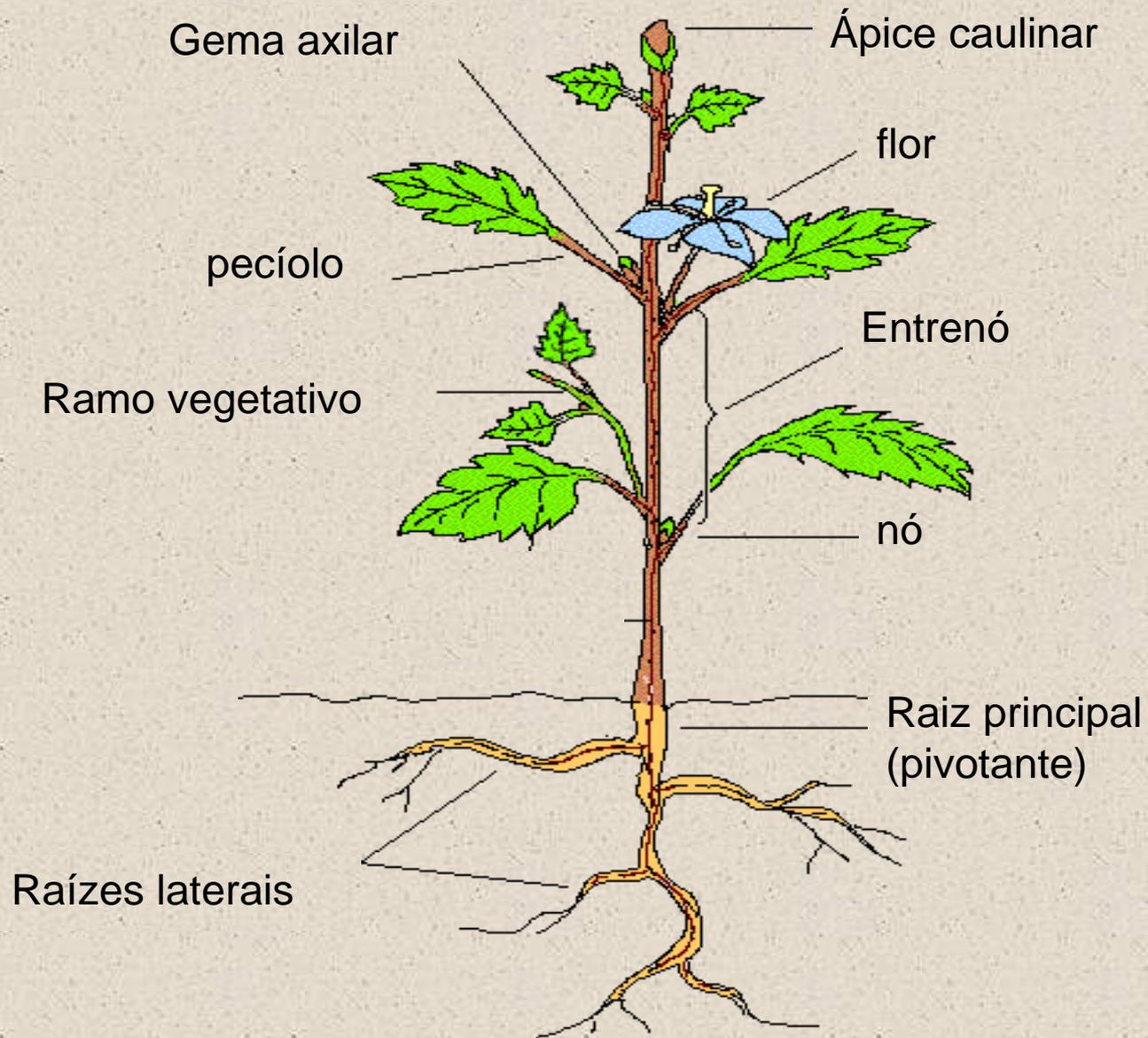


Raiz

Prof. Dr. Diego Demarco

Assistam esta aula online em

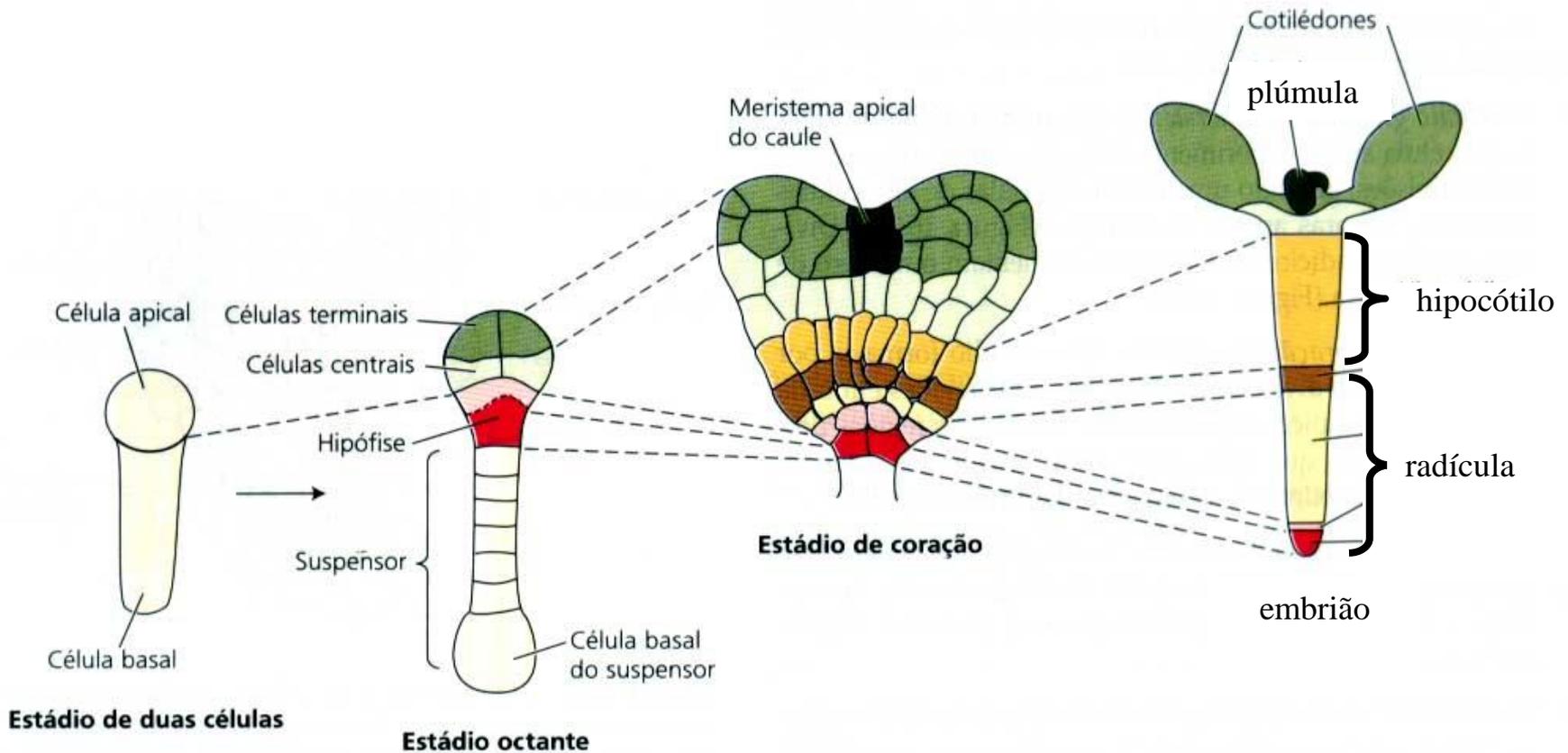
<http://eaulas.usp.br/portal/video.action?idItem=22770>

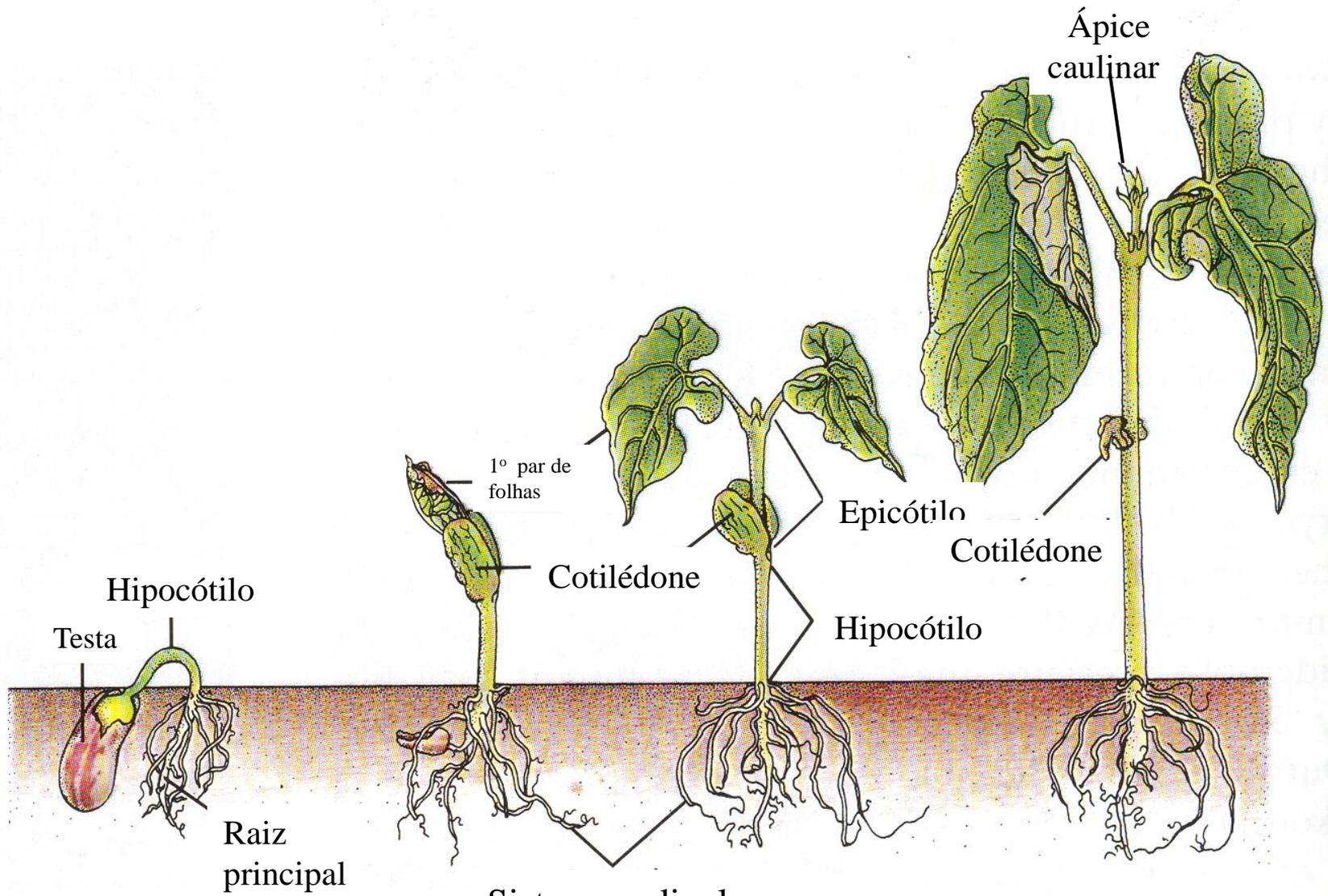


Funções das raízes

- **Fixação e suporte** da planta;
- **Absorção e condução** da água e sais minerais;
- ***Armazenamento** de substâncias nutritivas;
- ***Aeração**

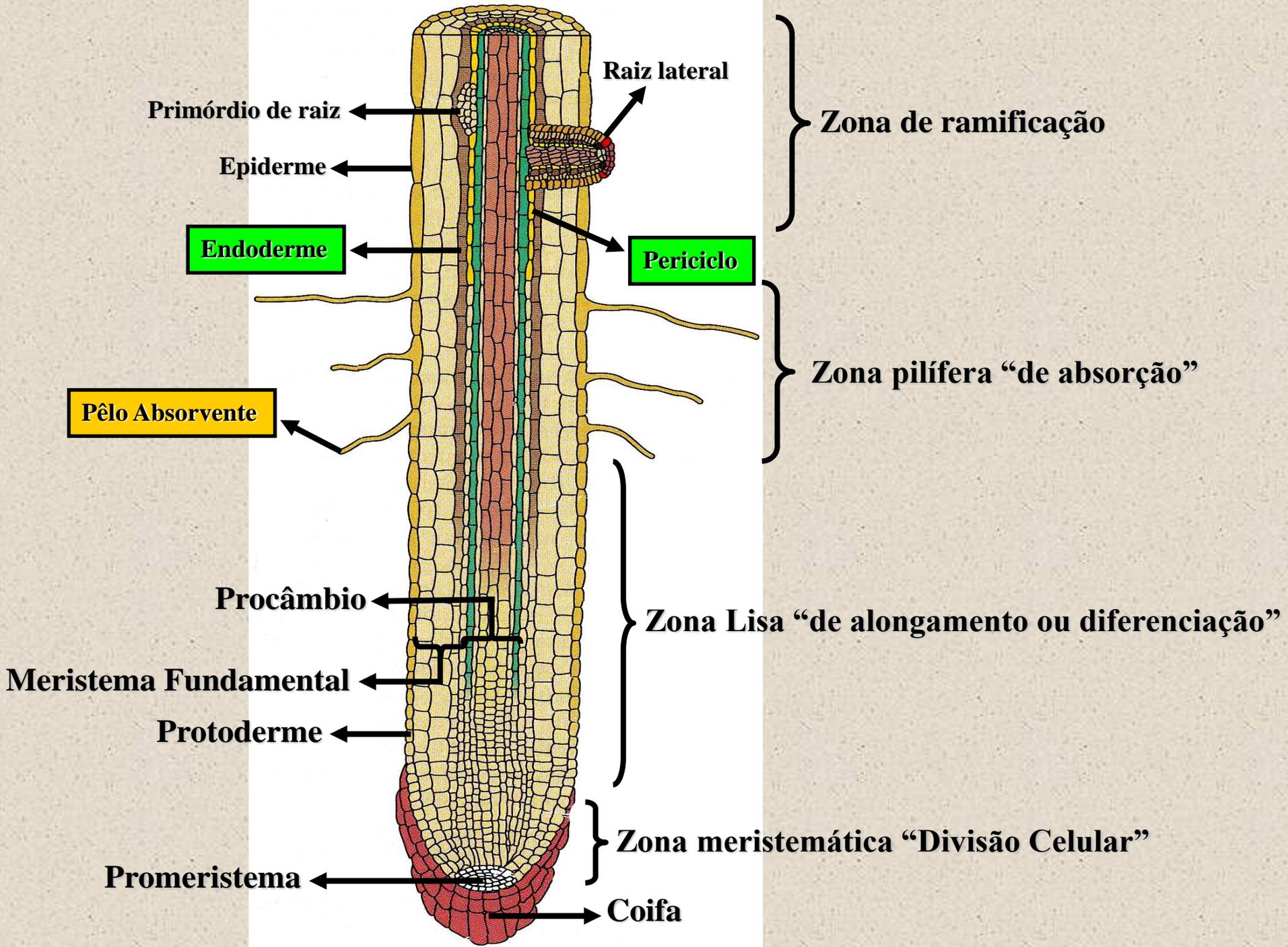
Origem da raiz principal a partir da radícula do embrião





