A new species of *Ijuhya* (*Bionectriaceae*) from Tenerife (Spain)

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Abstract: A new species of *Ijuhya* is described and illustrated based on material collected in the Canary Island of Tenerife (Spain). The new species described herein was sequenced. Based on ascomata not changing colour in 3% KOH or lactic acid and phylogenetic analysis, this species is placed in the *Bionectriaceae* as defined by Rossman *et al.* (1999). Its placement in *Ijuhya* is based on morphological and phylogenetic comparison with the most similar genera including *Lasionectria* (Sacc.) Cooke and *Lasionectriella* Lechat & J. Fourn. *Ijuhya aurantiaca* differs from other *Ijuhya* species by bright orange ascomata and 3–5-septate, conspicuously striate ascospores. An updated dichotomous key to *Ijuhya* is presented.
Keywords: Ascomycota, Canary Islands, *Hypocreales*, ribosomal DNA, taxonomy.

Résumé : une espèce nouvelle du genre *Ijuhya* est décrite et illustrée d'après du matériel récolté sur l'île de Tenerife en Espagne. L'espèce décrite ici a été séquencée. Les ascomes ne changeant pas de couleur dans KOH à 3 %, ni dans l'acide lactique, ainsi que d'après l'analyse phylogénétique, cette espèce est placée dans les *Bionectriaceae* comme définies par Rossman *et al.* (1999). Son placement dans le genre *Ijuhya* est établi sur la comparaison morphologique et phylogénétique avec les genres les plus ressemblants, dont *Lasionectria* (Sacc.) Cooke and *Lasionectriella* Lechat & J. Fourn. *Ijuhya aurantiaca* diffère des autres espèces d'*Ijuhya* par des ascomes orange vif et des ascospores striées et munies de 3–5 cloisons. Une clé dichotomique mise à jour du genre *Ijuhya* est proposée.
Mots-clés : ADN ribosomal, Ascomycota, *Hypocreales*, îles Canaries, taxinomie.

Introduction

In the continuity of a survey of the genus *Ijuhya* Starbäck (Lechat & Baral, 2008; Lechat & Courtecuisse, 2010; Lechat & Fournier, 2017a; Lechat & Hairaud, 2012; Lechat *et al.*, 2015), a new species of *Ijuhya* was collected on twigs of *Convolvulus canariensis* L. (*Convolvulaceae*) in the Canary Islands (Spain), which proved different from the species reported in the literature. Morphological features characterising the genus *Ijuhya* and distinguishing it from the most closely similar genera *Lasionectria* (Sacc.) Cooke and *Lasionectriella* Lechat & J. Fourn. were defined by Lechat & Fournier (2017a), and the new species morphologically matches well this definition, which is confirmed by the analysis of its LSU sequences placing it in the genus *Ijuhya*. Based on these results and after comparison with the most similar species of *Ijuhya*, *I. aurantiaca* Lechat, J. Fourn. &. Negrin is proposed as a new species.

Materials and methods

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

Taxonomy

Ijuhya aurantiaca Lechat, J. Fourn. & Negrín, *sp. nov.* Fig. 1
MycoBank: MB 822091

Diagnosis: Differs from other *Ijuhya* species with fascisculate hairs around upper margin by bright orange ascomata and 3–5-septate, conspicuously striate ascospores 35–45 × 5–7 µm.

Holotype: Spain, Canary Islands, Tenerife, Tegueste, Anaga Rural Park, Hoya de Zapata, 28º31'59" N, 16º17'46" W, alt. 855 m, humid evergreen laurel forest, on twigs of *Convolvulus canariensis* L., 18 Feb. 2017, *leg*. Rubén Negrín, CLL17006 (LIP); Genbank LSU MF536525

Etymology: The specific epithet "*aurantiaca*" refers to the bright orange ascomata.

