

Fungal diversity in Namibian Stipagrostis 'fairy circles' including descriptions of four new Curvularia species

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Introduction

- Barren patches of land surrounded by flourishing grass (Stipagrostis ciliata; Poaceae) are found in the Namib desert and are commonly referred to as "fairy circles".
- These unusual circles were first described from the Namib desert in 1971 and have received much attention in recent years, but their origin remains unexplained.
- One of the more recent hypotheses emerging from a high-throughput sequencing approach is that microbial phytopathogens could be involved.
- 'Zone specific' fungi (i.e., fungal species which differ between fairy circles and their matrix) have also been identified in these circles.^[1]



Aim

In this study, we considered the culturable diversity of fungi associated with Namib desert fairy circles of two regions.

Results, Discussion and Conclusions

- A total of 487 strains representing 54 genera and 104 species were identified. These included 193 strains from the Mirabib (102 from margin, 91 from inside), 204 from Far East (115 from margins, 89 from insides), and 90 from the matrix.
- The most commonly isolated genera from *Stipagrostis ciliata* were *Curvularia* (n = 75), Fusarium (n = 73), and Monosporascus (n = 41).
- Twelve species of *Curvularia* were identified. The most common *Curvularia* species identified was C. moringae^[2] (n = 30), which was described from Moringa ovalifolia from the Namib desert.
- Four species of *Curvularia* did not conform to any known species and were considered novel. These species will be described as Curvularia gobabebensis prov. nom., Curvularia maraisii prov. nom., Curvularia namibensis prov. nom., and Curvularia stipagrosticola prov. nom.
- Many of the genera isolated contain melanin, or produce chlamydospores, which act as a protection mechanisms, and allow them to persist in these harsh



C. moringae CN011H6 C. moringae CN011E9

C. moringae CN038C9 C. moringae CN013B5

C. moringae CN010G6

- C. species BRIP17068b/DS2015B

- C. sacchari-officinarum CGMCC3.19331¹

C. micrairae BRIP17068a[™]

- C. elliptiformis LC12004 - C. eragrostidis CBS189.48

C. clavata BRIP61680b

C. eleusinicola USJCC 0005





- environments.
- This indicates the wealth of fungi that exist and remain to be discovered from the Namib desert and contributes to the current knowledge of the microbes associated with fairy circle grasses.



The abundance of fungal genera from Namib desert fairy circles; A: Genera having more than 3 strains; B: Genera having 3 or less strains.

Acknowledgements

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References

[1] van der Walt AJ et al. (2016) Unique microbial phylotypes in Namib desert dune and gravel plain fairy circle soils. Applied and Environmental Microbiology 82: 4592–4601. https://doi.org/10.1128/AEM.00844-16

[2] Crous PW et al. (2020) Fungal Planet description sheets: 1112-1181. Persoonia 45: 251–409. https://doi.org/ 10.1016/j.simyco.2021.100116

Figure 2

Phylogenetic tree based on a maximum-likelihood approach of the GAPDH, ITS, and TEF1 loci from phylogenetically related Curvularia species. The tree was rooted to Exserohilum turcicum and Bipolaris zeae. The taxonomic novelties proposed in this study are represented in bold and highlighted in blue, and additional strains included in this study are shown in bold. Bootstrap values above 75% are shown on the branch nodes.

<u>_100</u>— C. microspora GUCC6272^T - C. trifolii CBS173.55 - C. coatesiae BRIP24261 C. pallescens CBS156.35 C. borreriae MFLUCC 11-0422 . pallescens CBS859.73 _г *C. mebaldsii* CN060G8 mebaldsii BRIP12900 C. tsudae ATCC44764 - C. patereae CBS198.87 C. perotidis CBS350.90^T C. variabilis CPC28815¹ ₉₃ *C. manamgodae* CGMCC3.19446[™] C. species CBS274.52 C. buchloes CBS246.49 ⁸⁸₁ *C. rouhanii* CBS144674⁻ *↓ C. rouhanii* CN022H5 *C. rouhanii* CN061A5 C. rouhanii CN034A6 ⁹⁹ *C. rouhanii* CN025B3 d *C. rouhanii* CN010I9 *C. rouhanii* CN010F6 *C. rouhanii* CN028H7 _ *C. subpapendorfii* CBS656.74[™] *− C. ellisii* CBS193.62[⊤] C. pseudoellisii CBS298.80 - *C. neergaardii* BRIP12919^{lso1} C. australiensis BRIP12044¹ C. gobabebensis prov. nom. CN013F6 and a gobabebensis prov. nom. CN010F9 C. gobabebensis prov. nom. C. gobabebensis prov. nom. CN013C4 C. tribuli CBS126975 C. tribuli CN024I3 G*C. tribuli* CN043E6 C. tribuli CN027E2 C. tribuli CN059G9 C. tribuli CN043E2 C. tribuli CN036G4 C. tribuli CN038E7 [|]*C. tribuli* CN024H6







