation (MEA, 18 d). **r** Immersed pycnidia with conidial drops. **s–u** Phialides. **v** Conidia. *Sources*: *a*, *b*. VQC. *c*, *d*. VQP. *e*, *f*, *i–v*. V6. *g*, *h*. VIC.

Scale bars: *a*, *c*, *h–j*, *o*, *s–u*=7 *b*, *d*,*p*, *v*=5 µm. e, *f*, *r*=0.2 mm. *g*, *k*, *l*, *n*=10 µm. *m*=15 µm. *q*=3 µm

Fig. 14.

Myrmaecium rubricosum. **a–d, i** Ectostromata in face view (**d, i**. showing ostioles). **e, f, j** Vertical stroma sections. **g** Pink pigment dissolved in KOH. **h** Vertical section of a perithecium. **k** Prosenchymatous stroma tissue. **l** Subiculum. **m–o** Apical ascal rings in *Congo red* (note free ends of paraphyses in n and o). **p–s** Asci. **t–v** Ascospores (**u, v** showing surface ornamentation). *Sources*: *a*, *e*, *j*. MP133; *b*, *g*. WJ940; *c*. VRF; *d*. TH; *f*, *m*, *o*, *t*, *v*. VRM; *h*, *k*, *n*, *r*, *s*. VRP; *i*, *l*. VRJ1; *p*, *u*. isolectotype; *q*. WJ1247. *Scale bars*: *a*, *b*, *j*=2 mm.

c, *l* =1 mm. *d*, *e*=0.5 mm. *f*=0.3 mm. *h*=30 μm. *i*=0.2 mm. *k*=20 μm. *m*, *n*, *t*–*v*=7 μm. *o*–*s* =10 μm

