MYCORRHIZAL RELATIONSHIPS IN THICKET COMMUNITIES

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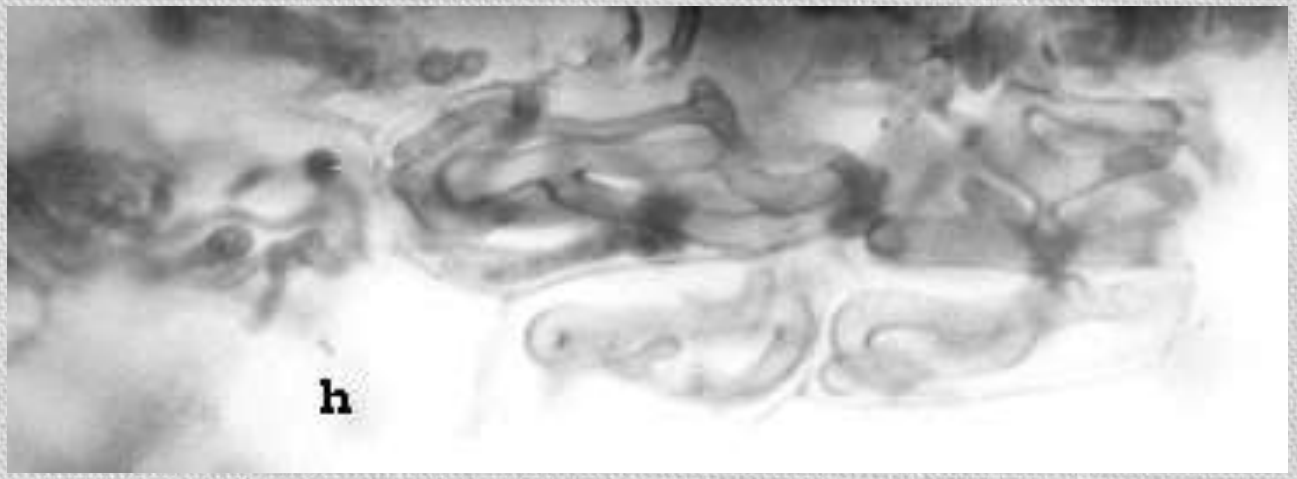
What are mycorrhizas?

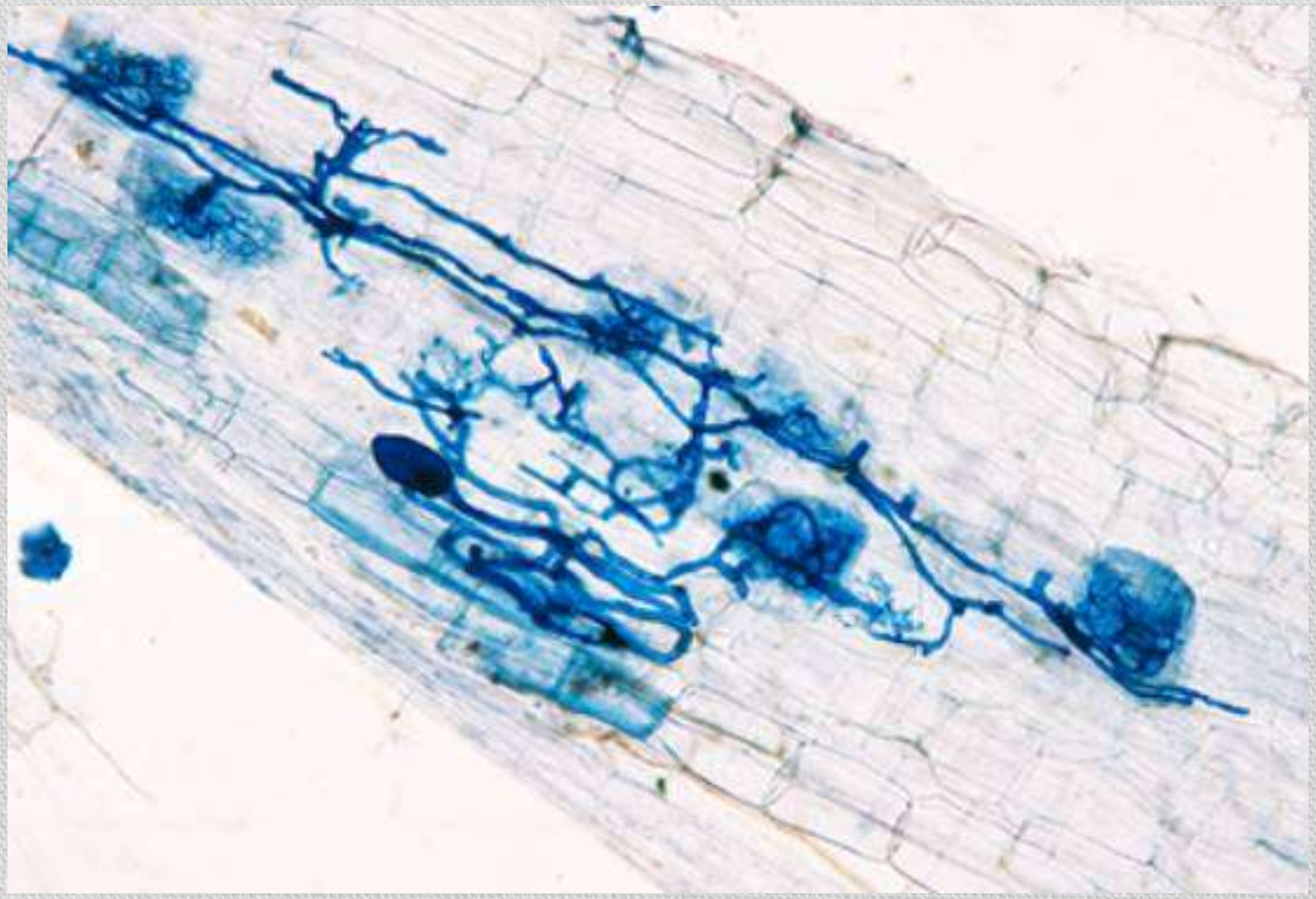
- Mycorrhizas are mutualistic associations between soil fungi and plant roots.
- Host plant receives mineral nutrients
- Fungus obtains photosynthetically derived carbon compounds
- Several types of mycorrhizas (Smith and Read, 2008).
- Ecto and Endo - mycorrhizas
- Few plants are non-mycorrhizal

