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Cost-Benefit Analysis of Different Pruning Intensities in Guava (*Psidium guajava* L.) cv. Lucknow-49

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KEYWORDS

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ABSTRACT

The present investigation entitled **"Cost-Benefit Analysis of Different Pruning Intensities in Guava (*Psidium guajava* L.) cv. Lucknow-49"** was carried out during the year 2023-2025 at Govind Nagar Farm, Department of Fruit Science, College of Horticulture & Forestry, A.N.D.U.A.&T., Narendra Nagar (Kumarganj), Ayodhya, Uttar Pradesh, India (Lat 26.51° Long 81.78°). This study was conducted to analyze the cost of cultivation and returns per hectare for guava fruit production. Based on the nature of the data, various statistical and economic tools were employed to estimate the costs and returns associated with guava production. It was laid out in a factorial randomized block design with 13 treatments namely: T_1 (Control-No Pruning), T_2 (Ti_1P_1- 2nd week of April + Pruning of 25 % of shoot length from the tip), T_3 (Ti_1P_2- 2nd week of April + Pruning of 50 % of shoot length from the tip), T_4 (Ti_1P_3- 2nd week of April + Pruning of 75 % of shoot length from the tip), T_5 (Ti_2P_1- 4th week of April + Pruning of 25 % of shoot length from the tip), T_6 (Ti_2P_2- 4th week of April + Pruning of 50 % of shoot length from the tip), T_7 (Ti_2P_3- 4th week of April + Pruning of 75 % of shoot length from the tip), T_8 (Ti_3P_1- 2nd week of May + Pruning of 25 % of shoot length from the tip), T_9 (Ti_3P_2- 2nd week of May + Pruning of 50 % of shoot length from the tip), T_{10} (Ti_3P_3- 2nd week of May + Pruning of 75 % of shoot length from the tip), T_{11} (Ti_4P_1- 4th week of May + Pruning of 25 % of shoot length from the tip), T_{12} (Ti_4P_2- 4th week of May + Pruning of 50 % of shoot length from the tip) and T_{13} (Ti_4P_3- 4th week of May + Pruning of 75 % of shoot length from the tip). The experiment was replicated three times. The results showed that treatment T_9 outperformed the rest, with the cultivation cost per hectare at Rs. 138348.00 and the annual returns per hectare at Rs. 341776.10 with respect to other treatments. The study also assessed the economic viability of guava cultivation, calculating key metrics such as gross return (Rs. 480124.10), net return (Rs. 341776.10) and benefit-cost ratio (1:2.47). Pruning at different time intervals and intensities respectively, was adopted in the experiment to study the effect on yield and its return. Thus, the treatment combination T_9 (Ti_3P_2- 2nd week of May + Pruning of 50% of shoot length from the tip) is recommended for application to Guava trees to obtain good yield and hence profit.

1. INTRODUCTION

Guava (*Psidium guajava* L.) is one of the most widely grown fruit crops in tropical and sub-tropical regions, sometimes referred to as the "apple of the tropics" or the "poor man's apple." It is indigenous to Tropical America, which stretches from Mexico to Peru and is a member of the Myrtaceae family with chromosome number 2n=22 (Radha and Mathew, 2007). Originally brought to the Indian subcontinent by the Portuguese in the early 17th century, guavas are now mostly produced in India, China, Thailand, Pakistan, Mexico, Indonesia, Brazil, and Bangladesh (Singh, 1995). However, it appears to be an Indian fruit because of its accessibility, abundance of nutrients, and low cost to the average person (Dinesh and Vasugi, 2010).

Guava is the fifth most important fruit in terms of area and production after mango, banana, citrus, and apple in India. The area of guava in India is about 308 million hectares and produces 4582 million tonnes. In India, the largest area and highest production of guava fruit are in Uttar Pradesh and the highest Productivity is in Andhra Pradesh. Interestingly, Uttar Pradesh is known for its high-quality guavas, ranking third after Madhya Pradesh and Bihar. Within Uttar Pradesh- Prayagraj, Saharanpur, Badaun, Pratapgarh, and Kaushambi districts are major guava growers. It grows everywhere in India in the homestead gardens, even without or little care, but it is commercially cultivated in the states of Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal, Punjab, Gujarat, Maharashtra, Karnataka, and Andhra Pradesh (NHB 2020-2021).

