Promoción y protección de raíces en cultivos

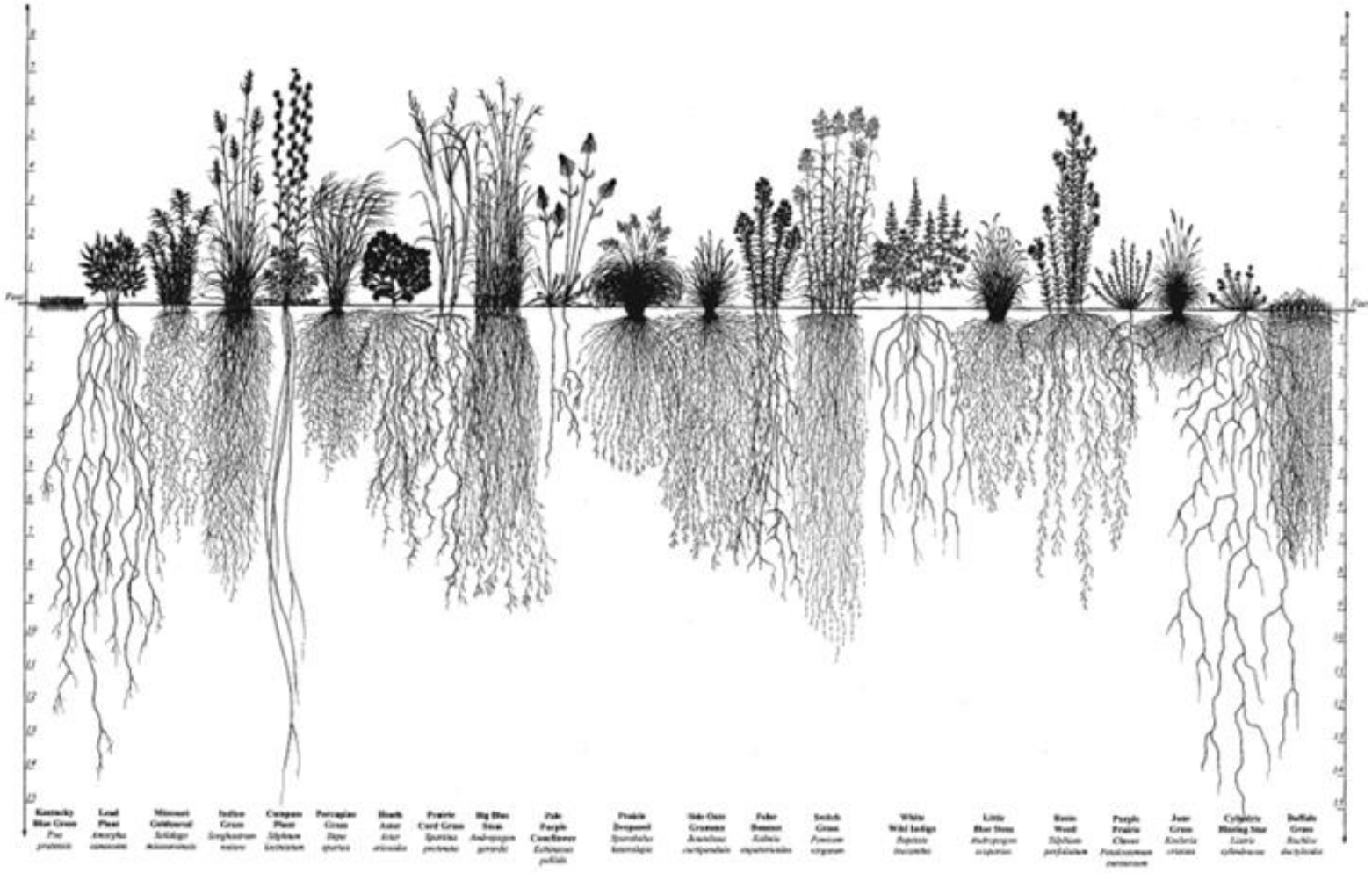
UNIVERSIDAD DE ANTIOQUIA
1803

Camilo Ramírez

Instituto de Biología
Universidad de Antioquia

Grupo de investigación
Bacteriología Agrícola y Ambiental

Abordaremos…



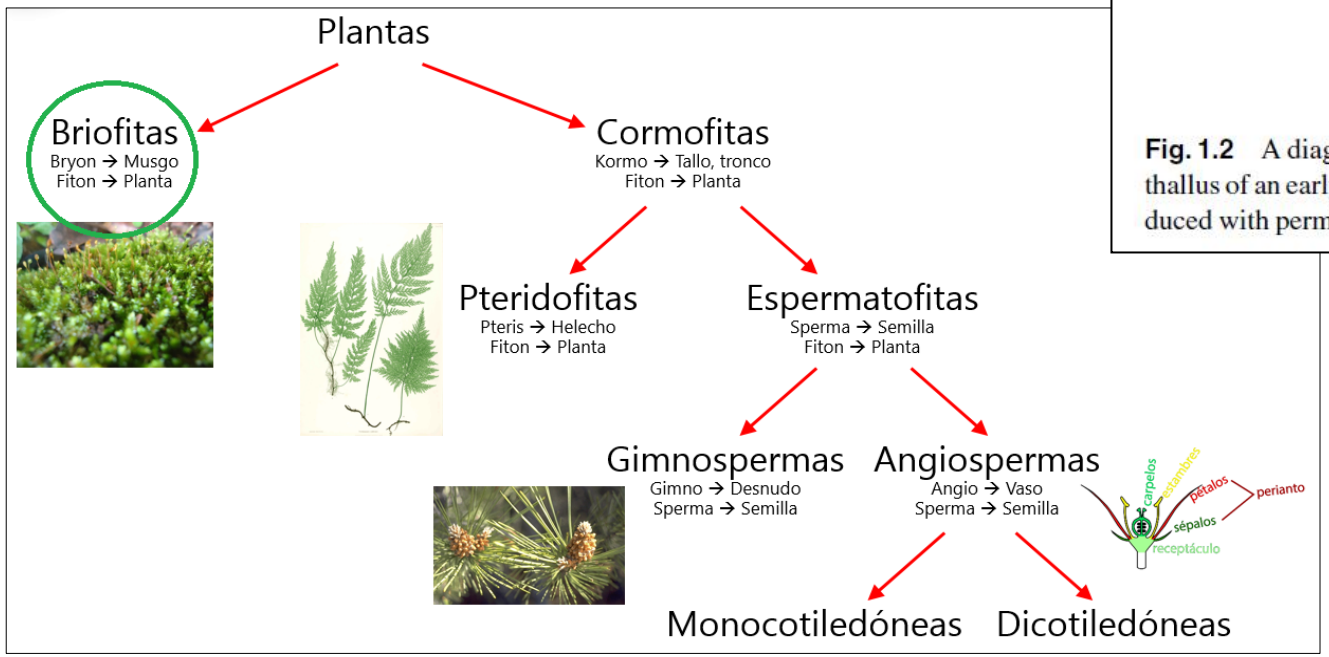
1. Papel de la raíz.

2. Factores determinantes.

3. Elementos de manejo.

El papel de la raíz

Las raíces son una **ADAPTACIÓN**



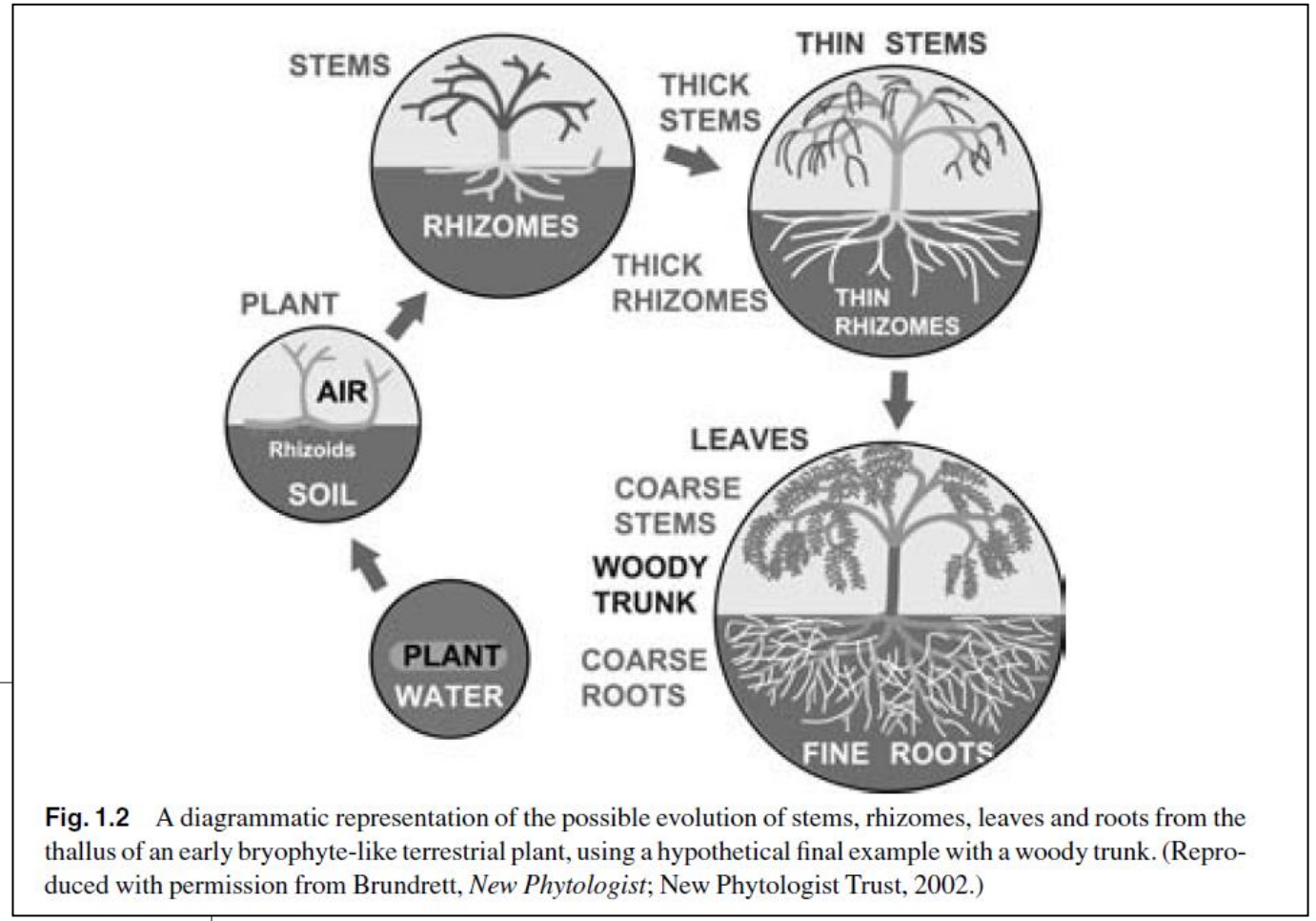


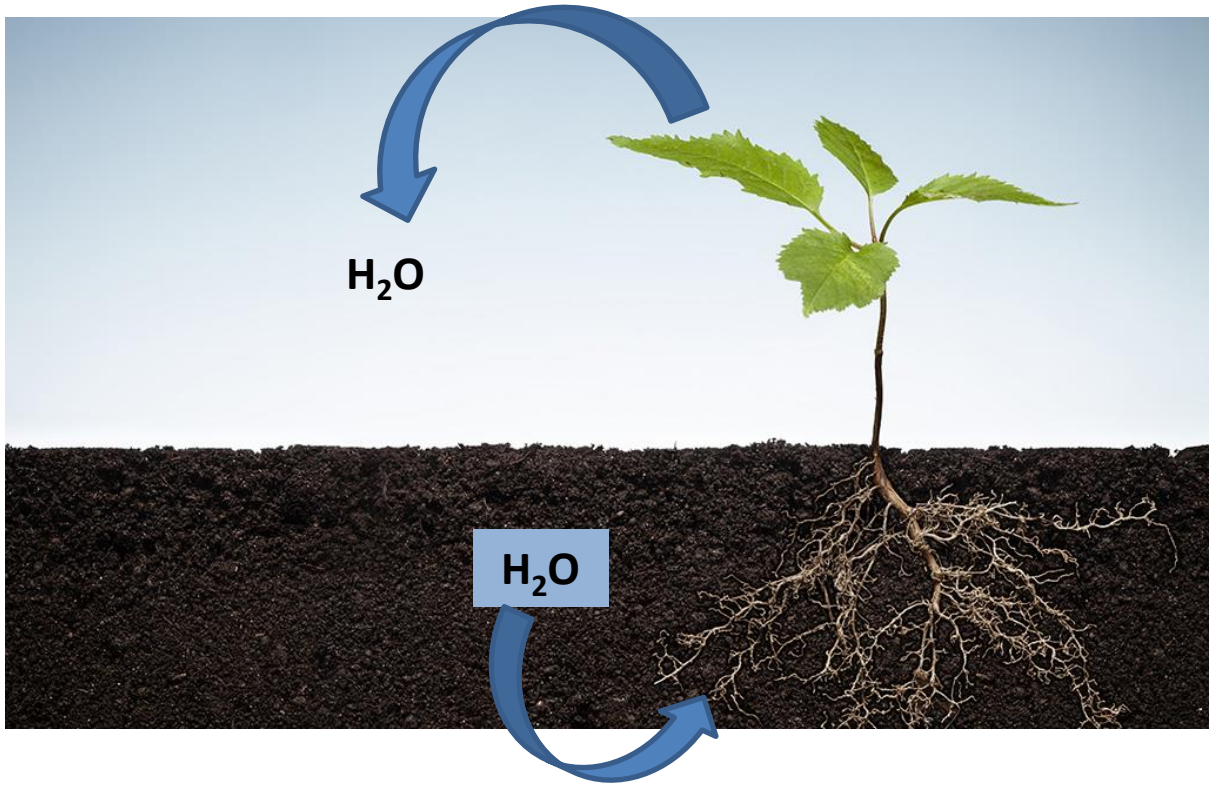
Fig. 1.2 A diagrammatic representation of the possible evolution of stems, rhizomes, leaves and roots from the thallus of an early bryophyte-like terrestrial plant, using a hypothetical final example with a woody trunk. (Reproduced with permission from Brundrett, *New Phytologist*; New Phytologist Trust, 2002.)

