

RESUMO - A) SPACE FARMING

EVALUATION OF THE GERMINATION OF BEET SEEDS (BETA VULGARIS) SUBJECTED TO DIFFERENT DOSES OF IONIZING RADIATION (GAMMA) FOR APPLICATION IN THE ESTABLISHMENT OF SELF-SUFFICIENT COLONIES ON MARS, BASED ON PLANT CULTIVATION

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One of the most challenging conditions that agriculture in extraterrestrial environments must face is cosmic radiation. This radiation is primarily composed of high-energy particles coming from the sun and galactic sources, and poses a significant risk to the health of astronauts and the development of agricultural crops in an environment like that of Mars. The establishment of self-sufficient colonies on Mars, based on plant cultivation, aims to ensure the survival of

explorers and promote the expansion of humanity through the cosmos. Beetroot has a high nitrate content, which can improve athletic performance and cardiovascular health (Bescós et al., 2020). Is a vegetable rich in essential vitamins, such as A, C, and B complex, which play fundamental roles in metabolism, immunity, and skin health (Silva et al., 2022). Research on seed germination is essential for space agriculture, as it helps understand how plants react to extraterrestrial environmental conditions, such as microgravity and radiation (Zabel et al. 2020). Beetroot seeds (*Beta vulgaris*) have a varied size, generally around 5 to 8 mm in diameter (Taiz & Zeiger, 2017).

Methodology: The experiment was set up according to a completely randomized factorial statistical scheme 4x2, comprising four doses and placed by two substrate (germination paper-Germinex and vermiculite) moistened with distilled water. The seeds were subjected to gamma radiation in the Cobalt 60 irradiator type Gammacell-220 at CETER-IPEN. The tests were conducted at room temperature, Average 25°C. in the presence of air. Doses of 0, 5, 12.5 and 25 Gy (266,64Gy/hr) 40 replicates for treatment. For the assessment of germination percentages, sufficient time was allowed for germination to actually occur. Data collection was concluded after the primary root was emitted.

Results showed that doses of 5 Gy 99% and 12.5 Gy resulted in a germination rate of 97%. However, the dose of 25 Gy caused significant decline, with the germination rate being 20% lower than that of the control group. High doses of radiation proved to be a limiting factor for the viability of beet seeds. This work provides data on the radiobiological response of the species, highlighting the importance of radiation mitigation strategies to ensure agricultural production in space scenarios.

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Palavras-chave: beta vulgaris; food irradiation ;space farming; seed germination;
controlled agriculture.