

New taxonomic combinations in endophytic representatives of the genus *Nigrograna*

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Nigrograna (Ascomycota: Pleosporales), with the type species *N. mackinnonii*, has been considered a synonym of *Biatriospora*. Recently, it was shown that these two genera are distinct. In this study, four species earlier described in *Biatriospora*, i.e. *B. antibiotica*, *B. carollii*, *B. peruviansis* and *B. yasuniana*, which are phylogenetically related to *N. mackinnonii*, are combined in *Nigrograna*.

Recently, three teams of authors published eight *Nigrograna* species almost simultaneously (2016–2017), thus some were not compared phylogenetically. A comparison of available sequences showed that all nine accepted species are unique. It can be concluded that *Nigrograna* is ecologically diverse, comprising species living as endophytes or saprobes of plants (some of them associated with other fungi living on those plants) as well as species living in marine or estuarine environments. Interestingly, all associations with vascular plants concern angiosperms.

Key words: *Biatriospora*, taxonomy, endophytic fungi.

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Nigrograna (Ascomycota: Pleosporales), s typovým druhem *N. mackinnonii*, byla považována za synonymum rodu *Biatriospora*. Nedávný výzkum ukázal, že oba rody jsou samostatné. V této studii je předložena kombinace čtyř druhů rodu *Biatriospora*, konkrétně *B. antibiotica*, *B. carollii*, *B. peruviansis* a *B. yasuniana*, které patří do blízkosti druhu *N. mackinnonii* a měly by tedy být řazeny do rodu *Nigrograna*.

V letech 2016–2017 bylo třemi autorskými týmy publikováno osm druhů rodu *Nigrograna*, které nebyly vzájemně porovnány. Porovnání dostupných sekvencí DNA ukazuje, že všech devět uznávaných druhů rodu *Nigrograna* je unikátních. Souhrn dosavadních znalostí ukazuje, že *Nigrograna* je ekologicky velmi různorodý rod zahrnující endofyty a saprotrofy žijící na rostlinách (některé s vazbou na jiné houby, které na rostlinách žijí), ale také druhy žijící v mořském či brakickém prostředí. Je pozoruhodné, že všechny druhy s vazbou na cévnaté rostliny jsou vázány na rostliny krytosemenné.

SHORT TAXONOMIC REPORT

Nigrograna (Ascomycota: *Pleosporales*) was described by de Gruyter et al. (2013) as a genus comprising a single asexual species, *N. mackinnonii* (Borelli) Gruyter, Verkley & Crous, which is the causal agent of eumycetoma in Latin America (Ahmed et al. 2018). Ahmed et al. (2014) combined this species into the genus *Biatriospora*, based on the sequence similarity to an isolate labelled *Biatriospora marina* K.D. Hyde & Borse, and so *Nigrograna* was considered a synonym of *Biatriospora*. Following this concept, four plant endophytic species with an unknown sexual state, *B. antibiotica* M. Kolařík & Kubátová, *B. carollii* M. Kolařík & R. Gazis, *B. peruviensis* M. Kolařík & R. Gazis and *B. yasuniana* M. Kolařík & D. Spakowicz were described by Kolařík et al. (2017) from the Czech Republic and Amazonia. Jaklitsch & Voglmayr (2016) discovered species forming sexual morphs which were phylogenetically related to *N. mackinnonii*, but possessed ascospores substantially different from *Biatriospora marina*. So, these authors doubted the validity of the *B. marina* strain used by Ahmed et al. (2014) and showed that these two genera are distinct. At the same time, they published three new species and one taxonomic combination [*N. mycophila* Jaklitsch, Friebes & Voglmayr and *N. norvegica* Jaklitsch & Voglmayr, *N. obliqua* Jaklitsch & Voglmayr, *N. fuscidula* (Sacc.) Jaklitsch & Voglmayr]. *Nigrograna mycophila* and *N. norvegica* are mycophilous, associated with *Diaporthales* stromata on hardwoods in Europe. *Nigrograna obliqua* lives as a saprotroph on the bark of hardwoods in Europe. The generic concept of Jaklitsch & Voglmayr (2016) was followed by Tibpromma et al. (2017), who introduced a new sexual species, *N. cangshanensis* Z.L. Luo, H.Y. Su & K.D. Hyde, living as a saprobe on decaying wood in China.

The species published by Jaklitsch & Voglmayr (2016), Kolařík et al. (2017) and Tibpromma et al. (2017) are compared here for the first time. To this aim, the reduced ITS rDNA sequence dataset from Kolařík et al. (2017) was completed with *Nigrograna* sequences published by Borman et al. (2016), Jaklitsch & Voglmayr (2016), Travadon et al. (2016) and Tibpromma et al. (2017). Alignment and Maximum likelihood phylogenetic analysis follow Kolařík et al. (2017). The analysis showed that all compared species formed distinct phylogenetic lineages and are thus unique (Fig. 1). Based on the three abovementioned papers, it can be concluded that *Nigrograna* is ecologically diverse, comprising species living as endophytes or saprobes of angiosperms (possibly associated with other fungi living on those plants). In addition, Kolařík et al. (2017) showed that *N. antibiotica*, *N. peruviensis*, *N. mackinnonii* and numerous unclassified *Nigrograna* spp. were also isolated from true marine (i.e. sponges, sediments) and estuarine environments (Fig. 1). Interestingly, all associations with vascular plants concern angiosperms. *Nigrograna* spp. are distributed worldwide with diversity hotspot