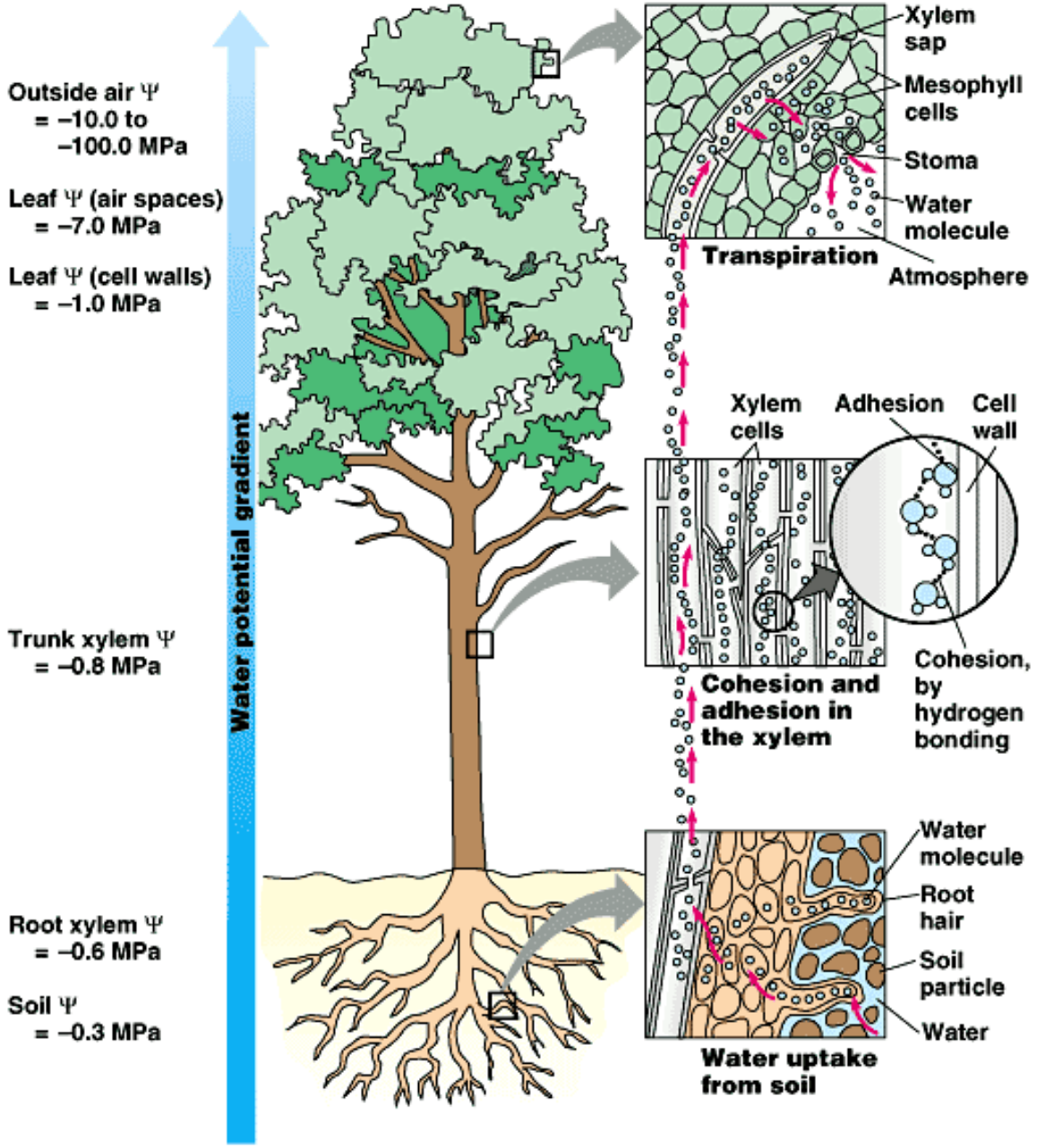
Funciones

Anclaje

Funciones

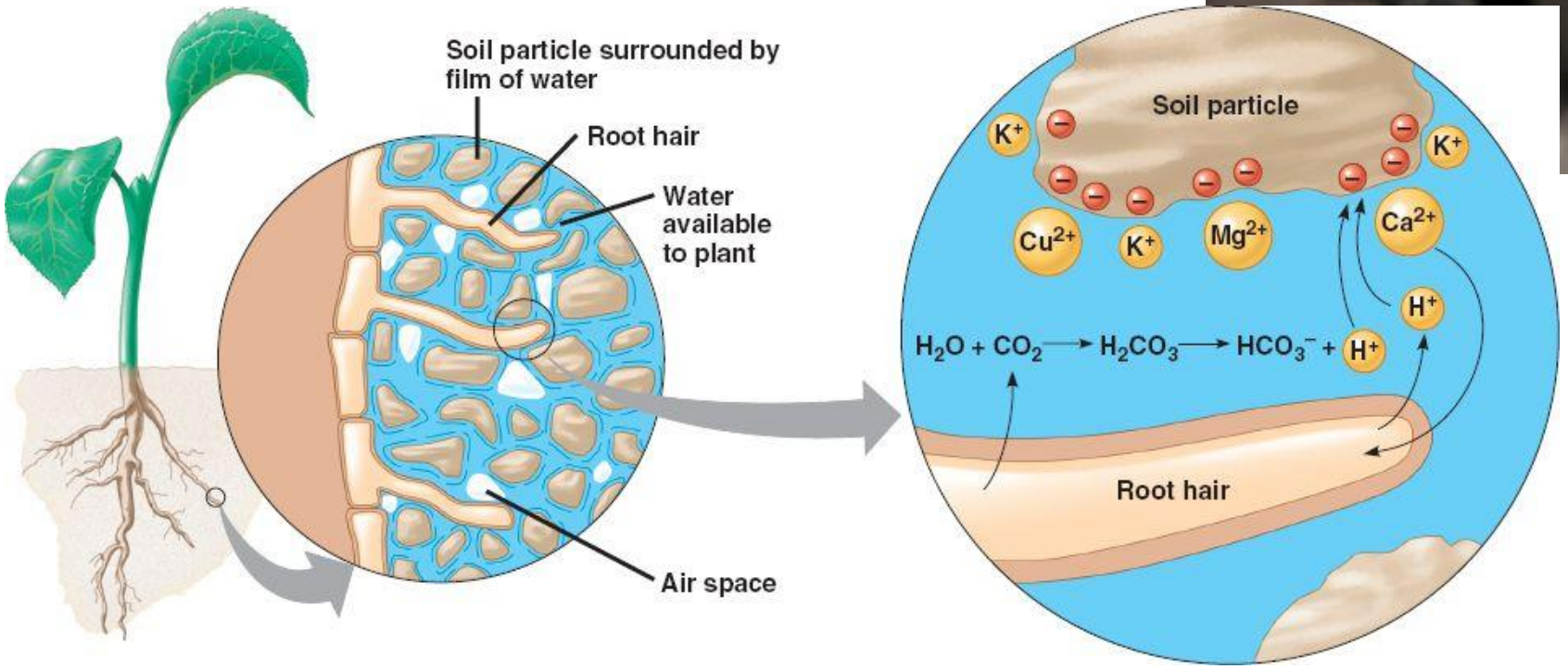
Absorción de agua



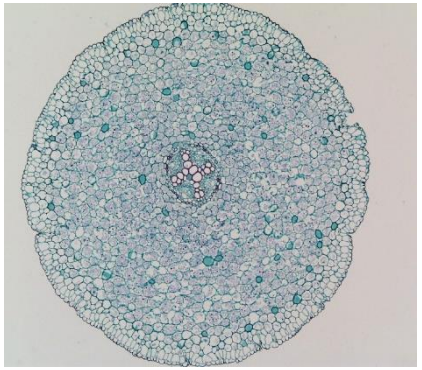


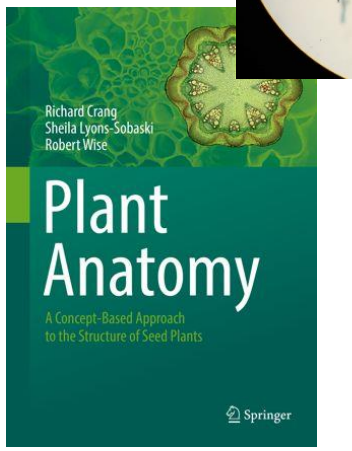
Funciones

Absorción de nutrientes



Elemento importante:
La arquitectura radicular





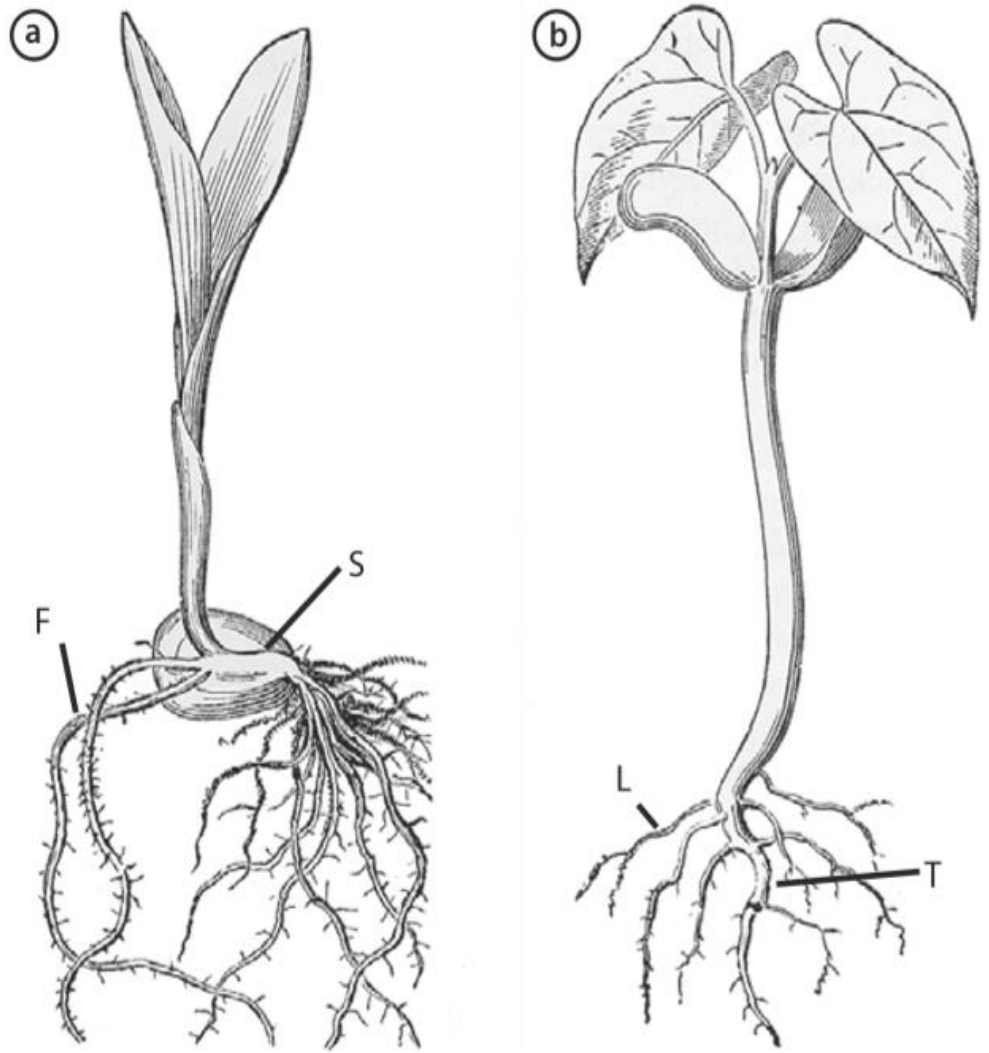


Fig. 10.2 a, b Drawings of a maize (*Zea mays*-monocot) and b bean (*Phaseolus vulgaris*-eudicot) seedlings. F, fibrous root; S, stem; L, lateral root; T, taproot. Scale bars = xx µm. (a, b A Grey (1887), public domain)

Elemento importante:
La arquitectura radicular

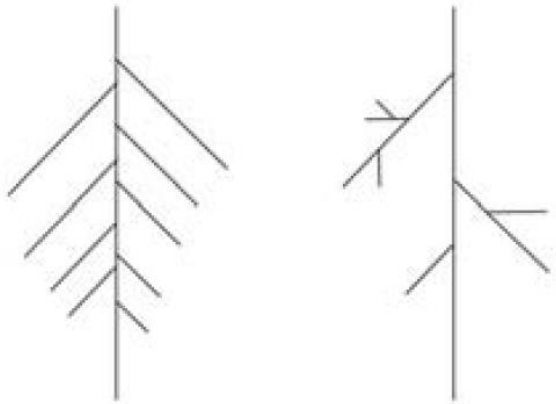


Fig. 2.9 Diagram showing the distinction between (a) herringbone, and (b) dichotomous branching patterns. (Modified and reproduced with permission from Fitter *et al.*, *New Phytologist*; New Phytologist Trust, 1991.)

