

Outline- **Phloem Transport, ch. 10**

1. Metabolites are transported from source to sink in the phloem.

2. Phloem contains 3 types of cells.

3. Contents

4. **PHLOEM LOADING**

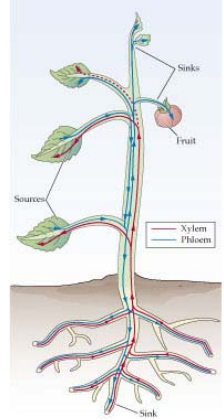
PHLOEM UNLOADING

5. **LONG DISTANCE MOVEMENT** in phloem is driven by a pressure gradient.

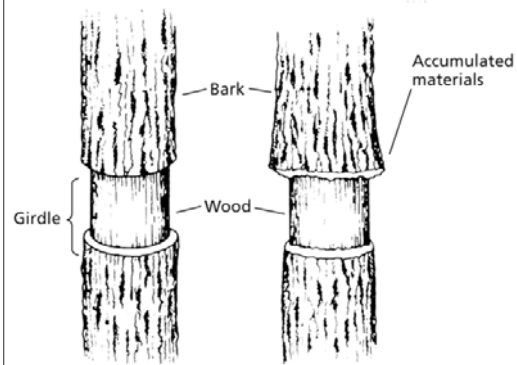
1. Metabolites move from source to sink.

SOURCE: Tissue/organ that makes or stores food reserves. A net exporter.
E.g. Seed endosperm, Green Photosynthetic leaf.

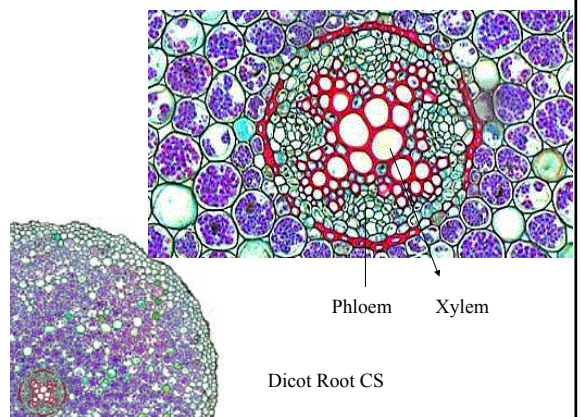
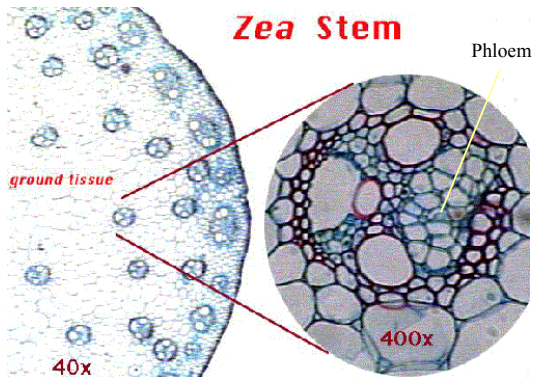
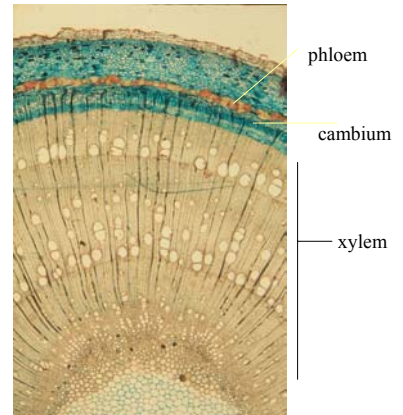
SINK: Organ/tissue or cell that requires metabolites for energy and for biosynthesis. A net importer.
E.g. Shoot meristem, roots, developing seeds



