


**ISSN Print:** 2664-844X
**ISSN Online:** 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(10): 604-609
www.agriculturaljournals.com
Received: 23-07-2026
Accepted: 09-09-2026
Published: 15-10-2026

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# Effect of carbon stock on growth, yield and quality of acid lime (*Citrus Aurantifolia* Swingle) cv Sai Sharbati

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**DOI:** https://www.doi.org/10.33545/2664844X.2026.v8.i10h.2072

**Abstract**
The present study entitled "Effect of Carbon Stock on Growth, Yield and Quality of Acid Lime (*Citrus aurantiifolia* Swingle)" was carried out during 2025–26 at the Horticulture Farm, Government College of Agriculture, Dhule. The experiment was conducted in a Randomized Block Design with eight treatments and one control ($T_9$), replicated three times, to assess the influence of carbon stock on growth, yield and quality of acid lime under the agro-climatic conditions of Dhule.
Significant differences were observed among the treatments. Treatment $T_4$ recorded the highest growth and biomass, with maximum plant height (3.80 m), canopy volume (31.04 m³), total biomass (43.41 kg tree$^{-1}$) and plant carbon (21.70 kg tree$^{-1}$). It also recorded the highest number of fruits per plant (712), average fruit weight (51.25 g) and fruit yield (36.49 kg tree$^{-1}$; 10.11 t ha$^{-1}$). For quality parameters, $T_4$ recorded maximum TSS (8.40 °Brix), reducing sugar (0.85%), non-reducing sugar (0.71%) and total sugar (1.60%), along with minimum titratable acidity (5.60%). Treatment $T_2$ was statistically at par with $T_4$ for most parameters, whereas $T_6$ recorded the lowest performance with higher acidity (8.25%). Overall, $T_4$ showed superior performance for growth, yield and fruit quality of acid lime.

**Keywords:** *Citrus aurantifolia*, Carbon stock, Growth, Yield, Fruit quality, Biomass, Plant carbon

## Introduction

Carbon is essential for maintaining biological activity, biodiversity, ecological balance and ecosystem productivity. However, increasing anthropogenic activities have resulted in greater emissions of greenhouse gases, particularly carbon dioxide ($CO_2$), contributing to global warming and climate change. Carbon sequestration is an important approach for reducing atmospheric $CO_2$ by storing carbon in vegetation, soil and other terrestrial carbon pools. Photosynthesis is the major natural process through which atmospheric $CO_2$ is converted into organic carbon and stored in plant biomass and soil organic carbon (*SOC*) (Lal, 2004; De Moraes Sá *et al.*, 2009) [2, 1]. Agricultural systems contribute to greenhouse gas emissions through soil disturbance, residue burning and the use of fossil-fuel-based inputs. In contrast, perennial cropping systems such as fruit orchards and agroforestry have considerable potential for carbon sequestration because of their long life span, continuous biomass production and sustained carbon fixation. Fruit orchards can store carbon in trunks, branches, leaves and roots for long periods, thereby contributing to climate-change mitigation and ecological balance. The biological carbon sequestration potential of perennial crops can also improve nutrient cycling and soil health. Soil is one of the major terrestrial carbon sinks, and its carbon-storage capacity is influenced by soil properties, climate, vegetation, crop type and management practices (Hammad *et al.*, 2020; Meena *et al.*, 2020) [3, 4]. Carbon enters the soil mainly through plant residues, litter decomposition and microbial activity. Soil organic matter serves as an important source of plant nutrients and plays a significant role in maintaining soil fertility and productivity. Therefore, the assessment of soil organic carbon along with above-ground biomass (*AGB*) and below-ground biomass (*BGB*) is important for understanding the carbon-sequestration potential of perennial fruit crops. Perennial fruit crops, particularly citrus and acid lime (*Citrus aurantiifolia* Swingle), have considerable potential for carbon storage because of their long duration and continuous biomass accumulation. Carbon stored in woody biomass, roots and soil may contribute to improved soil health and long-term productivity. As scarce information is available regarding relationship between carbon stock and growth, yield and fruit quality of acid lime. Understanding this relationship is important for developing sustainable orchard management practices that can improve productivity while contributing to environmental sustainability.

