Relaciones hidricas de las plantas:

Relaciones hidricas de las plantas

- Absorcion de agua por las raices
- Transporte de agua por el xilema
- Movimiento del agua desde las hojas hasta la atmosfera
- Medicion del estado hidrico de las plantas

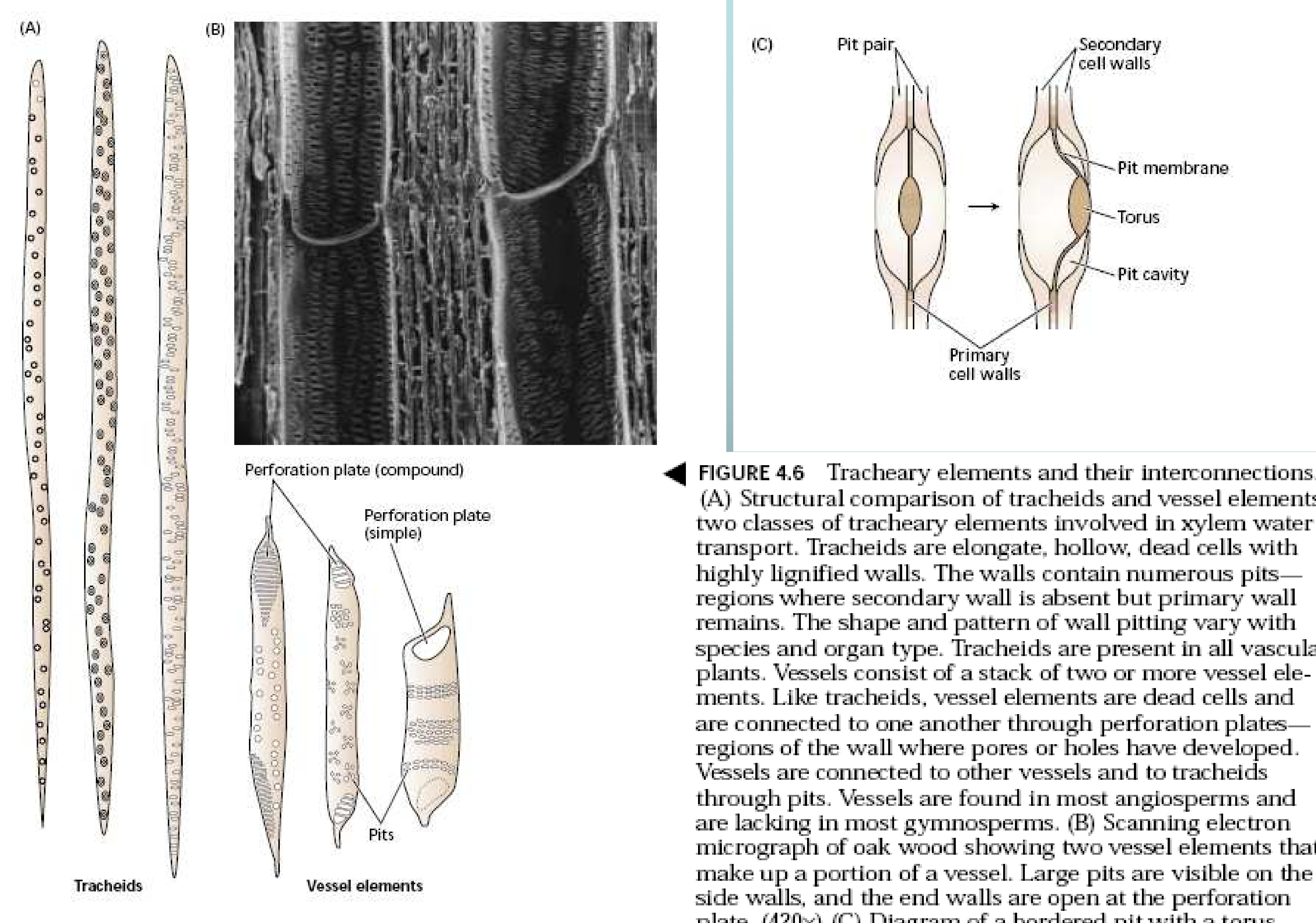


FIGURE 4.6 Tracheary elements and their interconnections. (A) Structural comparison of tracheids and vessel elements, two classes of tracheary elements involved in xylem water transport. Tracheids are elongate, hollow, dead cells with highly lignified walls. The walls contain numerous pits—regions where secondary wall is absent but primary wall remains. The shape and pattern of wall pitting vary with species and organ type. Tracheids are present in all vascular plants. Vessels consist of a stack of two or more vessel elements. Like tracheids, vessel elements are dead cells and are connected to one another through perforation plates—regions of the wall where pores or holes have developed. Vessels are connected to other vessels and to tracheids through pits. Vessels are found in most angiosperms and are lacking in most gymnosperms. (B) Scanning electron micrograph of oak wood showing two vessel elements that make up a portion of a vessel. Large pits are visible on the side walls, and the end walls are open at the perforation plate. (420×) (C) Diagram of a bordered pit with a torus either centered in the pit cavity or lodged to one side of the cavity, thereby blocking flow. (B © G. Shih-R. Kessel/Visuals Unlimited; C after Zimmermann 1983.)

