Geejayessia montana (*Hypocreales, Nectriaceae*), a new species from French Alps and Spain

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Abstract: *Geejayessia montana* sp. nov. is described and illustrated, based on two collections from high elevation in French Alps and Asturias in Spain. The placement of the new species in *Geejayessia* is supported by morphological characters of both sexual and asexual morphs as well as analysis of ITS sequences. Furthermore, the new combination *Geejayessia hispanica* (Lechat & Priou) Lechat & J. Fourn. comb. nov. is proposed. An updated key to the known species of *Geejayessia* is presented.
Keywords: Ascomycota, *Nectriaceae*, ribosomal DNA, sporodochia, taxonomy.

Résumé : *Geejayessia montana* sp. nov. est décrite et illustrée, à partir de deux récoltes en altitude, dans les Alpes françaises et dans les Asturies en Espagne. Le placement de *G. montana* dans le genre *Geejayessia* repose sur les caractères morphologiques des formes sexuée et asexuée ainsi que sur l'analyse des séquences ITS. Par ailleurs, la nouvelle combinaison *Geejayessia hispanica* (Lechat & Priou) Lechat & J. Fourn. comb. nov. est proposée. Une clé mise à jour des espèces connues de *Geejayessia* est présentée.
Mots-clés : ADN ribosomal, Ascomycota, *Nectriaceae*, sporodochies, taxinomie.

Introduction

An unknown nectriaceous species was collected, between 1300 and 1700 m elevation, on *Cytisophyllum sessilifolium* (*Fabaceae*) in France and on *Cytisus* sp. (*Fabaceae*) in Spain. This species matches well the morphological characters of the recently introduced genus *Geejayessia* Schroers, Gräfenhan & Seifert (Schroers *et al*., 2011), which was confirmed by the analysis of its ITS sequences clearly placing this species inside this genus. Based on these results and after comparison with known species of this genus, *Geejayessia montana* Lechat & J. Fourn. is proposed as a new species. Moreover, based on analysis of its ITS sequence, *Cosmospora hispanica* Lechat & Priou (Lechat & Priou, 2008) is combined in *Geejayessia* as *G. hispanica* (Lechat & Priou) Lechat & J. Fourn. comb. nov., raising the number of known species to seven. A key to species is provided.

Materials and methods

Microscopic observations and measurements were made in water and ascospore ornamentation was observed in lactic acid-cotton blue without heating. The specimen was cultured, sequenced and phylogenetically analysed using the methods described in Lechat & Fournier (2015). The holotype specimen is deposited in LIP herbarium (Lille) and its ITS sequence in the GenBank database.

Taxonomy

Geejayessia montana Lechat & J. Fourn., *sp. nov*. Figs. 1-2
MB 822826

Diagnosis: Differs from the similar, dark-coloured *Geejayessia atrofusca* in having ascomata becoming purple in 3% KOH and yellow in lactic acid, and wider verruculose ascospores.

Holotype: France: Alpes-de-Haute-Provence, Colmars-les-Alpes, National Park of Mercantour, sentier de la cascade de la Lance, 1300 m asl, on dead twigs of *Cytisophyllum sessilifolium* (*Fabaceae*), 6 Jun. 2010, *leg*. C. Lechat, CLL10010, deposited at Faculté de Pharmacie de Lille, France (LIP), ex-type culture deposited at CIRM (Centre International des Ressources Microbiennes, France) BRFM1441. GenBank ITS sequence: MF611653.

Etymology: The epithet "*montana*" refers to the apparent preference of this fungus for mountainous habitat.

