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# THE INFLUENCE OF A COMPOST-BASED SUBSTRATE DERIVED FROM HOUSEHOLD BIODEGRADABLE WASTE ON THE GROWTH AND DEVELOPMENT OF TWO RADISH CULTIVARS

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**Abstract**: *The recovery of biodegradable household waste is an important approach to reduce the volume of domestic waste, while generating useful materials in horticulture. The objective of this study was to identify a method for reusing food and vegetable waste through composting, as well as to evaluate the potential of using the resulting compost as a component of the growing substrate for radishes. The compost was obtained by cold composting biodegradable household waste, including food waste and vegetable matter. Subsequently, this compost was used in an experiment aimed at the cultivation of two radish cultivars, designated C1 and C2. Four experimental variants were analyzed, corresponding to the cultivation of each variety on two types of substrates: garden soil (used as a control) and a volumetric mixture composed of 50% garden soil and 50% compost. Plant development was assessed by measuring the accumulation of fresh biomass and tuberized root mass – the latter representing the edible part of the plant and an essential indicator of the productive value of the crop. The results indicated a higher fresh biomass and higher tuberized root mass for both varieties, when they were grown on the compost-enriched substrate. In addition, the C1 variety showed a higher productivity than the C2 variety on both types of substrates. In conclusion, the use of compost derived from biodegradable household waste—accounting for 50% of the substrate volume—had a favorable effect on the growth and development of early-maturing radishes, demonstrating the potential of this valorization method in horticultural production.*

## • Introduction

Composting biodegradable waste reduces pollution and supports sustainable agriculture. Compost improves soil fertility, recycles organic matter, and reduces the need for synthetic fertilizers. As a growing-medium component, it can promote plant development.

Due to its short growth cycle and tuberized root, radish (Raphanus sativus L.) is suitable for evaluating compost effects.

This study assesses compost-based substrates in two radish varieties (C1 and C2) under protected cultivation.

## • Material and method

The compost was obtained through cold composting of biodegradable organic waste over a period of approximately 12 months. The material subjected to composting consisted of plant-based residues and food scraps (figure 1): ***potato peels (30%), shredded dry grapevine leaves and canes (30%), tomato residues (9%), watermelon rinds (5%), fruit peels and cores (5%), shredded green grass (10%), crushed eggshells (4%), and coffee grounds (2%).***



Figure 1. The process of adding biodegradable household waste to the composting container

The experiment was conducted starting on March 20, 2026, in an unheated greenhouse in Chișcani, Brăila County, using two radish varieties (C1 and C2) grown on two types of substrate (Table 1). The study consisted of four experimental variants, with three replicates of 10 plants each. For each variant, 15 plants were analyzed—selecting 5 from each replicate. The fresh mass of the tuberized root and the total fresh mass of the plant were determined; the mean values were then calculated and processed using Microsoft Excel.

*Table 1*
The experimental variants included in the study

| Variant | The radish cultivar | The culture substrate used |
|---|---|---|
| V1 | C1 | 100% (v/v) garden soil |
| V2 | C1 | 50% (v/v) compost + 50% (v/v) garden soil |
| V3 | C2 | 100% (v/v) garden soil |
| V4 | C2 | 50% (v/v) compost + 50% (v/v) garden soil |

## • Conclusions

Composting biodegradable household waste offers a sustainable source of organic material for horticulture. Under the experimental conditions, a substrate containing 50% compost increased root and total fresh plant mass in both radish varieties compared with garden soil alone. The highest increases were recorded for C1 (46.97% and 50.64%, respectively), while C2 showed increases of 34.10% and 33.98%.These findings support the use of compost as an alternative growing-medium component. Further research should assess different compost proportions, substrate nutrient content, and the statistical significance of the results.

## • Results and discussions

Table 2 presents the physicochemical properties of compost obtained from household biodegradable waste.

