Staying Hydrated Through Transpiration

A Plant's Guide to Water

All Living Things Need Water

The very first forms of life have been traced back to water. Without water, life as we know it would look entirely different or may not even exist. Modern day plants require water for many metabolic processes. From photosynthesis, to transpiration, to forming rigid cell structures, water is used constantly to provide nutrition, metabolites and structure to all parts of the plant. Here we will focus on the notable features in plants that move water around the entire plant body.

It All Starts At the Roots

Plant roots are composed of highly permeable cells that take up nutrients and water from the soil, and the vasculature in the roots shoots these metabolites up to the plant above ground. The vasculature is composed of xylem, which carries water and nutrients, and phloem, which brings water and sugars to all parts of the plant.

Moving Up the Stem

As the metabolites get pushed up the roots toward the top of the plant, they get transferred from the roots to the stem, the branches, the leaves, and finally out of the leaves in a process known as transpiration. Xylem brings nutrients and water upward, but not downward. Phloem brings sugars and water up and down the stem where they are used for cellular respiration and growth.

Entering the Leaf

Leaves are packed with organelles called chloroplasts which are the primary sites of photosynthesis, and they contain a pigment called chlorophyll that gives plants their green colour. Water is shipped to the chloroplast to be used for photosynthesis, along with metabolites such as carbon dioxide, nitrogen, etc. The greener the plant, the more photosynthesis is occurring, the more sugar is being produced, etc.

What's the Stomata With That?

As water is produced via cellular respiration, plants finish transpiration by releasing water into the air through pores in the underside of leaves called stomata. The stomata open to exchange gases with the atmosphere, releasing water. They close when they need to reduce gas and water loss.

The Cycle Continues

The water cycle promotes the pathway that water takes within a plant, and in optimal conditions, is continuous. This natural progression of water through the plant's vasculature is one of the many ways that plants have evolved to utilize water efficiently within their unique roots and shoots.