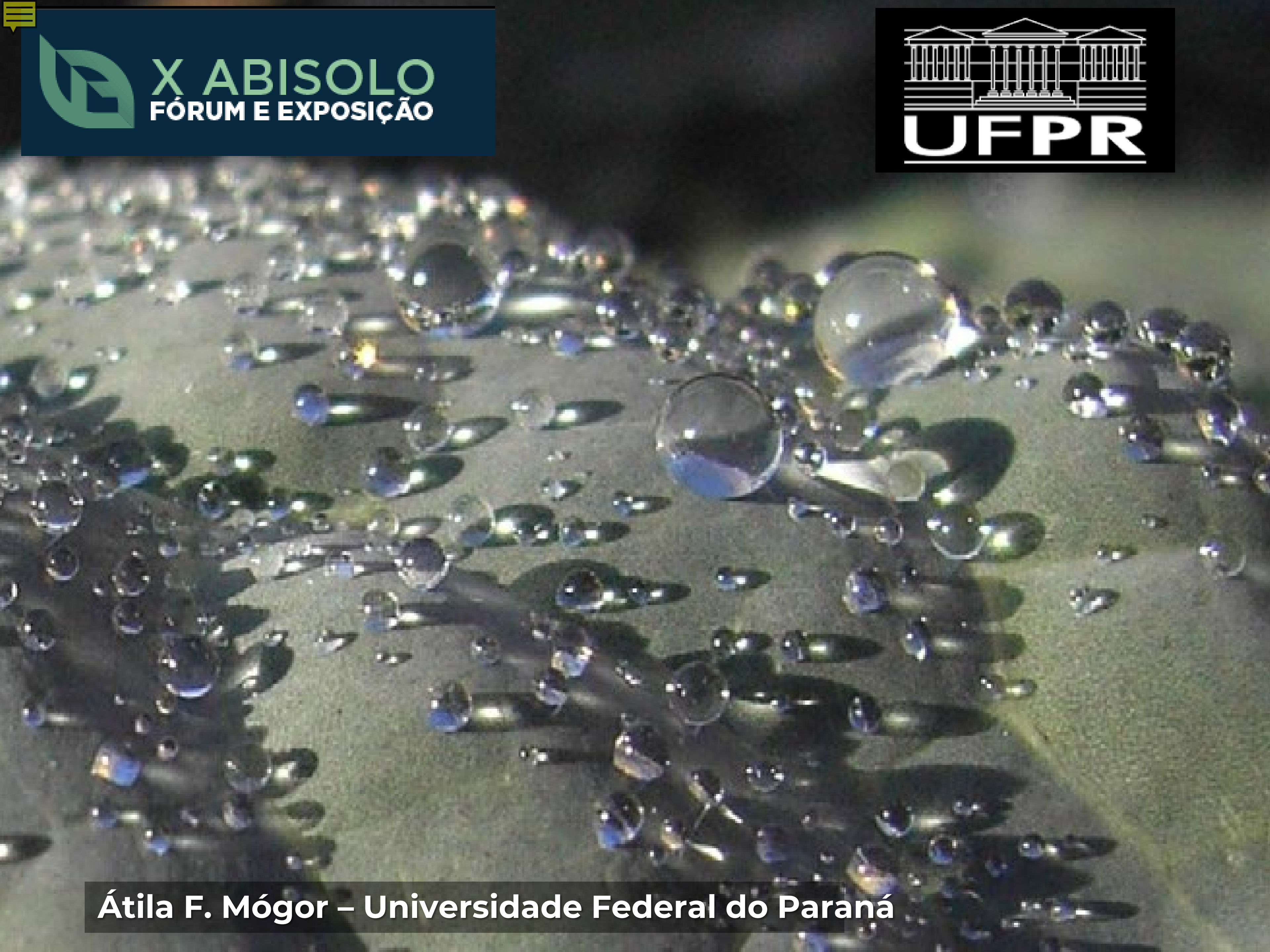




abisolo

Associação Brasileira das Indústrias de Tecnologia em Nutrição Vegetal

Aspectos fisiológicos da absorção foliar de nutrientes



X ABISOLO
FÓRUM E EXPOSIÇÃO

UFPR

Átila F. Mógor – Universidade Federal do Paraná

the plant journal

SEB SOCIETY FOR EXPERIMENTAL BIOLOGY

The Plant Journal (2021) **105**, 870–883 doi: 10.1111/tpj.15090

FOCUSED REVIEW

Foliar water and solute absorption: an update

Victoria Fernández[1,*], Eustaquio Gil-Pelegrín[2] and Thomas Eichert[3]

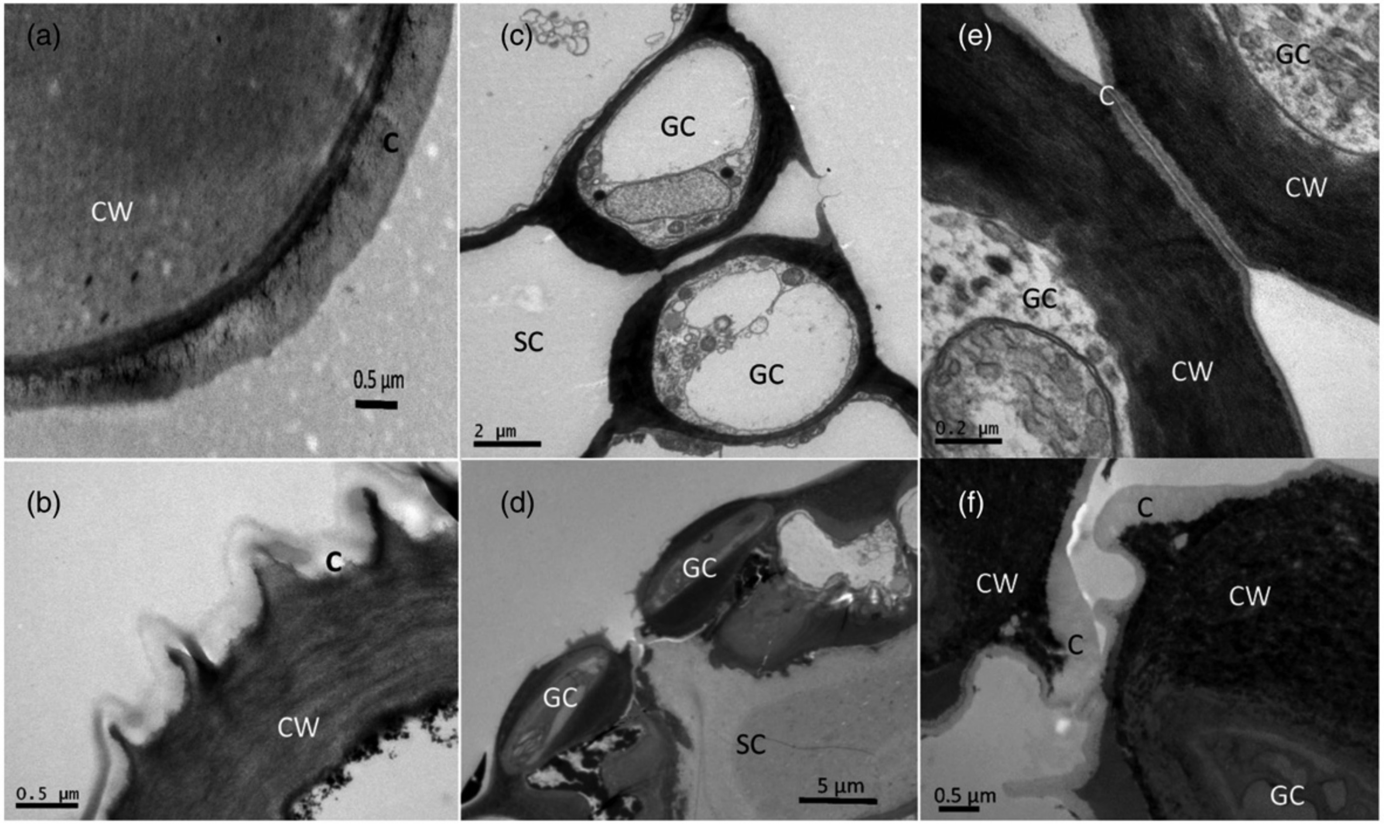
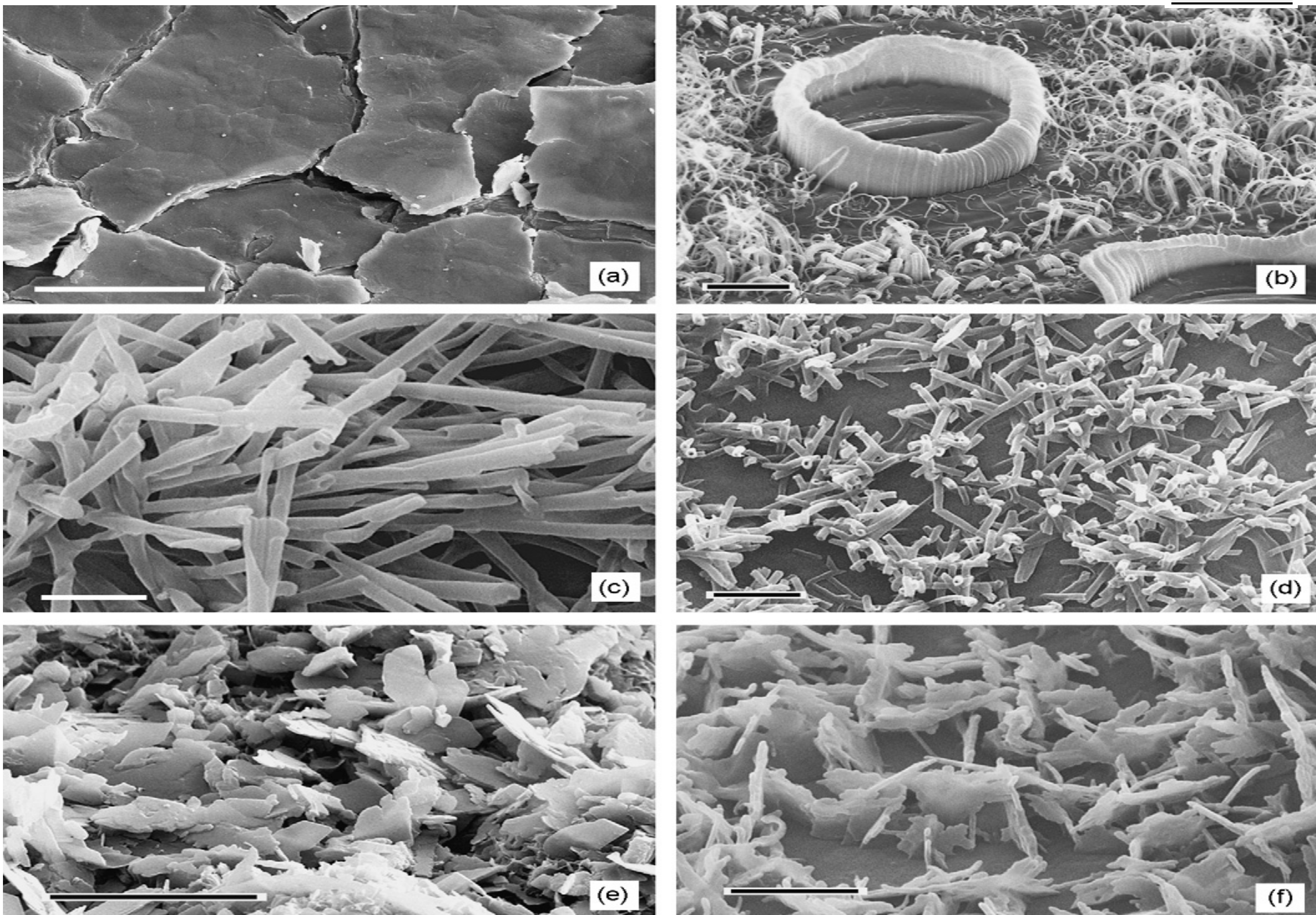


Figure 1. Examples of the characteristics of different plant surfaces covered with a cuticle

The hydrophobic coatings of plant surfaces: Epicuticular wax crystals and their morphologies, crystallinity and molecular self-assembly

micron



K. Koch, H.-J. Ensikat/Micron 39 (2008) 759–772

the plant journal
SEB SOCIETY FOR EXPERIMENTAL BIOLOGY
The Plant Journal (2021) **105**, 870–883 doi: 10.1111/tpj.15090

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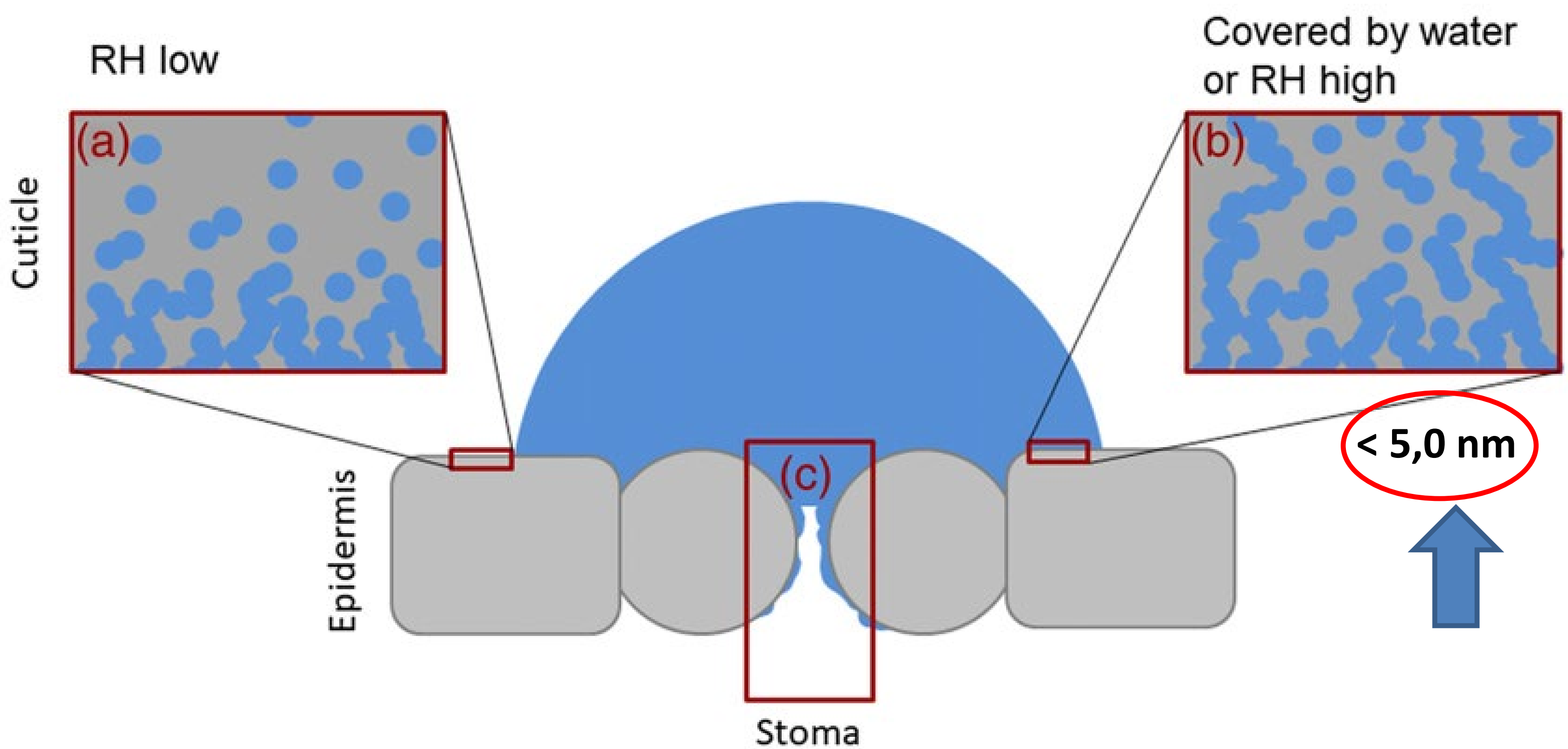
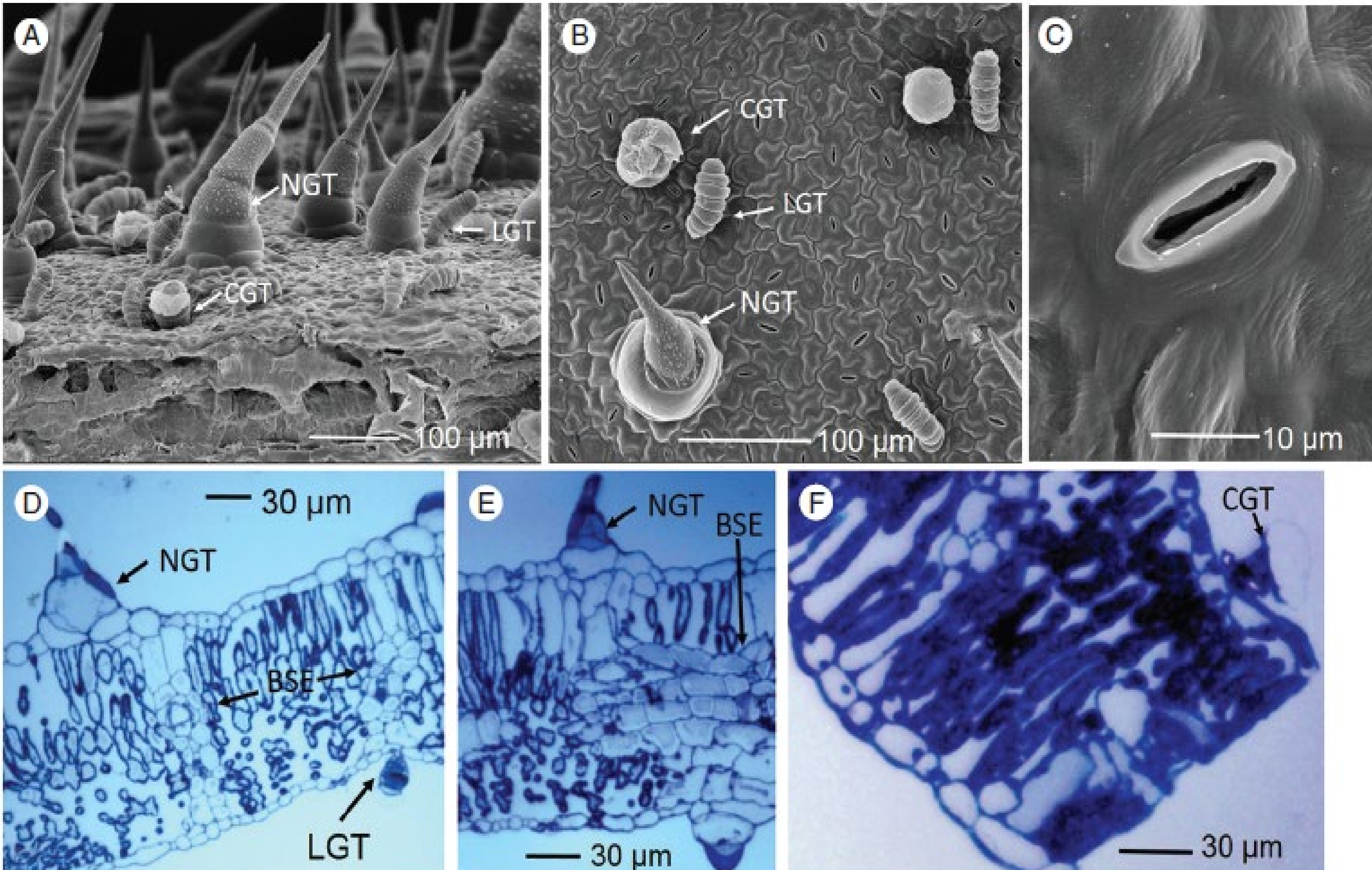
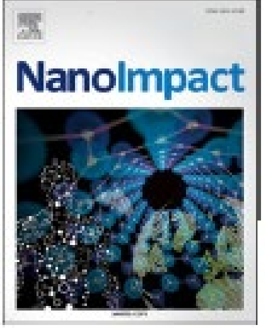


Annals of Botany **123**: 57–68, 2019
doi: 10.1093/aob/mcy135, available online at www.academic.oup.com/aob

