Mycorrhizal contribution to tomato yield in different management systems.

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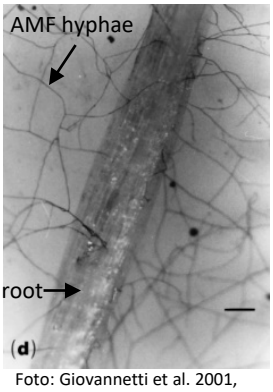


Foto: Giovannetti et al. 2001, New Phytologist

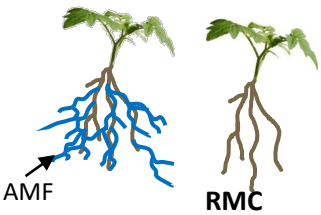
Arbuscular mycorrhizal fungi (AMF)

- Arbuscular mycorrhizal fungi (AMF) live in symbiosis with most land-plants, including many crops, e.g. Tomato, , corn, wheat, squash, rice, potato, and many more (they do, however, not associate with plants of the *Brassicaceae*, e.g. cabbage, cauliflower, mustard, etc.)
- They enter plant roots and form a network of fine hyphae that extend the roots system and spread out in the soil (Fig. 1).
- They can take up nutrients from soil (P, N, and micro-nutrients) and provide them to plants, can make plants more resistant to draught stress and pest pressure
- They exist almost everywhere on earth but the way we manage soils can affect their abundance and species composition

Question: How does long-term agricultural management affect abundance, composition, and functioning of AMF communities in soil?

Century experiment, Russel Ranch , Davis

Tomato mutant system



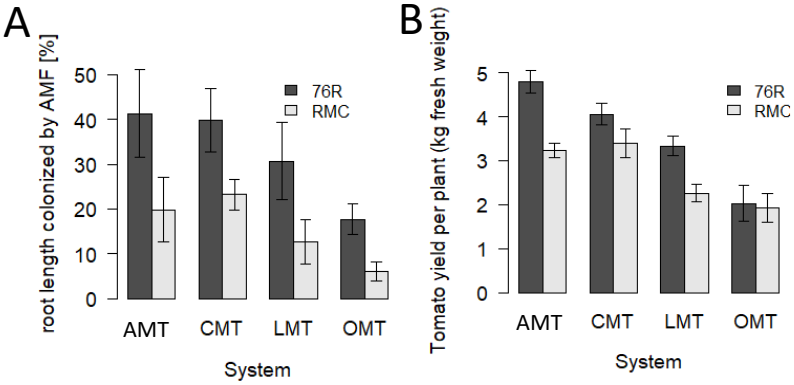
76R
Regular tomato

RMC
Mutation:
reduced **m**ycorrhizal **c**olonization

4 different long-term rotations

	Rotation
OMT	Organic Maize-Tomato
CMT	Conventional Maize-Tomato
LMT	Legume-Maize-Tomato
AMT	Alfalfa Maize-Tomato

Tomato mutant that forms only reduced AMF associations(RMC) and its regular wildtype progenitor (76R) planted in 4 different management systems at Russel Ranch



Abundance of AMF in roots (A) and tomato fresh yield (B) of 2 different tomato genotypes across 4 different management systems in July 2018. Black bars represent the 76R tomato wildtype forming regular AMF associations, grey bars represent the RMC mutant forming reduced AMF associations

Results

Highest AMF abundance in the Alfalfa (AMT) and Conventional (CMT) rotations, intermediate in the mixed (LMT) and lowest in organic (OMT) system. AMF abundance was significantly reduced In the RMC mutant plants in all systems.

Tomato yields followed a similar pattern and showed lower yields with reduced AMF abundance. Strongest yield reduction in AMT and LMT systems (-32%). Absence of AMF effects on yield in OMT

Conclusions

Depending on management system, AMF contributed to up to 32% of tomato yields. Highest AMF abundance and contribution to yield was observed in the Alfalfa rotation. The unexpectedly low abundance and yield-contribution of AMF in the organic system could be related to high soil P levels compared to other systems due to long-term compost application and the generally difficult season in the organic system at Russel Ranch in 2018.

The management of crop rotations offers tools to manage the contribution of beneficial soil organisms to yields. Specific factors affecting abundance and functioning of AMF in these systems remain to be identified.