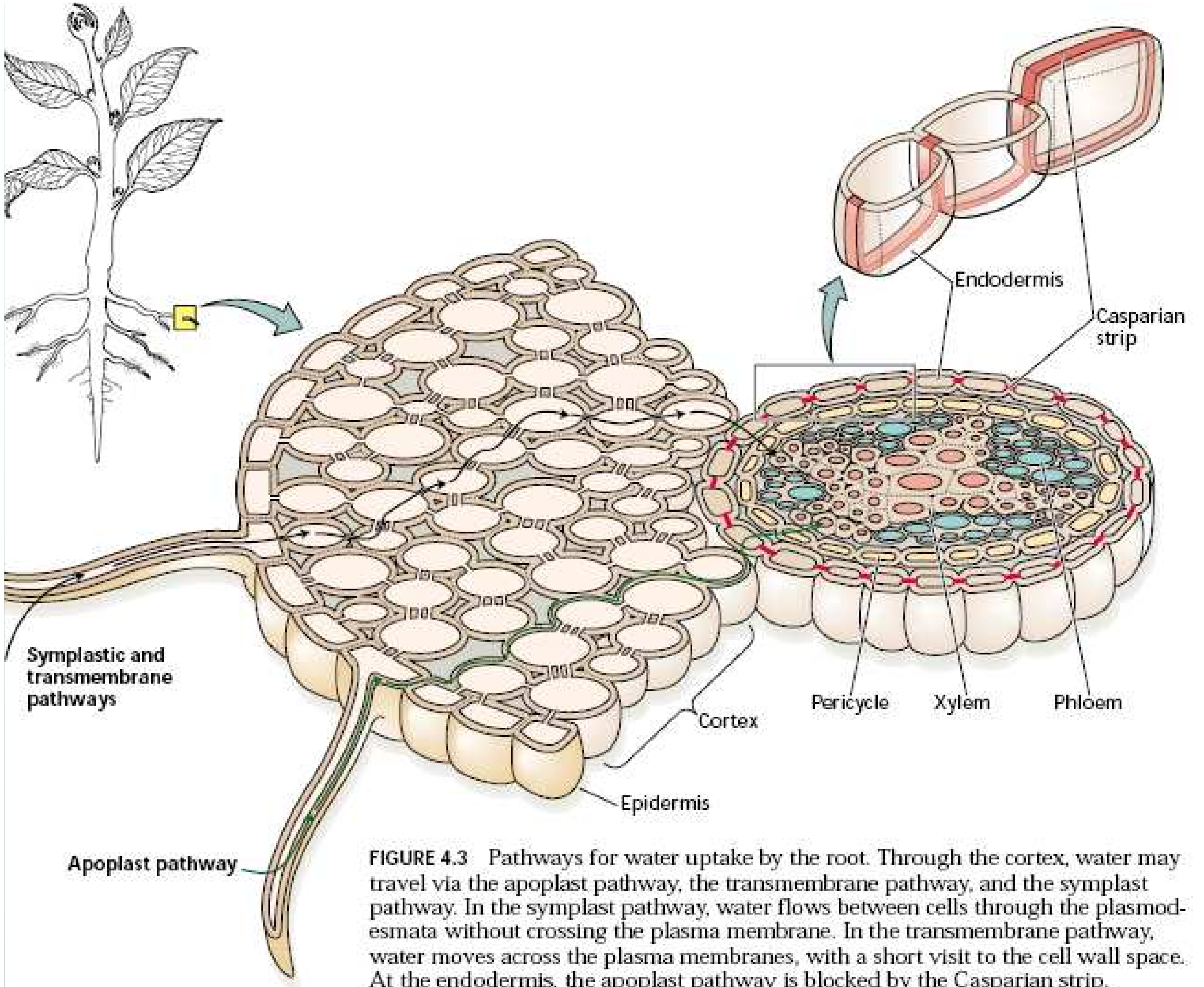


FIGURE 4.3 Pathways for water uptake by the root. Through the cortex, water may travel via the apoplast pathway, the transmembrane pathway, and the symplast pathway. In the symplast pathway, water flows between cells through the plasmodesmata without crossing the plasma membrane. In the transmembrane pathway, water moves across the plasma membranes, with a short visit to the cell wall space. At the endodermis, the apoplast pathway is blocked by the Casparian strip.

De la epidermis a la endodermis tres vias:

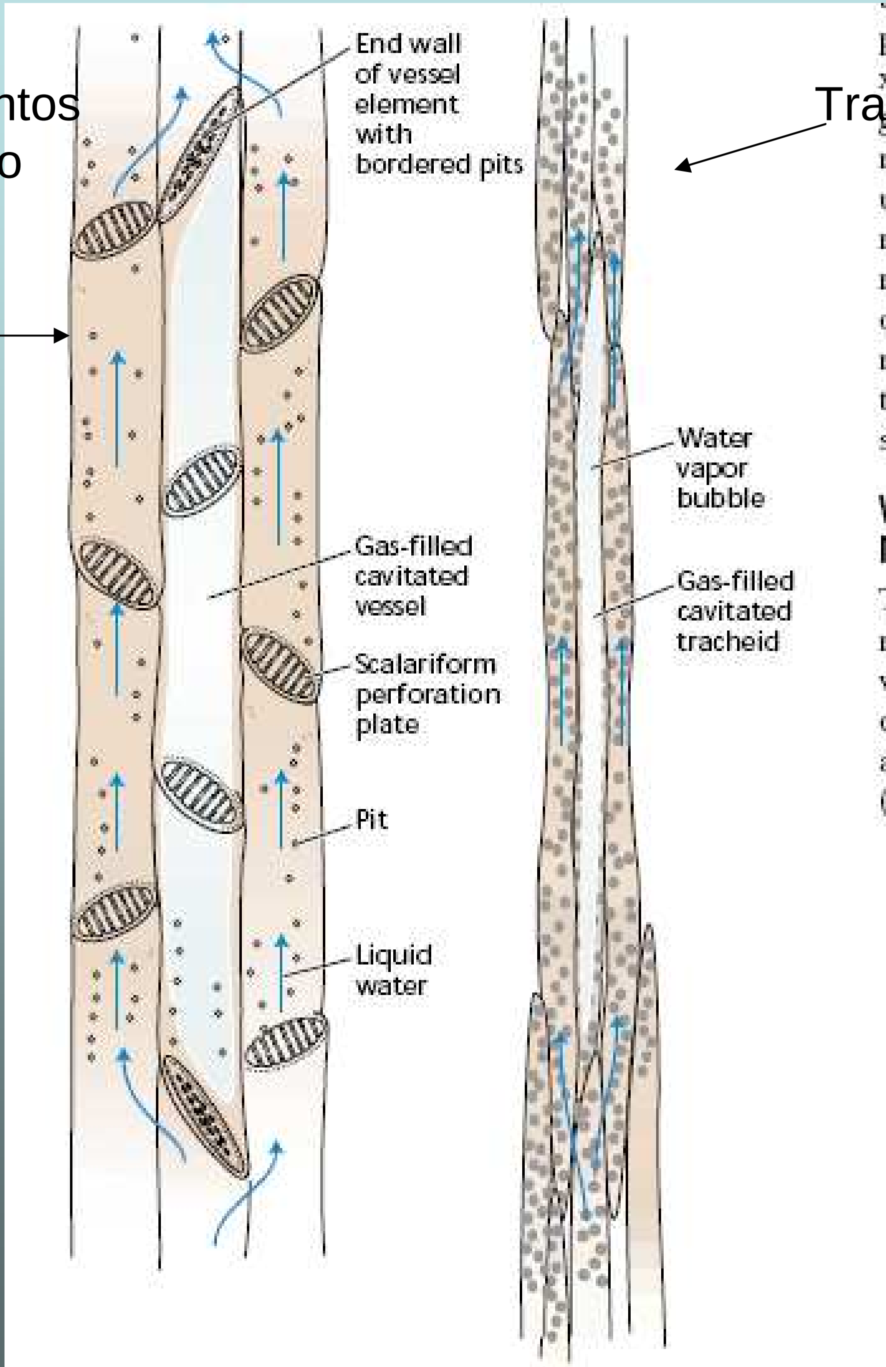
Apoplasto: sistema continuo de paredes celulares, espacios de aire intercelulares.

Simplasma: sistema de conexion de celulas por plasmodesmos

Camino tras membrana: el agua atraviesa al menos dos membranas

Elementos de vaso

Traqueida



Traqueidas y vasos forman una
serie de caminos paralelos
interconectados. La cavitacion que es
la formacion de burbujas de aire impide
movimiento de agua.
El agua se puede mover al lado de conductos
Bloqueados a través de agujeros de interconexio

