Agry 515, 2012

- Nutrient Stress and diseases (Chap. 10)
- Mycorrhizas (Chap. 15)

Fig. 1. Diseases/infection is highly interactive with nutrient status (Fig. 10.1 in Marschner, 2012)

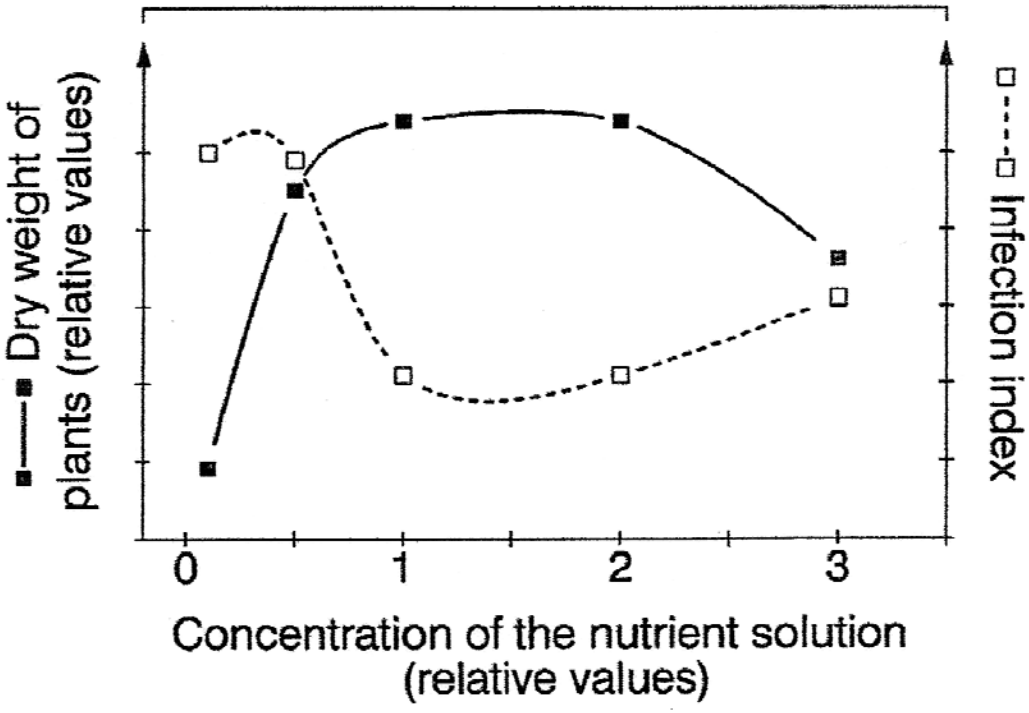
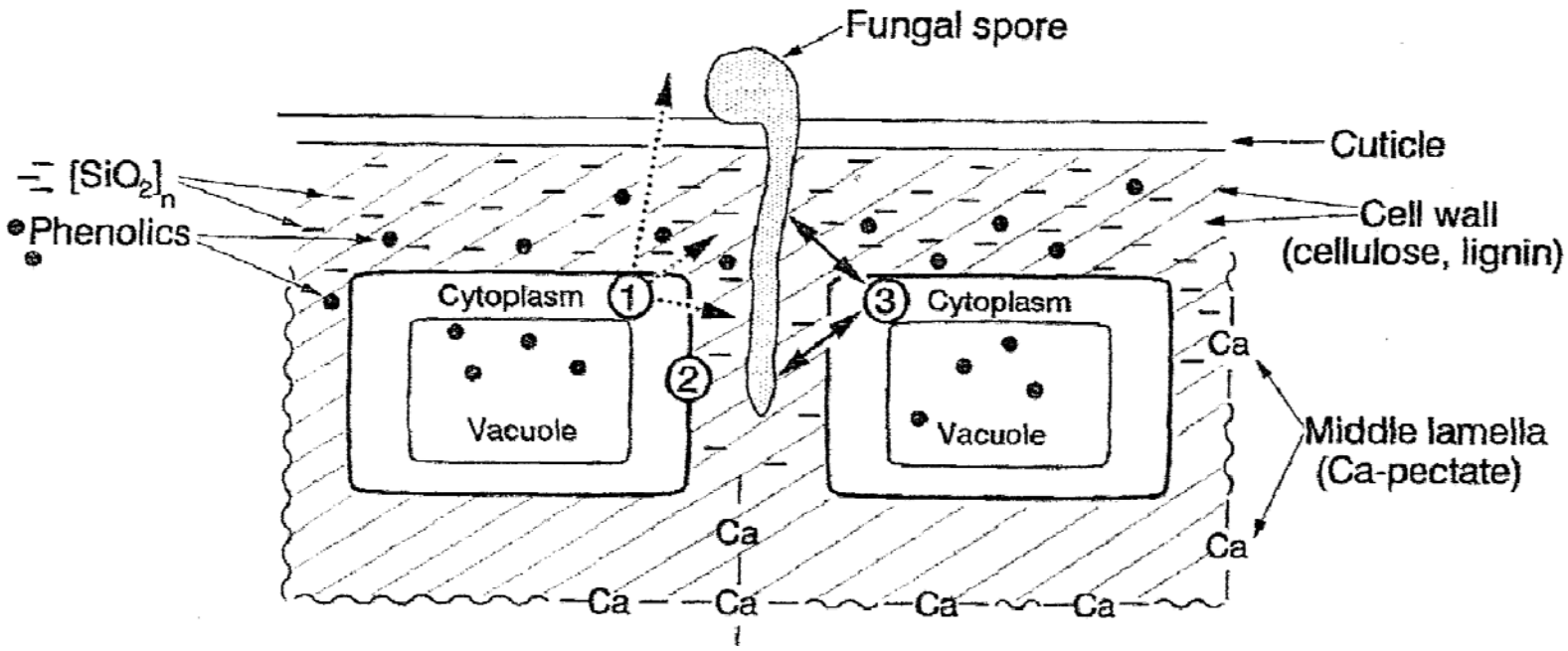