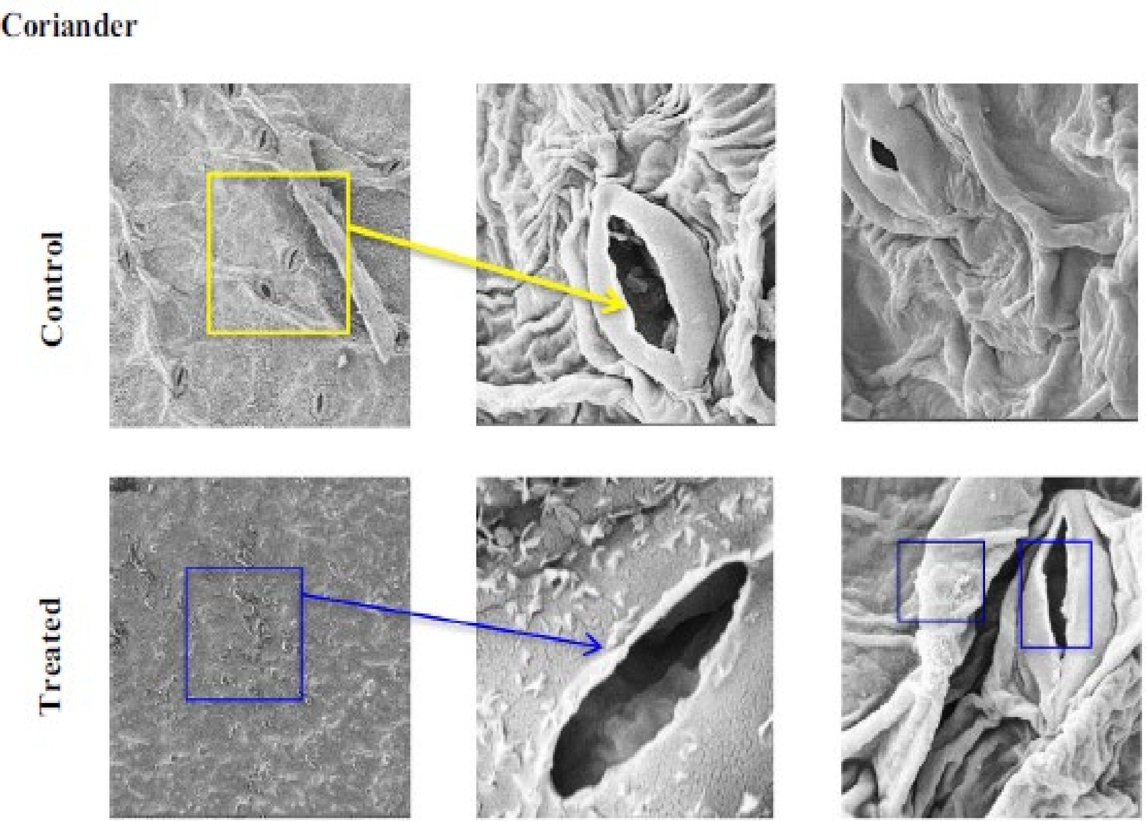


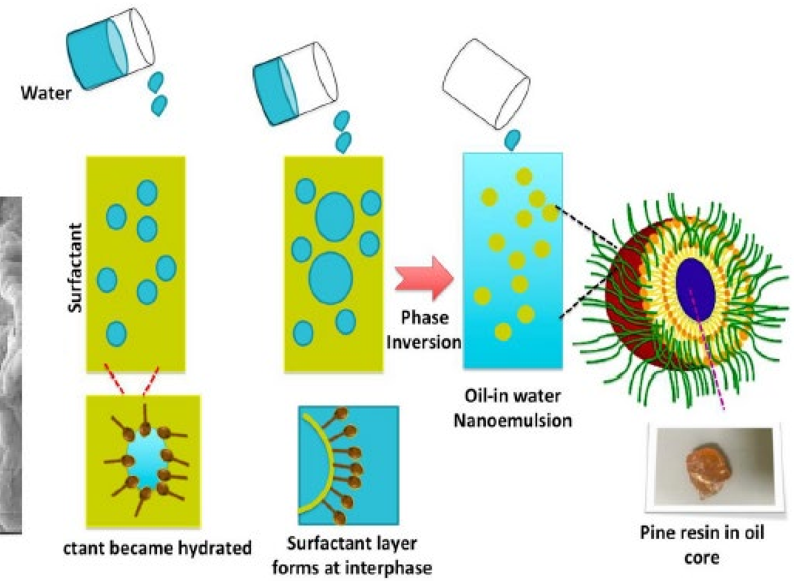


Analogous foliar uptake and leaf-to-root translocation of micelle nanoparticles in two dicot plants of diverse families

Smriti Kala[a,*], Chetan K.D. Jawle[a], Nisha Sogan[b], Amrish Agarwal[a], Krishna Kant[c], B.K. Mishra[c], Jitendra Kumar[a]

NanoImpact 28 (2022) 100431





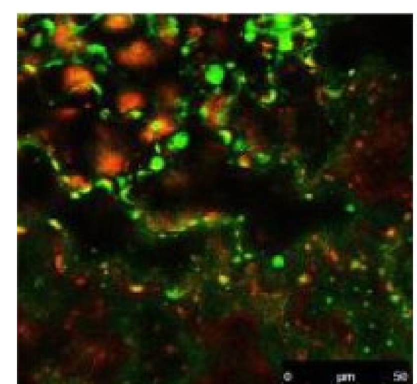
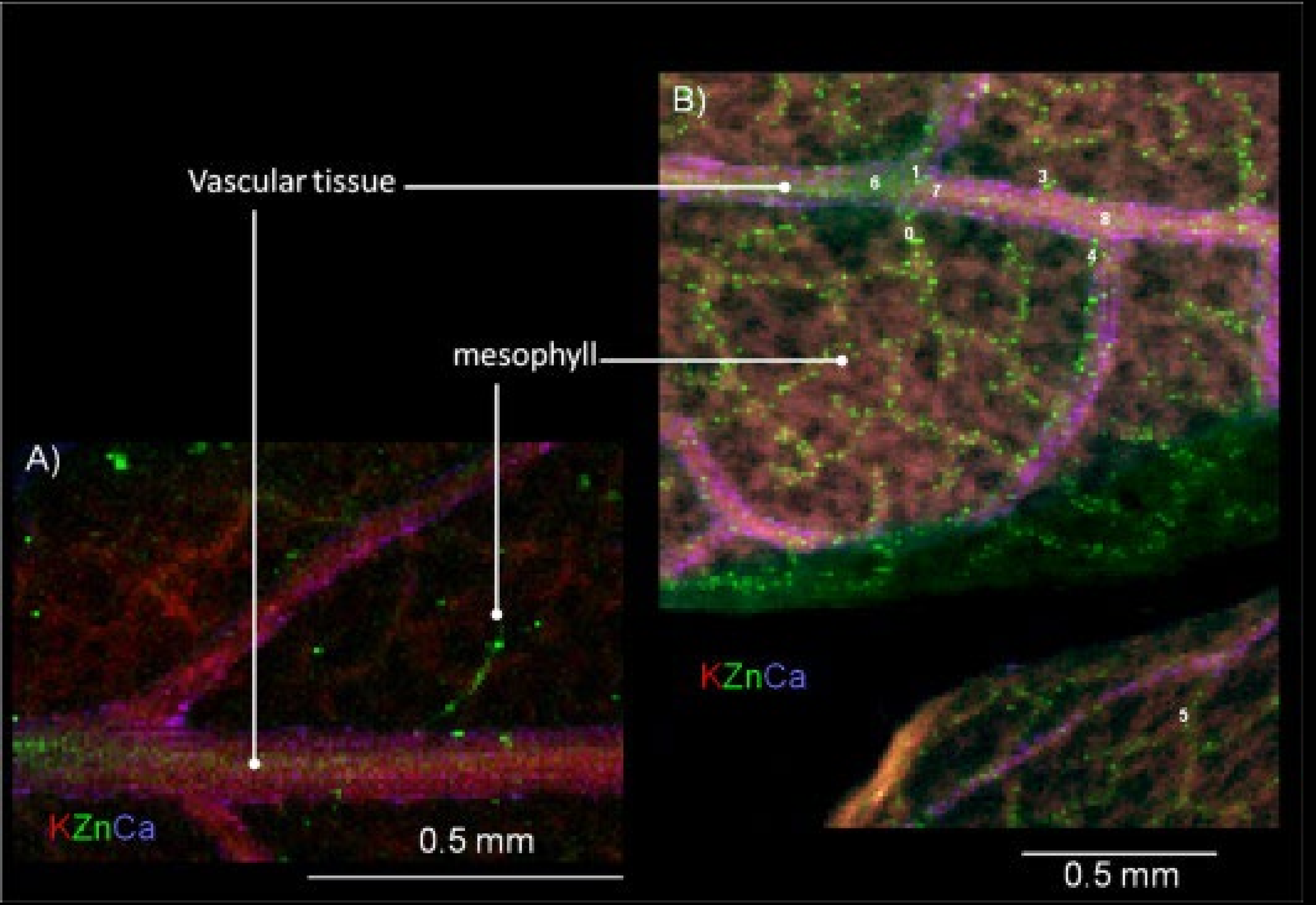
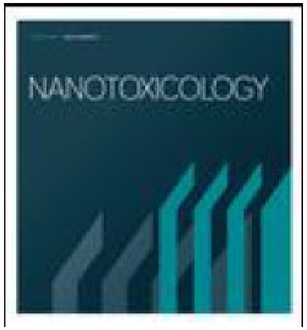


Fig. 2. a) Confocal images of nanomicelles. Confocal images showing translocation of **12 nm** fluorescently labelled nanoparticle by leaf.



Vascular tissue
mesophyll
A)
KZnCa
0.5 mm
B)
KZnCa
0.5 mm



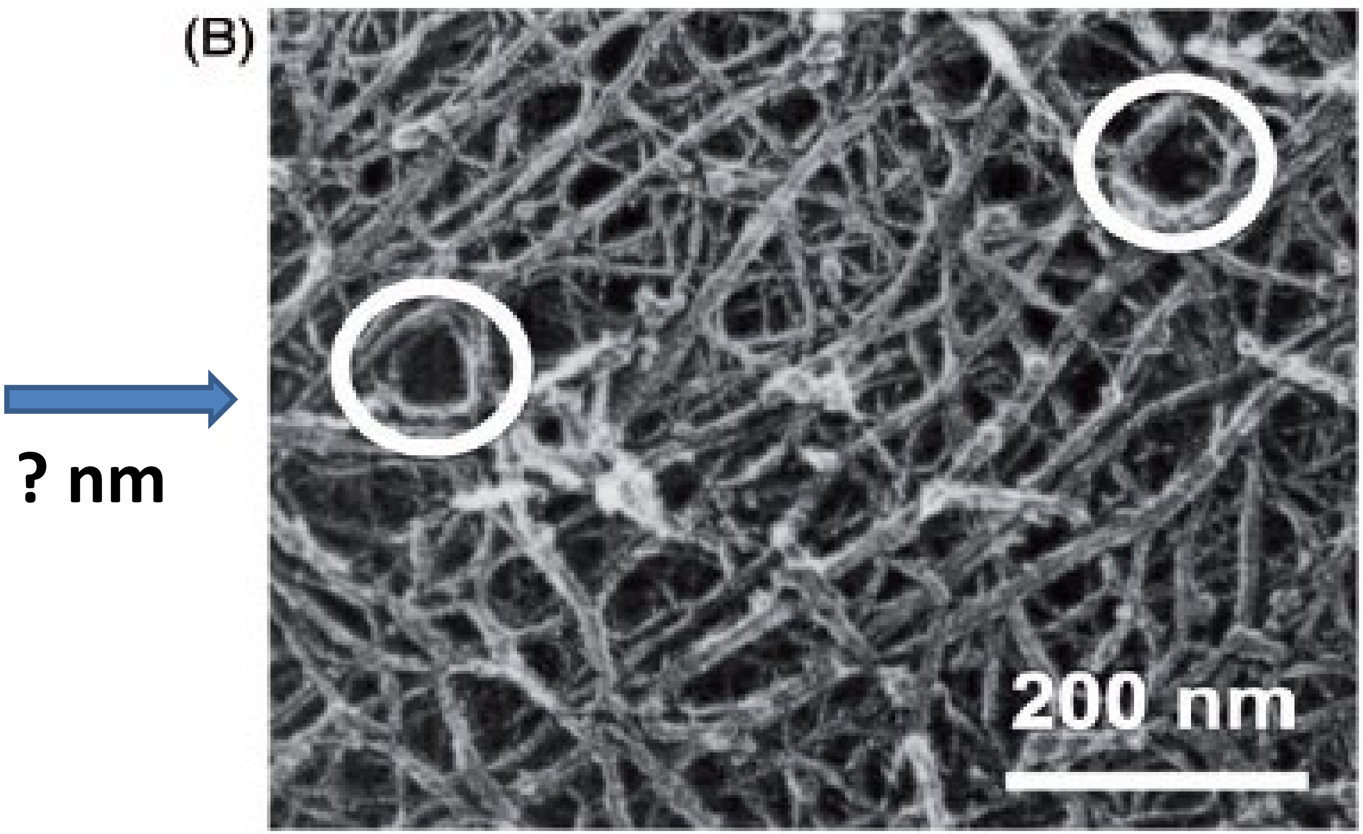
Nanotoxicology

Nanotoxicology, 2016; 10(3): 257–278

Taylor & Francis
Taylor & Francis Group

Barriers, pathways and processes for uptake, translocation and accumulation of nanomaterials in plants – Critical review

Fabienne Schwab, Guangshu Zhai, Meaghan Kern, Amalia Turner, Jerald L. Schnoor & Mark R. Wiesner



(B) Electron micrograph of **onion** cell wall cellulose fibers. http://jcs.biologists.

Electron Tomography of Cryo-Immobilized Plant Tissue

Purbasha Sarkar[1,2¤], Elena Bosneaga[1,2], Edgar G. Yap Jr.[2], Jyotirmoy Das[1], Wen-Ting Tsai[2],

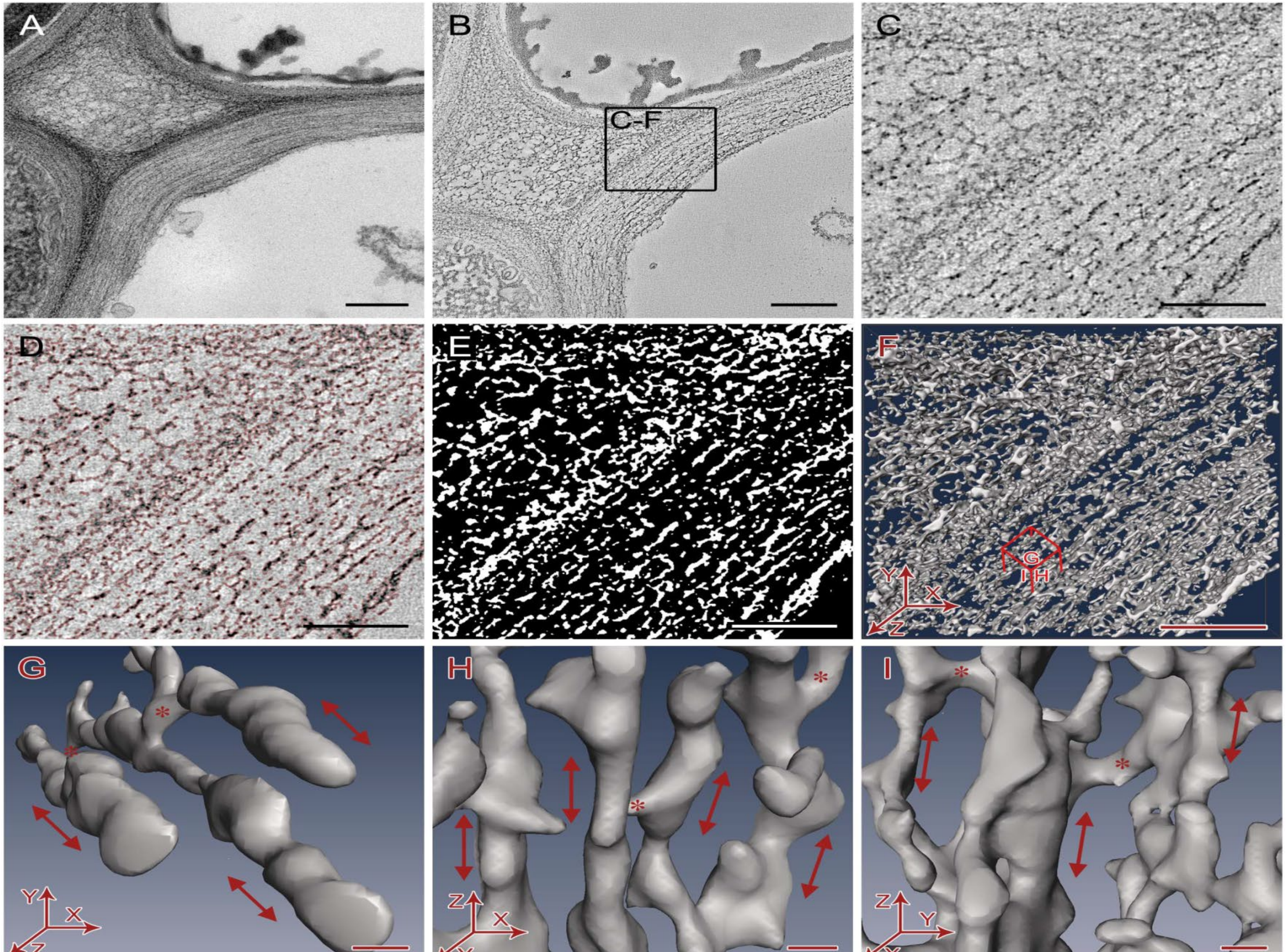
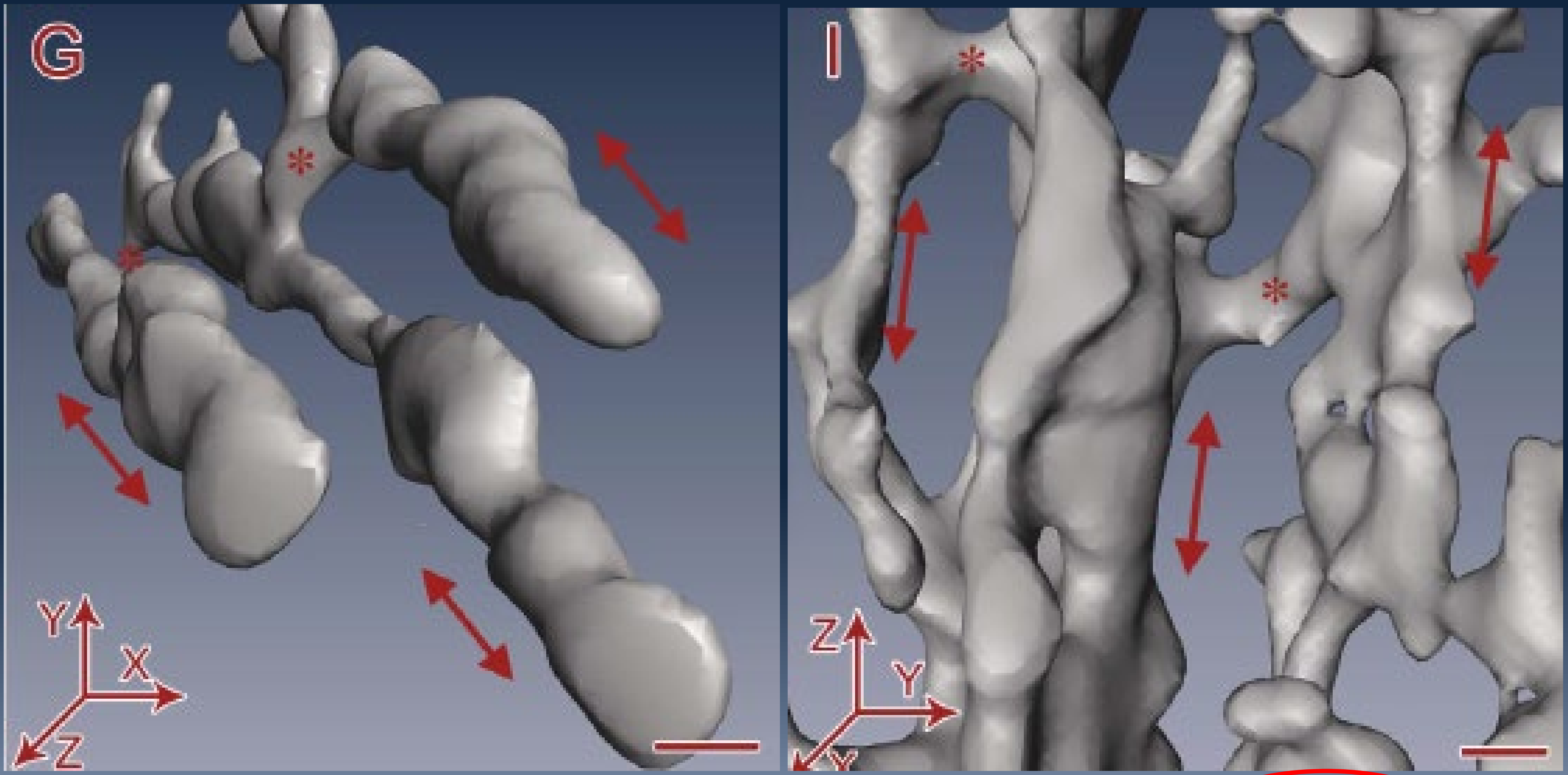