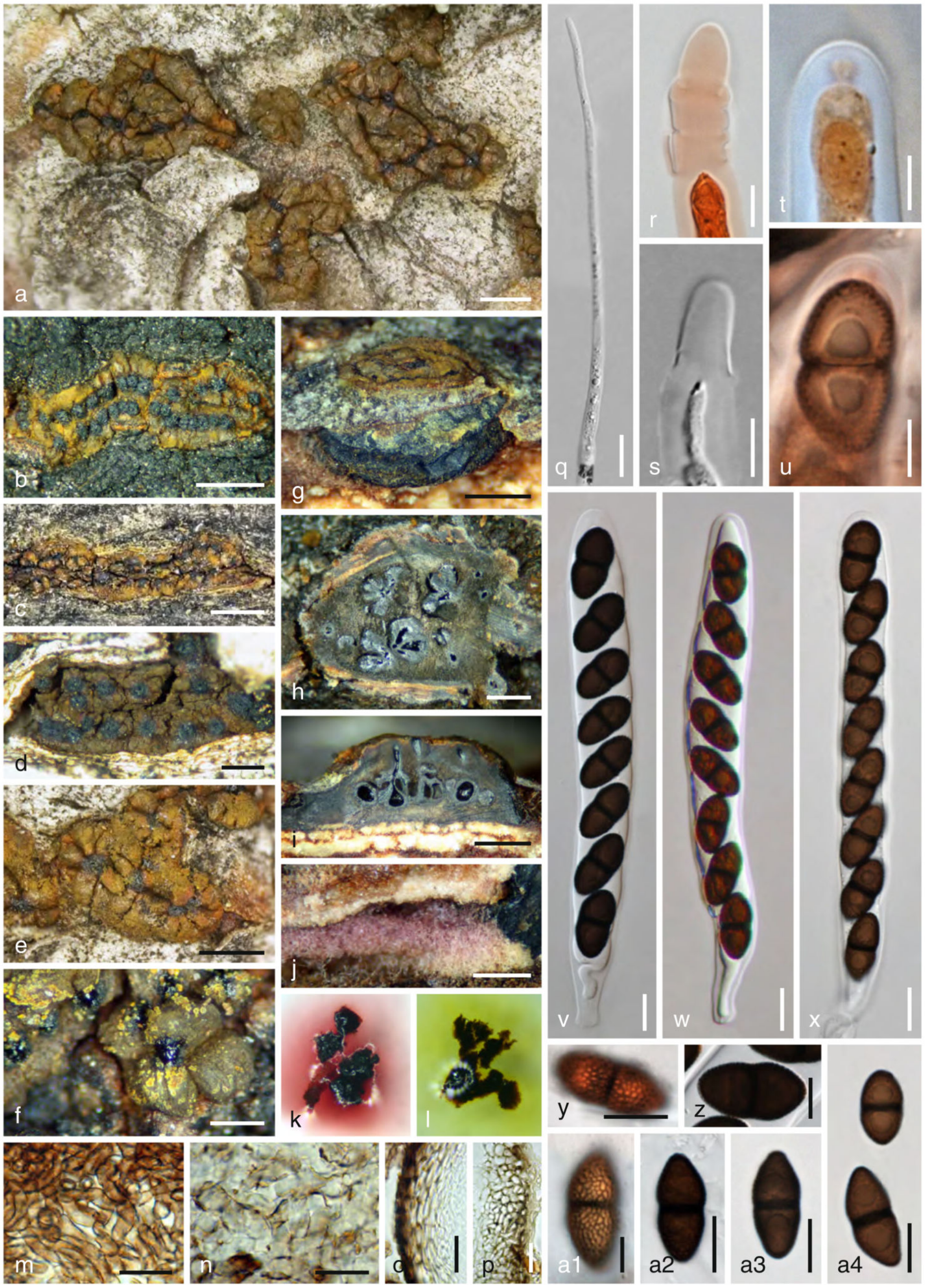

Fig. 15.

Myrmaecium fulvopruinatum. **a–f** Ectostromata in face view (**f** showing *yellow* pigment particles).**g** Stroma side view (surrounded by bark at upper level). **h** Transverse section at the ascomatal level. **i** Vertical stroma section. **j** Subiculum. **k** Purple pigment dissolved in KOH. **l** Yellow-green pigment dissolved in lactic acid. **m, n** Entostroma (**m** upper level; **n** below ascomata). **k** Peridium. **p** Section through stromatic zone. q Paraphysis. **r, s** Fissitunicate ascus dehiscence. **t, u** Apical ascal rings in *Congo red*. **v–x**. Asci. **y–a4**. Ascospores (y, a1. showing surface ornamentation). *Sources: a*, *e*, *m–q*. PWB=Picea; *b*, *f*, *j*. VFQ; *c*, *v*, *al*, *a3*.

VFJ; *d*, *t*, *u*, *x*, *a4*. VFB; *g*, *i*, *k*, *l*. VF; *h*. VFJ1; *r*. WJ870; s, *w*. WJ1190; *y*. isolectotype L0819035; *z*, a2. VFA. *Scale bars: a*, *d*, *e*, *h*, *j*=0.5 mm. *b*, *c*, *g*, *i*=1 mm. *f*=0.3 mm. *m–p*=20 µm. *q–s*, *v–z*, a2-a4=10 µm. *t*, *u*, a1 = 5 µm