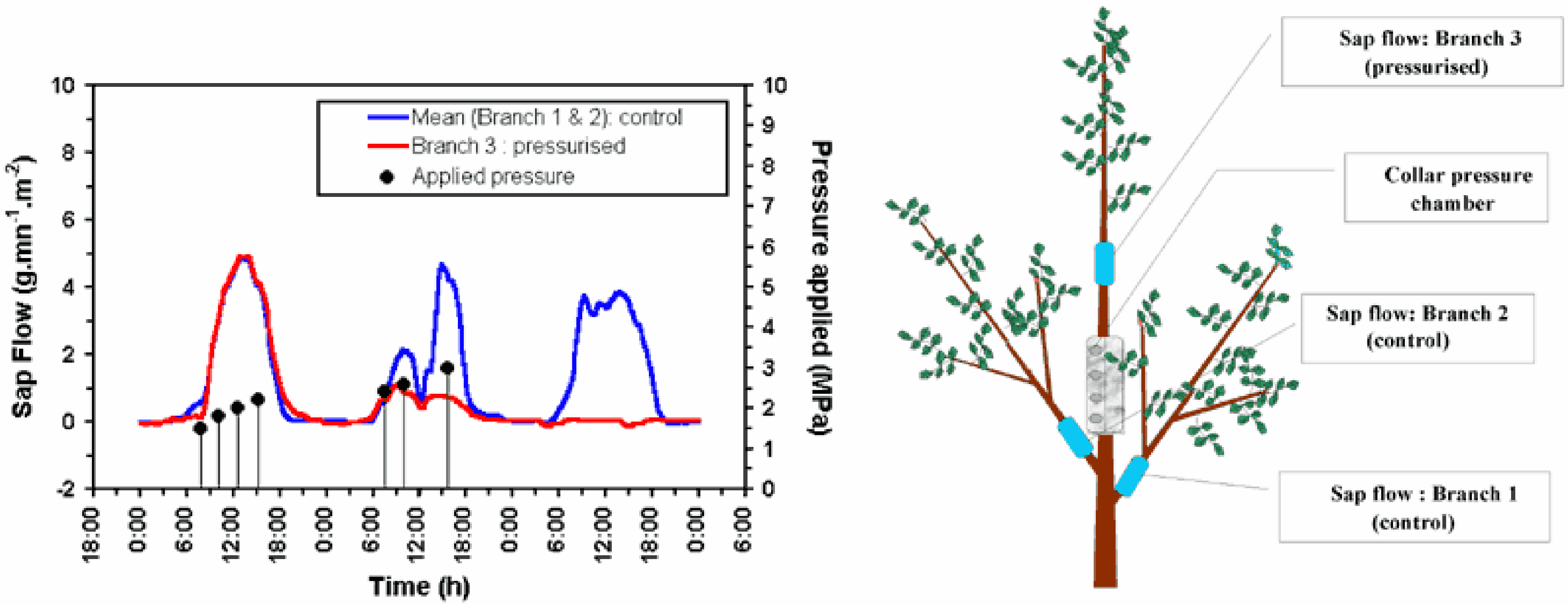
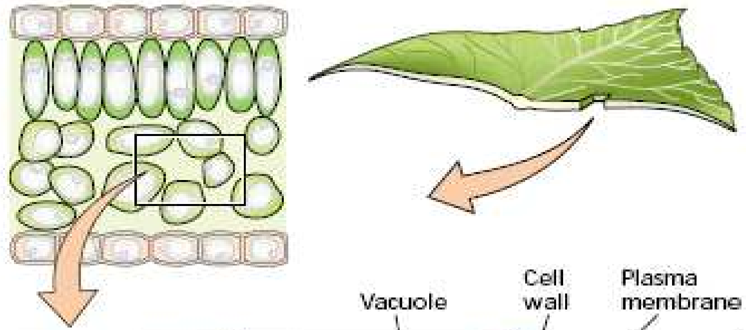
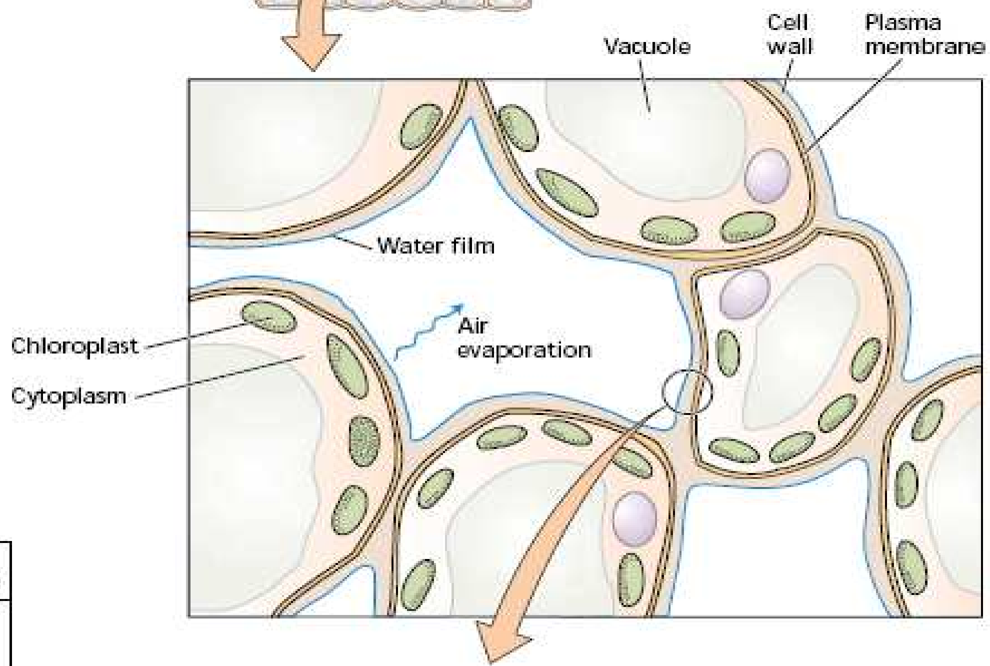


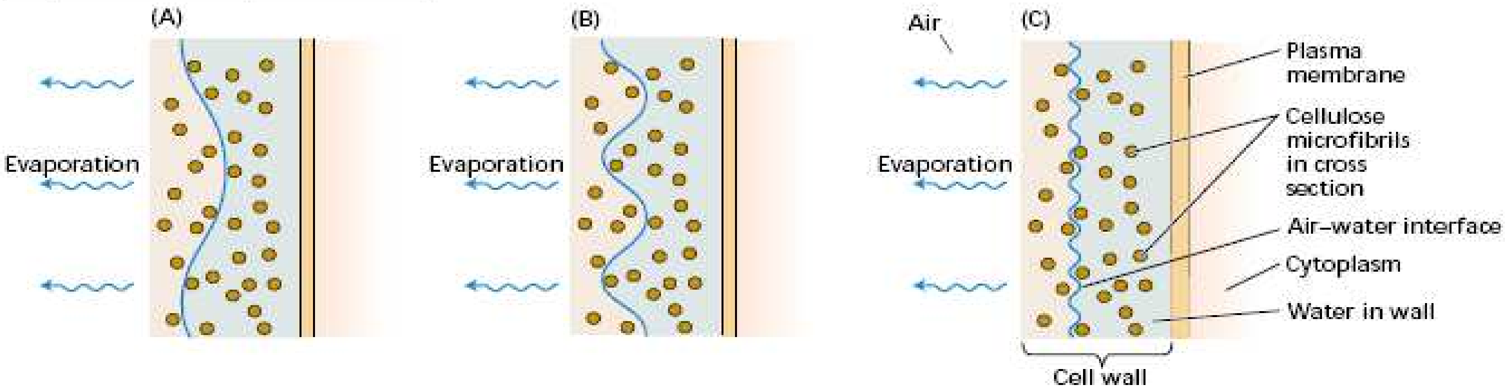
Figure 1 Indirect measurement of cavitation in experiments using a collar pressure chamber in a walnut tree. The collar pressure chamber provides a way to generate external pressure on a portion of a branch. This external pressure, applied for 2 min. intervals in these experiments, is transmitted within the conducting system, and it can induce different degrees of cavitation. During the first day, a pressure of 1 to 2MPa was applied without any effect on the sap flow. On the second day, higher pressure were applied and no changes in sap flow were observed below pressures of 2.4 MPa. For pressures between 2.4 and 2.6 MPa, some cavitation was induced, as shown by the reduction of the sap flow, as compared with the control branches. Around 4 PM a pressure of 3 MPa was applied. For walnut, the vessels are completely cavited at this pressure and no more sap flow occurrs. No sap flow was observed through the pressured branch on the third day, indicated that the discountinuity of the water column caused by cavitation was permanent (Ameglio et al. 1994).