Fig. 11.1 Effect of the nutrient solution concentration on growth (noninfected plants) and on degree of infection (inoculation) with bacterial stem rot (*Xanthomonas pelargonii*) in *Pelargonium*. Relative values; water only = 0; basic nutrient solution = 1; twofold concentration of nutrient solution = 2; threefold concentration of nutrient solution = 3. (Modified from Kivilaan and Scheffer, 1958.)

Fig. 2. Schematic of fungal hypha penetrating apoplasm of leaf cell (Fig. 110.3 in Marschner 2012)



① Diffusion of low-molecular-weight assimilates (sugars, amino acids)
② Plasma membrane permeability
③ Interactions between fungus/epidermal cell (formation of toxins, phenolics)

Table 1. N/K nutritional level influence disease severity differently (Table 10.2 in Marschner)

Table 11.2
Tentative Summary of the Effects of Nitrogen and Potassium Levels on the Severity of Diseases (+ → ++++) Caused by Parasites[a]

	Nitrogen level		Potassium level	
Pathogen and disease	Low	High	Low	High
Obligate parasites				
Puccinia ssp. (rust diseases)	+	+++	++++	+
Erysiphe graminis (powdery mildew)	+	+++	++++	+
Facultative parasites				
Alternaria ssp. (leaf spot diseases)	+++	+	++++	+
Fusarium oxysporum (wilt and rot disease)	+++	+	++++	+
Xanthomonas ssp. (bacterial spots and wilt)	+++	+	++++	+

[a]Based on Kiraly (1976) and Perrenoud (1977).

Fig. 3. Disease specificity in nutrient interaction (Fig. 10.8 in Marschner 2012)

