International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS)
ISSN : 2581-9925, Impact Factor: 6.882, Volume 04, No. 04(II), October - December, 2022, pp. 375-378

EFFECT OF COMPOST ON SHOOT AND ROOT LENGTH OF RAPHANUS SATIVUS CULTIVAR PUSA CHETKI

Dr. Rajshree Gupta*

ABSTRACT

Radishes, known for their rapid growth, can be cultivated in various types of soils. However, the best outcomes are achieved when they are grown in soil that is rich, friable, moist, and contains a high proportion of humus. The presence of these favourable soil conditions promotes optimal growth and development of radish plants. Research has shown that the addition of compost to the soil can significantly impact radish growth. Experiments conducted with different compost levels demonstrated distinct effects. Radish plants cultivated in soils with 5%, 10%, and 15% compost content displayed pronounced positive effects on their growth. This suggests that incorporating compost in moderate amounts can enhance the overall performance of radishes. Interestingly, when the compost level reached 20%, it was observed to have an inhibitory effect on the growth of radishes. This finding suggests that while compost can be beneficial, excessive amounts might adversely affect the growth and development of radish plants. Therefore, it is important to find the right balance and not exceed the optimal compost concentration. Given the rapid growth rate of radishes, it is crucial to provide them with a rich, fertile soil. Such soil characteristics ensure the availability of essential nutrients and promote vigorous growth. By creating an environment that meets these requirements, gardeners and farmers can maximise the productivity and quality of their radish crops.

Keywords: *Compost, Pot Culture Experiments, Cultivar Pusa Chetki, Shoot Length, Root Length, Analysis of Variance.*

Introduction

Crops, including vegetables, require a steady supply of nutrients to thrive and produce high-quality yields. However, soil often lacks an adequate quantity of essential nutrients. To address this issue, farmers employ fertilisation techniques to provide plants with the necessary elements for growth. One popular method is the use of compost, which serves as a valuable storehouse of various nutrients such as phosphorus, sulphur, and more.

Compost is a result of the biological decomposition of bulk organic waste materials under controlled conditions. Through a carefully managed process, organic matter such as kitchen scraps, yard waste, and agricultural residues are broken down by microorganisms like bacteria and fungi. These microorganisms consume the organic waste, converting it into a nutrient-rich compost.

The resulting compost is teeming with essential nutrients that plants need for optimal development. It contains a range of macronutrients, micronutrients, and trace elements vital for plant growth and productivity. Phosphorus, for example, is crucial for energy transfer and cellular development, while sulphur is necessary for amino acid synthesis and overall plant health. Compost acts as a reservoir for these nutrients, making them readily available to crops when mixed with the soil.

* Associate Professor, Botany, BBD Government College, Chimanpura, Shahpura, Jaipur, Rajasthan, India.

In addition to nutrient content, compost also enhances soil structure and fertility. When incorporated into the soil, compost improves its physical properties, such as water retention, aeration, and drainage. It helps to create a well-balanced soil ecosystem, promoting the growth of beneficial microorganisms that aid in nutrient cycling and disease suppression. The soluble salt content in compost further benefits the soil by enhancing its overall fertility.

By utilising compost as a fertiliser, farmers can effectively enrich their soil, provide crops with essential nutrients, and foster a healthy and productive agricultural system. This sustainable practice reduces dependence on synthetic fertilizers, minimises waste, and contributes to the long-term health and sustainability of our food production systems.

Objectives

- Determine the optimal soil conditions for radish growth
- Investigate the effects of different compost levels on radish plants
- Assess the impact of compost concentration on radish growth
- Identify the threshold at which high compost levels become inhibitory for radish growth
- Understand the importance of rich, fertile soil for rapid radish growth
- Provide guidelines for gardeners and farmers to achieve optimal soil conditions for successful radish cultivation

Material and Methods

In this experiment, 20 seeds of Raphanus sativus cultivar Pusa chetki were carefully sown in pots filled with 10 kg of air-dried garden soil. To ensure the reliability of the results, each treatment was replicated thrice, providing a total of three sets of pots for each concentration of municipal compost.

The pots containing the seeds were placed under natural environmental conditions, allowing the plants to grow and develop. After 10 days of sowing, the pots were examined to monitor the germination process and ensure that the seeds had successfully sprouted.

Following the initial observation, 15 days of growth allowed the plants to establish themselves further. At this stage, four healthy plants were selected and retained in each pot, ensuring uniformity within the experimental units. This step aimed to eliminate any potential bias caused by variations in plant growth and development.

Continuing the experiment, the plants were allowed to grow undisturbed for a total of 45 days. During this period, careful measurements were taken to record the shoot and root lengths of each plant. These measurements provided valuable data for assessing the growth performance and development of the Raphanus sativus cultivar Pusa chetki.