FIGURE 4.9 Tensions or negative pressures originate in leaves. As water evaporates from the surface film that covers the cell walls of the mesophyll, water withdraws farther into the interstices of the cell wall, and surface tension causes a negative pressure in the liquid phase. As the radius of curvature decreases, the pressure decreases (becomes more negative), as calculated from Equation 4.1.





	Radius of curvature (μm)	Hydrostatic pressure (MPa)
(A)	0.5	−0.3
(B)	0.05	−3
(C)	0.01	−15



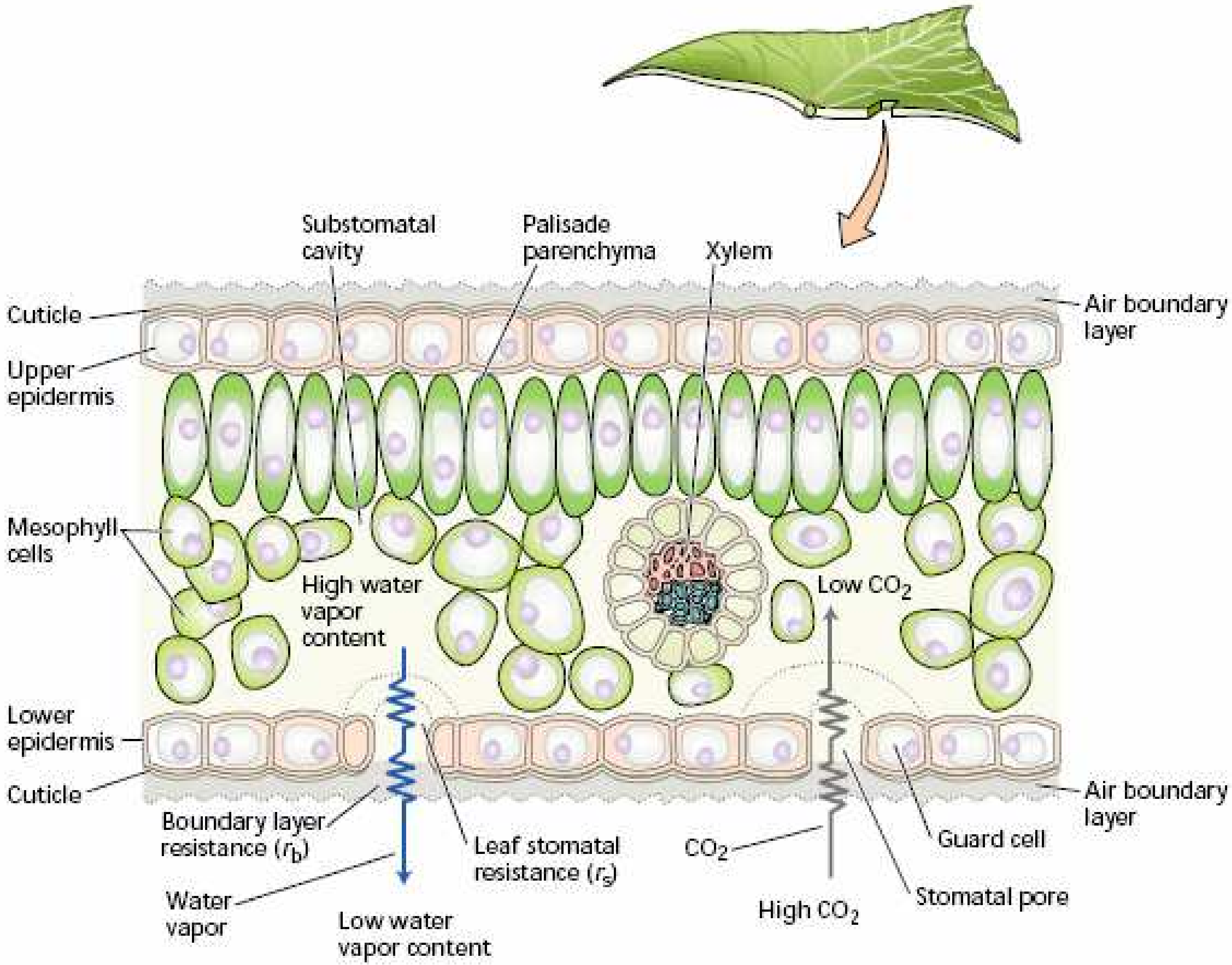


FIGURE 4.10 Water pathway through the leaf. Water is pulled from the xylem into the cell walls of the mesophyll, where it evaporates into the air spaces within the leaf. Water vapor then diffuses through the leaf air space, through the stomatal pore, and across the boundary layer of still air found next to the leaf surface. CO_2 diffuses in the opposite direction along its concentration gradient (low inside, higher outside).