Endomycorrhizas

- Arbuscular mycorrhizal fungi (AMF)
- Majority of crop plants, fruit trees, grasses, indigenous trees and shrubs (Hawley and Dames, 2005; Smith and Read, 2008)
- Phylum: Glomeromycota



Paris type colonisation (Hawley and Dames, 2005)



Arum-type colonisation

Thicket plants


a


b


c


d

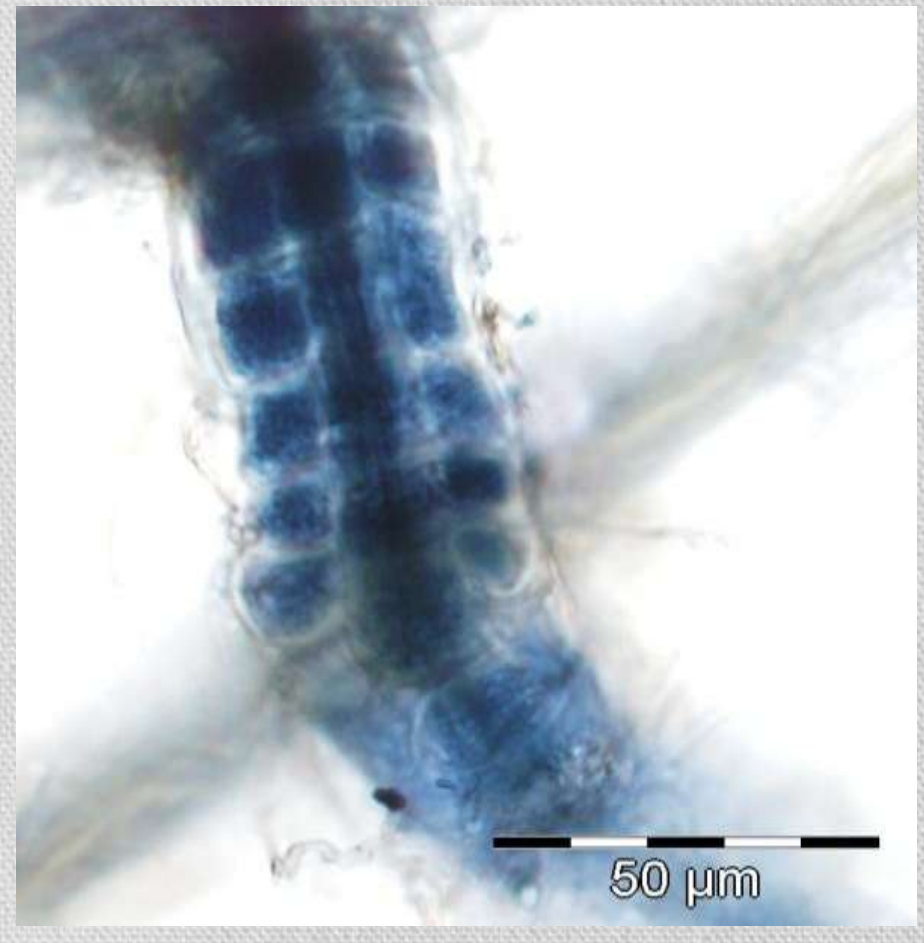

e


f


g

(a) Portulacaria afra (b) Crassula ovata
(c) Pappea capensis (d) Rhigozum obovatum
(e) Schotia afra (f) Euclea undulata (g) Aloe ferox

