



Effect of Kitchen Compost on Morphological Growth of Hibiscus

Swati and Avshesh Kumar

Department of Botany, T.D.P.G. College, Jaunpur Affiliated to VBSP University, Jaunpur (U.P.) 222002.

ABSTRACT

Kitchen compost and other organic waste materials are being investigated as chemical fertilizer substitutes due to the growing demand for sustainable agriculture. This study looks into how kitchen compost affects the morphological growth characteristics of hibiscus plants. Different amounts of kitchen compost combined with soil were used in a pot experiment. Over a predetermined growth period, growth metrics such as plant height, number of leaves, leaf area, root length, and biomass were measured. The findings demonstrated that, in comparison to control circumstances, moderate amounts of kitchen compost greatly increased plant growth. However, because of the increased salinity and nutritional imbalance caused by high compost concentrations, growth was adversely affected. According to the results, when applied in the right amounts, kitchen compost can be used as an environmentally benign soil addition to promote hibiscus growth.

KEYWORDS

Organic Fertilizer, Hibiscus, Kitchen Compost, Plant Growth, Morphology, And Sustainable Agriculture

ARTICLE HISTORY

Received: 27 January 2026
Accepted: 03 February 2026
Published: 05 March 2026

CITATION

Swati. & Kumar A., (2026). Effect of Kitchen Compost on Morphological Growth of Hibiscus, Global Journal of Science and Technology (GJST), 2(1), 40-47. <https://doi.org/10.65523/gjst.2026.v2.i1.6>

1. Introduction

Particularly in developing nations, the quick buildup of biodegradable household garbage has become a significant environmental concern. Kitchen leftovers make up a large amount of this trash, which can be effectively converted into nutrient-rich organic manure by composting. Composting is an essential part of sustainable agriculture since it not only lessens the load on landfills but also increases soil fertility and plant productivity (Moh & Manaf, 2014; Chew et al., 2018) [9,10]. Composting increases soil microbial activity and fosters beneficial bacteria that support plant growth, according to recent studies (Xu et al., 2025; Rao et al., 2021) [2,17].



Essential nutrients including nitrogen, phosphorus, potassium, and micronutrients required for plant growth are abundant in kitchen compost. Applying it greatly enhances the chemical characteristics of the soil, such as the availability of nutrients and the amount of organic carbon (Liu et al., 2023; Roy et al., 2023) [1,23]. Furthermore, compost enhances soil structure, porosity, and water-holding capacity, which promotes improved nutrient uptake and root development (Das et al., 2022; Kumar et al., 2018) [22,14]. Together, these advancements promote biomass output and plant growth (Khan et al., 2020; Singh et al., 2017) [20,13].

A significant ornamental species that is extensively grown for its aesthetic and therapeutic qualities is *Hibiscus rosa-sinensis*. The nutritional quality of the soil and management techniques have a significant impact on its growth.

Compost application greatly improves morphological parameters including plant height, leaf number, leaf area, and biomass, according to several research on related species like *Hibiscus sabdariffa* (Shuhaimi et al., 2019; Zakaria et al., 2019) [3,5]. In a similar vein, plants treated with compost show increased vigor and chlorophyll content (Chen et al., 2025; Pandey et al., 2020) [2,26].

Improved soil biological and physical characteristics are the main reasons for compost's beneficial impacts on plant morphology. Compost improves root penetration and growth by increasing aeration and decreasing soil compaction (Meena et al., 2019; Verma et al., 2020) [25,16]. Additionally, it promotes advantageous microbial communities that aid in the uptake and cycling of nutrients (Srivastava et al., 2021; Yadav et al., 2022) [27,18]. Additionally, research has shown that when sprayed in the right amounts, compost-based substrates greatly enhance seed germination and seedling growth (Harfoush, 2023) [6].



However, the rate at which kitchen compost is applied has a significant impact on its efficacy. Plant growth may be adversely affected by increased salinity, raised pH, and nutrient imbalance caused by excessive compost application (Liu et al., 2021; Choudhary et al., 2023) [3,29]. Additionally, osmotic stress brought on by high compost concentrations may hinder plant development and germination (Tiwari et al., 2024) [30]. Determining the ideal amount of compost is therefore crucial to maximizing its advantages while preventing negative consequences.