## Materials and Methods

The experiment was conducted during 2025–26 at the Horticulture Farm, Government College of Agriculture, Dhule, Maharashtra, to study the effect of carbon stock on growth, yield and quality of acid lime (*Citrus aurantifolia* Swingle). The experiment consisted of nine treatments with three replications and



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was laid out in a Randomized Block Design (RBD) consisting of nine treatments replicated three times, with two plants selected under each treatment. Among the nine treatments, $T_1$ to $T_8$ consisted of selected acid lime plants, while $T_9$ was maintained as control (land with no vegetation). Soil samples were collected from different locations within the experimental area at three depths, viz., 0–30, 30–60 and 60–90 cm. The collected samples were shade-dried to remove excess moisture, crushed using a wooden mortar and pestle, and passed through a 2 mm sieve to obtain a uniform sample. Total carbon content in the soil was determined by the method of Nelson *et al.* (1982) [5]. Plant height was measured using a measuring bamboo, while the East–West and North–South canopy spreads were measured in the respective directions and their average values were recorded.

### *Growth parameters*

### *Estimation of above and below ground biomass*

Above ground stem biomass of selected trees in the system was determined according to Ravindranath *et al.* (2008) [6] by following formula.

$$\text{AGB} = \text{Volume } (m^2) \times \text{Wood density } (\text{kg } m^{-3})$$

The below ground biomass (*BGB*) has been calculated by multiplying above ground biomass taking 0.26 as the root to shoot ratio. (Ravindranath *et al.*, 2008) [6]

$$\text{BGB (kg)} = \text{AGB (kg)} \times 0.26$$

Canopy volume was calculated as per Westwood *et al.* (1963) [7]. The canopy volume was calculated by using the formula:

$$\text{Canopy volume } (m^3) = \frac{4}{3}\pi a^2 b$$

Where,

$$\pi = \frac{22}{7}$$

a = ½ of the plant height

$b$ = average of East-West and North-South spread

The total plant biomass was calculated adding biomass of all the components, Below ground and above ground. (Sheikh *et al.*, 2011) [8]
$TPB = AGB + BGB$ (All values are in kilogram)

Plant carbon was estimated by assuming that carbon constitutes approximately 50% of the total plant biomass, as reported by Chavan *et al.* (2011) [9]. Thus, plant carbon was calculated by dividing the total plant biomass by two.

$$\text{Plant Carbon} = \text{total plant biomass} \times 50\% \text{ or Biomass}/2$$

### *Soil organic carbon stock*

Soil organic carbon stock was estimated at three soil depths, namely 0–30, 30–60 and 60–90 cm, using the standard formula described by Jasmine, Wagner and Abbott (2021).

$$\text{SOC Stock} = \text{TOC} \times \text{BD} \times \text{D}$$

Where:
*TOC* = Total Organic Carbon
BD = Bulk Density of Soil
D = Depth of Soil Layer

### *Total organic carbon (TOC)*

The total organic carbon content of soil was determined by dry combustion at high temperature, followed by collection and detection of the evolved $CO_2$, as described by Nelson *et al.* (1982) [5].

### *Yield and quality parameters*

### *Yield per plant (kg)*

Fruit yield was recorded by weighing the fully mature fruits collected at each harvest. The yield from all harvests was summed and expressed as kilograms per plant.

### *Yield per hectare (t/ha)*

The fruits harvested from each observational plant were weighed at every harvest. The total fruit weight obtained during the season was recorded as kg per tree and then converted into tonnes per hectare.

### *Titratable acidity (%)*

Titratable acidity of the fruit pulp was determined by following the method described by Ranganna (1986) [10]. The acidity was calculated and expressed as percentage.

$$\text{Titratable acidity (\%)} = \frac{\text{Burette reading} \times \text{Normality of NaOH} \times \text{Volume made} \times \text{Eq.wt of acid} \times 100}{\text{Weight of sample} \times \text{aliquot of sample} \times 1000}$$

### *Total soluble solids (0Brix)*

The total soluble solids content of the fruit pulp was measured using an *Erma* hand refractometer having a range of 0–32 °Brix. The readings were recorded and expressed in °Brix as per the method described by Ranganna (1986) [10].

### *Total sugar (%)*

Total sugar content of the fruit pulp was estimated using Fehling's reagent following the method described by Ranganna (1986) [10]. The total sugar content was calculated using the standard formula and expressed as percentage of invert sugars.
Total sugar (%) = 100 × 250× 0.05 × *volume made*
*Burette reading* × *weight of sample* × 50



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### *Reducing sugar (%)*

Reducing sugar content was estimated using Fehling's reagent according to the method described by Ranganna (1986) [10]. The reducing sugar content was calculated using the formula given below.