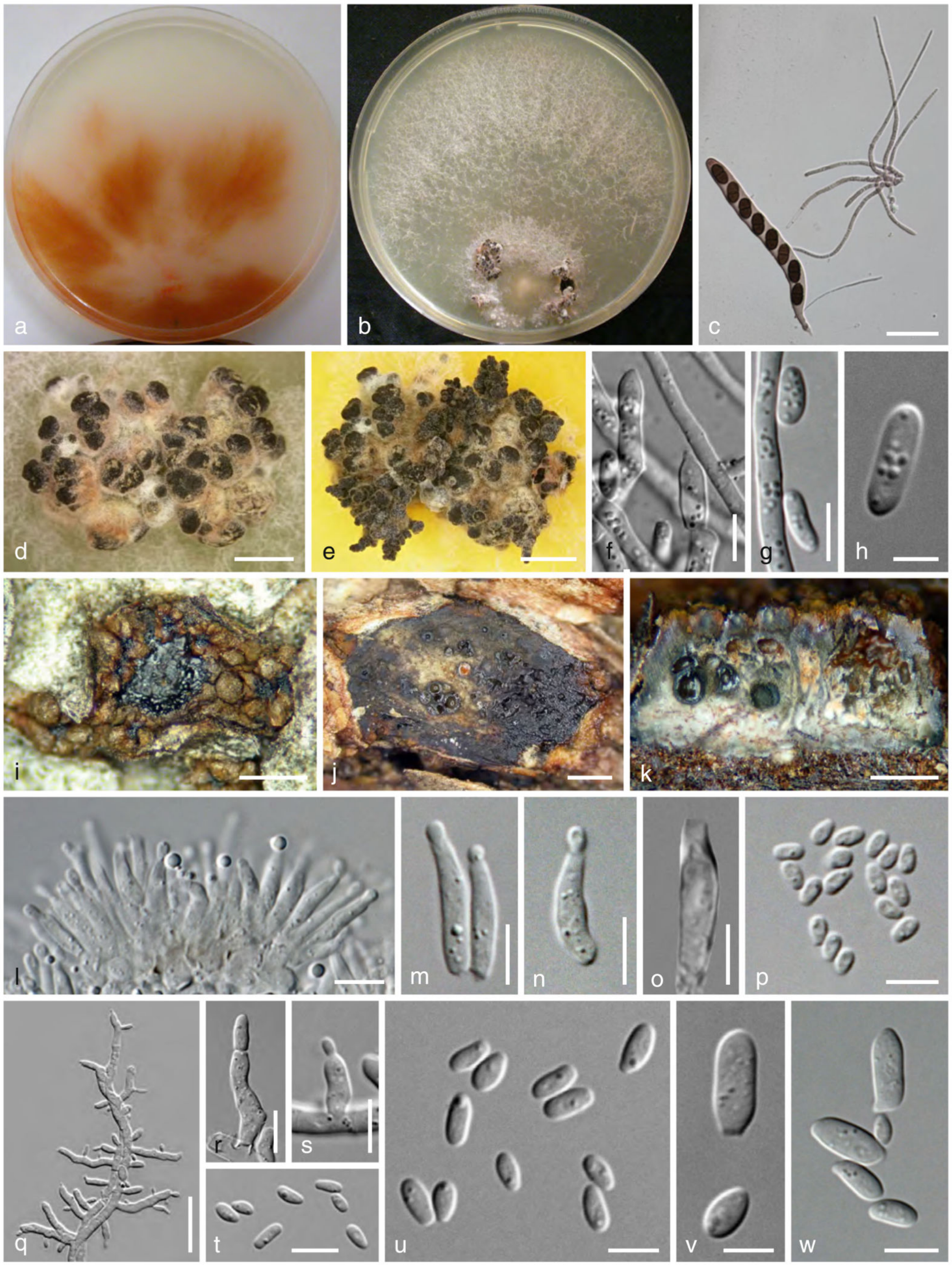

Fig. 16.

a–h *Myrmaecium rubricosum*. **a, b** Cultures at 22 °C after 21 days (**a** On CMD; **b** On MEA, with sexual morph stromata in the centre). **c** Ascus and paraphyses from stroma formed in MEA culture (after 70 days). **d**, **e**. Stroma on MEA (d. after 21 days; e. after 71 days). **f–h** Effuse conidiation (MEA, 3 d). f Phialides. **g**, **h** Conidia. **i–w** *Myrmaecium fulvopruinatum* asexual morphs. **i–p** On natural host. **i** Asexual stroma in face view. **j** Stroma with locules in horizontal section. **k** Stroma with locules and ascomata in vertical section. **l–o** Phialides. **p** Conidia. **q–w** Effuse conidiation (MEA, 3 d). **q** Conidiophore. **r, s** Phialides. **t–w** Conidia.

Sources: a–e. VRM. *f–h*. VRP. *i–k*. PWB. *l–p*. VF. *q–w*. VFJ. Scale bars: *c, q*=30 µm. *d, e*=2.5 mm. *f*, *g*, *l*, *s*, *w*=7 µm. *h*=3 µm. *i–k*=0.6 mm. *m–p, u, v*=5 µm. *r*, *t*=10 µm