Figure 3. The electron tomography data collection and segmentation process used on Arabidopsis primary cell walls. September 2014 | Volume 9 | Issue 9 | e106928

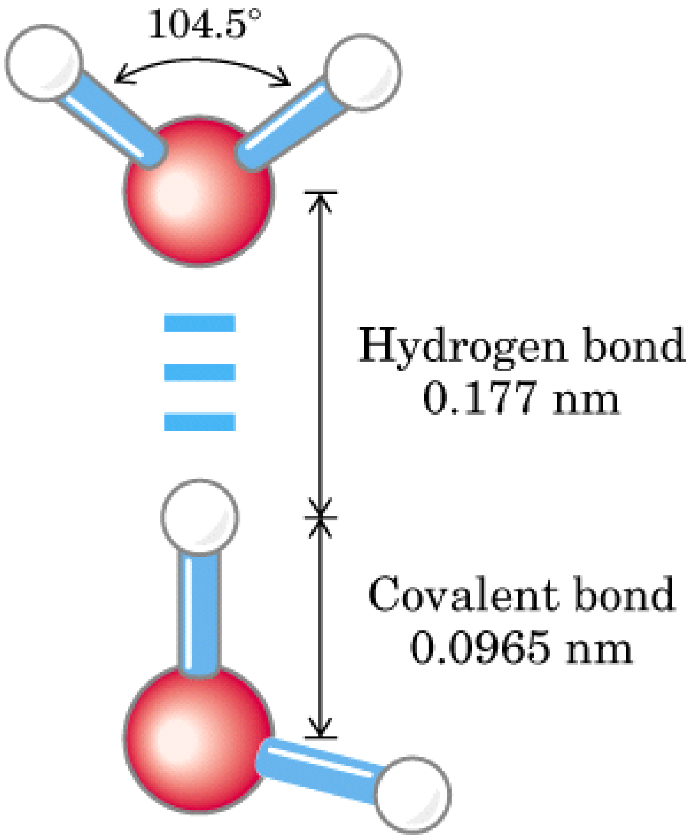


Diâmetro geralmente em torno de 15 nm, podendo variar de 6,0 a 40,0 nm

Nano-enabled agriculture: How do nanoparticles cross barriers in plants? https://doi.org/10.1016/j.xplc.2022.100346

Honghong Wu[1,2,3,*] and Zhaohu Li[1,2,3,*]

Plant Communications
Review Article



(c)

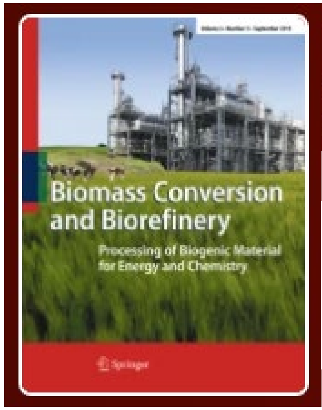
Ca^{++} = 0,09 nm

K^{+}= 0,53 nm

Mg^{++}= 1 ,08 nm

$Mg(OH)_2$ ± 10,0 nm

Effect of ultrasound on the dissolution of magnesium hydroxide: pH-stat and nanoscale observation
Xiaojia Tang, Miao Liu, Qian Tang, Zhongyuan Du, Subei Bai, Yimin Zhu. Ultrasonics - Sonochemistry 55 (**2019**) 223–231https://doi.org/10.1016/j.ultsonch.2019.01.023

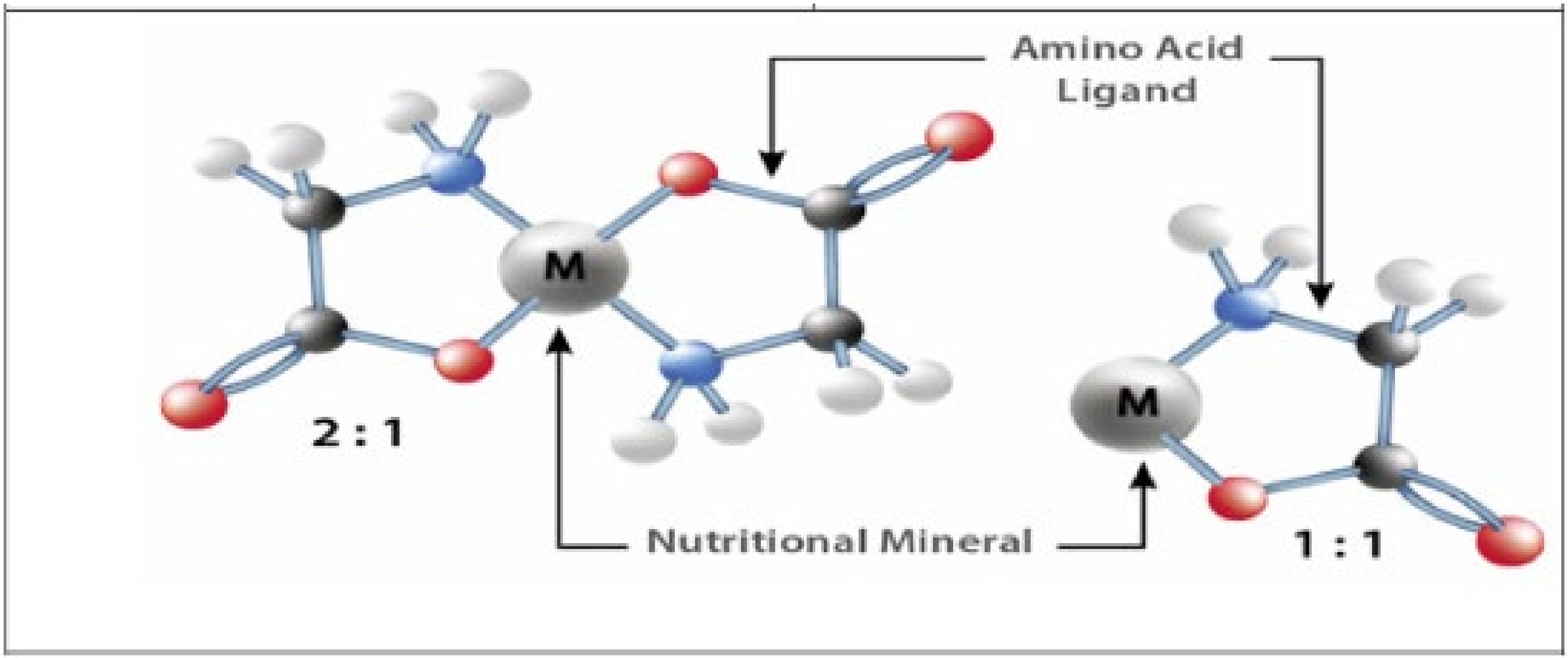


Biomass Conversion and Biorefinery
Processing of Biogenic Material for Energy and Chemistry

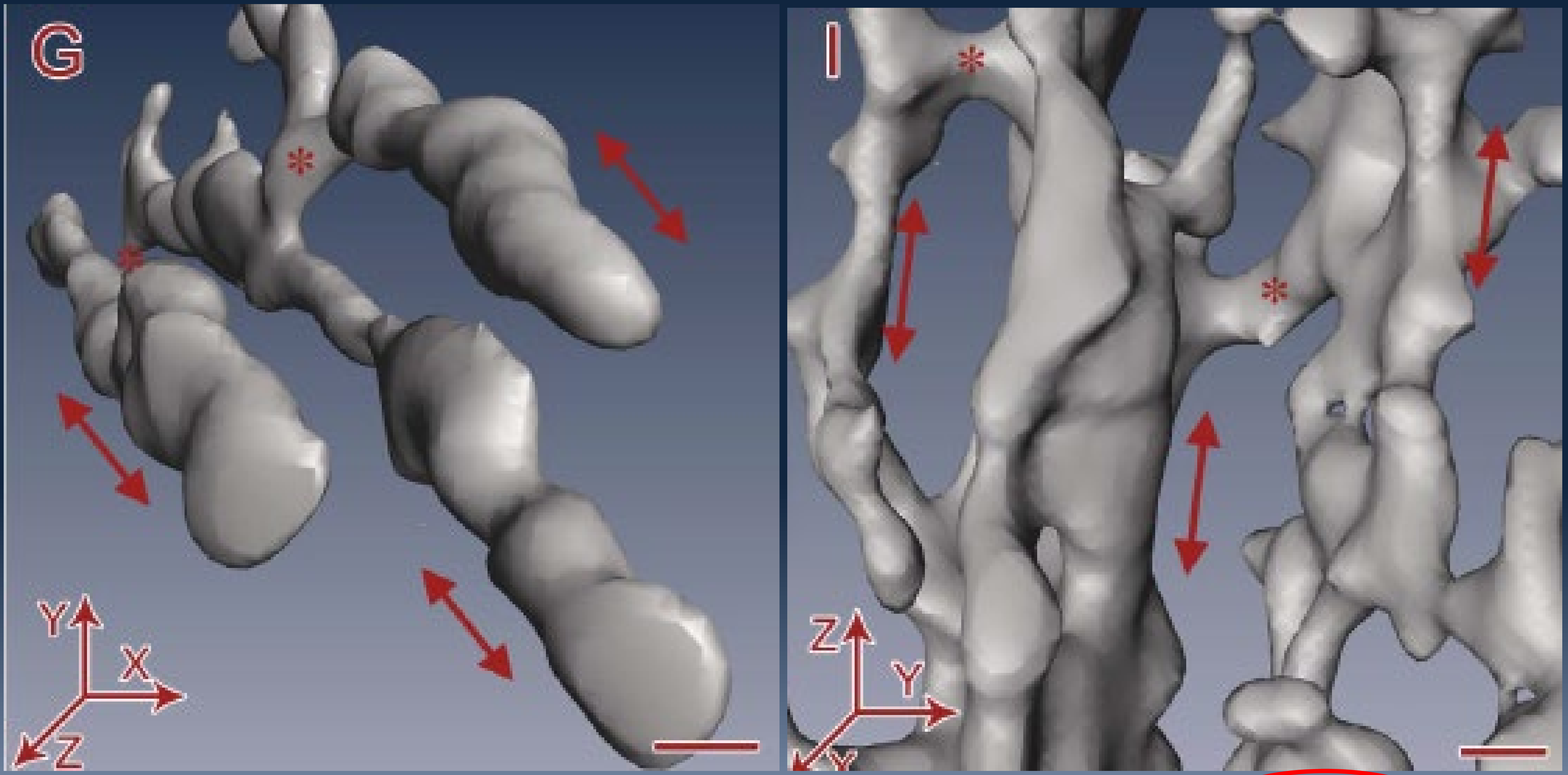
Chelated amino acids: biomass sources, preparation, properties, and biological activities

Biomass Conversion and Biorefinery (2024) 14:2907–2921

Rania H. Jacob[1] · Adel S. Afify[1] · Sanaa M. Shanab[2] · Emad A. Shalaby[1]



4,0 a 40 nm



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Absorption of foliar-applied Zn in sunflower (*Helianthus annuus*): importance of the cuticle, stomata and trichomes

Annals of Botany 123: 57–68, 2019

ANNALS OF BOTANY

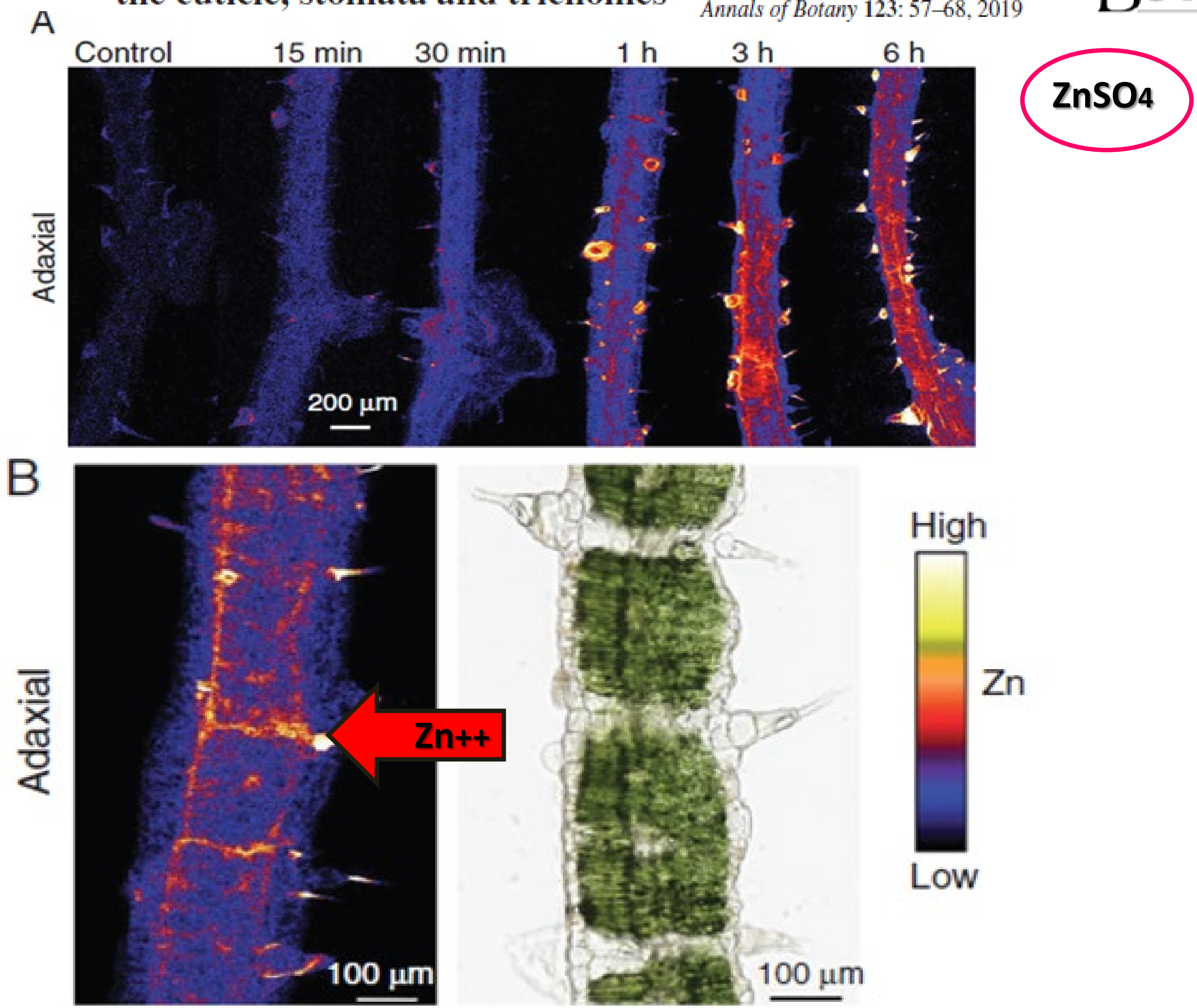

Fig. 5. (A) µ-XRF scans showing Zn distribution in cross-sections of sunflower leaves underlying **$ZnSO_4$** droplets

Electron Tomography of Cryo-Immobilized Plant Tissue

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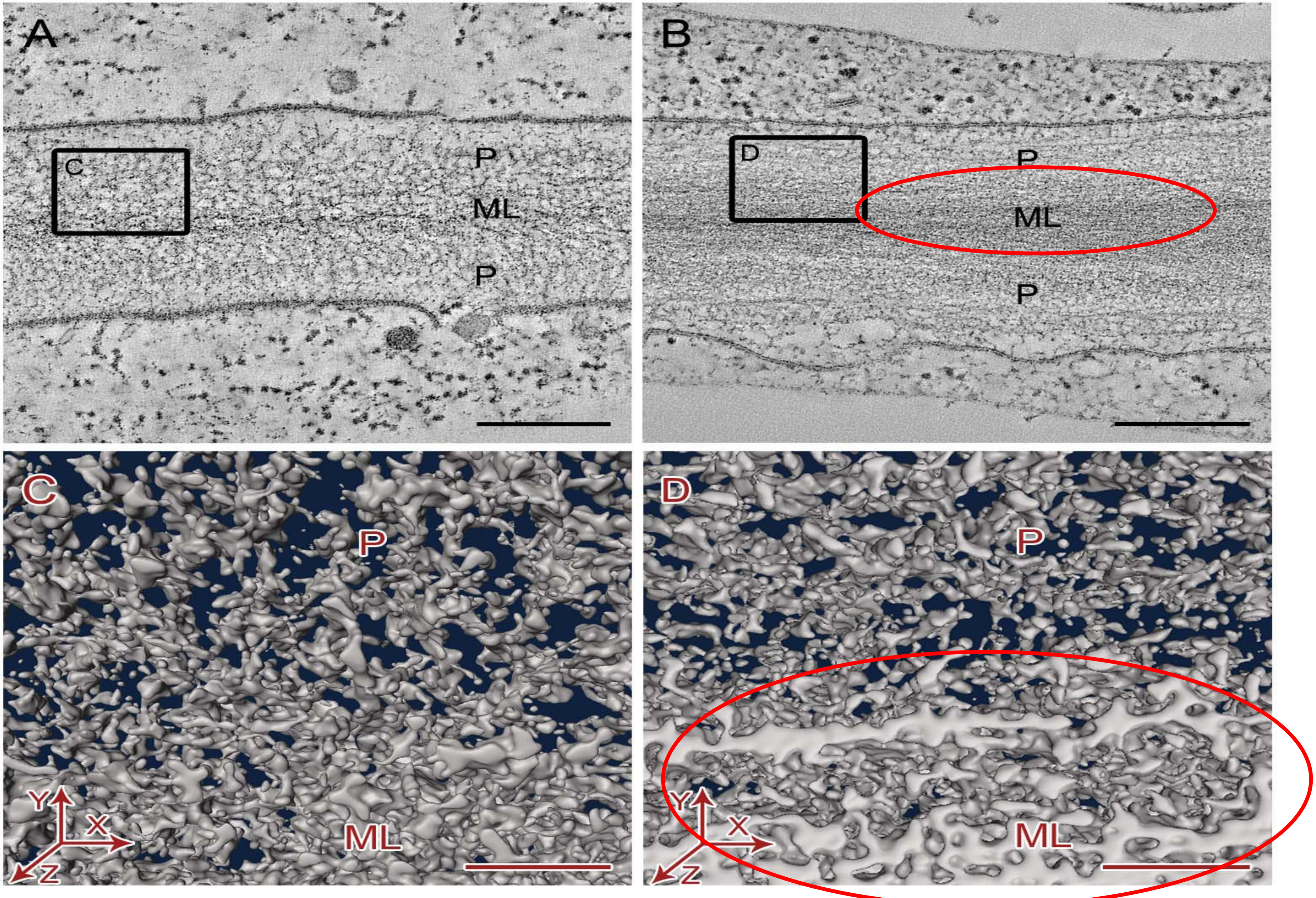


