



ISSN Print: 2664-6064
ISSN Online: 2664-6072
NAAS Rating (2025): 4.69
IJAN 2025; 7(8): 01-07
www.agriculturejournal.net
Received: 12-05-2025
Accepted: 15-06-2025

Rutuja D Fule
M.Sc. Student, Department of
Fruit Science, Post Graduate
Institute, Mahatma Phule
Krishi Vidyapeeth (MPKV),
Rahuri, Maharashtra, India

Jitendra K Dhemre
Associate Professor,
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

PE More
Assistant Professor,
Department of Plant
Pathology, Mahatma Phule
Krishi Vidyapeeth (MPKV),
Rahuri, Maharashtra, India

SP Gaikwad
Associate Professor,
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Corresponding Author:
Rutuja D Fule
M.Sc. Student, Department of
Fruit Science, Post Graduate
Institute, Mahatma Phule
Krishi Vidyapeeth (MPKV),
Rahuri, Maharashtra, India

Effect of foliar spray of potassium nitrate on growth, flowering and yield of rejuvenated custard apple (*Annona squamosa* L.) cv. Balanagar

Rutuja D Fule, Jitendra K Dhemre, PE More and SP Gaikwad

DOI: <https://www.doi.org/10.33545/26646064.2025.v7.i8a.259>

Abstract

The present investigation entitled “Effect of Foliar Spray of Potassium Nitrate on Growth and Yield of Rejuvenated Custard Apple (*Annona squamosa* L.) cv. Balanagar” was conducted during 2024 at the All India Coordinated Research Project on Arid Zone Fruits, Department of Horticulture, MPKV, Rahuri. The study aimed to evaluate the influence of pruning and foliar application of potassium nitrate (KNO_3) on the growth, flowering and yield in 32 years old rejuvenated custard apple orchard. The experiment was laid out in a Factorial Randomized Block Design with two replications and 18 treatment combinations across six pruning levels and three foliar sprays of KNO_3 . Foliar spray was applied twice-at flowering and fruit set stage. Two years after rejuvenation, the maximum plant height (484.00 cm), plant spread (255.75 cm EW), (246.67 cm NS) and shoot length (112.25 cm) were recorded in T₆ [Control without pruning] while T₅ [Recommended practice of 25% pruning] recorded the highest number of shoots per tree (252.00) and yield (17.94 kg/tree). The earliest flowering (34.87 days) recorded in T₄ [Retention of main trunk including primary branches and basal portion of secondary branches 10-15 cm]. Among the foliar sprays, S₂ (KNO_3 2%) significantly enhanced plant height (322.24 cm), plant spread (EW) (212.36 cm), number of shoots (203.42), days to flowering (39.67 days) and yield (15.09 kg/tree). The findings indicate that T₅S₂ [25% pruning with KNO_3 2% spray] is most effective for improving growth and productivity in rejuvenated custard apple trees.

Keywords: Custard apple, rejuvenation, potassium nitrate, pruning levels

Introduction

Custard apple (*Annona squamosa* L.), a tropical fruit of the Annonaceae family (2n = 14), originates from tropical America and is cultivated in countries like the Philippines, West Indies, South Africa, Sri Lanka, Israel and Myanmar. In India, about 56,000 hectare are under cultivation with an average yield of 513.4 MT/ha. Major producing states include Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh Andhra Pradesh and Tamil Nadu. In Maharashtra alone, production reached 828.92 MT/ha during 2023-24, with major cultivation in Pune, Ahilyanagar, Aurangabad, Dhule, Dharashiv and Solapur (Anon., 2024). The crop is well-suited to Maharashtra's rainy season due to its drought tolerance and adaptability to sandy loam or well-drained clay loam soils (Bajpai *et al.*, 1973)^[4].

Among nutrients, nitrogen is vital for vegetative growth, while potassium plays a crucial role in fruit development (Pleguezuelo *et al.*, 2011; Cavalcante *et al.*, 2012)^[5, 14]. Potassium nitrate (KNO_3) enhances plant growth by improving frost, disease, drought and salinity tolerance, as well as water-use efficiency. It reduces water loss, boosts nutrient availability and supports healthier plants and higher yields. Its ease of application and compatibility with other fertilizers make it farmer-friendly. Unlike other nitrogen sources, KNO_3 is non-volatile and readily absorbed by plants, limiting uptake of harmful elements. KNO_3 also plays a role in breaking bud dormancy by increasing ethylene levels and enzyme activity, which promotes flowering (Trewavas, 1983; Valmayor, 1962)^[21, 22]. It influences hormonal balance, particularly gibberellins, encouraging starch accumulation and floral initiation even under dormant conditions (Protacio, 2000)^[16].

