

## Title Page

# A Comparative Analysis on Estimation of the Height of *Capsicum Annuum* in Organic-Infused Seedling Pots Versus Plastic Grow Bags.

Sowmiya.k<sup>1</sup> , Velumani.A<sup>2</sup>

Sowmiya.k<sup>1</sup>

Research Scholar,

Department of Agricultural Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, India, Pincode: 602105.

[192023024.sse@saveetha.com](mailto:192023024.sse@saveetha.com)

Dr.Velumani.A<sup>2</sup>

Research Guide, Corresponding Author,

Department of Agricultural Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, India, Pincode: 602105.

[velumania.sse@saveetha.com](mailto:velumania.sse@saveetha.com)

**Keywords:** Height per plant, Organic Infused seedling pot, Plastic grow bags,(Novel *Aloe barbadensis miller*), Fertilizer .

## **ABSTRACT**

**Aim:** This study is aimed to determine the Height of a plant from Organic Infused seedling pot and plastic grow bags or trays for (*Capsicum Annum*) chillies by the use of nitrogen, phosphorus, potassium fertilizers and (Novel *Aloe barbadensis miller*). **Materials and Methods:** The experimental land area is 460 cm x 230 cm. Organic Infused seedling pots and plastic grow bags or trays along with some fertilizers and (Novel *Aloe barbadensis miller*) for chillies (*Capsicum Annum*) were the experimental and control group. The sample size for each group was 20 and the total sample size was 40. The G-power calculation showed 80% with an alpha = 0.05 and a confidence interval of 95 % for evaluating the sample size by clinical.com. Soil test analysis was conducted in Tamil Nadu soil test center(Gianni 2020). **Results:** From the results it shows that the growth rate was enriched by Organic infused seedling pot and it induced the nutrient contents to the soil. Thereafter, the application of Organic Infused seedling pots to the chillies varieties increased the growth of height in the plant. The mean value of Organic Infused seedling pot is 112.01 for height per plant. 105.60 produced for Plastic Grow bags per plant. The two-tailed significance value obtained is 0.003 (p<0.05) which is statistically significant. It was inferred that two groups have a significant difference. **Conclusion:** Among the two varieties of seedling pot for chillies grown using organic manure, Organic Infused seedling pots have the highest plant height than Plastic grow bags (Novel *Aloe barbadensis miller*). The fertilizers and pesticides provide good nutrition and increased growth rate and good soil nutrients availability.

**Keywords:** Height per plant, Organic Infused pot, Plastic grow bags, (Novel *Aloe barbadensis miller*), Fertilizer.

## **Introduction**

A species of flowering plant in the Solanaceae family with native origins in the Americas and widespread cultivation is (*Capsicum annuum*). It is well-known for its hot fruits, often called chillies peppers or simply chillies, which are extremely spicy (Kaushik 2022). The spiciness of chillies peppers can range from mild to extremely spicy and they come in a variety of sizes, shapes, and colors. They are prized for their flavor and culinary adaptability and serve as a basic component in many cuisines. Sweet pepper (*Capsicum annuum*) grows on warm, moist, but not soggy soil. It is a source of the vitamins C, A, and E, and while producing this type of crop, providing the right quantity of nutrients, such as by using fertilizer, is crucial for the growth and production of sweet pepper (Gou et al. 2020). It is possible to think of organic-infused seedling

pots, which contain a variety of natural ingredients like aloe vera extract, banana peel powder, and coconut coir, as composite materials(Sanogo, Etarock, and Clary 2009). Composites in the form of organic-infused pots can improve soil moisture control and nutrient retention. Banana peel powder and aloe vera extract can help to enrich the nutrients while also helping to retain moisture (Rasyid 2008). Application of Composite Pots for (*Capsicum annuum*) Cultivation are,Improved Nutrient Availability,Enhanced Soil structure,Root Health, Moisture Retention, Sustainable Agriculture, Organic Gardening, Nutrient-Rich Potting Mix, Improved Plant Growth.