Guava production is currently lower than its potential, mainly as a result of managerial techniques. Canopy influences guava fruiting potential a lot in structure, density, and photosynthetic effectiveness (Kallo et al., 2005; Burondkan et al., 2000). According to Lal (1983), trimming increased the production of guava cv. Sardar. Additionally, Salah (2005) used both harsh and moderate pruning to get the largest guava bud emergence. According to Singh and Bal (2006), pruning can assist in reducing the size of the tree and enhancing the quality of the fruit. To produce more high-quality fruits per unit area, the management of the tree canopy should be given primary priority. Restricting the growth of vegetation is a crucial technique in tree canopy management. Guava trees adapt well to canopy change in terms of vegetative and reproductive growth; therefore, using

specific bio-regulators and pruning the canopy (Lal, 1983; Tiwari et al., 1992) may be steps to improve production efficiency.

This study focuses on evaluating the effectiveness of these methods in subtropical climates, specifically targeting the Guava cultivar Lucknow-49. The objective is to offer valuable insights into sustainable agricultural practices that can enhance the production of guava, thereby benefiting farmers' livelihoods and ensuring the availability of this nutrient-rich fruit. By conducting a detailed analysis of experimental data and observations, the research aims to address these challenges with innovative and eco-friendly solutions. Ultimately, this research seeks to establish a more resilient and productive Guava cultivation system.

2. MATERIALS AND METHODS

The present investigation was carried out at the Govind Nagar Farm, College of Horticulture & Forestry, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during the years 2023-2025. The experiment was laid out in factorial randomized block design with 13 Treatment, namely: T_1 (Control- No Pruning), T_2 (Ti_1P_1- 2nd week of April + Pruning of 25 % of shoot length from the tip), T_3 (Ti_1P_2- 2nd week of April + Pruning of 50 % of shoot length from the tip), T_4 (Ti_1P_3- 2nd week of April + Pruning of 75 % of shoot length from the tip), T_5 (Ti_2P_1- 4th week of April + Pruning of 25 % of shoot length from the tip), T_6 (Ti_2P_2- 4th week of April + Pruning of 50 % of shoot length from the tip), T_7 (Ti_2P_3- 4th week of April + Pruning of 75 % of shoot length from the tip), T_8 (Ti_3P_1- 2nd week of May + Pruning of 25 % of shoot length from the tip), T_9 (Ti_3P_2- 2nd week of May + Pruning of 50 % of shoot length from the tip), T_{10} (Ti_3P_3- 2nd week of May + Pruning of 75 % of shoot length from the tip), T_{11} (Ti_4P_1- 4th week of May + Pruning of 25 % of shoot length from the tip), T_{12} (Ti_4P_2- 4th week of May + Pruning of 50 % of shoot length from the tip) and T_{13} (Ti_4P_3- 4th week of May + Pruning of 75 % of shoot length from the tip). The experiment was replicated three times. The experiment used plants that were thirty to thirty-five years old. For the regular cultural activities, plant protection measures, and basal application of manures and fertilizers, the Guava plantation's set timetable was adhered to. Data was collected on economic parameters like cost of cultivation (Rs./ha.), gross return (Rs./ha.), net return (Rs./ha.) and benefit: cost ratio. The data obtained

during experimentation were statistically analyzed as per the method given by Panse and Sukhatme (1985).

2.1 Economic Studies

2.1.1 Cost of Cultivation (Rs./ha)

The cost of cultivation of different treatments was estimated on a per-hectare basis by considering all the expenditures incurred for the establishment of guava cv. Lucknow- 49 of the canopy management experiment and added with common cost for various operations.

2.1.2 Gross Return (Rs./ha)

Gross return was worked out by multiplying the fruit yield of guava per hectare separately under various treatments by their existing market prices.

2.1.3 Net Return (Rs./ha)

Net return was obtained by deducting the cost of cultivation from the gross return from the individual treatment (Rs./ha.) calculated.