Endomycorrhizas



- Ericoid mycorrhizal fungi (EMF)
- *Erica* hair roots (Allsopp & Stock, 1993; Smith and Read, 2008)
- Phylum: Ascomycotina; Basidiomycotina

Fynbos plants

(a) *Erica nemorosa*

(b) *Erica glumiflorae*

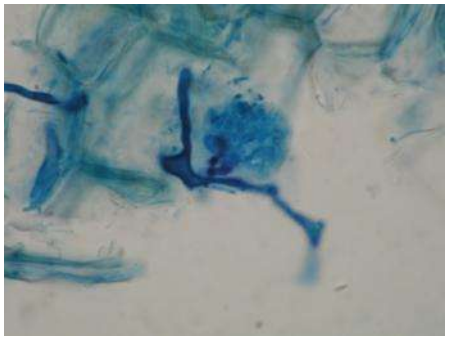
(c) *Erica cerinthoides*

Photosynthesis

Transfer of C – hexose sugars

Extraradical hyphae (ERH)

Intraradical fungal structures



P

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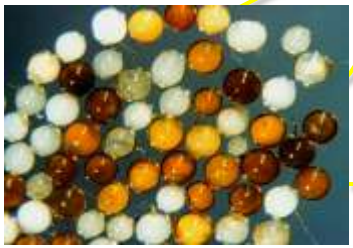

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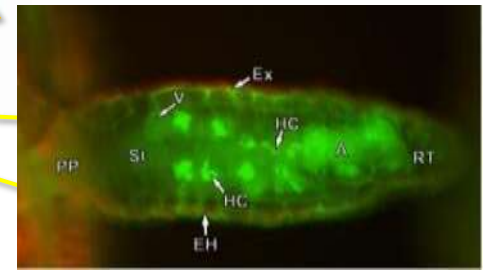


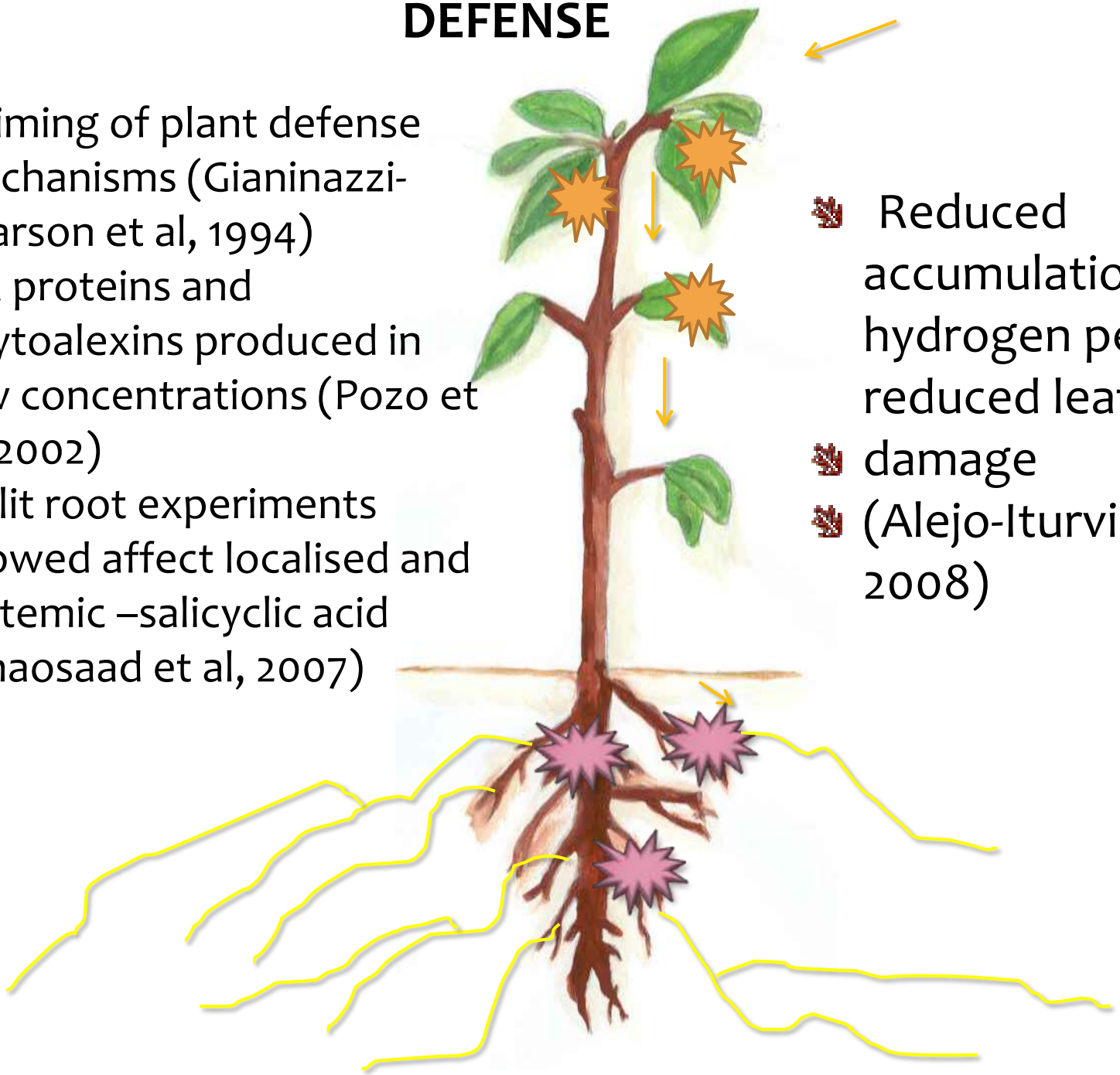
Extraradical hyphal growth – important soil hyphal network

