Exploring Plant Deference Responses in Symbiotic & Pathogenic Interactions (Prof Dale Walters)

Arbuscular mycorrhizal (AM) fungi form symbiotic associations with root systems of most agricultural, horticultural and hardwood crop species and can reduce damage to plants by soil-borne pathogens. A better understanding of the mechanisms of bioprotection could assist exploitation of AM fungi as an environmentally friendly alternative to agrochemicals for control of plant diseases.

Objectives - To investigate how symbiotic and pathogenic organisms affect expression of the tomato pirin gene.

Expression analysis of a plant defence-related gene - A previous SEERAD-funded study demonstrated that colonization of tomato roots by AM fungi alters the expression of a number of plant genes. One of these genes is predicted to code for pirin, a protein implicated in the plant defence response to pathogens.

A recent study has compared the level of pirin gene expression in non-colonized tomato plants with that in plants colonized by either the AM fungus Glomus mosseae or the root knot nematode pathogen Meloidogyne incognita. Gene expression was analyzed using the polymerase chain reaction (PCR), a technique that allows rapid and specific amplification and quantitation of a nucleic acid target sequence.

Achievements/Findings:

- Symbiotic and pathogenic organisms have different effects on pirin gene expression
- Expression is moderately increased (+25%) in both roots and leaves of plants colonized by AM fungus
- Expression is greatly reduced (> 70 %) in both roots and leaves of plants infected by root knot nematode

Implications/Significance - The data are consistent with a role for pirin in plant defence mechanisms

- Bioprotection by AM fungi could involve increased activity of pirin-associated plant defence mechanisms
- The increased susceptibility to foliar and wilt diseases of plants infected with root knot nematode could be related to a systemic reduction in activity of pirin-associated plant defence mechanisms
- A role for pirin in defence responses is supported by the chromosomal location of the tomato pirin gene adjacent to a locus that confers resistance to viral diseases

Potential benefits - The pirin gene merits further investigation as a potential target for strategies to increase resistance to pathogens in crop species.

Research Sponsors - The Scottish Government

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