Net return = Gross return – Cost of cultivation

2.1.4 Benefit: Cost Ratio

The benefit-cost ratio was estimated on the basis of the cost of cultivation, gross return and net return obtained from the guava orchard. The return per hectare was estimated in terms of fruit yield per hectare at the existing market rate available during the years 2023-24 and 2024-25. The benefit-cost ratio was obtained by dividing the net return by the cost of cultivation

Benefit-cost ratio = Net return/Cost of cultivation

3. RESULT AND DISCUSSION

3.1 Economic Studies

3.1.1 Cost of cultivation (Rs./ha.)

The data in **Table 1** revealed that the cost of cultivation varied as a result of variations in different treatments. The maximum cost of cultivation was noted with T_4 (Ti_1P_3), T_7 (Ti_2P_3), T_{10} (Ti_3P_3) and T_{13} (Ti_4P_3) i.e., Rs. 143948.00

followed by T_3 (Ti_1P_2), T_6 (Ti_2P_2), T_9 (Ti_3P_2) and T_{12} (Ti_4P_2) i.e., Rs. 138348.00 and minimum in T_1 (Control- No Pruning) i.e., Rs. 121300.00.

3.1.2 Gross return (Rs./ha.)

Data presented in **Table 1** indicated that the highest gross return/hectare (Rs. 480124.10) was recorded with T_9 (Ti_3P_2) followed by (Rs. 461343.50) was recorded with T_8 (Ti_3P_1) and the lowest (Rs. 224979.40) was recorded with T_1 (Control- No Pruning).

3.1.3 Net Return (Rs./ha.)

Data pertaining to **Table 1** revealed that the highest net returns were obtained with the treatment T_9 (Ti_3P_2) i.e., (Rs. 341776.10) followed by T_8 (Ti_3P_1) i.e., (Rs. 327195.50) and lowest with T_1 (Control- No Pruning) i.e., (Rs. 103679.40).

3.1.4 Benefit: Cost Ratio

The data presented in **Table 1** revealed that the maximum benefit: cost ratio was obtained with T_9 (Ti_3P_2) i.e., (1: 2.47) followed by T_8 (Ti_3P_1) i.e., (1: 2.44) and minimum with T_1 (Control- No Pruning) i.e., (1: 0.85).

Table 1: Cost of Cultivation, Gross Return, Net Return and Benefit: Cost Ratio Attributes of Guava Orchard

Treatments	Cost of Cultivation (Rs)	Gross Return (Rs)	Net Return (Rs)	Benefit: Cost Ratio
T_1- Control- No Pruning	121300.00	224979.40	103679.40	0.85
T_2- Ti_1P_1	134148.00	344615.70	210467.70	1.57
T_3- Ti_1P_2	138348.00	376858.50	238510.50	1.72
T_4- Ti_1P_3	143948.00	399018.50	255070.50	1.77
T_5- Ti_2P_1	134148.00	422563.50	288415.50	2.15
T_6- Ti_2P_2	138348.00	437853.90	299505.90	2.16
T_7- Ti_2P_3	143948.00	429211.50	285263.50	1.98

T_8- Ti_3P_1	134148.00	461343.50	327195.50	2.44
T_9- Ti_3P_2	138348.00	480124.10	341776.10	2.47
T_{10}- Ti_3P_3	143948.00	435194.70	291246.70	2.02
T_{11}- Ti_4P_1	134148.00	442507.50	308359.50	2.30
T_{12}- Ti_4P_2	138348.00	440513.10	302165.10	2.18
T_{13}- Ti_4P_3	143948.00	411151.10	267203.10	1.86

4. CONCLUSION

Based on the ongoing summary of the current investigation, it can be inferred that economic studies parameters viz. cost of cultivation, gross return, net return and benefit: cost ratio were recorded maximum in treatment nine which is more promising than others. Hence, it can be concluded that all the treatments show good effects on increasing fruit yield and economic returns as compared to the control but T_9 (Ti_3P_2- 2nd week of May + Pruning of 50% of shoot length from the tip) was found to be more pronounced among all the treatments and can be used in increasing the yield and hence maximum return in Guava orchard.

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6. COMPETING INTERESTS

Authors have declared that no competing interests exist.

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