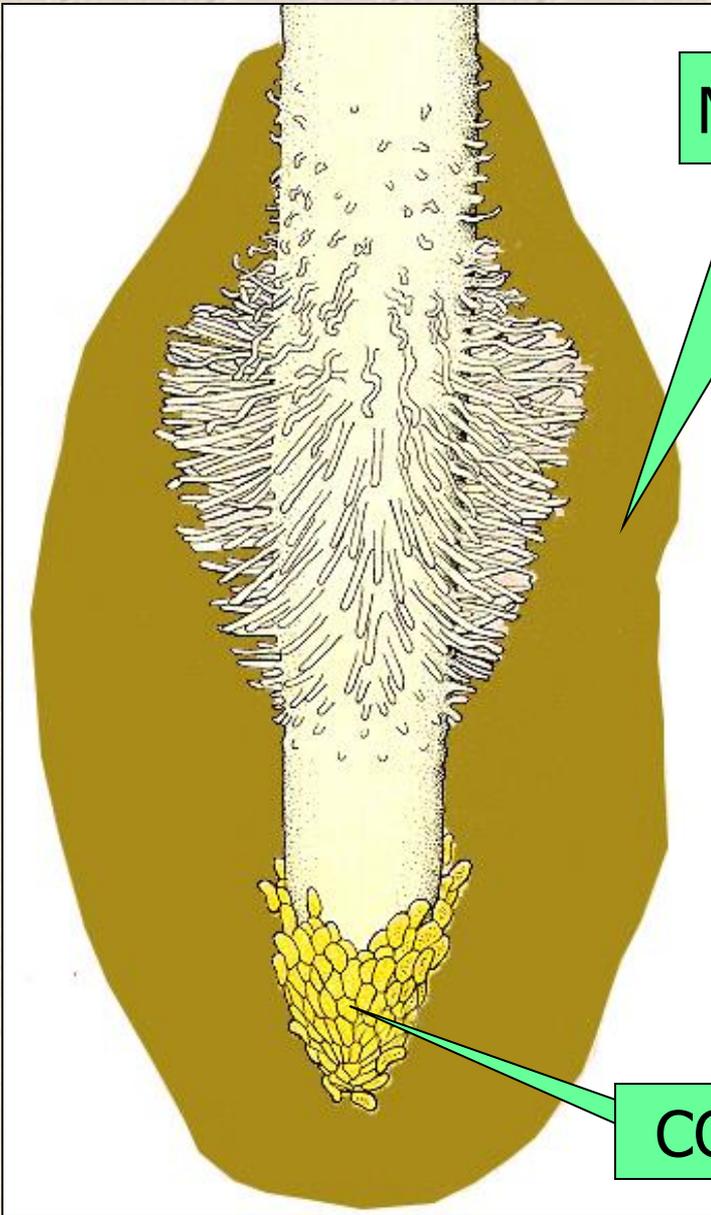
Sistema radicular

Phaseolus vulgaris, Leguminosae
Eudicotiledônea



COIFA

MUCILAGEM

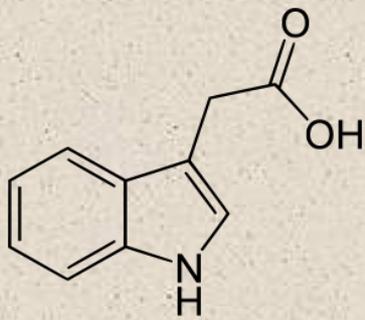


MUCILAGEM



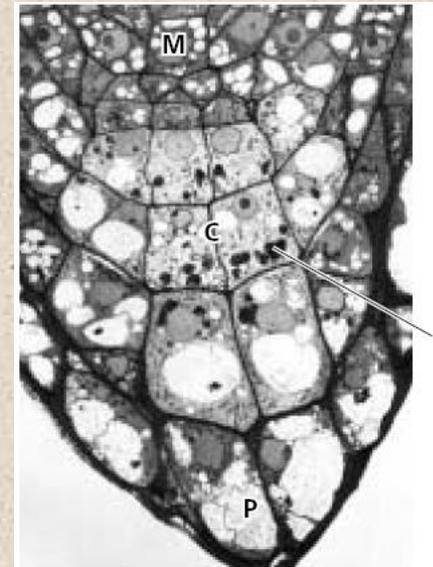
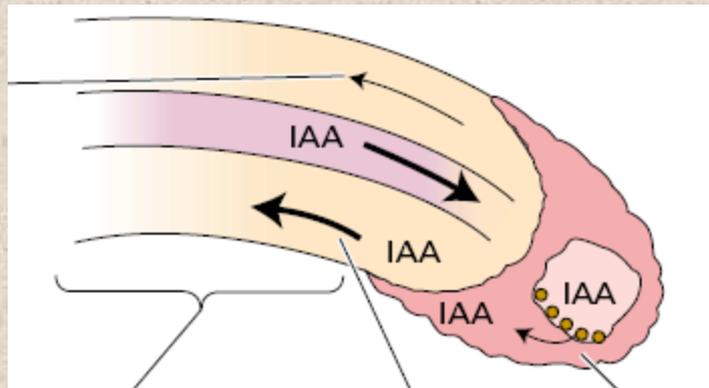
COIFA



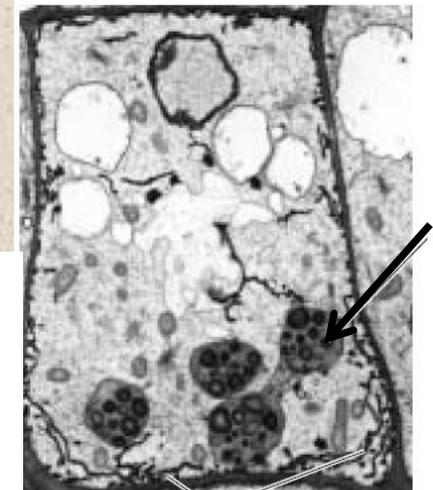


Tropismos

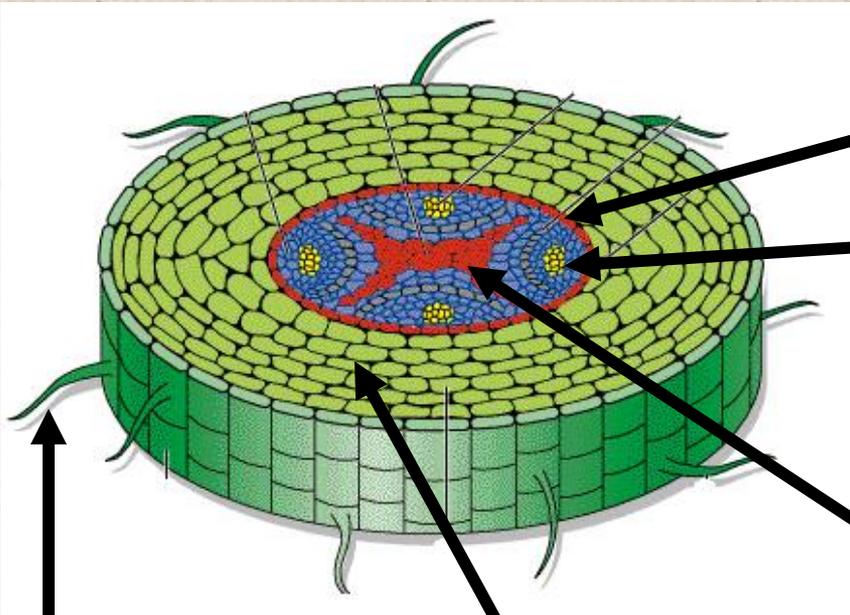
- **Auxina** (estimula crescimento no caule, reprime na raiz)
- **Estatólitos** (grãos de amido em células da coifa)



(B)