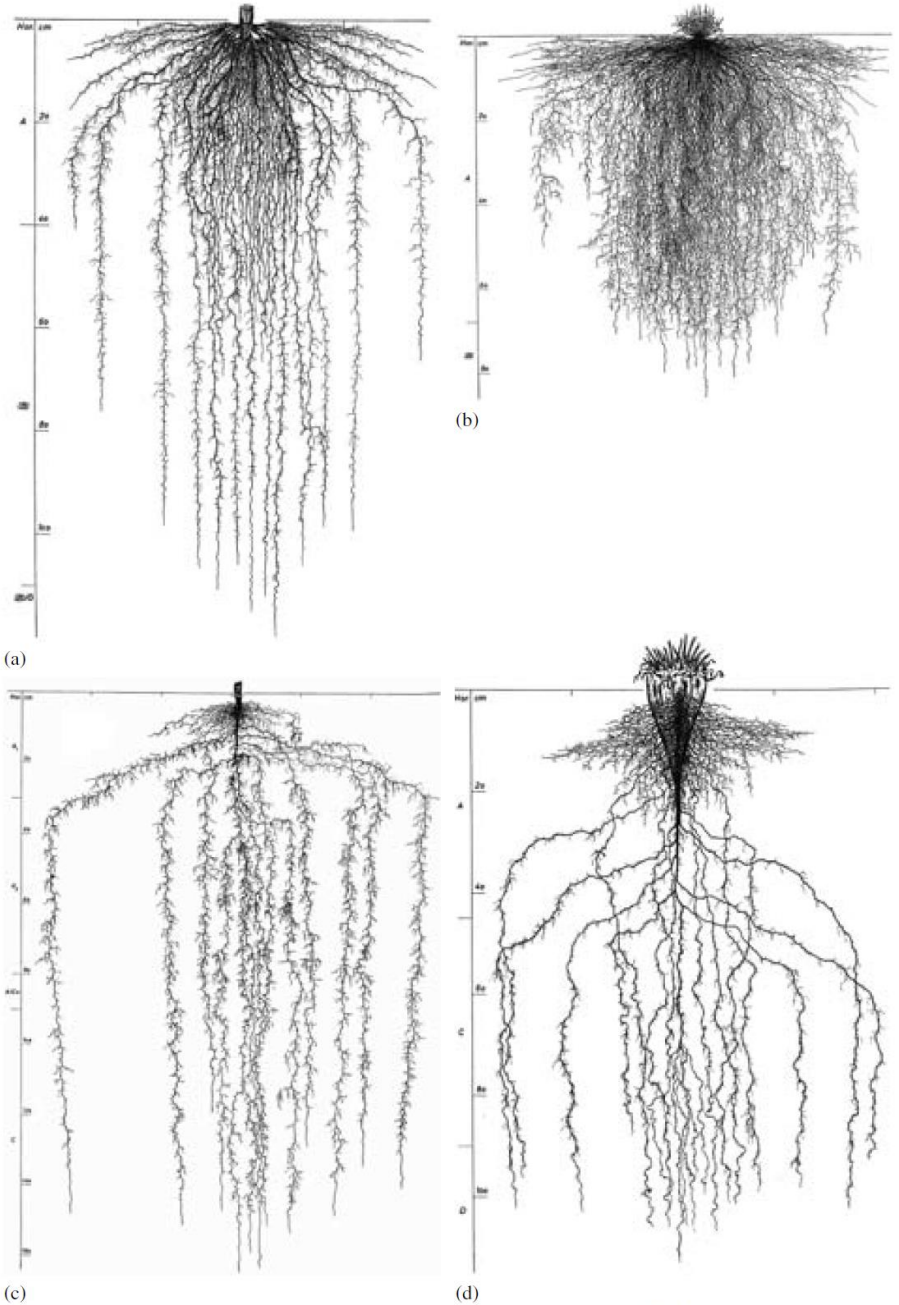
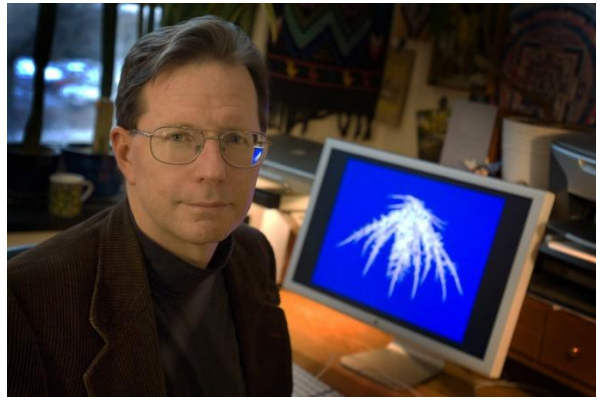
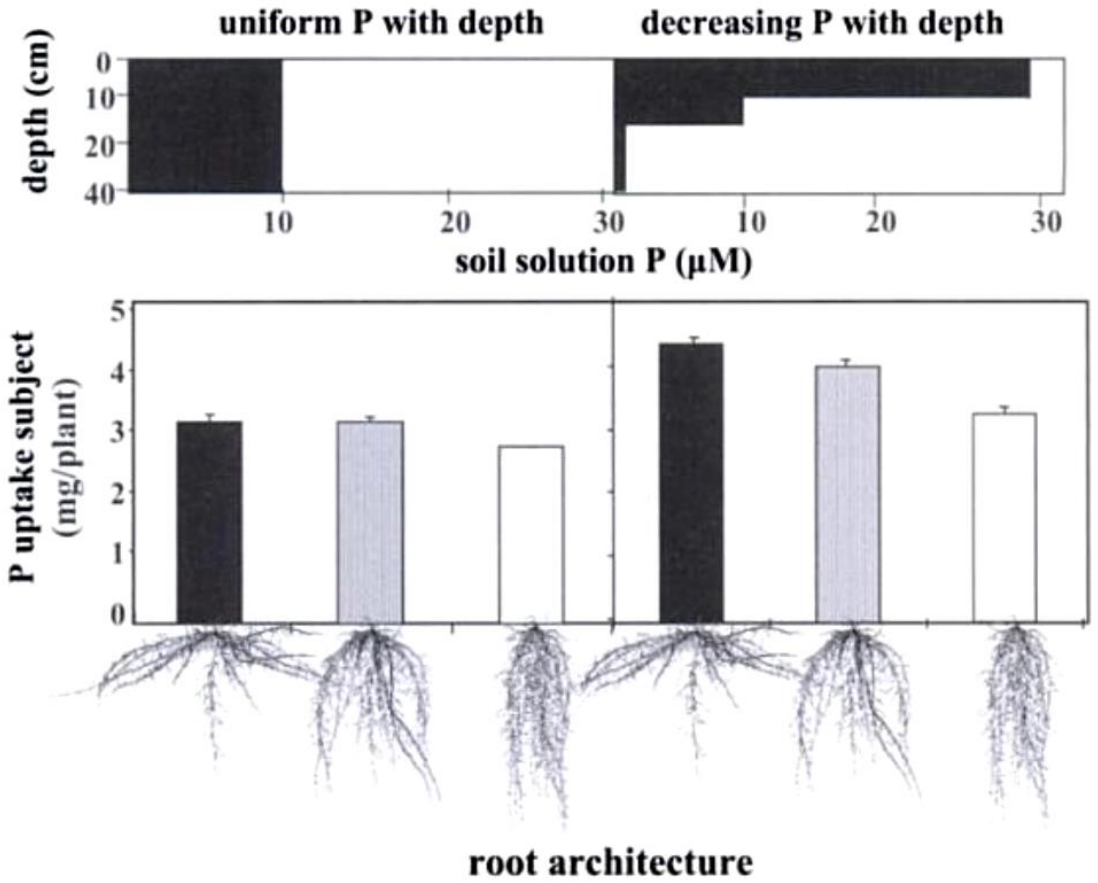


Fig. 2.7 Drawings of excavated root systems: (a) maize, *Zea mays*; (b) ryegrass, *Lolium multiflorum*; (c) oilseed rape, *Brassica napus*; and (d) sugar beet, *Beta vulgaris*. (Reproduced with permission from Kutschera, *Wurzelatlas*; DLG-Verlags-GmbH, 1960.)

Elemento importante:
La arquitectura radicular



Jonathan Lynch
Penn State University



(Lynch, 2005)

