

**MOLECULAR GENETIC ANALYSIS OF THE SYMBIOSIS BETWEEN  
THE COTTON PLANT AND AN ARBUSCULAR MYCORRHIZAL  
FUNGUS**

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## SUMMARY

Symbioses between arbuscular mycorrhizal (AM) fungi and the cotton plant afford nutrient benefits and possibly disease protection to the plant. The agricultural benefits of mycorrhiza to cotton and other crop plants may be enhanced with a greater understanding of the genes involved in such symbiotic interactions. To enable identification of symbiosis-related genes, a procedure was developed in which the root system of a cotton seedling could be colonised by an AM fungus during culture in the laboratory. Four different cultivars from two different cotton species were successfully colonised with the AM fungus *Gigaspora margarita* using this system.

A new technique known as differential display PCR was employed to identify potential symbiosis-related genes in root material harvested from mycorrhizal and non-mycorrhizal cotton plants. Although isolation of these gene fragments proved to be difficult, a number of the gene fragments were cloned and found to possess DNA sequence similarity with genes activated in plant-microbe interactions, including symbioses. One of these fragments is from a gene for a membrane intrinsic protein (MIP), and this gene was shown to be more active in mycorrhizal than non-mycorrhizal cotton roots.

Twelve cotton defence-response genes were analysed to determine if there is any similarity between the response of the plant to fungal pathogens or symbionts. The defence-response genes representing the enzymes phenylalanine ammonium lyase (PAL), chalcone synthase (CHS) and chitinase did not appear to be activated in mycorrhizal cotton roots, in contrast to what is observed in other plant-mycorrhiza interactions. Other defence-response genes with unknown function which were activated in mycorrhizal cotton roots deserve further investigation. One which has sequence similarity with a putative signal transduction protein may provide insights into the mechanism by which the defence response is regulated in mycorrhizal cotton roots.