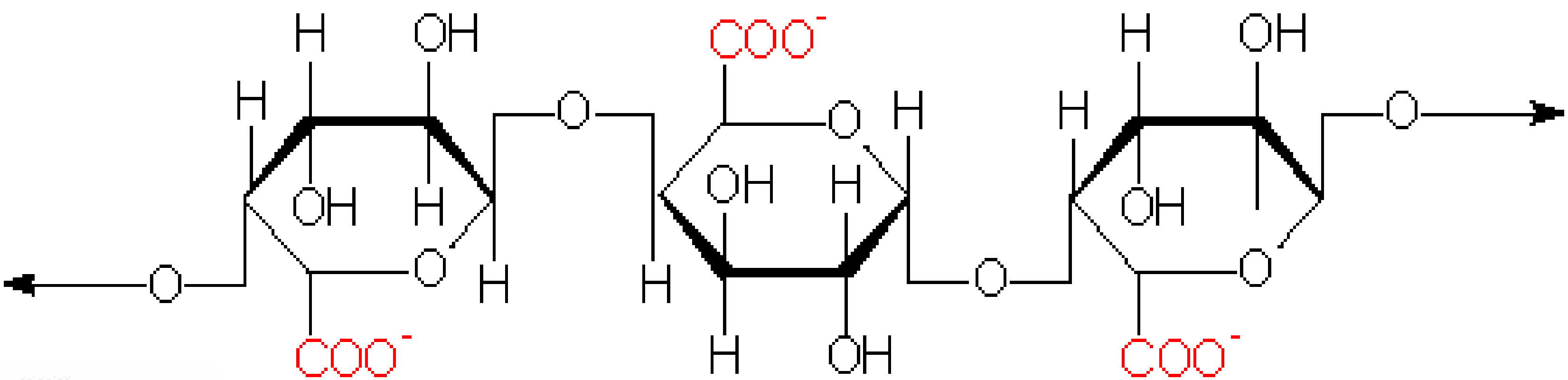
Journal of the
Science of Food and
Agriculture

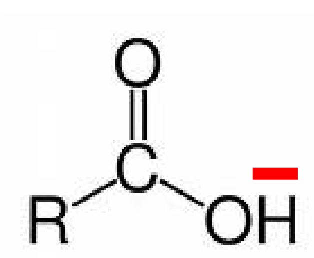
SCI
where science
meets business

Article

Cation-exchange capacity of plant cell walls at neutral pH

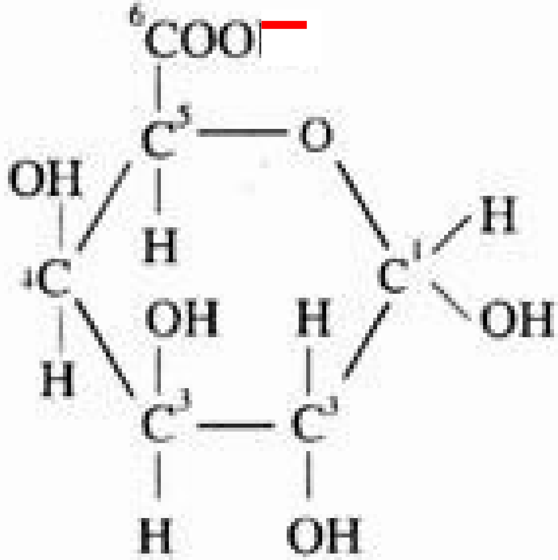
Michael S. Allen, Michael I. McBurney, Peter J. Van Soest



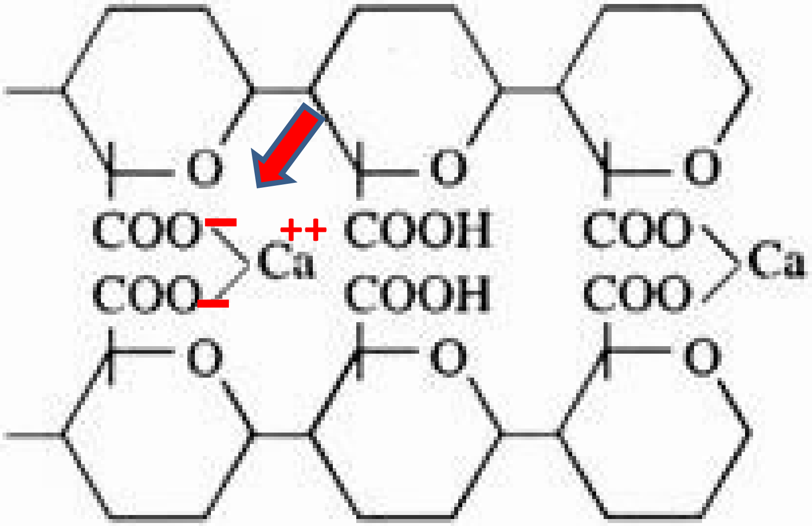


LAMELA MÉDIA

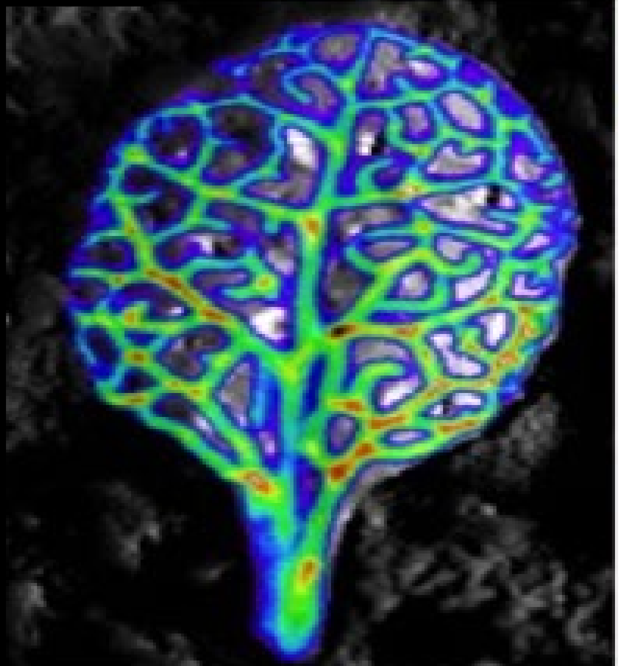
pectic acid (α - 1 , 4 - galacturonic acid)

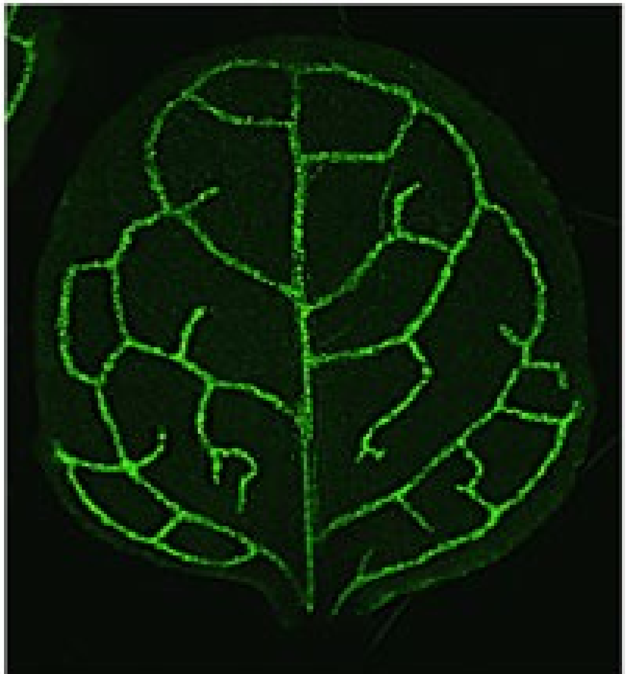


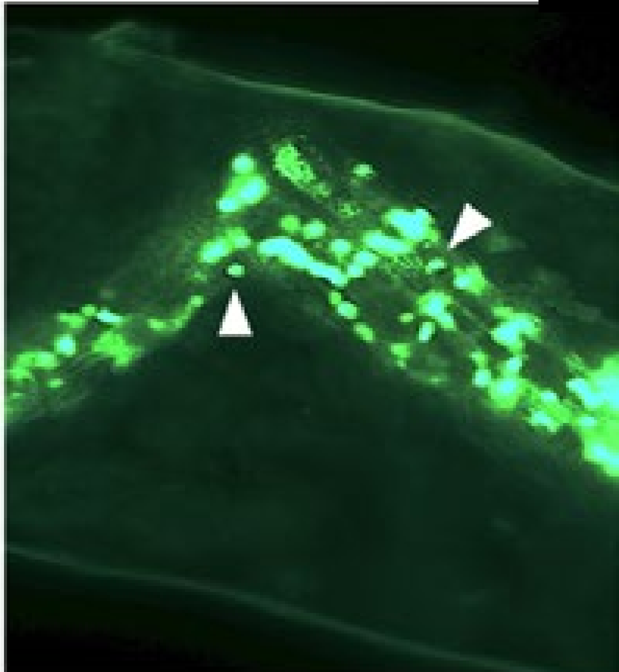
α-D-galacturonic acid

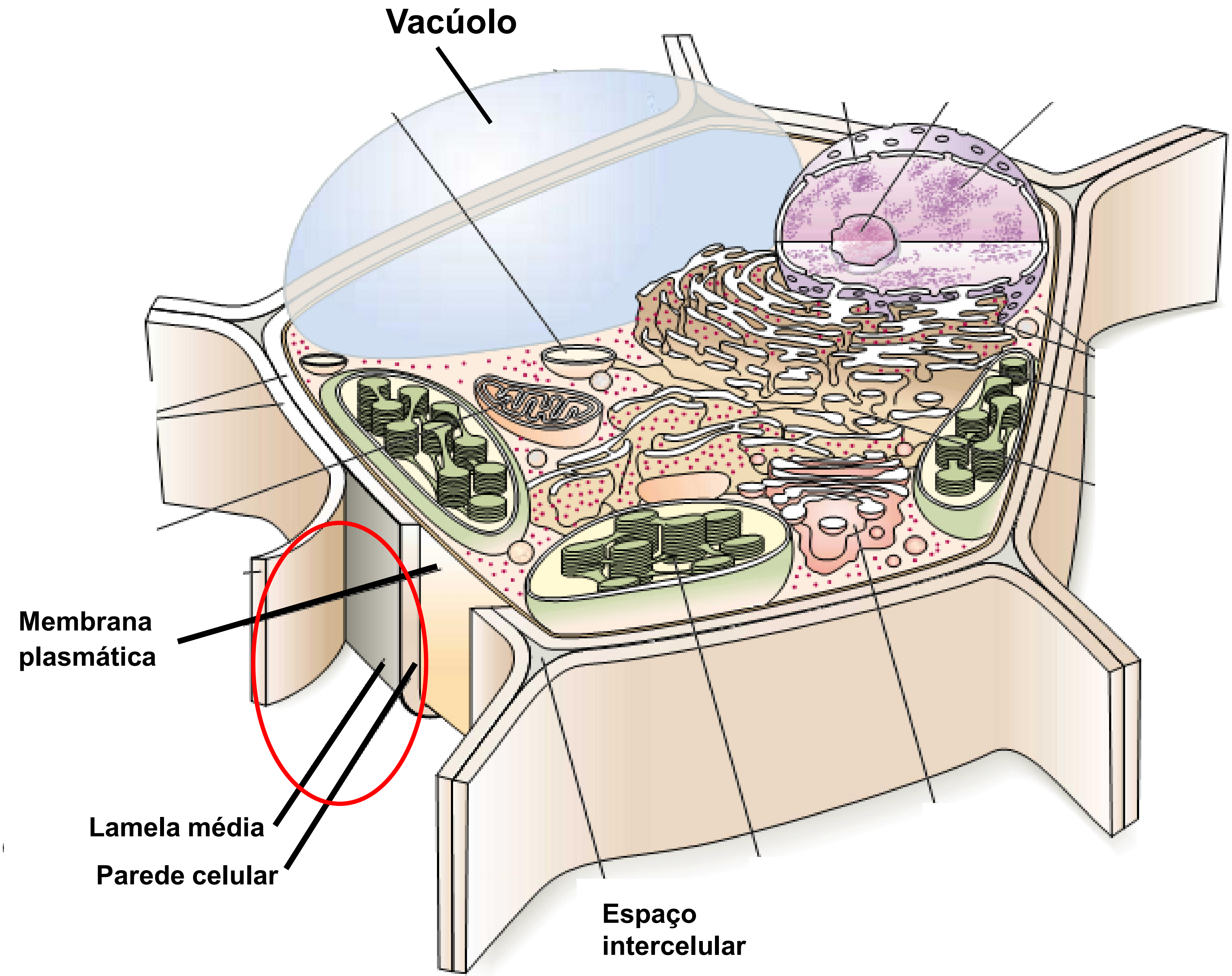


Calcium pectate



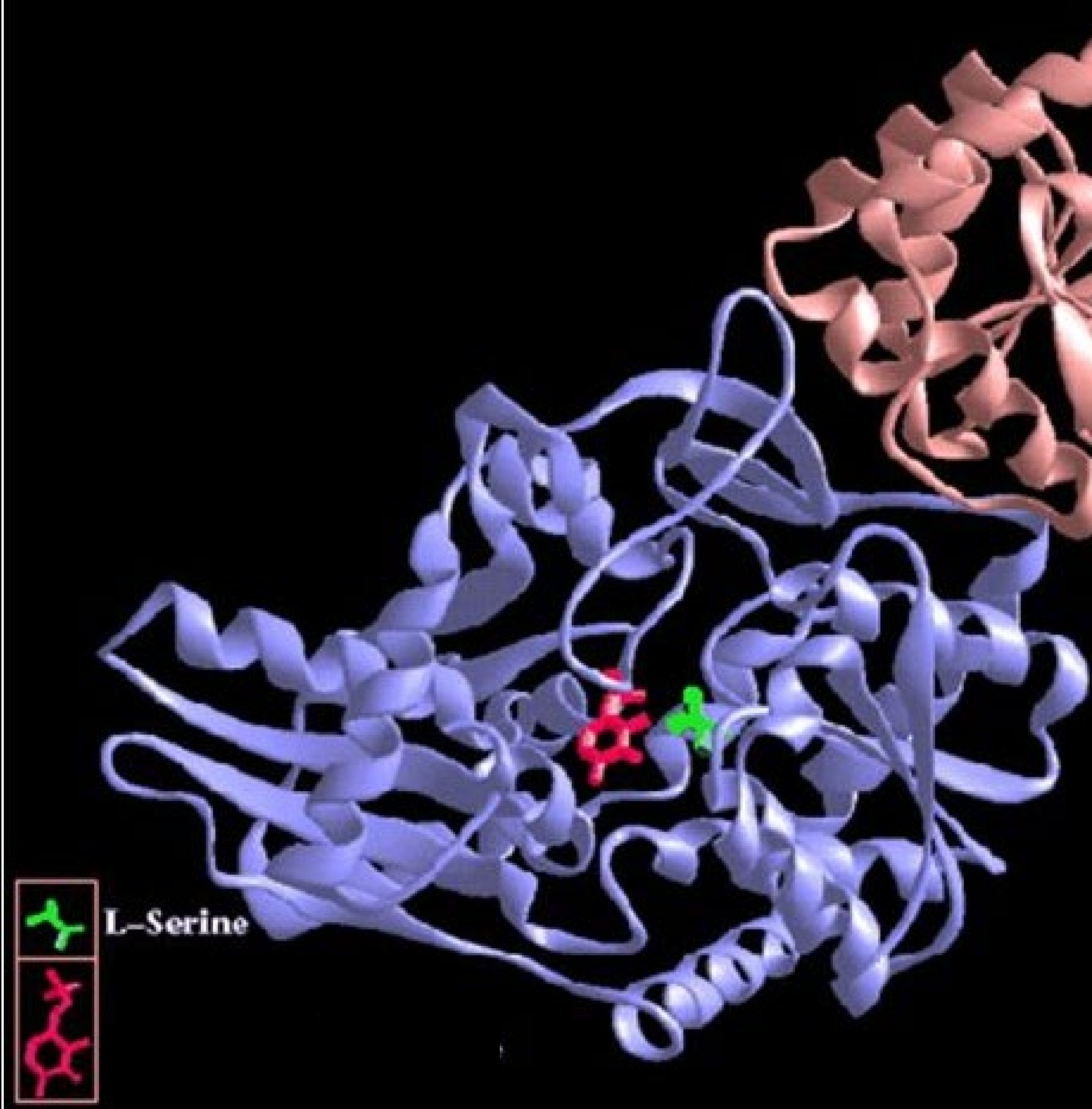


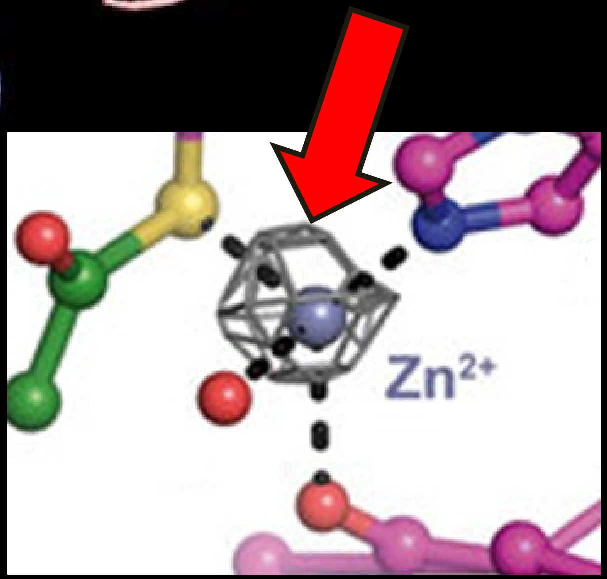




Vacúolo
Membrana
plasmática
Lamela média
Parede celular
Espaço
intercelular

Tryptophan Synthase (E.C. 4.2.1.20)

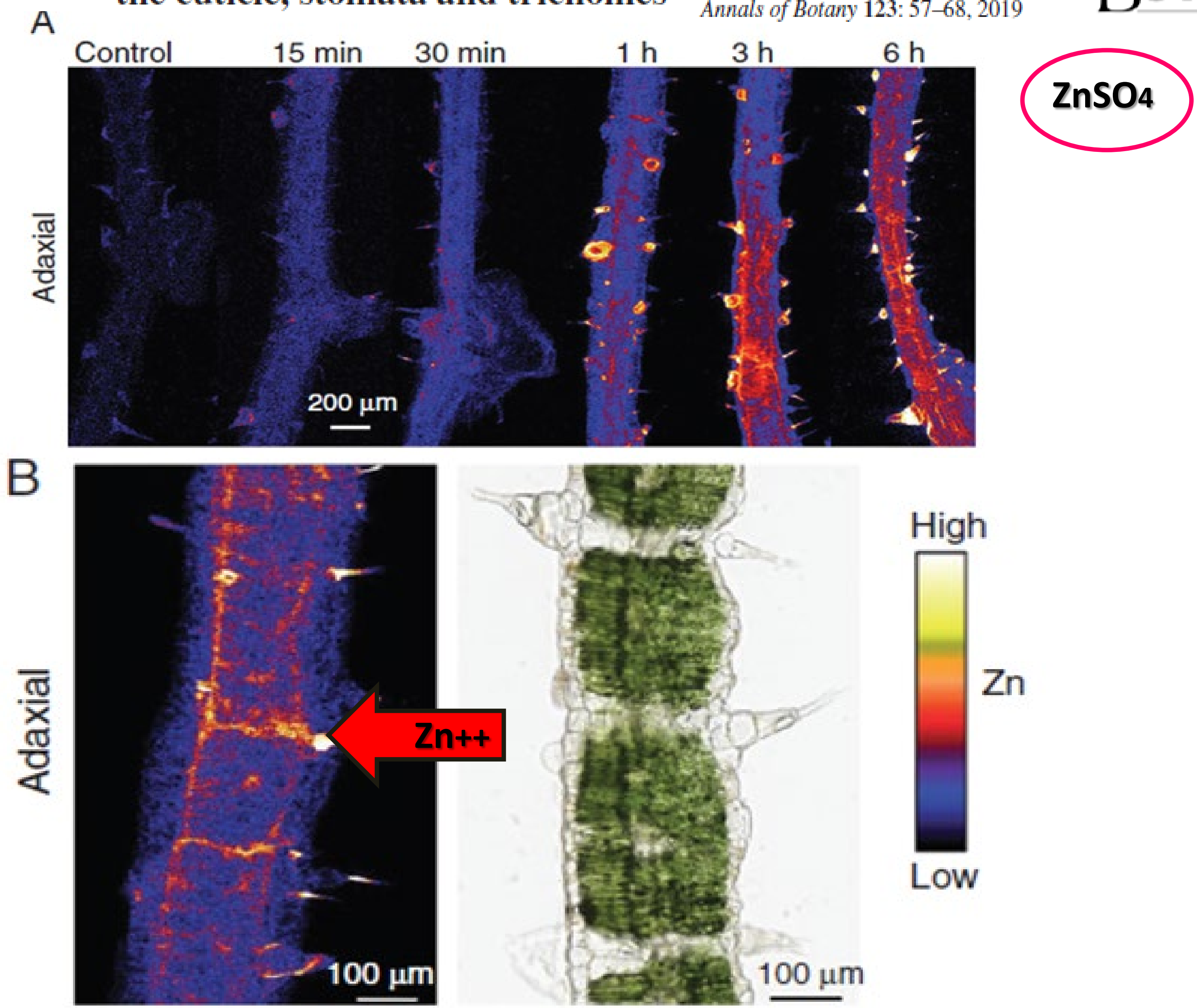




Absorption of foliar-applied Zn in sunflower (*Helianthus annuus*): importance of the cuticle, stomata and trichomes