In recent years, foliar fertilization in fruit crops has gained prominence due to rising fertilizer costs and inefficiencies associated with soil application.

Nutrients applied to the soil often undergo leaching or become unavailable due to complex chemical interactions (Kundu et al., 2007) ^[11]. Foliar feeding effectively overcomes these issues by delivering nutrients directly to plant tissues, enhancing efficiency and nutrient availability in modern horticulture.

2. Materials and methods

The experiment was conducted during May to November, 2024 on thirty two year old rejuvenated custard apple (*Annona squamosa* L.) cv. Balanagar at the All India Coordinated Research Project on Arid Zone Fruits, Department of Horticulture, MPKV., Rahuri, Dist. Ahmednagar, Maharashtra. The trial consisted of 18 treatment combinations comprising six pruning levels [T1: Retention of only main trunk 45-60 cm height, T2: Retention of main trunk along with only basal portion of

primary branches 10-15 cm length, T3: Retention of main trunk along with primary branches 45-100 cm, T4: Retention of main trunk including primary branches and basal portion of secondary branches 10-15 cm, T5: Recommended practice of 25% pruning, T6: Control without pruning] and three foliar spray application of KNO₃ [S1: KNO₃ 1%, S2: KNO₃ 2%, S3:Control], laid out in a Factorial Randomized Block Design (FRBD) with two replications. The spacing of the orchard was 5 m × 5 m. The data were collected on various growth, yield and plant protection parameters including plant height (cm), plant spread (E-W and N-S) (cm), number of shoots, stem girth (cm), shoot length (cm), shoot girth (cm), days to flowering, fruit fly infestation (%), number of mealy bug colonies per fruiting body and anthracnose disease intensity (%). The collected data were subjected to statistical analysis as per the standard procedure outlined for FRBD.

Table 1: Details of treatment combinations

Sr. No	Treatment combinations	
1.	T ₁ S ₁	Retention of only main trunk 45-60 cm height and spraying with KNO ₃ 1%.
2.	T ₂ S ₁	Retention of main trunk along with only basal portion of primary branches 10-15 cm length and spraying with KNO ₃ 1%.
3.	T ₃ S ₁	Retention of main trunk along with primary branches 45 -100 cm length and spraying with KNO ₃ 1%.
4.	T ₄ S ₁	Retention of main trunk including primary branches along with the only basal portion of secondary branches 10-15 cm length and spraying with KNO ₃ 1%.
5.	T ₅ S ₁	Recommended practice (University recommendation) (25% pruning) and spraying with KNO ₃ 1%.
6.	T ₆ S ₁	Control and spraying with KNO ₃ 1%.
7.	T ₁ S ₂	Retention of only main trunk 45-60 cm height and spraying with KNO ₃ 2%.
8.	T ₂ S ₂	Retention of main trunk along with only basal portion of primary branches 10-15 cm length and spraying with KNO ₃ 2%.
9.	T ₃ S ₂	Retention of main trunk along with primary branches 45 -100 cm length and spraying with KNO ₃ 2%.
10.	T ₄ S ₂	Retention of main trunk including primary branches along with the only basal portion of secondary branches 10 -15 cm length and spraying with KNO ₃ 2%.
11.	T ₅ S ₂	Recommended practice (University recommendation) (25% pruning) and spraying with KNO ₃ 2%.
12.	T ₆ S ₂	Control and spraying with KNO ₃ 2%.
13.	T ₁ S ₃	Retention of only main trunk (45-60 cm height).
14.	T ₂ S ₃	Retention of main trunk along with only basal portion of primary branches (10-15 cm length).
15.	T ₃ S ₃	Retention of main trunk along with primary branches (45 -100 cm length).
16.	T ₄ S ₃	Retention of main trunk including primary branches along with the only basal portion of secondary branches (10-15 cm length).
17.	T ₅ S ₃	Recommended practice (University recommendation) (25% pruning).
18.	T ₆ S ₃	Control (without pruning).

