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ORIGINAL PAPER

Expression of *Dm-AMP1* in rice confers resistance to *Magnaporthe oryzae* and *Rhizoctonia solani*

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Abstract *Magnaporthe oryzae* and *Rhizoctonia solani*, are among the most important pathogens of rice, severely limiting its productivity. *Dm*-AMP1, an antifungal plant defensin from *Dahlia merckii*, was expressed in rice (*Oryza sativa* L. sp. indica cv. Pusa basmati 1) using *Agrobacterium tumefaciens*-mediated transformation. Expression levels of *Dm-AMP1* ranged from 0.43% to 0.57% of total soluble protein in transgenic plants. It was observed that constitutive expression of *Dm-AMP1* suppresses the growth of *M. oryzae* and *R. solani* by 84% and 72%, respectively. Transgenic expression of *Dm-AMP1* was not accompanied by an induction of pathogenesis-related (PR) gene expression, indicating that the expression of DmAMP1 directly inhibits the pathogen. The results of in vitro, *in planta* and microscopic analyses suggest that *Dm-AMP1* expression has the potential to provide broad-spectrum disease resistance in rice.

Keywords DmAMP1 · *Magnaporthe oryzae* · *Rhizoctonia solani* · Transgenic rice · Plant-microbe interactions · Defensins

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Introduction

Rice is a host for more than 70 diseases caused by fungi, bacteria and viruses. Rice blast (*M. oryzae*) and sheath blight (*R. solani*) are among the most devastating fungal diseases affecting productivity of rice (Ou 1985). *M. oryzae*, an Ascomycete fungus, produces specialised infection structures known as appressoria that infect aerial tissues and hyphopodia that can infect root tissues (Sesma and Osbourn 2004). *M. oryzae* is highly variable and hence, durable resistance through breeding has attained limited success. Sheath blight is considered to be an important disease of rice next to the blast disease. It is caused by the fungus *R. solani* which is a Basidiomycete that occasionally produces sexual spores (basidiospores) but no asexual spores (conidia). In nature, *R. solani* reproduces asexually and exists primarily as vegetative mycelium and/or sclerotia and has a broad host range (Anderson 1982). Attempts to control *R. solani* with resistant rice cultivars have not been successful because effective source of resistance is not available. Currently, these diseases are controlled by the application of chemicals, use of resistant cultivars and agronomic management practices. However, plant genetic engineering might be an attractive method for improving resistance to fungal diseases in commercial rice varieties.

Plants possess an impressive arsenal of antimicrobial compounds that are either constitutively arrayed within certain tissues or synthesized in direct response