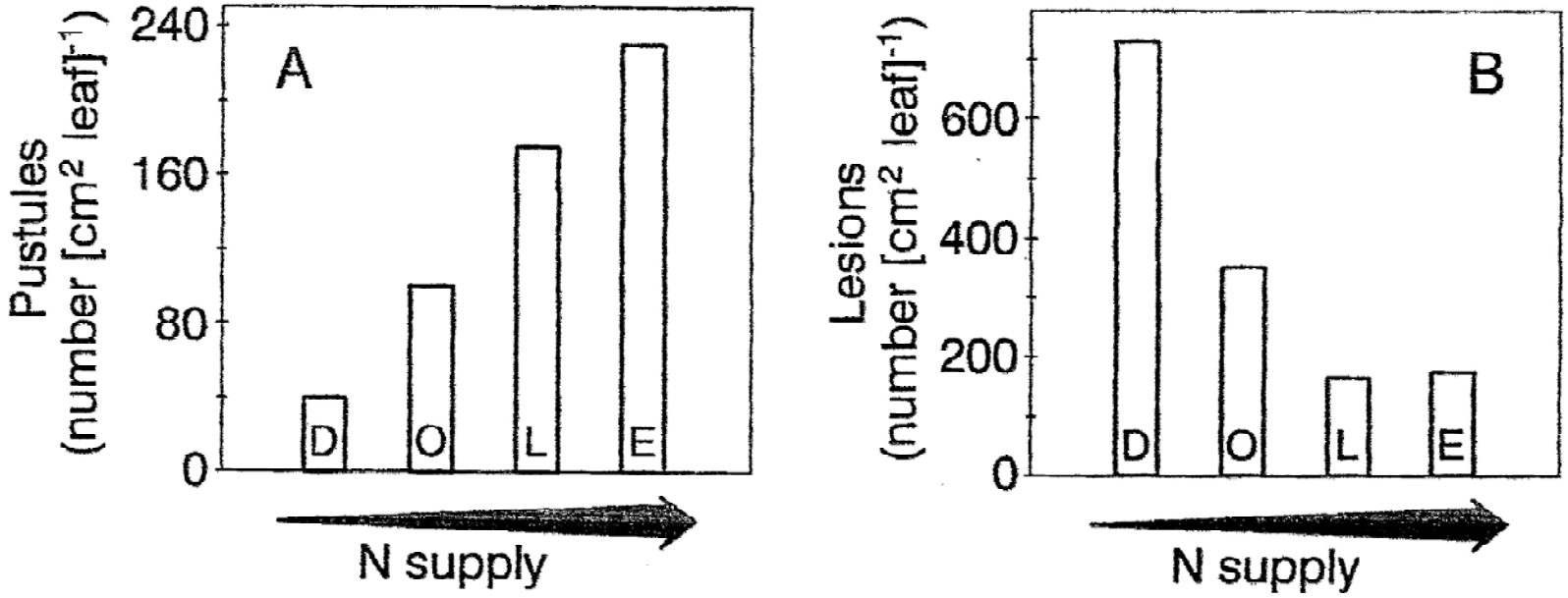


Fig. 11.6 Number of pustules of stem rust (*Puccinia graminis* ssp. *tritici*) in wheat (A) and number of necrotic lesions caused by bacterial spot (*Xanthomonas vesicatoria*) in tomato (B) grown in nutrient solutions with increasing nitrogen concentration. D, deficient; O, optimal; L, luxurious; E, excessive. (Based on Kiraly, 1976.)

Fig. 4. Si as a beneficial with respect to aphid infestation (Fig. 10.14 in Marschner 2012)