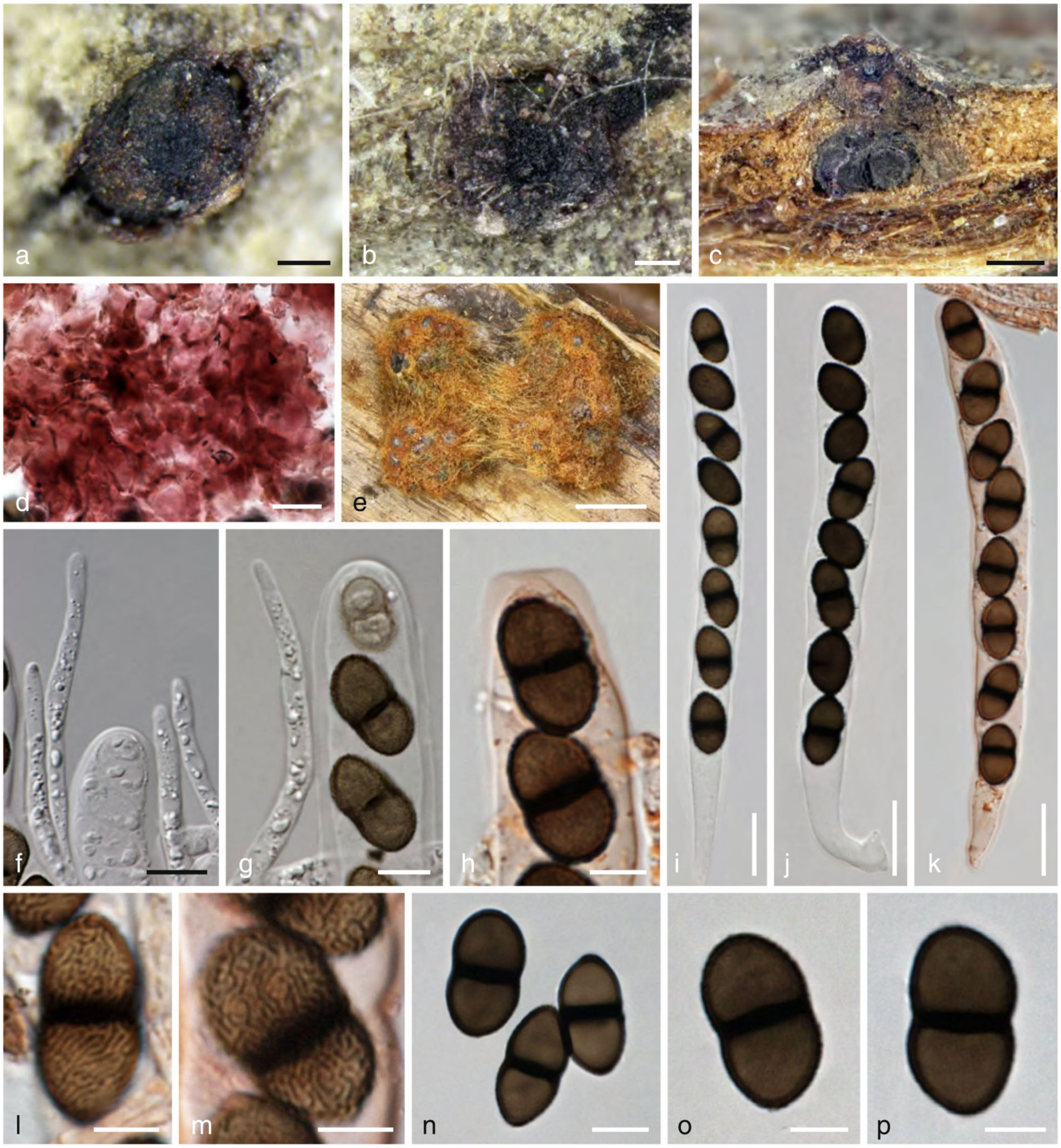

Fig. 17.

Myrmaecium rubrum (holotype). **a, b** Ectostromata in face view. **c** Stroma in side view. **d** Stroma tissue in KOH. **e** Stroma in MEA culture. **f, g** Free ends of paraphyses. **h** Ascus apex in *Congo Red*. **i–k** Asci (k. in *Congo Red*). **l–p** Ascospores (**l, m** showing surface ornamentation). *Scale bars: a, b*=0.1 mm. *c*=0.2mm. *d, i–k*=15 µm. *e*=1 mm. *f, g, n*=7 µm. *h, l, m, o, p*=5 µm

