

Plant Histology

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(13)

Complex Tissue

Phloem

Phloem is a conduction tissue in plants. The main function is to conduct food substances such as sugars, amino acids, micronutrients, lipids etc. from leaves to root and stem.

Phloem may be classified as **primary** or **secondary** on the basis of its time of appearance in relation to the development of the plant or organ as a whole.

The **primary phloem** is originated from the procambium of apical meristem. The **secondary phloem** originates from vascular cambium

Phloem is composed of four kinds of cells

- a) Sieve elements
- b) Companion cells
- c) Phloem parenchyma
- d) Phloem fibres

Sieve elements

Sieve elements are main component of phloem. their walls of areas (sieve areas) penetrated by pores.

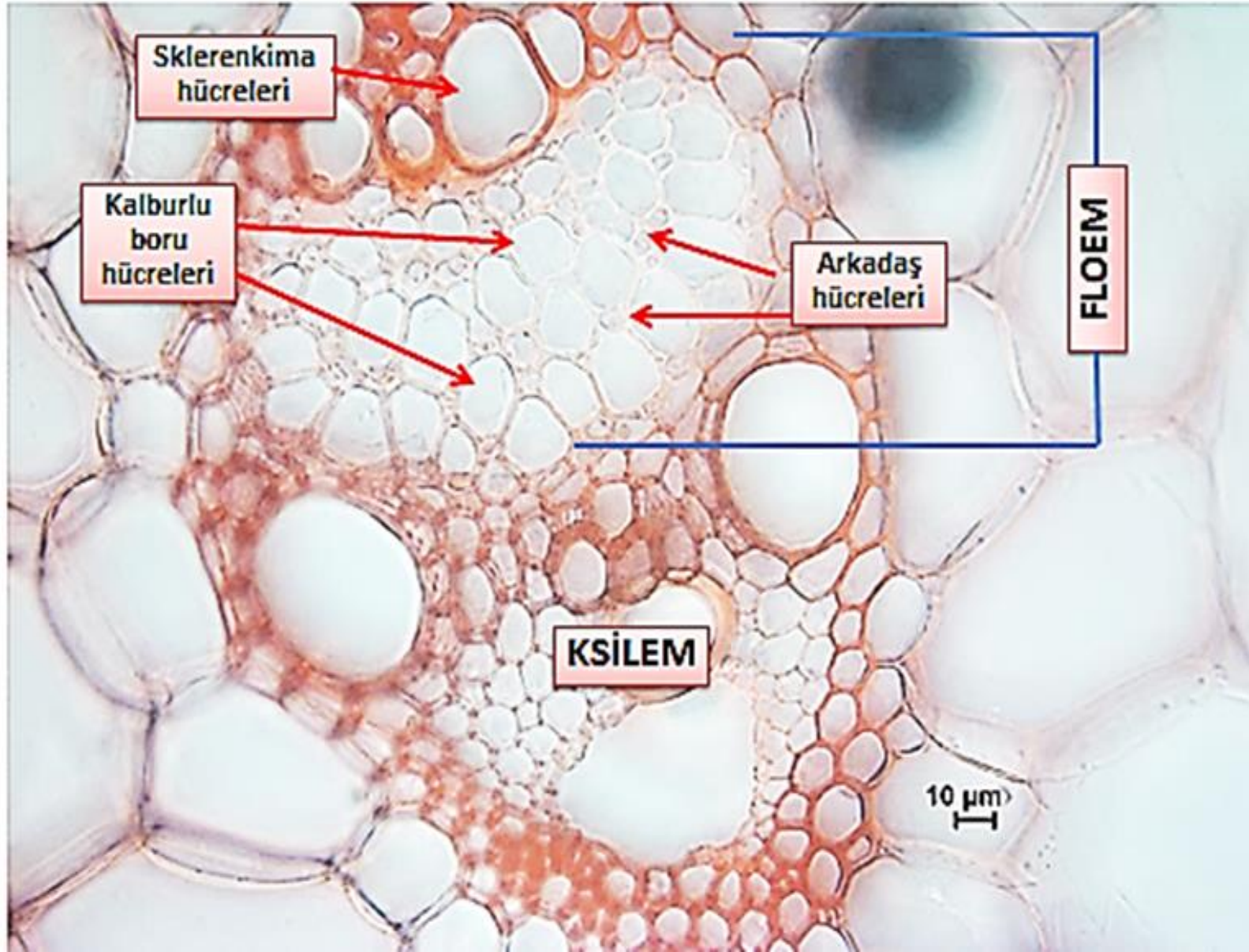
Sieve elements are divided into on sieve tubes and sieve cells on the basis of specialization into cells hape:

Sieve tubes

Sieve tubes are long tube like structure and are formed from a row of cells arranged in longitudinal series. The end wall of sieve tube cells shows perforation called as sieve plate which establishes the connectivity with the neighboring sieve cell. The protoplasts of sieve-tube elements contain P-protein (phloem protein or formerly called as slime). *P Proteins (Phloem Proteins)* are a category of proteins present in the sap of the sieve tubes in Angiosperm plants. The unique carbohydrate known as **callose** is associated with conducting sieve-tube elements and it is deposited there in response to mechanical injury, some kind of stimulation. Callose normally accumulates at sieve plates. Callose apparently plays a role in sieve-pore development.

Sieve cells

The sieve cells are narrow elongated cells without conspicuous sieve areas. Sieve cells possess more sieve area.



Companion cells

- *Companion cells* and sieve-tube elements are closely related ontogenetically and occurred from the same mother cell. The companion cell cytoplasm has a evident nucleus and is connected to sieve tubes through pits found in lateral walls in Angiospermae.
- Gymnosperms and Pteridophytes haven't companion cell but have analogous cell known as **albuminous cell**.

Phloem parenchyma

- They are living and have primary wall and simple pits. Main function of phloem parenchyma store starch, oil and the other ergastic substances like xylar parenchyma.
- The parenchyma cell in secondary phloem are two types, *phloem parenchyma* and *ray cells*.
- Usually parenchyma cells are absent in monocots.

Phloem fibres

- They are dead and have secondary wall and simple pits. Main function of phloem fibres provide mechanical support like xylary fibres.