



# LIT to International Space Station

Martin Hayes

# Plant stress & natural solution

- Ever since plant life was washed ashore from the earth's oceans over 400 million years ago it has had to adapt too many environmental stresses and evolve alongside other living organisms within the soil.
- Today- plant life although it may look different, still faces many environmental hardships that it must overcome to survive.
- A natural way plants have adapted to such stresses is by working with micro-organisms within the soil, which is known as Symbiosis.

Good job  
down there  
fellas

Sugar

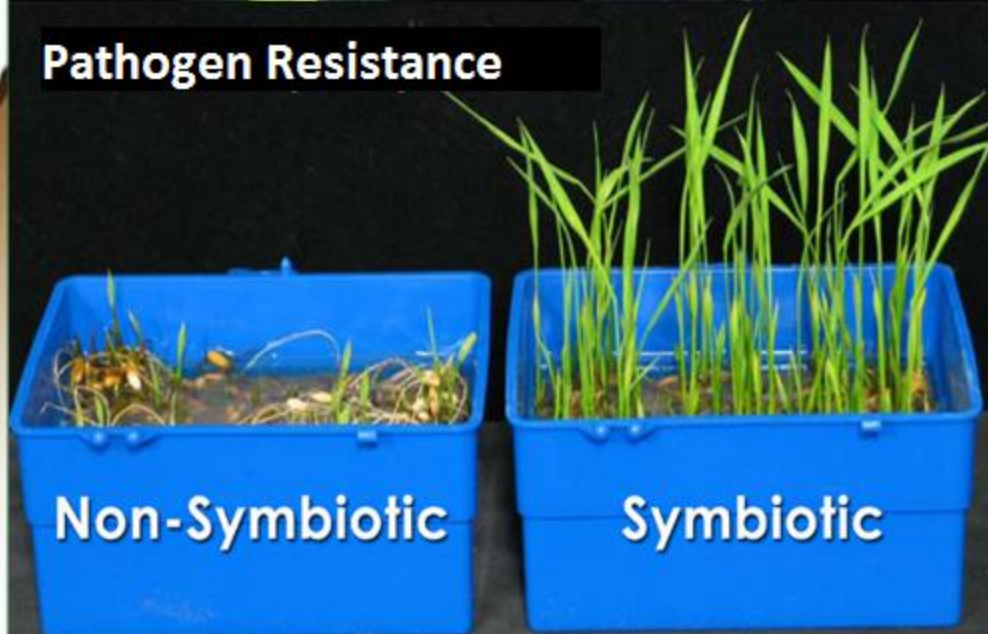
Water &  
Nutrients

MYCORRHIZAL FUNGI INCREASE THE ROOT SYSTEM  
SEVERAL HUNDRED TO SEVERAL THOUSAND TIMES!