Annals of Botany 123: 57–68, 2019

ANNALS OF BOTANY



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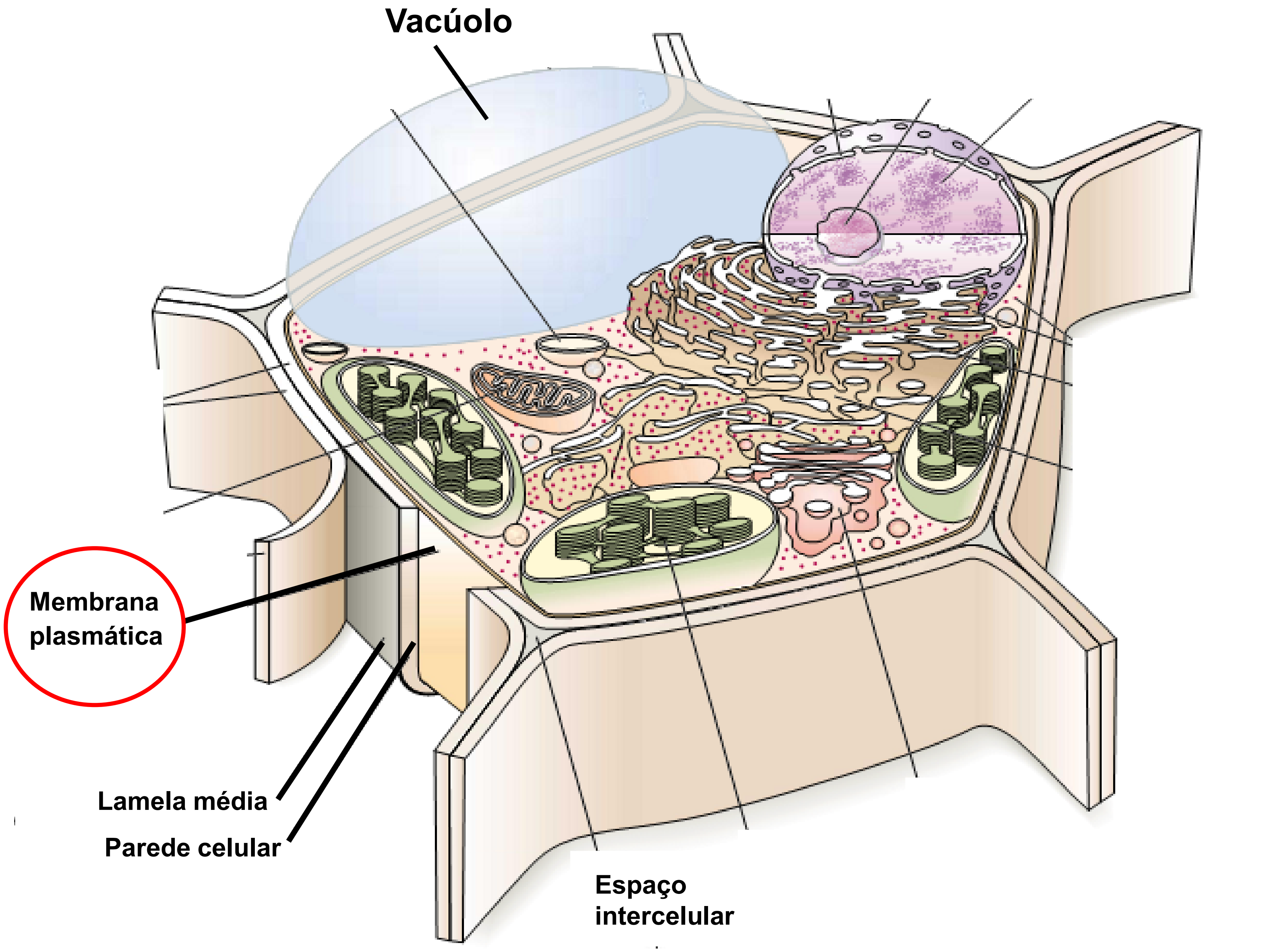
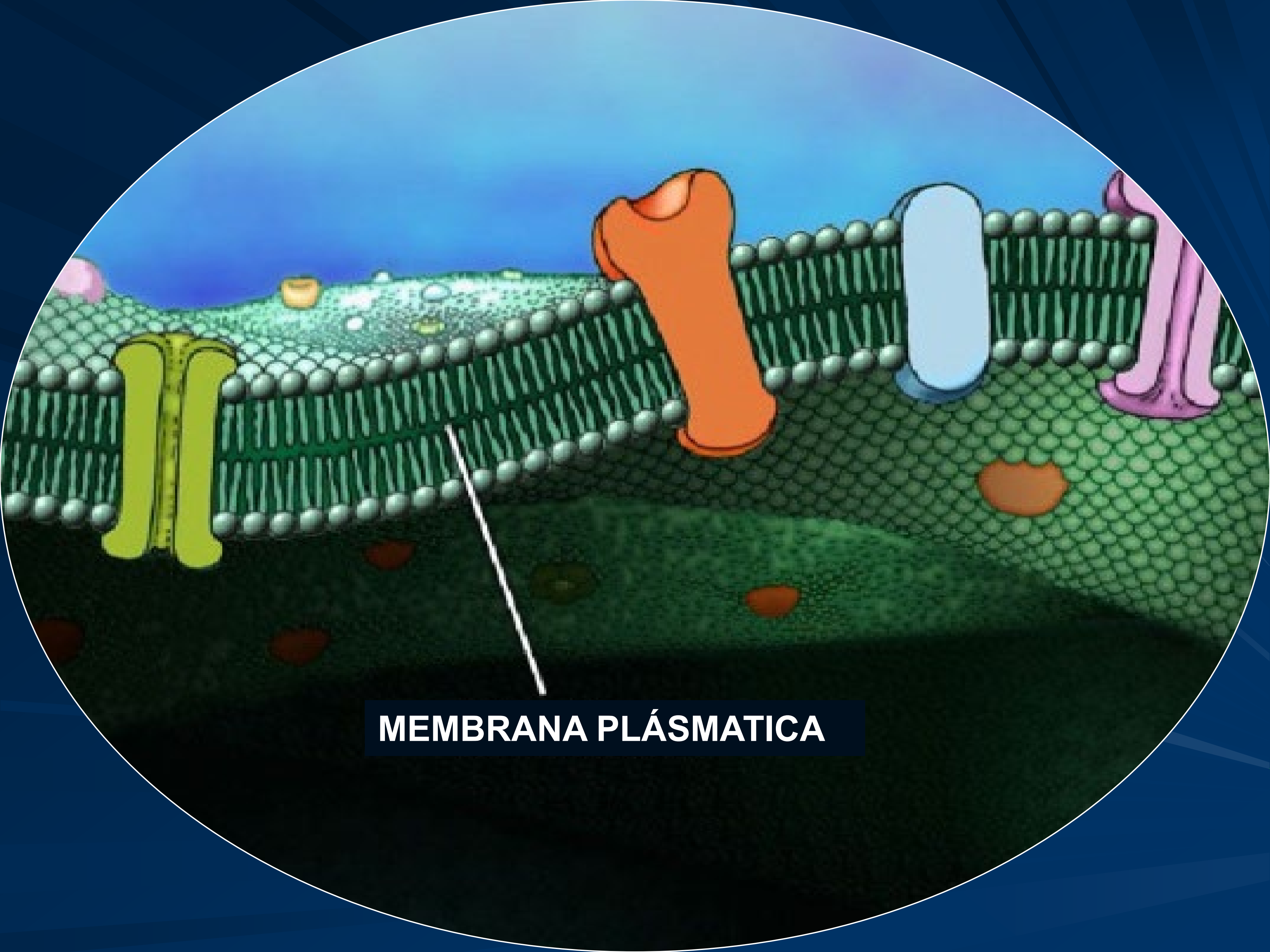
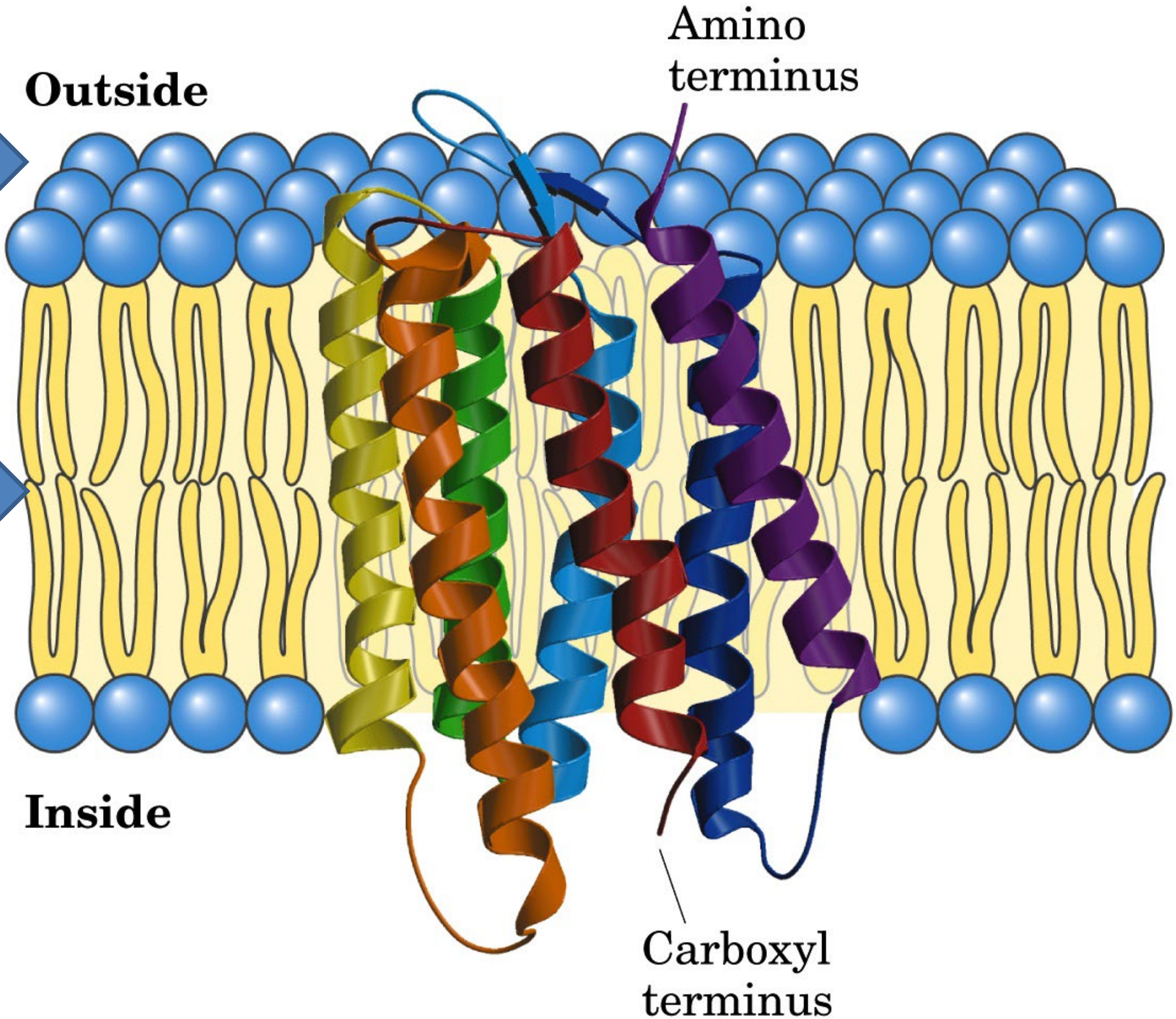


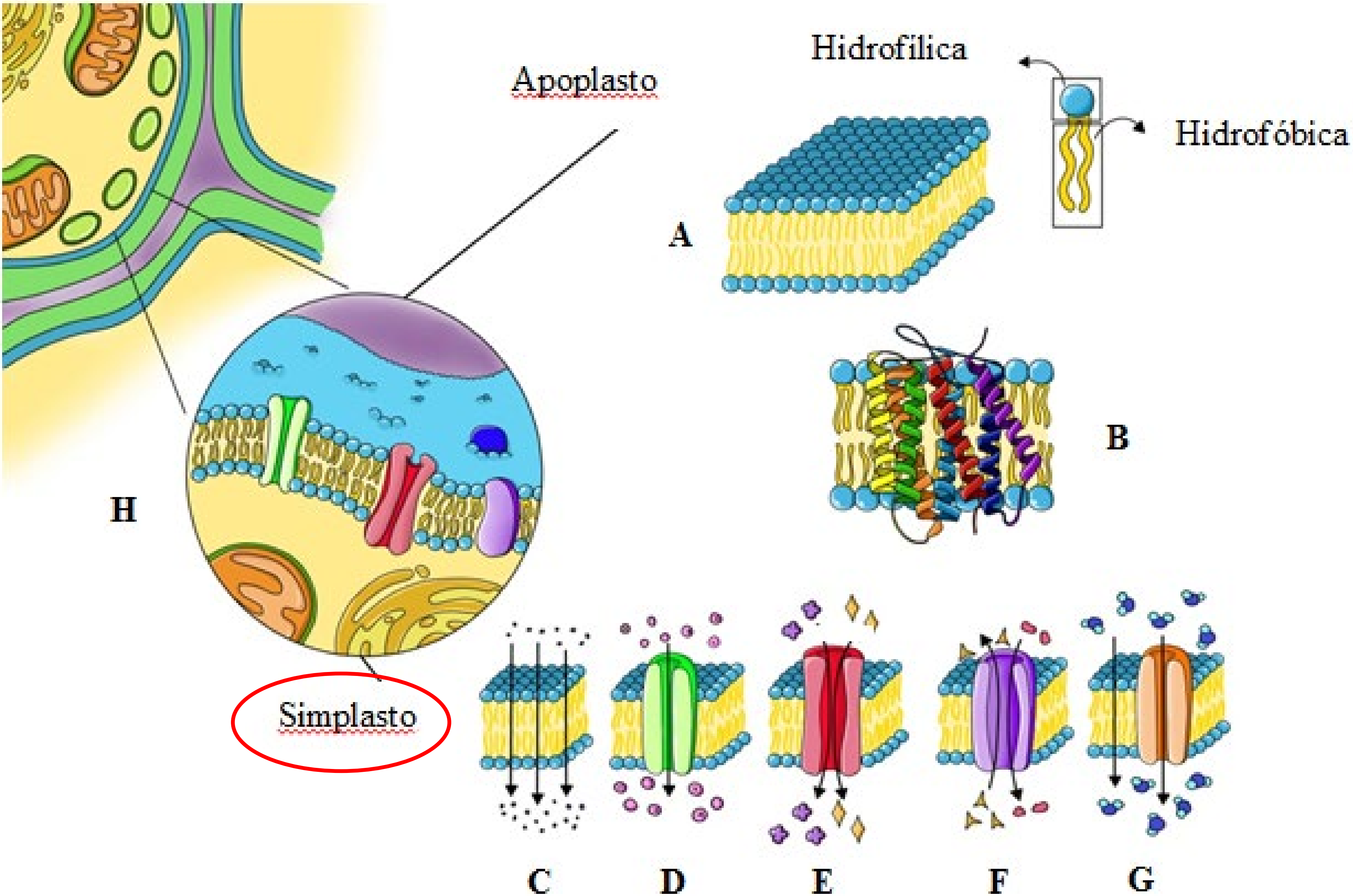
Vacúolo
Membrana plasmática
Lamela média
Parede celular
Espaço intercelular