2.1 Observations recorded

2.1.1 Growth parameters

2.1.1.1 Plant height (cm)

The average height of the four trees was measured from ground level to the growing tip with the help of marked bamboo (13 ft.) and presented in centimetre

2.1.1.2 Plant spread (EW & NS) (cm)

Plant spread in both E-W & N-S directions were measured by using measuring tape and presented in centimetre.

2.1.1.3 Number of shoots

The average of visible number of new shoots in each tree was recorded from tagged branch of each tree. The number of shoots emerged from the date of pruning till the date of visible appearance of first new shoot were counted and recorded.

2.1.1.4 Stem girth (cm): Diameter of selected stem was measured with the help of measuring tape after computing

mean; it was recorded as average diameter of stem in centimetre.

2.1.1.5 Shoot length (cm)

Four shoots randomly from all directions were selected and tagged and their length was measured by using measuring tape and presented in centimetre.

2.1.1.6 Shoot girth (cm)

Four shoots randomly from all directions were selected and tagged and measured by using measuring tape and presented in centimetre

2.1.1.7 Days to flowering

The date of visible appearance of flower on each observational tree was recorded. The average number of days from the date of pruning till the date of appearance of flower were counted and recorded as the period required for appearance of flowering.

2.1.2 Yield parameter

2.1.2.1 Yield (kg / tree)

A weight of fruits harvested at each picking was recorded from each tree and sum of all pickings was expressed as yield in kilograms per tree.

2.1.3 Plant Protection

2.1.3.1 Fruit fly Infestation (%)

The infestation of fruit fly was estimated by random selection of five fruits from all directions of the tree from each treatment and replication. Selected fruits were kept for ripening and on ripening the fruits were observed for fruit fly damage. The total number of fruits and number of damaged fruits were counted and converted into percent infestation by the following formula.

$$\text{Fruit fly infestation (\%)} = \frac{\text{Number of infested fruits}}{\text{Total number of fruits}} \times 100$$

2.1.3.2 Number of mealy bug colony per fruiting body

Five fruiting bodies were randomly selected from each direction in every treatment. The number of visible mealy bug colonies on each fruiting body was recorded by direct visual observation. A cluster of ten or more individuals was considered a single colony. The total number of colonies was averaged per fruiting body by the following formula.

Number of mealy bug colony/fruiting body =

$$\frac{\text{Survived mealy bug colony}}{\text{Total number of fruiting body observed}} \times 100$$

2.1.3.3 Anthracnose disease intensity (%)

Anthracnose disease intensity was recorded on leaves after the initiation of new flushes. Four trees per treatment were selected and from each tree, five mature leaves from each direction were examined visually for disease symptoms. The number of infected leaves by incidence of anthracnose was counted and the per cent disease intensity was worked out as per following formula. The following formula was used:

Anthracnose disease intensity (%) =

$$\frac{\text{Sum of numerical rating}}{\text{Total number of observation} \times \text{Maximum rating}} \times 100$$

3. Result and discussion

3.1 Plant Height (cm)

The data presented in Table 2 revealed that plant height was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among the pruning treatments, significantly maximum plant height (484.00 cm) was recorded in T₆ [Control], followed by T₅ [Recommended practice: 25% pruning intensity], while minimum (192.13 cm) was observed in T₁ [Retention of only main trunk at 45 to 60 cm height]. With respect to foliar application, S₂ (KNO₃ 2%) recorded significantly maximum plant height (322.24 cm), followed by S₁ (KNO₃ 1%), whereas the lowest (281.23 cm) was observed in S₃ (Control). The interaction effect was also significant. Maximum plant height (530.38 cm) was recorded in T₆S₂, followed by T₆S₁ and the lowest (176.85 cm) in T₁S₃. The

increased height might be attributed to reduction in apical dominance due to pruning, promoting vigorous shoot elongation. Similar findings were reported by Lal and Mishra (2008)^[13] in mango cv. Dashehari.

3.2 Plant Spread (EW and NS) (cm)

The data presented in Table 3 and 4 revealed that plant spread in both east-west and north-south directions was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among pruning levels, the highest plant spread (255.75 cm EW and 246.67 cm NS) was recorded in T₆ [Control], followed by T₅ [Recommended practice: 25% pruning intensity]. For foliar spray levels, S₂ (KNO₃ 2%) recorded the highest spread in EW (212.36 cm), while S₃ (Control) recorded the highest in NS (206.17 cm), suggesting a possible influence of internal reserves and natural growth pattern over exogenous chemical stimulation. Interaction effect (T × S) was also significant. The maximum spread (304.75 cm EW and 250.00 cm NS) was observed in T₆S₂ respectively. Wider canopy spread under unpruned and unsprayed conditions may be due to uninterrupted apical dominance and continued lateral growth, as supported by Lal and Mishra (2007)^[12].