## Drought Resistance



## Pathogen Resistance



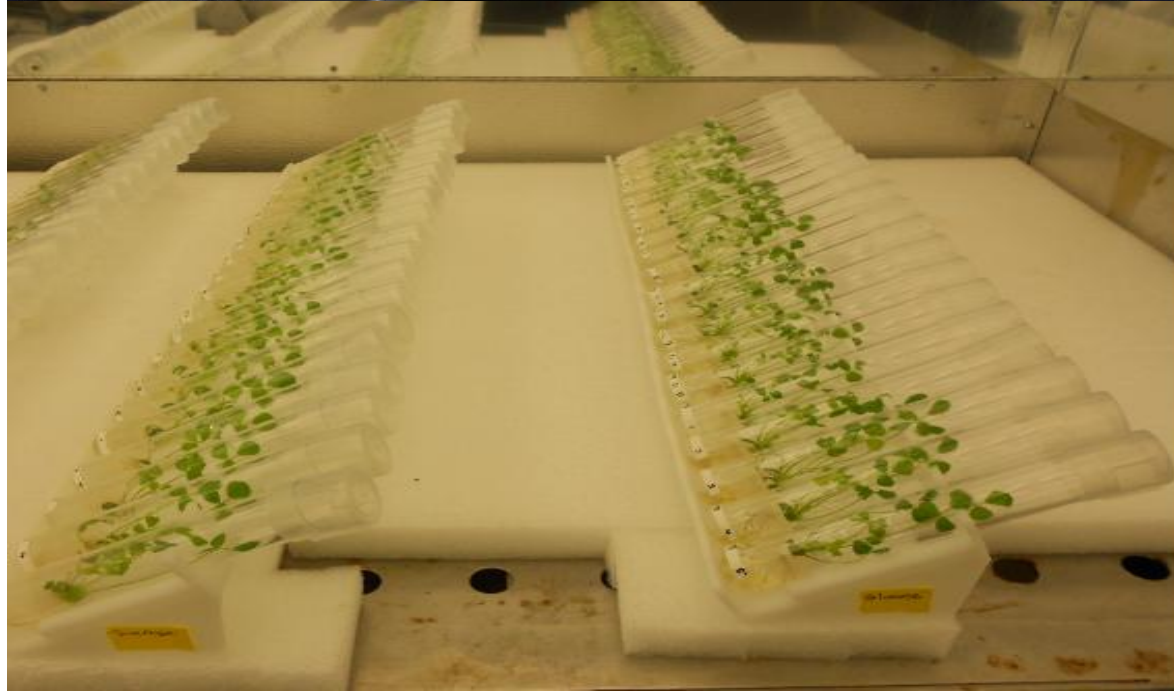
Non-Symbiotic

Symbiotic



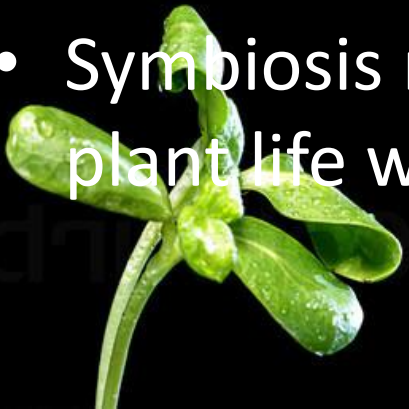
# Here at LIT

- Research into these beneficial plant microbial interactions.
- State of the art technologies to grow plants in controlled environmental conditions.
- Our aim is to further understand how these symbiotic relationships work. Through this increase the growth of crops, by enhancing plant resistance to environmental stresses and increasing nutrient uptake.