Endoplasmic reticulum



Endoderme

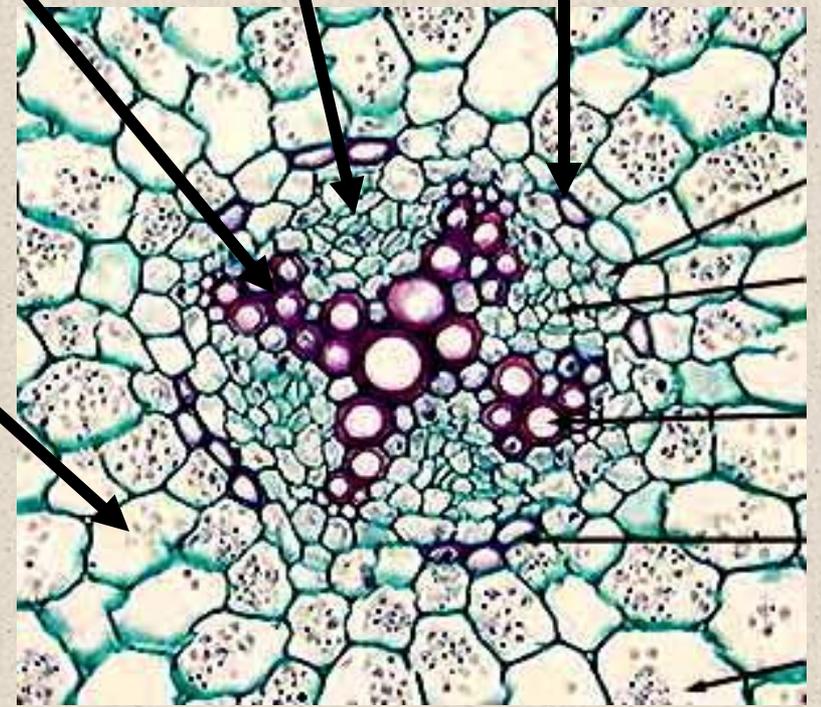
Floema

Xilema

Córtex

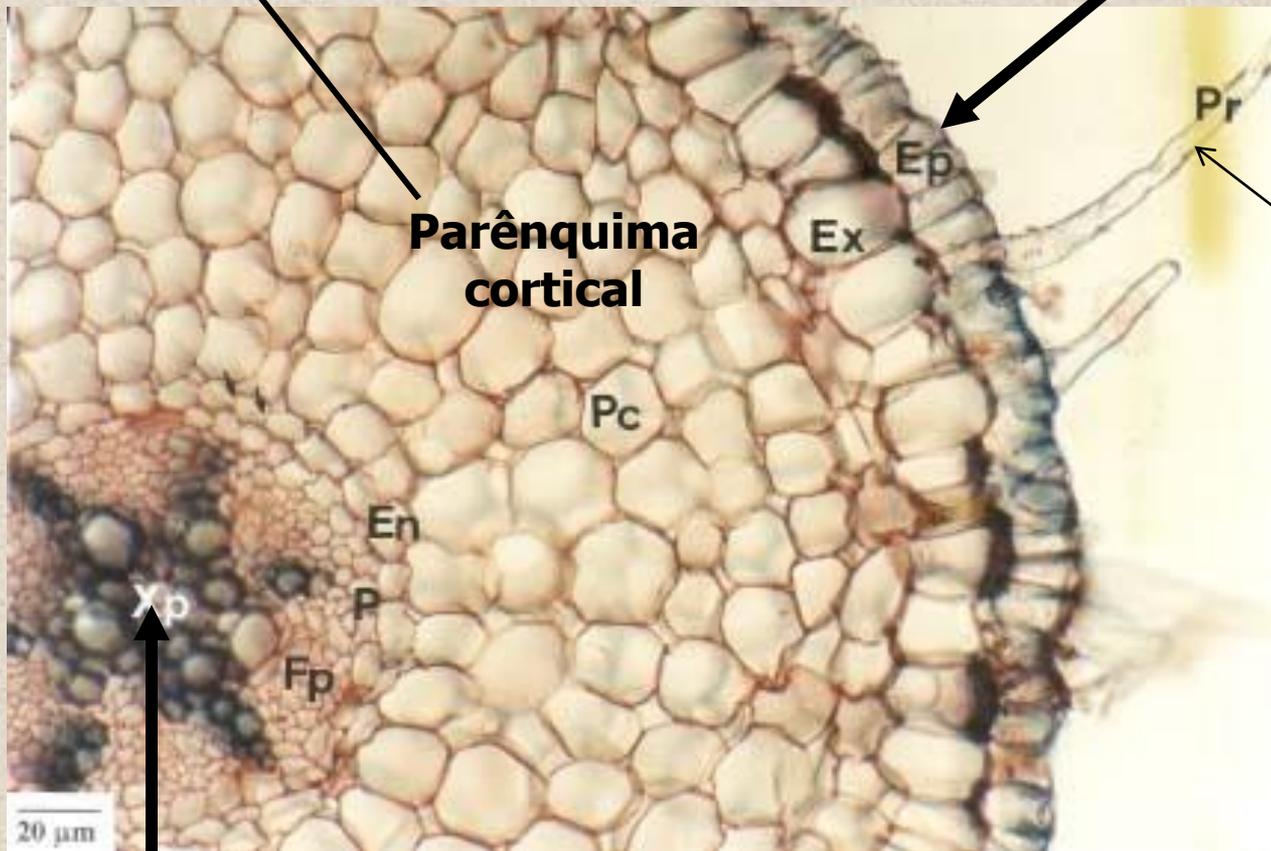
Pêlo radicular

Estrutura de uma raiz primária



Local de acúmulo
de substâncias

Epiderme



**Parênquima
cortical**

Ex

Ep

Pr

Pelo absorvente

Xp

P

Fp

20 μm

**Cilindro
vascular**

Tecido de sustentação



Monstera deliciosa

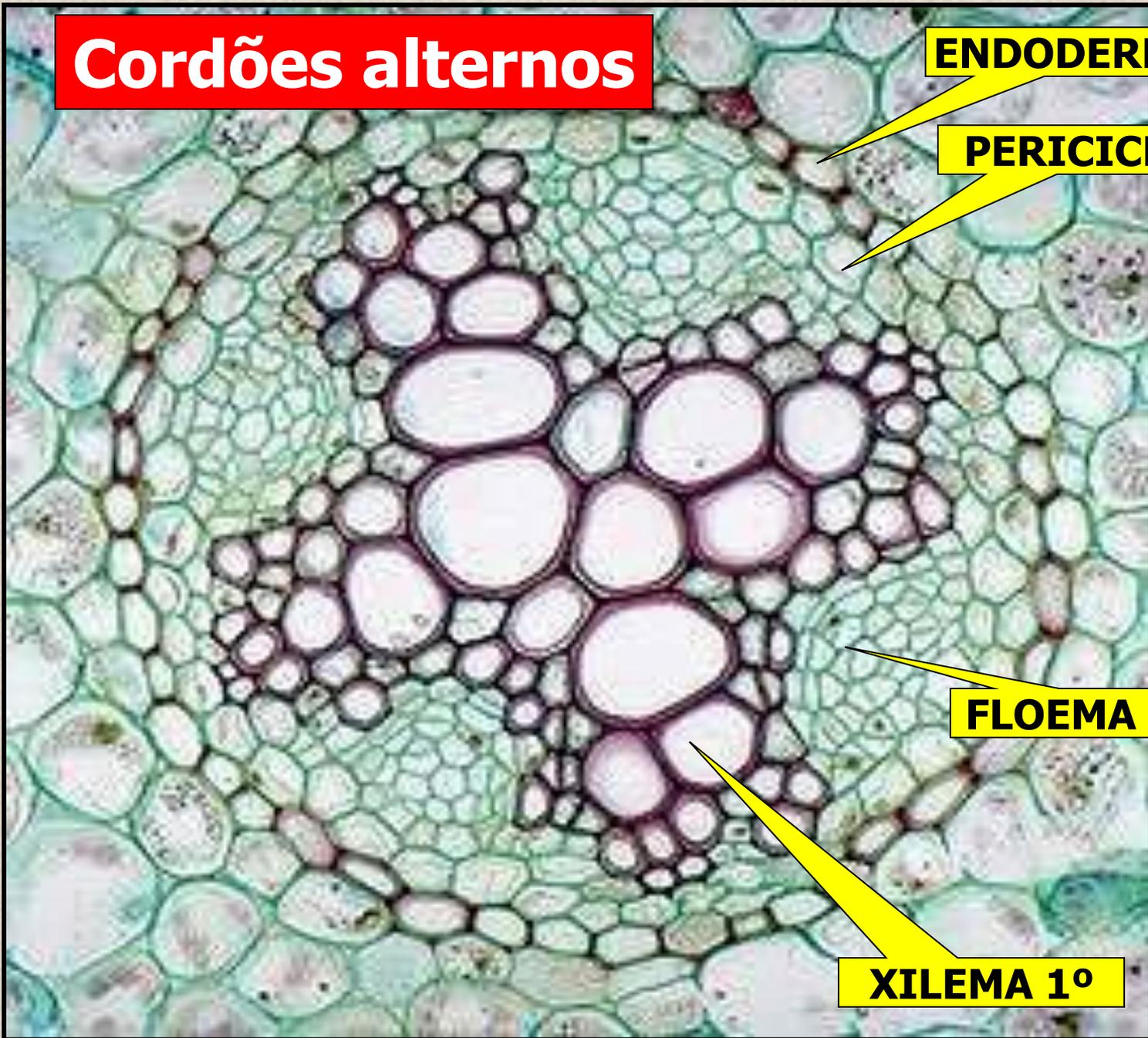
Cordões alternos

ENDODERME

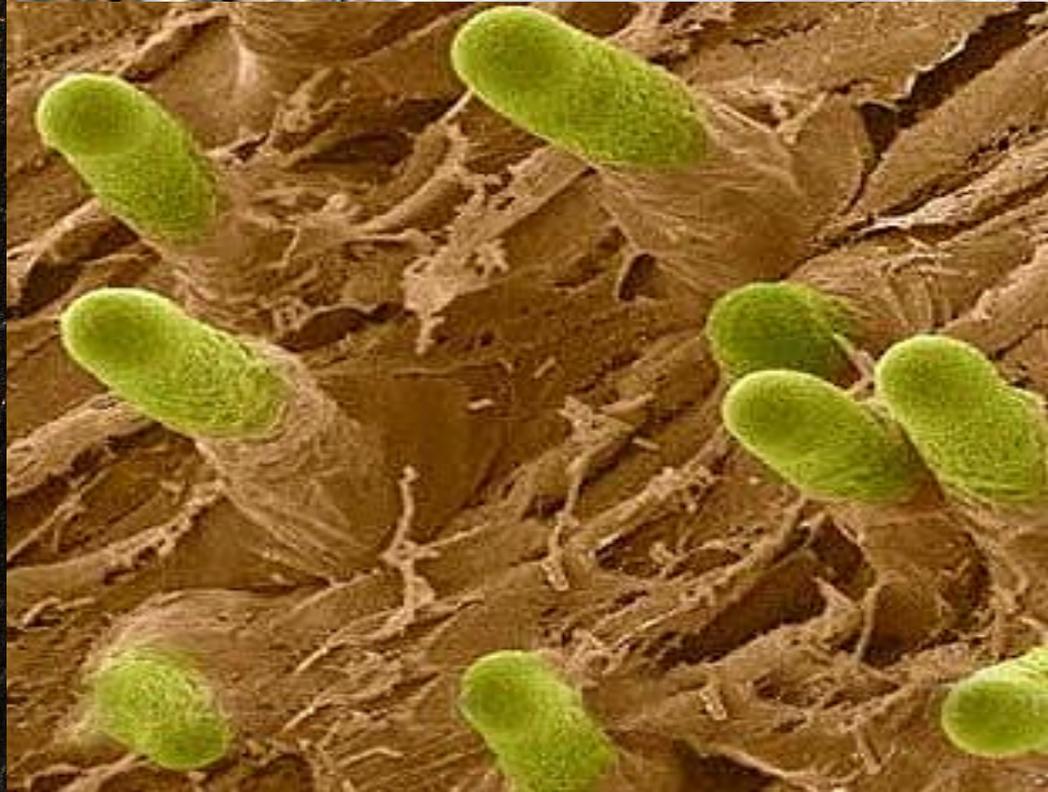
PERICICLO

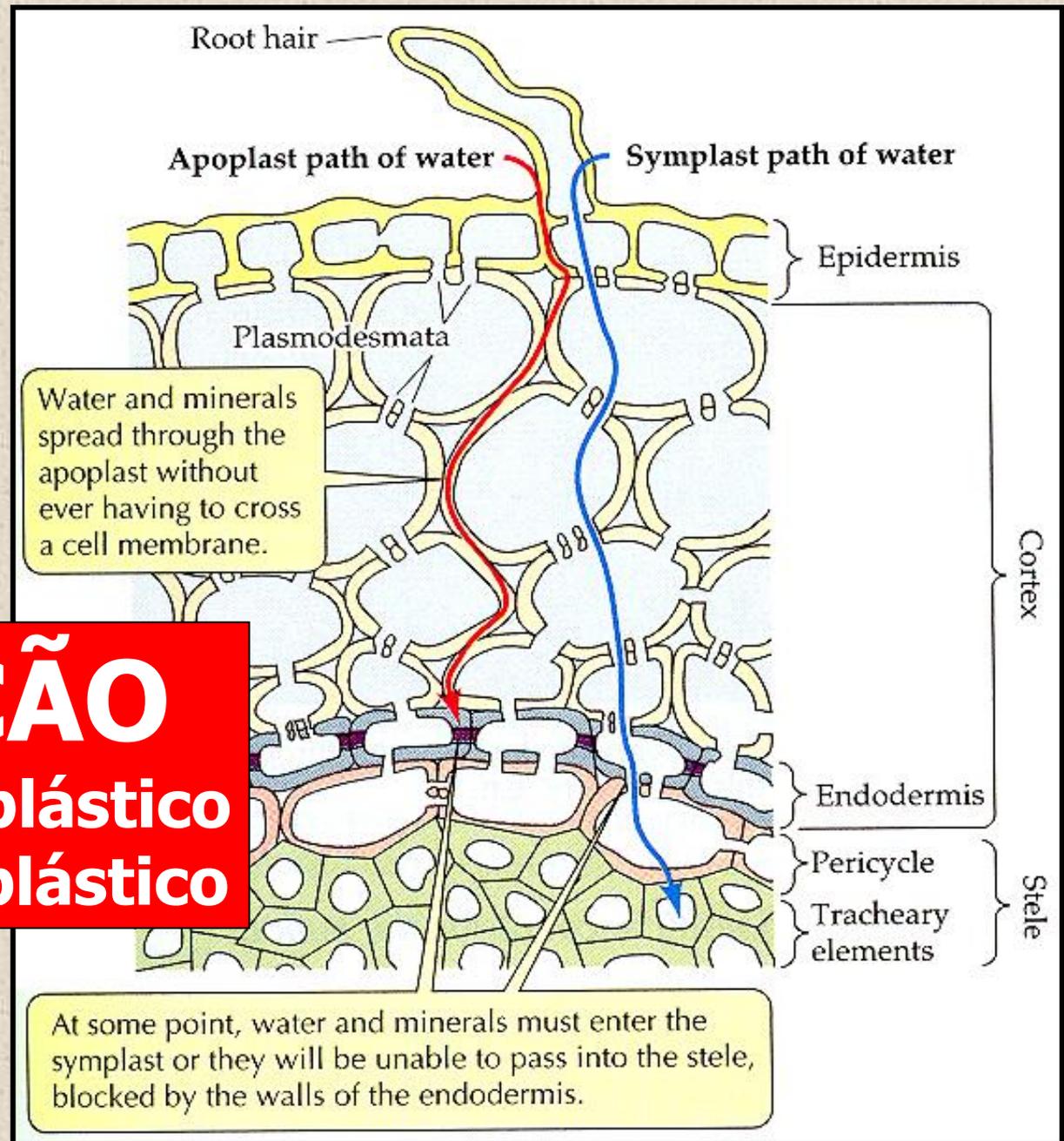
FLOEMA 1°

XILEMA 1°



Pêlos Radiculares

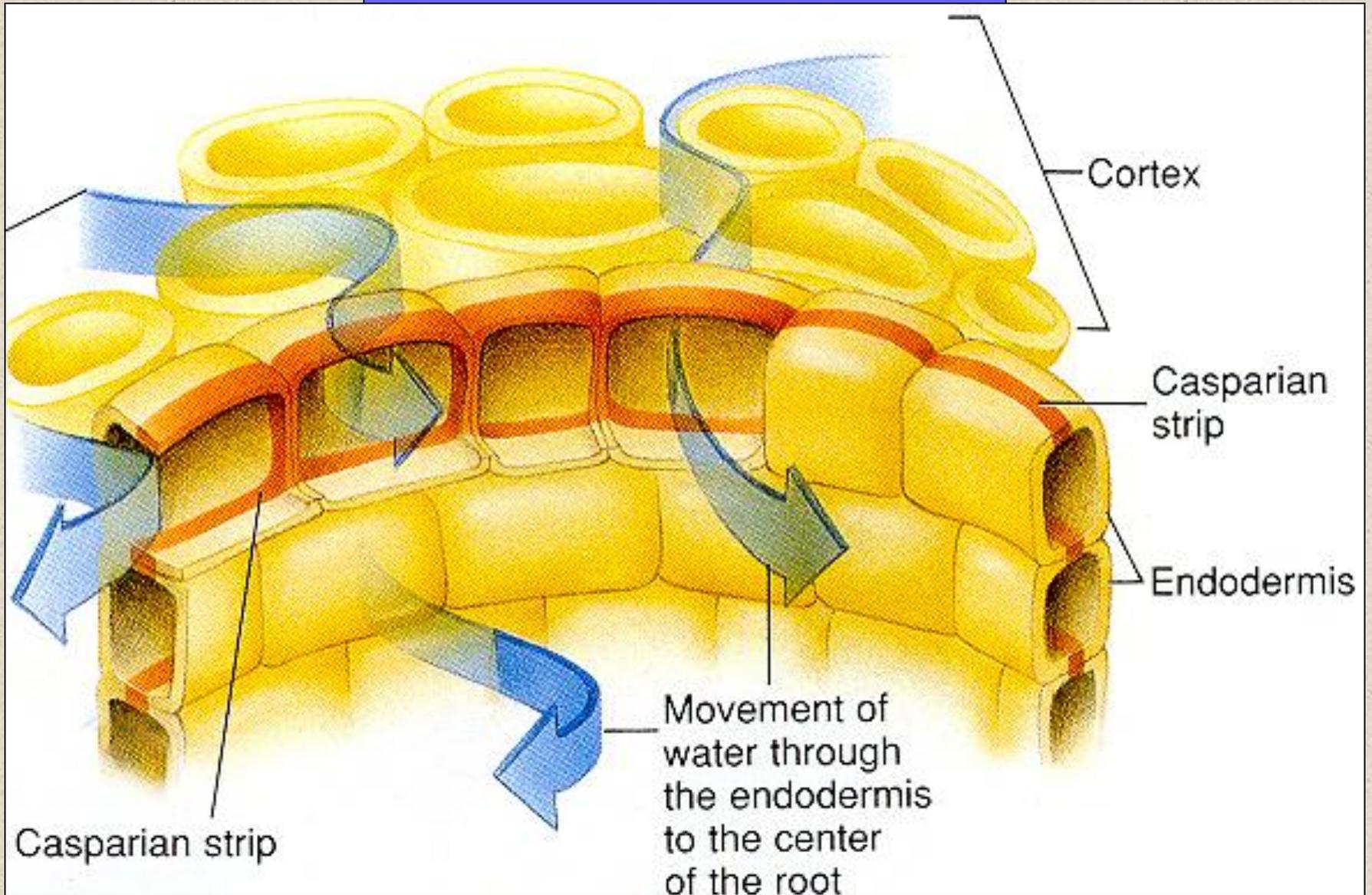




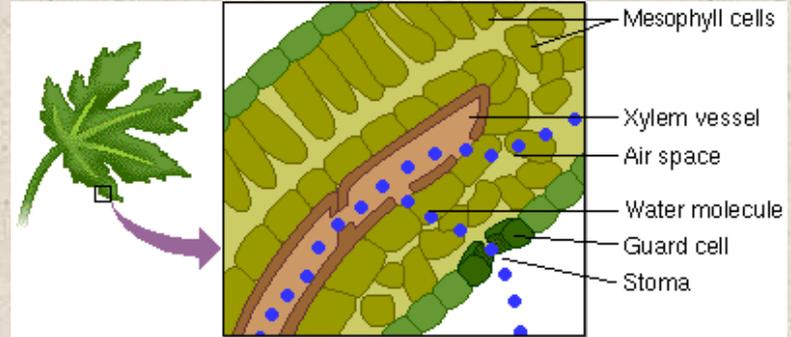
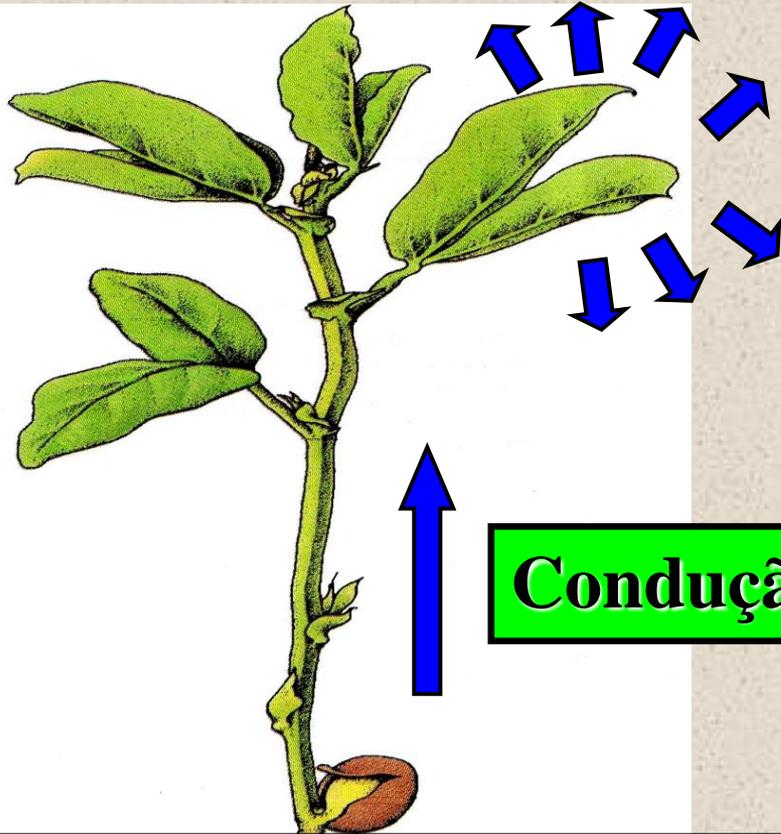
ABSORÇÃO