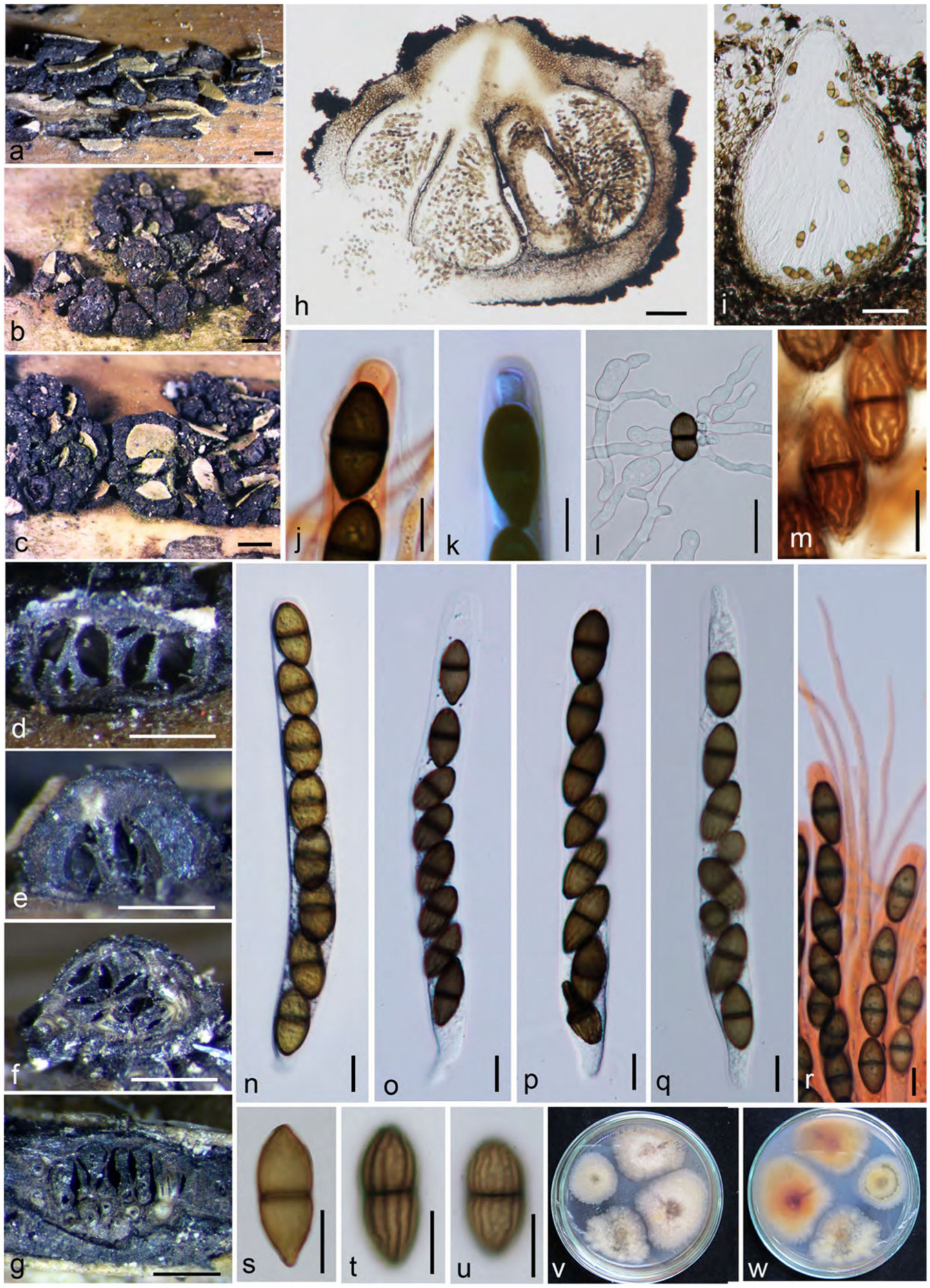

Fig. 18.

Bambusaria bambusae. **a**–**c** Stromata on host surface. **d**, **e**, **h** Stromata in vertical section. **f**, **g** Stromata in transverse section at the ascomatal level. **i** Ascoma in vertical section. **j**, **k** Ascus apices (**j** *Congo red*, **k** *cotton blue*). l Germinating ascospore. **m**, **s–u** Ascospores (**m**, **t**, **u** showing surface ornamentation). **n–q** Asci with ascospores. r Paraphyses. **v**, **w** Culture on PDA (w. reverse). *a–l*. MFLU 15–0050; m. isotype IMl 180328. *Scale bars*: *a–c*=1mm. *d–g*=0.5 mm. *h*=100 μm. *i*, *l*=50 μm. *j*, *k*, *m–u*=10 μm