Elemento importante:
La arquitectura radicular

También importa en la exploración a mayores distancias…

Factores determinantes en el desarrollo de la raíz

Factores
Físicos

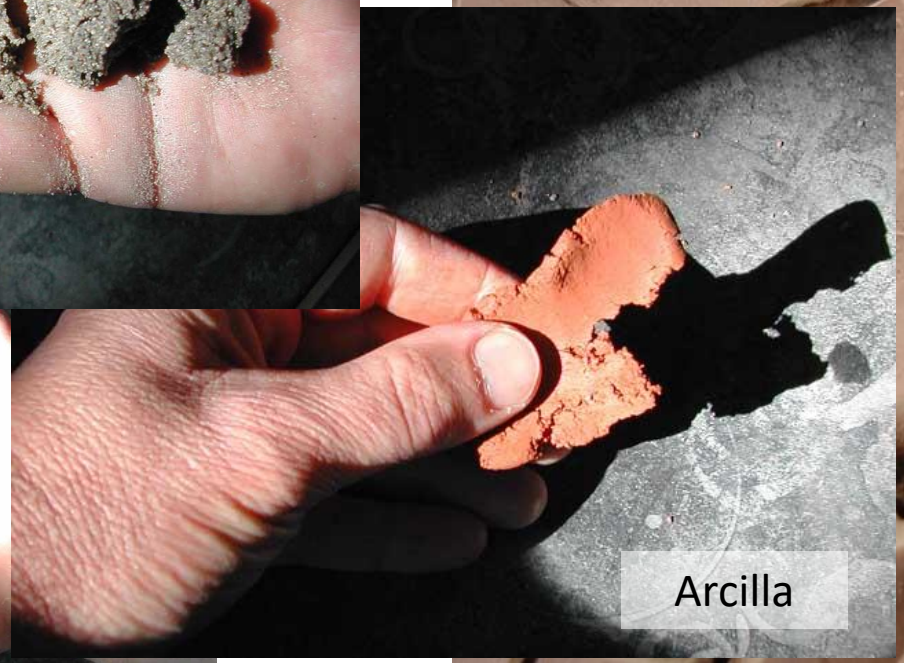
Factores
Químicos

Factores
Biológicos

Raíces sanas

Factores Físicos

Textura



Factores Físicos

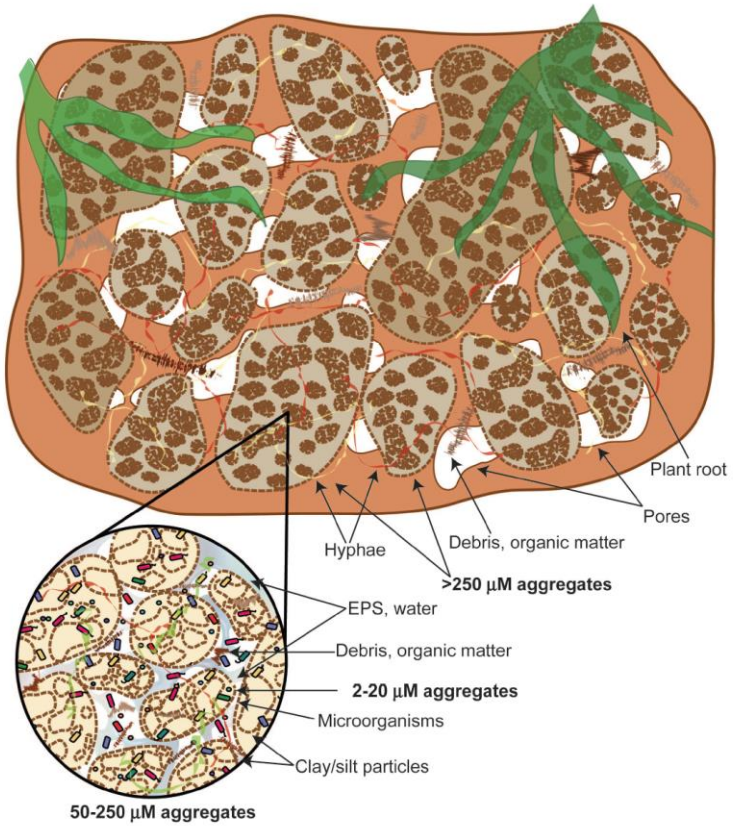
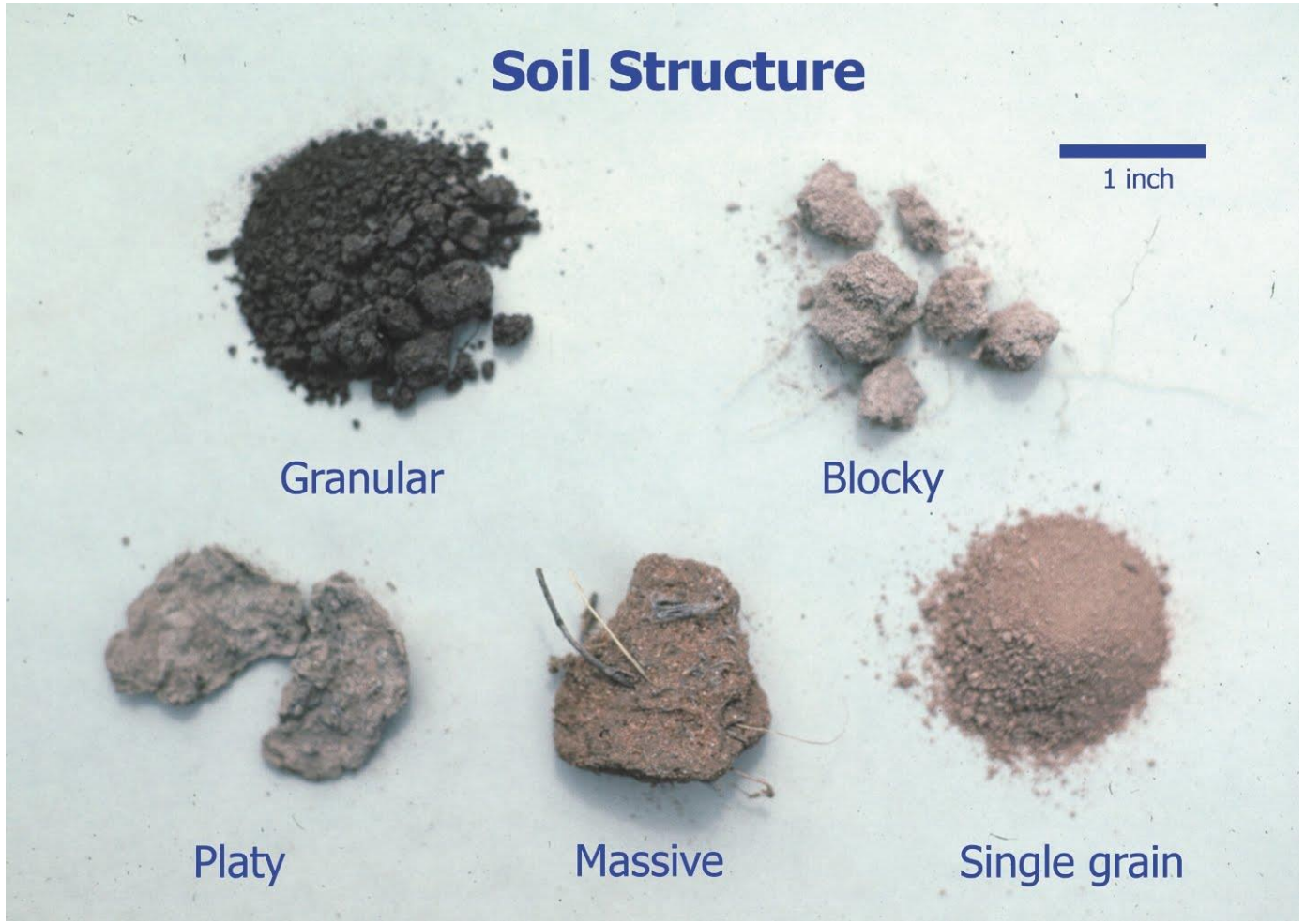


FIGURE 2 | The hierarchical model of soil aggregate classification. Larger aggregates are composed of smaller units, which are formed from even smaller aggregates.

Estructura



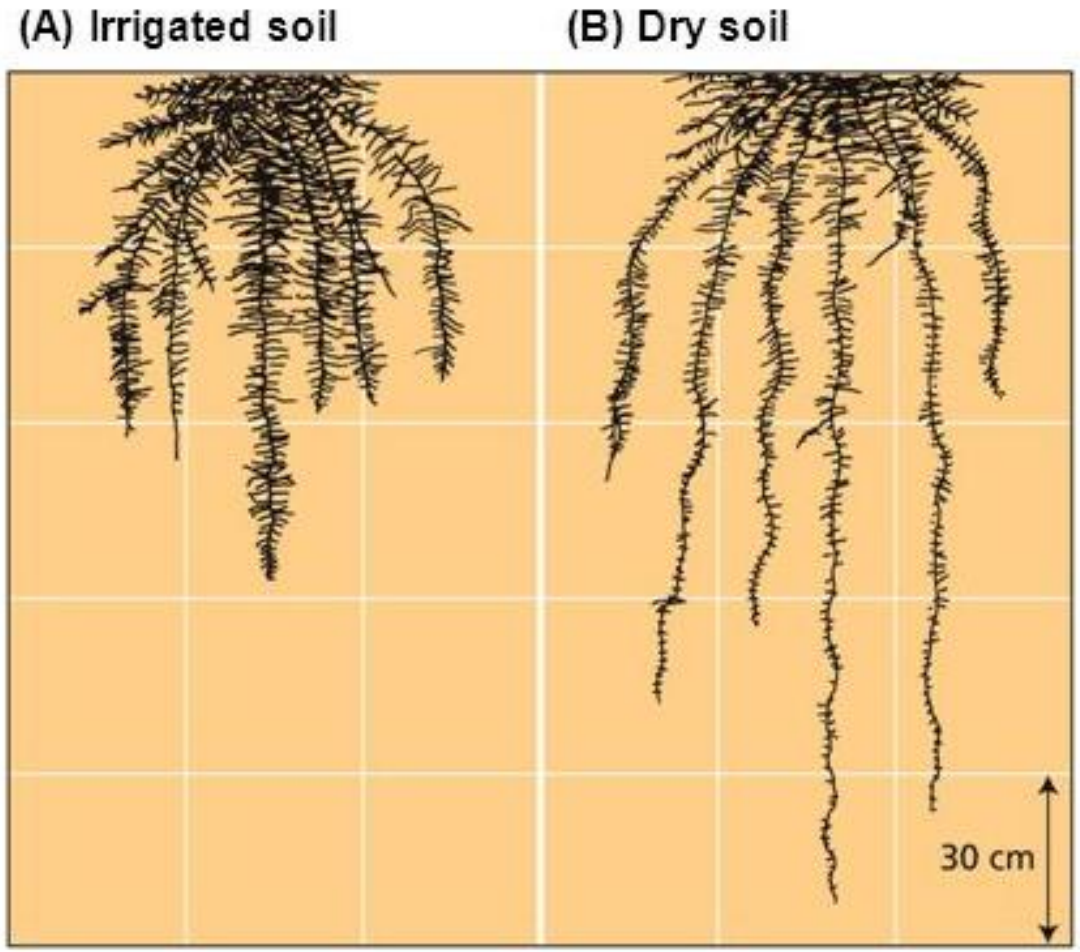
Factores Físicos

Compactación

Efecto de la compactación del suelo

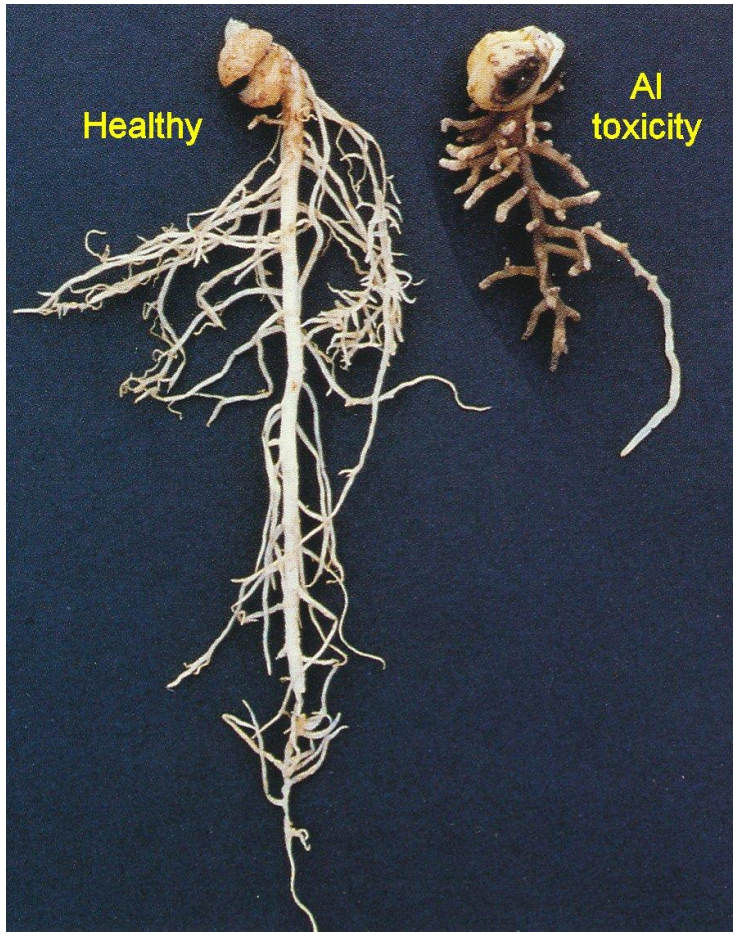
http://www.ipm.iastate.edu/ipm/icm/files/images/soil-compaction.jpg