Ascomata cespitose in groups of 4–50, crowded on dead fusarium-like sporodochia forming a basal, prosenchymatous stroma, opyriform with an acute papilla, 300–350 µm high, 270–300 µm wide (Me = 310 × 280 µm, n = 20), smooth, dark reddish brown to nearly black when dry, becoming purple in 3% KOH, yellow in lactic acid, covered by a crustose layer 3–5 µm thick, composed of brown amorphous elements dissolving in 3% KOH. Hyphal elements of **sporodochia** cylindrical, thick-walled 2–3 µm diam, hyaline to pale yellow, becoming brownish orange in 3% KOH, evolving to globose or subglobose cells proliferating to form ascomatal wall. **Ascomatal wall** in vertical section 35–45 µm thick, of two regions; outer region 22–25 µm thick, composed of subglobose to ellipsoidal, thick-walled cells 6–12 × 5–7 µm with brownish orange wall 2–2.5 µm thick; inner region 14–17 µm thick, composed of ellipsoidal, elongate to flattened, hyaline, thin-walled cells 9–18 × 3–5 µm. **Perithecial apex** composed of cylindrical to narrowly clavate cells 8–15 × 5–6 µm with wall 2–3 µm thick. **Asci** cylindrical to narrowly clavate, 90–115 × 10–12(–15) µm (Me = 100 × 11.5 µm, n=20), apex rounded to slightly flattened with a thickening, containing eight overlapping uniseriate ascospores; evanescent, moniliform paraphyses inserted between asci, up to 10 µm wide. **Ascospores** ellipsoidal with broadly rounded ends, equally 1-septate, (8–10–)12–14(–15) × (5.5–)6–7(–7.5) µm (Me = 13.5 × 6.5 µm, n=20), hyaline, faintly verruculose, slightly constricted at septum.

Asexual morph: fusarium-like.

Cultural characteristics: After 12 d at 25°C on Difco PDA containing 5 mg/L streptomycin, colony 3.5–4.5 cm diam., producing fast-growing fusarium-like asexual morph, lacking aerial mycelium, translucent at margin, white to yellowish, sporulating in centre. Reverse pale yellow. Microconidia cylindrical, curved, rounded at ends, non-septate, hyaline, smooth 11–14 × 3–3.5 µm; macroconidia formed in a pale yellow slimy mass, cylindrical, straight to slightly curved, acute at ends with a beaked foot cell, 3–6-septate; 34–40(–50) × 5.5 µm when 3-septate, (48–)54–73(–78) × (5–)6–7 µm when 5–6-septate. Chlamydospores not seen.

Additional specimen: Spain, Asturias, Natural Park of Somiedo, Saliencia, Alto de La Farrapona, 1700 m asl, on dead twig of *Cytisus* sp. (*Fabaceae*), 4 Jun. 2017, *leg*. J. Fournier, CLL17014 (LIP).

Discussion

When the new species described above was collected for the first time in France, the genus *Geejayessia* had not been introduced yet and our collection was considered to belong to the genus *Cosmospora* Rabenh. in the broad sense defined by Rossman *et al*. (1999).

Cosmospora, as defined by Gräfenhan *et al.* (2011), is now restricted to fungicolous, non-stromatic species formerly placed in *Cosmospora* and *Nectria* Fr., having an acremonium-like asexual