Ascomata gregarious, abundantly distributed on host surface, superficial, difficult to remove from substrate, non-stromatic, subglobose, (230–)250–290(–310) µm high × 240–260(–270) µm diam. (Me = 270 × 250 µm, n = 25), bright orange, not collapsing when dry, not changing colour in 3% KOH or lactic acid. Ascomatal apex flat, discoid 170–230 µm diam, with a minute, acute papilla. Ascomatal surface completely obscured by smooth, hyaline hyphal elements arising from base of ascomata, proliferating and agglutinating to form triangular teeth 50–100 µm long, up to 30 µm wide at base, composed of fasciculate hairs 1.5–2 µm wide, hyaline, slightly flexuous, rounded at tip arranged in a stellate fringe around upper margin of ascomata. In vertical section, ascomatal wall 30–40 µm thick, excluding loose outermost hyphal elements, of a single region composed of thick-walled, globose to ellipsoidal cells 3–9 × 2.5–3.5 µm, with pale orange wall 1–2 µm thick, becoming hyaline, thin-walled and elongate toward interior. **Asci** clavate to fusiform, wider in middle, attenuated at apex, (70–)80–90(–100) × 11–18 µm (Me = 85 × 15 µm, n=30), apices rounded, without ring, with eight multiseriate ascospores. No interthecial elements detected but hymenium with conspicuous orange oily droplets. **Ascospores** (30–)35–45(–50) × 5–7 µm (Me = 42 × 6 µm, n=30), long fusiform, straight, (1–2–)3–5(–6)-septate, hyaline, coarsely striate with striae over whole length, completely filling each ascus.

Asexual morph: unknown.

Discussion

The new species *Ijuhya aurantiaca* is proposed to accommodate the collection described above, based on comparison of LSU sequences which confirms it belongs in the genus *Ijuhya* and comparison of morphological characters with other known species showing its distinctiveness. We regrettably failed to grow *I. aurantiaca* in culture, thus we lack information on its asexual morph.

Ijuhya aurantiaca is a distinctive species that can be recognized in the field thanks to its orange red ascomata bearing a conspicuous upper fringe of fasciculate hairs. Its long fusiform, 3–5-septate, conspicuously striate ascospores 35–45 × 5–7 µm provide a further differential character which clearly sets it apart from its relatives. In our phylogenetic analysis, the most closely related species is *I. peristomialis* (Berk. & Broome) Rossman & Samuels, which differs from the new species in having pale yellow to pale brownish orange ascomata with significantly longer fascicles of hairs 145–300 µm long