3.3 Number of shoots

The data presented in Table 5 revealed that number of shoots was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among pruning levels, the maximum number of shoots (252.00) was recorded in T₅ (Recommended practice: 25% pruning intensity, while the minimum (151.17) was observed in T₆ [Control]. Increased shoot number is due to pruning induced apical dominance removal, promoting lateral bud growth, as also noted by Jadhav et al. (2020)^[9] in custard apple. For foliar spray levels, S₂ (2% KNO₃) recorded the maximum shoots (203.42), followed by S₁ (196.83), while the minimum (191.50) was in S₃ (Control). The increase is ascribed to the dual role of KNO₃ in providing potassium and nitrogen, essential for cell division and vegetative vigour, as supported by Sharma et al. (2016) and Ramesh et al. (2016)^[17, 18]. Interaction effect (T × S) was also significant. The highest number of shoots (262.50) was recorded in T₅S₂, followed by T₅S₁ (250.00), while the lowest (145.00) was observed in T₆S₃. The synergistic effect of pruning and foliar nutrition enhanced shoot proliferation by combining physiological stimulation with nutrient availability.

3.4 Stem girth (cm)

The data presented in Table 6 revealed that stem girth was significantly influenced by pruning and foliar application of KNO₃, whereas the interaction effect between pruning and spraying was found non-significant. Among pruning levels, maximum stem girth (57.88 cm) was recorded under T₆ [Control without pruning]. Regarding foliar sprays, the highest stem girth (57.75 cm) was observed in S₁ (1% KNO₃). The interaction effect (T × S) was found non-significant; however, the highest numerical value for stem girth (68.50 cm) was recorded in T₆S₁. Pruning and foliar KNO₃ together enhance stem thickness by balancing vegetative growth and improving nutrient uptake, supporting cambial activity and girth development.

3.5 Shoot length (cm)

The data presented in Table 7 revealed that shoot length was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Maximum shoot length (112.25 cm) was recorded in T₆ (Control without pruning), whereas minimum shoot length (74.36 cm) was recorded in T₄ (Retention of main trunk including primary branches along with the only basal portion of secondary branches 10-15 cm length). Maximum shoot length (97.00 cm) was observed in S₁ (KNO₃ 1%) likely due to potassium's role in cell elongation and photosynthesis. Similar results were reported by Gami et al. (2019) [8] in guava. The interaction effect of pruning and potassium nitrate was significant. Maximum shoot length (129.25 cm) was recorded in T₁S₃ and it was statistically at par with T₆S₁ which recorded 126.00 cm, whereas minimum shoot length (57.17 cm) was recorded in T₄S. Moderate pruning combined with optimal KNO₃ application enhanced apical shoot growth, likely by influencing hormone balance and improving nutrient mobility.

3.6 Shoot girth (cm)

The data presented in Table 8 revealed that shoot girth was significantly influenced by pruning levels and their interaction with foliar application of potassium nitrate, while the effect of spraying alone was found to be non-significant. Among the pruning levels, the maximum shoot girth (12.13 cm) was recorded in T₁ (Retention of only main trunk 45-60 cm height). Moderate pruning may enhance shoot girth by improving light penetration, hormonal balance and assimilate distribution, promoting radial stem growth. Regarding foliar spray, although the effect was non-significant, numerically higher shoot girth (10.37 cm) was noted in S₃ (Control without spray) while the minimum (9.98 cm) was observed in S₁ (KNO₃ 1%). Interaction effect (T × S) was found to be significant. The highest shoot girth (13.19 cm) was recorded in T₁S₃. The increased shoot girth in T₁S₃ may be due to reduced pruning stress and better recovery, enabling efficient translocation of photosynthates for girth development.