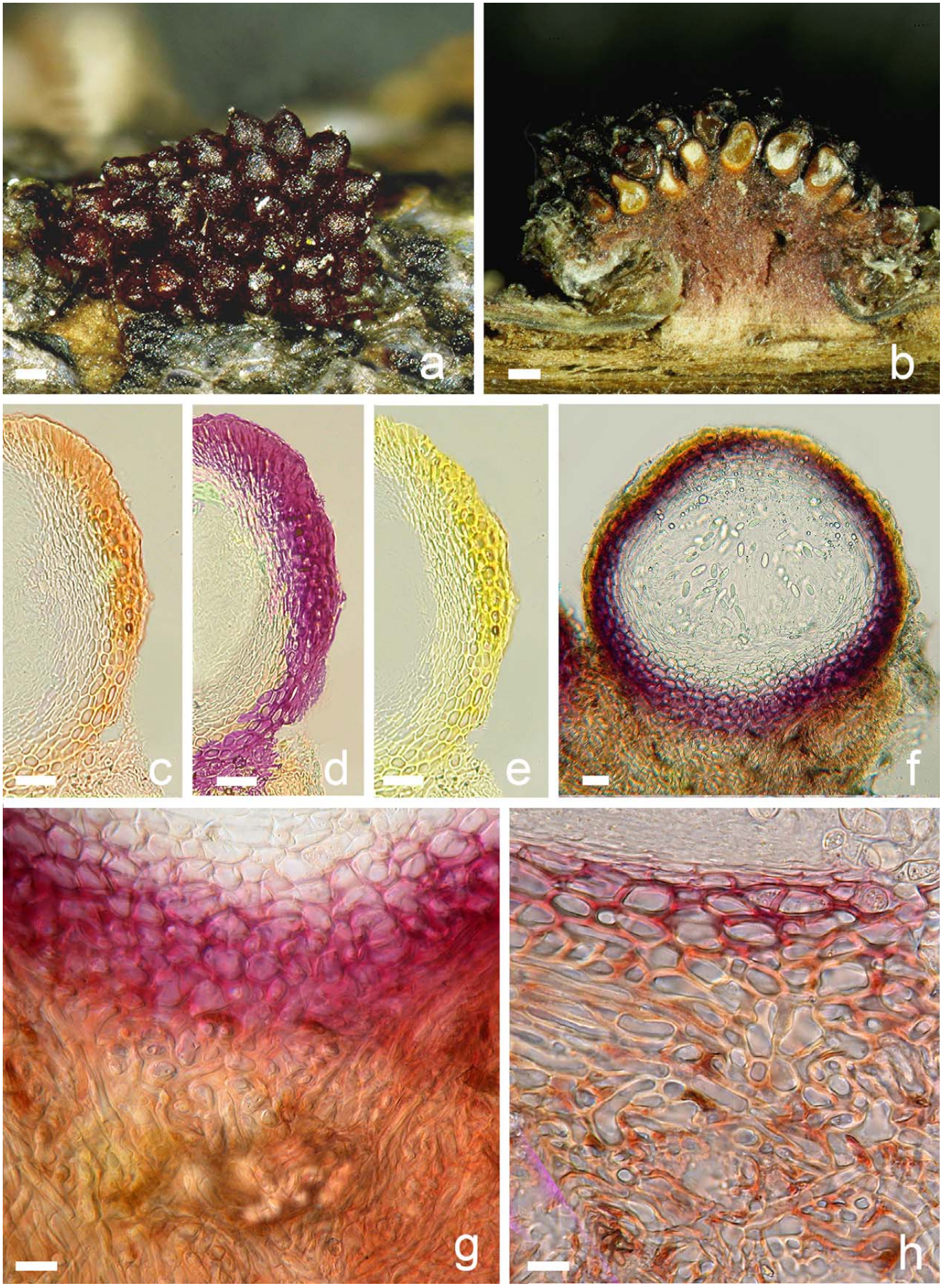

Fig. 1: a–f *Geejayessia montana* (Holotype CLL10010). a: Ascomata on the substrate. b: Vertical section through ascomata and stroma. c-e: Vertical section of lateral ascomatal wall. c: in water. d: in 3% KOH. e: in lactic acid. f: vertical section of an ascoma in 3% KOH; g-h: hyphal elements of sporodochium evolving to form ascomatal wall, in 3% KOH. Scale bars: a, b =200 µm; c-f =20 µm; g-h = 10 µm.