The total number of articles published over the past five years is 1,180 in Google Scholar, and Science Direct has published around 162 articles related to this topic. Fibrous materials including peat, rice hulls, coconut coir, and groundnut shell powder are used to make fiber containers and are easily accessible on the market. They do work with a number of horticultural species(Reddy 2019). Although plastic grow bags (Novel *Aloe barbadensis miller*)are fantastic for many plants, they are not always the greatest choice for the roots of the plants. This results in the plant finally developing a circular pattern of root development(Daniel 2022). Banana, Pomegranate, Orange, Sweet Lime, and other fruit peels were among those used. These fruit peels contain vitamins and minerals like calcium, citrate, iron, zinc, and potash. In the current study, fruit peel powders are utilized as a natural fertilizer(Jideani and Anyasi 2020). It enhances drainage and aeration for healthier root growth. As it holds onto nutrients and delivers them gradually to the plants, it also stops nutrient leaching. This promotes improved nutrition absorption(Huang et al. 2023).The best study in the article that is comparable to my research is (Jideani and Anyasi 2020), which is among these studies.

The usage of coco-peat, banana peel powder, citrus peel powder, and aloe vera gel as substitutes for manure pots to determine the height per plant of chillies(*Capsicum annuum*)plants has not yet been thoroughly investigated by researchers. The purpose of the study is to compare two distinct seed germination containers—one made of organically infused seed and the other of plastic grow bags with —in order to determine the height per plant of chillies (*Capsicum annuum*)with (Novel *Aloe barbadensis miller*). The aim of this study is to compare the height per plant of Capsicum Annum in Organic-Infused Seedling Pots Vs Plastic Grow Bags.

## MATERIALS AND METHODS

The most economically significant member of the Capsicum genus is (*Capsicum annuum*). Among this variety cayenne types of green chillies are taken as experimental test varieties. The experimental farming work was carried out in the field of chettipedu village in Thandalam, Tamil nadu. During the winter between October 2023. The pre-test analysis was carried out to calculate the sample size using an online clinical sample calculator with a 95% confidence interval, 80%

G-power, and 0.05 threshold was calculated using clinical.com(Gianni 2020). Organic potting mixtures are necessary for the growth of healthy plants to find height per plant.. In this, we'll go through how to make an organic potting mix using certain materials, such as coco peat, powdered banana peel, powdered citrus peel, and extract from aloe vera (Novel *Aloe barbadensis miller*). We'll also go through how to add 5 kg of coco peat as the main component to the mixture. 5 kg of coco peat, 1.5 kg of banana peel powder, 1.5 kg of citrus powder, and 2.25 kg (15%) of aloe vera extract make up the entire mixture. Mixing implements for large containers or buckets (such as a shovel or gardening fork) Scale and Water Measuring(De 2003). The 5 kg of coco peat should first be soaked in water for about 30 minutes until it has fully expanded. It will be simpler to work with as a result(Hardenburg, Watada, and Wang 1986).The soaked coco peat, banana peel powder, citrus powder, and aloe vera extract should all be combined in a sizable container or bucket. Water should be gently added while mixing to retain a somewhat moist consistency.To create a combination that can hold moisture without becoming soggy is the goal. Perform a squeeze test on your plants before planting. It is prepared for use if it holds together without dropping more water. Now that the organic potting mix has been produced, you can pot your plants. Plant your seeds or transplants after filling the pots or containers as necessary. The 5 kg of coco peat included as the major ingredient, along with coco peat,banana peel powder, citrus powder, and aloe vera extract, makes up the finished organic potting mix. This mixture gives your plants a wholesome, nutrient-rich environment in which to grow to determine the height per plant (Ozturk et al. 2019).