Factores Químicos

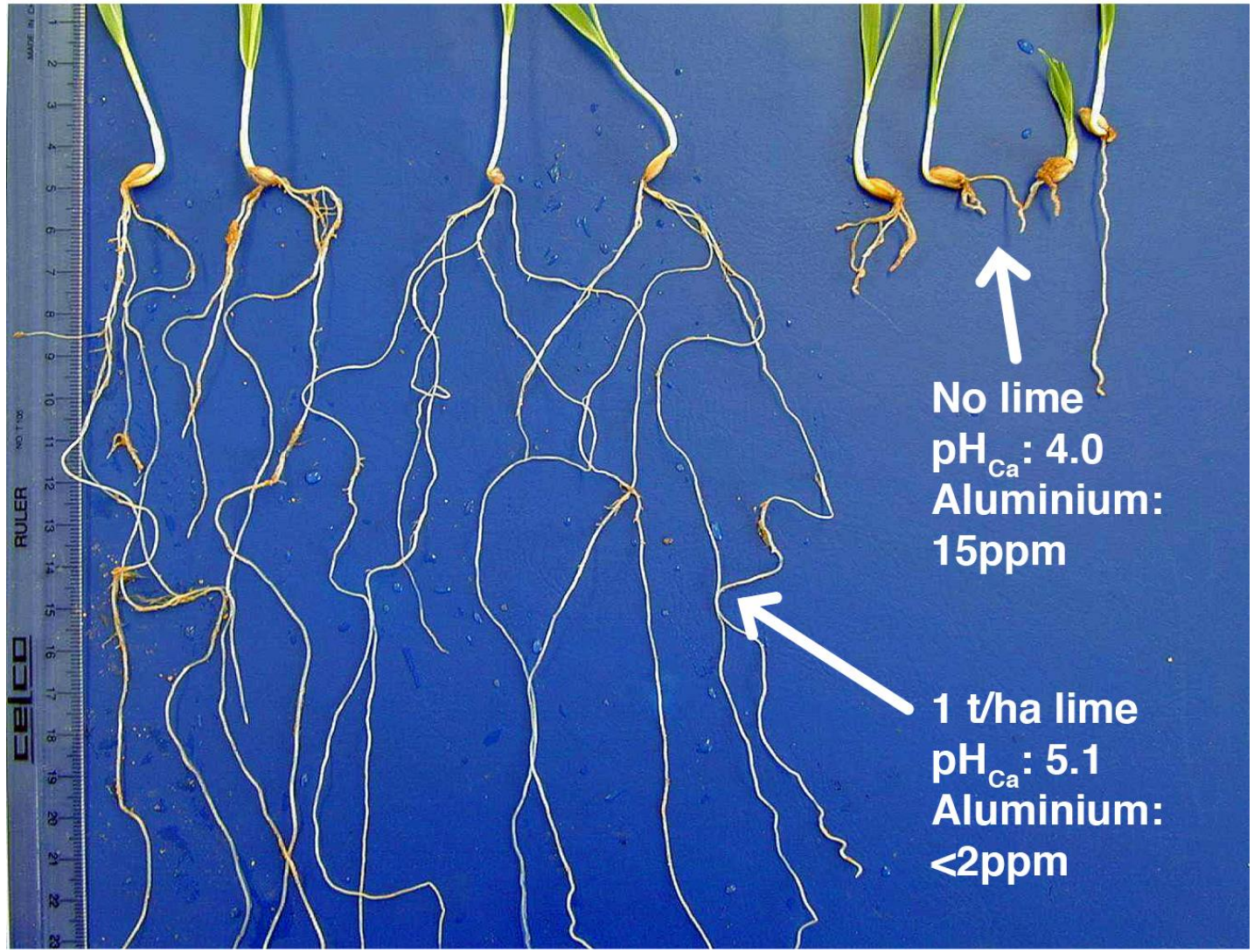


Agua

Factores Químicos

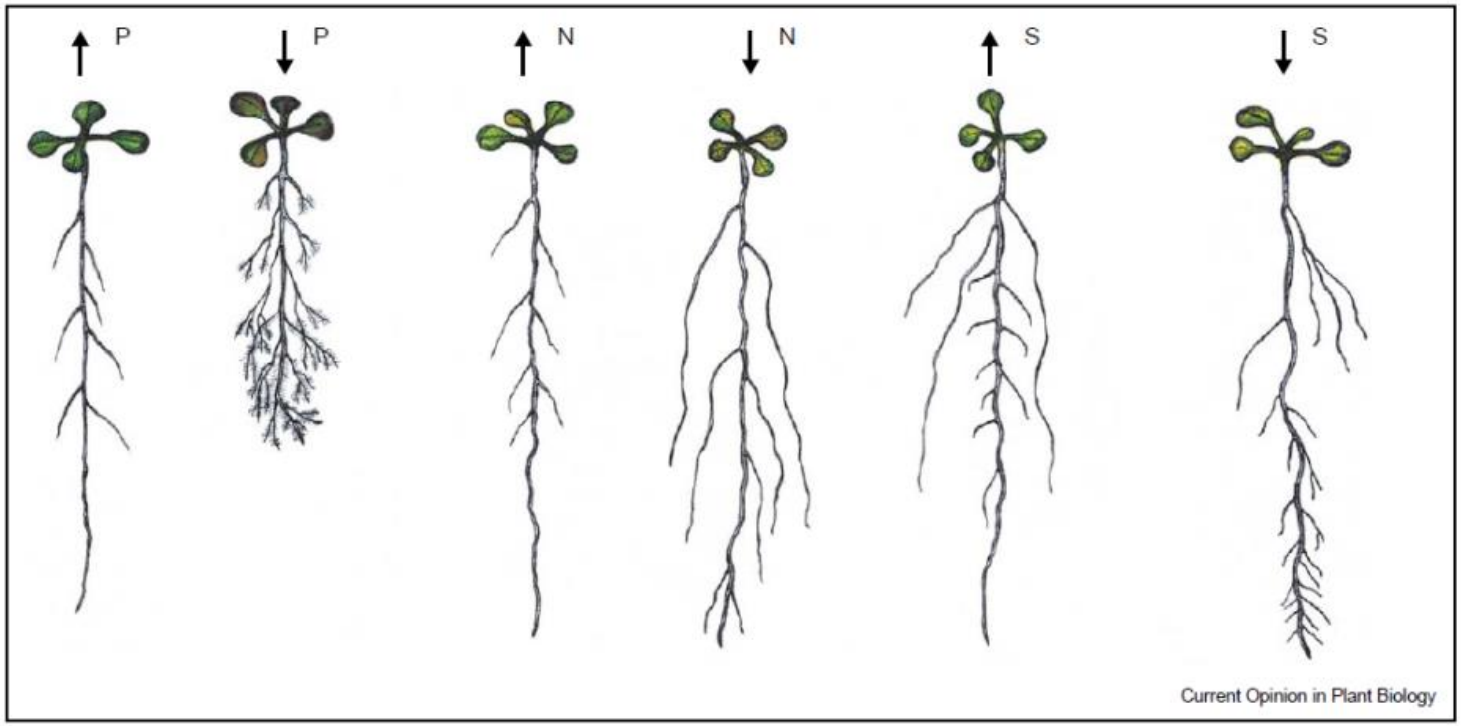


pH



Factores Químicos

Nutrientes



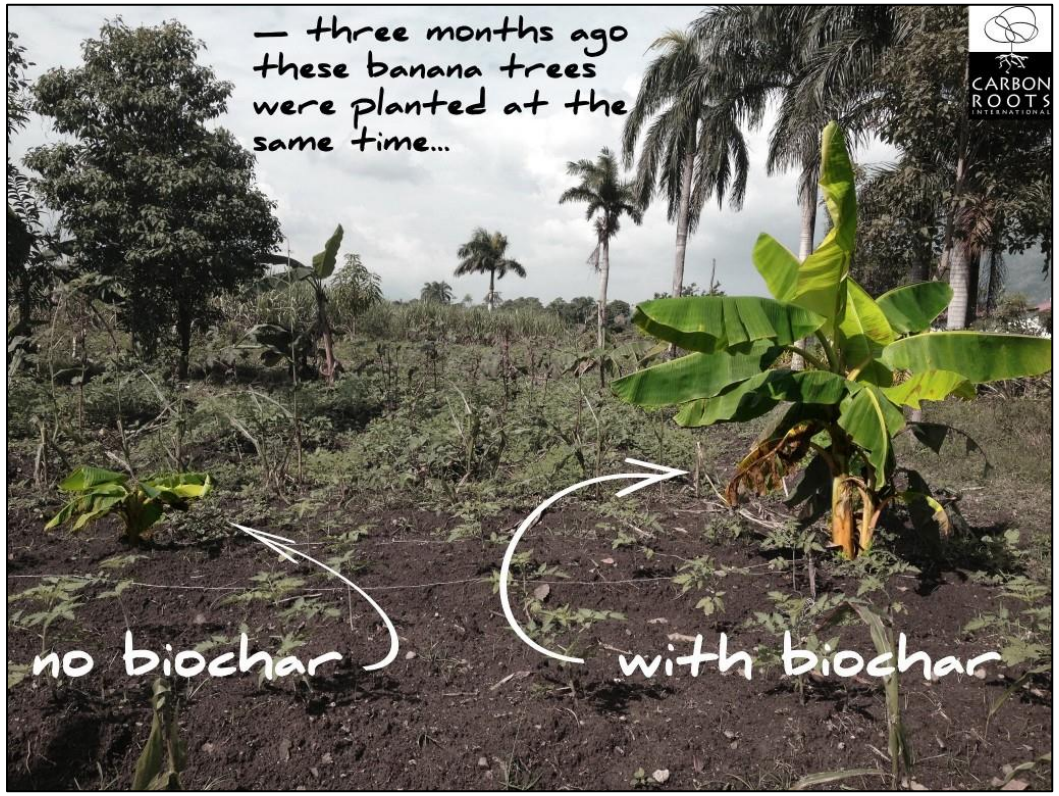
The role of nutrient availability in regulating root architecture

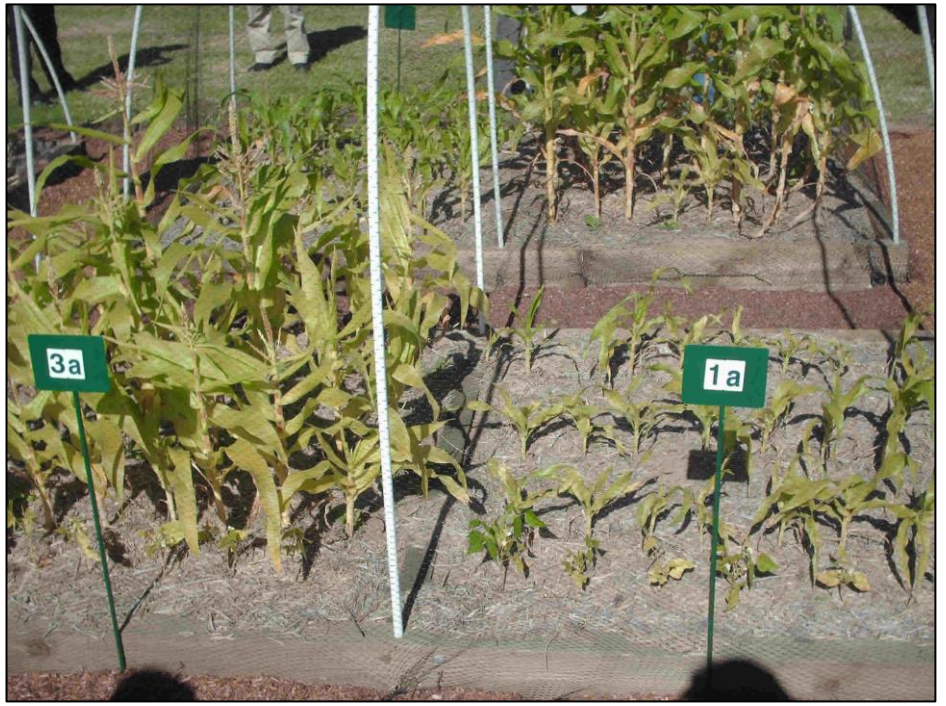
José López-Bucio, Alfredo Cruz-Ramírez and Luis Herrera-Estrella