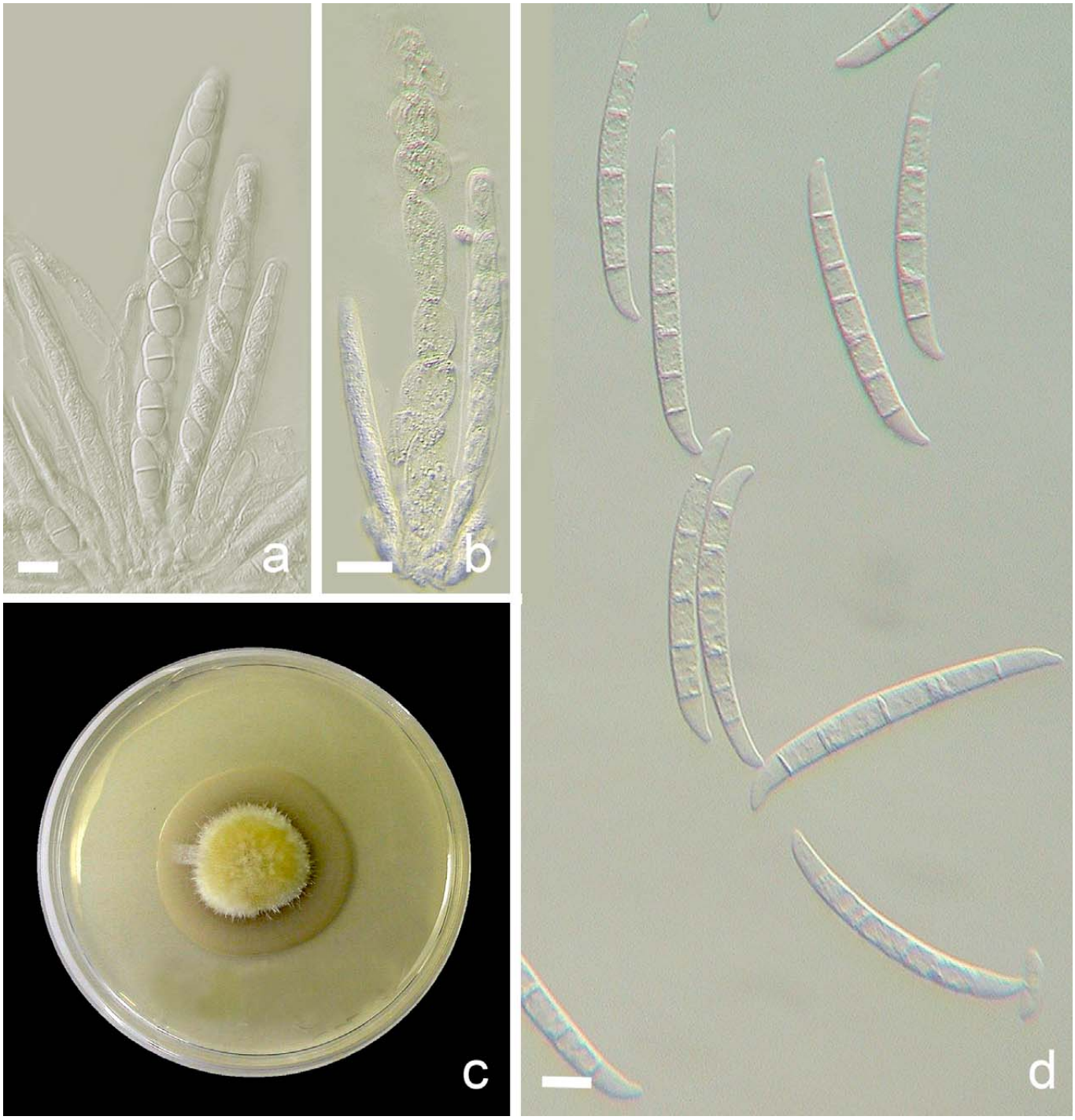

Fig. 2: CLL10010 (Holotype): a Asci and ascospores; b: Immature asci and monilioid paraphysis; c: Culture after two weeks in Petri dish 90 mm diam.; d: Macroconidia from culture. Scale bars: a, b, d =10 µm.

morph. The genus *Geejayessia*, introduced by Schroers *et al*. (2011), accommodates some nectria-like species previously assigned to *Cosmospora*, *Fusarium* Link and *Nectria* Fr. According to this new concept, species of *Geejayessia* occur on decaying twigs of woody hosts and are characterized by ascomata crowded on an erumpent, prosenchymatous stroma and having a fusarium-like asexual morph.