#### For Group1: Organic-Infused Seedling Pots

Traditional techniques were used to plow the test plot. The 20 samples of (*capsicum annuum*) green chillies seeds were sown in the organic-infused seedling pots for germination.The plant can be sown in the main field along with the fertilizers pot after the germination period of 20 to 25 days(Vazhacharickal and Joseph 2016).These chillies were planted in a field that had been irrigated with water, using a split plot design, with a row spacing of 20 to 25 cm

#### For Group 2: Plastic grow Bags

One contemporary option for container gardening and nursery operations is the use of plastic grow bags. These bags are normally composed of sturdy, UV-resistant plastic and come in a variety of sizes. The 20 samples of (*Capsicum Annum*) green chillies seeds were sown in the plastic grow bags or germinating trays along with (Novel *Aloe barbadensis miller*) for germination(Russo 2012). After germinating between 20 to 30 days, the plastic trays are discarded and the saplings are transplanted with a row spacing of 20 to 25 cm. So that the root of the saplings got disturbed while dismantling the tray or growing bags.

After being sown in the pot, the seeds begin to germinate with the necessary moisture and sunlight. After germination, the plants are reinstalled in the prepared soil. Intercultural farming operations include weeding and other agricultural tasks(Singh, Jakhar, and Singh 2007). It is done 20 days following the seeding date. Insecticides like fosmrite, which blocks the transmission of nerve impulses in insects and mites by inhibiting the acetylcholinesterase enzyme, barazide, a practical way to get rid of a variety of lepidopteran pests, and fungicides like shamir, which provides excellent protection against chillies anthracnose and fruit rot, must be applied frequently because fungal diseases are less common in chillies than insect pests (Gomez and Thivant 2017). All pertinent farming culture methods and procedures for plant protection were consistently followed throughout the experiment period across all plots and treatments. The height per plant was measured and recorded.

### **Statistical Analysis**

The statistical analysis was carried out with SPSS v 26. The mean, standard deviation and significance of the results can be obtained from the software tool. 20 samples were carried out for analysis of each group. 95 % confidence level can be achieved with a significant value less than 5%. Organic-Infused seedling pot and plastic grow bags and (*Novel Aloe barbadensis miller*)were the independent variables and (*Capsicum Annum*) plant was the dependent variable.

## **RESULTS**

This study compares and contrasts the height per plant between the two varieties of germinating pot for (*Capsicum Annum*) chillies samples, which are grown using (NPK) nitrogen, phosphorus and potassium fertilizers(Beeckman 2009; Altman and Waisel 2012). For both Organic-Infused seedling and plastic grow bags,the fertilizer materials (*Novel Aloe barbadensis miller*) had a substantial impact on the germinating height per plant. Table 1 shows the green chillies plant will germinate and grow for transplanting after 20 to 25 days.The application of Nitrogen, Phosphorus, Potassium fertilizer has a greater impact on the height per plant. Table 2 shows the group statistics of green chilli Height per plant obtained from the statistical analysis, in which the mean value for each plant is height Per plant of Organic-Infused Seedling pot and Plastic grow bags or trays (*Novel Aloe barbadensis miller*).Table 3 shows the independent sample t-test for green chillies height per plant. The tabulation shows the two-tailed significant values of  $P= 0.003$  ( $p<0.05$ ) for chillies height per plant. Figure 1 (a) displays the potting practices in both seedling pot varieties, Figure 1 (b) displays the growth of Organic-Infused pot and Figure 1 (c) displays the growth of plastic grow bags or trays. Figure 2 shows the comparison of capsicum annum plants for Organic-Infused seedling pots and Plastic grow bags or trays. shown in the bar chart X-axis is Seed varieties and Y-axis are mean (*capsicum annum*) plant values with 95% confidence interval and +/-1 standard deviation.

## **DISCUSSION**

According to this study, the two types of seedling pots are comparable in height per plant and number of chillies (*capsicum annum*) per plant; however, the comparison of Organic Infused seedling pots and Plastic grow bags and (*Novel Aloe barbadensis miller*) shows that the former has the maximum plant height(Xiong, Ho, and Shahidi 2012). By contrast, the mean accuracy of the Organic Infused seedling pot variety is higher than that of the Plastic Grow Bags variety(Hussmann 2018). Additionally, the standard deviation of the Organic Infused seedling pot is (112.10), slightly higher than that of Plastic grow bags (105.60). 40 samples were planted over a field measuring 460 cm by 230 cm. For the purpose of the result analysis, the statistically significant two-tailed significance value of 0.003 ( $p<0.05$ ) has been chosen. It was concluded that there are notable differences between the two groups.