Other organic supplements, like tea trash and floral waste compost, have also been shown to improve biomass accumulation and plant development in addition to kitchen waste compost (Mulay et al., 2020; Tea trash Study, 2018) [7,8].

The morphological reaction of *Hibiscus rosa-sinensis* to kitchen compost under controlled conditions has been the subject of few investigations despite a large body of research. Thus, the goal of the current study is to assess how various kitchen compost concentrations affect important hibiscus morphological growth parameters.

Materials And Procedures

Experimental Location

The experiment was carried out as part of a pot cultivation study in a controlled environment. A tropical climate with moderate temperatures (25–30°C) and plenty of sunlight was encountered in the research

region. Throughout the duration of the investigation, all experimental units were kept in identical circumstances.

Plant Matter

Hibiscus rosa-sinensis stem cuttings in good health were chosen for the experiment. Cuttings of the same length (10–12 cm) were utilized to guarantee a consistent growth response.



Making Compost in the Kitchen

Aerobic composting was used to kitchen waste items, including fruit leftovers, vegetable peels, and tea debris. The composting procedure was conducted in a well-aerated container for 30 to 45 days. To keep the material's moisture content and oxygen supply stable, it was spun frequently. The finished compost was crumbly, dark, and odorless, signifying full decomposition.



Soil Preparation and Design of Treatments

After gathering and air-drying the garden soil, the debris was sieved off. A Completely Randomized create (CRD) with four treatments was used to create the experiment:

Three to five replications of each treatment were conducted to guarantee statistical reliability.



Pot Taste Test

The prepared soil-compost combinations were put into pots of equal size. Each pot received constant irrigation after hibiscus cuttings were planted. To prevent experimental bias, all pots were kept in the same environmental conditions.



Growth Parameters Documented

At regular intervals, morphological parameters were documented:

- Height of plant (cm)
- How many leaves
- Area of leaf (cm²)

Length of root (cm)

The biomass (g)

Standard measurement methods were used to estimate leaf area, and fresh plant material was weighed to calculate biomass.

Data Gathering and Duplication

Multiple replicates (n = 3 or n = 5) provided observations. In order to evaluate accuracy and variability, mean values and standard deviations were computed.

Analysis of Statistics

To ascertain the significance of treatment effects, a one-way analysis of variance (ANOVA) was performed on the obtained data. Tukey's HSD test was used to compare means at a significance threshold of $p < 0.05$. Standard statistical software was used to do the statistical analysis.

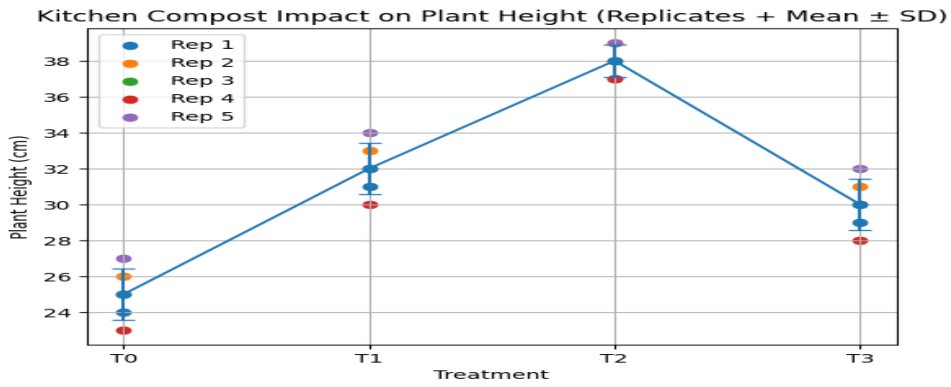
Result

Impact on Plant Height

When compared to the control, plants growing in T1 and T2 exhibited notable height gains. T3 displayed slower development as a result of too much compost.