Reducing sugar (%) = 100 × 0.05 × *volume made*

*Burette reading* × *weight of sample taken*

### *Non-reducing sugars (%)*

The non-reducing sugars were estimated by using following formula.

$$\text{Non-Reducing Sugar} = \left(\text{Total sugar} - \text{Reducing sugar}\right) \times 0.95$$

## Result and Discussion

### *Growth parameters*

table 1 showed the impact of the various acid lime plant on growth parameters. plant biomass and plant carbon.

### *Growth parameters*

The data presented in Table .1 showed significant differences among treatments for growth parameters of 15-year-old acid lime trees. Treatment $T_4$ recorded the maximum plant height (3.80 m), East–West spread (3.95 m), North–South spread (3.96 m) and canopy volume (31.04 m³), and was statistically at par with $T_2$ (3.77 m, 3.92 m, 3.92 m and 30.33 m³, respectively). The minimum values were recorded in $T_6$. The superior growth in $T_4$ may be attributed to greater biomass accumulation and carbon storage, resulting in better canopy development.

### *Biomass production*

Significant variation was observed among treatments for above-ground biomass, below-ground biomass and total biomass. Treatment $T_4$ recorded the highest *AGB* (35.45 kg tree$^{-1}$), *BGB* (8.96 kg tree$^{-1}$) and total biomass (43.41 kg tree$^{-1}$), and was statistically at par with $T_2$ (33.67 kg tree$^{-1}$, 8.75 kg tree$^{-1}$ and 42.42 kg tree$^{-1}$, respectively). The lowest biomass was recorded in $T_6$. The higher biomass in $T_4$ indicates better tree vigour and greater dry matter accumulation, contributing to increased carbon storage.

**Table 1.** Effect of Carbon stock on growth of Acid lime

| Treatment | Plant Height (m) | *E*-W Spread (m) | *N*-S Spread (m) | Canopy Volume (m$^3$) | AGB (kg tree$^{-1}$) | BGB (kg tree$^{-1}$) | Total Biomass (kg tree$^{-1}$) | Plant Carbon (kg tree$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| $T_1$ | 3.68 | 3.72 | 3.74 | 26.80 | 30.16 | 7.84 | 38.00 | 19.00 |
| $T_2$ | 3.77 | 3.92 | 3.92 | 30.33 | 33.67 | 8.75 | 42.42 | 21.21 |
| $T_3$ | 3.71 | 3.76 | 3.75 | 27.39 | 30.40 | 7.90 | 38.30 | 19.15 |
| $T_4$ | 3.80 | 3.95 | 3.96 | 31.04 | 35.45 | 8.96 | 43.41 | 21.70 |
| $T_5$ | 3.56 | 3.60 | 3.62 | 24.29 | 26.96 | 7.01 | 33.97 | 17.00 |
| $T_6$ | 3.42 | 3.48 | 3.46 | 21.56 | 23.93 | 6.22 | 30.15 | 15.08 |
| $T_7$ | 3.49 | 3.55 | 3.57 | 23.16 | 25.71 | 6.68 | 32.39 | 16.20 |
| $T_8$ | 3.63 | 3.70 | 3.71 | 26.09 | 28.96 | 7.53 | 36.49 | 18.25 |
| SE m (±) | 0.04 | 0.03 | 0.04 | 0.42 | 1.04 | 0.16 | **1.01** | **0.42** |
| CD at 5% | 0.13 | 0.10 | 0.15 | 1.27 | 3.18 | 0.48 | **3.08** | **1.30** |

### *Plant carbon sequestration*

Significant differences were observed in plant carbon among treatments. The highest plant carbon was recorded in $T_4$ (21.70 kg tree$^{-1}$), which was statistically at par with $T_2$ (21.21 kg tree$^{-1}$), while the lowest value was recorded in $T_6$ (15.08 kg tree$^{-1}$). Higher biomass and canopy development resulted in greater carbon accumulation. Similar findings were reported by Mehta *et al.* (2016) [11] in citrus. The results indicate that better vegetative growth and biomass production enhance carbon storage in acid lime trees.

