Evaluation of Earthworms and Vermicompost on LHS-1 Lunar Regolith Simulant To Improve Plant Growth Efficiency

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With missions to the Moon planned for the near future, a significant amount of lunar research is being conducted, including finding a reliable food source (plants) to allow for permanent lunar settlements. However, lunar regolith deters plant growth due to toxic chemicals and lack of organic material. This study explored the use of vermicompost and earthworms (Eisenia fetida), which provide nutrients to soil, as viable treatments to increase the fertility of Lunar Highland Simulant 1 (LHS-1) and thus increase plant growth. The samples with six replicates each included Potting Soil, LHS-1, LHS-1/Vermicompost, LHS-1/Earthworm, and LHS-1/Vermicompost/Earthworm. Brassica rapa seedlings were grown for 18 days using growth lights for 24 hours/day, a capillary action watering system, and a fan to circulate air. Germination percentage, number of leaves, shoot height over time, fresh weight of shoots and leaves, root length, leaf area, chlorophyll a, chlorophyll b, and total chlorophyll were measured. Kruskal-Wallis test, followed by Dunn's multiple comparison test were conducted. Potting soil (control) and LHS-1/Vermicompost/Earthworm demonstrated similar plant growth trends, while the other LHS-1 treatments demonstrated less growth. However, the chlorophyll content of LHS-1/Vermicompost/Earthworm was significantly lower to potting soil ($p < 0.05$). Results indicated that overall earthworms were only able to improve lunar regolith when vermicompost was added to it. For this reason, future research using earthworms in lunar regolith with vermicompost or other forms of organic matter should be investigated which could lead to growing sustainable food sources on the Moon.

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