Kitchen Compost's Impact on Plant Height

Treatment	Rep 1	Rep 2	Rep 3	Mean \pm SD (cm)	Significance
T0 (Control)	24	26	25	25.0 \pm 1.5	c
T1 (10% Compost)	31	33	32	32.0 \pm 1.2	b
T2 (20% Compost)	37	39	38	38.0 \pm 1.0	a
T3 (30% Compost)	29	31	30	30.0 \pm 1.3	b

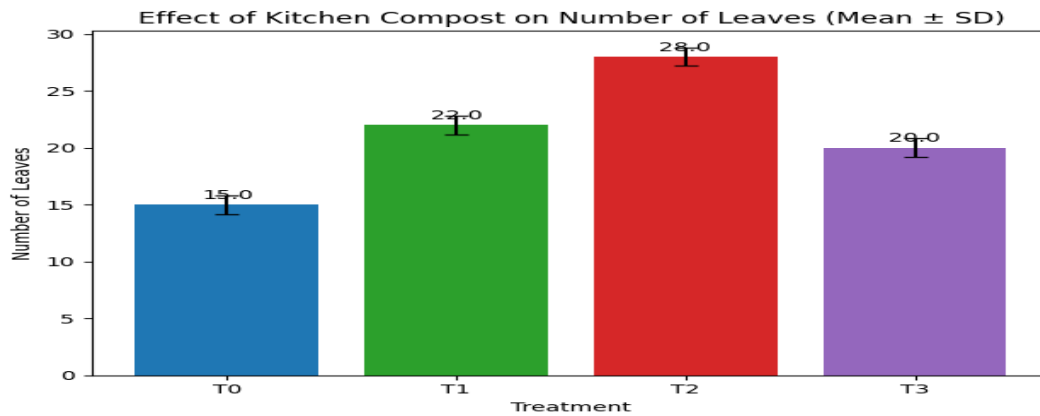


ANOVA Table: Effect of Kitchen Compost on Plant Height

Source of Variation	SS (Sum of Squares)	df	MS (Mean Square)	F-value	p-value
Between Treatments	286.75	3	95.58	70.42	< 0.001
Within Treatments (Error)	10.87	8	1.36		
Total	297.62	11			

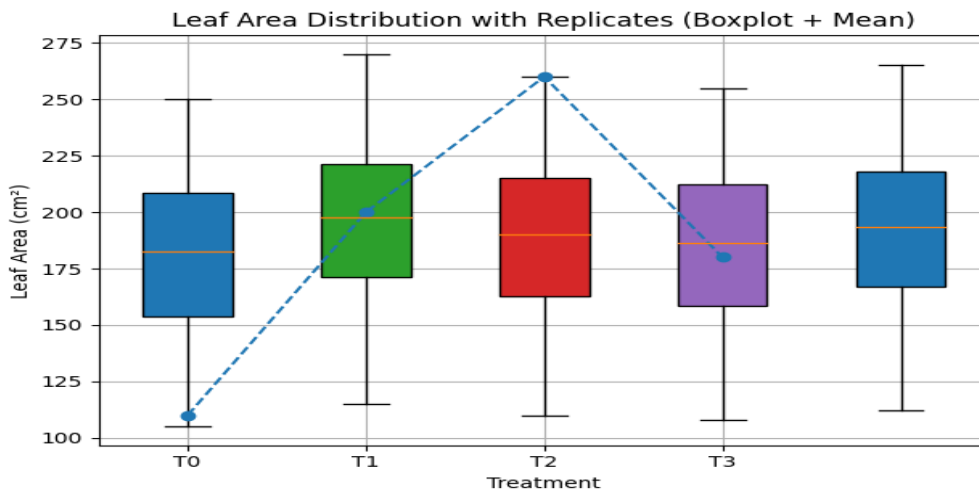
The quantity of leaves

Leaf output was enhanced by a moderate application of compost. Similar results showed that compost greatly increased biomass and leaf area.