**Table 2.** Effect of Carbon stock on Yield parameters of Acid Lime:

| Treatment | Number of Fruits Per plant | Average weight of fruits (g) | Yield (kg tree$^{-1}$) | Yield (t ha$^{-1}$) |
|---|---|---|---|---|
| $T_1$ | 660 | 48.21 | 31.81 | 8.81 |
| $T_2$ | 705 | 50.78 | 35.80 | 9.92 |
| $T_3$ | 675 | 49.50 | 33.42 | 9.25 |
| $T_4$ | 712 | 51.25 | 36.49 | 10.11 |
| $T_5$ | 635 | 47.00 | 29.85 | 8.27 |
| $T_6$ | 565 | 44.28 | 25.03 | 6.93 |
| $T_7$ | 615 | 46.80 | 28.78 | 7.97 |
| $T_8$ | 645 | 47.82 | 30.83 | 8.54 |
| SE m (±) | 12.53 | 0.81 | 1.15 | 0.25 |
| CD at 5 % | 38.01 | 2.48 | 3.49 | 0.76 |

### *Yield contributing characters*

The study evaluated the effect of different treatments on yield and yield contributing characters of acid lime during Hasta Bahar. The results showed significant variations among the treatments. Treatment $T_4$ exhibited the highest yield (10.11 t/ha), with the maximum number



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of fruits per plant (712), average fruit weight (51.25 g) and fruit yield (36.49 kg/tree). Treatment $T_2$ also showed superior performance and was statistically at par with $T_4$, recording 705 fruits per plant, 50.78 g average fruit weight and 9.92 t/ha yield. The remaining treatments showed comparatively lower performance, while $T_6$ recorded the lowest yield (6.93 t/ha) and number of fruits per plant (565). The higher yield under $T_4$ may be associated with greater biomass production and carbon accumulation, which can improve nutrient cycling and the source–sink relationship in acid lime trees. These findings indicate that better plant growth, biomass accumulation and carbon storage can contribute to enhanced fruit production. Fruit tree-based systems also have an important role in carbon sequestration through the accumulation of carbon in plant biomass and soil (Lal, 2004; Kumar *et al.*, 2018) [2, 12].

### *Quality contributing characters*

The study evaluated the effect of different treatments on the physico-chemical characteristics of acid lime fruits. The results showed significant variations among the treatments for Total Soluble Solids (TSS), Titratable Acidity, Reducing Sugar, Non-Reducing Sugar and Total Sugar.

**Table 3.** Effect of Carbon Stock on Quality parameters of Acid Lime:

| Treatment | TSS (° Brix) | Titratable Acidity (%) | Reducing Suger (%) | Non-Reducing Suger (%) | Total Reducing Sugers (%) |
|---|---|---|---|---|---|
| $T_1$ | 7.88 | 6.18 | 0.76 | 0.62 | 1.41 |
| $T_2$ | 8.25 | 5.90 | 0.82 | 0.69 | 1.55 |
| $T_3$ | 7.98 | 6.12 | 0.78 | 0.65 | 1.46 |
| $T_4$ | 8.40 | 5.60 | 0.85 | 0.71 | 1.60 |
| $T_5$ | 7.48 | 6.65 | 0.72 | 0.58 | 1.33 |
| $T_6$ | 6.38 | 8.25 | 0.58 | 0.46 | 1.06 |
| $T_7$ | 6.99 | 7.73 | 0.66 | 0.52 | 1.22 |
| $T_8$ | 7.60 | 6.30 | 0.74 | 0.60 | 1.37 |
| SE m (±) | 0.11 | 0.10 | 0.02 | 0.02 | 0.04 |
| CD at 5% | 0.33 | 0.30 | 0.06 | 0.06 | 0.13 |

### *Total soluble solids (TSS)*

The Total Soluble Solids (TSS) content varied significantly among the treatments. Treatment $T_4$ recorded the highest TSS value (8.40 °Brix), followed by $T_2$ (8.25 °Brix). Treatment $T_4$ was statistically at par with $T_2$, indicating better soluble solids accumulation. Treatment $T_6$ recorded the lowest TSS value (6.38 °Brix). These results suggest that the treatments had a significant influence on TSS content and overall fruit quality.

### *Titratable acidity*

The titratable acidity content showed significant variation among the treatments. Treatment $T_4$ recorded the lowest acidity (5.60%), followed by $T_2$ (5.90%), whereas $T_6$ recorded the highest acidity (8.25%). The lower acidity observed in $T_4$ and $T_2$ indicates better fruit quality and flavour balance. These results highlight the influence of treatments on the acidity level of acid lime fruits.

### *Reducing sugar*

The reducing sugar content varied significantly among the treatments. Treatment $T_4$ recorded the highest reducing sugar content (0.85%), followed by $T_2$ (0.82%). The remaining treatments showed a gradual decline, while $T_6$ recorded the lowest value (0.58%). The higher reducing sugar content under $T_4$ and $T_2$ indicates better sugar accumulation and improved fruit quality.