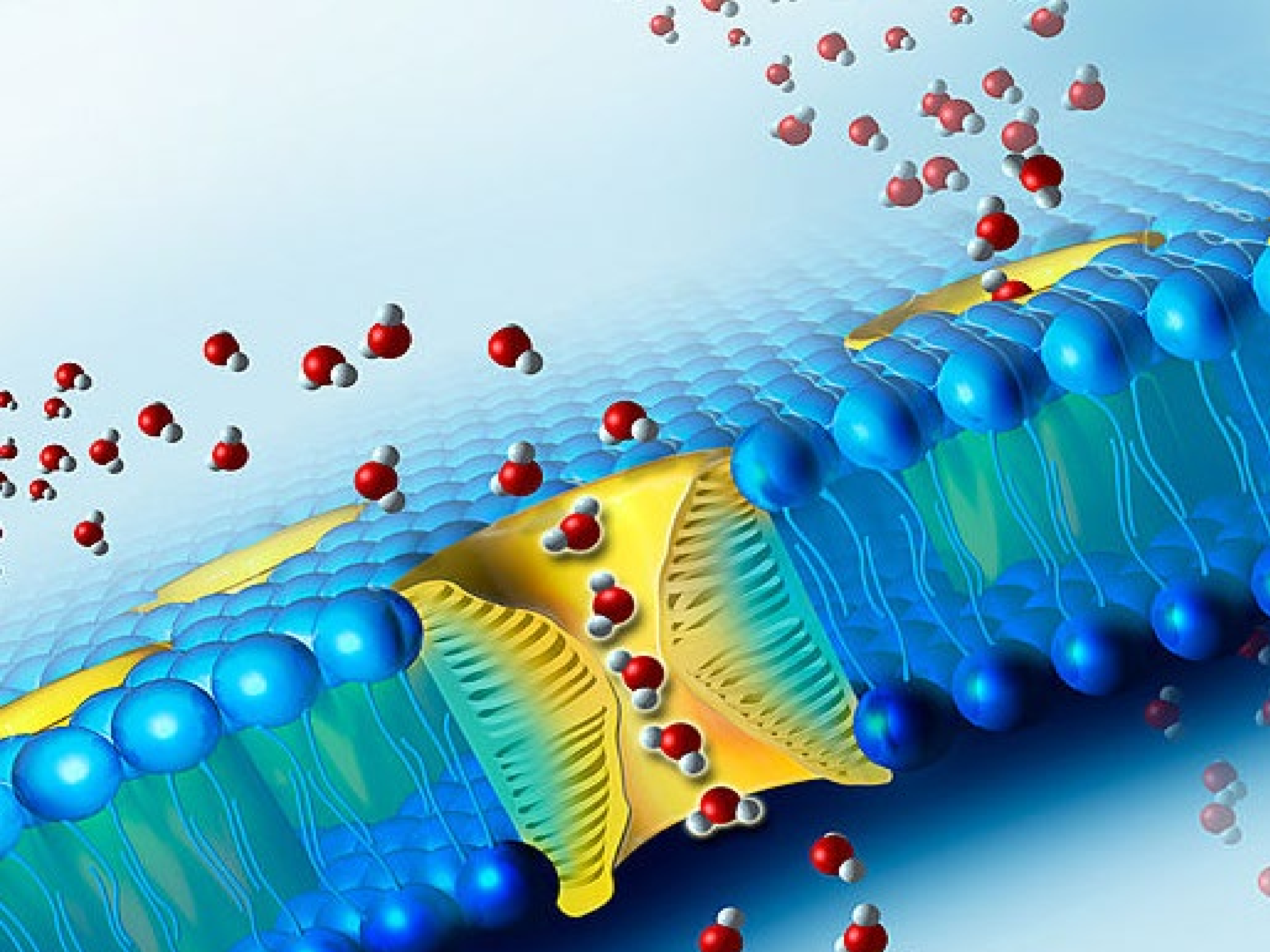

MEMBRANA PLÁSMATICA

Hidrofílica

Hidrofóbica



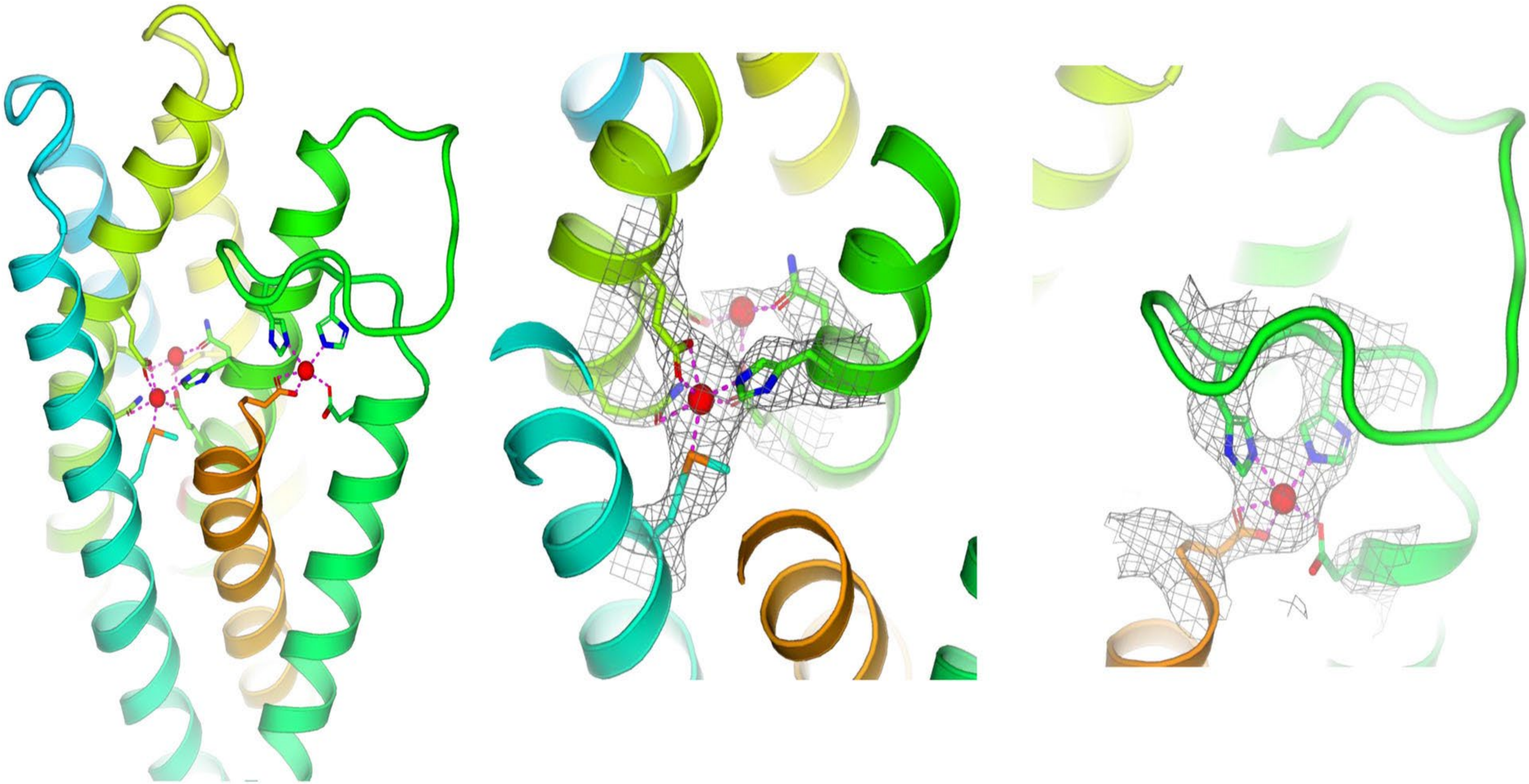

Hidrofílica
Apoplasto
Hidrofóbica
A
B
H
Simplasto
C
D
E
F
G



nature communications

Structural mechanism of intracellular autoregulation of zinc uptake in ZIP transporters

Changxu Pang [1,3], Jin Chai [1,3], Ping Zhu [1], John Shanklin [1] & Qun Liu [1,2]



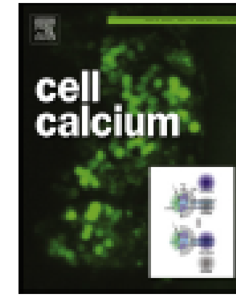
Review
Cell Calcium 58 (2015) 86–97

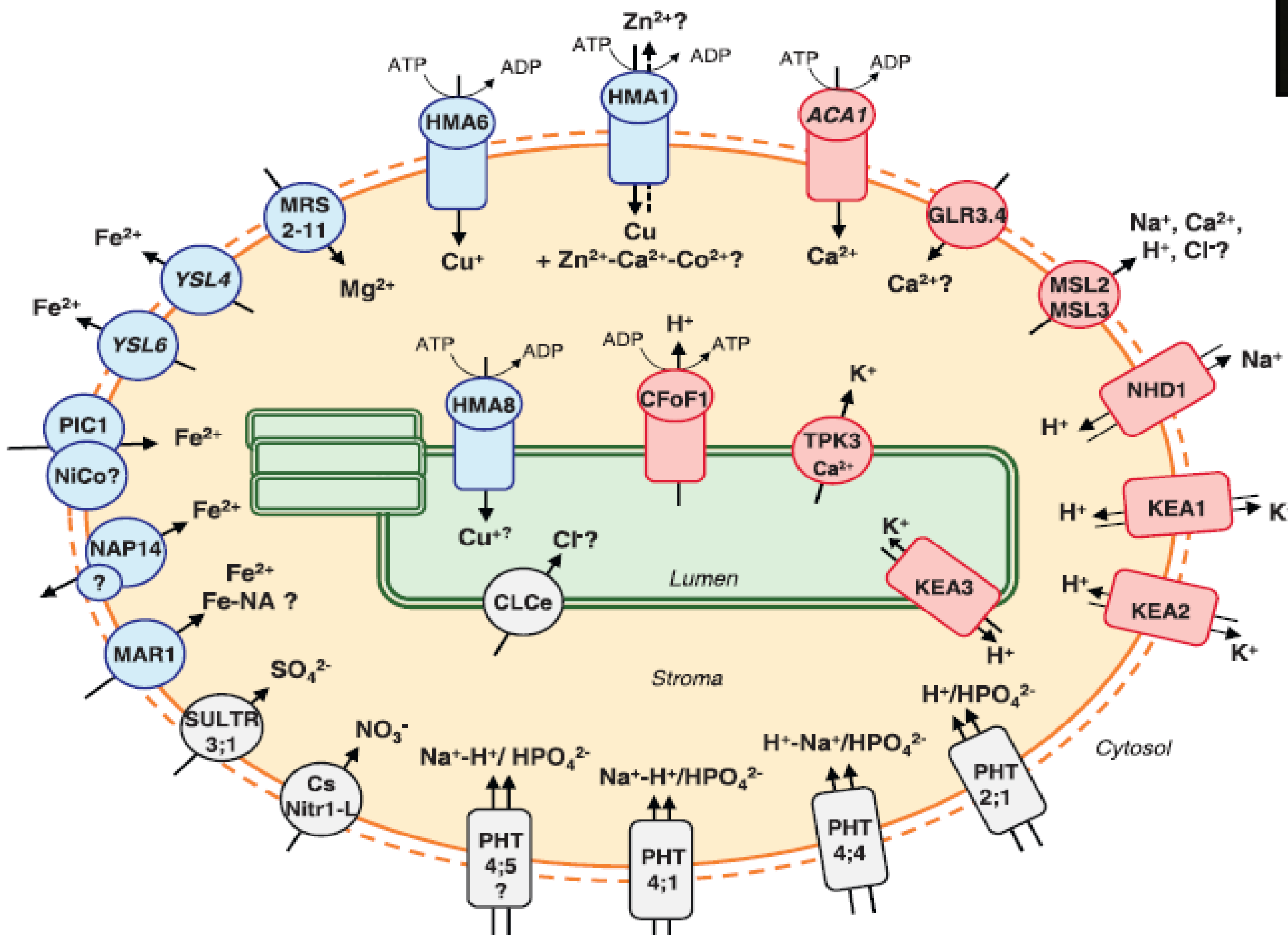
Ions channels/transporters and chloroplast regulation

Fig. 1. Overview of Arabidopsis chloroplast ions transporters/channels. Metals transporters are represented in blue, anions transporters in grey and other ions in orange.

Review

Ions channels/transporters and chloroplast regulation





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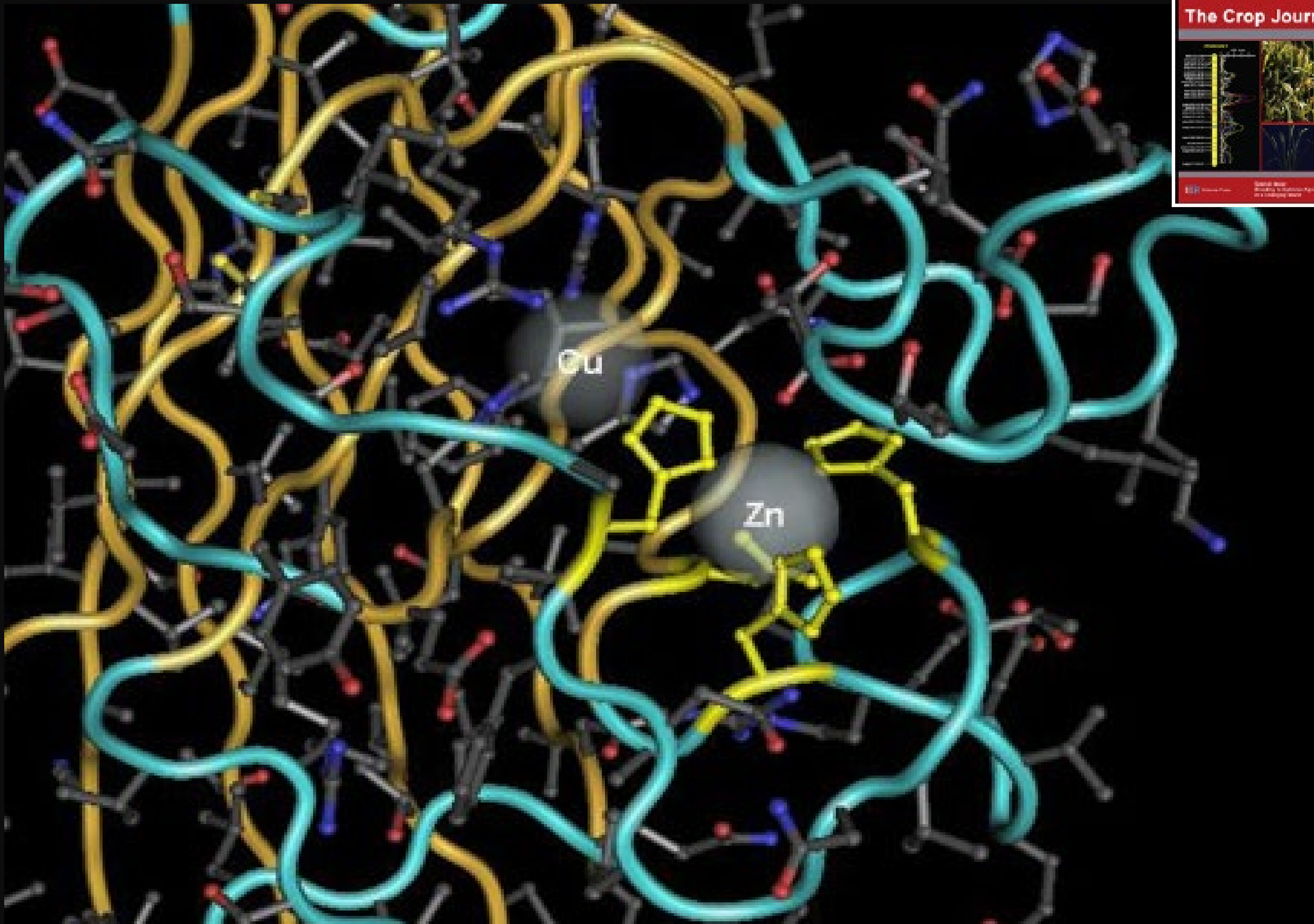


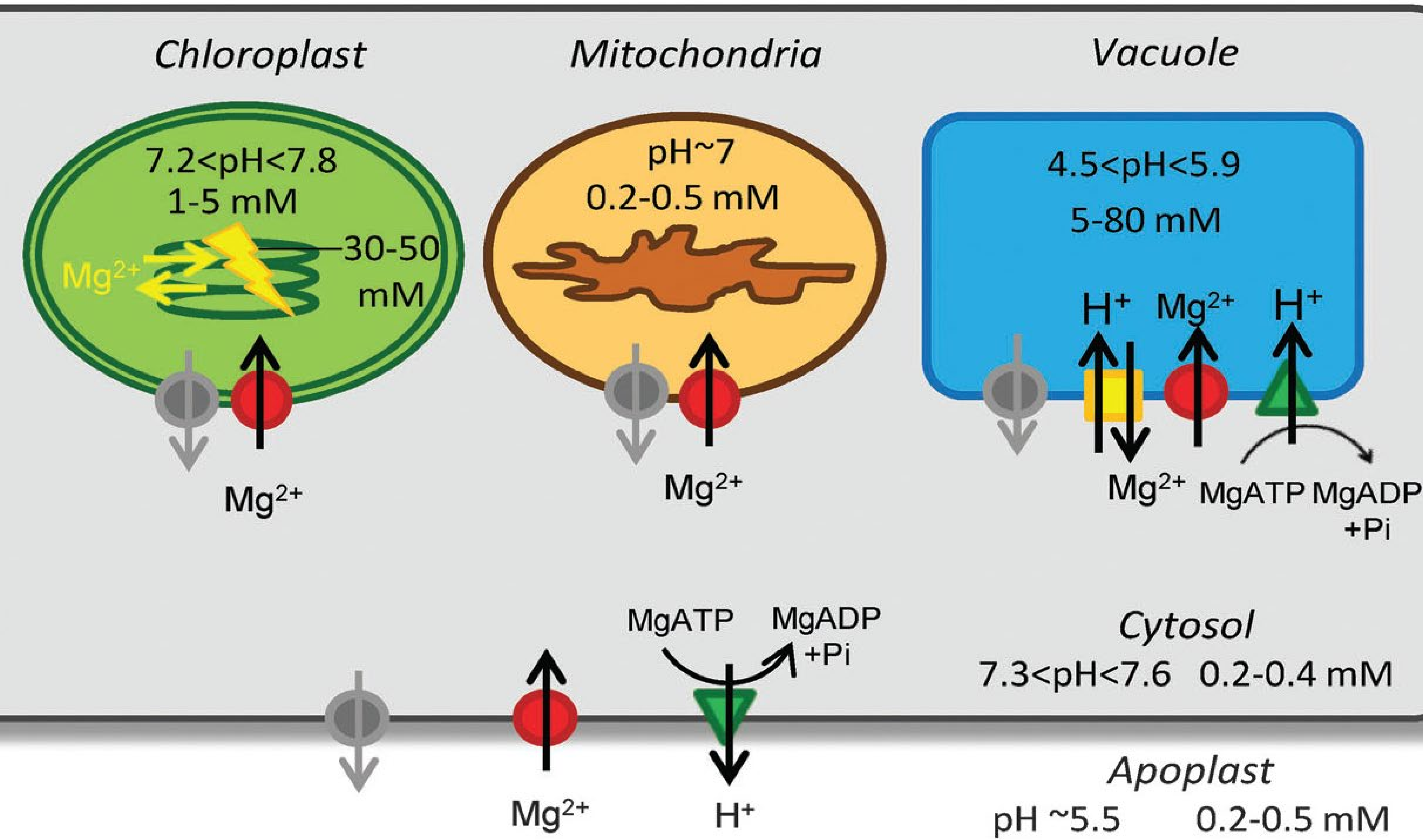
Fig. 3 – The predicted 3D structure of the chloroplast Cu/Zn-SOD (AhCSD2) in *Arachis hypogaea*

Metallomics

RSC Publishing

An update on magnesium homeostasis mechanisms in plants

Christian Hermans,†*[a] Simon J. Conn,†[b] Jiugeng Chen,[a] Qiying Xiao[a] and Nathalie Verbruggen[a]



