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Mycorrhiza
November 2010, Volume 20, Issue 8, pp 519-530

Agroecology: the key role of arbuscular mycorrhizas in ecosystem services

Abstract

The beneficial effects of arbuscular mycorrhizal (AM) fungi on plant performance and soil health are essential for the sustainable management of agricultural ecosystems. Nevertheless, since the ‘first green revolution’, less attention has been given to beneficial soil microorganisms in general and to AM fungi in particular. Human society benefits from a multitude of resources and processes from natural and managed ecosystems, to which AM make a crucial contribution. These resources and processes, which are called ecosystem services, include products like food and processes like nutrient transfer. Many people have been under the illusion that these ecosystem services are free, invulnerable and infinitely available; taken for granted as public benefits, they lack a formal market and are traditionally absent from society’s balance sheet. In 1997, a team of researchers from the USA, Argentina and the Netherlands put an average price tag of US \$33 trillion a year on these fundamental ecosystem services. The present review highlights the key role that the AM symbiosis can play as an ecosystem service provider to guarantee plant productivity and quality in emerging systems of sustainable agriculture. The appropriate management of ecosystem services rendered by AM will impact on natural resource conservation and utilisation with an obvious net gain for human society.

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Mycorrhiza (2010) 20:519–530
DOI 10.1007/s00572-010-0333-3

REVIEW

Agroecology: the key role of arbuscular mycorrhizas in ecosystem services

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Received: 24 February 2010 / Accepted: 4 July 2010 / Published online: 10 August 2010
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Abstract The beneficial effects of arbuscular mycorrhizal (AM) fungi on plant performance and soil health are essential for the sustainable management of agricultural ecosystems. Nevertheless, since the ‘first green revolution’, less attention has been given to beneficial soil microorganisms in general and to AM fungi in particular. Human society benefits from a multitude of resources and processes from natural and managed ecosystems, to which AM make a crucial contribution. These resources and processes, which are called ecosystem services, include products like food and processes like nutrient transfer. Many people have been under the illusion that these ecosystem services are free, invulnerable and infinitely available; taken for granted as public benefits, they lack a formal market and are traditionally absent from society’s balance sheet. In 1997, a team of researchers from the USA, Argentina and the Netherlands put an average price tag of US \$33 trillion a

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Keywords Arbuscular mycorrhiza · Ecosystem services · Agroecology · Ecosystem sustainability

Introduction

Arbuscular mycorrhizas (AM) constitute a key functional group of soil biota that can greatly contribute to crop productivity and ecosystem sustainability in new plant production strategies. AM fungi, able to establish a symbiotic interaction with the root organs of 80% of plant families, not only improve the growth of plants through increased uptake of available soil phosphorus (P) and other non-labile mineral nutrients essential for plant growth, they have also ‘non-nutritional’ effects in stabilising soil aggregates, in preventing erosion, and in alleviating plant stress caused by biotic and abiotic factors (Smith and Read 2008). The beneficial effects of AM fungi on plant performance and soil health are essential for the sustainable management of agricultural ecosystems (Jeffries et al. 2003; Barrios 2007). Nevertheless, since the ‘first green revolution’, less attention has been given to beneficial soil microorganisms in general and to AM in particular.

Human society benefits from a multitude of resources and processes from natural and managed ecosystems, to which AM make a crucial contribution. These resources

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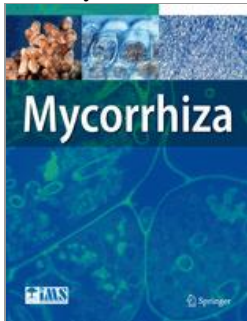
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Agroecology: the key role of arbuscular mycorrhizas in ecosystem services

Journal

Mycorrhiza

Volume 20, Issue 8 , pp 519-530

Cover Date

2010-11-01

DOI

10.1007/s00572-010-0333-3

Print ISSN

0940-6360

Online ISSN

1432-1890

Publisher

Springer-Verlag

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Keywords

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