### *Non-reducing sugar*

The non-reducing sugar content showed significant differences among the treatments. Treatment $T_4$ recorded the highest value (0.71%), followed by $T_2$ (0.69%). The values gradually decreased in the remaining treatments, with $T_6$ recording the lowest non-reducing sugar content (0.46%). These results indicate that the treatments influenced sugar accumulation in acid lime fruits.

### *Total sugar*

The total sugar content varied significantly among the treatments. Treatment $T_4$ recorded the highest total sugar content (1.60%), followed by $T_2$ (1.55%), while $T_6$ recorded the lowest value (1.06%). The higher total sugar content under $T_4$ and $T_2$ may be attributed to better carbohydrate accumulation, resulting in improved fruit quality. Overall, the treatments showed a significant influence on the quality parameters of acid lime fruits. Treatment $T_4$ performed best for TSS, reducing sugar, non-reducing sugar and total sugar, while recording the lowest titratable acidity. The higher quality under $T_4$ may be associated with better carbohydrate accumulation and improved plant growth.

### *Soil organic carbon stock (SOC) and total organic carbon (TOC)*

**Table 4.** Shows the impact of Acid lime on *SOC* Stock and *TOC*.

Total organic carbon represents the carbon present in soil organic matter and plays an important role in nutrient retention, nutrient cycling, water retention, aeration and overall soil quality.

The results pertaining to total organic carbon (*TOC*) content at 0–30 cm soil depth in acid lime orchard soil were found significant and are presented in Table 4. Treatment $T_4$ recorded the highest *TOC* content (0.75%) and was statistically at par with $T_2$ (0.73%), $T_3$ (0.73%), $T_1$ (0.71%), $T_8$ (0.70%), $T_5$ (0.70%), $T_7$ (0.67%) and $T_6$ (0.65%). The lowest *TOC* content (0.50%) was recorded in the control treatment $T_9$. At 30–60 cm soil depth, significant differences were observed among the treatments. Treatment $T_4$ recorded the highest *TOC* content (0.63%) and was statistically at par with $T_2$ (0.61%), $T_3$ (0.61%), $T_1$ (0.59%), $T_5$ (0.58%) and $T_8$ (0.58%). Treatment $T_7$ (0.55%) and $T_6$ (0.53%) recorded comparatively lower values, whereas the lowest *TOC* content (0.33%) was recorded in control $T_9$.

Similarly, at 60–90 cm soil depth, treatment $T_4$ recorded the highest *TOC* content (0.45%) and was statistically at par with $T_2$ (0.42%), $T_3$ (0.42%), $T_1$ (0.41%), $T_5$ (0.39%), $T_8$ (0.39%) and $T_7$ (0.37%). Treatment $T_6$ recorded a comparatively lower value (0.34%), while the minimum *TOC* content (0.21%) was recorded in control $T_9$.

A gradual decline in *TOC* content with increasing soil depth was observed across all treatments. The highest *TOC* content was recorded in the 0–30 cm soil layer, followed by 30–60 cm and 60–90 cm depths. This may be attributed to greater accumulation of leaf litter, root residues and other organic matter, along with higher biological activity in the surface soil.



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The data pertaining to soil organic carbon (*SOC*) stock at 0–30 cm soil depth were significantly influenced by the different treatments and are presented in Table 4. Treatment $T_4$ recorded the highest *SOC* stock (24.85 Mg ha$^{-1}$) and was statistically at par with $T_2$ (23.99 Mg ha$^{-1}$), $T_3$ (23.62 Mg ha$^{-1}$), $T_1$ (22.71 Mg ha$^{-1}$), $T_8$ (22.44 Mg ha$^{-1}$), $T_5$ (22.03 Mg ha$^{-1}$), $T_7$ (21.81 Mg ha$^{-1}$) and $T_6$ (20.92 Mg ha$^{-1}$). The lowest *SOC* stock was recorded in control $T_9$ (12.45 Mg ha$^{-1}$).

At 30–60 cm soil depth, significant differences were observed among the treatments. Treatment $T_4$ recorded the highest *SOC* stock (20.40 Mg ha$^{-1}$) and was statistically at par with $T_2$ (19.70 Mg ha$^{-1}$), $T_3$ (19.45 Mg ha$^{-1}$), $T_1$ (19.40 Mg ha$^{-1}$), $T_8$ (19.35 Mg ha$^{-1}$), $T_5$ (18.86 Mg ha$^{-1}$), $T_7$ (18.61 Mg ha$^{-1}$) and $T_6$ (16.98 Mg ha$^{-1}$). The control treatment $T_9$ recorded the lowest *SOC* stock (9.57 Mg ha$^{-1}$).