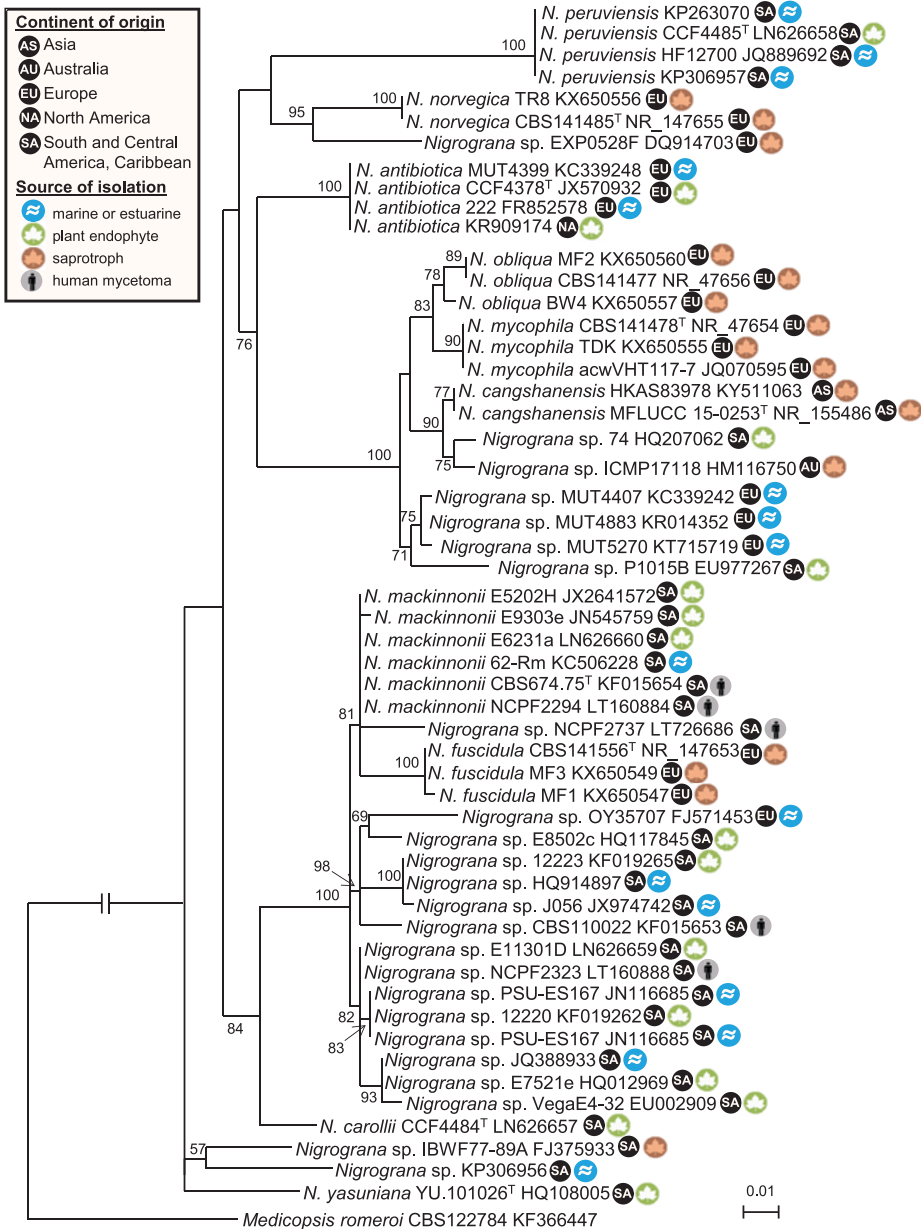


Fig. 1. Maximum likelihood phylogenetic tree based on ITS rDNA sequences showing the relatedness of all described *Nigrograna* species. The tree was computed in PhyML 3.1 software using 500 bootstrap replicates and the HKY substitution model. The tree is rooted with *Medicopsis romeroi*. The branch leading to the outgroup has been shortened to 1/10 of the actual length. Ecology and geography are taken from Kolařík et al. (2017) or Travadon et al. (2016) in the case of sequence KR909174 and Borman et al. (2016) in the case of LT726686 and LT160884.

being Central and South America, where they can also behave as human pathogens. Several species, such as *N. antibiotica* and species described by Jaklitsch & Voglmayr (2016), have distinct geographical patterns, living in the temperate regions of Europe and in the case of *N. antibiotica* also in the USA.

The new combinations for the species described by Kolařík et al. (2017) under the name *Biatriospora* are provided below.

Nigrograna antibiotica (M. Kolařík & Kubátová) M. Kolařík, **comb. nov.**

(Mycobank MB 827555)

Basionym: *Biatriospora antibiotica* M. Kolařík & Kubátová, Plant Syst Evol 303: 44 (2017)

Nigrograna carollii (M. Kolařík & R. Gazis) M. Kolařík, **comb. nov.**

(Mycobank MB 827556)

Basionym: *Biatriospora carollii* M. Kolařík & R. Gazis, Plant Syst Evol 303: 46 (2017)

Nigrograna peruviansis (M. Kolařík & R. Gazis) M. Kolařík, **comb. nov.**

(Mycobank MB 827557)

Basionym: *Biatriospora peruviansis* M. Kolařík & R. Gazis, Plant Syst Evol 303: 46 (2017)

Nigrograna yasuniana (M. Kolařík & D. Spakowicz) M. Kolařík, **comb. nov.**

(Mycobank MB 827558)

Basionym: *Biatriospora yasuniana* M. Kolařík & D. Spakowicz, Plant Syst Evol 303: 46 (2017)

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