I2.1 The *Botrytis cinerea* mating type loci

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Botrytis cinerea is a heterothallic ascomycete with two mating types, MAT1-1 and MAT1-2. Sexual development in ascomycetes is usually controlled by a *MAT* locus that contains genes encoding transcription factors, either of the class of alpha-domain proteins or high mobility group (HMG)-domain proteins. By convention, the alpha-domain gene is named *MAT1-1-1* and the HMG-domain gene is named *MAT1-2-1*. Ascomycete species that are homothallic contain both genes, physically linked in the same region of the genome. The two *B. cinerea* strains of which the genome was sequenced, B05.10 and T4, are of opposite mating type and their genome sequences have revealed novel features in the structure of the MAT loci.

Incomplete fragments of the *MAT1-2-1* and *MAT1-1-1* genes were detected that border the *MAT* loci of the MAT1-1 and MAT1-2 isolates, respectively. Both of these fragments encode truncated, non-functional proteins. This structure strongly suggests that *B. cinerea* has evolved from a homothallic ancestor containing complete *MAT1-1-1* and *MAT1-2-1* genes at the same locus. The MAT1-1 and MAT1-2 alleles have arisen by the loss of either the HMG-domain or alpha-domain sequences, leaving the disabled gene fragments seen in the current *MAT* loci. Two additional genes were detected, designated *MAT1-1-5* and *MAT1-2-3*, that have not previously been reported from other fungi. Homologs of *MAT1-1-5* are present in other leotiomycetes (including *Sclerotinia sclerotiorum*), whereas the *MAT1-2-3* gene is exclusively present in species of the genus *Botrytis*. Knockout mutants in *MAT1-1-5*, generated by gene replacement, appeared to be sterile. In crosses of such a mutant with the wild type MAT1-2 strain SAS405, there was normal development of primordia and stipes, but the dikaryon failed in differentiating the cap structure in which the asci and ascospores develop.

B. cinerea is unusual in that some isolates are capable of 'dual mating'. This refers to the observation that most isolates act in a standard heterothallic, cross-fertilizing fashion (MAT1-1 or MAT-1-2). Some isolates, however, can mate with both MAT1-1 ánd MAT1-2 isolates. Certain dual mater isolates can even self-fertilize and are truly homothallic. The *MAT* locus of five homothallic *B. cinerea* isolates was analysed. Four of those contain a MAT1-2 locus, without any sequence of the MAT1-1 locus being detected. Remarkably, one homothallic isolate contains a MAT1-1 locus, without any sequence of the MAT1-2 locus being detected. We conclude that dual mating and homothallism is controlled by sequences outside the *MAT* locus.