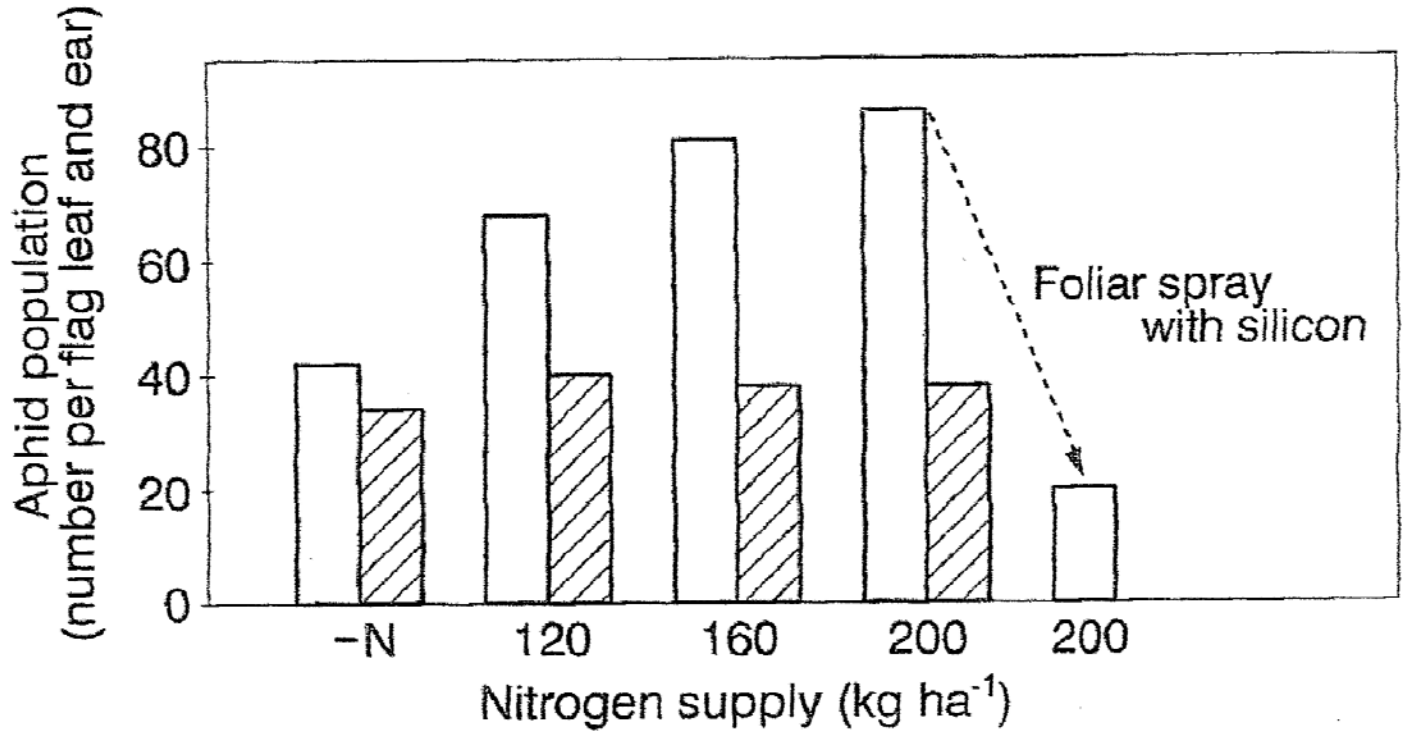


Fig. 11.12 Effect of nitrogen supply and foliar sprays containing silicon (1% Na_2SiO_2) on population density of two aphid species in winter wheat. Striped bars, *Metopolophium dirhodum*; open bars, *Sitobion avenae*; −N denotes nitrogen-deficient control plant. (Based on Hanisch, 1980.)

Fig 5. Marschner's schematic of EC and VA mycorrhizae (Fig. 15.3 Marschner 2012)

