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Whole-Genome Sequence Data Uncover Widespread Heterothallism in the Largest Group of Lichen-Forming Fungi

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Accepted: January 31, 2019

Data deposition: All figures and tables generated during the study are included in this article and all data used have been deposited in FigShare: https://figshare.com/s/f6236882992a565c3d3c, last accessed February 18, 2019.

Abstract

Fungal reproduction is regulated by the mating-type (*MAT1*) locus, which typically comprises two idiomorphic genes. The presence of one or both allelic variants at the locus determines the reproductive strategy in fungi—homothallism versus heterothallism. It has been hypothesized that self-fertility via homothallism is widespread in lichen-forming fungi. To test this hypothesis, we characterized the *MAT1* locus of 41 genomes of lichen-forming fungi representing a wide range of growth forms and reproductive strategies in the class Lecanoromycetes, the largest group of lichen-forming fungi. Our results show the complete lack of genetic homothallism suggesting that lichens evolved from a heterothallic ancestor. We argue that this may be related to the symbiotic lifestyle of these fungi, and may be a key innovation that has contributed to the accelerated diversification rates in this fungal group.

Key words: lichen-forming fungi, mating system, heterothallism, MAT, sexual reproduction.