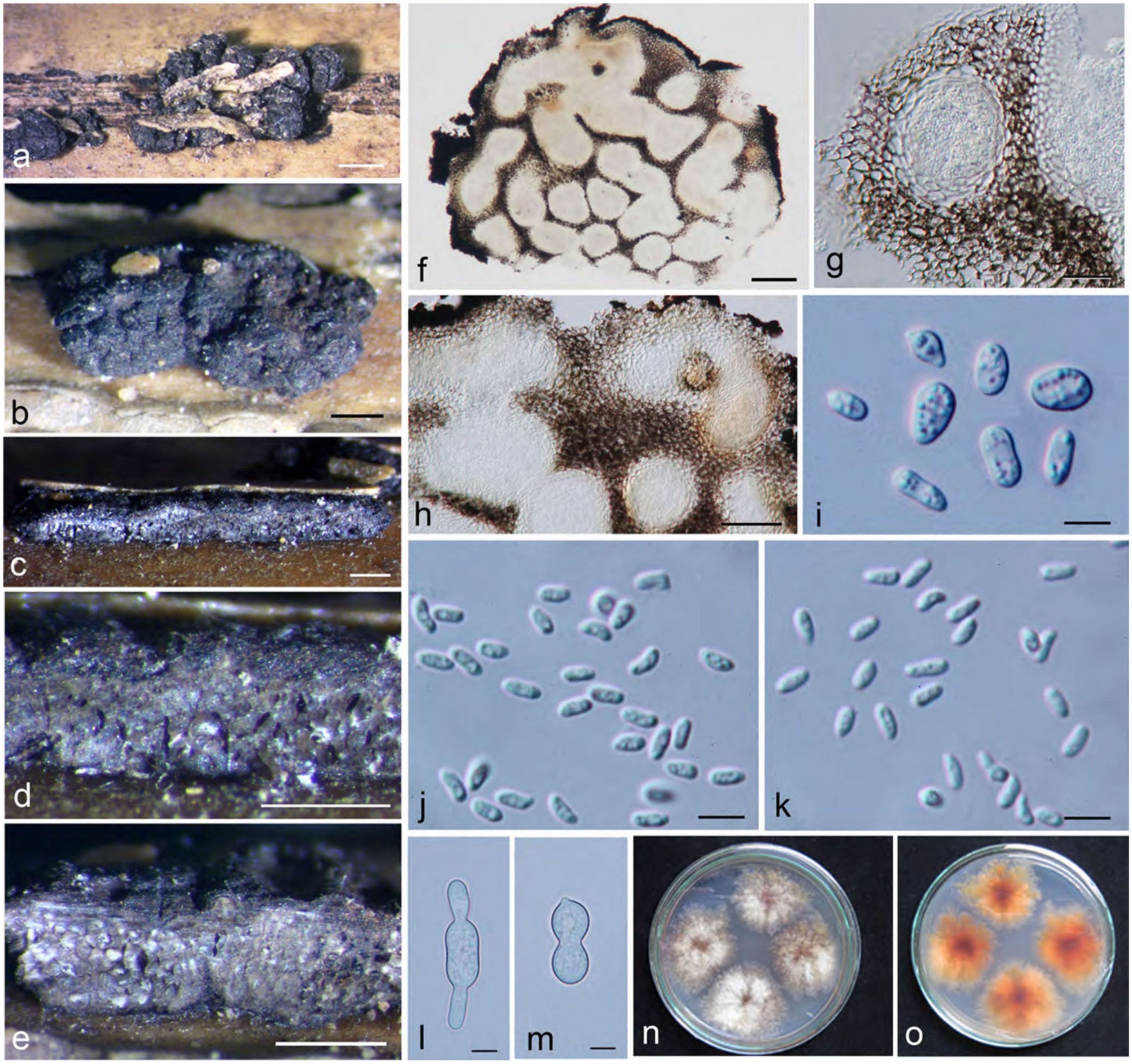

Fig. 19.

Bambusaria bambusae (MFLU 15–0051). **a**–**h**, **j**–**m** Asexual morph on the natural host. **a**, **b**. Conidiomata. **c**–**g**. Vertical sections of multiloculate conidiomata and locules. **i**–**m**. Conidia (**i** from MEA, 10 d, 24 °C; **l**, **m** germinating and budding). **n**, **o** Culture from conidia on PDA (o. reverse). *Scale bars*: *a*=3 mm. *b*–*e*=0.5 mm. *f*=100 μm. g, *h*=50 μm. *i*–*k*=5 μm. *l*, *m*=10 μm

Table 1

Isolates and GenBank accession numbers used in the phylogenetic analyses. The KP-sequences were newly generated during this study

						GenBank accession numbers			
Species	**Isolate No.**	**Code**	**Herbarium No.**[a]	**Substrate/Host**	**Country**	**SSU**	**ITS-LSU**	***rpb2***	***tef1***
Bambusaria bambusae	MFLUCC 12-0851	DDQ00253	MFLU 15-0050	*Thyrsostachys siamensis*	Thailand	–	KP687812	KP687890	KP687982
Bambusaria bambusae	CBS 139763	DDQ00254	MFLU 15-0051	*Thyrsostachys siamensis*	Thailand	KP687962	KP687813	KP687891	KP687983
Myrmaecium fulvopruinatum	CBS 139057	VF	WU 33433	*Fagus sylvatica*	Austria	KP687967	KP687858	KP687933	KP688027
Myrmaecium fulvopruinatum		VF1	WU 33434	*Fraxinus excelsior, Alnus glutinosa*	Austria	–	KP687859	KP687934	KP688028
Myrmaecium fulvopruinatum		VFB	WU 33436	*Betula pendula*	Austria	–	KP687860	KP687935	KP688029
Myrmaecium fulvopruinatum	CBS 139058	VFJ	NY (M.E.B.B. 6905) (E)	*Fagus grandifolia*	U.S.A.	KP687968	KP687861	KP687936	KP688030
Myrmaecium fulvopruinatum		VFJ1	WU 33437	unidentified corticated twigs	Taiwan	–	KP687862	KP687937	KP688031
Myrmaecium fulvopruinatum	CBS 139059	VFQ	WU 33438	*Quercus cerris*	Austria	KP687969	KP687863	KP687938	KP688032
Myrmaecium rubricosum	CBS 139067	VRF	WU 33447	unidentified bark	France	KP687977	KP687881	KP687955	KP688049
Myrmaecium rubricosum		VRJ		*Quercus robur*	France	–	KP687882	KP687956	KP688050
Myrmaecium rubricosum		VRJ1	WU 33448	unidentified bark	U.S.A.	–	KP687883	KP687957	KP688051
Myrmaecium rubricosum	CBS 139069	VRM	WU 33449	*Picea abies*	Austria	KP687978	KP687884	–	KP688052
Myrmaecium rubricosum	CBS 139068	VRP	WU 33450	*Quercus pubescens*	Croatia	KP687979	KP687885	KP687958	KP688053
Myrmaecium rubrum	CBS 109505			*Quercus* sp.	Italy	GU456303	GU456324[b]	GU456344	GU456260
Valsaria insitiva	CBS 139056	VA	WU 33453	*Acer monspessulanum*	Croatia	KP687965	KP687847	KP687922	KP688016
Valsaria insitiva		VAC	WU 33454	*Acer campestre*	Austria	–	KP687849	KP687924	KP688018
Valsaria insitiva		VAF	WU 33455	*Ficus carica*	France	–	KP687850	KP687925	KP688019
Valsaria insitiva		VCE	WU 33456	*Cercis siliquastrum*	Greece	–	KP687854	–	–
Valsaria insitiva	CBS 139061	VIJ	WU 33457	unidentified corticated twigs	Taiwan	–	KP687866	KP687941	KP688035
Valsaria insitiva		VIP	WU 33458	*Paliurus spina-christi*	Greece	KP687971	KP687867	KP687942	KP688036
Valsaria insitiva		VIR2	WU 33459	*Robinia pseudacacia*	Austria	–	KP687871	KP687946	KP688040
Valsaria insitiva		VJF	WU 33460	*Ficus carica*	France	–	KP687873	–	–
Valsaria insitiva		VL	WU 33461	unidentified corticated twigs	France	–	KP687875	KP687949	KP688043
Valsaria insitiva	CBS 127882	VV	WU 33462 (E)	*Vitis vinifera*	Croatia	KP687980	KP687886	KP687959	KP688054
Valsaria insitiva		VV1	WU 33463	*Vitis vinifera*	Italy	KP687981	KP687887	KP687960	KP688055