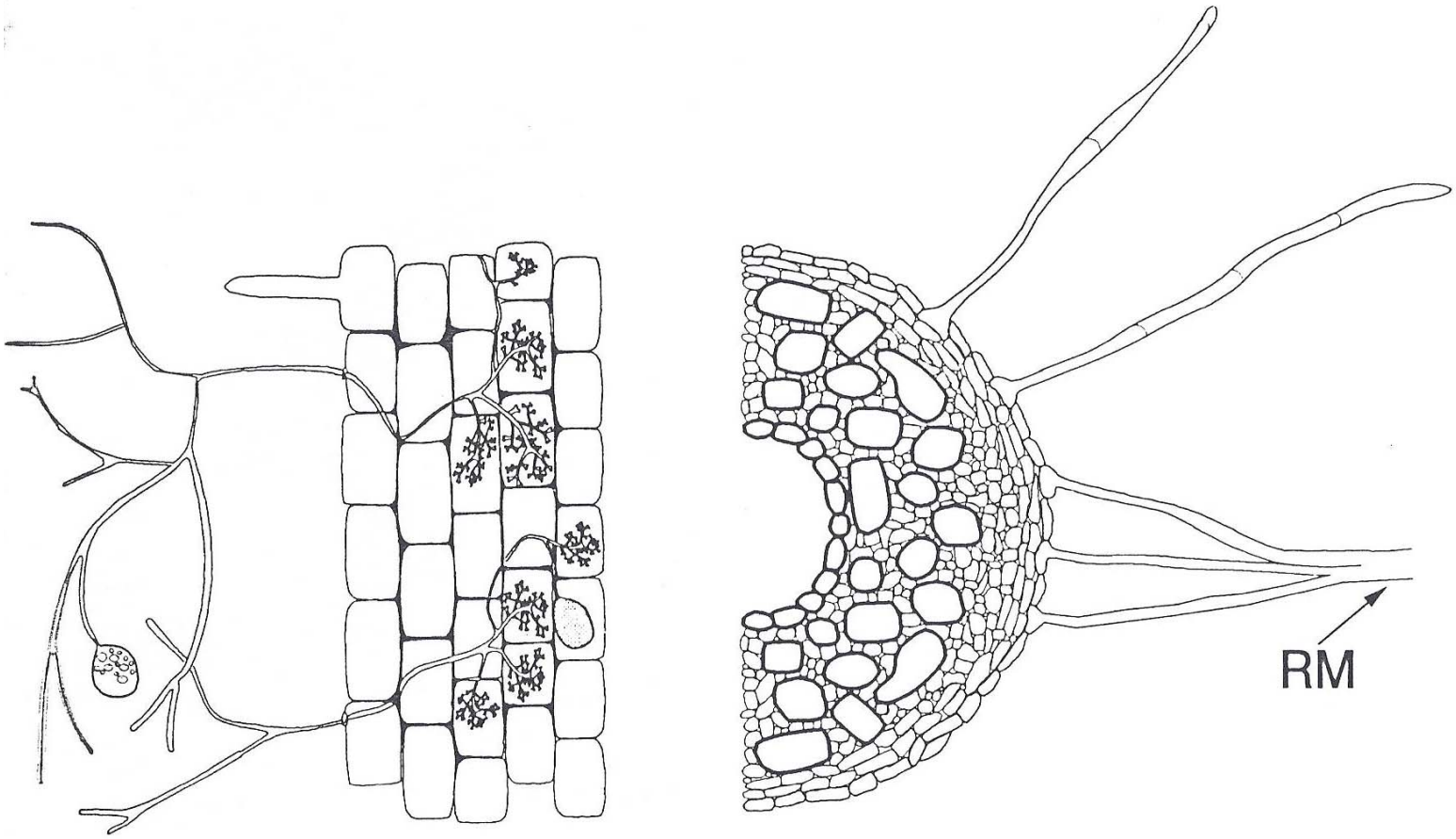
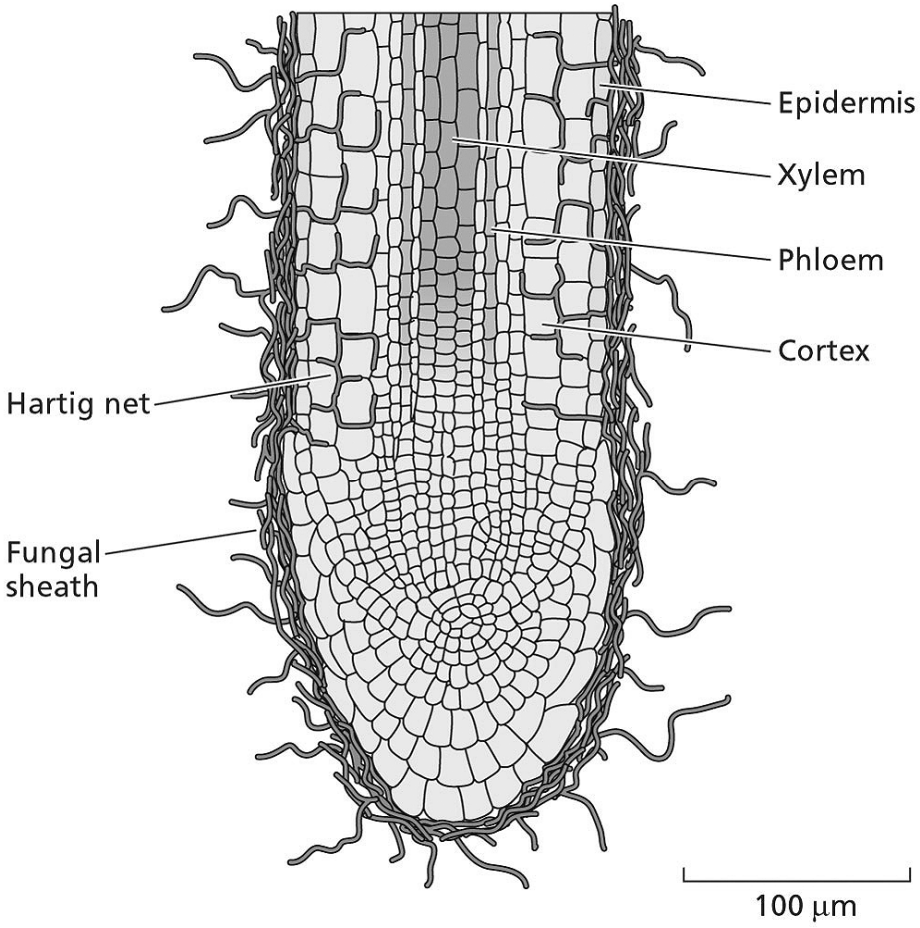


Fig. 15.18. Schematic presentation of the main structural features of the vesicular-arbuscular (VA) mycorrhizas (*left*) and of ecto- (EC) mycorrhizas (*right*). RM, rhizomorphs.