10-3. Sugar accumulates in bark after girdling

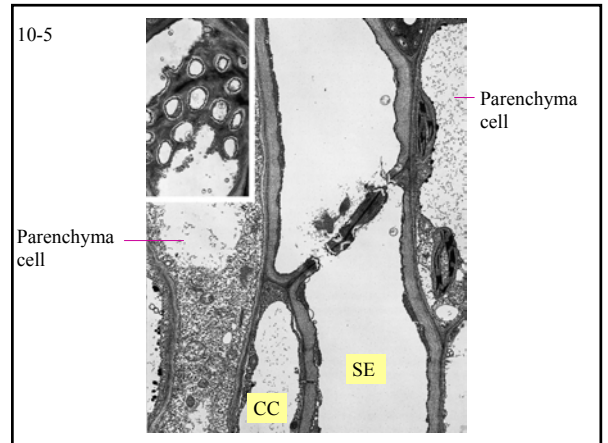
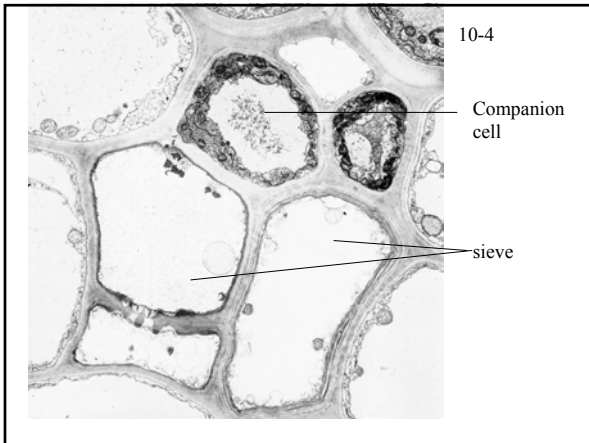
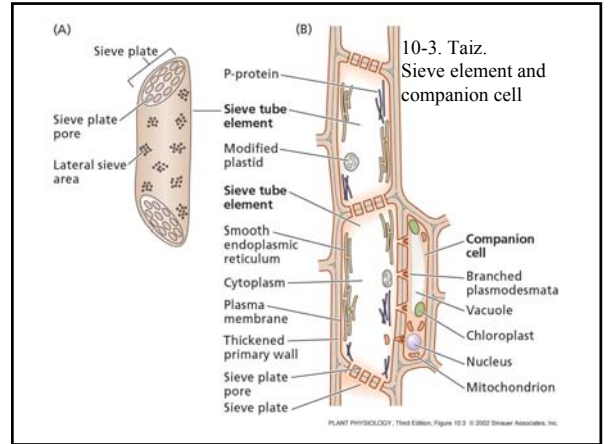
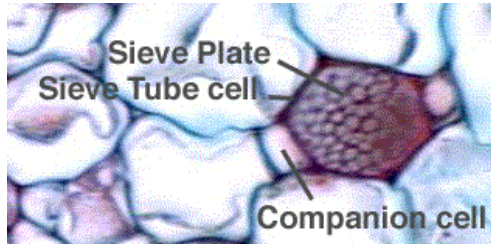


10-2. Stem of 3 year old ash



2. Phloem consists of 3 types of cells

sieve tube element,
companion cell,
phloem parenchyma

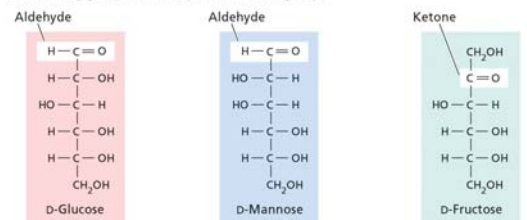


Tab. 10-2. Phloem sap- Materials transported in the phloem

Component	Conc. g/L
Sugars (sucrose)	80-106
Amino acids AspNH ₂ , GluNH ₂	5
Organic Acids	2-3
Protein	1.4-2.2
K ⁺	2.3-4.4
Cl ⁻	0.3 -0.7
H ₂ PO ₄ ⁻	0.3 -0.5
Mg ²⁺	0.1

Fig. 10-9 Taiz

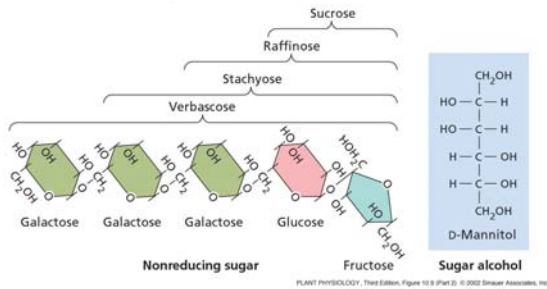
(A) Reducing sugars, which are not generally translocated in the phloem.
The reducing groups are aldehyde and ketone groups.



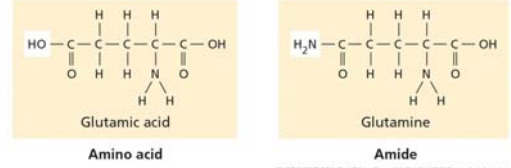
PLANT PHYSIOLOGY, Third Edition, Figure 10.9 (Part 1) © 2002 Sinauer Associates, Inc.