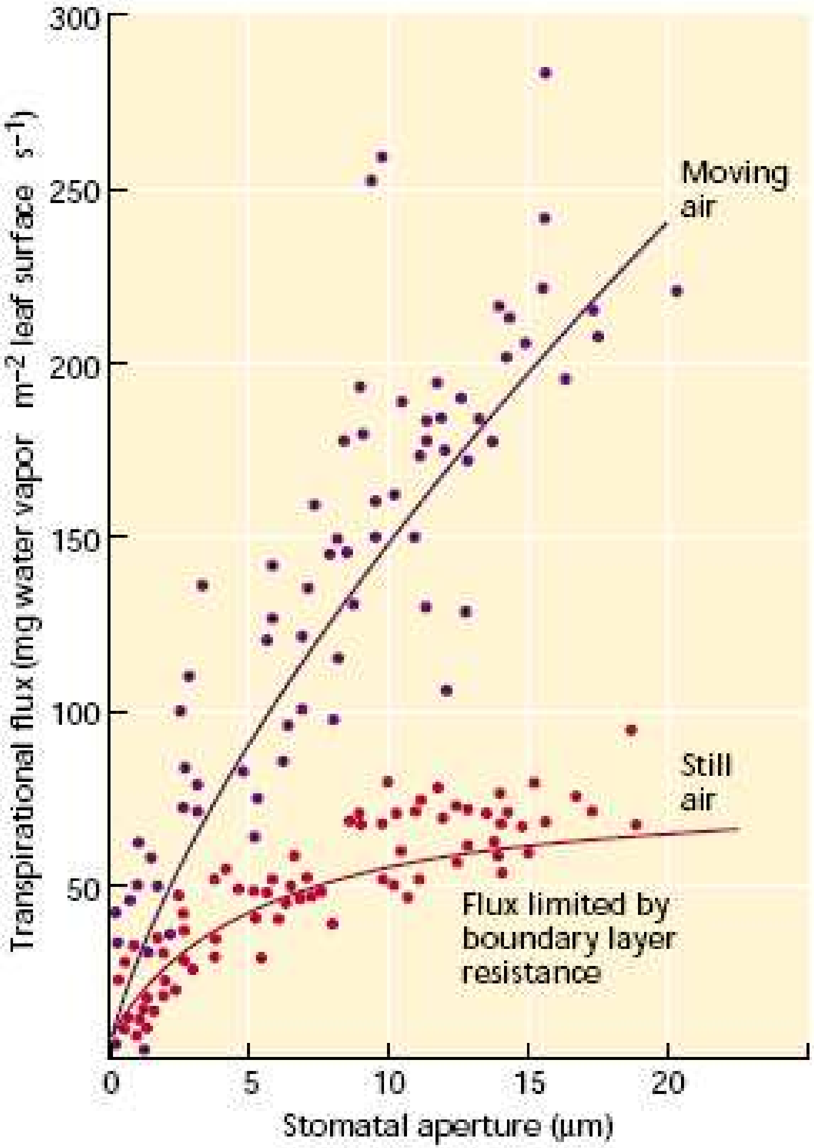
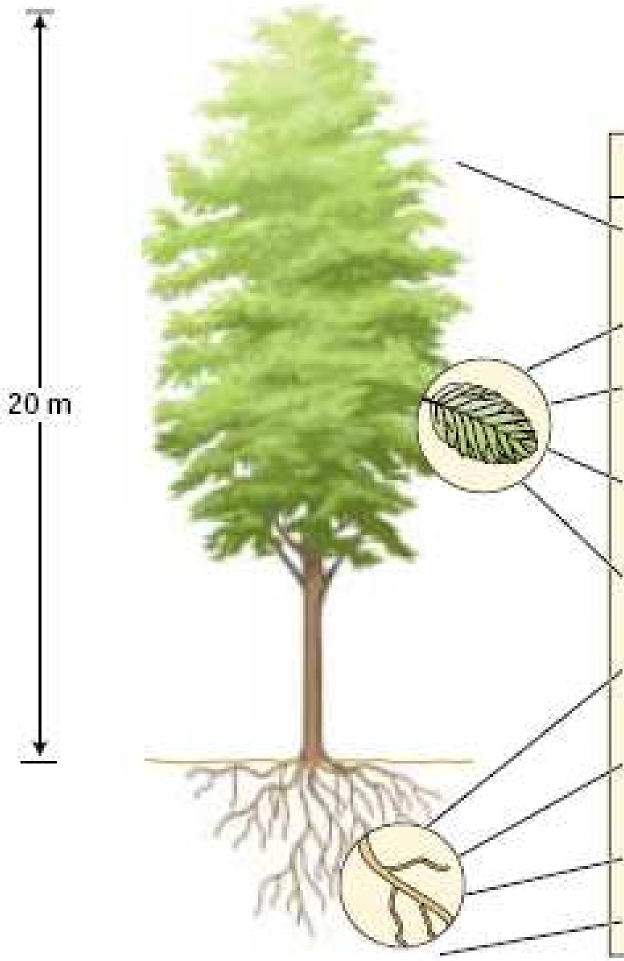


FIGURE 4.12 Dependence of transpiration flux on the stomatal aperture of zebra plant (*Zebrina pendula*) in still air and in moving air. The boundary layer is larger and more rate limiting in still air than in moving air. As a result, the stomatal aperture has less control over transpiration in still air. (From Bange 1953.)

TABLE 4.2
Representative values for relative humidity, absolute water vapor concentration, and water potential for four points in the pathway of water loss from a leaf

Location	Relative humidity	Water vapor	
		Concentration (mol m^{-3})	Potential (MPa)[a]
Inner air spaces (25°C)	0.99	1.27	–1.38
Just inside stomatal pore (25°C)	0.95	1.21	–7.04
Just outside stomatal pore (25°C)	0.47	0.60	–103.7
Bulk air (20°C)	0.50	0.50	–93.6

Source: Adapted from Nobel 1999.
Note: See Figure 4.10.
[a]Calculated using Equation 4.5.2 in Web Topic 4.5; with values for $RT/\bar{V}_w$ of 135 MPa at 20°C and 137.3 MPa at 25°C.



Location	Water potential and its components (in MPa)				
	Water potential (Ψ_w)	Pressure (Ψ_p)	Osmotic potential (Ψ_s)	Gravity (Ψ_g)	Water potential in gas phase $\left(\frac{RT}{\bar{V}_w} \ln [RH]\right)$
Outside air (relative humidity = 50%)	–95.2				–95.2
Leaf internal air space	–0.8				–0.8
Cell wall of mesophyll (at 10 m)	–0.8	–0.7	–0.2	0.1	
Vacuole of mesophyll (at 10 m)	–0.8	0.2	–1.1	0.1	
Leaf xylem (at 10 m)	–0.8	–0.8	–0.1	0.1	
Root xylem (near surface)	–0.6	–0.5	–0.1	0.0	
Root cell vacuole (near surface)	–0.6	0.5	–1.1	0.0	
Soil adjacent to root	–0.5	–0.4	–0.1	0.0	
Soil 10 mm from root	–0.3	–0.2	–0.1	0.0	

Valores del potencial hidrico en varios puntos del recorrido del agua desde el suelo hasta la atmosfera

Expresión del potencial hídrico

$$\Psi = P + \pi + \tau$$

P = presión hidrostática o potencial de turgor
π = potencial osmótico
τ = potencial matricial

Comparado a los valores simplásmicos de P y π el valor de τ es muy pequeño.

En el apoplasto el componente dominante del Ψ es P. En el equilibrio El Ψ en el simplama es similar al del apoplasma.