Fig. 6. Plant Physiology (3rd ed.) schematic of EC and VA mycorrhizae



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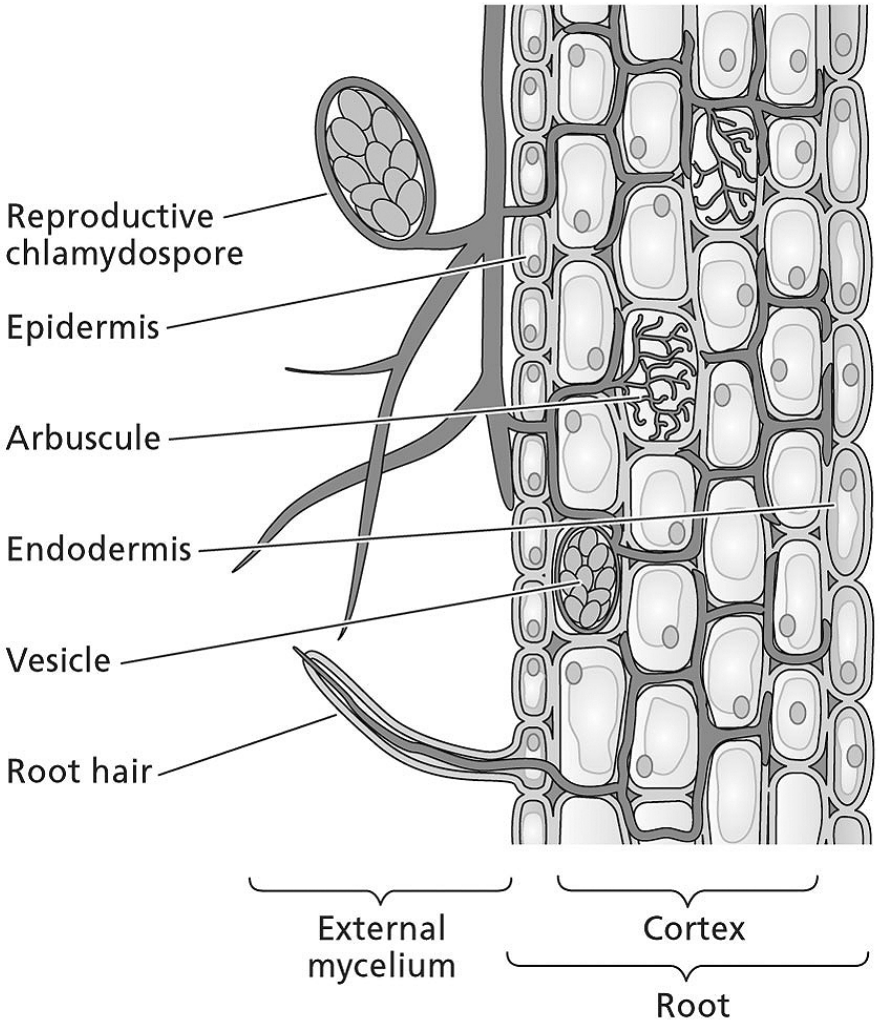