Mycorrhizal Benefits

- Enhanced nutrient uptake
- Increased plant growth and vigour (Cardoso & Kuyper, 2006; Douds & Johnson, 2007)
- Improved tolerance to plant pathogens and abiotic stresses

DEFENSE

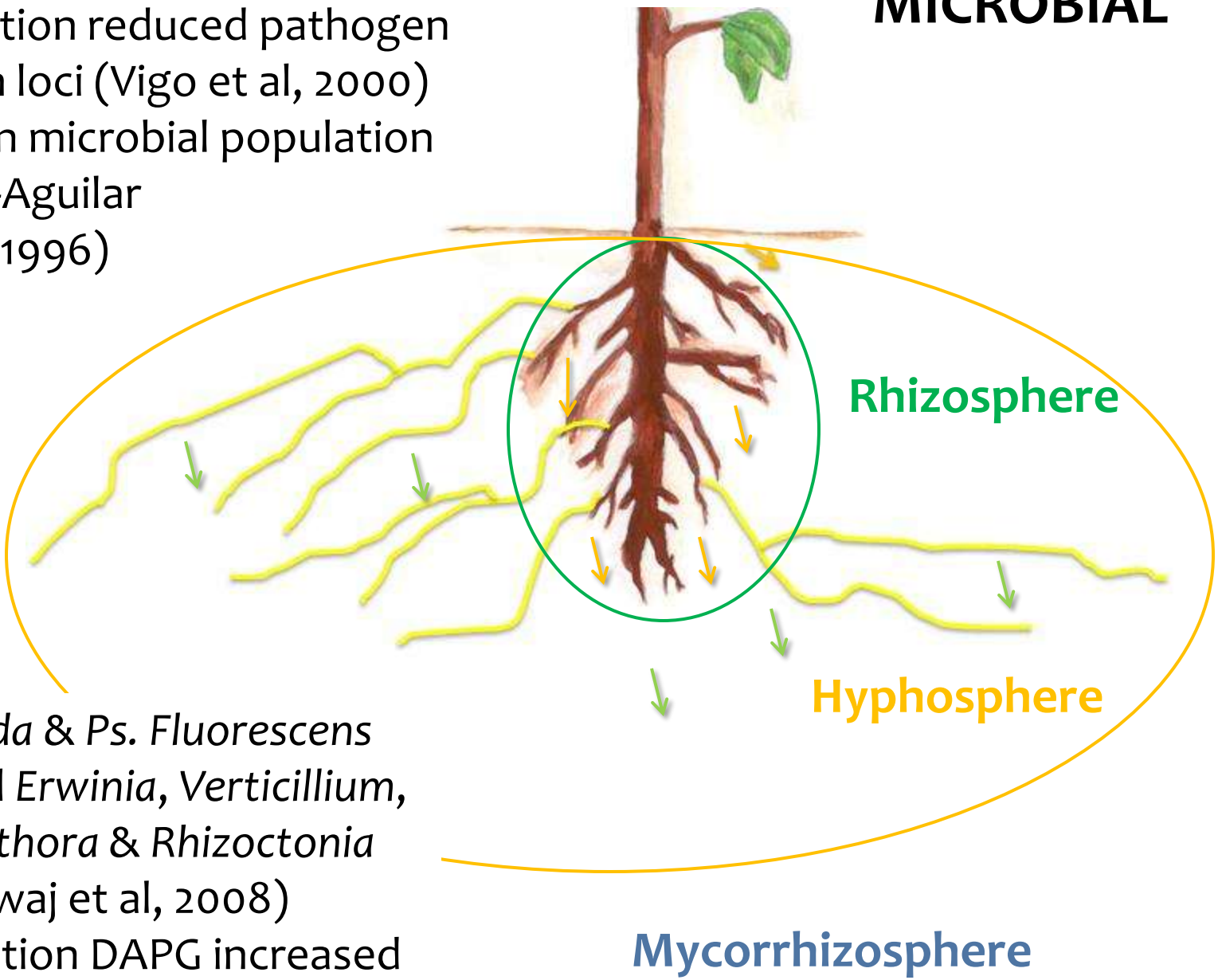
- Priming of plant defense mechanisms (Gianinazzi-Pearson et al, 1994)
- PR proteins and Phytoalexins produced in low concentrations (Pozo et al, 2002)
- Split root experiments showed affect localised and systemic –salicyclic acid (Khaosaad et al, 2007)