Species	Isolate No.	Code	Herbarium No.[a]	Substrate/Host	Country	GenBank accession numbers			
						SSU	ITS-LSU	*rpb2*	*tef1*
Valsaria insitiva		VV2	WU 33464	*Vitis vinifera*	Greece	–	KP687888	–	–
Valsaria insitiva		VW	WU 33465	*Wisteria sinensis*	France	–	KP687889	KP687961	KP688056
Valsaria insitiva		V5	WU 33466	*Cytisus scoparius*	Italy	–	KP687842	–	KP688012
Valsaria insitiva		V8	WU 33467	*Spiraea* sp.	Austria	–	KP687845	–	–
Valsaria insitiva		V35	WU 33427	*Vitis vinifera*	Austria	–	KP687839	–	KP688009
Valsaria lopadostomoides	CBS 139062	VIQ	WU 33470 (H)	*Quercus ilex*	Greece	KP687972	KP687868	KP687943	KP688037
Valsaria neotropica	CBS 139064	VJM	WU 33471 (H)	unidentified corticated twig	France	KP687974	KP687874	KP687948	KP688042
Valsaria robiniae	CBS 121890	VC	WU 33472	*Hippocrepis emerus*	Slovenia	–	KP687851	KP687926	KP688020
Valsaria robiniae		VC1	WU 33473	*Hippocrepis emerus*	Croatia	–	KP687852	KP687927	KP688021
Valsaria robiniae	CBS 128015	VCA	WU 33474	*Caragana arborescens*	Austria	–	KP687853	KP687928	KP688022
Valsaria robiniae	CBS 125583	VCol	WU 33475	*Colutea arborescens*	Austria	KP687966	KP687855	KP687930	KP688024
Valsaria robiniae		VIR	WU 33477	*Robinia pseudacacia*	Italy	–	KP687869	KP687944	KP688038
Valsaria robiniae	CBS 139063	VIR1	WU 33478	*Robinia pseudacacia*	Italy	KP687973	KP687870	KP687945	KP688039
Valsaria robiniae		V29	WU 33479	*Amorpha fruticosa*	Hungary	–	KP687835	KP687913	KP688005
Valsaria robiniae		V30	WU 33480	*Amorpha fruticosa*	Hungary	–	KP687837	KP687915	KP688007
Valsaria rudis		VQC	WU 33483	*Quercus cerris*	Croatia	–	KP687877	KP687951	KP688045
Valsaria rudis	CBS 139065	VQM	WU 33484	*Quercus macrolepis*	Greece	KP687975	KP687878	KP687952	KP688046
Valsaria rudis	CBS 139066	VQP	WU 33485 (E)	*Quercus pubescens*	Austria	KP687976	KP687879	KP687953	KP688047
Valsaria rudis		V3	WU 33486	*Quercus cerris*	Italy	–	KP687836	KP687914	KP688006
Valsaria rudis		V7	WU 33487	*Quercus petraea*	Austria	–	KP687844	KP687920	KP688014
Valsaria rudis		V31	WU 33488	*Quercus petraea*	Austria	–	KP687838	KP687916	KP688008
Valsaria spartii		VA2	WU 33493	*Acer sempervirens*	Greece	–	KP687848	KP687923	KP688017
Valsaria spartii	CBS 121714	VCBS	CBS H-19925	*Ceratonia siliqua*	Greece	–	EU040213	KP687929	KP688023
Valsaria spartii	CBS 125584	VCS	WU 33494	*Cytisus scoparius*	Italy	–	KP687856	KP687931	KP688025
Valsaria spartii		VCV	WU 33495	*Calicotome villosa*	Greece	–	KP687857	KP687932	KP688026
Valsaria spartii		VG	WU 33496	*Genista florida*	Spain	–	KP687864	KP687939	KP688033
Valsaria spartii	CBS 139060	VIC	WU 33497	*Ceratonia siliqua*	Spain	KP687970	KP687865	KP687940	KP688034
Valsaria spartii		VIS	WU 33498	*Spiraea* sp.	France	–	KP687872	KP687947	KP688041
Valsaria spartii		VMA	WU 33499	*Melia azedarach*	Greece	–	KP687876	KP687950	KP688044
Valsaria spartii	CBS 128016	VR	WU 33500	*Retama sphaerocarpa*	Spain	–	KP687880	KP687954	KP688048