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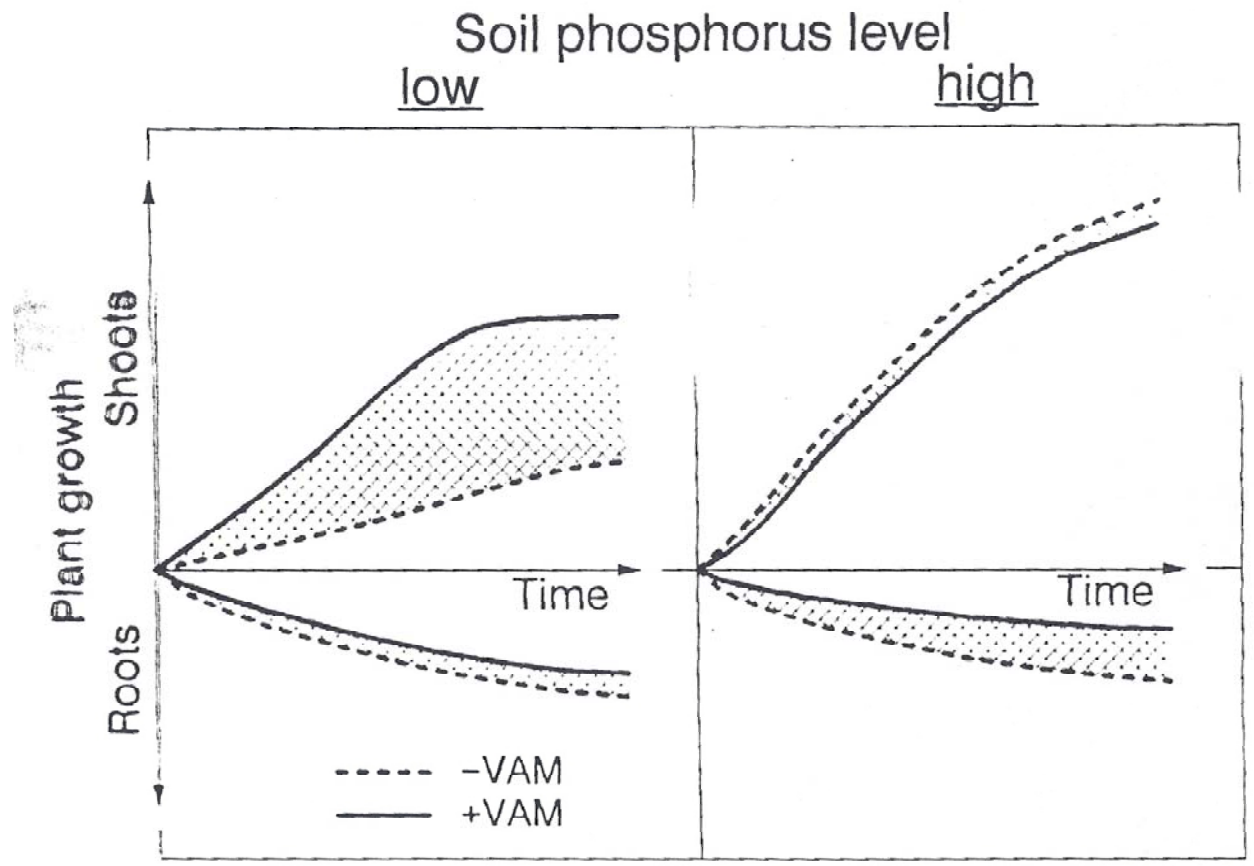
Fig. 7. VAM affects shoot growth under low P but root growth under high P (Fig. 15.21 in Marschner 1995)



Schematic presentation of effects of soil phosphorus level and root colonizatio
VAM fungi on root and shoot growth.

Fig. 8.VAM can extend the nutrient depletion zone of a plant root increasing the effective rooting volume (Fig. 15.7 Marschner 2012)