Current Opinion in Plant Biology 2003, 6:280–287

Factores Biológicos

Materia orgánica y actividad microbiana



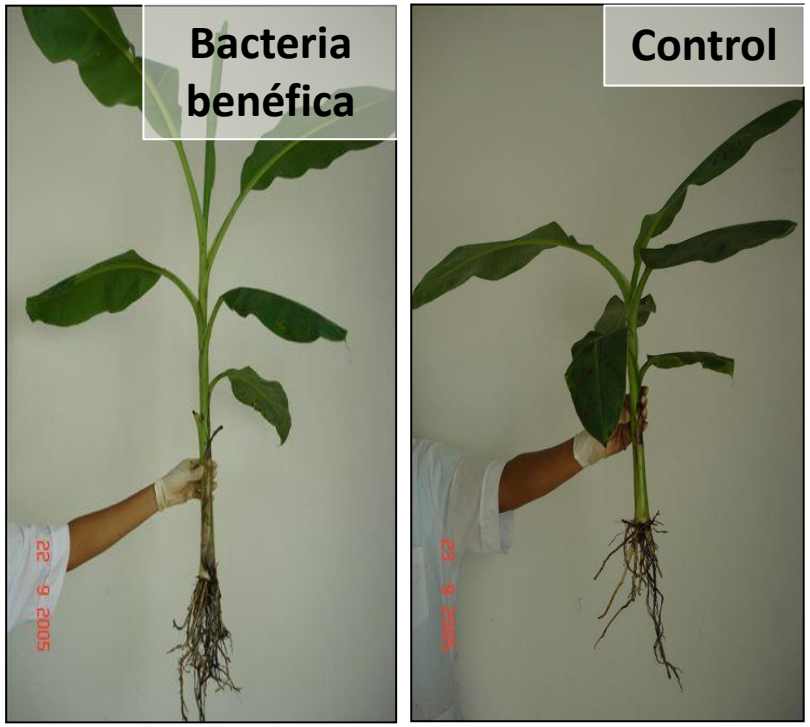


Factores Biológicos

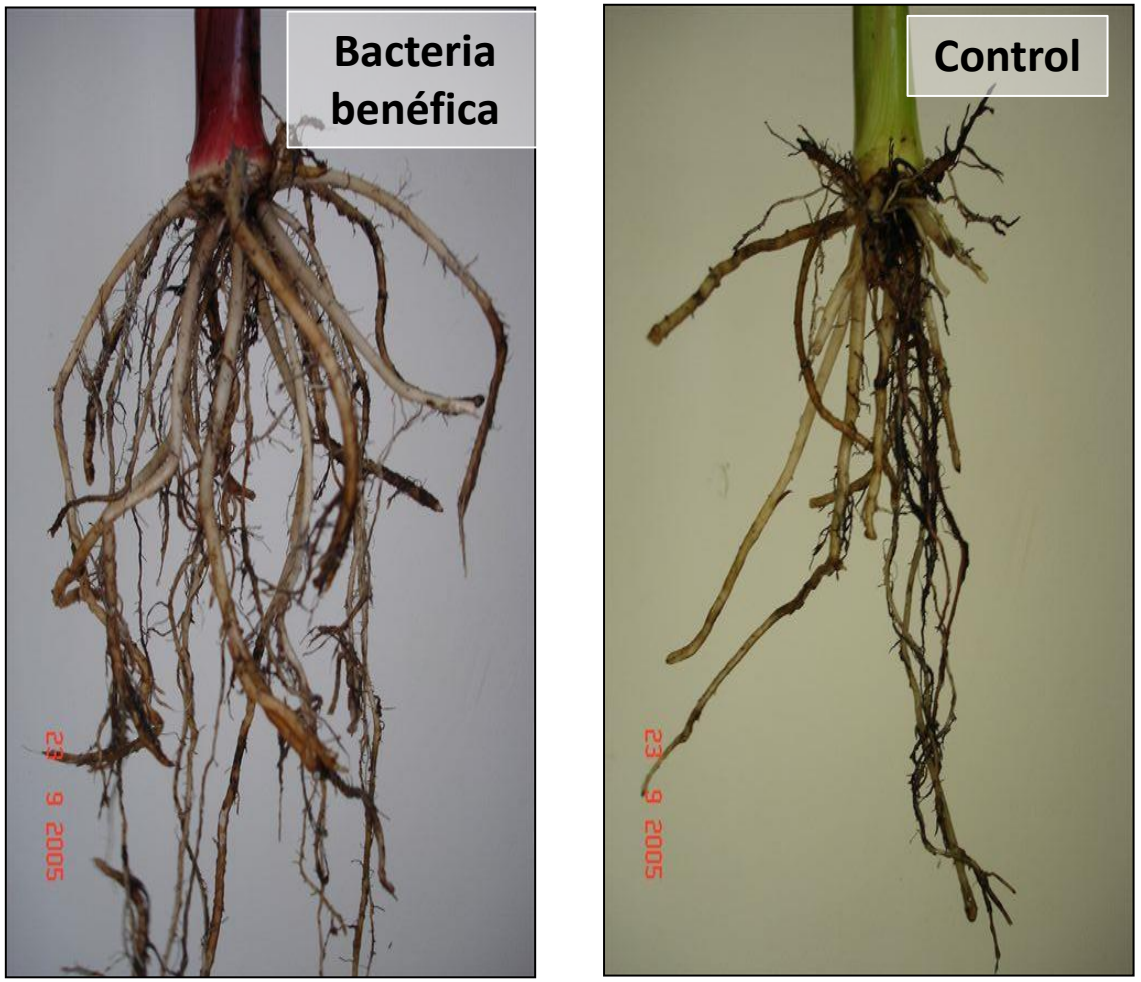
- Artrópodos
- Nemátodos
- Hongos
- Bacterias
- Virus

Plagas y patógenos

Factores Biológicos



Microorganismos benéficos



Elementos de manejo:
Promoción y protección de raíces

Factores
Físicos

Factores
Químicos

Factores
Biológicos

Raíces sanas

Factores Físicos

C:N = 400/1

C:N = 10/1

Aplicación de materia orgánica y mulch

$C/N \approx 10 \Rightarrow$ Descomposición fácil.

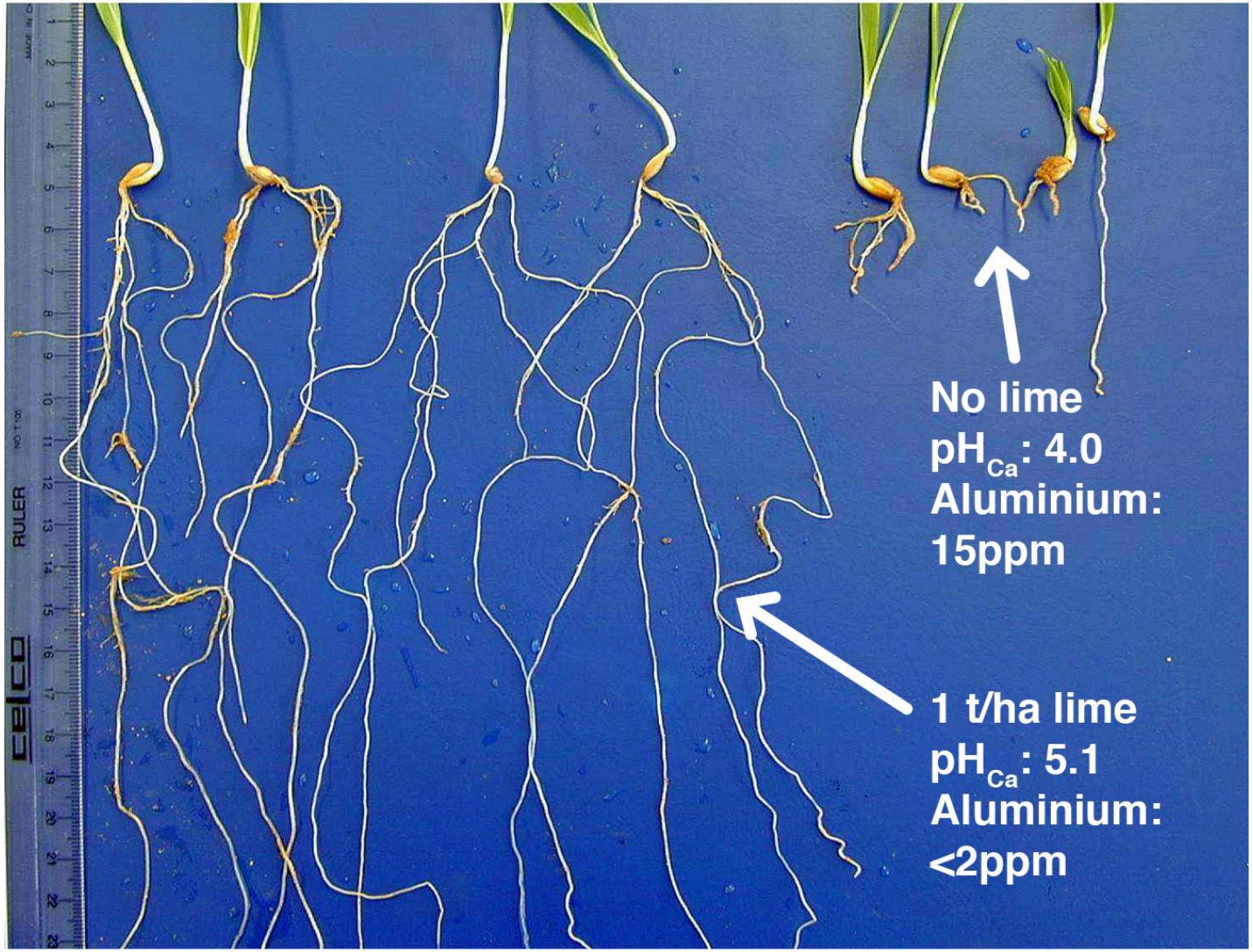
$C/N > 30 \Rightarrow$ Descomposición difícil.