Mediciones de potenciales hidricos

Técnicas psicrométricas

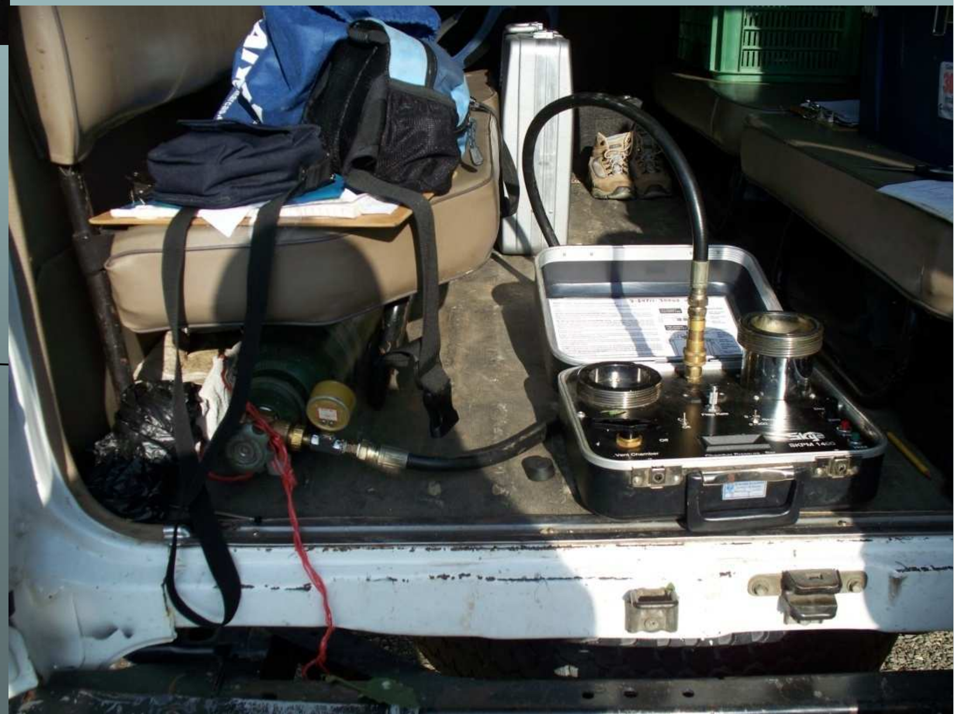
Técnica cámara de presión

Manguera a la bomba

Regulador entrada de aire

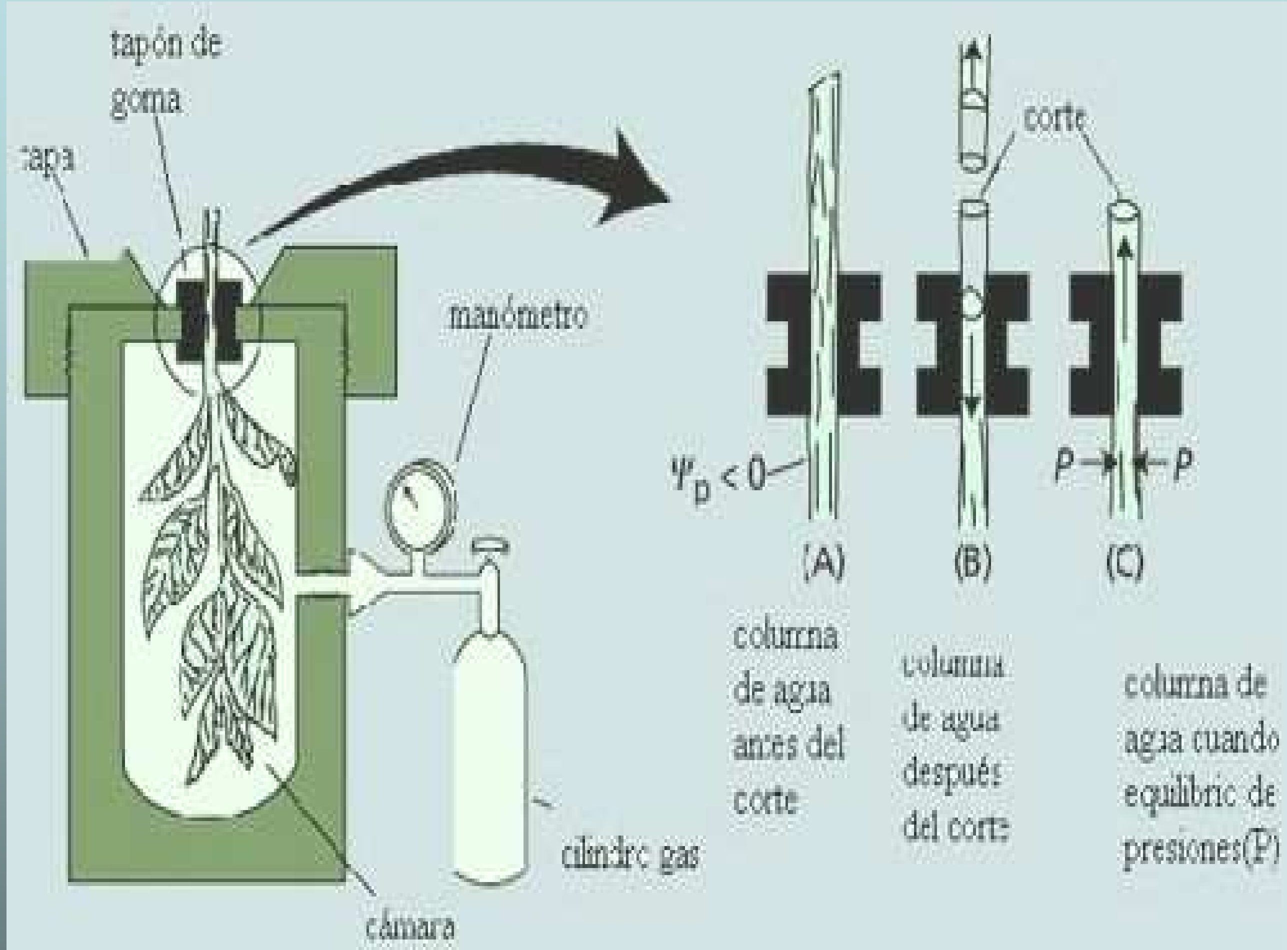
Bomba de presiòn

Entrada de aire o N



Mediciones deben ser realizadas
Inmediatamente después de haberse
Cortado las hojas.
La velocidad de presurización debe ser
lenta?


Free
Hold
0 - 20
Range
0 - 200
Flow Rate
SKPM 1400



Como varian los valores de potencial hidrico?

Cual es la variacion diaria?