3.7 Days to flowering

The data presented in Table 9 revealed that days to flowering were significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among the pruning levels, the minimum days to flowering (34.87) were recorded in T₄ [Retention of main trunk including primary branches along with the only basal portion of secondary branches 10-15 cm length], followed by T₅ [Recommended practice: 25% pruning] (36.38), while the maximum (46.73) was observed in T₆ [Control without pruning]. Earlier flowering in moderately pruned trees may result from removal of senescent wood, stimulating fresh shoot growth favourable for floral bud differentiation, as noted by Chander et al. (2022) [6]. Among foliar sprays, S₂ (KNO₃ 2%) recorded the significantly minimum days to flowering (39.67), followed by S₁ (40.62), while the maximum (41.28) was noted in S₃ (Control). Potassium nitrate reduced flowering days by enhancing nitrate uptake, which boosts ethylene production and initiates reproductive growth. Similar results were reported by Shukla and Bisen (2016) [19] in guava cv. Allahabad Safeda. Interaction effect (T × S) was also significant. The earliest flowering (34.25 days) was observed in T₄S₂, followed by T₄S₁ (34.50) and

T₄S₃ (35.85), while the latest (47.90) was recorded in T₆S₃. Moderate pruning combined with foliar nutrition likely hastened flowering by promoting vegetative renewal and enhancing biochemical signals, as supported by Sonika et al. (2023) and Vinay and Chithiraichelvan (2015) [20, 23] in custard apple cv. Balanagar.

3.8 Yield (kg/tree)

The data presented in Table 10 revealed that yield per tree was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among the pruning levels, the significantly highest yield (17.94 kg/tree) was recorded in T₅ [Recommended practice: 25% pruning], followed by T₄ [Retention of main trunk including primary branches along with the only basal portion of secondary branches 10 -15 cm length] (16.79 kg/tree), while the lowest (12.50 kg/tree) was observed in T₆ [Control without pruning]. This increase may be due to improved light penetration and resource allocation as also noted by Amarnath et al. (2020) and Jadhav et al. (2020) [1, 9]. Among foliar sprays, S₂ (KNO₃ 2%) recorded the significantly highest yield (15.09 kg/tree), followed by S₁ (14.42 kg/tree), while the lowest (13.76 kg/tree) was noted in S₃ (Control). The improved yield under KNO₃ may be due to enhanced nutrient uptake and fruit development, as reported by Joundale et al. (2024) and Prasath et al. (2024) [10, 15]. Interaction effect (T × S) was also significant. The maximum yield (18.56 kg/tree) was observed in T₅S₂, followed by T₅S₁ (17.97 kg/tree), whereas the minimum (11.90 kg/tree) was recorded in T₆S₃. The combination of pruning and foliar nutrition positively influenced fruit yield. These results align with Jadhav et al. (2020) and Joundale et al. (2024) [9, 10].

3.9 Fruit fly infestation (%)

The presented investigation revealed that no fruit fly infestation was observed in custard apple cv. Balanagar during the experimental period. This absence may be due to climatic conditions from May to November may have been unfavourable for fruit fly activity. Good orchard practices like pruning and sanitation likely further minimized potential breeding sites.

3.10 Number of mealy bug colony per fruiting body

The data presented in Table 11 revealed that number of mealy bug colonies per fruiting body was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. Among pruning levels, the minimum number of mealy bug colonies (6.67) was recorded in T₁ [Retention of only main trunk 45-60 cm height], followed by T₅ [Recommended practice: 25% pruning intensity] (6.83), while the maximum (10.67) was observed in T₆ [Control]. Reduced pest incidence in pruned treatments is likely due to better canopy aeration and unfavourable microclimate, as noted by Anupama and Panchbhair (2020) and Choudhary et al. (2020) [3, 7]. Regarding foliar sprays, S₂ (KNO₃ 2%) recorded the minimum number of colonies (5.33), followed by S₁ (KNO₃ 1%) (8.33), whereas the maximum (10.67) was recorded in S₃ (Control). While potassium nitrate itself is not an insecticidal agent, its role in enhancing plant physiological health and nutrient balance. Improved plant vigour may contribute to enhanced systemic resistance against pests, making the host plant less susceptible to

colonization. This is consistent with the understanding that healthy, well-nourished plants are less prone to pest attack due to stronger tissue structure and induced biochemical defences. The interaction effect ($T \times S$) was also found to be non-significant. The minimum number of mealy bug colonies (3.00) was recorded in T_5S_2 , followed by T_5S_1 (4.00), while the maximum (13.00) was observed in T_6S_3 . The combined effect of pruning and foliar feeding improved canopy condition and plant defence, contributing to reduced mealy bug colonization.

