New Disease Reports

Both MAT1-1 and MAT 1-2 idiomorphs present in rice blast populations (*Magnaporthe oryzae*) collected in rice fields in northern Brazil

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Brazil is the largest rice-producing country outside of Asia. The rice blast fungus (*Magnaporthe oryzae*) is a major disease of rice (*Oryza sativa*) in Brazil and throughout the world. *Magnaporthe oryzae* expresses a large number of pathotypes, and new forms frequently appear in the field after resistant rice cultivars are introduced. Even so, it is believed that reproduction in the rice blast fungus is asexual and populations are clonal. Sexual recombination in *M. oryzae* is considered rare because field-collected isolates have low sexual fertility (Saleh *et al*., 2012). In addition, mating type studies have shown that only one mating type predominates in a particular region (Kanamori *et al*., 2007). However, there are reports of the presence of highly fertile and hermaphrodite isolates, and isolates carrying both mating types, in regions close to the centre of rice origin, suggesting that sexual recombination may contribute to genetic variability (Saleh *et al*., 2014).

Ninety-eight leaf isolates of *M. oryzae* were collected from eight commercial fields in the northern state of Tocantins in the 2015/2016 cropping season. Up to 12 isolates were collected per field (Fig. 1). DNA from isolates grown on potato dextrose agar for seven days (Fig. 2) were extracted using the method of D'Ávila *et al.* (2016) except that repeated washings with 70% ethanol were done at the end of the extraction process. The dried DNA was re-suspended in water and its concentration determined in a Nanodrop 2000 spectrophotometer (Thermo Scientific, USA) and adjusted to 30 ng/µL. The frequencies of MAT1-1 and MAT1-2 idiomorphs were assessed by amplicons produced after PCR using the primers MAT1-1F, MAT1-1R, MAT1-2F and MAT1-2R (Takan *et al*., 2012). PCR was performed in a final volume of 10 µl using the Qiagen Multiplex PCR Kit as described by the manufacturer, and following agarose gel electrophoresis, fragments were scored as either MAT1-1 (960 bp) or MAT1-2 (802 bp) (Takan *et al*., 2012). DNA of isolates KA-3 (MAT1-1) and GUY 11 (MAT1-2) were used as controls since their mating idiomorphs have been determined previously (Leung *et al*., 1988). A single amplicon matching the MAT1-2 idiomorph was produced for 91 isolates, while seven isolates had the MAT1-1 idiomorph (Fig. 2).

This is the first study to detect *M. oryzae* rice isolates carrying the MAT1-1 idiomorph in Brazil. Despite the low frequency of the MAT1-1 idiomorph, the study showed that sexual reproduction is possible in the northern rice-producing regions of Brazil. Although the occurrence of sexual reproduction in *M. oryzae* from rice fields is only inferred, the presence of both idiomorphs may help to explain the challenges of rice blast management in Brazil, which has been reported as increasingly difficult due to the high variability of this pathogen and a dependence on chemical control for disease management. The ability to reproduce sexually is believed to be an ancestral state that can be lost when the pathogen encounters less favourable conditions. Sexual reproduction is therefore expected in the centre of origin, rather than in introduced areas. The high genetic variability in *M. oryzae* in northern Brazil supports the idea that the conditions here must be favourable for sexual reproduction and are similar to those in south-eastern Asia, the putative centre of origin of the fungus (Saleh *et al*., 2014).

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Figure 1

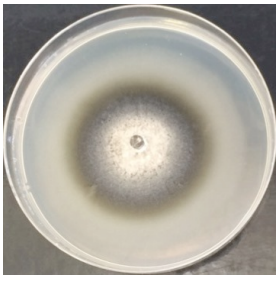

Figure 2

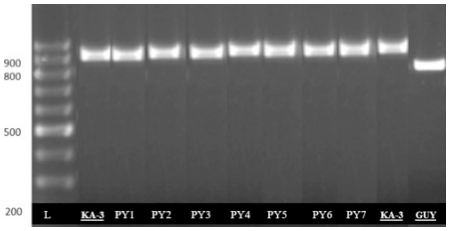

Figure 3

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