This outcome demonstrates that the farming output of the Organic Infused seedling pots is higher than that of the Plastic grow bags chillieses(Hussmann 2018). The purpose of applying fertilizers to soil is to enhance its physical properties, including bulk density, aggregation, and soil aeration (*Novel Aloe barbadensis miller*). They also help plants retain water and nutrients; the results of the study mentioned above are consistent with our research. There were insufficient amounts of aeration medium, easily accessible water, and substances that inhibit root development and lower water-holding capacity(Saleth et al. 2009). This study suggests that there will be a 50% decrease in pesticide use due to the inorganic and low-input systems' poor results. Weeds continue to harm plants, seriously reducing the quality of plants and chillieses(Beeckman 2009) We found different results from our analysis of the two studies mentioned above.

The limitations of this study's findings may be limited by the sample size used. If the sample size is too small, it can lead to a lack of statistical power and result in inconclusive or unreliable results. Every individual seed should be monitored every week to check their growth of germination rate. The scope of the study relies on use of different seedling pots varieties of green chilli and combination (Orange peel powder, Banana peel powder and Aloe vera extract (*Novel Aloe barbadensis miller*) fertilizers and infused manure as pre and post emergence.

## **CONCLUSION**

Among the two varieties of seedling pots for germination using Organic Infused seedling pot and plastic grow bags ,where in comparison Organic Infused seedling pots have the highest plant height than Plastic grow bags(Hardenburg, Watada, and Wang 1986). The orange peel powder , Banana peel powder and Aloe vera gel provide good nutrition and growth rate for the seedling due to the better water source as well(Brumos, Agusti, and Ramireddy 2021)Due to their complementary roles in enhancing the physical and nutritional conditions of the medium, the combined use of fertilizers had a substantial impact on seedling growth indices. This study

demonstrated the height per Plant is (112.01) for Organic Infused seedling pots and (105.60) Plastic grow Bags. The two groups have a two-tailed significance value of  $p = 0.003$  ( $p < 0.05$ ). It was inferred that two groups have a significant difference.

## **DECLARATION**

### **Conflict of interest**

The authors of this paper declare no conflict of interest.

### **Author contributions**

The author KS was involved in data collection, data analysis, and manuscript writing. Author AV was involved in processing the idea, data verification, and critical review of the manuscript.

### **Acknowledgments**

The authors would like to express their gratitude towards Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (Formerly known as Saveetha University) for providing the necessary infrastructure to carry out this work successfully.

**Funding:** We thank the following organizations for providing financial support that enabled us to complete the study.

1. Sun Fab Packaging, Chennai
2. Saveetha School of Engineering
3. Saveetha University
4. Saveetha Institute of Medical and Technical Sciences