3.11 Anthracnose disease intensity (%)

The data presented in Table 12 revealed that anthracnose disease intensity (%) was significantly influenced by pruning levels, foliar application of potassium nitrate and their interaction. The symptoms were confined to leaves, indicating that the observations pertain to anthracnose leaf

spot rather than fruit infection. Among pruning levels, the minimum anthracnose intensity (6.46%) was recorded in T_5 [Recommended practice: 25% pruning intensity], while the maximum (17.97%) was observed in T_6 [Without pruning]. The reduction under moderate pruning is attributed to better canopy aeration and reduced humidity reported by Anupama and Panchbhair (2020) and Choudhary et al. (2020)^[3, 7]. For foliar spray levels, the minimum intensity (6.15%) was recorded in S_2 (KNO_3 2%) followed by S_3 (Control) (14.61). Though KNO_3 is not a fungicide, improved plant vigour and resistance due to better nutrition contributed to lower disease expression. The interaction effect ($T \times S$) was also significant. The lowest anthracnose intensity (0.63%) was observed in T_4S_1 , whereas the highest (28.13%) occurred in T_6S_3 . This highlights the integrated role of pruning and nutrition in reducing disease severity by modifying the microclimate and strengthening plant health.

Table 2: Effect of pruning levels and foliar application of KNO_3 on plant height (cm) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	189.91	215.90	237.80	259.72	311.88	477.29	282.08
S ₂	209.63	218.64	234.66	298.92	441.21	530.38	322.24
S ₃	176.85	222.87	232.69	243.21	367.48	444.33	281.23
Mean	192.13	219.14	235.05	267.28	373.52	484.00	295.19
	(T)	(S)	T x S				
SE (m) $\pm$	5.80	4.10	10.04				
CD at 5%	17.30	12.23	29.96				

Table 3: Effect of pruning levels and foliar application of KNO_3 on plant spread (EW) (cm) of custard apple cv. Balanagar

Spraying (S)/ Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	156.75	177.05	188.05	202.25	228.50	253.75	201.13
S ₂	160.00	179.25	192.25	206.00	231.93	304.75	212.36
S ₃	166.25	189.00	196.00	207.50	232.40	208.75	199.98
Mean	161.00	181.77	192.10	205.25	230.94	255.75	204.47
	(T)	(S)	T x S				
SE (m) $\pm$	1.69	1.19	3.17				
CD at 5%	5.04	3.56	9.46				

Table 4: Effect of pruning levels and foliar application of KNO_3 on plant spread (NS) (cm) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	158.50	163.00	176.61	191.00	238.25	243.75	195.18
S ₂	163.00	170.00	187.47	194.75	236.75	246.25	199.70
S ₃	167.25	178.75	191.50	204.50	245.00	250.00	206.17
Mean	162.92	170.58	185.19	196.75	240.00	246.67	200.35
	(T)	(S)	T x S				
SE (m) $\pm$	0.89	0.63	1.54				
CD at 5%	2.65	1.87	4.59				

Table 5: Effect of pruning levels and foliar application of KNO_3 on number of shoots of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	162.50 (12.77)	178.50 (13.38)	210.00 (14.51)	224.00 (14.98)	250.00 (15.83)	156.00 (12.51)	196.83 (14.00)
S ₂	170.00 (13.06)	196.50 (14.04)	212.00 (14.58)	227.00 (15.08)	262.50 (16.22)	152.50 (12.37)	203.42 (14.22)
S ₃	160.00 (12.67)	170.50 (13.08)	208.00 (14.44)	222.00 (14.92)	243.50 (15.62)	145.00 (12.06)	191.50 (13.80)
Mean	164.17 (12.83)	181.83 (13.50)	210.00 (14.51)	224.33 (14.99)	252.00 (15.89)	151.17 (12.31)	197.25 (14.01)
	(T)	(S)	(T x S)				
SE (m) $\pm$	0.02	0.02	0.04				
CD at 5%	0.07	0.05	0.13				

Table 6: Effect of pruning levels and foliar application of KNO₃ on stem girth (cm) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	60.00	50.50	55.00	57.75	54.75	68.50	57.75
S ₂	50.00	56.50	41.50	57.25	52.50	48.50	51.04
S ₃	38.00	45.50	48.75	57.50	56.50	56.63	50.48
Mean	49.33	50.83	48.42	57.50	54.58	57.88	53.09
	(T)	(S)	T x S				
SE (m) ±	3.04	2.15	5.08				
CD at 5%	NS	NS	NS				