DOI: 10.1039/c3mt20223b

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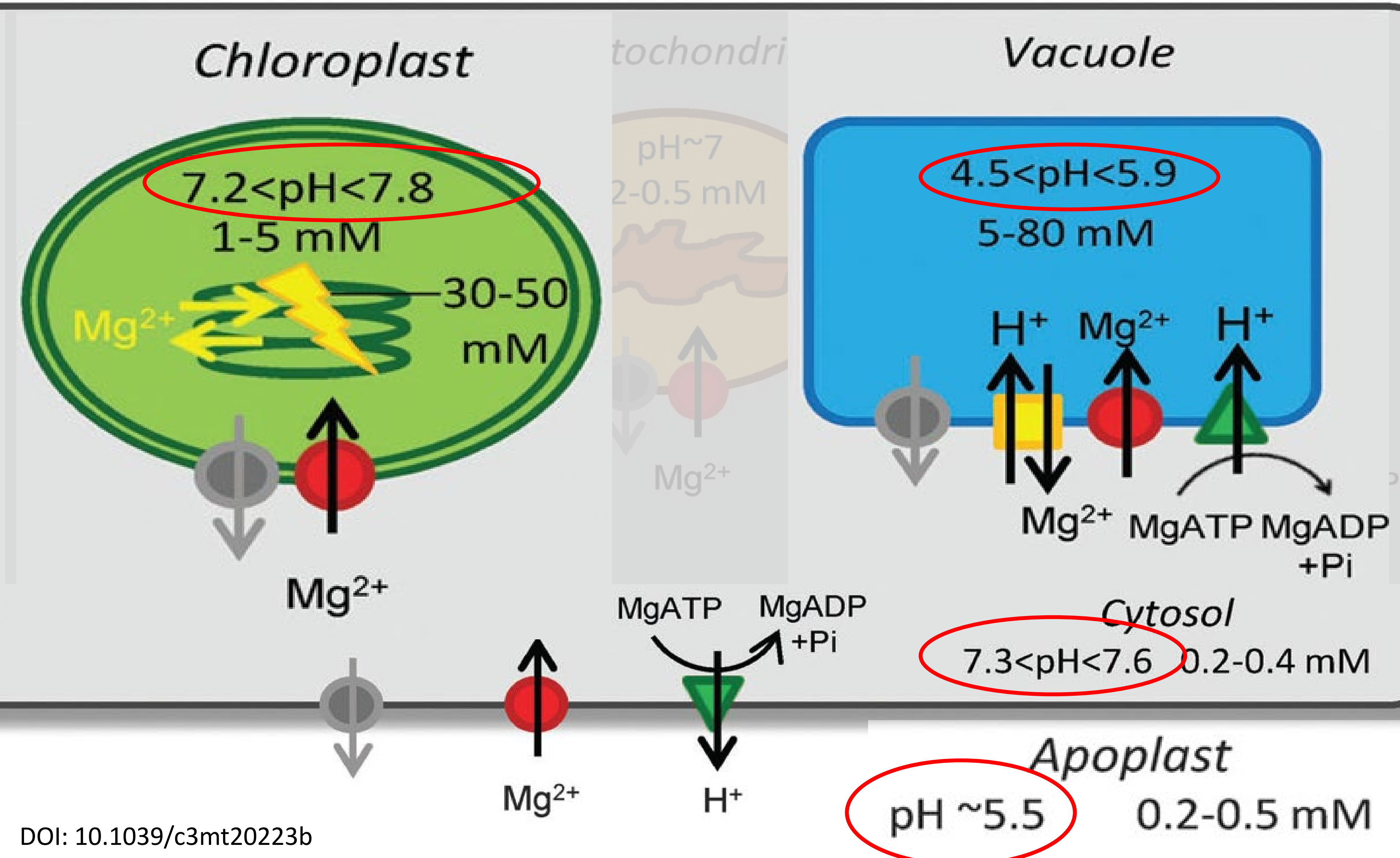
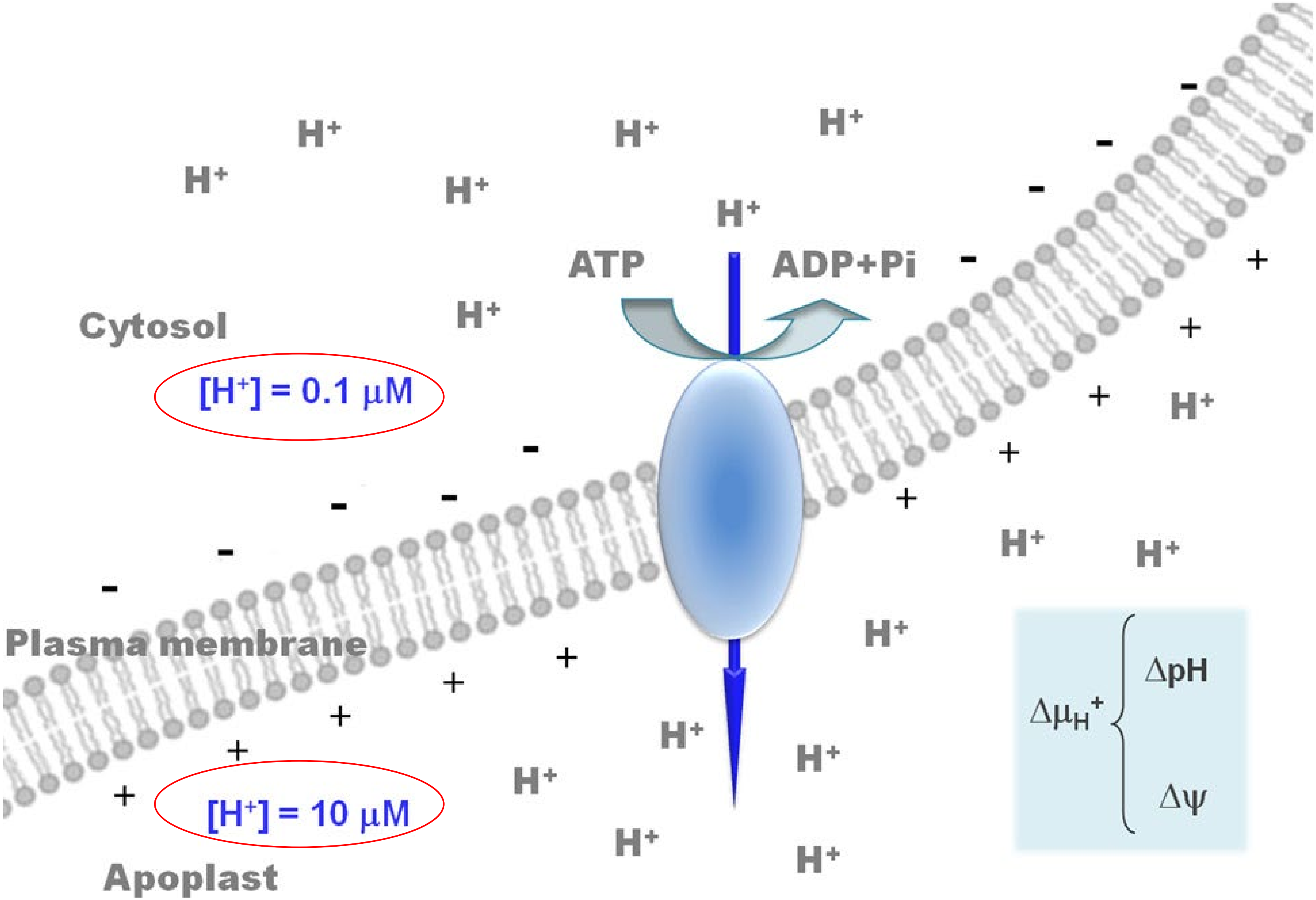


DOI: 10.1039/c3mt20223b

Plant Cell Reports

Plant lipid environment and membrane enzymes: the case of the plasma membrane H^+-ATPase

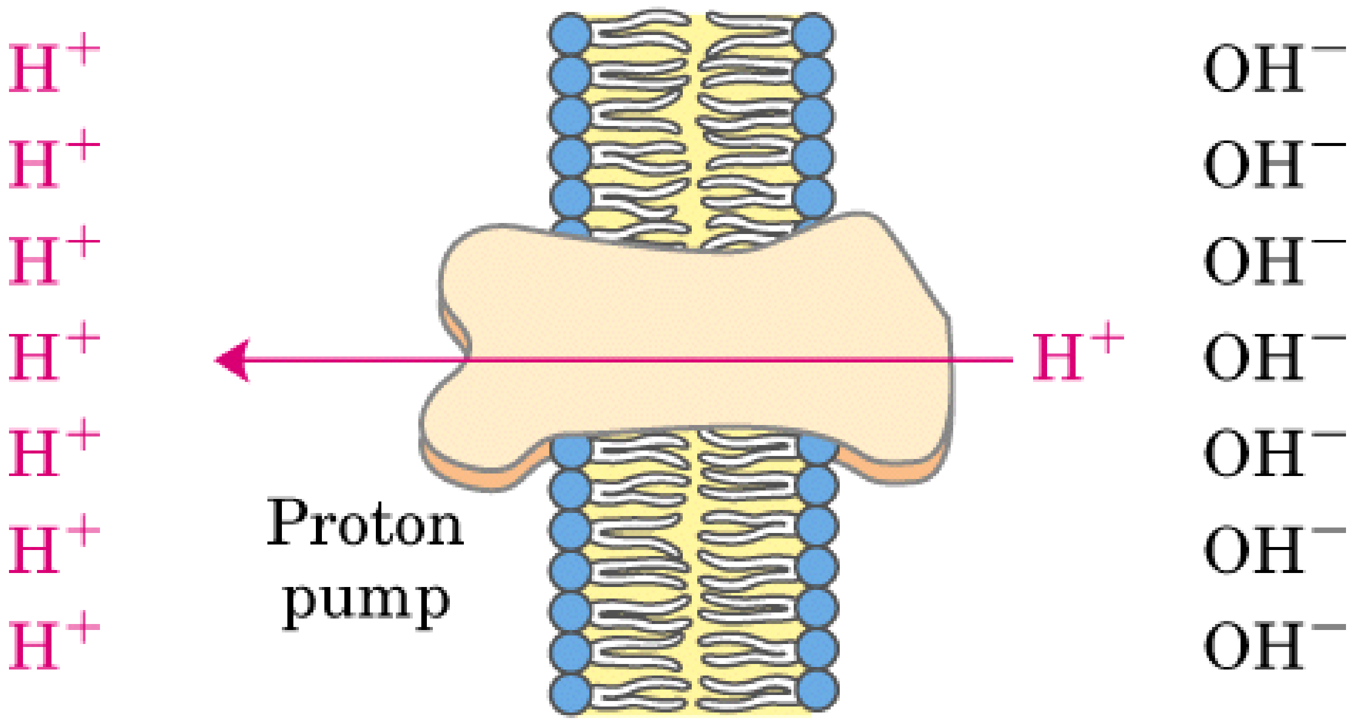


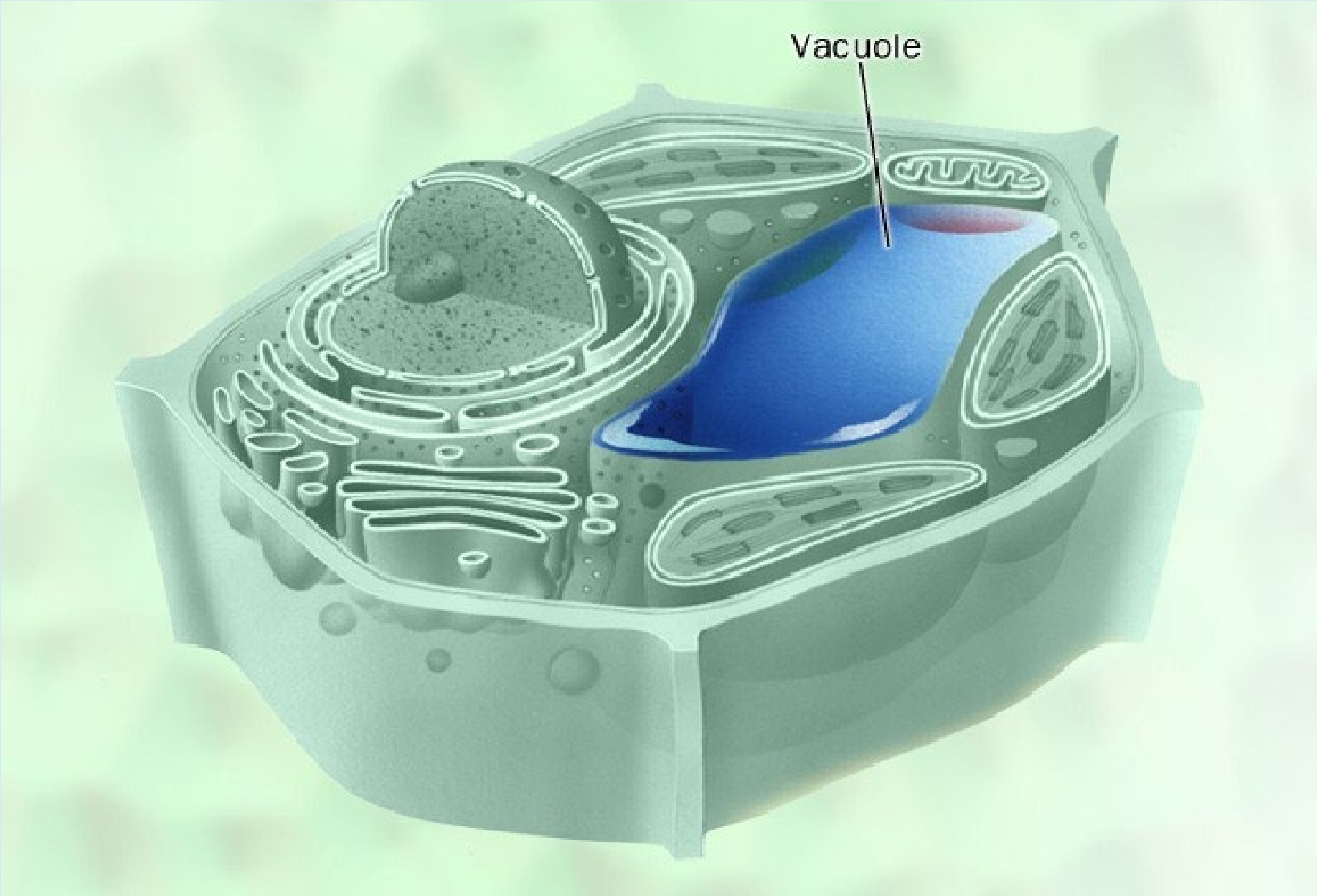
Plant Cell Rep
DOI 10.1007/s00299-014-1735-z

International Journal of *Molecular Sciences*

MDPI

Regulation of Cytosolic pH: The Contributions of Plant Plasma Membrane H^+-ATPases and Multiple Transporters




Vacuole

Huang et al. *Horticulture Research* (2021)8:227
https://doi.org/10.1038/s41438-021-00702-z

Horticulture Research
www.nature.com/hortres

Mechanisms and regulation of organic acid accumulation in plant vacuoles

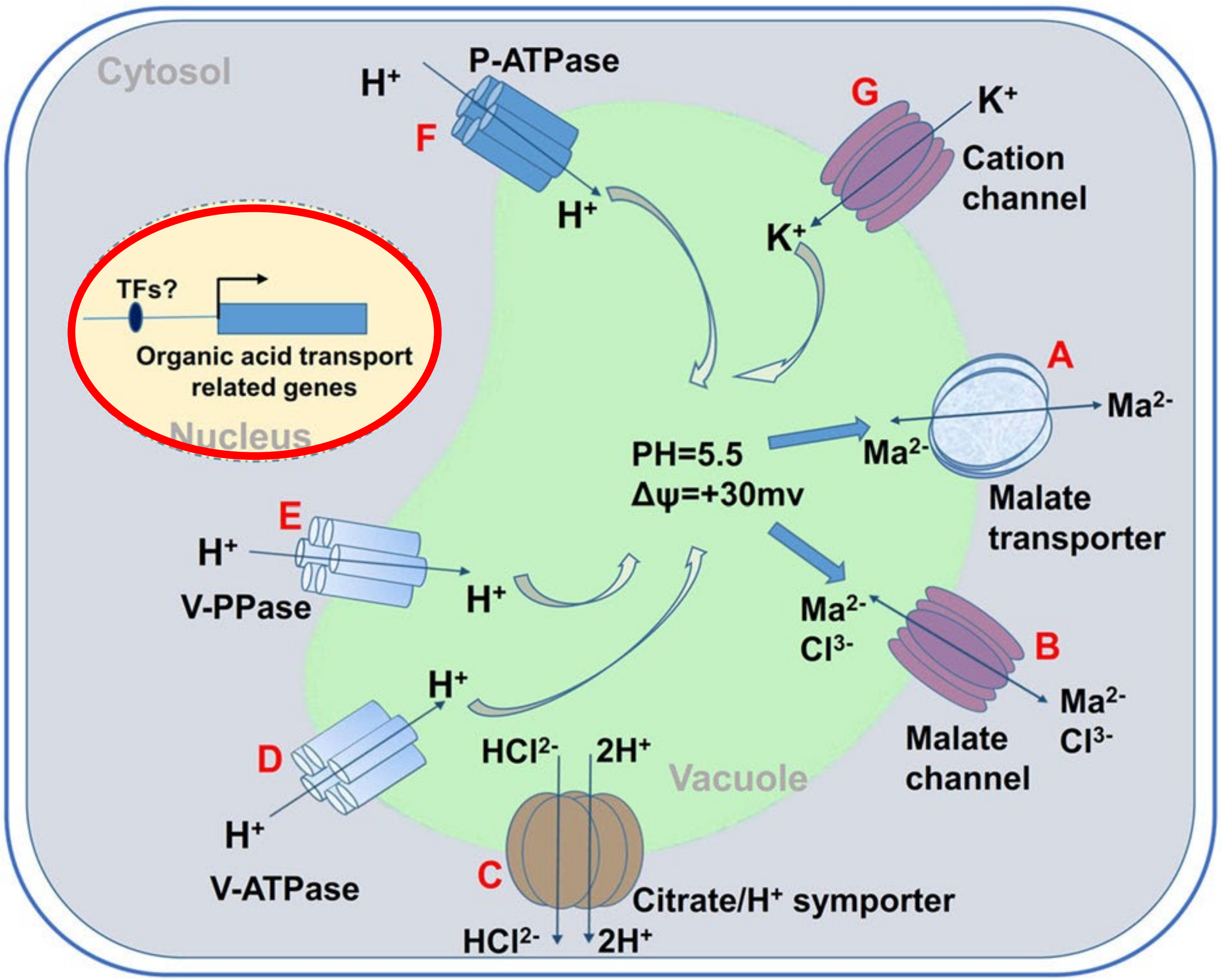


Fig. 1 Vacuolar proteins that are involved in the transport of **organic acids.**

Modification of Leaf Apoplastic pH in Relation to Stomatal Sensitivity to Root-Sourced Abscisic Acid Signals

Wensuo Jia, William John Davies

Plant Physiology®

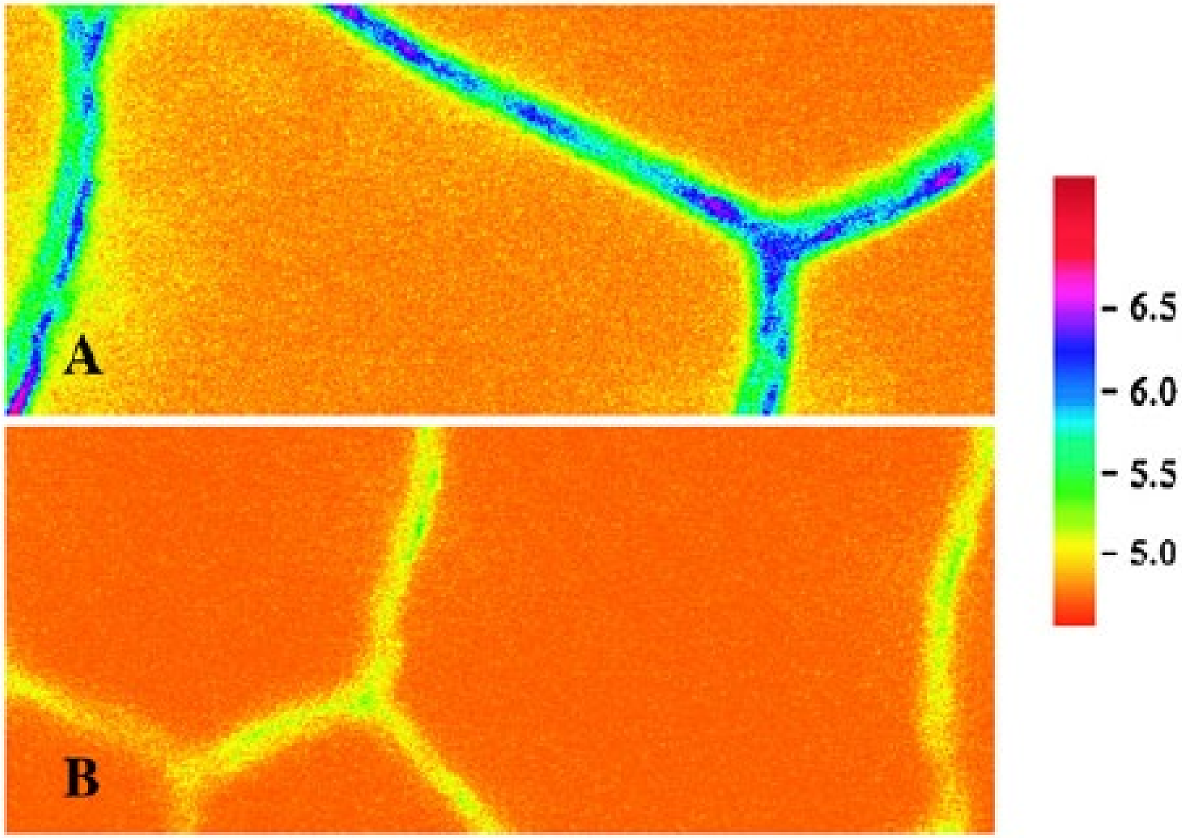
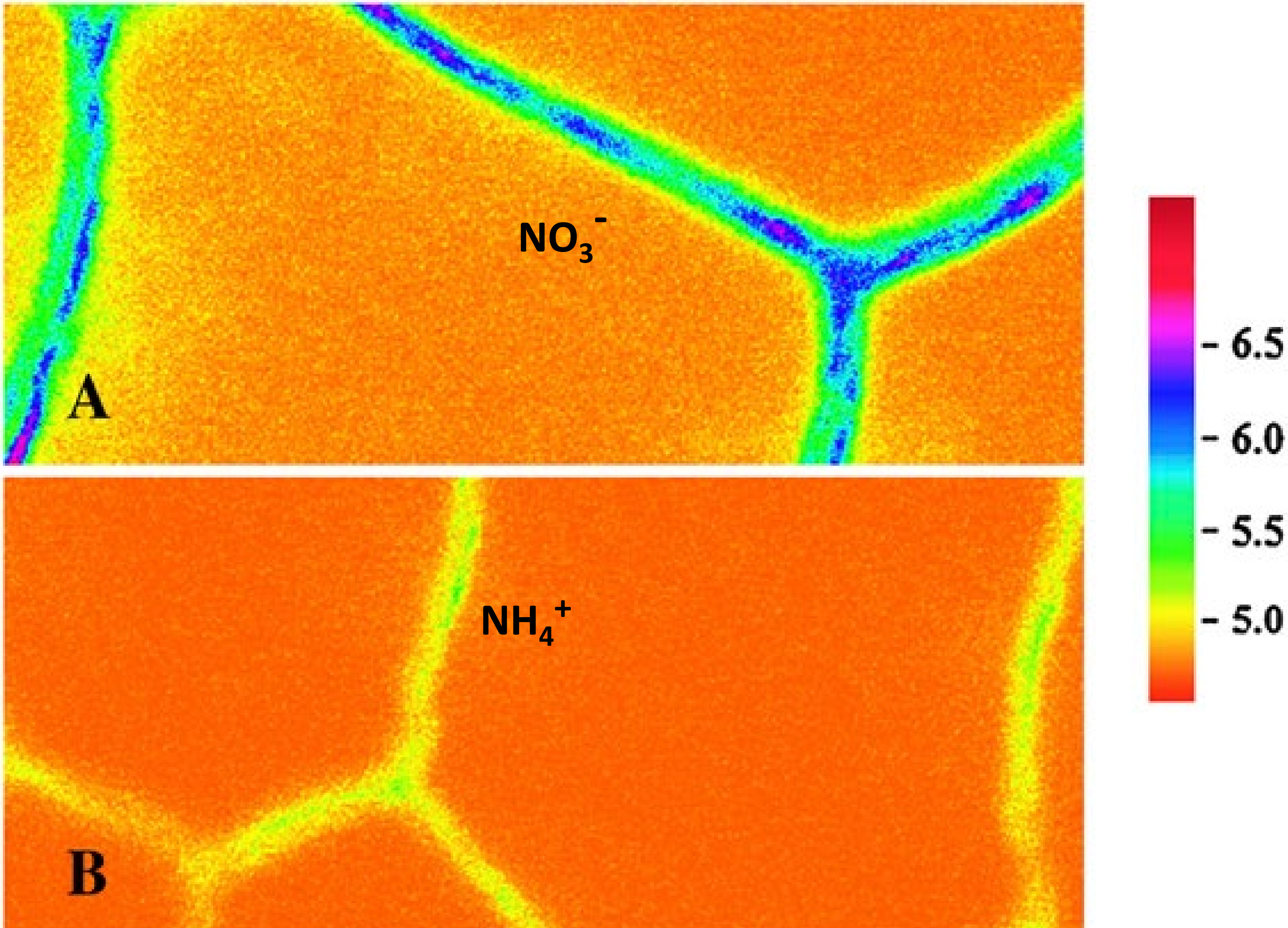


Figure 8. Fluorescence images of pH indicator SNARF in a *C. communis* leaf, showing apoplastic pH in relation to nitrate and ammonium ions fed through the transpiration stream. A total of 20 mM nitrate or ammonium containing pH indicator SNARF was fed to transpiring *C. communis* leaves. A, Nitrate; B, ammonium.