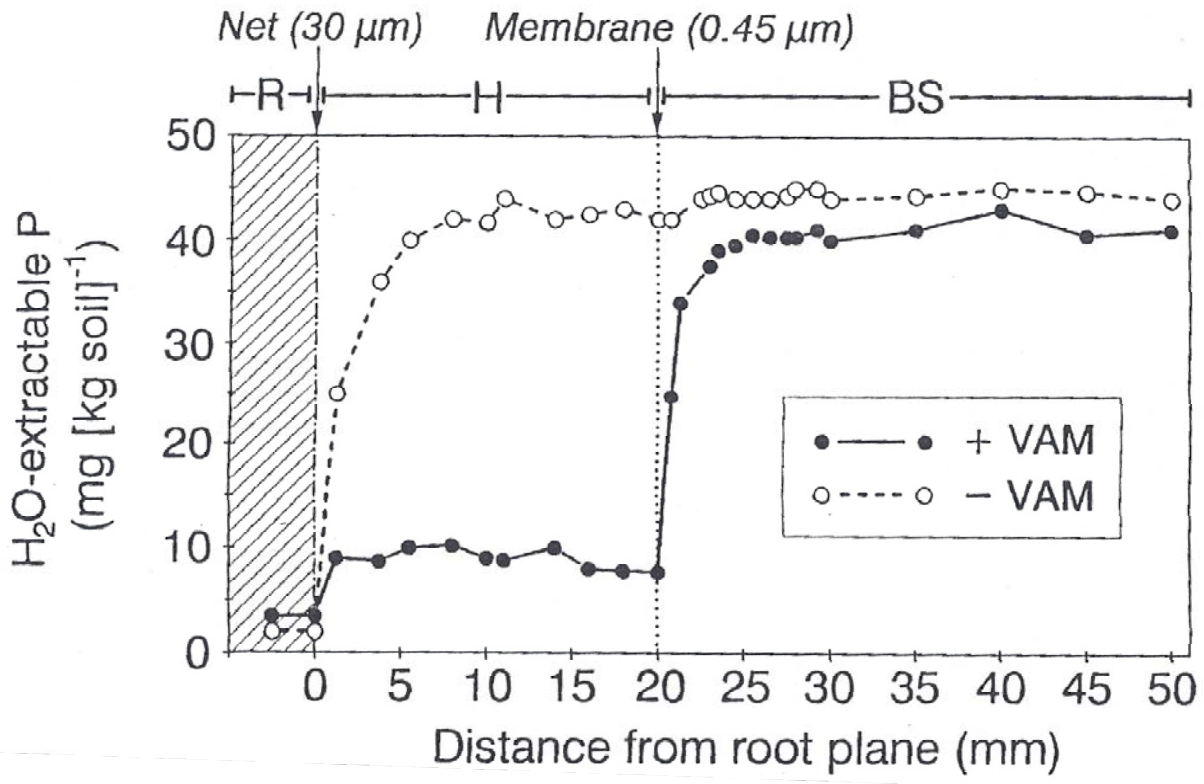
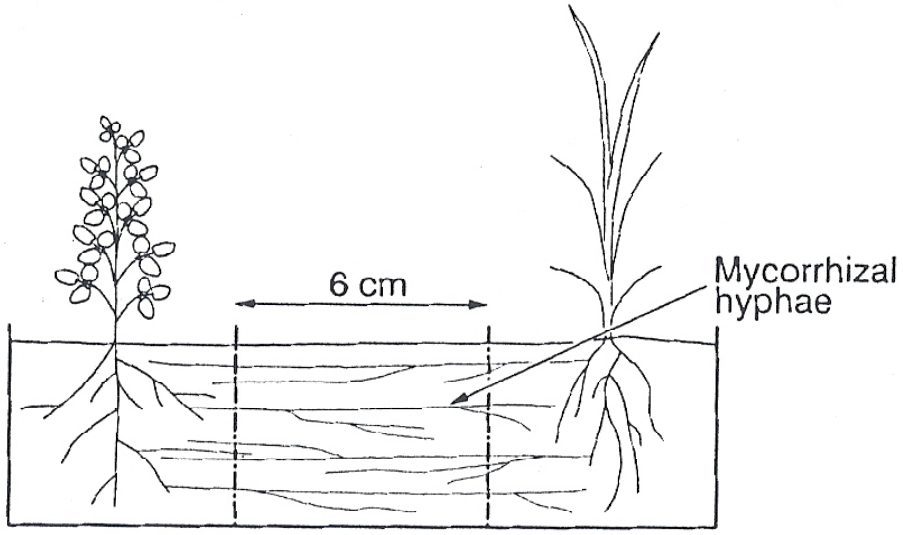


Figure 15.22. Depletion profile of water-extractable phosphorus in the root (R), hyphal (H), and bulk soil (BS) of non-mycorrhizal (-VAM) and mycorrhizal (*Glomus mosseae*, +VAM) white clover plants grown in a Luvisol (Li *et al*., 1991c)

Fig. 9. Can VAM infection mediate intra- or inter-species nutrient transfers? (Fig. 15.11 Marschner 2012)



N supply to soybean	Dry weight (g plant^{-1})		N content (mg plant^{-1})	
	Soybean	Maize	Soybean	Maize
−N	3.9	7.2	30	33
+NH_4NO_3	21.8	8.6	351	55
+N_2 fix	25.1	6.9	419	40

Fig. 15.26 Dry weight and nitrogen uptake of soil-grown VA-mycorrhizal (*Glomus mosseae*) maize and soybean plants grown either without nitrogen (−N), with NH_4NO_3, or nodulated (N_2 fix). (Based on Bethlenfalvay *et al.*, 1991.)