

Root Cells

Plants for Space Researchers are looking at plant roots to understand how best to help plants thrive in the microgravity environment of space. The specialised cells found in the plants roots work together to help penetrate into soil and absorb and transport nutrients and water.

Root Hair Cells

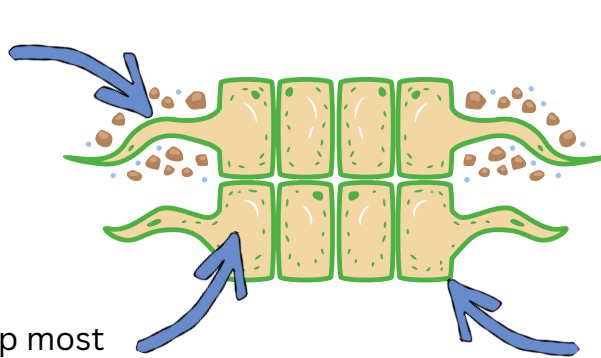
Specialised epidermal cells that increase the surface area of the root that is in contact with the outside environment.

No Cuticle

lacking a waxy layer helps absorb water.

Large Vacuole

The Vacuole takes up most of the room in the cell and helps with water absorption and storage.



No Chloroplasts

Root cells do not perform photosynthesis.

Thin Cell Wall

Thin cell walls are less of a barrier for faster water, nutrient absorption, and gas exchange.

Statocytes

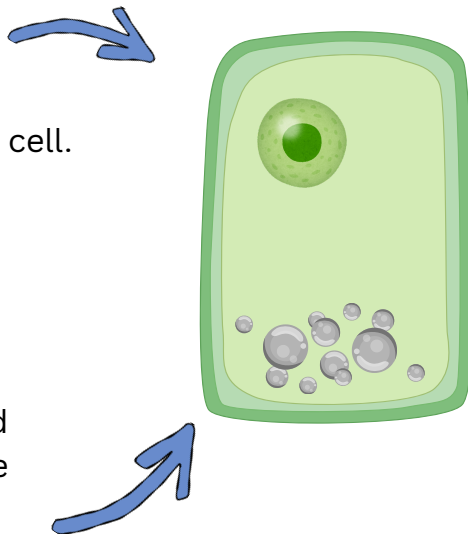
Statocytes are specialised root cells in the root cap that contain statoliths. Statoliths are organelles (starch grains wrapped in a membrane) that are found. They detect gravity and help direct root growth.

Nucleus

The nucleus is usually oriented to the top of the cell.

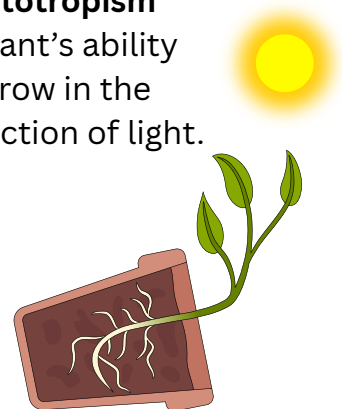
Statoliths

Statoliths are starch filled organelles that sink to the bottom of the root cell. This tells the root to grow downwards (Gravitropism)!



Phototropism

A plant's ability to grow in the direction of light.



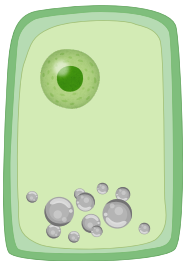
Gravitropism

A plant's ability to grow in the direction of gravity.

Roots in Space

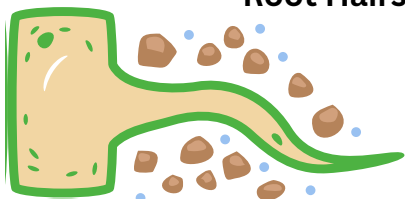
When plants are grown in Space they have to survive in an environment that they did not evolve to grow in. One aspect that plants for space researches are investigating are the challenges that plants face when grown in a microgravity environment.

Plant root cell responding to gravity



Statocytes

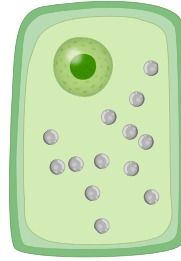
On Earth Statoliths sink to the bottom of the root cell. This tells the root to grow downwards!



Root Hairs

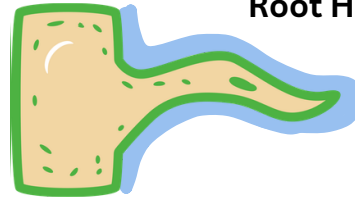
On earth, water is pulled down through the soil and away from roots. This enables roots to perform gas exchange.

Plant root cell responding to microgravity



Statocytes

In space Statoliths are not pulled down by gravity and don't sink. This will make roots grow in all directions.



Root Hairs

In space water clings to roots preventing gas exchange. This will stress the plants similar to what happens when plants are over watered or flooded.

The Researcher

Dr Troy Miller is a plant scientist at the University of Western Australia, working with the Plants for Space team. He studies how plant roots respond to different environments – including what happens when you grow a plant in space, where there's no gravity to help water move through the soil. Without gravity, roots can experience low oxygen (hypoxia) stress. Troy's research focuses on how cells in the roots grow, sense gravity, and transport oxygen. His work helps scientists design plants that can survive in space – and also supports better farming on Earth, especially in areas where heavy rainfall or flooding affects crop growth.