Transporte apoplástico
Transporte simplástico

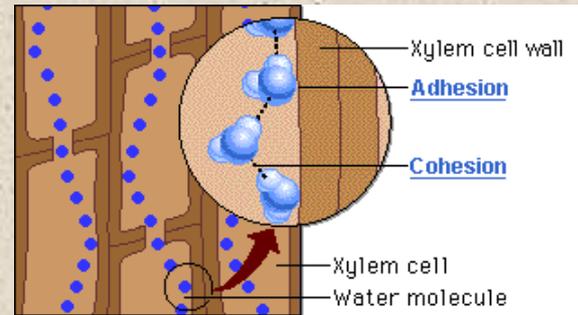
ENDODERME



Xilema

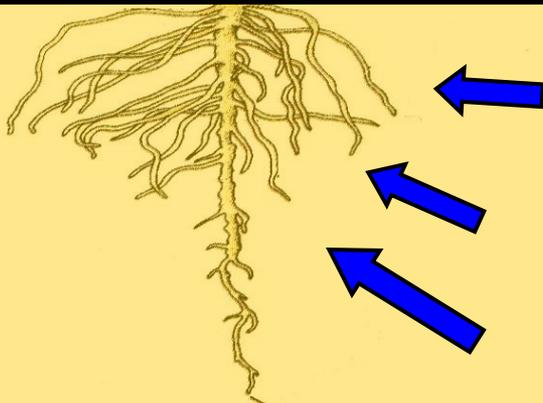


Condução

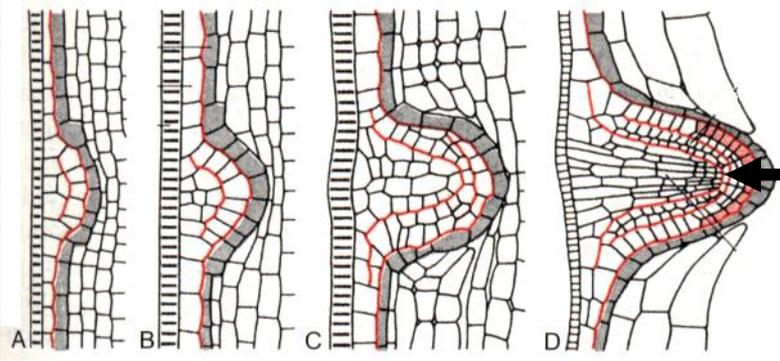


Absorção

H₂O
Sais Minerais

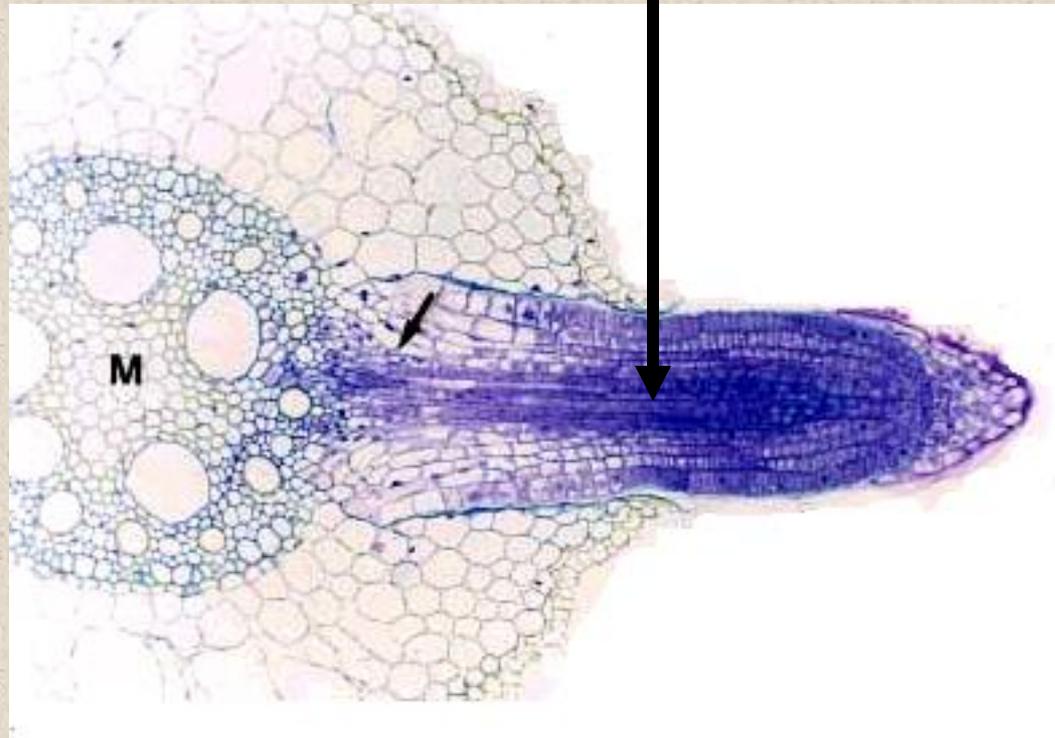


Periciclo e a origem de raízes laterais



Raiz lateral em formação

Cilindro vascular



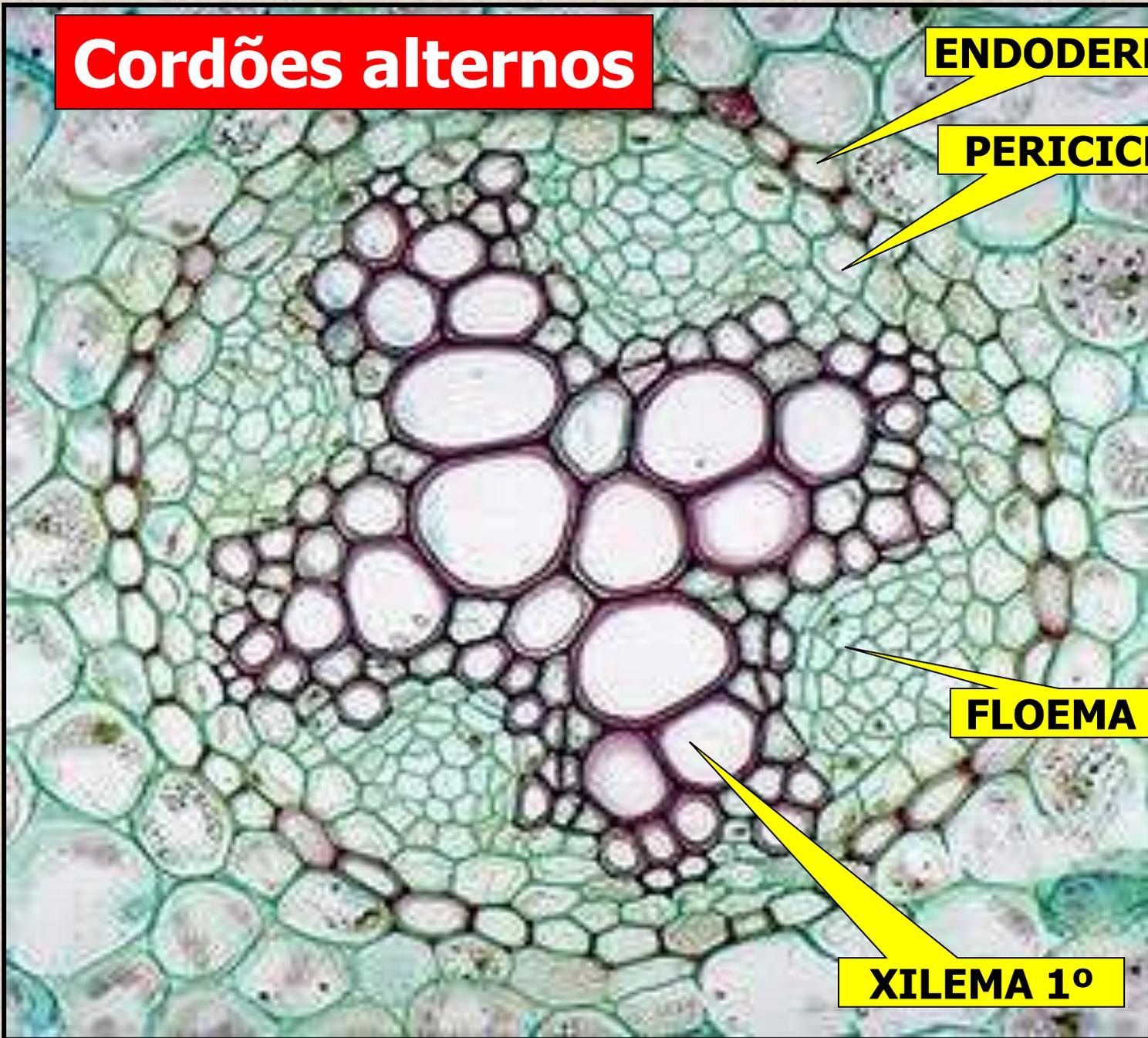
Cordões alternos

ENDODERME