## REFERENCES

- Altman, Arie, and Yoav Waisel. 2012. *Biology of Root Formation and Development*. Springer Science & Business Media.
- Beeckman, Tom. 2009. *Annual Plant Reviews, Root Development*. John Wiley & Sons.
- Brumos, Javier, Javier Agusti, and Eswarayya Ramireddy. 2021. *Integration of Hormonal Signals Shaping Root Growth, Development, and Architecture*. Frontiers Media SA.
- Daniel, Ruth. 2022. *The Grow Bag Gardening Guide: Gardening in Grow Bags: Answers to All Your Questions*. Independently Published.
- De, Amit Krishna. 2003. *Capsicum: The Genus Capsicum*. CRC Press.
- Gianni, Maria Lorella. 2020. *Human Milk and Lactation*. MDPI.
- Gomez, I., and L. Thivant. 2017. *Training Manual for Organic Agriculture*. Scientific Publishers - UBP.
- Gou, Jing-Yi, Sheng-Zhou Suo, Kun-Zhong Shao, Qi Zhao, Dan Yao, Hui-Ping Li, Jin-Lin Zhang, and Christopher Rensing. 2020. "Biofertilizers with Beneficial Rhizobacteria Improved Plant Growth and Yield in Chili (*Capsicum Annum L.*)."*World Journal of Microbiology & Biotechnology* 36 (6): 86.
- Hardenburg, Robert E., Alley E. Watada, and Chien Yi Wang. 1986. *The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks*.
- Huang, Dongfen, Xulin Liu, Hengfu Huan, Guodao Liu, and An Hu. 2023. "Intercropping of Stylosanthes Green Manure Could Improve the Organic Nitrogen Fractions in a Coconut Plantation with Acid Soil."*PloS One* 18 (3): e0277944.
- Hussmann, Stephan. 2018. *Automation in Agriculture: Securing Food Supplies for Future Generations*. BoD – Books on Demand.
- Jideani, Afam I. O., and Tonna A. Anyasi. 2020. *Banana Nutrition: Function and Processing Kinetics*. BoD – Books on Demand.
- Kaushik, Prashant. 2022. *Developing Hybrids for Yield and Quality in Chili (*Capsicum Annum L.*): An Approach*. Eliva Press.
- Ozturk, Munir, Khalid Rehman Hakeem, Muhammad Ashraf, and Muhammad Sajid Aqeel Ahmad. 2019. *Crop Production Technologies for Sustainable Use and Conservation: Physiological and Molecular Advances*. CRC Press.
- Rasyid, Raudah Mohm. 2008. *Effects of Application of Different Fertilizer on Growth Capsicum (*Capsicum Annum L.*) in Fertigation System*.
- Reddy, Narendra. 2019. *Sustainable Applications of Coir and Other Coconut By-Products*. Springer.
- Russo, V. M. 2012. *Peppers: Botany, Production and Uses*. CABI.
- Saleth, R. M., Inocencio, A., Noble, A. D., Ruaysoongnern, and S. 2009. *Economic Gains of Improving Soil Fertility and Water Holding Capacity with Clay Application: The Impact of Soil Remediation Research in Northeast Thailand*. IWMI.
- Sanogo, S., B. F. Etarock, and M. Clary. 2009. "Recovery of *Verticillium Dahliae* from Tall Morningglory (*Ipomoea Purpurea*) in New Mexico and Its Pathogenicity on Chile Pepper."*Plant Disease* 93 (4): 428.
- Singh, Karan, Mohan Lal Jakhar, and Dhirendra Singh. 2007. *Multitherapeutic Medicinal & Spiceal Plants*.
- Vazhacharickal, Prem Jose, and Jessina Joseph. 2016. *Morphological Diversity of Chilli Pepper (*Capsicum Annum L.*) Varieties in Kerala and Its Antilarvicidal Properties among Targeted and Non Target Organisms: A Brief Overview*. Cuvillier Verlag.

Xiong, Youling L., Chi-Tang Ho, and Fereidoon Shahidi. 2012. *Quality Attributes of Muscle Foods*. Springer Science & Business Media.

## **TABLES AND FIGURES**

**Table 1.** The green chilli plant will germinate normally by 5 to 6 days . computing that germinating speed by Organic Infused seedling pot. The application of organic manure materials has an impact on the Height per plant.

Sample number	Plants height from Organic-Infused seedling pot	Plants Height from Plastic grow bags
1	112	105
2	111.9	104.23
3	112.3	104.95
4	112	110
5	111	105.23
6	112	105
7	112.25	104.93
8	112	105.21
9	111.97	104
10	112	105.21
11	111.92	104.99
12	112	104.93
13	112.14	105.12
14	111.9	104.93
15	112.23	104.9
16	112.34	105.12
17	111.93	109
18	112.24	105.21
19	111.9	109
20	112.23	105.2

**Table 2 .** Group statistics of green chilli Height per plant obtained from the statistical analysis, in which the mean value of per plant is chillies for Organic Infused seedling pot is 112.01 for

Height per plants. 105.60 produced for Plastic Grow bags Height per plant.