Factores
Físicos

Arado y prácticas de conservación

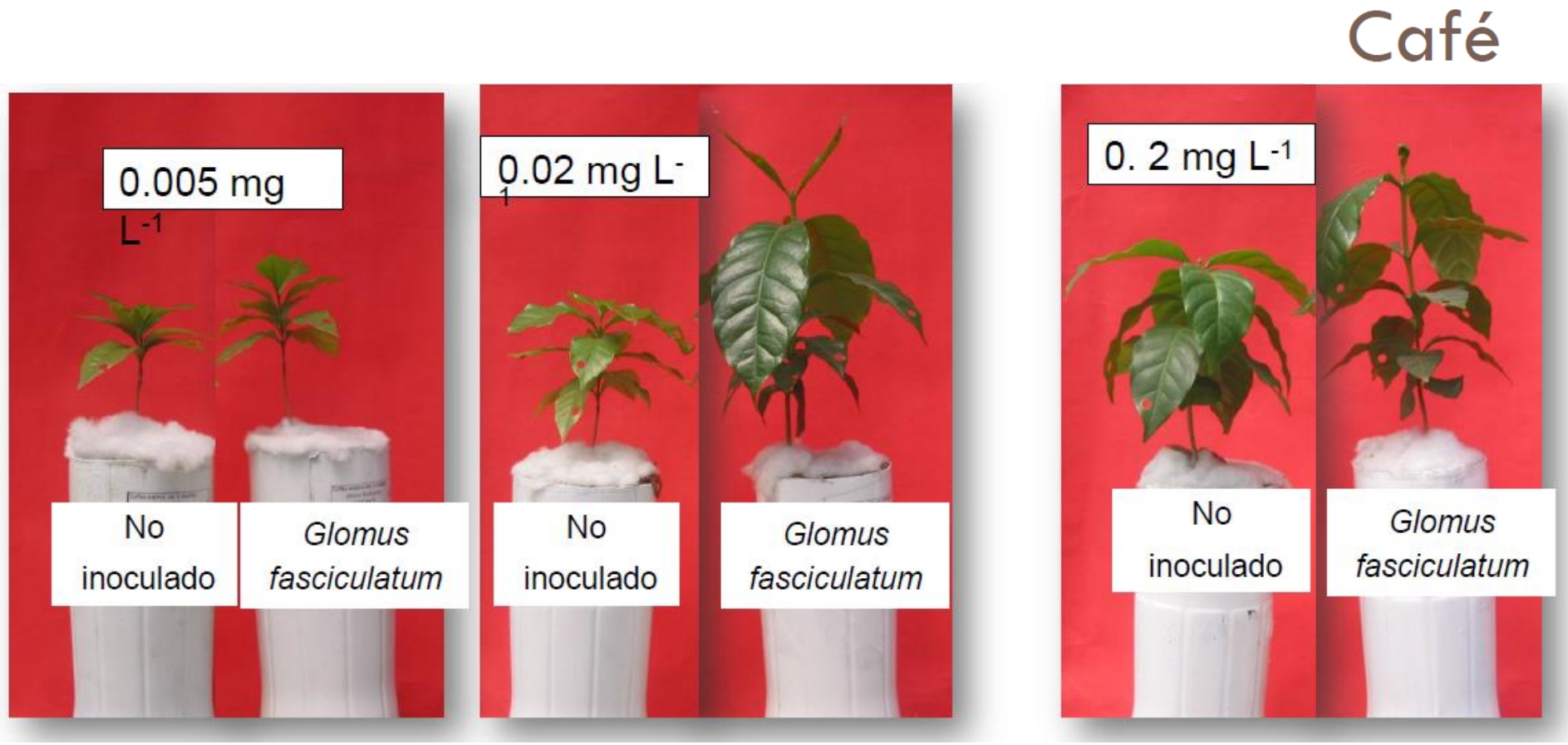
Factores Químicos

Encalado y fertilización adecuados



Factores Biológicos

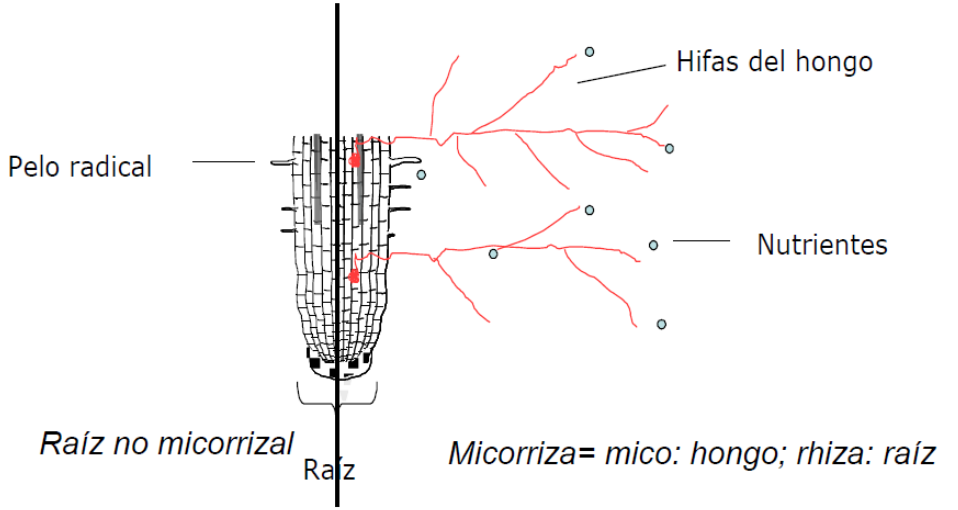
Hongos formadores de micorrizas



Cortesía: Dr. Walter Osorio, Universidad Nacional

Factores Biológicos

Asociación micorrizal



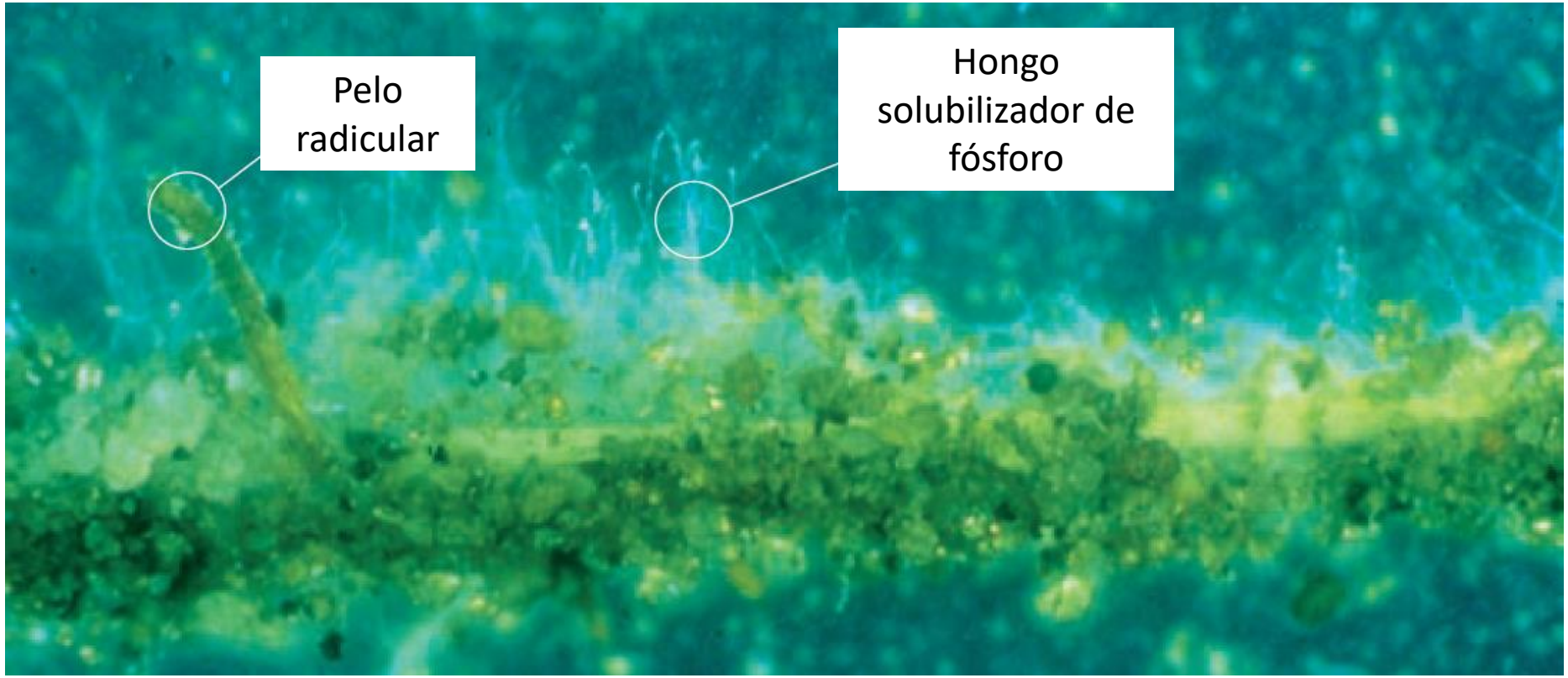
Captación de P: 1-2 mm 10 cm

Micorriza explora 1000 veces más suelo que la raíz

Cortesía: Dr. Walter Osorio, Universidad Nacional

Factores Biológicos

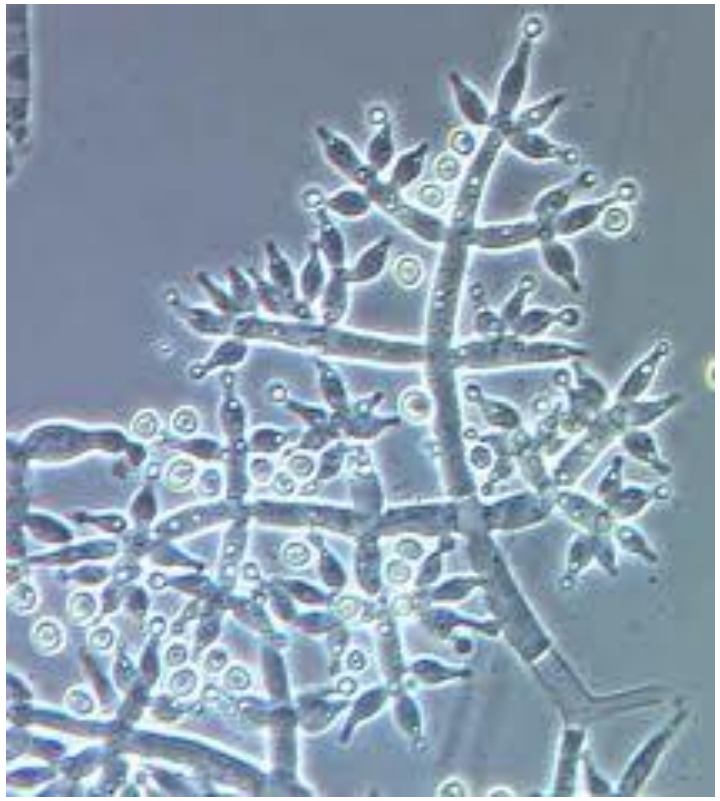
Hongos solubilizadores de fósforo
Ej: *Penicillium bilaii*



Factores Biológicos

Hongos biocontroladores

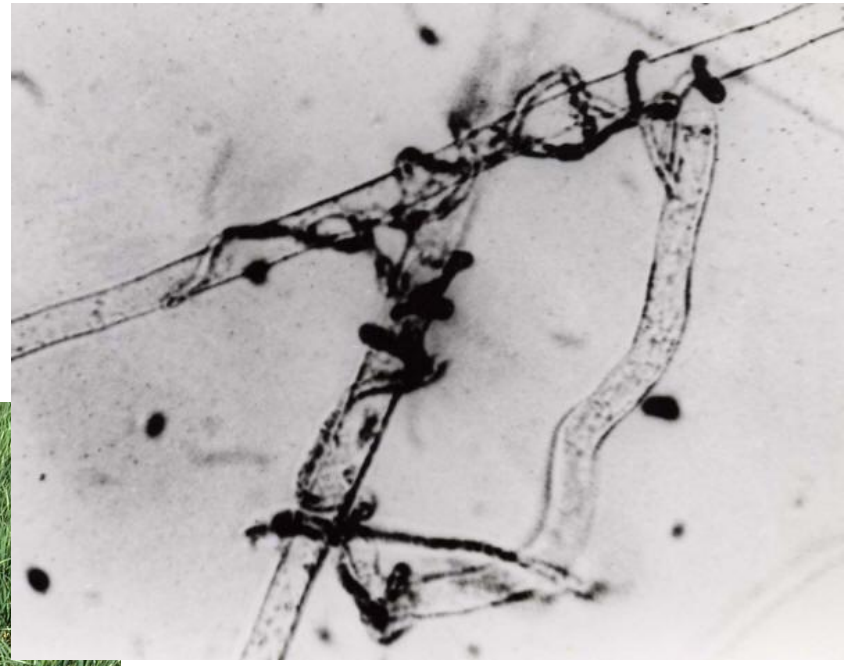
Ej: *Trichoderma* spp. - *Gliocladium* spp.



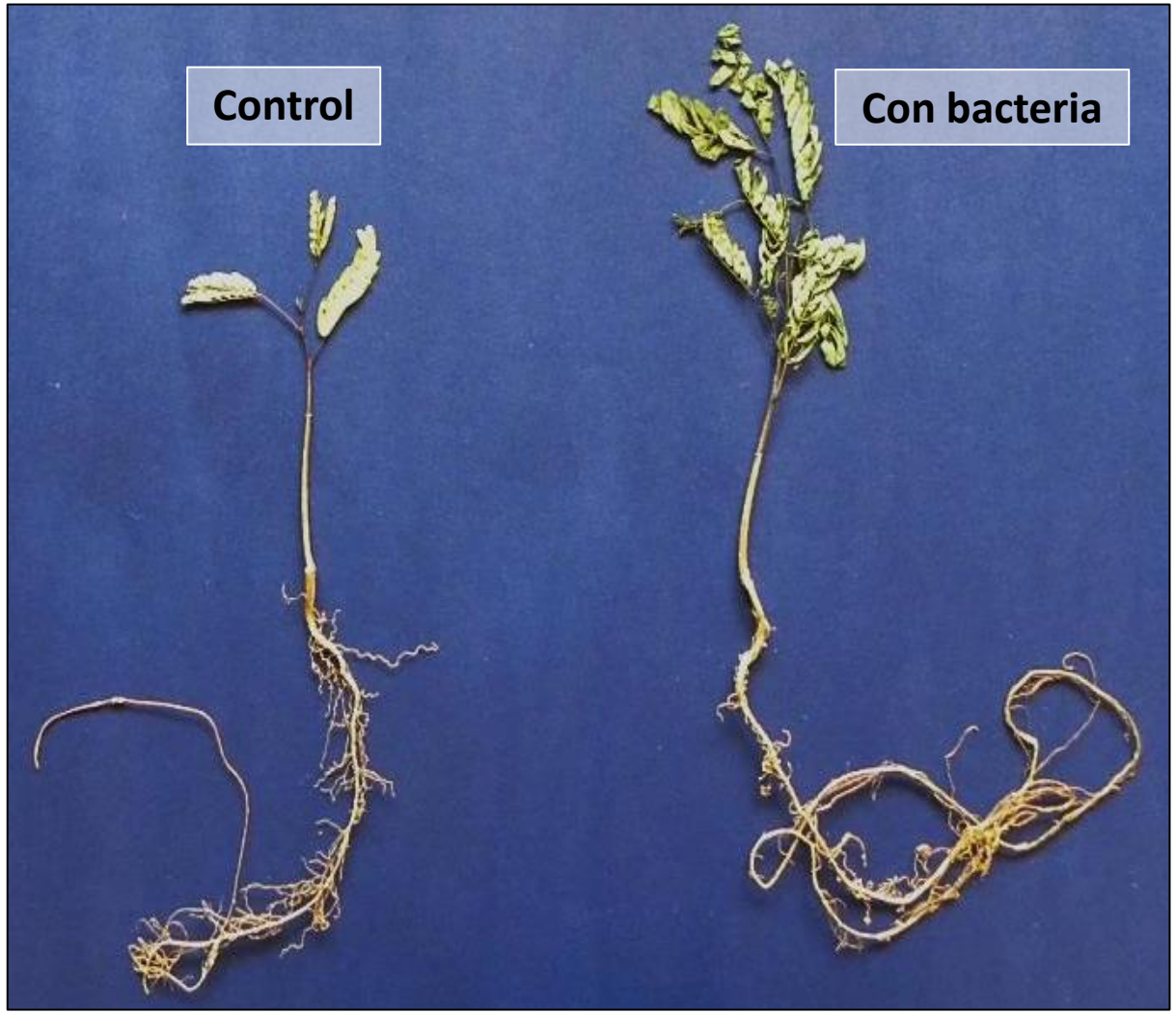
Factores Biológicos

Hongos biocontroladores

Ej: *Trichoderma* spp. - *Gliocladium* spp.

