Mycorrhizas in integrated systems from genes to plant development

Proceedings of the fourth European Symposium on Mycorrhizas

Final report

European Commission
Directorate-General XII
Science, Research and Development
In vitro Interaction between the Saprophytic Fungus Aspergillus niger and the Arbuscular Mycorrhizal Fungus Glomus mosseae

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Summary. – Percentage of germination and length of the mycelium of Glomus mosseae spores cultivated in water–agar decreased significantly in the presence of Aspergillus niger. This decrease was independent on the change in the pH of the medium. Soluble and volatile compounds produced by A. niger are involved in this effect. The decrease caused by volatile compounds was significantly greater when A. niger was grown on malt extract agar. The possible mechanisms of in vitro interactions between A. niger and G. mosseae are discussed.

Keywords: Aspergillus niger, Glomus mosseae, arbuscular mycorrhiza, saprophytic fungi

Introduction

The activity of rhizosphere inhabiting microorganisms exerts a significant effect upon arbuscular mycorrhizas (AM). Many studies have been focussed on the interactions between AM and pathogenic fungi, but information about the interactions of mycorrhizas and saprophytic fungi is scarce (1). Saprophytic fungi live in the rhizosphere and rhizoplane of plants where they get a great nutritional benefit from organic compounds released from living roots, or from sloughed cells. Their activity and metabolism may result in the production of substances that promote or inhibit the growth of other rhizosphere microorganisms. The saprophyte Aspergillus niger, a widespread fungus in the rhizosphere of vegetable crops, is known to produce lytic enzymes (5) and antibiotics (6).

The purpose of this study was to determine the relationships between Glomus mosseae and A. niger, and to examine some of the possible mechanisms involved.

Materials and Methods

Effect of A. niger on the development of G. mosseae. Aspergillus niger was isolated by the particle washing method (8), using a multichamber washing apparatus. The fungus was cultivated in tubes containing potato dextrose agar (PDA) at 4°C as stock culture. Sporocarps of G. mosseae (Nicol. & Gerd.) Gerd. & Trappe were isolated by wet sieving the soil (4) from alfalfa pot cultures. Spores were excised from sporocarps. They were stored in water at 4°C and used within one month. Spores of G. mosseae were surface-sterilized as described by Mosse (7).

The effect of A. niger on the spore germination of G. mosseae was tested in four different experiments using 9-cm diameter plastic Petri dishes. In the first experiment the effect of A. niger was tested on 1 %, sterile water agar, with pH adjusted to 7.0. Five surface-sterilized spores per plate were placed near (1 cm) the edge of the Petri dish, and a thin streak of the saprophytic fungus was inoculated at least 7 cm away from them. In the second experiment 10 mM of MES was added to 1% water agar. Thus the pH of the medium was maintained at 7.0 during the experiment. The third experiment tested the effect of exudates from A. niger. Exudates were obtained by growing the saprophyte in PDA liquid medium. Two ml of these exudates were added to 10 ml of 1% water agar (pH 7.0) in a Petri dish. In the fourth experiment the effect of volatile compounds released by A. niger was tested in compartmentalized Petri dishes. In one side, five G. mosseae spores were placed near the edge of the plate, and the saprophytic fungus was inoculated in the other side. In an initial assay the dishes contained 1% water agar (pH 7.0) in both compartments. In a second assay the plates contained 1% water agar (pH 7.0) in one side and malt extract agar (MEA) medium, for A. niger, in the other.
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