- Reduced accumulation of hydrogen peroxide, reduced leaf
- damage
- (Alejo-Iturvide et al, 2008)

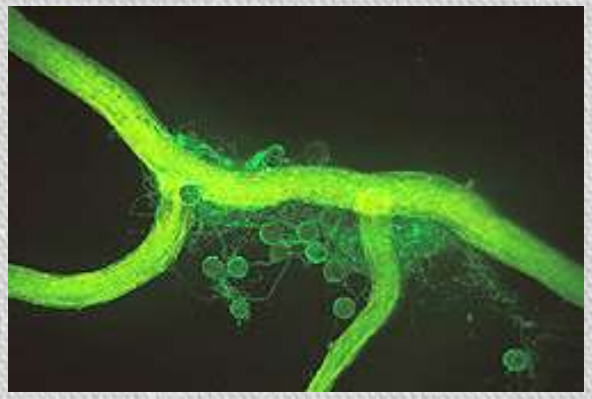
MICROBIAL

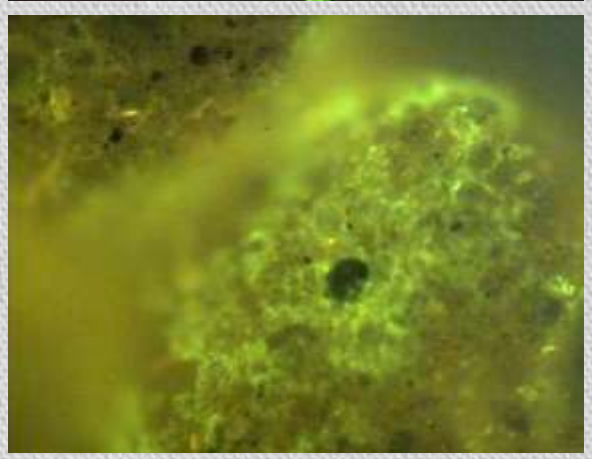
- Altered root exudate composition reduced pathogen infection loci (Vigo et al, 2000)
- Shifts in microbial population (Azcon-Aguilar & Barea, 1996)



- *Ps. putida* & *Ps. Fluorescens* inhibited *Erwinia*, *Verticillium*, *Phytophthora* & *Rhizoctonia* (Bharadwaj et al, 2008)
- Production DAPG increased (Jones et al, 2004)

Glomalin – C- Sequestration





- AMF produce a protein glomalin.
- Coats soil particles.
- Promotes stability, aggregation and increases moisture penetration and aeration.
- Superglue of soil.

Improved Tolerance to Stressful Growing Conditions

- AMF colonisation
- Enhanced nutrient status
- Anatomical and physiological changes
- Priming of defense mechanisms
- Competition
- Shift in microbial populations

- Key to Soil Health and Sustainability

Mycorrhizas in Thicket Communities

- Assess mycorrhizal populations richness and abundance
- Inoculate in nursery or at planting if populations are low
- Investigate contribution to C- sequestration
- Effects of climate change

MYCOROOT

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