**Topic 9.2: Transport in the Phloem of Plants**

**Essential Idea: Structure and function are correlated in the phloem in plants.**

**Statements & Objectives:**

**9.2.U1 Plants transport organic compounds from sources to sinks.**

​Define translocation, phloem sap, source and sink.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

List example source and sink tissues.

(**List** Give a sequence of brief answers with no explanation.)

State that phloem transport is bidirectional.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**9.2.U2 Incompressibility of water allows transport along hydrostatic pressure gradients.​**

​Outline why pressure in the phloem increases due to the movement of water into the phloem.

(**Outline** Give a brief account or summary.)

**9.2.U3 Active transport is used to load organic compounds into phloem sieve tubes at the source.**

State that sucrose is the most prevalent solute in phloem sap.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Outline why sucrose is used for phloem transport, as opposed to glucose.

(**Outline** Give a brief account or summary.)

Describe the active transport of sucrose into the phloem via a co-transport protein.

(**Describe** Give a detailed account or picture of a situation, event, pattern or process.)

**9.2.U4 High concentrations of solutes in the phloem at the source lead to water uptake by osmosis.**

State that the phloem becomes hypertonic to xylem due to the active transport of sucrose into the phloem.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

State that water moves into the phloem by osmosis.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**9.2.U5 Raised by hydrostatic pressure causes the contents of the phloem to flow toward sinks.**

State that water moves from area of higher pressure to area of lower pressure and that the movement of water also moves the solutes dissolved in it.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**9.2.A1 Structure-function relationships of phloem sieve tubes.**

State that the function of phloem includes loading of carbohydrates at a source, transport of carbohydrates through the plant, and unloading of carbohydrates at a sink.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Outline the structure and function of sieve tube cells, with specific mention of the rigid cell wall and sieve plates.

(**Outline** Give a brief account or summary.)

Outline the structure and function of companion cells, with specific mention of mitochondria and cell membrane infolding.

(**Outline** Give a brief account or summary.)

**9.2.S1 Identification of xylem and phloem in microscope images of stem and root.**

State two ways xylem cells can be identified in cross sections of stem and root.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Identify xylem given microscope images of stem and root.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

Identify phloem within the vascular bundle of a stem and root. ​

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**9.2.S2 Analysis of date from experiments measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide.**

State that aphids consume phloem sap as the main component of their diet.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Outline how aphids have been used to measure the rate of flow and composition of phloem sap.

(**Outline** Give a brief account or summary.)

**9.2.NOS Developments in scientific research follow improvements in apparatus-experimental methods for measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide were only possible when radioisotopes became available.**

Outline how radioactive carbon isotopes are used to study translocation.

(**Outline** Give a brief account or summary.)

**Key Terms**

Translocation

​Sink

​vascular cambium

​bidirectional

​hypertonic

aphid stylets

phloem

​hydrostatic pressure

​cortex

active transport

​sieve plates

phloem loading

sieve tube cells

transpiration stream

​epidermis

​sucrose

​mitochondria

​radioisotopes

companion cell

​starch grain

​pith

​co-transport protein

infolding

source

​mass flow

sap

​osmosis

​vascular bundle