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COTTON RESEARCH AND DEVELOPMENT CORPORATION

SUMMARISED REPORT

Title: Management of VA Mycorrhizal Fungi for Sustainable Production of Cotton.

Project Number: US9C (1992/3)

Soil samples were collected from more than 60 locations between Emerald and Warren used to grow irrigated or dry-land cotton. Vesicular-arbuscular mycorrhizal (VAM) fungi found in the soils were identified. Pot cultures of selected, common fungi were established.

In each soil sample we found between 2 and 5 species of VAM fungi. All fungi were from two genera, *Glomus* and *Acaulospora*. All the fungi had relatively small spores. A total of 10 species have been identified, of which *Glomus intraradices* and *Glomus mosseae* are the most common. An undescribed species of *Acaulospora* is also common. The common species are found throughout the cotton growing areas.

In this and a related project funded by ARC, four fungal isolates of each of two common species were compared for their effect on plant growth. From this research we have concluded that the variation within one species is as great as the variation between species of VAM fungi. The first aim was to develop our understanding of each fungus so that we could predict the effect that fungus would have on growth of cotton. The practical consequence of our work is that knowing the species of fungus present in a soil provides us with little capacity to predict how it will influence plant growth.

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Title: Management of VA Mycorrhizal Fungi for Sustainable Production of Cotton.

Project Number: US9C

Research Organisation: University of Sydney

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A final report prepared for the Cotton Research and Development Corporation

Management of VA Mycorrhizal Fungi for Sustainable Production of Cotton.

US9C

Introduction

Late or slow initiation of vesicular-arbuscular mycorrhizas (VAM) in seedlings of cotton reduces production of lint. A system of managing the VAM fungi will enable a more consistent yield across fields, and a higher production from problem fields and recently cleared country.

The first step in developing a management strategy is to understand which VAM fungi are found in soils used to grow cotton and how each influences plant growth.

Objective

Map the distribution and identify as many species of VAM fungi as possible in the cotton growing region. Place common species in pot culture and determine the morphology the differences in morphology of infection to commence the development of a key to identify the fungi.

Results and Discussion

Soil samples were collected from more than 60 locations used to grow irrigated and dry-land cotton from Emerald to Warren. The samples were collected from 5 to 20cm below the surface. On return to the lab, the samples were mixed 50/50 with sterile coarse sand. Seedlings of leek (*Allium porrum*) were grown in the soil mixtures in a glass house for up to 6 months. Spores of VAM fungi extracted from each sample and their identity determined. Pot cultures of selected, common fungi were established, purified and maintained in a growth room.

In each soil sample we found between 2 and 5 species of VAM fungi. All fungi were from two genera, *Glomus* and *Acaulospora*. All fungi had relatively small spores, suggesting limited potential to survive. A total of 10 species have been identified, of which *Glomus intraradices* and *Glomus mosseae* are the most common. The common species are found throughout the cotton growing areas. An undescribed species of *Acaulospora* is also widely distributed. The result is surprising. I would have predicted different common species to be found in different soils and different climates.

We commenced attempts to differentiate the species based on the morphology of infection. However, the variation within one species was significant. Some consistent differences in the morphology of mycorrhizas formed by *Glomus* and *Acaulospora* were evident when mycorrhizas were established in seedlings of both cotton and leek.

In this and a related project funded by ARC, four fungal isolates of each of two common species were compared for their effect on plant growth. We examined, amongst other factors, the rate of initiation and spread of VAM, the uptake of Phosphate, and the growth rate of seedlings. For example, two isolates of *Glomus mosseae* from Narrabri, one from Burren Junction and one from pot culture held at the

University of Sydney were compared. The isolates differed in each of these factors significantly. From this research we concluded that the variation within one species is as great as the variation between species of VAM fungi.

A management strategy based on knowing the species of fungi present would be unable to predict the effect the fungi would have on growth of cotton. The system of management will require understanding of how mixed populations of fungi interact with cotton. This understanding is subject of a further application to CRDC.

Budget

Funds from CRDC for this project: \$20,000

Funds from ARC for a related project: \$8,000 in 1992, 3 and 4.