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A44
TOLERANCE OF HIGH MOUNTAIN QUINOA ACHENE TO EXTRAPLANETARY CONDITIONS

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Chenopodium quinoa Wild (Chenopodiaceae) is an Andean traditional crop with a high nutritional value and distribution, including Colombia, Chile, and northwest Argentina. In the last years quinoa has received worldwide attention because it presents ecotypes able to adapt to different environmental conditions such as high altitudes (0–4000 MASL), contrasting temperatures, drought conditions, salinity, marginal soils with low nutrient concentrations, and it is also highly tolerant to UVB radiation and low atmospheric pressure. Due to its ductility against extreme environmental conditions, being a C3 species with high photosynthetic assimilation and presenting some ecotypes with a short life cycle, quinoa is considered an excellent candidate to be incorporated as an experimental crop in long-term space missions. These missions will require life support systems which provide nutritious and fresh food and regenerate resources such as oxygen. Currently, little is known about the survival, growth and development of plants exposed to extraplanetary conditions. In order to determine the quinoa tolerance for space travel, achenes (fruit-seed) from a high mountain ecotype (3800 MASL), adapted to high radiation, low pressure and sub-zero temperatures, were selected to be exposed to extra-planetary conditions (low pressure, P, 10^{-7} Tor, reached in a high vacuum chamber), laser simulated solar plasma radiation, Pl, and cryogenic temperatures, T, of −200°C, for 4, 8 and 16 h. The treated samples were later analyzed by scanning electron microscopy coupled to X-ray spectroscopy (SEM-EDS) to study the morphology and mobility of minerals. Seed viability was evaluated by germination and early growth of radicle and hypocotyl under normal atmospheric conditions for 14 days. Quinoa germination was not inhibited under any treatment. Final germination always reaches values of up to 90%. The rate and final germination subjected to low pressure (10^{-7} Tor) treatments during 4 h and 8 h were not different to control. The combined application of low pressure and cryogenic temperatures showed a delay in germination rates, nevertheless, final germination reaches a value of near 90% in both control and treatments. When plasma application was added, the germination rate was improved, reversing the delay observed in combined low P and T treatments. Early growth (radicle and hypocotyl length) was affected by different treatments being the radicle the most affected. The analysis of achenes by SEM-EDS indicated structural changes in the pericarp and in the K^+ content, which were reversed when adding low temperatures. Our result suggested that quinoa achene has a great tolerance to extraplanetary turning this high mountain ecotype into an excellent alternative for space missions.

A45
BENEFITS OF INOCULATING TOMATO WITH *Trichoderma harzianum* ITEM 3636

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Tomato (*Solanum lycopersicum* L.) is one of the most popular vegetables worldwide. It is sensitive to low temperatures and is grown under cover (greenhouses) or in the field when the weather allows it. The fresh tomato market, both local and global, must be continuously supplied since world consumption has increased at the rate of 1 kg per inhabitant per year during the last 10 years. Tomato cultivation is intensive, a wide range of pesticides and other chemical inputs are used to ensure successful harvests. The use of ecological strategies to minimize the use of chemical inputs in traditional horticultural practices is the ultimate goal of sustainable horticulture. Several studies have shown that some rhizospheric strains of *Trichoderma* have direct effects on plants, increasing their potential for growth and nutrient absorption, as well as stimulating plant defenses against biotic and abiotic damage. In the present work, we analyzed the potential of *Trichoderma harzianum* ITEM 3636 to promote the yield of tomato plants in the field. Seeds belonging to the UCO 16 INTA variety were used, which were germinated in trays filled with a sterile mixture of soil:perlite (2:1) and placed into a growth chamber under controlled cycles of 16 h of light at 25°C and 8 h in the dark at 20°C, for 2 weeks. Then, elevated beds were mounted in the experimental field of the National University of Río Cuarto, Córdoba, for transplantation. The control without inoculation and inoculation with ITEM 3636 treatments were tested. At the time of transplantation, seedlings were inoculated by immersion of roots in a fungal suspension (1×10^5 conidia/mL). The furrow irrigation system was used. Chemical herbicides were not applied. Furthermore, neither chemical fungicides nor insecticides were used. Plants and their fruits were collected after 90 days of growth in the field. The evaluated parameters were number of fruits/plant, weight of fruits/plant, and yield/m^2. Pairwise comparisons were made with Student's *t*-test ($P < 0.05$). We observed that inoculation with ITEM 3636 caused an average of 33.6 fruits/plant higher than that of the control, although the difference was not statistically significant. However, this value represents an increase of 12%. In the case of mean fruit weight/plant and yield (kg/m^2), we observed that inoculation with ITEM 3636 caused significant increases of 14% and 15%, respectively, compared to control plants. Based on these results, we conclude that *T. harzianum* ITEM 3636 could have the potential to be formulated as a biofertilizer for application in horticulture.

A46
Trichoderma harzianum AS A GROWTH PROMOTING AGENT IN HYDROPONIC CULTURE OF TOMATO *(Solanum lycopersicum)*

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Tomato, due to its nutritional characteristics, is considered as a food of great commercial interest throughout the world. The importance of the crop has generated several studies that seek to increase its production through the application of biofertilizers based on beneficial microorganisms. Hydroponic cultivation is a method that allows plant production without the need to use the soil as a source of nutrients, or as a physical support.