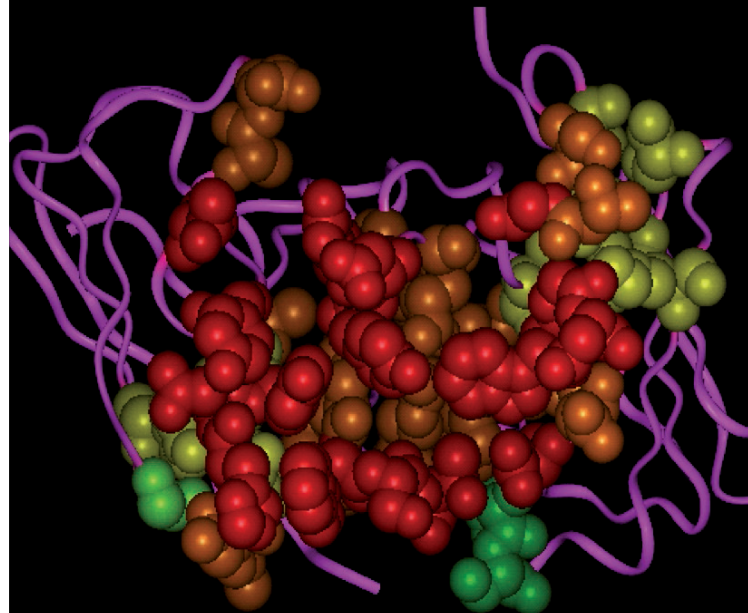


TAKING ROOT IN SPACE COMMUNITIES

Advances in horticulture research, such as in hydroponics, allow farming in places once thought impossible.

The most extreme place is a spacecraft where research is active to individuate plants able to provide directly safe food and medicines. In the framework of the BIOXTREME project funded by ASI (Agenzia Spaziale Italiana) we are now exploring the potential of plants as "dual" source of antioxidant nutraceuticals and microbicide/immunostimulant biopharmaceuticals.

To operate in this field, a task force of ENEA scientists with different expertise and backgrounds is involved in the attempt to mimic the extreme environmental conditions of the space (namely, ionizing and non-ionizing radiations, microgravity, altered light and photoperiod conditions, ect.) finding countermeasures to adverse effects of the non-natural conditions of life on Space.



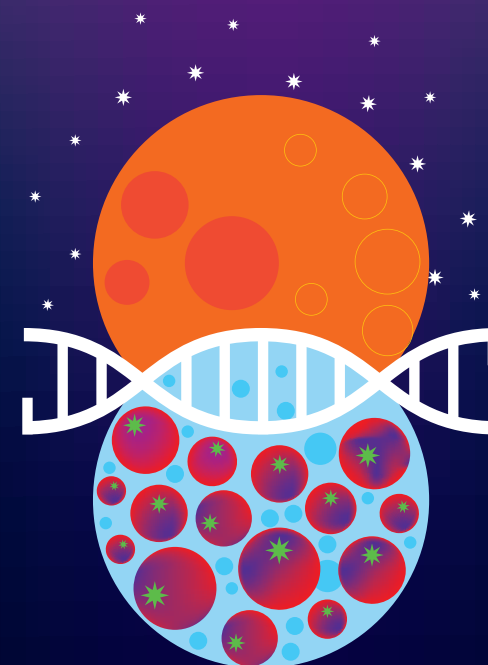
ENEA

DIPARTIMENTO SOSTENIBILITÀ
DEI SISTEMI PRODUTTIVI E TERRITORIALI

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BIOXTREME

Taking root in space communities

MAIN OBJECTIVES

- **Developing two plant-based platforms** for the production of bioactive molecules. Plants and roots of a tomato cultivar called 'Microtom' represent 'ideotypes' with extremely favorable characteristics as living material for use in Space (i.e. in the field of 'Bioregenerative Life Support');
- **Examining the biological effects** of the application of physical conditions of 'challenge' while mimicking the actual situation of the cosmos. Changes in the normal physiology of living plant material in extreme conditions will be analyzed according to Systems Biology methods profiling mainly changes induced in the proteome;
- **Optimizing the production of bioactive molecules** (low molecular weight antioxidant molecules) produced in the berries;

- **Optimizing the production of recombinant bioactive molecules** of proven microbicide ability (antibacterial and antifungal polypeptides and antibodies);
- **Studying the effect of treatment with recombinant immunostimulatory (flagellin)** in animal models with radio-induced immunosuppression;
- **Developing 'ready-made' pharmaceuticals** for early intervention in Space conditions.

PLATFORMS & FACILITIES

Multiple cutting-edge platforms of molecular biology, biochemistry, plant and animal cell biology support ongoing projects. Notably, a fully equipped proteomic platform based on DIGE (Differential In-Gel Electrophoresis) and a contained greenhouse (Biosafety Level 2 Containment) designed to be a complete and compact solution for growing plants expressing high value-added biopharmaceuticals.

