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REGULAR ARTICLE

Mycorrhizal fungi suppress aggressive agricultural weeds

Valeria Rinaudo · Paolo Bàrberi · Manuela Giovannetti · Marcel G. A. van der Heijden

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Abstract Plant growth responses to arbuscular mycorrhizal fungi (AMF) are highly variable, ranging from mutualism in a wide range of plants, to antagonism in some non-mycorrhizal plant species and plants characteristic of disturbed environments. Many agricultural weeds are non mycorrhizal or originate from ruderal environments where AMF are rare or absent. This led us to hypothesize that AMF may suppress weed growth, a mycorrhizal attribute which has hardly been considered. We investigated the impact of AMF and AMF diversity (three versus one AMF taxon) on weed growth in experimental microcosms where a crop (sunflower) was grown together with six widespread weed species. The presence of AMF reduced total weed biomass with 47% in microcosms where weeds were grown together with sunflower and with 25% in microcosms where weeds were grown alone. The biomass of two out of six weed species was significantly reduced by AMF (−66% & −59%) while the biomass of the four remaining weed species was only slightly reduced (−20% to −37%). Sunflower productivity was not influenced by AMF or AMF diversity. However, sunflower benefitted from AMF via enhanced phosphorus nutrition. The results indicate that the stimulation of arbuscular mycorrhizal fungi in agro-ecosystems may suppress some aggressive weeds.

Keywords *Helianthus annuus* · *Chenopodium album* · *Echinocloa crus-galli* · *Sinapis* · *Setaria* · *Amaranthus* · Mycorrhizal symbiosis · Plant-microbe interactions · Agricultural sustainability · Weed management · Crop-weed interactions · Functional biodiversity · Competition

Abbreviations
AMF Arbuscular mycorrhizal Fungi

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Valeria Rinaudo and Marcel G. A. van der Heijden contributed equally to this work.

V. Rinaudo · M. G. A. van der Heijden (✉)
Institute of Ecological Science, Vrije Universiteit,
Amsterdam, The Netherlands
e-mail: marcel.vanderheijden@art.admin.ch

V. Rinaudo · P. Bàrberi
Land Lab, Scuola Superiore Sant'Anna,
Pisa, Italy

M. Giovannetti
Department of Crop Plant Biology,
University of Pisa,
Pisa, Italy

M. G. A. van der Heijden
Ecological Farming Systems, Research Station ART,
Agroscope Reckenholz-Tänikon,
Zurich, Switzerland

Introduction

Excessive weed growth is one of the biggest problems in agriculture causing between 10% and 30% of crop yield loss every year (Oerke and Dehne 1997). Hence, for the maintenance of crop production, it is essential to develop mechanisms by which weeds can effec-