Introduction of Enceladus Farm: Growing plants simulating the composition of Enceladus' subsurface ocean.

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Recent scientific experiments have been performed with very complex and expensive instruments. While these *"accurate"* experiments are important for understanding details of nature, because the methods of them are very complicated, it is difficult for people outside of the experiments (even for scientists who are not related to the experiments) to see their interesting points. Although experiments need not always to be interesting, this discrepancy between people is very serious problem in recent science.

In the field of kitchen earth science, many interesting experiments have been conducted using materials and instruments that are easy to prepare. Here, I introduce our project to grow salt-tolerant plants simulating Enceladus' subsurface ocean with kitchen materials. Enceladus is a Saturnian icy satellite with ~250 km in radius. Cassini probe observed that water vapor emanates from the surface of Enceladus, which strongly implies the existence of an interior ocean (liquid water). Due to this observation, Enceladus is known as one of the most important body for astrobiology. From the analyses of vapor, it was revealed that several salts such as NaCl are contained in Enceladus ocean.

Typical plants cannot live if salt is contained in water. However, several species of plants have mechanism to grow even from salt water (salt tolerance). We are growing three salt-tolerant plants (Ice plant, Salicornia (sea asparagus) and Swiss chard) using 3.3 g/kg NaCl and NaHCO3 4.0 g/kg, which is consistent with the salinity range of Enceladus ocean. The purpose of our project is not grow plants in Enceladus itself (surface temperature of Enceladus is only ~80 K and sunlight is weak). By growing plants with Enceladus-simulated water, we plan to check salt and chemical tolerance of terrestrial plants in wider range of condition such as high (or low) pH. Salinity in soil is a serious problem for agriculture and ecology. Considering water conditions other than the Earth, we may be able to know the properties of plants more widely, which is useful for astrobotany as well as terrestrial crops.

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