Group Statistics					
PlantHeight	Group	N	Mean	Std. Deviation	Std. Error Mean
	organic infused seedling pot	20	112.0125	0.28005	0.06262
	plastic grow bags	20	105.608	1.64606	0.36807

**Table 3.** Independent sample t-test for green chillies per plant. The tabulation shows the two-tailed significant values of  $P= 0.003(p<0.05)$  for chillies per plant.

### Independent Samples Test

PlantHeight	Levene's Test for Equality of Variances			t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		
	Equal variances assumed	12.581	0.001	17.154	38	0.003	6.4045	0.37336	Lower	Upper
Equal variances not assumed				17.154	20.099	0.003	6.4045	0.37336	5.62593	7.18307



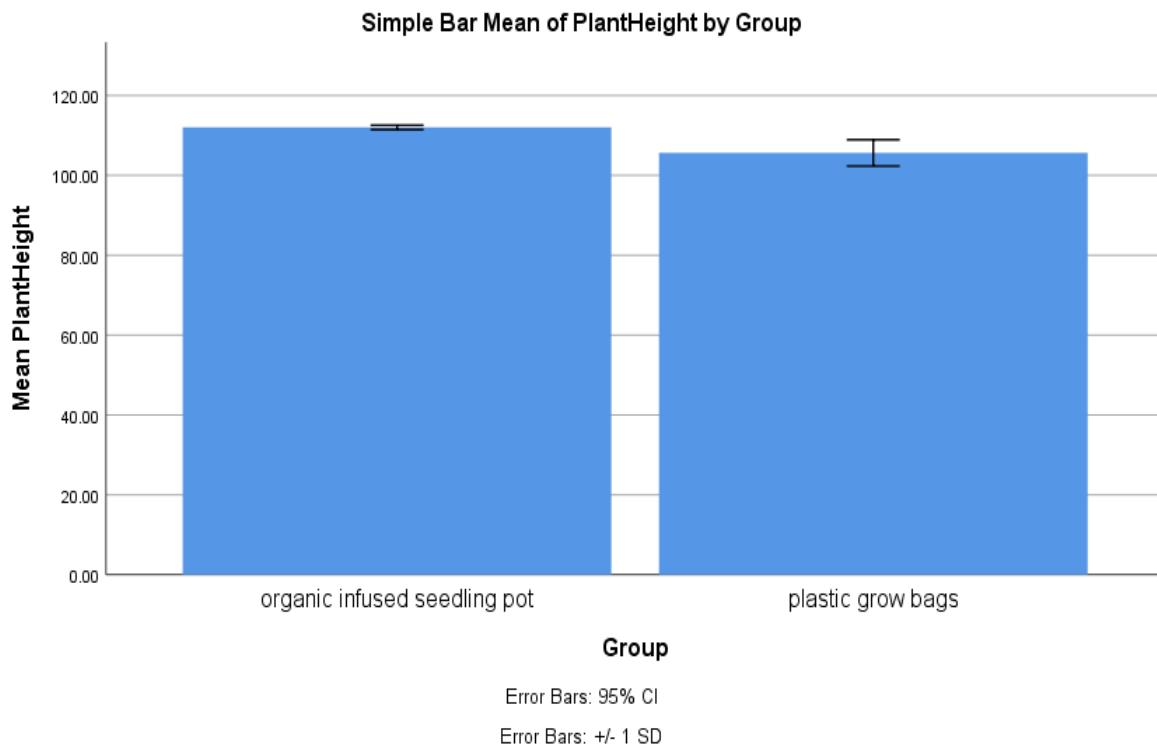
a.)



b.)

c.)

Fig 1. (a) shows the Organic Infused seedling pots which are made to germinate the green chillies. (b) shows the plastic grow bags to germinate the capsicum annuum seeds. (c) shows the sown of seeds in organic germinating pots.



**Fig 2.** Comparison of (*capsicum annuum*) Green chillies Height per plant for Organic Infused seedling pots and Plastic grow bags shown in the bar chart X-axis and Y-axis are mean Plastic grow bags plant values with 95% confidence interval and +/-1 standard deviation.