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Research Article

The Usage of Tea Factory Waste as Soil Substrate for the Production of Snap Bean (*Phaseolus vulgaris* L.)

Arzu KARATAŞ*[1], Hatice Filiz BOYACI[2]

[1,2]Recep Tayyip Erdogan University, Faculty of Agriculture, Department of Horticulture, 53300, Rize, Türkiye

[1]https://orcid.org/0000-0002-2895-571X, [2]https://orcid.org/0000-0002-3799-4673

*Corresponding author e-mail arzu.karatas@erdogan.edu.tr

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Abstract: Intensive use of inorganic chemicals in agriculture causes soil inefficiency. Alternative sources are needed to ensure the sustainability of agriculture. Utilizing organic wastes presents a feasible solution as they can support plant growth while ensuring their elimination. This study investigated the potential for utilizing the large amount of waste generated during tea processing in tea factories every year in snap bean cultivation. The effects of tea factory waste mixed into the soil at four different rates were compared to the soil and the soil to which farmyard manure was added. The study was conducted in pots. The experiment was designed with three replications according to randomized complete blocks. The effects of the growth media were determined using 26 parameters related to plant development and yield. Observations made 30 days after seed sowing and at the end of harvest revealed that tea factory waste treatments made significant contributions to plant height, stem diameter, and the number of trifoliate leaves compared to soil, which had no added organic matter. However, the SPAD values were negatively affected. All findings revealed that the T4 medium containing equal parts soil and tea waste created the best results, except for the growth medium containing the farmyard. In conclusion, it was found that tea factory waste can be a beneficial organic matter for the growth and development of snap bean plants. To maximize its usefulness as a new source, promoting the populations of fungal and bacterial agents that facilitate its rapid decomposition in the soil is necessary.

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1. Introduction

Tea factory waste consists of the fiber part of the leaves, dust, and some tea leaves of *Camellia sinensis* (L.) plant, is generated during the processing of tea in a factory. It is projected that global tea production will reach 7.5 million tons by 2025, and nearly 10% of it may become waste during processing in factories. This biomass waste, which causes environmental problems, has the potential to be utilized in the food and agriculture sectors (Seth et al., 2023). Although this abundant and easily available material has found some applications in environmental management, animal feed, bioenergy, and green packaging materials, there is still needs to reveal its different potential benefits (Karataş, 2022; Wang et al., 2024; Yazıcı, 2025). Easily degradable biomass wastes can be transformed into valuable resources in the agricultural sector. They have the potential to provide the necessary nutrients for plants