Table 7: Effect of pruning levels and foliar application of KNO₃ on shoot length (cm) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	98.58	104.75	91.50	57.17	104.00	126.00	97.00
S ₂	85.67	66.67	81.22	86.42	97.83	108.08	87.65
S ₃	129.25	71.08	73.42	79.50	85.92	102.67	90.31
Mean	104.50	80.83	82.04	74.36	95.92	112.25	91.65
	(T)	(S)	T x S				
SE (m) ±	1.01	0.72	1.75				
CD at 5%	3.02	2.13	5.23				

Table 8: Effect of pruning levels and foliar application of KNO₃ on shoot girth (cm) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	12.71	9.24	8.95	6.95	11.33	10.67	9.98
S ₂	10.48	8.91	9.23	8.52	10.68	12.17	10.00
S ₃	13.19	11.93	9.11	9.12	10.05	8.83	10.37
Mean	12.13	10.03	9.09	8.20	10.69	10.55	10.11
	(T)	(S)	T x S				
SE (m) ±	0.63	0.45	1.09				
CD at 5%	1.88	NS	NS				

Table 9: Effect of pruning levels and foliar application of KNO₃ on days to flowering of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	46.00	41.00	38.85	36.40	34.50	46.95	40.62
S ₂	43.45	40.10	38.70	36.15	34.25	45.35	39.67
S ₃	44.10	42.90	39.40	37.50	35.85	47.90	41.28
Mean	44.52	41.33	38.98	36.68	34.87	46.73	40.52
	(T)	(S)	T x S				
SE (m) ±	0.26	0.18	0.45				
CD at 5%	0.78	0.55	1.34				

Table 10: Effect of pruning levels and foliar application of KNO₃ on yield (kg/tree) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	10.14	13.31	15.50	16.86	17.97	12.73	14.42
S ₂	11.54	13.62	16.49	17.47	18.56	12.88	15.09
S ₃	10.67	12.10	14.54	16.02	17.30	11.90	13.76
Mean	10.78	13.01	15.51	16.79	17.94	12.50	14.42
	(T)	(S)	T x S				
SE (m) ±	0.11	0.08	0.20				
CD at 5%	0.34	0.24	0.58				

Table 11: Effect of pruning levels and foliar application of KNO₃ on number of mealy bug colony per fruiting body of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	7.00 (2.73)	8.00 (2.91)	8.00 (2.91)	10.00 (3.24)	6.00 (2.54)	11.00 (3.39)	8.33 (2.95)
S ₂	4.00 (2.11)	4.00 (2.11)	6.00 (2.54)	7.00 (2.73)	3.00 (1.85)	8.00 (2.91)	5.33 (2.38)
S ₃	9.00 (3.07)	12.00 (3.53)	11.00 (3.39)	11.00 (3.36)	8.00 (2.91)	13.00 (3.67)	10.67 (3.32)
Mean	6.67 (2.64)	8.00 (2.85)	8.33 (2.95)	9.33 (3.11)	5.67 (2.43)	10.67 (3.32)	8.11 (2.88)
	(T)	(S)	T x S				
SE (m) ±	0.11	0.08	0.19				
CD at 5%	0.33	0.24	NS				

Table 12: Effect of pruning levels and foliar application of KNO₃ on anthracnose disease intensity (%) of custard apple cv. Balanagar

Spraying (S) / Pruning levels (T)	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	Mean
S ₁	18.75 (25.66)	12.34 (20.57)	32.33 (28.59)	0.63 (4.38)	12.03 (20.29)	21.88 (27.89)	21.85 (15.70)
S ₂	11.09 (19.43)	3.59 (10.92)	2.34 (8.76)	13.7 (21.76)	2.19 (8.42)	3.91 (11.40)	6.15 (13.45)
S ₃	17.03 (24.37)	9.84 (18.28)	18.91 (25.77)	8.59 (17.04)	5.16 (13.12)	28.13 (32.03)	14.61 (21.77)
Mean	15.63 (23.15)	8.59 (16.59)	16.61 (22.29)	7.66 (14.39)	6.46 (13.94)	17.97 (23.77)	12.15 (19.02)
	(T)	(S)	T x S				
SE (m) ±	0.36	0.25	0.62				
CD at 5%	1.07	0.76	1.85				

4. Conclusion

On the basis of the present investigation, it can be concluded that 25% pruning (T₃) combined with 2% foliar spray of KNO₃ (S₂) significantly improved key growth and yield attributes in custard apple cv. Balanagar.