NO3-
A
NH4+
B
6.5
6.0
5.5
5.0

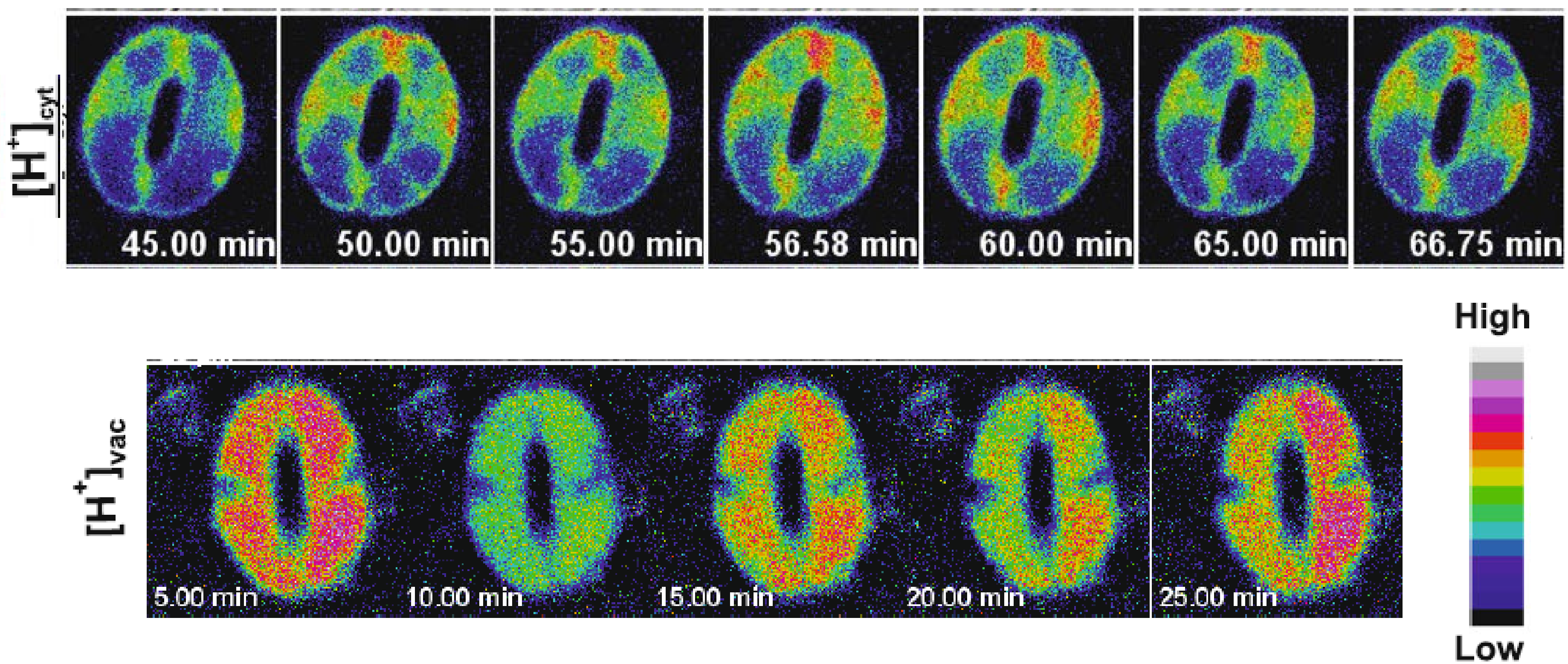
New Phytologist

Research

K^+ and pH homeostasis in plant cells is controlled by a synchronized K^+/H^+ antiport at the plasma and vacuolar membrane

New Phytologist (2024) **241:** 1525–1542
doi: 10.1111/nph.19436

Kunkun Li[1], Christina Grauschopf[1], Rainer Hedrich[1], Ingo Dreyer[2] and Kai R. Konrad[1]



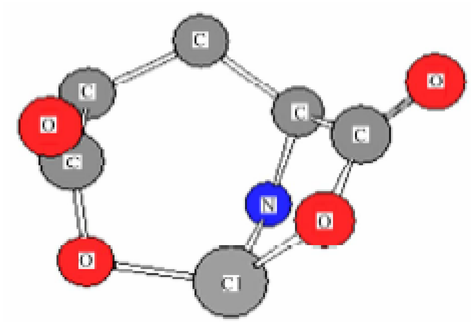
Dynamics of [H+]cyt / [H+]vac correlates with changes in the K+ gradient

Scientific Research
Open Access

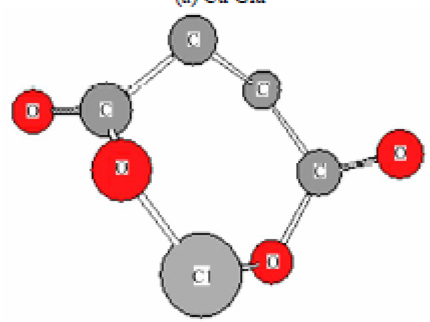
Vol.2, No.2, 85-90 (2010)
http://dx.doi.org/10.4236/ns.2010.22013

Natural Science

Metal ion-binding properties of L-glutamic acid and L-aspartic acid, a comparative investigation



(a) Cu-Glu



(b) Cu-Ttr

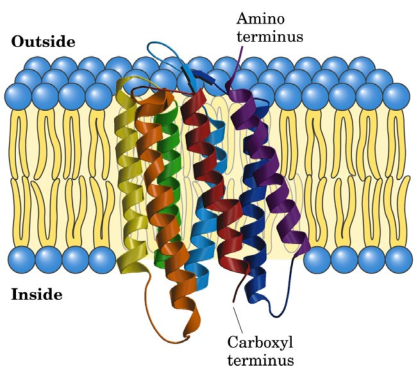
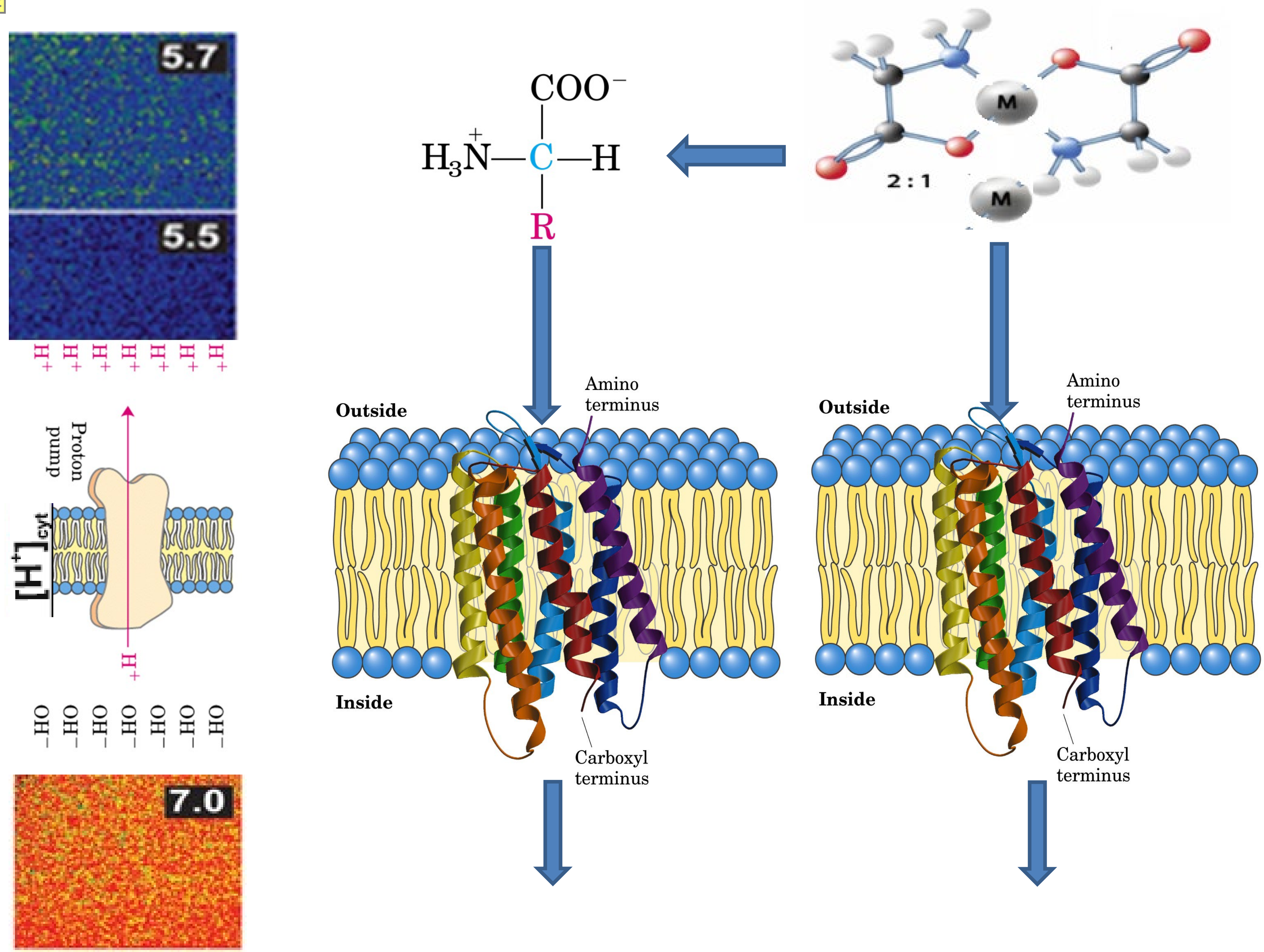


Table 2. Comparison of the stability constants of binary complexes of Asp, Ttr and Glu with M^{2+} at 25°C, I = 0.1 M, $NaNO_3$*.

No.	Species	$\log K^{M}_{M(Asp)}$	$\log K^{M}_{M(Ttr)}$	$\log K^{M}_{M(Glu)}$
1	Mg^{2+}	2.50±0.06	1.90±0.05	1.82±0.06
2	Ca^{2+}	1.26±0.06	1.80±0.05[1]	1.41±0.02
3	Mn^{2+}	3.91±0.03	4.08±0.08	3.19±0.08
4	Co^{2+}	6.69±0.06	3.27±0.08	4.15±0.09
5	Cu^{2+}	8.78±0.02	3.65±0.07	7.70±0.09
6	Zn^{2+}	5.35±0.06	2.69±0.07	5.84±0.03

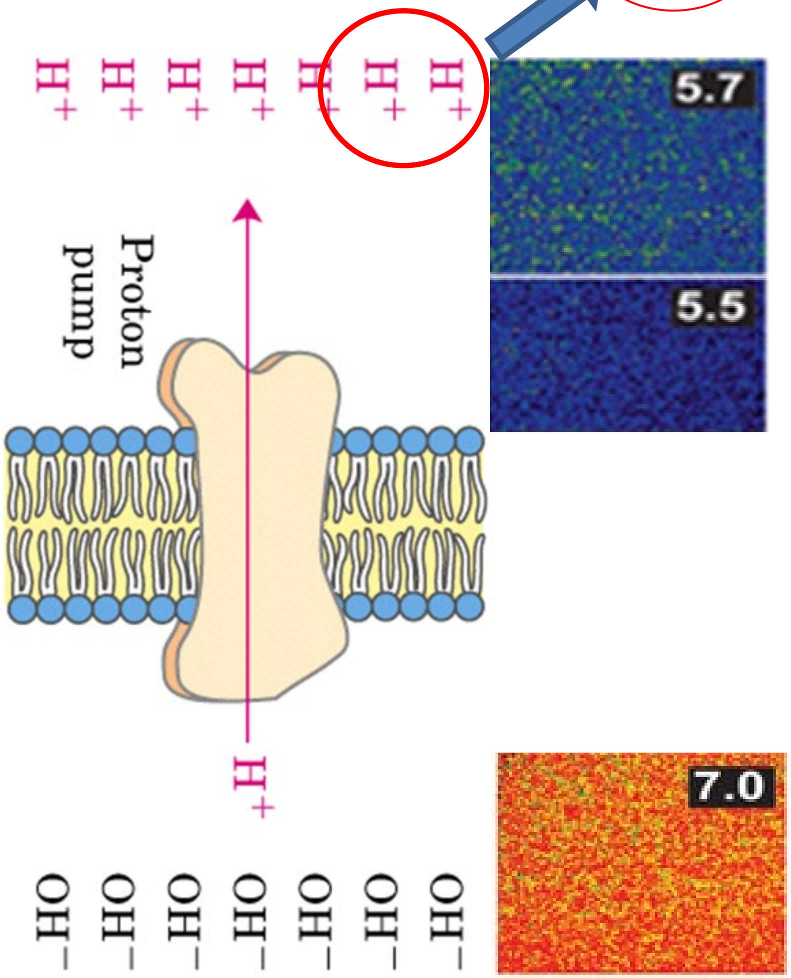
*The given errors are three times the standard error of the meanvalue or the sum of the propapable systematic errors. [1][6,14]

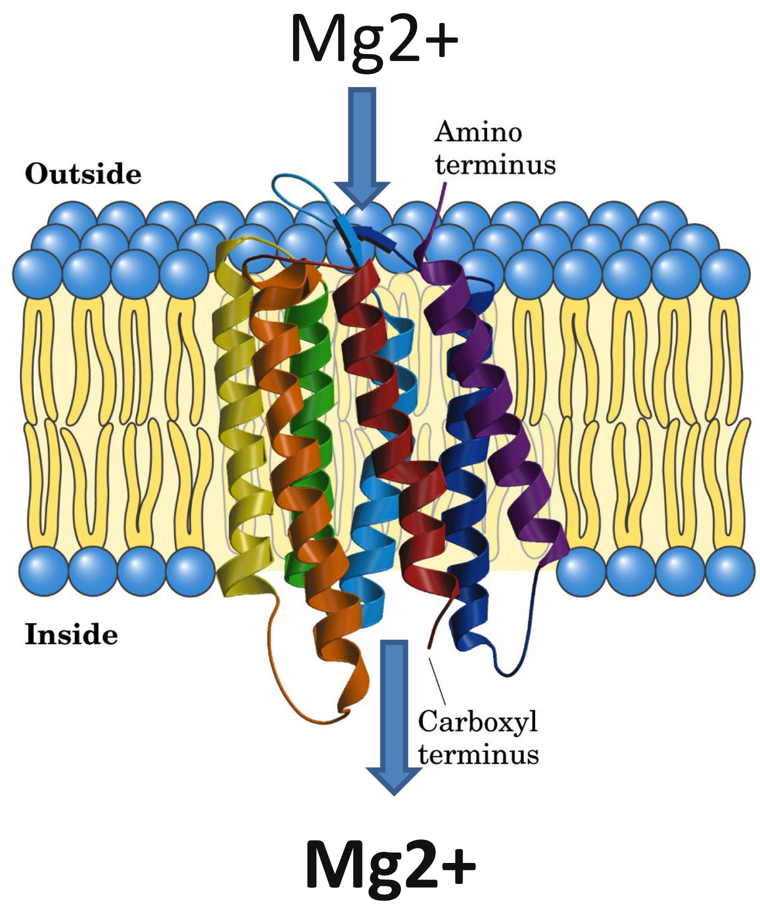

5.7
5.5
Proton pump
$[H^+]_{cyt}$
H^+
OH^-
7.0
COO^-
$H_3\overset{+}{N}$—C—H
R
M
2 : 1
M
Outside
Amino terminus
Inside
Carboxyl terminus
Outside
Amino terminus
Inside
Carboxyl terminus

Surface Technology
Volume 24, Issue 3, March 1985, Pages 301-317

Dissolution and hydration kinetics of MgO

$$MgO + 2H^{+} \rightarrow Mg^{2+} + H_2O(2)$$





Biochemical Indicators and Biofertilizer Application for Diagnosis and Allevation Micronutrient Deficiency in Plant

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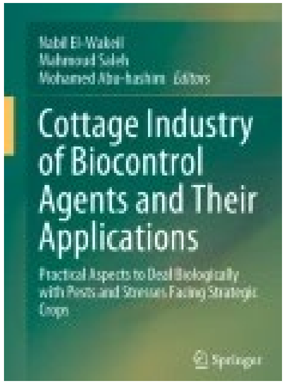
Zeinab A. Salama & Magdi T. Abdelhamid

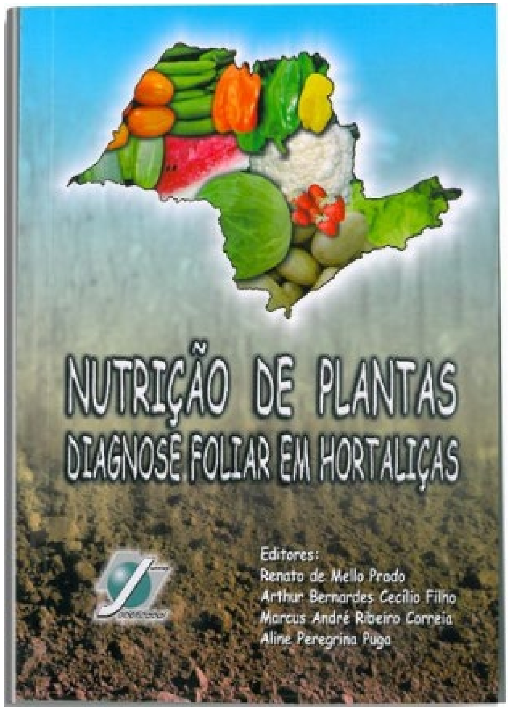


6.2 Limitações da análise foliar para fins de avaliar a nutrição das plantas

Capítulo 6

Perspectivas de Uso de Métodos Diagnósticos Alternativos: Testes Bioquímicos

Jairo Osvaldo Cazetta[1]
Ivana Machado Fonseca[2]
Renato de Mello Prado[3]



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