Mycorrhizas in integrated systems from genes to plant development

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Influence of Cellulase on the Susceptibility of Non-Host Cabbage to Colonization by *Glomus intraradices*

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Summary. - A preparation of cellulase and pectinase from *Aspergillus niger* was applied to the arbuscular mycorrhizal non-host cabbage plants. The following enzyme solutions were tested: 3 and 33 units of cellulase, 0.22 units of pectinase, and 3 units of cellulase plus 0.22 units of pectinase. The application of 3 and 33 units/ml of cellulase increased the growth of cabbage plants inoculated with *Glomus intraradices*. Some increase in fungal structures inside the roots was observed when 33 units/ml of cellulase was applied. However, no relationship was found between the presence of fungal structures in cabbage and its effect on plant growth.

Keywords: cellulases, Chenopodiaceae, Glomus intraradices, arbuscular mycorrhiza, non-host plants

Introduction

Several plant families such as Cruciferae and Chenopodiaceae are nonmycotrophic to arbuscular mycorrhizal fungi (AMF) (3). It has been proposed that intrinsic or internal factors control mycorrhizal colonization (6, 10). In fact, the signals for appressoria production cannot be detected in host exudates, suggesting that these molecules are tightly bound to roots, or else occur inside the host root (9). These molecules may be involved in the absence of colonization of non-host plants.

There is evidence that the penetration of root by AMF involves cell wall hydrolyzing enzymes (2). These enzymes may lead to an organized colonization of the root (1). The application of a mixture of cellulase and pectinase was able to remove a barrier to *Rhizobium*–host specificity (5). However, no attempt has been made to promote the colonization of nonmycotrophic plants with hydrolytic enzymes. We investigated whether such enzymatic treatment of cabbage roots could remove a barrier that can normally be overcome only in a host–specific manner.

Materials and Methods

**Experiment 1.** This experiment was carried out in 20 x 200 mm glass tubes filled with 25 g of a sand:vermiculite mixture (1/1, v/v) and 12 ml of diluted (1/2) Hewitt's nutrient solution (4) plus 50 mg ml⁻¹ K₂HPO₄ (pH 7). The tubes were plugged with cotton wool and autoclaved at 120°C for 20 min, and then inoculated with 1 g of rhizosphere soil from maize plant pot cultures of *Glomus intraradices* which contained spores, mycelium and colonized root fragments. In control tubes a filtered colonized root washing was added to the sterilized sand:vermiculite mixture. Seeds of cabbage (*Brassica oleracea*) were surface-sterilized with HgCl₂ for 10 min and thoroughly rinsed with sterilized water. After germination, seedlings were selected for uniformity before planting. Plants were grown in a chamber with supplementary light provided by Sylvania incandescent and cool–white lamps, 400 nmol m⁻² s⁻¹ (400-700 nm), with a 16/8 h day/night cycle at 25/19°C and 50% relative humidity.

**Experiment 2.** This experiment was done in open pots (300 g) with a sand:vermiculite (1/1; v/v) mixture. Cabbage was used as the test plant. Seeds were grown in moistened sand and 2-week-old seedlings were transplanted to the pots and grown under greenhouse conditions. Pots were inoculated with 5 g of rhizosphere soil from the same maize plant pot cultures of *G. intraradices* as in Experiment 1. In control pots a filtered colonized root washing was added to the sterilized sand:vermiculite mixture. Plants were watered from below, with a capillary system, and diluted (1/4) Hewitt's nutrient solution (4) plus 25 mg ml⁻¹ K₂HPO₄ or distilled water were added every fortnight.

215
Identification of Symbiosis - Related Genes in the Cotton - Arbuscular Mycorrhiza Association

Induction of Phenylalanine Ammonia-Lyase in Birch Challenged with Ectomycorrhizal Fungi
P. Simoneau, L. Feugay, J. D. Viémont, I. Swoboda, E. Heberle-Bors and D. G. Strullu.................. 203

Workshop 4: Molecular and biochemical aspects

Host Plant Chitinase Activities Induction During Ectomycorrhizal Infection
C. Albrecht and F. Lapeyrrie................................................................. 208

Biochemical Characterization of Membranes in Arbuscular Mycorrhiza: Fatty Acid Analysis
B. Bago, J. P. Donaire and C. Azcón-Aguilar........................................ 211

Influence of Cellulase on the Susceptibility of Non-Host Cabbage to Colonization by Glomus intraradices
I. Blilou, J. Martin and J. A. Ocampo.................................................. 215

Plant Cell Wall-Degrading Enzymes in Ericoid and Ectomycorrhizal Fungi
J. W. G. Cairney and R. M. Burke....................................................... 218

Expression of a PR-1a Protein-Related Gene in Pea Roots (Pisum sativum) after Pathogenic (Chalara
elegans) or Symbiotic (Glomus mossea) Infection and Chemical Induction
B. Dassi, F. A. Martin-Laurent, A. Gollotte, E. Dumas-Gaudot, V. Gianinazzi-Pearson and S. Gianinazzi.. 222

Molecular Characterization and Gene Analysis of Arbuscular Mycorrhizal Fungi
P. Franken, D. van Tuinen, F. A. Martin-Laurent and V. Gianinazzi-Pearson............................ 226

Purification of an Arbuscular Mycorrhizal Endoglucanase from Colonized Roots

Hydrolytic Enzymes in Arbuscular Mycorrhiza

Molecular Approaches to the Study of Nutrient Transfer in Vesicular Arbuscular Mycorrhizae
M. J. Harrison.................................................................................................. 238

Presence of Double-stranded RNAs in Endomycorrhizal Fungi Isolated from Orchid Roots
J. D. James, G. C. Saunders and S. J. Owens............................................ 241

Comparison Between a Myc+ Pea Cultivar (Frisson) and One of its Myc- Mutant (P2) in Their Ability to
Produce Defense Reactions after Elicitation with UV Light
D. Morandi and M. Paynot................................................................................. 245

Reduction of Phenolics in Mycorrhizas of Forest Trees
B. Münzenberger, I. Kotke and F. Oberwinkler............................................... 248

Superoxide Dismutase Activity in Mycorrhizal and Non-Mycorrhizal Pea (Pisum sativum L.) Plants
J. M. Palma, J. Arines, A. Vilariño, M. Quintela and J. A. Ocampo.......................... 252

Xyloglucan-specific Endoglucanase Activities in Onion Plants Colonized by the Arbuscular Mycorrhizal
Fungus Glomus mossea
A. Rejón-Palomares, I. García-Romera and J. A. Ocampo.................................. 256

Enzyme Activities of the Internal Hyphae of Gigaspora margarita Isolated from Onion Root Compared
with those of the Germinated Spores
M. Saito............................................................................................................. 260

Changes in Polypeptide Profiles of Two Pea Genotypes Inoculated with the Arbuscular Mycorrhizal
Fungus Glomus mossea
A. Samra, E. Dumas-Gaudot, V. Gianinazzi-Pearson and S. Gianinazzi.......................... 263

XIV