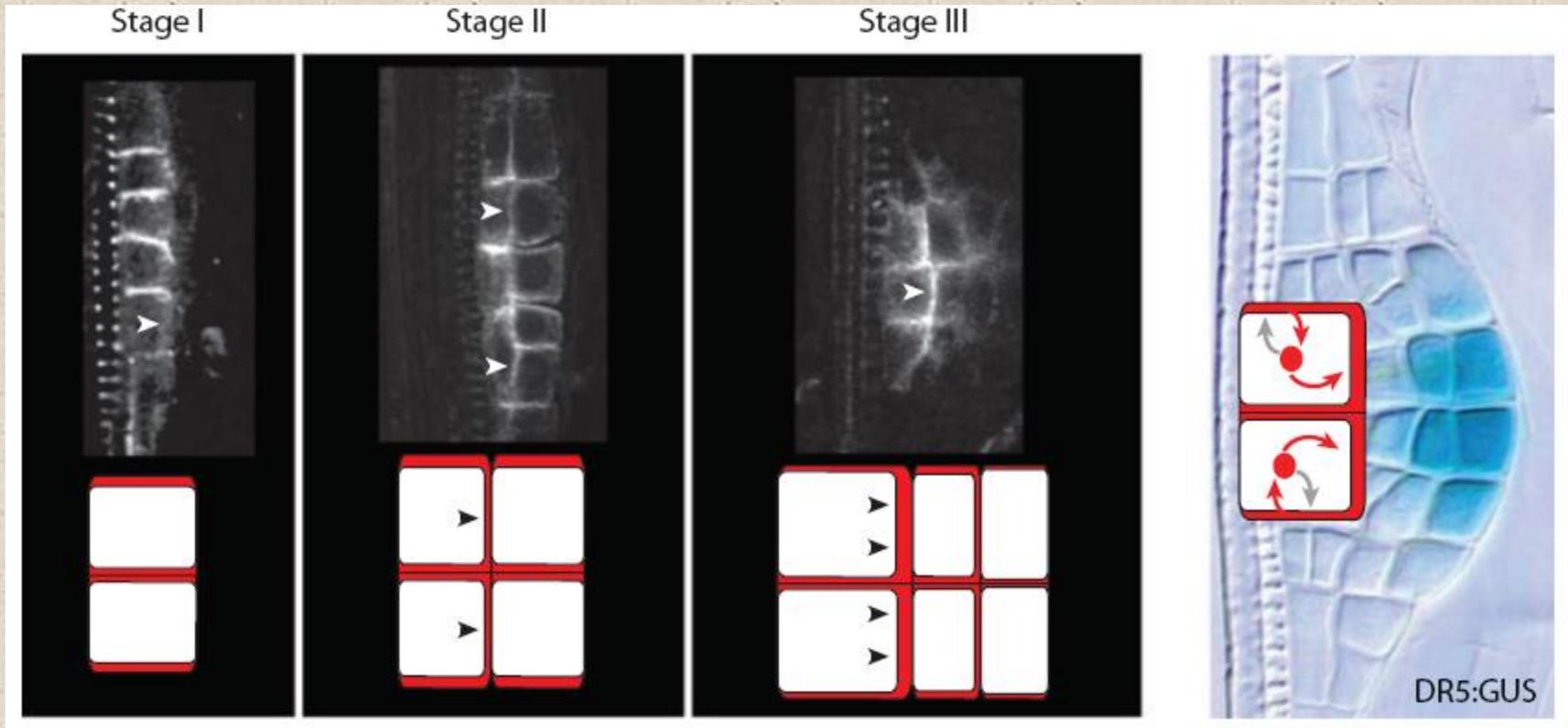
PERICICLO

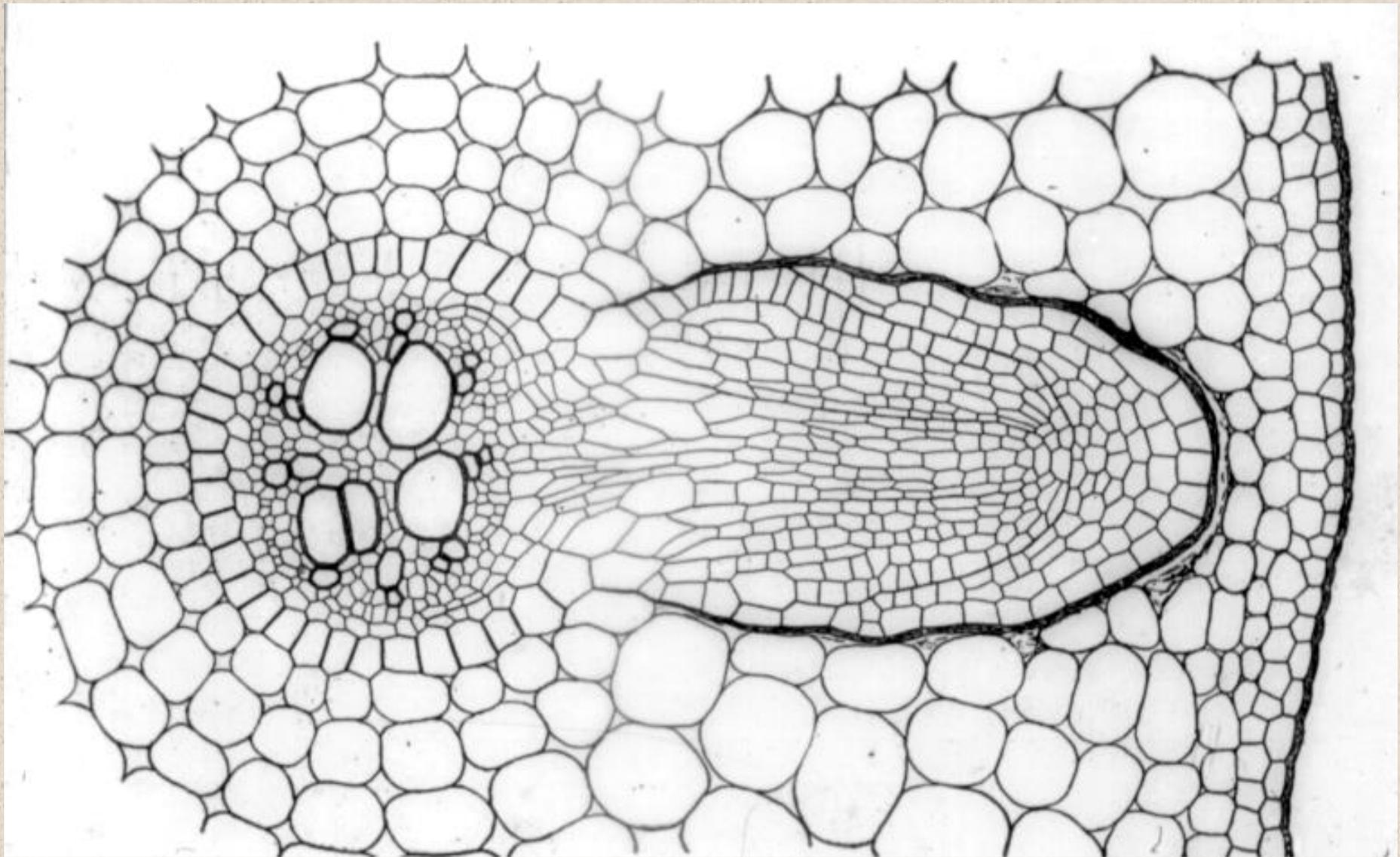
FLOEMA 1°

XILEMA 1°



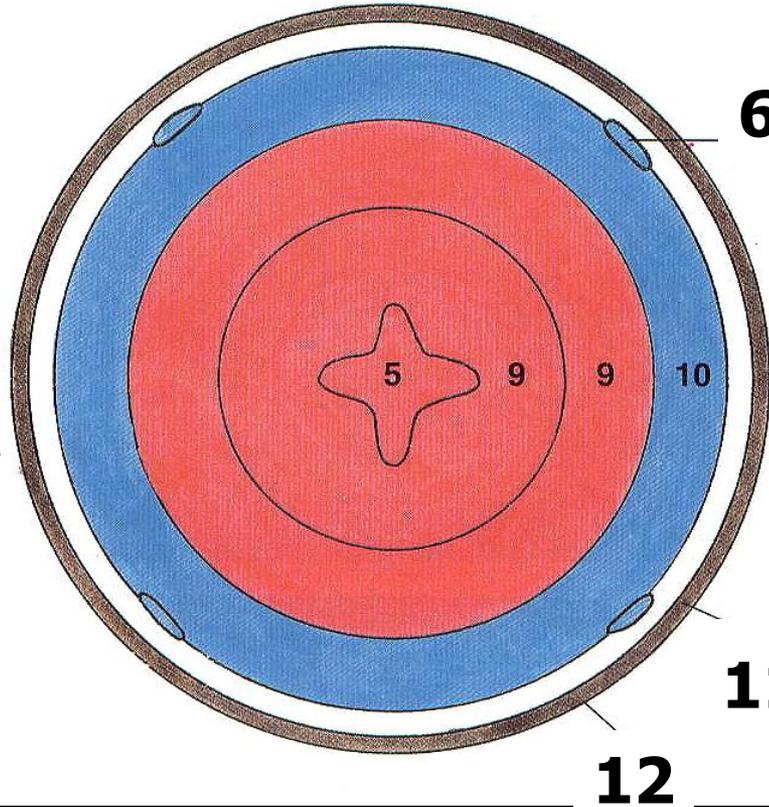
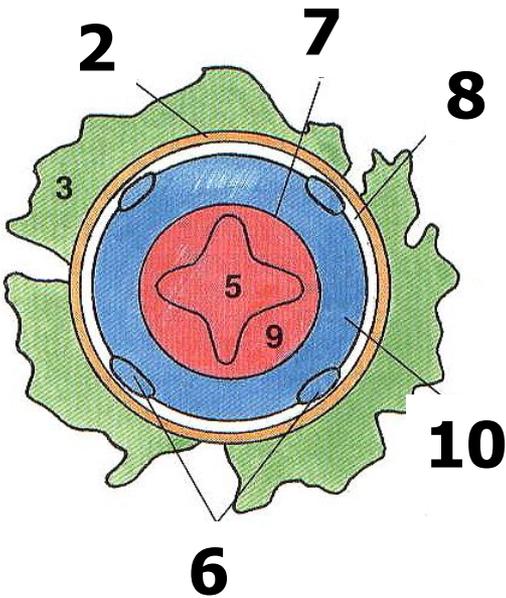
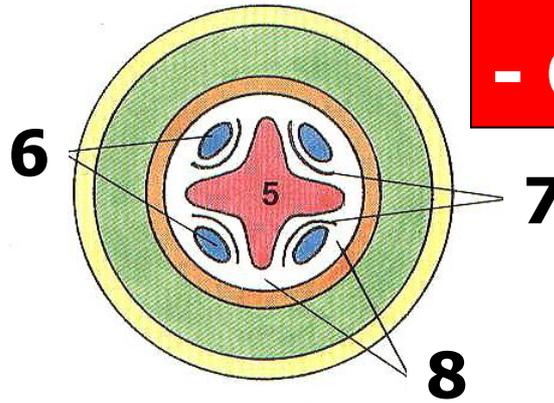
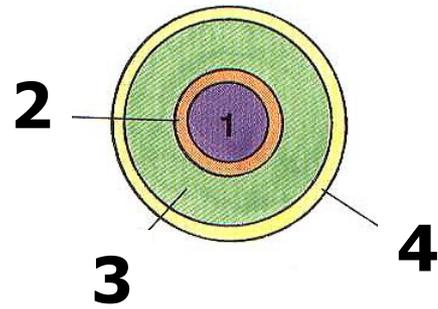
Desdiferenciação



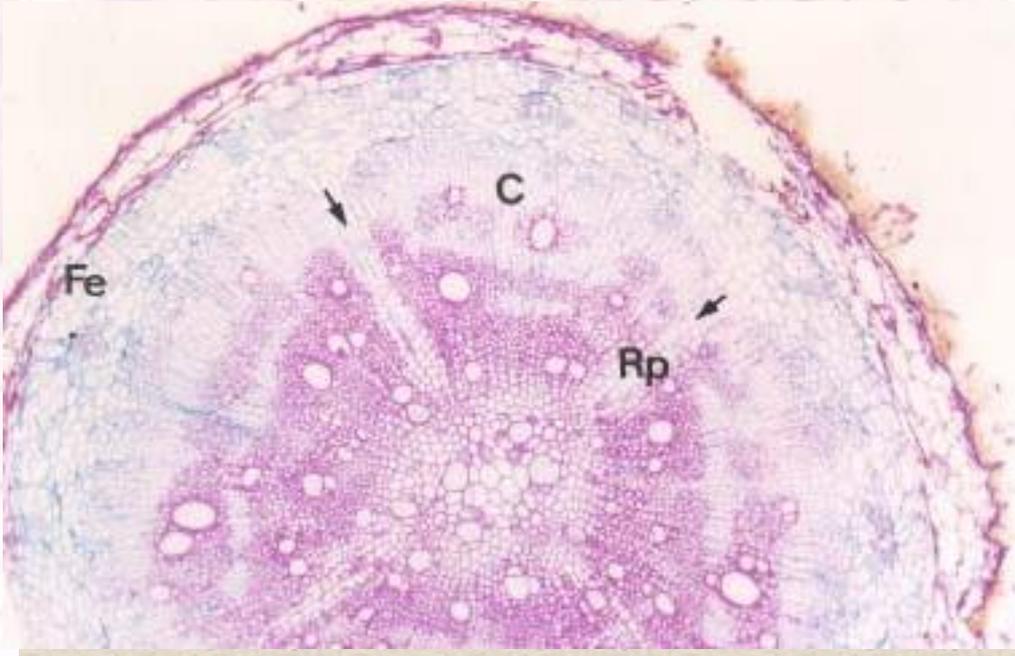
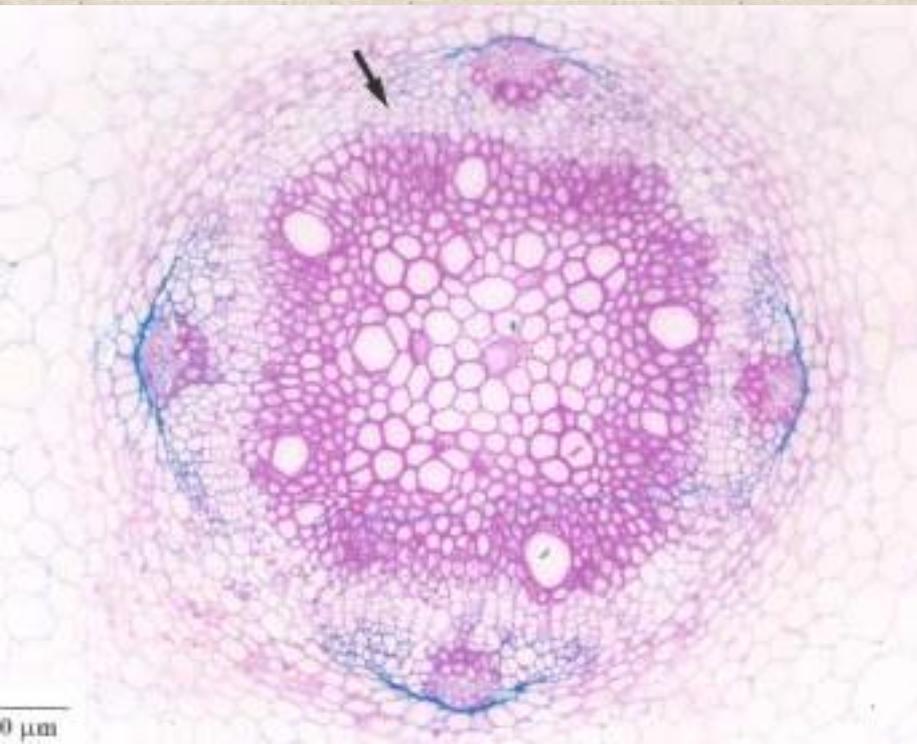
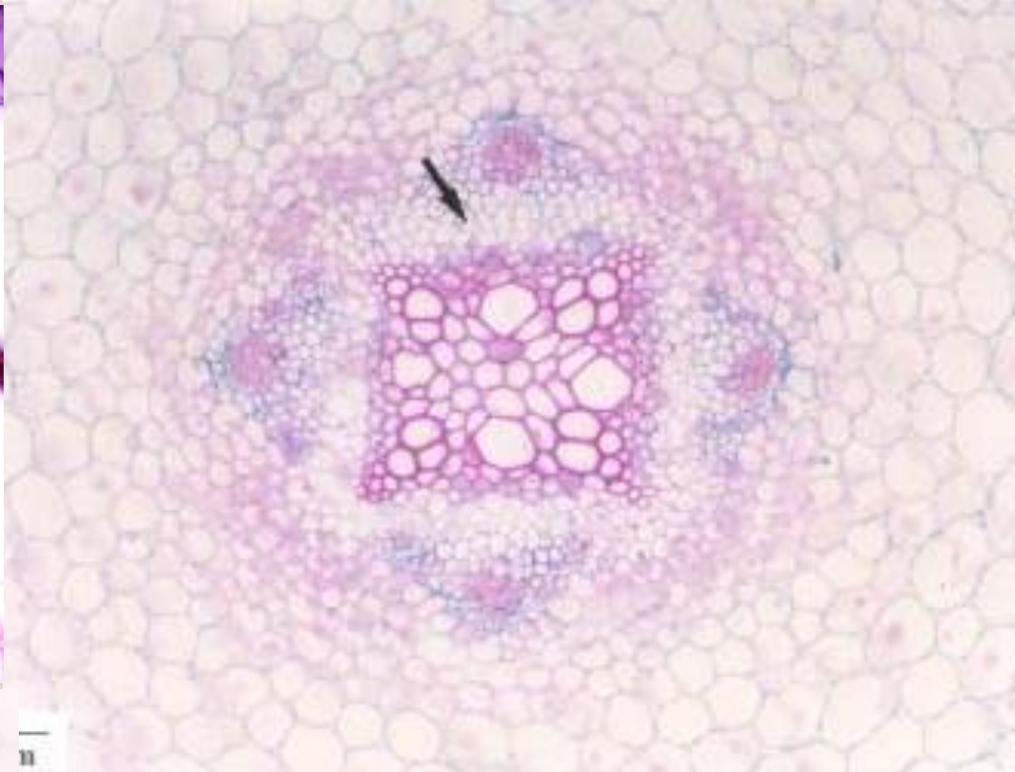
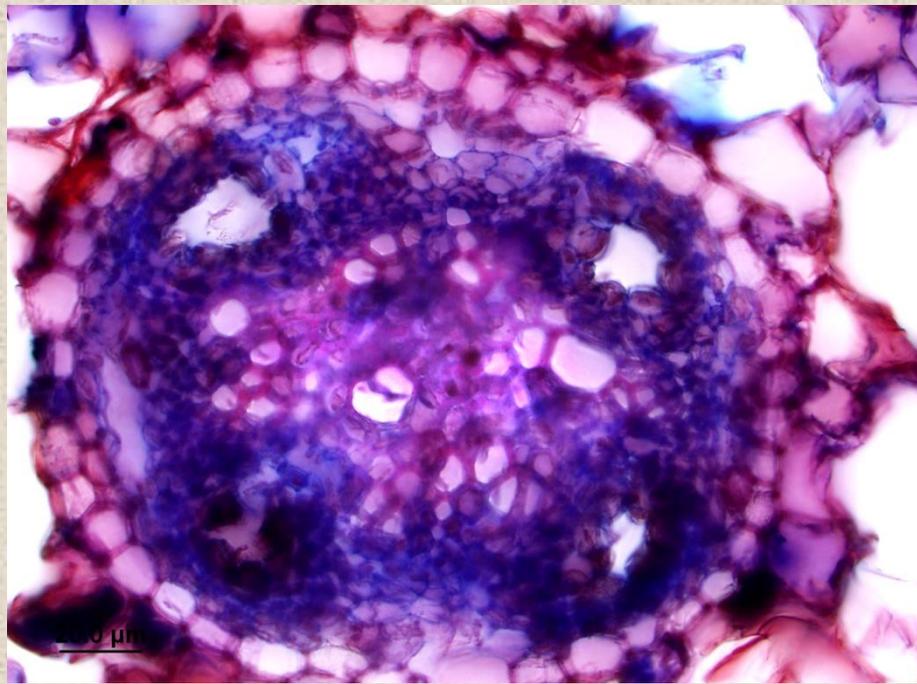