Similarly, at 60–90 cm soil depth, treatment $T_4$ recorded the highest *SOC* stock (16.19 Mg ha$^{-1}$) and was statistically at par with $T_2$ (16.12 Mg ha$^{-1}$), $T_3$ (15.53 Mg ha$^{-1}$), $T_1$ (14.77 Mg ha$^{-1}$), $T_8$ (14.55 Mg ha$^{-1}$), $T_5$ (14.51 Mg ha$^{-1}$) and $T_7$ (13.60 Mg ha$^{-1}$). Treatment $T_6$ recorded a comparatively lower *SOC* stock (12.91 Mg ha$^{-1}$), while the lowest value was observed in control $T_9$ (5.90 Mg ha$^{-1}$).

The *SOC* stock showed a gradual declining trend with increasing soil depth. The highest *SOC* stock was recorded in the surface soil layer (0–30 cm), followed by 30–60 cm and 60–90 cm depths. The higher *SOC* stock in the surface layer may be attributed to the continuous addition of leaf litter, root biomass and other organic residues under the tree canopy. Greater organic matter deposition and biological activity in the surface soil may have contributed to higher carbon accumulation. Similar findings regarding higher organic carbon accumulation in surface soils of perennial fruit orchards were reported by Purakayastha *et al.* (2008) [13] and Zade *et al.* (2020) [14].

**Table 4.** Effect of TOC and SOC Stock on Acid lime.

| Treatment | Soil TOC (%) | | | SOC Stock (Mg/ ha) | | |
|---|---|---|---|---|---|---|
| | 0-30 cm | 30-60 cm | 60-90 cm | 0-30 cm | 30-60 cm | 60-90 cm |
| $T_1$ | 0.71 | 0.59 | 0.41 | 22.71 | 19.40 | 14.77 |
| $T_2$ | 0.73 | 0.61 | 0.42 | 23.99 | 19.70 | 16.12 |
| $T_3$ | 0.73 | 0.61 | 0.42 | 23.62 | 19.45 | 15.53 |
| $T_4$ | 0.75 | 0.63 | 0.45 | 24.85 | 20.40 | 16.19 |
| $T_5$ | 0.70 | 0.58 | 0.39 | 22.03 | 18.86 | 14.51 |
| $T_6$ | 0.65 | 0.53 | 0.34 | 20.92 | 16.98 | 12.91 |
| $T_7$ | 0.67 | 0.55 | 0.37 | 21.81 | 18.61 | 13.60 |
| $T_8$ | 0.70 | 0.58 | 0.39 | 22.44 | 19.35 | 14.55 |
| $T_9$ Control | 0.50 | 0.33 | 0.21 | 12.45 | 9.57 | 5.90 |
| S.E.± | 0.03 | 0.03 | 0.03 | 1.31 | 0.90 | 1.09 |
| C.D.at 5% | 0.10 | 0.09 | 0.09 | 3.94 | 2.70 | 3.29 |

## Conclusion

On the basis of the findings of the present investigation, it could be concluded that carbon stock had a promising effect on the growth, yield and quality of acid lime. Among all the treatments, Treatment $T_4$ recorded the highest performance in terms of growth, biomass production, yield and quality parameters. Treatment $T_4$ also recorded the highest soil organic carbon (*SOC*) stock and total organic carbon (*TOC*) content, particularly in the surface soil layer, with a gradual decrease with increasing soil depth. The higher carbon stock under acid lime orchard soil may be attributed to continuous addition of leaf litter, root biomass and organic residues, which enhanced organic matter accumulation and microbial activity. Thus, the present study indicates that perennial acid lime orchards can contribute to soil carbon storage and carbon sequestration while improving soil health, growth, yield and fruit quality.

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**How to cite this article:** Gangurde N, Patil S, Nandre D, Patil R, Patil A. Effect of carbon stock on growth, yield and quality of acid lime (*Citrus Aurantifolia* Swingle) cv Sai Sharbati. *International Journal of Agriculture and Food Science*. 2026;8(10):604-609. doi: https://www.doi.org/10.33545/2664844X.2026.v8.i10h.2072

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