

RESEARCHER'S FACT SHEET: *Plant Science*



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Gravity-sensing mechanisms within plants are critical to their behavior on Earth.

The microgravity environment of the International Space Station U.S. National Laboratory provides an ideal platform for a variety of plant science studies. Gravity-sensing mechanisms within plants are critical to their survival on Earth, and buoyancy (a gravity-dependent phenomenon) is a factor in various plant processes. Moreover, other aspects of the space environment either influence plant behavior or provide an environment for a more controlled experimental system. Analyzing the broad range of space-specific adaptive processes in plants may advance fundamental studies as well as agricultural and commercial applications.

Features of space science

Effects of microgravity:

- ▶ Changes in gene expression.
- ▶ Altered processes of gravitropism, circumnutation, and growth and development, including stem cell pluripotency.
- ▶ Varied plant responses to the environment, soil structure and stress (e.g., light, temperature, gases and soil).

Novel in the space environment:

- ▶ Some of the noted microgravity effects result both from microgravity and from other conditions onboard the space station (e.g., gene expression in plants shifts dramatically as they alter metabolism in low atmospheric pressures).
- ▶ Specific and/or controlled levels and quality of light and gas as well as nutrient and water availability.



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ISS photos courtesy of NASA.

Exploiting space-specific phenomena

- ▶ Examine fundamental plant biology.
- ▶ Elucidate molecular pathways of plant response to gravity, light and other conditions altered in space.
- ▶ Analyze production levels of proteins of interest and associated mechanisms (for example, increased biofuel or decreased lignin production).
- ▶ Optimize light sensitivity and other growth factors.

Relevance & potential market applications

- ▶ Improve plant growth habits on Earth and recovery after types of weather trauma that cause a plant to bend over or to lie flat on the ground.
- ▶ Improve downstream crop yield via optimization of plant growth habits and development of new crop/plant varieties that may result in increased production, resistance to disease and pests, and growth in harsh environments.
- ▶ Improvements to commercial biofuel production.
- ▶ Decreased monetary and environmental costs of paper production and other commercial plant processing activities.



To learn more, contact CASIS: info@iss-casis.org



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For information on specific experiments in space, including resulting publications and patents, scan the code to your left.