RAIZ

- Crescimento 2º -



- 1- PROCÂMBIO
- 2- ENDODERME
- 3- CÓRTEX
- 4- EPIDERME
- 5- XILEMA 1º
- 6- FLOEMA 1º
- 7- CÂMBIO(Início)
- 8- PERICICLO
- 9- XILEMA 2º
- 10- FLOEMA 2º
- 11- FELOGÊNIO
- 12- PERIDERME



PERIDERME

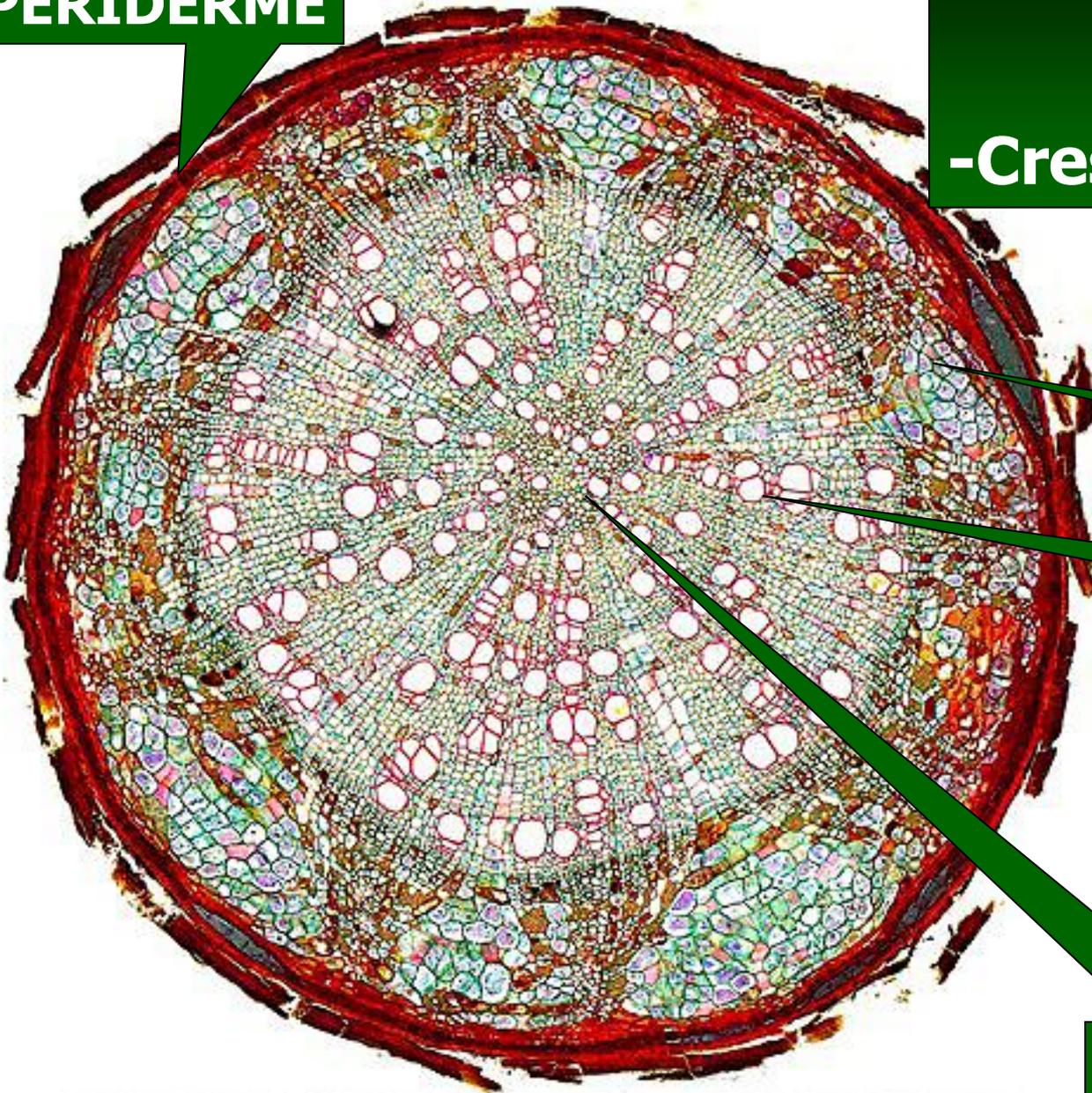
Raiz

-Crescimento 2º-

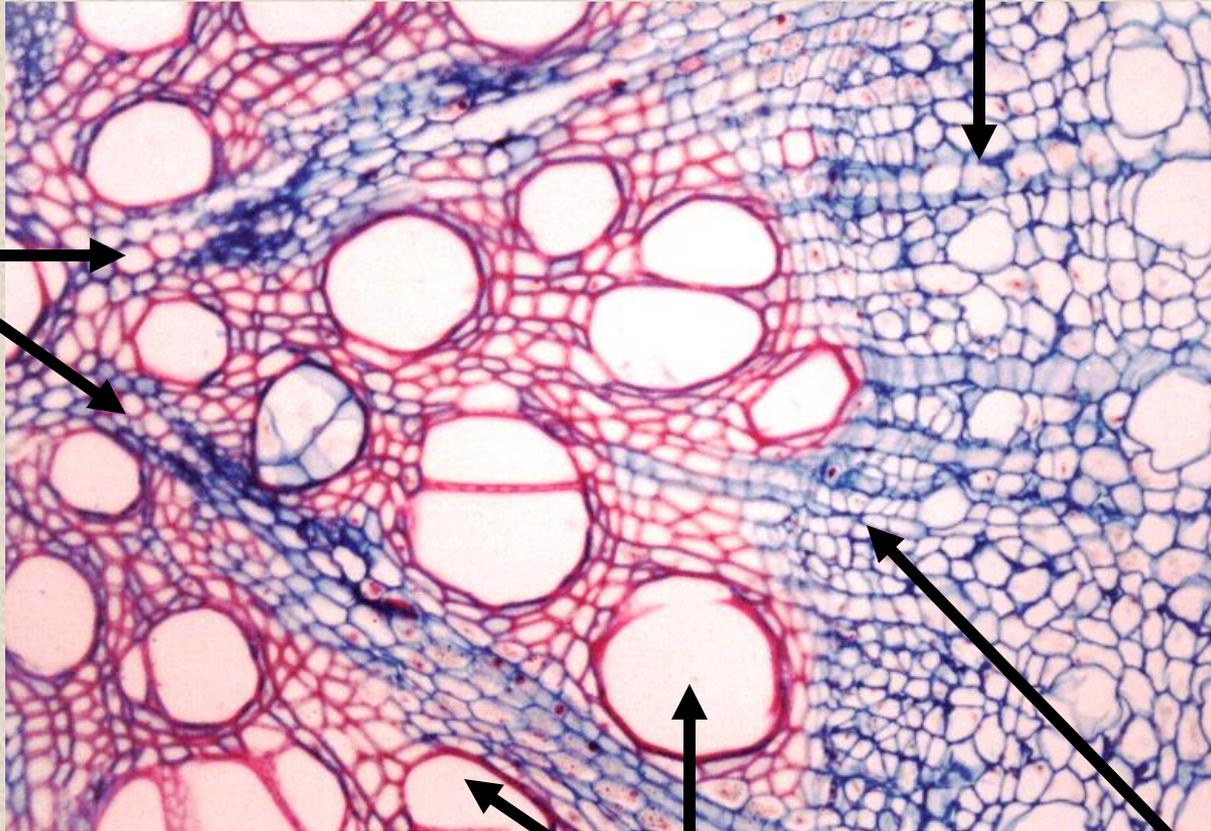
FLOEMA 2º

XILEMA 2º

XILEMA 1º



**Xilema
primário**



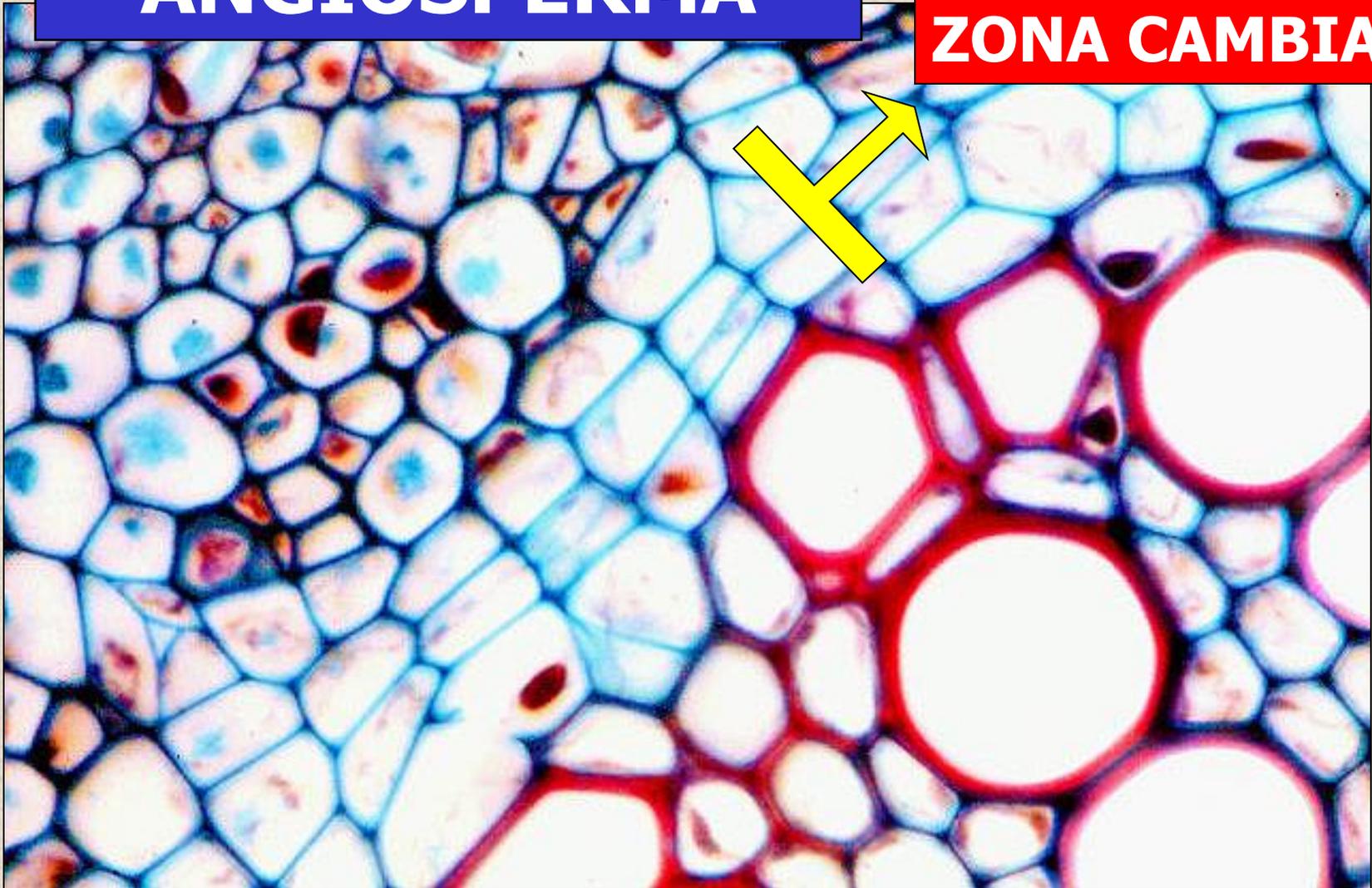
**Floema
secundário**

**Xilema
secundário**

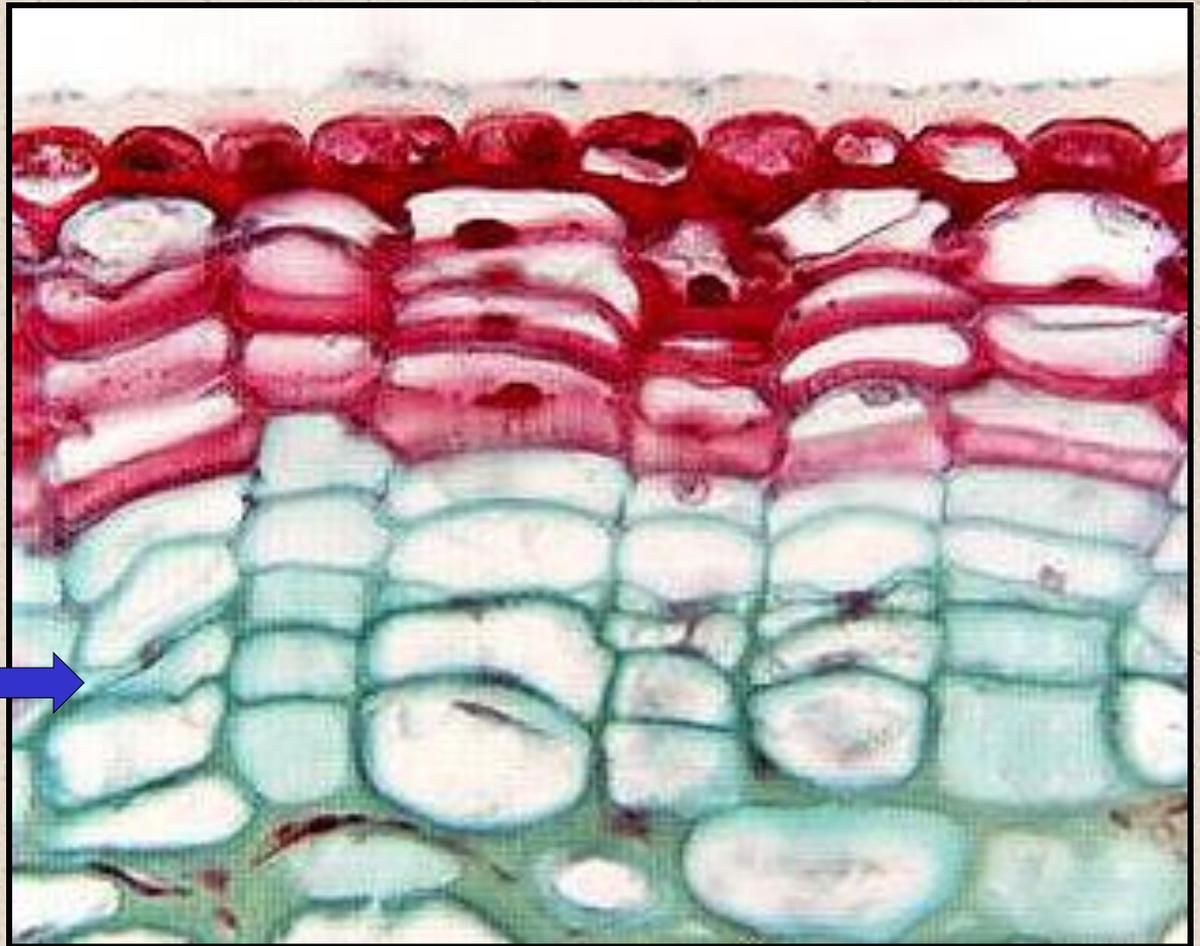
**Faixa
cambial**

CÂMBIO VASCULAR ANGIOSPERMA

ZONA CAMBIAL



PERIDERME