The new species described above matches well this ecological and morphological definition but appeared different from known species of *Geejayessia* described in Schroers *et al.* (2011). Externally, the most similar species is *G. atrofusca* (Schw.) Schroers & Gräfenhan, which also features dark reddish brown to nearly black ascomata. However, according to Samuels & Rogerson (1984), ascomatal wall of *G. atrofusca* (as *Nectria atrofusca*) does not change colour or weakly reacts in 3% KOH and in lactic acid, while that of the new species turns respectively purple and yellow in these reagents; ascospores of the new species likewise differ in being verruculose and significantly wider (5.5–)6–7(–7.5) vs. smooth and 4.5–5.5(–6) µm wide. Phylogenetic analysis of ITS sequences (Fig. 3) shows that the new species described herein is placed in the *Geejayessia* clade and that the closest species are *G. atrofusca* and *G. zealandica* (Cooke) Schroers. Besides its different geographical origin, the latter is morphologically set apart from the new species by its orange red to red ascomatal wall 80–125 µm wide and larger ascospores 15–20 × 6.5–8.2 µm (Nirenberg & Samuels, 2000).

Although no asexual morph of the new species was observed in natural environment, our observations lead us to think that the ascomata arise from hyphal elements of its own fusarium-like asexual morph, as shown by vertical section through ascomata and dead sporodochia, with hyphal elements grading into ellipsoidal and sub-