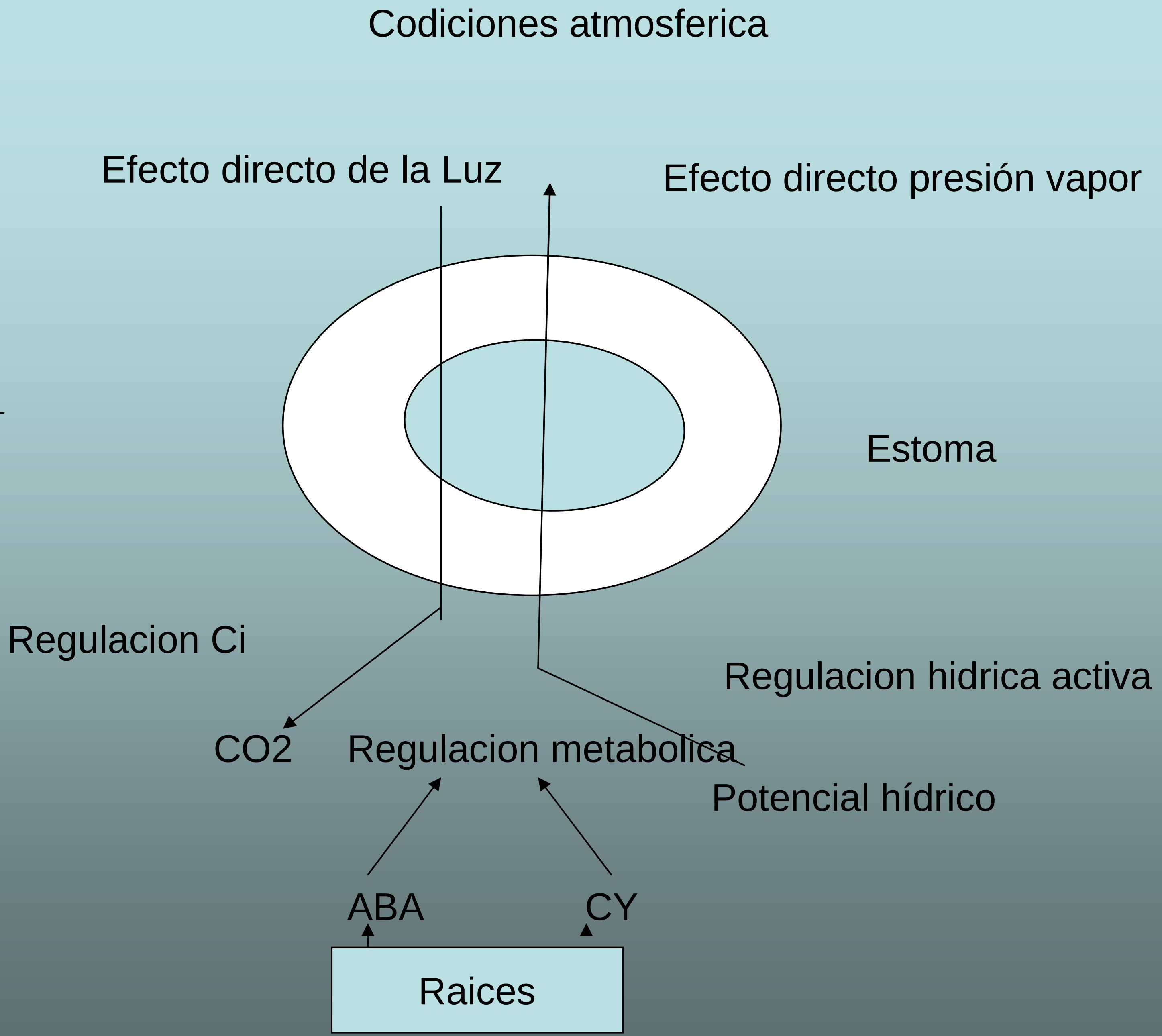
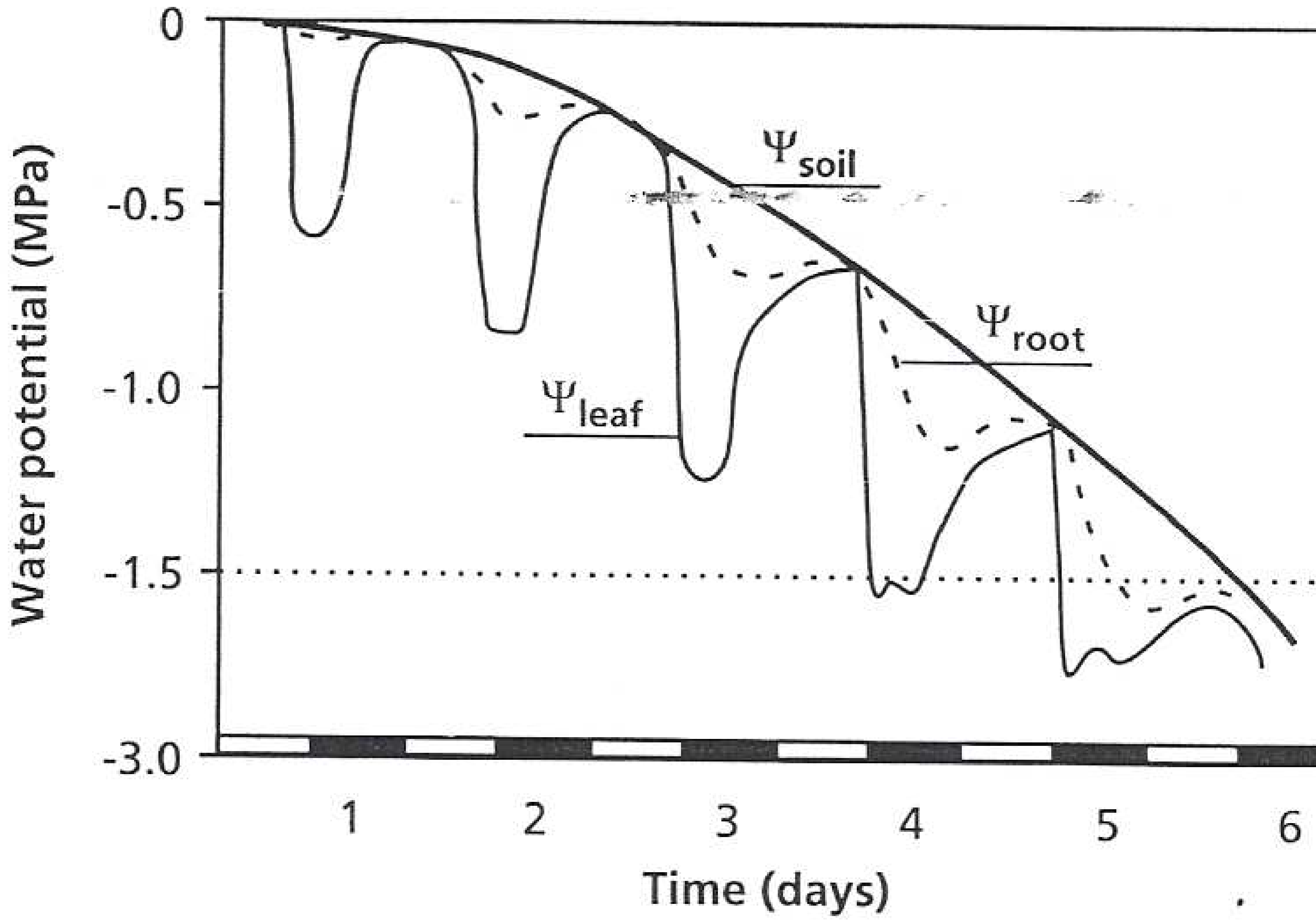
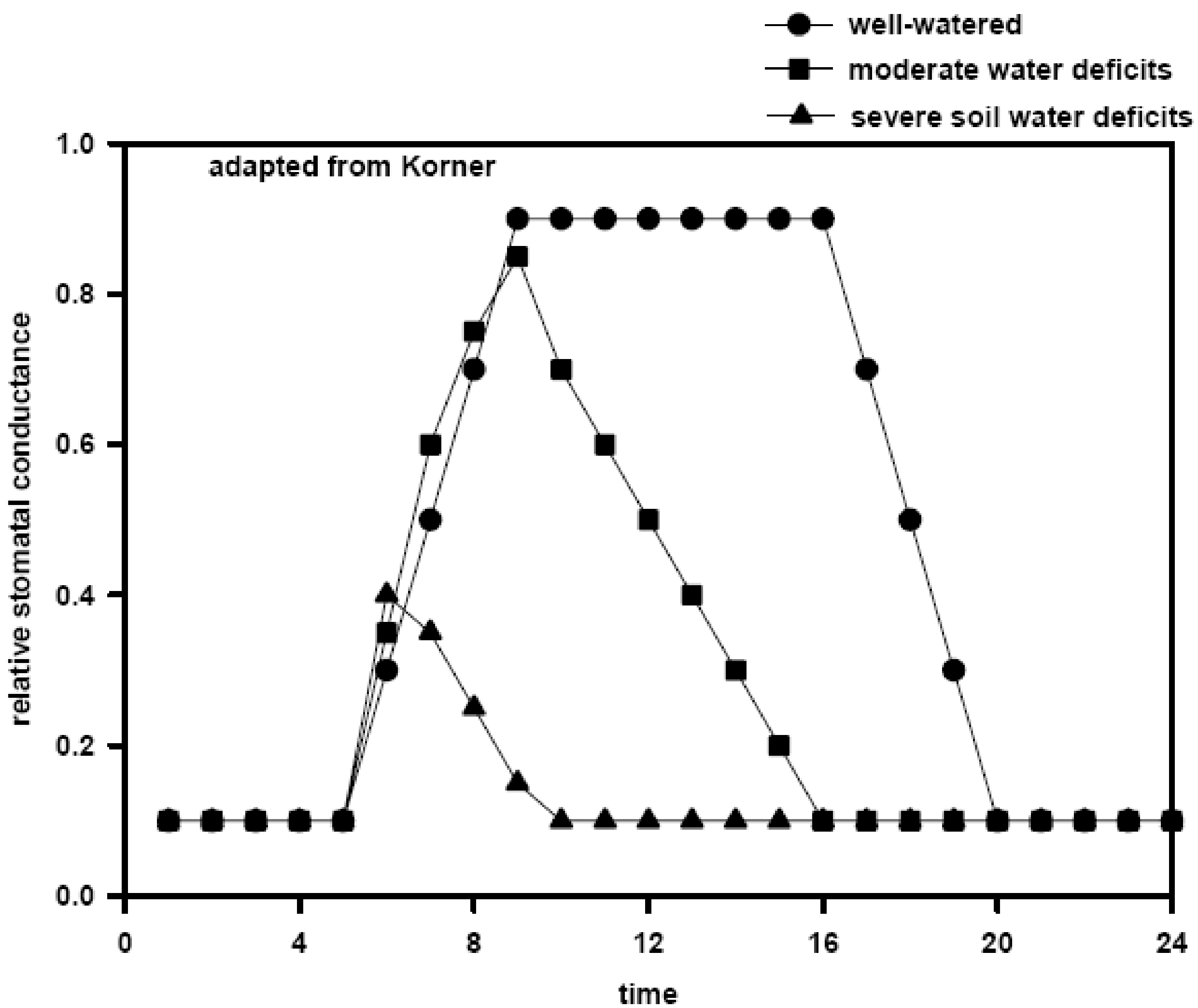