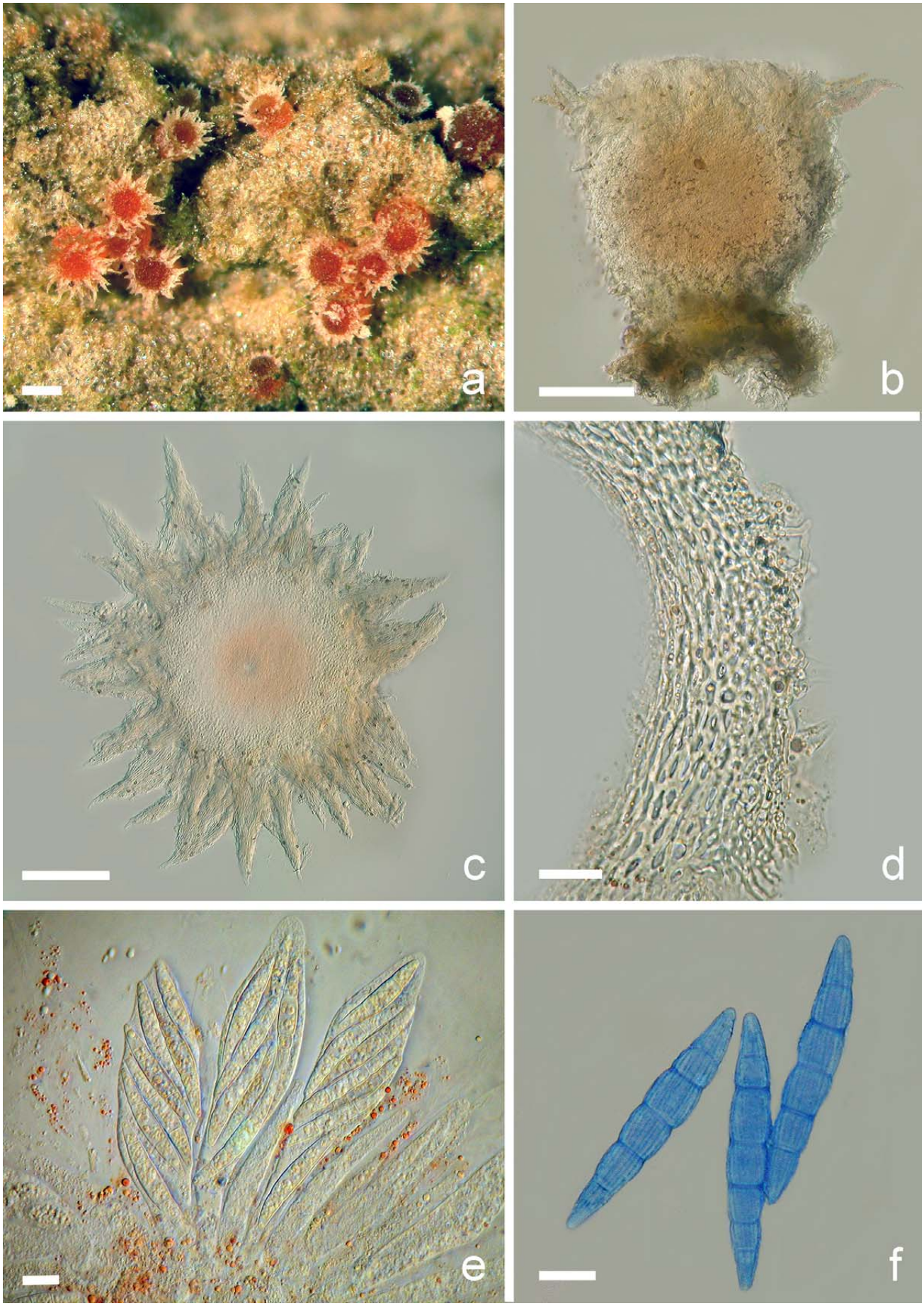

Fig. 1 – a–f: *Ijuhya aurantiaca* (Holotype CLL17006). a: Ascomata on the substrate. b: Close-up of ascoma in side view in water, showing the flat upper disc and some fasciculate hairs spreading horizontally. c: Ascomatal apex in top view showing the fasciculate hairs at periphery of the upper disc. d: Vertical section through the lateral ascomatal wall. e: Hymenium in water showing asci, ascospores and orange oily droplets. f: Ascospores in lactic acid/cotton blue showing the striate ornamentation. Scale bars: a =200 µm; b, c = 100 µm; d = 20 µm; e, f = 10 µm.

Updated key to species of *Ljuhya* (Modified from Lechat & Fournier, 2017a)