Species	Isolate No.	Code	Herbarium No.[a]	Substrate/Host	Country	GenBank accession numbers			
						SSU	ITS-LSU	*rpb2*	*tef1*
Valsaria spartii		V1	WU 33502	*Robinia pseudacacia*	Italy	–	KP687814	KP687892	KP687984
Valsaria spartii		V2	WU 33503	*Fraxinus ornus*	Italy	–	KP687825	KP687903	KP687995
Valsaria spartii		V4	WU 33504	*Cytisus sessilifolius*	Italy	–	KP687840	KP687917	KP688010
Valsaria spartii		V4a	WU 33504	*Cytisus sessilifolius*	Italy	–	KP687841	KP687918	KP688011
Valsaria spartii	CBS 139070	V6	WU 33505 (E)	*Spartium junceum*	Italy	KP687964	KP687843	KP687919	KP688013
Valsaria spartii		V9	WU 33506	*Chamaecytisus proliferus*	Spain	–	KP687846	KP687921	KP688015
Valsaria spartii	CBS 139071	V10	WU 33507	*Spartium junceum*	Spain	KP687963	KP687815	KP687893	KP687985
Valsaria spartii		V11	WU 33508	*Retama sphaerocarpa*	Spain	–	KP687816	KP687894	KP687986
Valsaria spartii		V12	WU 33509	*Acacia saligna*	Spain	–	KP687817	KP687895	KP687987
Valsaria spartii		V13	WU 33510	*Retama monosperma*	Spain	–	KP687818	KP687896	KP687988
Valsaria spartii		V14	WU 33511	*Calicotome villosa*	Spain	–	KP687819	KP687897	KP687989
Valsaria spartii		V15	WU 33512	*Retama sphaerocarpa*	Spain	–	KP687820	KP687898	KP687990
Valsaria spartii		V16	WU 33513	*Anagyris foetida*	Spain	–	KP687821	KP687899	KP687991
Valsaria spartii		V17	WU 33514	*Teline monspessulana*	Spain	–	KP687822	KP687900	KP687992
Valsaria spartii		V18	WU 33515	*Ulex parviflorus*	Spain	–	KP687823	KP687901	KP687993
Valsaria spartii		V19	WU 33516	*Teline linifolia*	Spain	–	KP687824	KP687902	KP687994
Valsaria spartii		V20	WU 33517	*Cytisus baeticus*	Spain	–	KP687826	KP687904	KP687996
Valsaria spartii		V21	WU 33518	*Retama monosperma*	Spain	–	KP687827	KP687905	KP687997
Valsaria spartii		V22	WU 33519	*Teline linifolia*	Spain	–	KP687828	KP687906	KP687998
Valsaria spartii		V23	WU 33520	*Acacia saligna*	Spain	–	KP687829	KP687907	KP687999
Valsaria spartii		V24	WU 33521	*Spartium junceum*	Spain	–	KP687830	KP687908	KP688000
Valsaria spartii		V25	WU 33522	*Cytisus striatus*	Spain	–	KP687831	KP687909	KP688001
Valsaria spartii		V26	WU 33523	*Spartium junceum*	Spain	–	KP687832	KP687910	KP688002
Valsaria spartii		V27	WU 33524	*Genista cinerea*	Spain	–	KP687833	KP687911	KP688003
Valsaria spartii		V28	WU 33525	*Ononis speciosa*	Spain	–	KP687834	KP687912	KP688004

[a] (E) epitype, (H) holotype

[b] Only LSU was available