Sources, sinks and assimilates

Translocation distributes organic substances around a plant. Learn the cargo, the conducting tissue and the direction before studying the transport mechanism.

1. THE ESSENTIAL TRANSPORT STATEMENT

SOURCE
Exports assimilates

→

PHLOEM
Sieve tubes carry sap

→

SINK
Imports assimilates

Assimilates such as sucrose and amino acids travel dissolved in water. Their movement through phloem sieve tubes is called translocation.

2. SUCROSE: A TRANSPORTED SUGAR

Sucrose is a soluble disaccharide and a major sugar in phloem sap. At receiving tissues, its carbon can support respiration and synthesis, or be incorporated into storage compounds such as starch.

3. AMINO ACIDS: ORGANIC NITROGEN

Amino acids also move in phloem sap. Receiving cells can use them to make proteins, including enzymes and structural proteins. Do not describe all transported assimilates as sugars.

Starch is an insoluble storage polymer, not the form carried dissolved in phloem sap. Water is the solvent carrying the assimilates; it is not itself an organic assimilate.

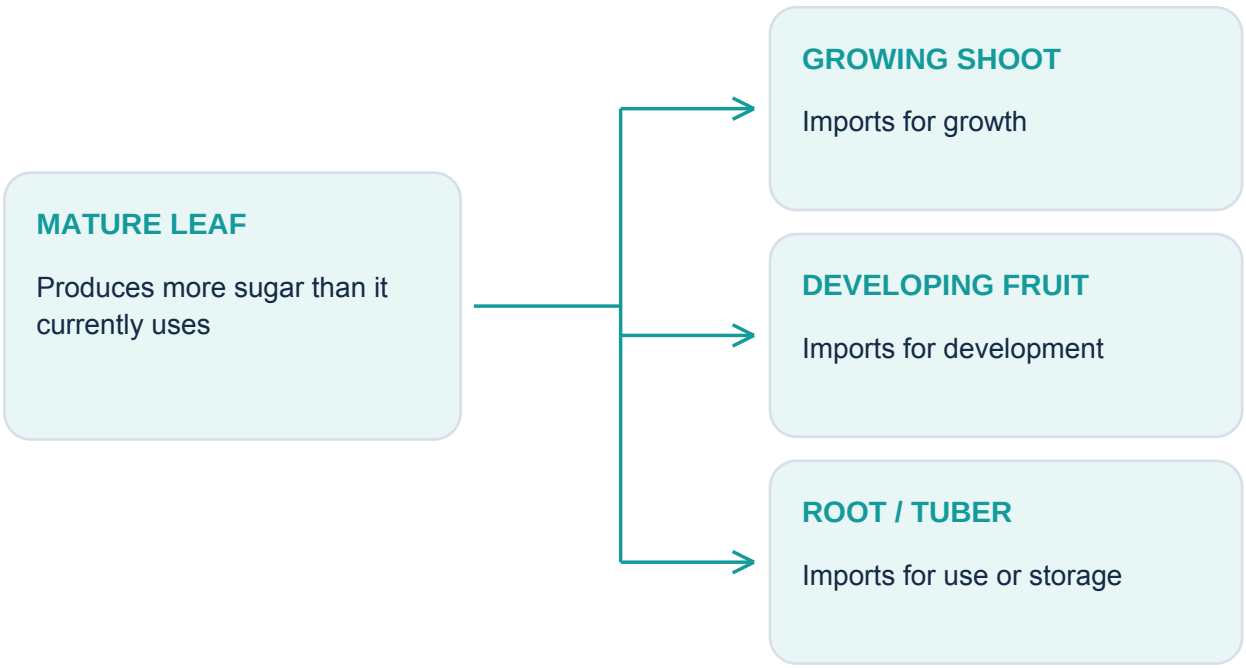
Source-sink examples: OpenStax Biology 2e, section 30.5.

Scope: Cambridge Biology 9700 syllabus, section 7.2, outcome 6, p. 26.

Follow export to import

A source supplies assimilates to phloem. A sink removes them for use or storage. These names describe the tissue's role at a particular time, not its height in the plant.

1. ONE SOURCE CAN SUPPLY SEVERAL SINKS



2. DIRECTION IS NOT ALWAYS DOWNWARDS

A leaf may supply a shoot above it and roots below it. Transport can occur in opposite directions in different sieve tubes at the same time. Each route still carries assimilates from a source towards a sink.

3. USE THE EVIDENCE TO ASSIGN THE ROLE

Ask: is this tissue exporting assimilates, or receiving them for use or storage? An organ's name alone is not enough. A photosynthesising leaf may still be a net importer while it is young.

Map is schematic: connections show possible transport routes, not exact vascular anatomy or equal shares of the exported material.

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The same organ can change roles

Source and sink are functional labels. Storage organs provide a useful example: compare reserve accumulation with reserve mobilisation, rather than memorising one permanent role.

1. TUBER: COMPARE TWO DEVELOPMENTAL STAGES

A. RESERVES ACCUMULATE

LEAF = SOURCE

Exports sucrose

→

TUBER = SINK

Imports; stores carbon

B. RESERVES SUPPORT NEW GROWTH

TUBER = SOURCE

→

NEW SHOOT = SINK

2. MOBILISATION MAKES RESERVES AVAILABLE

When a tuber sprouts, stored starch is broken down. Carbon from these reserves is converted into soluble transport forms, including sucrose, and exported to growing tissues. The starch granules do not move along phloem.

3. A YOUNG LEAF CAN ALSO SWITCH

A small, expanding leaf can import assimilates and act as a sink. As it matures, photosynthesis may produce a surplus that it exports. It then acts as a source. Classify the net flow at the stated stage.

Core recall: sucrose and amino acids, dissolved in water, move from sources to sinks in phloem sieve tubes. Next lessons explain companion-cell loading and pressure-driven mass flow.

Source-sink examples: OpenStax Biology 2e, section 30.5.

Scope: Cambridge Biology 9700 syllabus, section 7.2, outcome 6, p. 26.