A. Perithecia with a crown of fasciculate hairs around apical disc **1**
B. Perithecia without fasciculate hairs **11**
1. Fascicles of hairs reaching 200 µm long or more **2**
1. Fascicles of hairs less than 200 µm long **4**
2. Fascicles of hairs up to 300 µm long; ascospores (24–)30–60(–110) × 4–7(–8) µm, (1–)5–7(–11)-septate, striate; ascomata pale yellow ..... ***I. peristomialis***
2. Fascicles of hairs 145–250 µm long; ascospores much smaller **3**
3. Fascicles of hairs 150–200 µm long; ascospores 6–8(–9) × 3–4 µm, spinulose; ascomata orange-yellow ..... ***I. dentifera***
3. Fascicles of hairs 160–250 µm long; ascospores (18–)22–23.5(–25) × 4.5–5(–5.5) µm, striate; ascomata white to pale yellow ..... ***I. fournieri***
4. Ascospores striate or smooth **5**
4. Ascospores spinulose, 14.5–20 × (2.5–)3–5(–5.4) µm, ascomata orange to brownish-orange, hairs sparse, 30–50 µm long, or absent ..... ***I. parilis***
5. Ascospores striate **6**
5. Ascospores smooth ..... ***I. hongkongensis***
6. Ascospores faintly striate (8.5–)9.5–11.5(–12.5) × 2.8–3.2(–3.5) µm; ascomata brownish-orange, hairs 28–80 µm long ..... ***I. equiseti-hyemalis***
6. Ascospores coarsely striate **7**
7. Ascospores (10.5–)11–13(–14) × 2.5–3.5 µm; ascomata dark orange, fascicles of hairs 100–160 µm long ..... ***I. antillana***
7. Ascospores larger **8**
8. Ascospores (30–)35–45(–50) × 5–7 µm, (1–2–)3–5(–6)-septate ..... ***I. aurantiaca***
8. Ascospores averaging 14–28 µm long **9**
9. Fascicles of hairs over 100 µm long **10**
9. Fascicles of hairs less than 100 µm long, ascospores (19–)21–28 × 3.5–4.5 µm; ascomata dull orange ..... ***I. chilensis***
10. Ascospores (12–)14–16.5(–18) × (2.5–)3–3.5(3.8) µm; ascomata pale orange to dark orange; temperate ..... ***I. boothii***
10. Ascospores (14–)15–17(–18) × 3–3.5(–4) µm; ascomata white to pale orange; tropical ..... ***I. faveliana***
11. Asci containing dictyosporous ascospores ..... ***I. dictyospora***
11. Asci containing uni- to multiseptate ascospores **12**
12. Ascospores striate **13**
12. Ascospores smooth or spinulose **14**
13. Ascospores (19.5–)21.5–24.5(–25.5) × 4–5 µm ..... ***I. paraparilis***
13. Ascospores (8.5–)9–10(–11) × 2.5–2.8 µm ..... ***I. lilliputiana***
14. Ascospores smooth (7.5–)8.5–10 (–11) × 2–2.7(–3) µm ..... ***I. leucocarpa***
14. Ascospores spinulose, larger **15**
15. Asci 8-spored, ascospores (11–)12–14(–15) × 2.8–3.2(–3.5) µm ..... ***I. pachydisca***
15. Asci 2–4-spored, ascospores longer **16**
16. Asci 2–4-spored, ascospores (15–)16–20 × 3–3.3 µm (China) ..... ***I. hubeiensis***
16. Asci 4-spored, ascospores (14–)15–18(–19) × 3.5–4(–4.5) µm (Europe) ..... ***I. tetraspora***

and larger, often curved ascospores 30–60 × 4–7 µm with 5–7(–11) septa (Rossman & Samuels, 1999).

Ljuhya aurantiaca shares with *I. boothii* (Lechat & Hairaud) Lechat & J. Fourn. (Lechat & Hairaud, 2012; Lechat & Fournier, 2017b), *I. chilensis* (Speg.) Rossman & Samuels (Rossman & Samuels, 1999) and *I. faveliana* Lechat & J. Fourn. (Lechat & Fournier, 2017a) ascomata with fascicles of hairs less than 200 µm long and striate ascospores but it can be easily distinguished by its orange red ascomata and significantly larger ascospores, as shown in the updated dichotomous key included in this paper.

Phylogenetic analysis (Fig. 2) shows that the new species is nested in the subclade comprising the species having a crown of fasciculate hairs on the upper margin of ascomata, which is in agreement with previous observations (Lechat & Fournier, 2017a), with the exception of *I. paraparilis* (Samuels) Rossman & Samuels which lacks fascicles of hairs and thus appears placed in the wrong subclade. The inclusion of additional sequences would be necessary to test this preliminary hypothesis and the placement of *I. paraparilis* would require the examination of fresh material of this tropical species known only from the type (Samuels, 1988).

When they reinstated *Ljuhya* in the sense followed here, Rossman & Samuels (1999) listed ten species. With the recent additions cited in the introduction, plus those by Zhuang *et al.* (2007), the new combination of *Hydropisphaera boothii* (D. Hawksw.) Rossman & Samuels in *Ljuhya* (Lechat & Fournier, 2017b) and the addition of *I. aurantiaca* presented here as the first collection of *Ljuhya* from Canary Islands, the total number of known species of *Ljuhya* is now raised to eighteen. This strongly suggests that more extensive sampling worldwide might show the genus *Ljuhya* to be much more diverse than currently conceived.