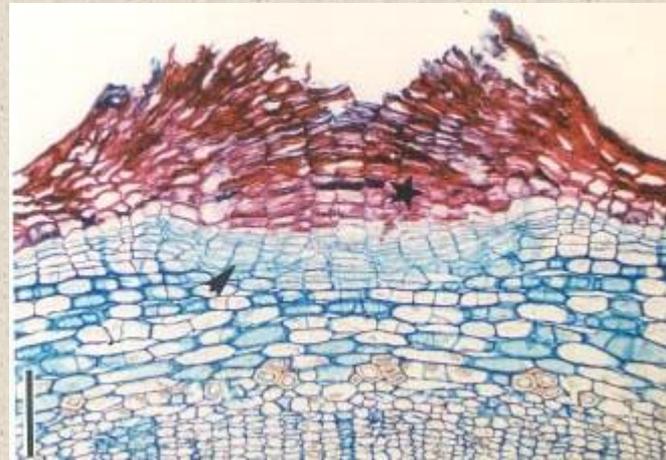
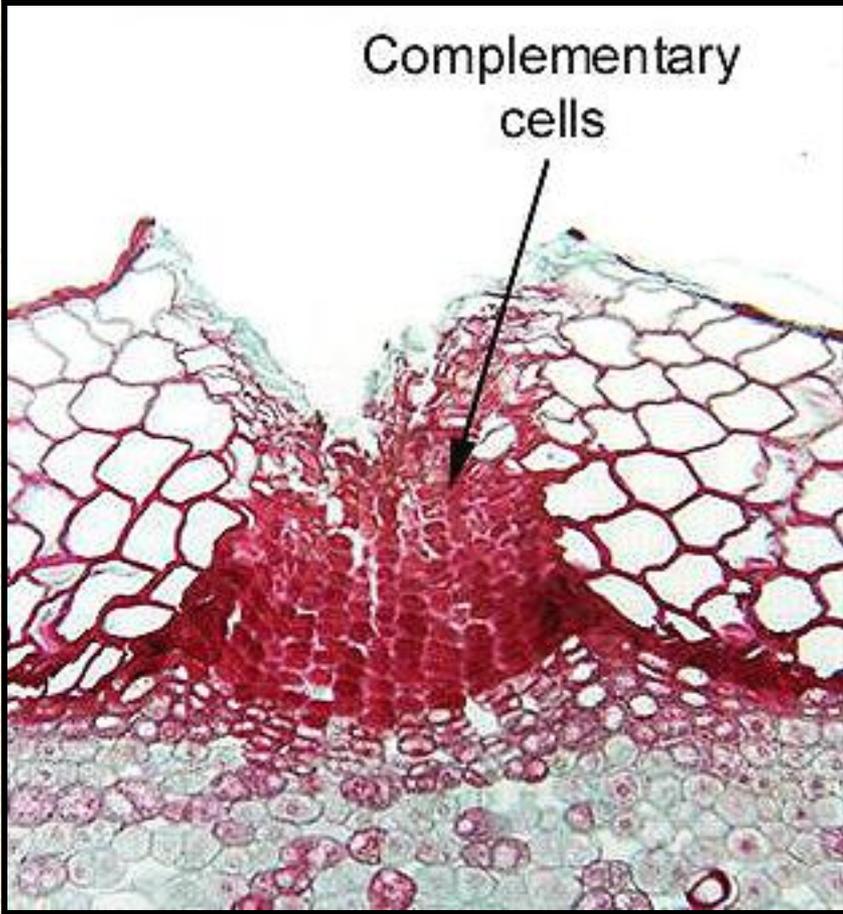
SÚBER

FELOGÊNIO

FELODERME

LENTICELA

Complementary
cells

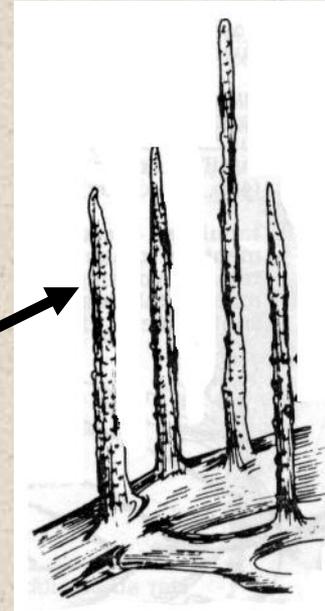


• Pneumatóforos

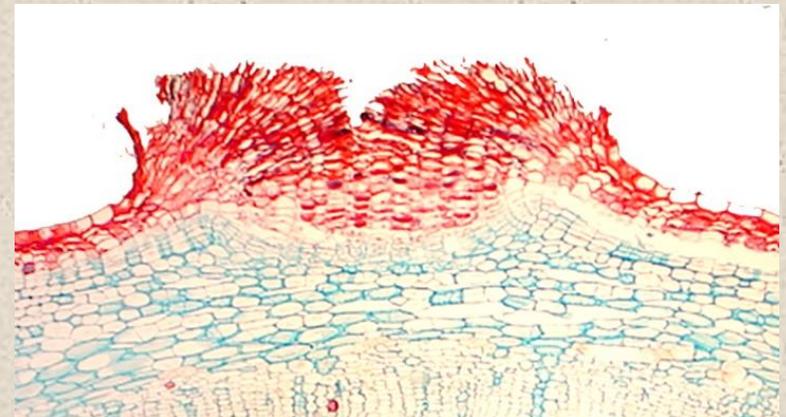


Raiz respiratória

Pneumatóforos



pneumatódio



Variações na estrutura e desenvolvimento das raízes

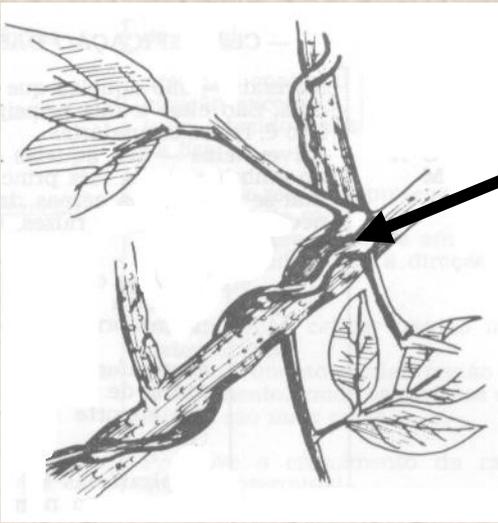
HAUSTÓRIO

Cipó-Chumbo (*Cuscuta* sp.) - Holoparasita

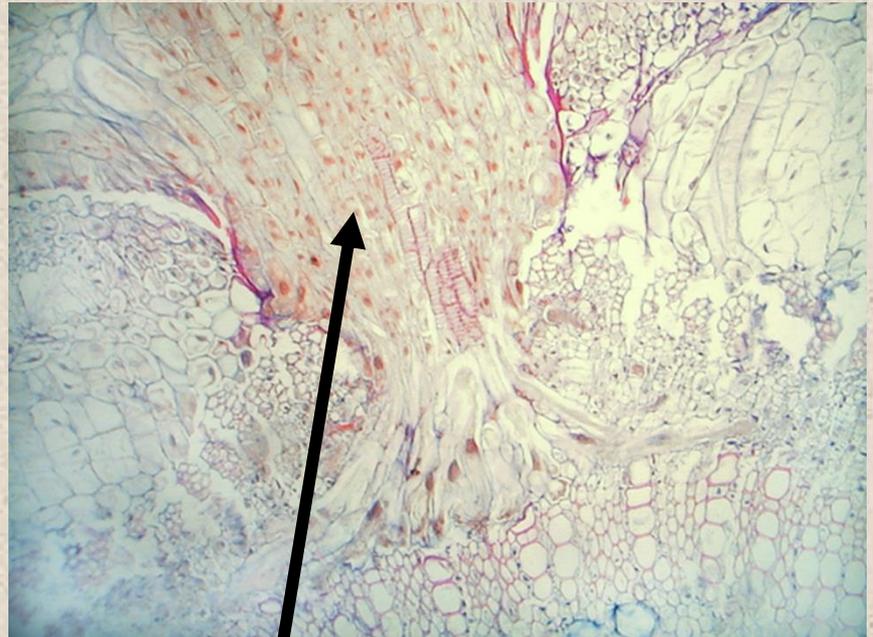
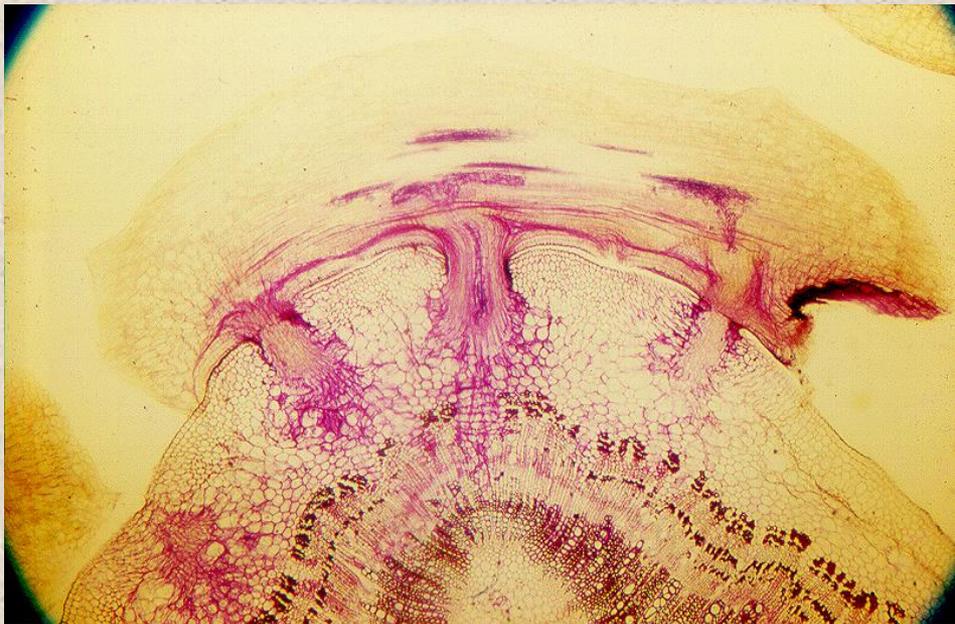
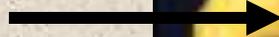


Detalhe do Cipó-Chumbo (*Cuscuta* sp.)