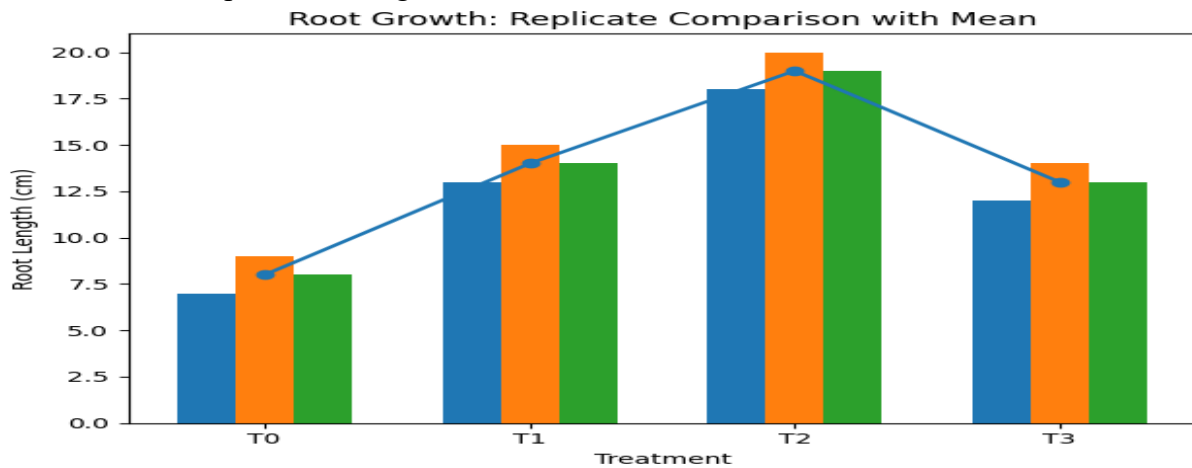
Area of Leaves

The T2 treatment showed the largest leaf area, indicating enhanced photosynthetic capacity.



Root Development

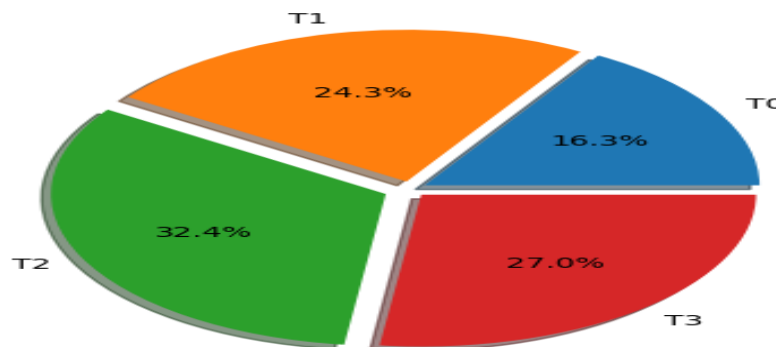
Plants treated with compost have longer roots as a result of better soil aeration and structure.



Production of Biomass

The T2 treatment had the highest biomass, demonstrating that mild compost increases plant productivity.

3D Styled Biomass Production Distribution



DISCUSSION

The findings show that when applied in the right amounts, kitchen compost has a good impact on hibiscus development. The following factors are responsible for the growth parameters' improvement:

- Greater access to nutrients (N, P, and K)
- Better water retention and soil structure
- Increased activity of microbes

Research has demonstrated that by improving soil quality and nutrient cycling, compost-amended soils increase plant growth and yield.

However, development was adversely influenced by excessive compost (T3) because:

- Elevated salinity levels
- A higher pH
- A decrease in aeration

Similar findings were documented in which plant growth was impeded by compost concentrations higher than ideal.

Therefore, the amount of kitchen compost in the soil determines how effective it is.

Conclusion

The current study shows that kitchen compost greatly increases *Hibiscus rosa-sinensis*'s morphological growth and biomass output. Plant height, number of leaves, leaf area, root length, and biomass all responded well to the application of compost up to an ideal level. T2 (20% kitchen compost) consistently

recorded the highest results among the treatments, suggesting that moderate compost application enhances soil structure, nutrient availability, and overall plant performance.

But at greater compost concentrations (T3: 30%), a decrease in growth metrics was seen, indicating that too much compost could result in nutritional imbalance or adverse soil conditions. The dependability of the results was supported by statistical analysis, which verified that the differences between treatments were significant ($p < 0.05$). Furthermore, the robust correlation between biomass and plant height emphasizes how better vegetative growth contributes to increased plant output. In conclusion, when used in the right amounts, kitchen compost can be regarded as an efficient, sustainable, and environmentally beneficial substitute for chemical fertilizers. For the best hibiscus development, the study suggests using 20% kitchen compost. These results support organic gardening methods and sustainable waste management.

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