

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

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HYDROPONIC CULTIVATION OF SOYBEAN FOR BIOREGENERATIVE LIFE SUPPORT
SYSTEMS (BLSS): THE EFFECT OF NITROGEN SOURCE AND BACTERIAL ROOT SYMBIOSIS**Abstract**

The ESA program MELiSSA (Micro-Ecological Life Support System Alternative) aims to conceive an artificial bioregenerative ecosystem based on both microorganisms and higher plants. Soybean [*Glycine max* (L.) Merr.] is one of the four species selected as candidates for hydroponic cultivation in BLSS, because of the high nutritional value of seeds, rich in proteins and lipids. A nitrate based solution is the best choice to feed crops in hydroponics, however, it requires a high amount of acid to buffer pH fluctuations in the recycling nutrient solution. Meanwhile, urea deriving from crew urine, which represents about 85% of the nitrogen source in the nutrient solution, is a promising alternative. Within MELiSSA program, the aim of this experiment was to evaluate the effects of the nitrogen source in the nutrient solution and of bacterial symbiosis in plant roots, in terms of plant growth, seed productivity and resource use efficiency. Plants of soybean cultivar 'OT8914' were cultivated in a Nutrient Film Technique system, under controlled environmental conditions (photoperiod 16 hours, light intensity 750 $\mu\text{mol m}^{-2}\text{s}^{-1}$, temperature regime 26/18 °C light/dark, relative humidity 70-85%). The following treatments were compared: - two nitrogen source in the nutrient solution: urea vs nitrate; - root symbiosis with *Bradyrhizobium japonicum* strain BUS-2: inoculation vs not inoculation. Results showed that urea as sole nitrogen source is not able to fulfil the nitrogen needs of soybean plants, particularly during the early growth stages, which are highly demanding. Root inoculation with rhizobium did not improve plant performances when they were fed by nitrate, probably because of its inhibitory effect on nodulation. The expected positive effect of urea on bacteria activity were not detectable, probably because of the absence of a solid medium to support the nodules developed.