Apressório

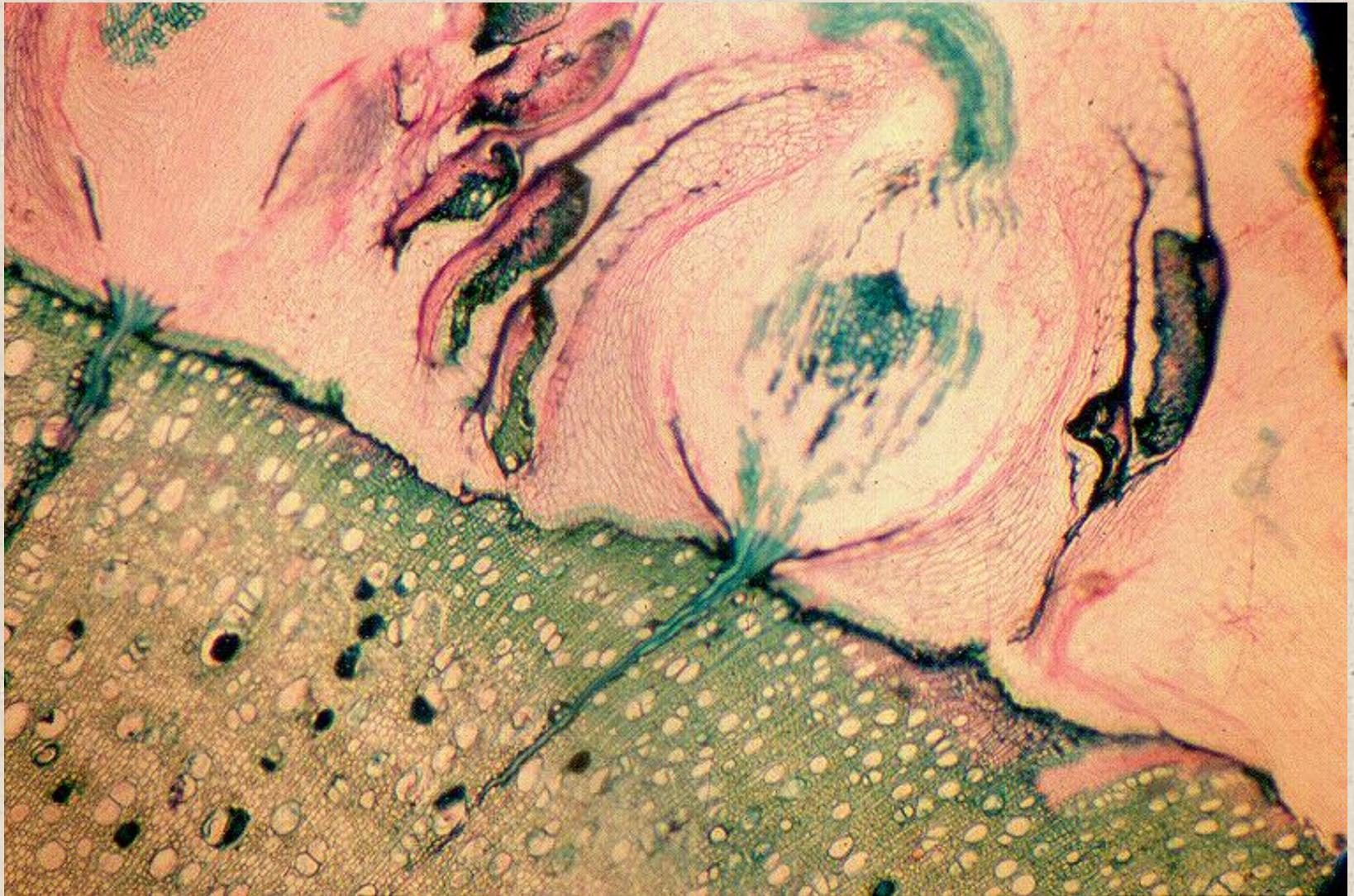


haustório

“Erva de Passarinho”
(Loranthaceae) - Hemiparasita



Vista anatômica de um haustório



**Células
sugadoras**

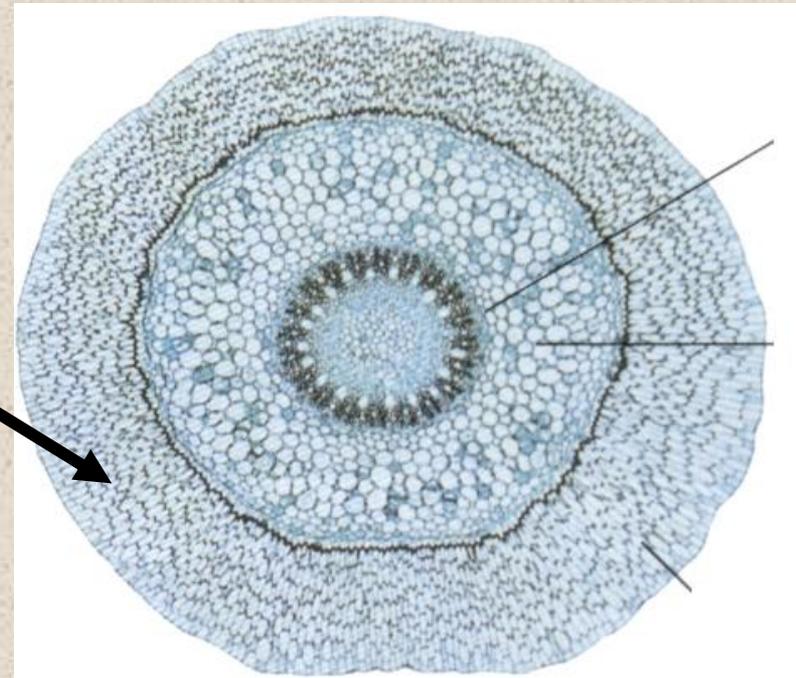


Velame

- Absorção de água e nutrientes e proteção contra radiação
- Epiderme uni ou multiestratificada com células mortas na maturidade
- **Orchidaceae e Araceae** (Velloziaceae, Bromeliaceae e Cyperaceae)

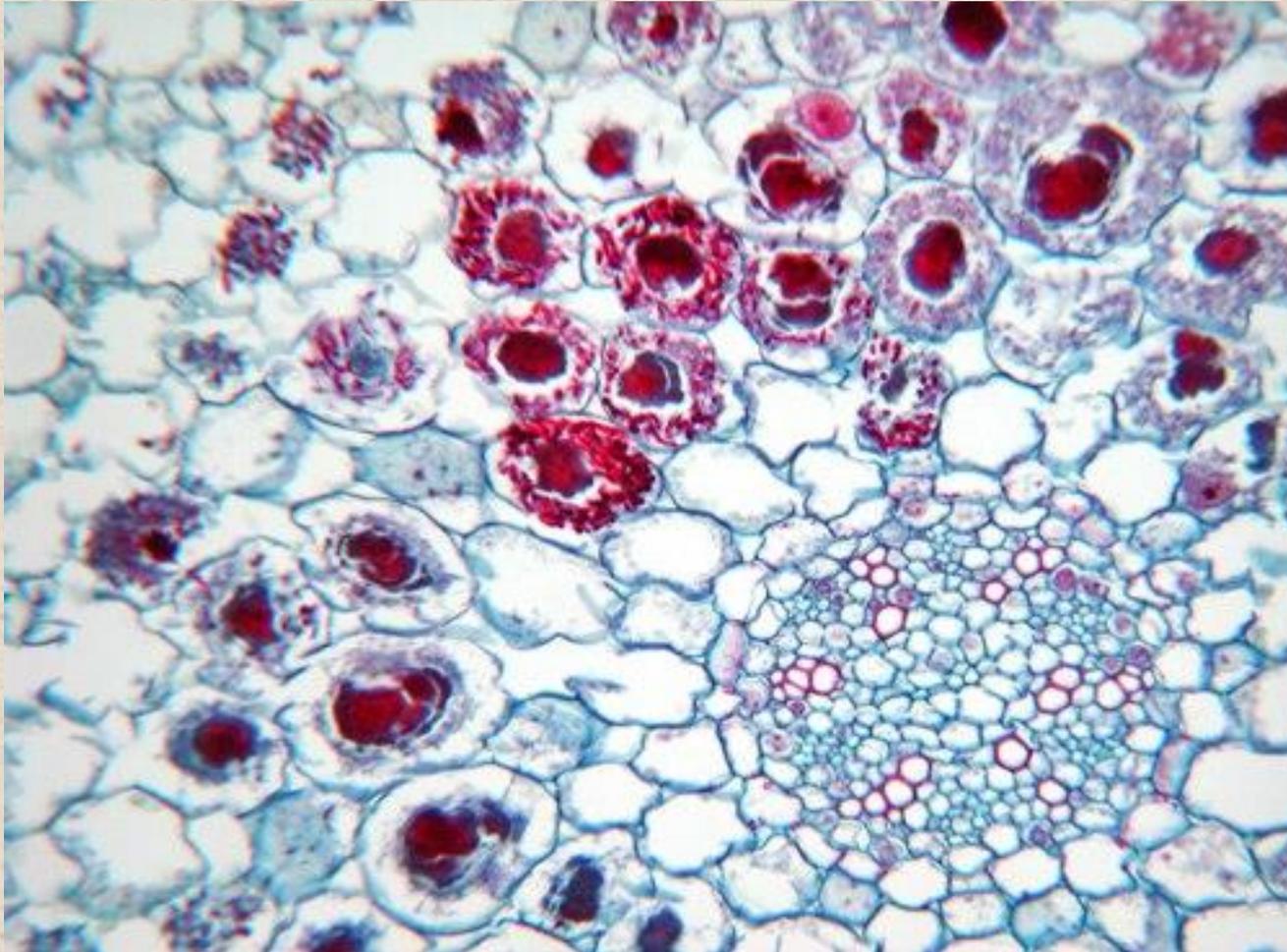


Velame
raiz
aérea



Micorrizas

- Íntima relação simbiótica entre raiz e fungo
- Aumentam a eficiência na absorção de nutrientes minerais



Resposta das plântulas às micorrizas



(a) Plântas controle crescendo na **ausência** de micorrizas



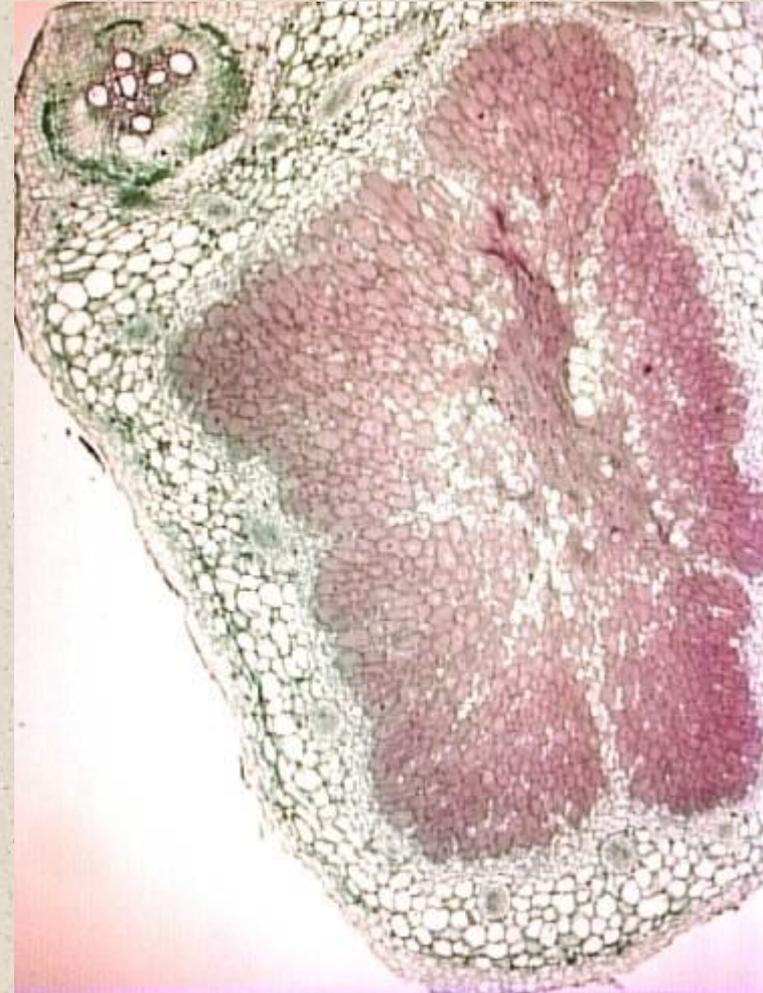
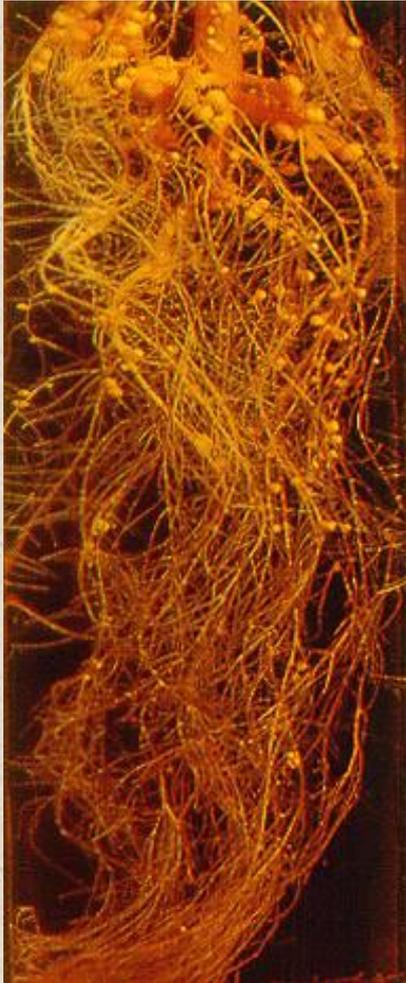
(a) Plantas crescendo nas mesmas condições do controle, mas na **presença** de micorrizas

Nódulos radiculares

- *Rhizobium* – bactérias fixadoras de nitrogênio ($\text{N}_2 \longrightarrow \text{NH}_4^+$)
- Bactéria penetra pelos pêlos radiculares e se multiplica no córtex
- Atividade simbiótica permite com que as plantas obtenham N_2 , via atividade bacteriana, em solos pobres

Nódulos radiculares

- Nódulos causados pela bactéria simbiótica *Rhizobium*

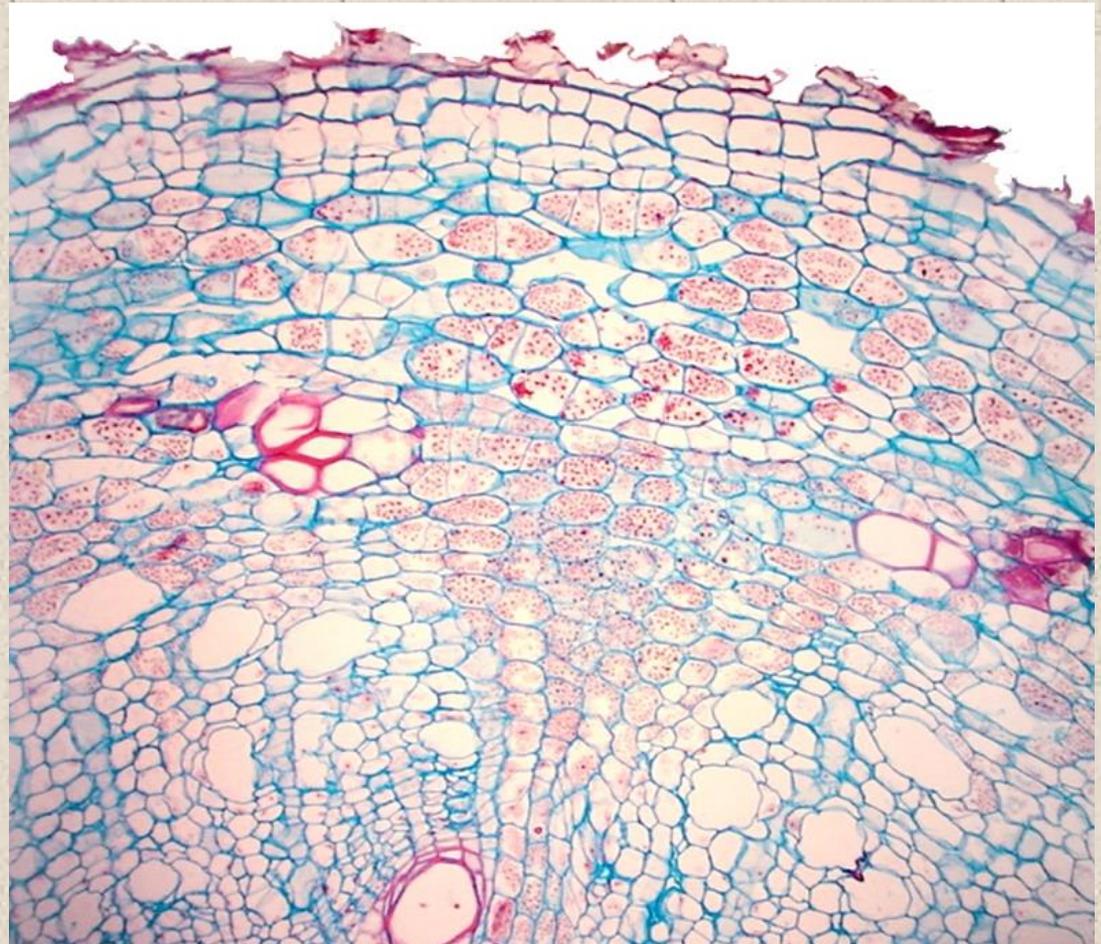


•Tuberação (crescimento secundário)

- Cenoura – câmbio produz uma grande quantidade de células parenquimáticas de xilema e floema secundários que acumulam amido



raiz axial tuberosa



Beterraba – câmbios sucessivos produzem xilema e floema secundários com uma alta proporção de células parenquimáticas amilíferas



Dúvidas?

diegodemarco@usp.br