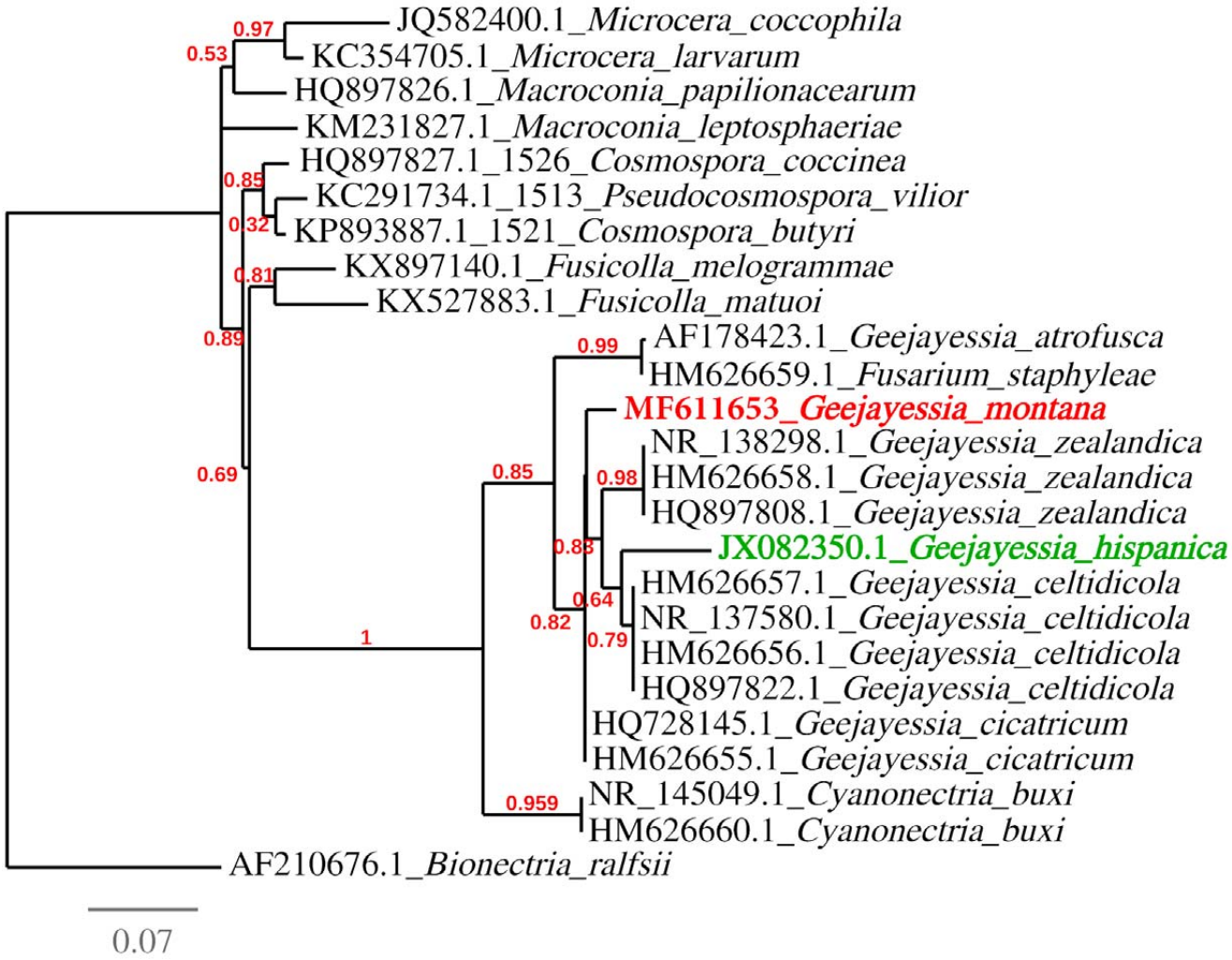

Fig. 3: Maximum likelihood phylogeny of *Geejayessia* spp. based on ITS sequences, rooted with *Bionectria ralfsii*.

Updated key to the species of *Geejayessia*

1. Ascomata not or weakly changing colour in 3% KOH; ascospores 11–14 × 4.5–5.5(–6) µm, smooth; on *Staphylea trifolia* ..... ***G. atrofusca***
1. Ascomata becoming dark red to purple in 3% KOH **2**
2. Ascomatal wall less than 35 µm thick **3**
2. Ascomatal wall more than 35 µm thick **6**
3. Ascospores smooth, 11–12 × 4–5.5 µm, macroconidia 1–3-septate, 21–26 × 4.5–5.5 µm; on *Phoenix canariensis* ..... ***G. hispanica***
3. Ascospores spinulose to verruculose **4**
4. Ascomatal wall up to 20 µm thick, ascomata bright red, ascospores (9.5–)11.5–13(–14.5) × 5–6 µm; macroconidia 5–7-septate, up to 125 µm long; on *Buxus sempervirens* ..... ***G. cicatricum***
4. Ascomatal wall more than 20 µm thick **5**
5. Ascomata orange to brownish orange, ascomatal wall 20–30 µm thick, ascospores (9.5–)11–12.5(–15) × (4.5–)5.5–6(–7) µm; macroconidia 3–5-septate, up to 74 µm long; on *Buxus sempervirens* ..... ***G. desmazieresii***
5. Ascomata dark red, ascomatal wall 15–25 µm thick, ascospores (10.5–)12.5–14(–16.5) × (4.5–)5–6(–6.5) µm; macroconidia 7-septate, up to 84 µm long; on *Celtis occidentalis* ..... ***G. celtidicola***
6. Ascomatal wall 35–45 µm thick, ascospores (8–10–)12–14(–15) × (5.5–)6–7(–7.5) µm; on various fabaceous hosts in Europe ..... ***G. montana***
6. Ascomatal wall 80–125 µm thick, ascospores (12–)15–20(–25) × (5.6–)6.5–8.2(–9) µm; on *Hoheria populnea* and *Plagianthus* sp. in New Zealand ..... ***G. zealandica***

globose cells to form the ascomatal wall (Fig. 1). Based on morphological characters of sexual and asexual morphs, comparison with known species and phylogenetic analysis, *Geejayessia montana* Lechat & J. Fourn. is proposed as a new species. Moreover, our phylogenetic analysis showed that *Cosmospora hispanica* Lechat & Priou (2008) is nested in the *Geejayessia* clade. As it possesses the key features of *Geejayessia*, including a fusarium-like asexual morph, we propose the new combination ***Geejayessia hispanica*** (Lechat & Priou) Lechat & J. Fourn., *comb. nov*., MycoBank 822841. Basionym: *Cosmospora hispanica* Lechat & Priou, *Bull. Soc. mycol. Fr.*, 124 (3-4): 163 (2008).

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