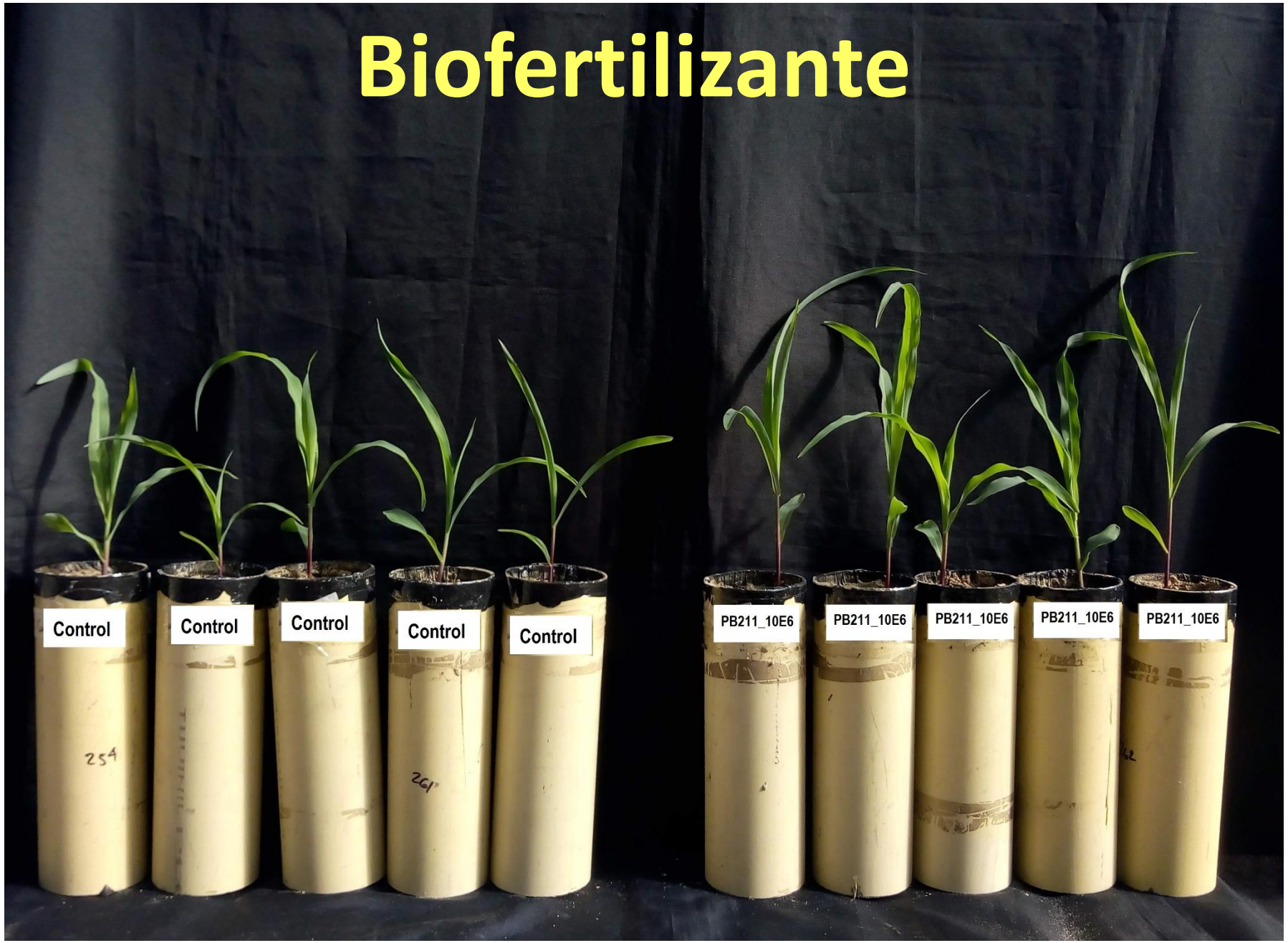


Bacterias fijadoras de N - Rizobios

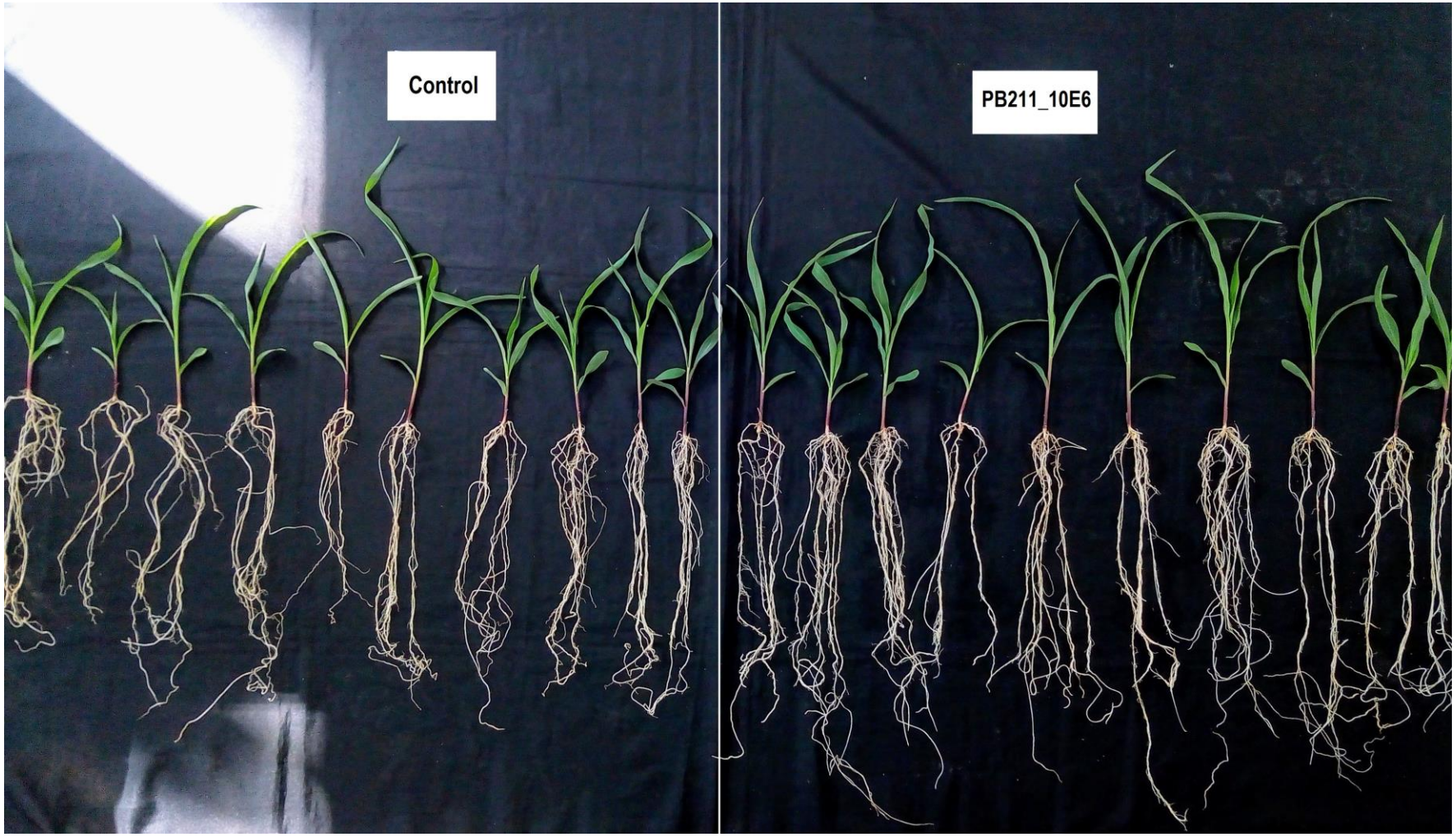


Leucaena

Biofertilizante

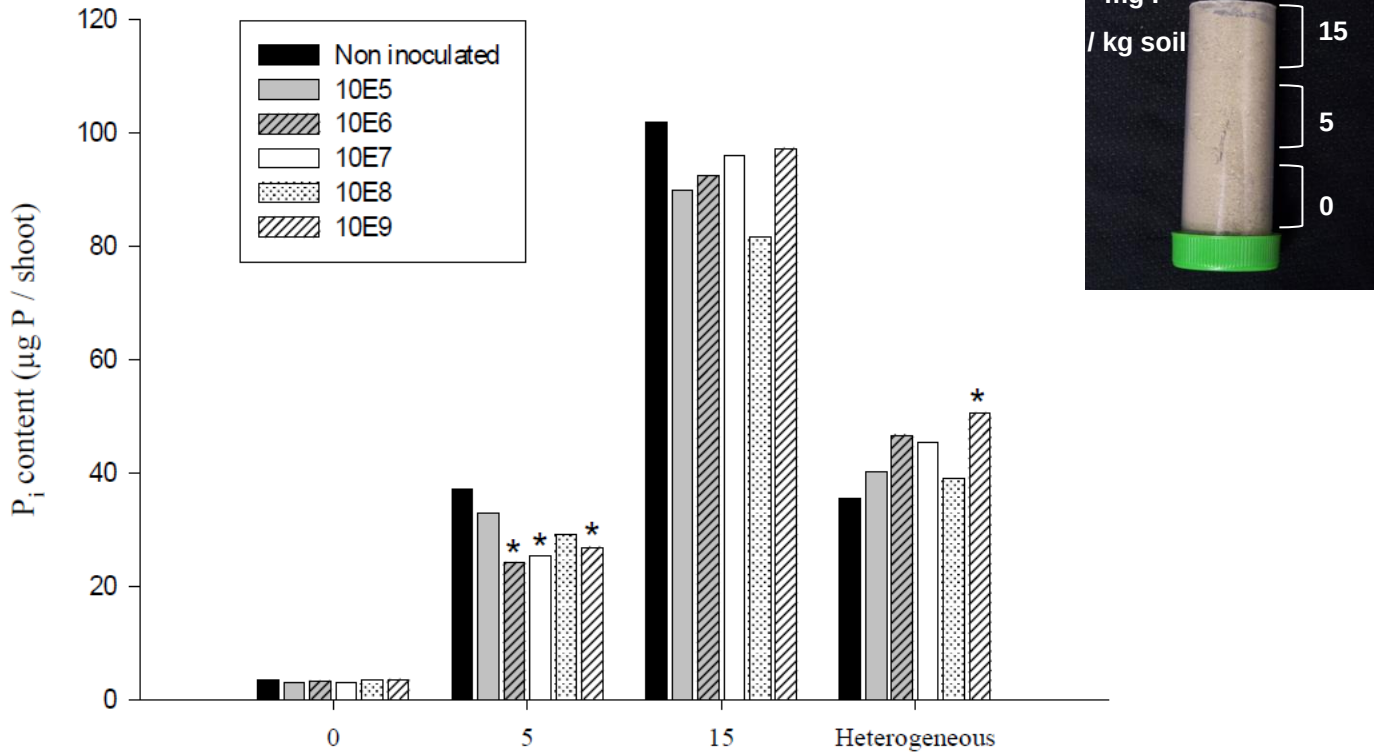


Biofertilizante



Cambios en la adquisición de nutrientes por alteraciones en la arquitectura radicular

Figure 4.7 Effect of the inoculation with *B. amyloliquefaciens* FZB42 on shoot P_i content and fresh shoot weight of Chinese cabbage grown at 3 levels of P homogeneously distributed in soil and 1 with heterogeneous distribution (highest concentration in topsoil)



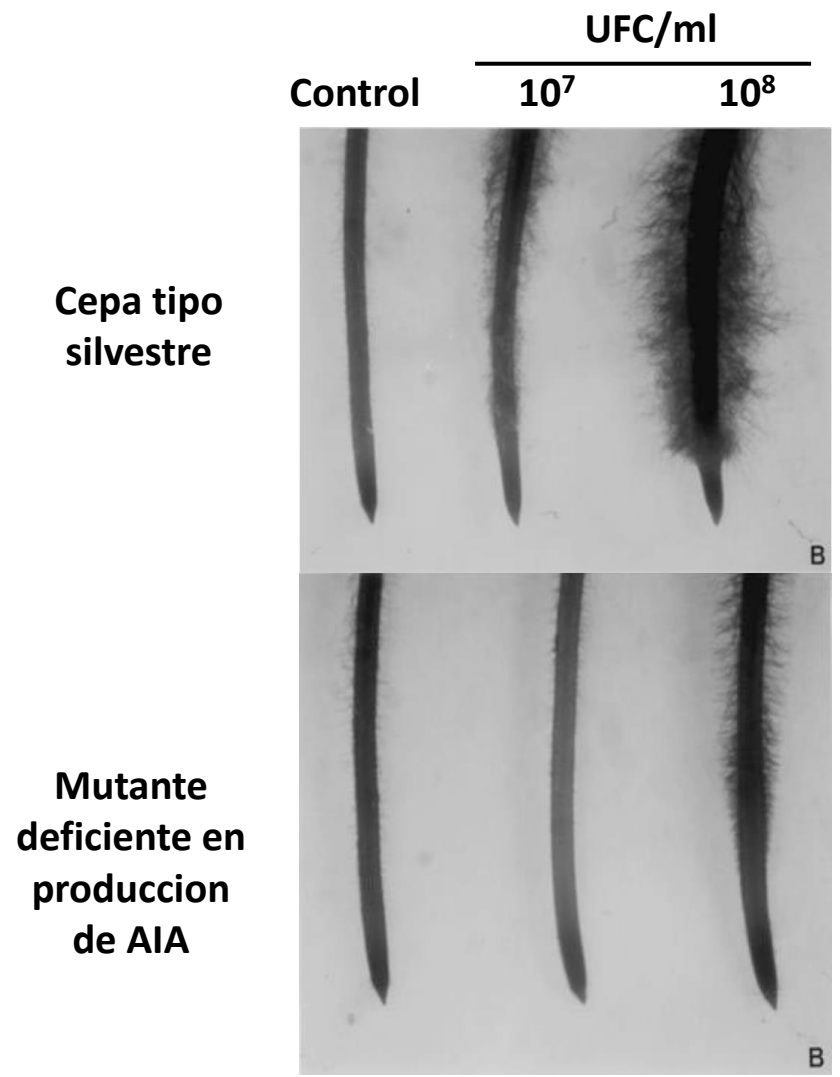
(Ramírez, 2010)

Cambios en la concentración o producción de hormonas Ácido Indol-acético (AIA)

Plant and Soil **212**: 155–164, 1999.

Phytostimulatory effect of *Azospirillum brasilense* wild type and mutant strains altered in IAA production on wheat

Sofie Dobbelaere, Anja Croonenborghs, Amber Thys, Ann Vande Broek and Jos Vanderleyden*
F.A. Janssens Laboratory of Genetics, Katholieke Universiteit Leuven, Kardinaal Mercierlaan 92, B-3001 Heverlee, Belgium



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Universidad de Antioquia

camilo.ramirez@udea.edu.co