After obtaining the necessary data, statistical analysis techniques were applied to examine the results. The analysis allowed for a comprehensive evaluation of the impact of different concentrations of municipal compost (5%, 10%, 15%, and 20%) on the growth parameters of the Raphanus sativus cultivar Pusa chetki. By comparing the measurements across the different treatments, any significant effects or variations could be identified and statistically validated.

Through this carefully designed experiment and subsequent statistical analysis, researchers aimed to determine the influence of municipal compost concentration on the growth and development of Raphanus sativus cultivar Pusa chetki. The results would provide valuable insights into the potential benefits and optimal dosage of municipal compost for enhancing the growth of this specific cultivar, contributing to the broader understanding of sustainable agricultural practices.

Results and Discussions

The experimental results revealed that the maximum shoot and root lengths were observed in plants treated with a 15% compost concentration. This finding suggests that a moderate level of compost significantly benefits the growth of radish plants. Furthermore, the 5% and 10% compost concentrations also displayed positive effects on shoot and root length, albeit to a slightly lesser extent. However, when the compost concentration reached 20%, it was observed to have a slightly harmful effect on both shoot and root length compared to the control group.

The initial measurements of shoot and root lengths in the control group were recorded as 20.4 cm and 19 cm, respectively. As the concentrations of compost increased, the shoot and root lengths also increased, reaching 22.5 cm and 22.3 cm, respectively. However, at the 20% compost level, both shoot

and root lengths decreased to 20 cm and 18.7 cm, respectively. These findings indicate that there is an optimal range for compost concentration, beyond which further increases become detrimental to the growth of radish plants. Statistical analysis revealed highly significant differences between the control group and the various compost concentrations.

The investigation clearly demonstrates that compost concentrations ranging from 5% to 15% have a beneficial impact on the shoot and root length of Raphanus sativus cultivar Pusa chetki, compared to the control group. However, the 20% compost level was found to be inhibitory to plant growth. This indicates that exceeding a compost concentration of 15% is ineffective and may even impede the growth of radish plants.

The positive effects of compost on seedling growth can be attributed to several factors. The application of compost to the soil at specific concentrations enhances the physiological activities of plants. This increased activity results in improved growth and development. Moreover, the presence of compost in the soil leads to an increase in soil moisture, creating a favorable environment for plant growth. Additionally, compost provides essential nutrients such as nitrogen (N), phosphorus (P), and potassium (K), which are vital for plant nutrition. The improved availability and uptake of these nutrients contribute to the overall growth enhancement observed in the radish plants.

In conclusion, the findings from this experiment emphasize the importance of using compost in radish cultivation. Moderate levels of compost, ranging from 5% to 15%, positively influence shoot and root length, promoting healthy growth in Raphanus sativus cultivar Pusa chetki. However, exceeding the optimal compost concentration of 15% can have detrimental effects on plant growth. By carefully managing compost application, farmers and gardeners can harness its benefits to enhance the growth and productivity of radish crops, ensuring a successful and sustainable cultivation process.

Table 1: Showing the effect of Compost on Shoot and Root Length of Raphanus Sativus Cultivar Pusa Chetki

Sr. No.	Compost	Shoot Length (cm)	Root Length (cm)
1	Control	20.4	19
2	5%	21.6	20.2
3	10%	21.6	21.4
4	15%	22.5	22.3
5	20%	20	18.7

(Values represent the mean of three replicates)
F-ratios (Control Vs Treatment)
i) Shoot length = 58.9615***
ii) Root length = 120.3559***

According to Krislova (1947),the humic substance entering into the plants at an early stage of development acts as a source of respiratory catalyst resulting in the increase in living activities of plants.

It was also noticed that 20% concentration of compost inhibited the shoot-root length of radish plants. Gray and Biddlestone (1977) earlier reported that municipal compost carry some trace metals for example Pb, Zn and Cu. Therefore, in the in the present work the reduction in growth parameters of radish plants might be associated with the increased levels of trace metals in soil at higher levels (20%) of compost which may inhibit the soil fertility and growth of soil microbes resulting in the reduced values of shoot-root length.

Such types of results were also recorded by Purves (1973) from his one year trial on potatoes.

Conclusions

In conclusion, the results of the experiment indicate that the addition of compost to the soil can have a significant impact on the growth of radish plants. Moderate levels of compost (5%, 10%, and 15%) were found to promote favourable growth characteristics in radishes, leading to improved shoot and root development. These findings suggest that incorporating compost in appropriate amounts can be beneficial for radish cultivation.

However, it is important to note that excessive levels of compost (20%) had an inhibitory effect on radish growth. This highlights the need to maintain a balanced compost concentration and avoid exceeding the optimal threshold. Finding the right balance in compost application is crucial to avoid potential negative effects on radish plants.

Overall, cultivating radishes in soil that is rich, friable, and contains a high proportion of humus, along with moderate levels of compost, can optimise the growth and productivity of radish crops. By providing the necessary nutrients and maintaining favourable soil conditions, gardeners and farmers can ensure vigorous growth and achieve high-quality radish yields.

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