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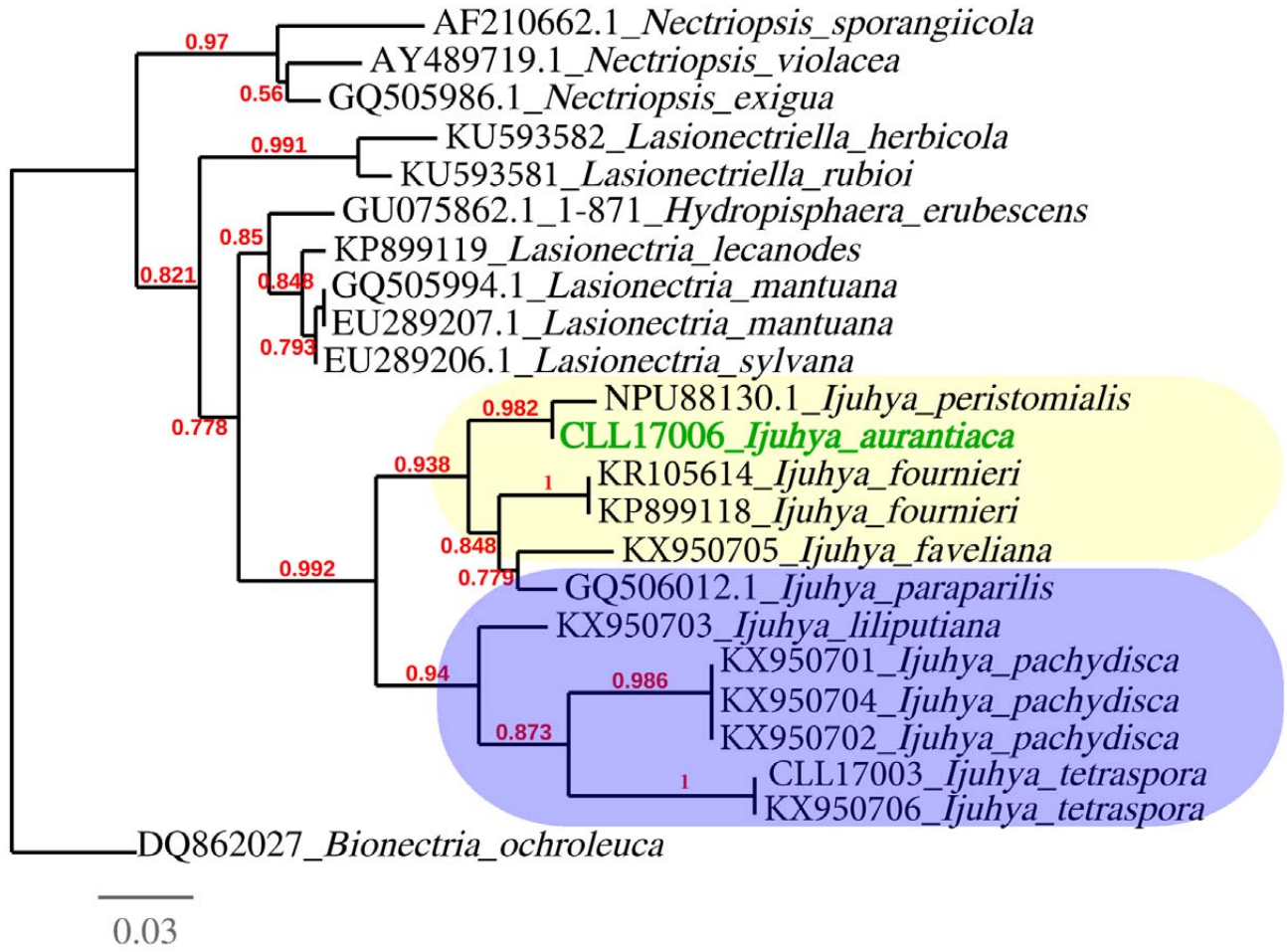

Fig. 2 – Maximum likelihood phylogeny of *Ijuhya* spp. based on LSU sequences. Species with hairy ascomata are highlighted in yellow and those with glabrous ascomata in blue.

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