Diagrama:Regulacion fisiologica de la coductancia estomatica

Fuente: Nilse y Orcutt, 1996



Como varia el potencial hídrico del suelo, raíz y hoja con el déficit de agua en el tiempo

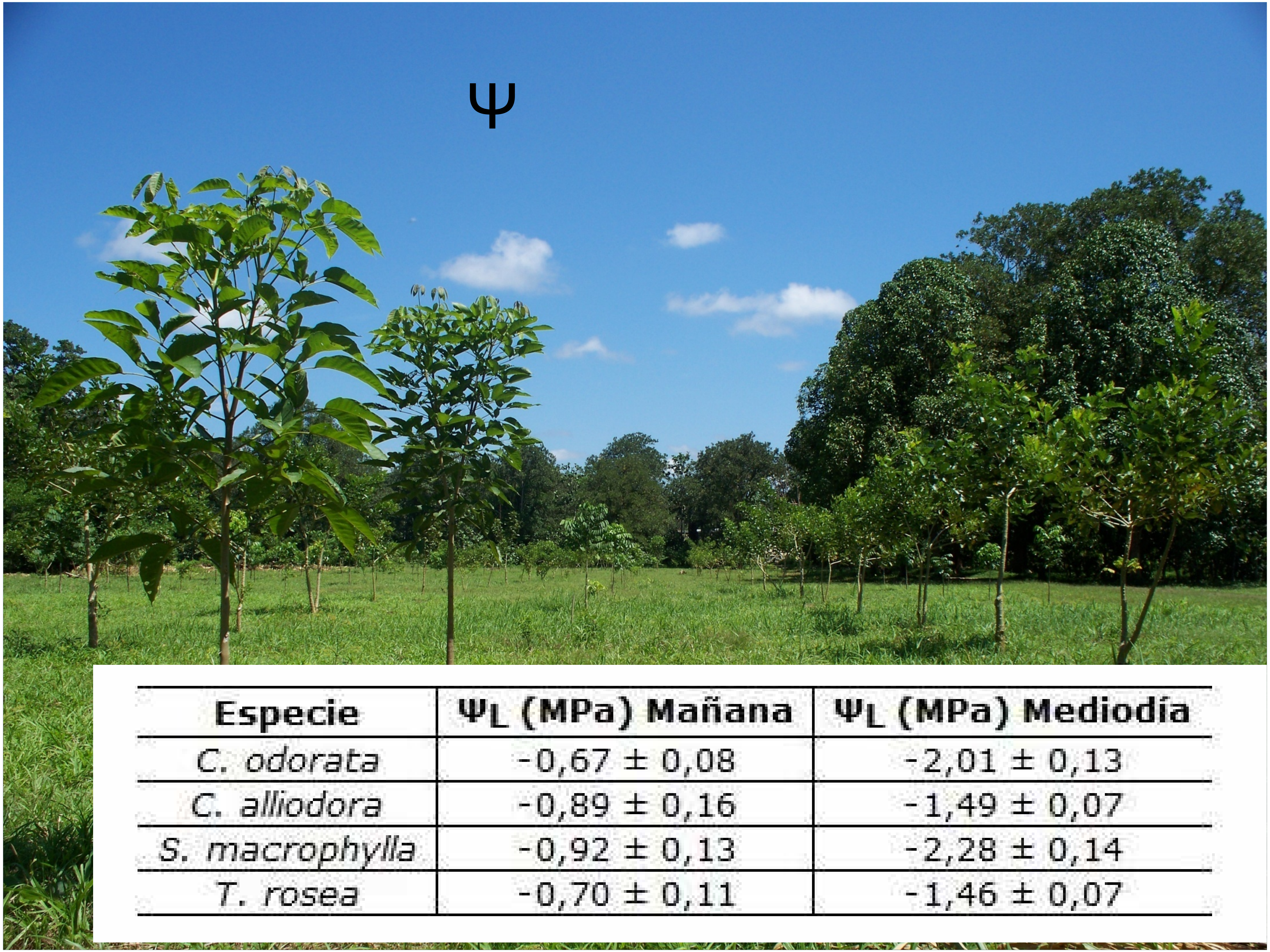


e 17 Conceptual diurnal pattern of stomatal conductance. (adapted from Korner, 1994) hìbrido

Hora	Tipo de dìa	Commandant	Mandarin	Porto
8:00 - 8:30	Soleado Nublado	-0,59 ± 0,06 -0,64 ± 0,05	-0,58 ± 0,06a -0,53 ± 0,04a	-0,53 ± 0,03a -0,58 ± 0,02a
13:00 - 14:00	Soleado Nublado	-1,34 ± 0,03a -1,20 ± 0,02b	-1,37 ± 0,06a -1,28 ± 0,02b	-1,36 ± 0,02 a -1,21 ± 0,02 b

Potenciales hìdricos foliares en tres hìbridos de Pimentòn en invernadero. Sartenejas Caracas

Ψ



Especie	Ψ_L (MPa) Mañana	Ψ_L (MPa) Mediodía
C. odorata	-0,67 ± 0,08	-2,01 ± 0,13
C. alliodora	-0,89 ± 0,16	-1,49 ± 0,07
S. macrophylla	-0,92 ± 0,13	-2,28 ± 0,14
T. rosea	-0,70 ± 0,11	-1,46 ± 0,07