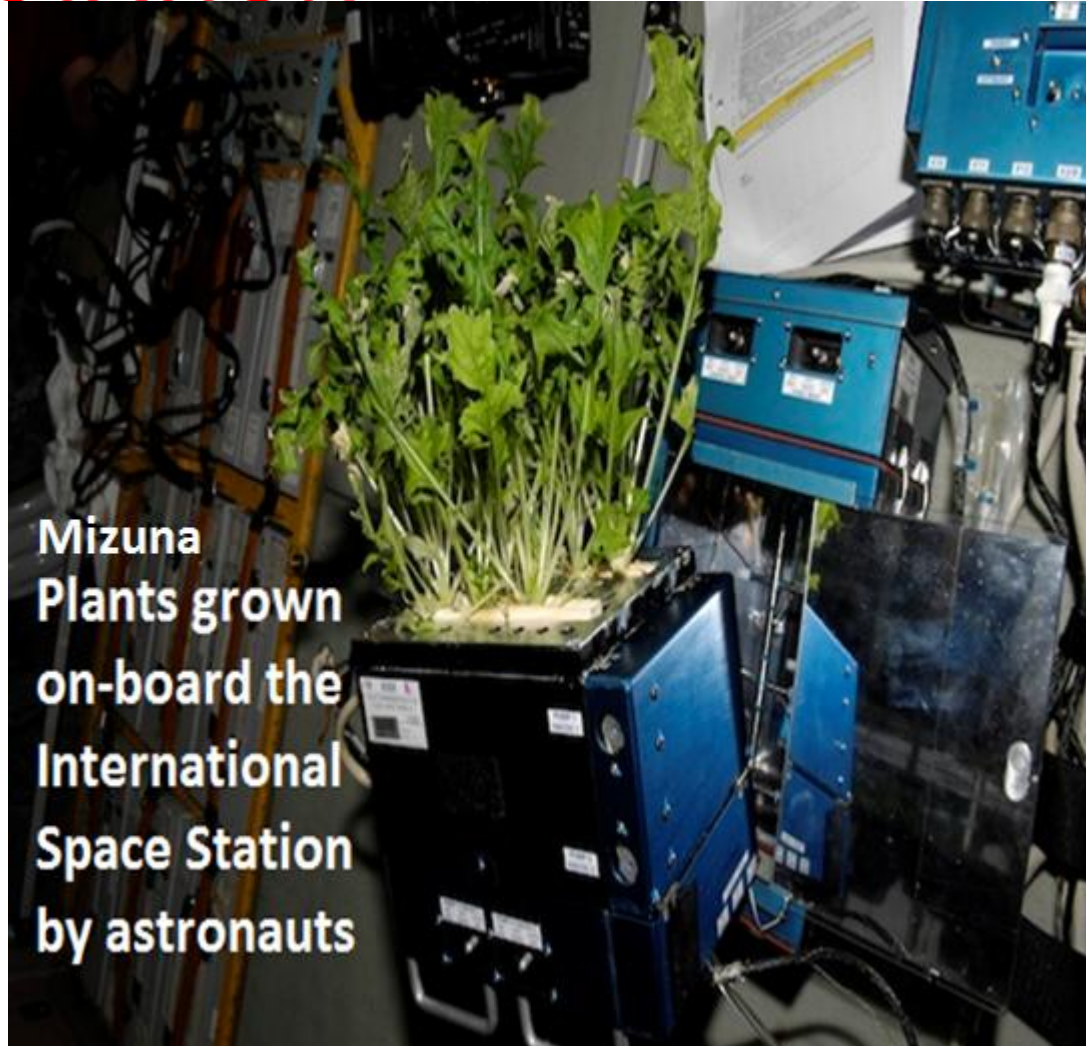
# Plant growth in space & the future of independent human space exploration

- The future of human space exploration could be aided dramatically by the effective production of plants in this unique environment.
- Vegetation could be used as a renewable food source for astronauts. To generate oxygen and remove air impurities, aiding in the supply of clean breathable air on-board spacecraft's.
- Symbiosis may play a role to generate and sustain plant life within the stressful environment of space.



# LIT & THE INTERNATIONAL SPACE STATION

- LIT to send experiment to ISS.
- Investigate whether or not symbiosis can occur in space.
- Unmask the effects that gravity has on these symbiotic interactions.



Mizuna  
Plants grown  
on-board the  
International  
Space Station  
by astronauts



November 2013 a SpaceX3 re-supply mission to the ISS will launch from Nasa Kennedy Space Centre with LIT's experiment on-board



Falcon 9 rocket

Dragon C2 spacecraft

Once the Dragon C2 spacecraft leaves the earth it will dock with the International Space Station with the aid of a robotic arm from the ISS.





- Will be contained within a specially designed chamber, equipped with lights (for photosynthesis), nutrients for plant growth and cameras that will feed us back live images of the symbiosis.
- Experimentation will start once the chamber has been passed from the Dragon capsule to the ISS.
- An astronaut will activate the interaction, which will continue for a period of up to 30 days.
- Day 30- process will be stopped by freezing the samples, and prepared for return in the Dragon C2 spacecraft.

## The experiment



# Dragon C2 Spacecraft return to Earth

- Drop down in the Pacific Ocean (coast of California).
- Collection by boat.
- Returned to the lab for analysis.



# Hope to find out

- Whether plants can grow and if symbiosis forms?
- Does the symbiosis improve the growth in space?
- What changes are occurring in the plant, under the effects of microgravity (genes-microarray analysis).





**Thank You**  
Martin Hayes