*Table 2*
**Physicochemical characteristics of compost obtained from household biodegradable waste**

| Parameter | Parameter value | Unit of measurement |
|---|---|---|
| pH | 6.80 | - |
| $NO_3^-$ | 5.30 | mg/L |
| $PO_4^{3-}$ | 28.70 | mg/L |

***pH*** indicates compost maturity and quality. Values between 6.5 and 7.5 are considered favorable, while pH stabilization reflects humification and compost maturation. ***Nitrogen ($NO_3^-$)*** supports plant growth, productivity, and stress tolerance. Compost provides available nitrogen and may reduce dependence on chemical fertilizers and nutrient leaching losses. ***Phosphorus ($PO_4^{3-}$)*** is essential for photosynthesis, respiration, and nucleic acid synthesis. Compost contributes to phosphorus availability and substrate fertility.

***By repurposing organic waste, the analyzed compost serves as a source of nutrients—containing 5.3 mg/L of $NO_3^-$ and 28.7 mg/L of $PO_4^{3-}$—thereby supporting the sustainable use of resources and reducing dependence on chemical fertilizers.***

Figure 2 shows the influence of the substrate on the mean fresh biomass of plants and tuberized roots in both radish varieties.

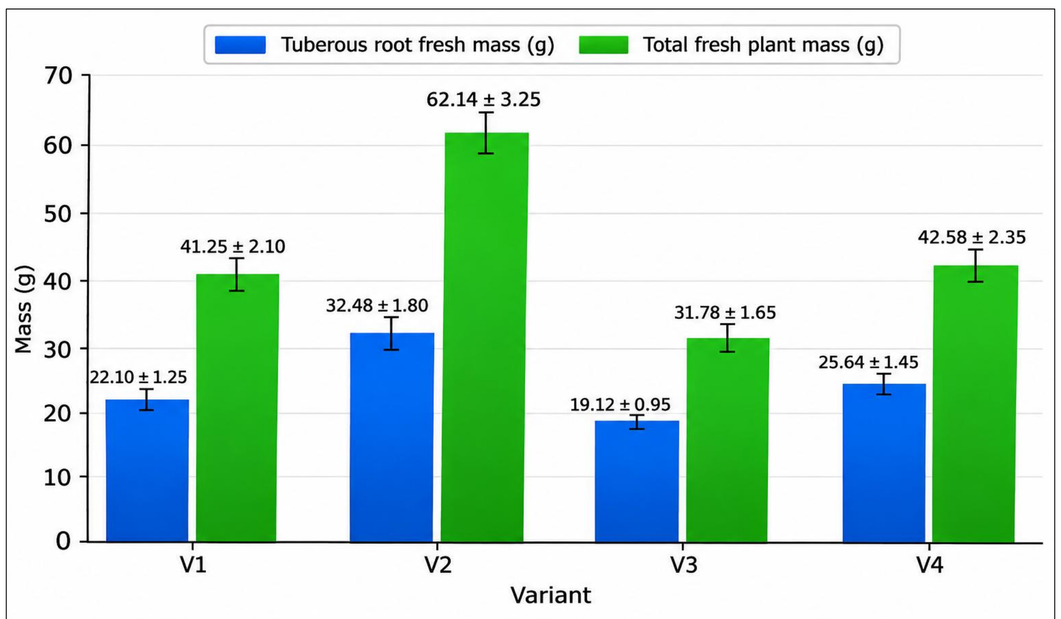



**Figure 2.** Fresh biomass of radish plants.

Percentage increases were calculated by comparing the compost-amended variants with their corresponding controls. For cultivar C1 (V2), the mass of the tuberized root increased by 46.97%, and the total fresh mass by 50.64%, compared to V1. For cultivar C2 (V4), the increases were 34.10% and 33.98%, respectively, compared to V3.The results highlight a greater accumulation of fresh biomass in plants grown on substrates containing 50% compost, for both cultivars. C1 exhibited higher biomass values and more pronounced percentage increases than C2, indicating a differential response of the cultivars to the modification of the substrate.The use of compost derived from biodegradable household waste represents a sustainable alternative for horticultural substrates, as it is associated with improved plant biomass and the development of the tuberized root—the edible part of the radish.