Fig. 10-9 Taiz

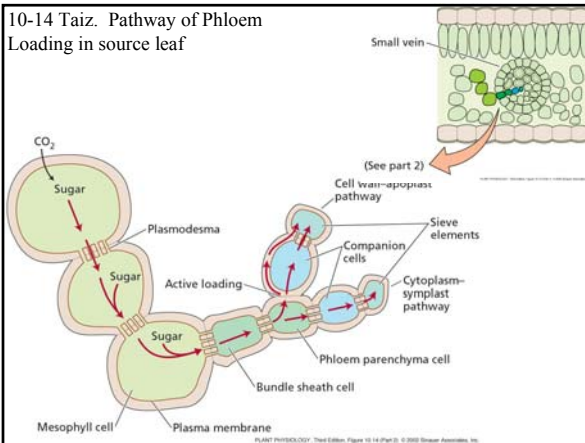
(B) Compounds commonly translocated in the phloem



Glutamic acid and glutamine are important nitrogenous compounds in the phloem, in addition to aspartate and asparagine.



10-14 Taiz. Pathway of Phloem Loading in source leaf

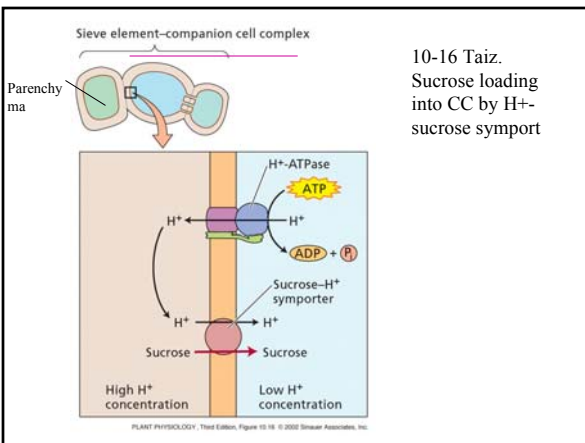


Source:

PHLOEM LOADING in source tissue is by energy-dependent transport. Sucrose is actively loaded into companion cell or phloem parenchyma by H^+ -coupled symport.

Sink:

PHLOEM UNLOADING is via the apoplast and symplast. Can be passive or active.

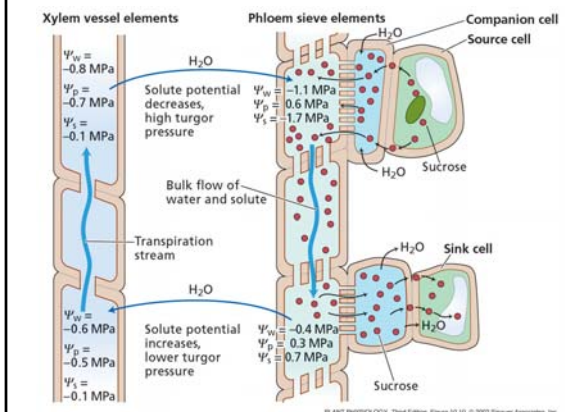


10-16 Taiz.
Sucrose loading
into CC by H^+ -
sucrose symport

How do metabolites move in the phloem?

Pressure-driven bulk flow
Munch mass flow hypothesis
simple fig.

10-10 Taiz. Pressure flow model of translocation in the phloem



Direction of flow

Water movement in xylem:

Sugar movement in phloem:

Can it move up?

Can it move down?

Why or why not?

Phloem Transport, ch. 10

1. Metabolites are transported from source to sink in the phloem.

SOURCE: Tissue/organ that makes or stores food reserves. A net exporter.

E.g. Seed endosperm, Green Photosynthetic leaf.

SINK: Organ/tissue or cell that requires metabolites for energy and for

biosynthesis. A net importer. E.g. Shoot meristem, roots, developing seeds.

2. Phloem contains 3 types of cells.

3. PHLOEM LOADING in source tissue is by energy-dependent transport.

Sucrose is actively loaded into companion cell or phloem parenchyma by H⁺-coupled symport.

PHLOEM UNLOADING is via the apoplast and symplast. Maybe passive.

4. LONG DISTANCE MOVEMENT in phloem is driven by a pressure gradient.

1. A sucrose gradient exists from source to sink. Loading results in high π (solute conc) & low $\Psi\pi$ (osmotic potential). Water moves in. P increases.

2. At sink, unloading causes decrease in solute conc, increase in $\Psi\pi$. H₂O leaves. Turgor pressure decreases.

3. Solution moves by mass flow under pressure gradient from source to sink.