5. Reference

- Amarnath KS, Mishra S, Singh RK. Effect of pruning in pomegranate (*Punica granatum* L.) for shoot growth, flowering and fruit yield. *Curr J Appl Sci Technol*. 2020;39(5):2457-1024.
- Anonymous. [Internet]. 2024 [cited 2025 Aug 3]. Available from: <https://agriwelfare.gov.in>
- Anupama KC, Panchbhai DM, Patil SR. Effect of pruning severity and irrigation methods on flowering, fruit growth and yield of custard apple. *Int J Curr Sci*. 2020;8(6):2533-2536.
- Bajpai PN, Shukla HS, Chaturvedi AM. Effect of pruning on growth, yield and quality of guava var. Allahabad Safeda. *Prog Hortic*. 1973;2(4):73-79.
- Cavalcante LF, Pereira WE, Curvelo CRS, Nascimento JAM, Cavalcante IHL. Estado nutricional de pinheira sob adubação orgânica do solo. *Cienc Agron*. 2012;43(3):579-588.
- Chander S, Kurian RM, Satisha J, Upreti KK, Laxman RH. Advancing fruiting season in *Annona* cv. Arka Sahan through pruning. *J Hortic Sci*. 2022;17(2):316-324.
- Choudhary K, Dhakare BB, Meena NK. Vegetative and quality parameters of custard apple as affected by pruning intensities and time. *J Crop Weed*. 2020;16(2):139-146.
- Gami J, Sonkar P, Haldar A, Patidar DK. Effect of pre-harvest spray of ZnSO₄, KNO₃ and NAA on growth, yield and quality of ber (*Zizyphus mauritiana* L.) cv. Seb under Malwa Plateau conditions. *Int J Curr Microbiol Appl Sci*. 2019;8(3):1977-1984.
- Jadhav AR, Chole AS, Dheware RM, Kadam SR. Effect of different levels of pruning on growth and yield of custard apple. *Int J Curr Microbiol Appl Sci*. 2020;11(3):228-231.
- Joundale RB, Kalalbandi BM, Jadhav SD. Studies on combination of different forms of potassium and micronutrients on fruit yield and post-harvest quality of guava (*Psidium guajava* L.). *Int J Minor Fruits Med Aromat Plants*. 2024;10(2):74-82.
- Kundu S, Ghosh B, Mitra SK, Mazumdar D. Effect of foliar spraying of nitrogen, phosphorus and potassium on yield and fruit quality of guava (*Psidium guajava* L.). *Acta Hortic*. 2007;735(5):147-152.
- Lal B, Mishra D. Effect of pruning on growth and bearing behaviour of mango cv. Chausa. *Indian J Hortic Sci*. 2007;64(2):268-270.
- Lal B, Mishra D. Studies on pruning in mango for rejuvenation. *Indian J Hortic*. 2008;65(4):405-408.
- Pleguezuelo CRR, Zuazo VHD, Fernandez JLM, Tarifa DF. Descomposicion de hojarasca y reciclado del nitrogeno de tropicales y subtropicales en terrazas de cultivo en la costa de Granada. *Comun Sci*. 2011;2(1):42-48.
- Prasath DM, Varu DK, Bohara T, Singh C. Effect of pruning and potassium nitrate on flowering in mango cv. Kesar. *Int J Adv Biochem Res*. 2024;8(8):416-420.
- Protacio CM. A model for potassium nitrate-induced flowering in mango. *Acta Hortic*. 2000;509(8):545-552.
- Ramesh D, Suresh Kumar T, Venkatalaxmi K, Kishore Kumar CS. Effect of foliar application of urea, KNO₃ and ZnSO₄ on yield and yield contributing characters of custard apple (*Annona squamosa* L.) cv. Balanagar. *Int J Agric Sci*. 2016;8(60):3371-3373.
- Sharma KM, Singh V, Amarcholi JJ, Patel RJ. Response of different concentrations of urea, KNO₃ and micronutrient mixture on fruit retention, yield and physical parameters of sapota cv. Kalipatti. *Indian Hortic J*. 2016;6(2):165-167.
- Shukla M, Bisen B. Studies on pruning intensity and foliar application of KNO₃ on plant growth, flowering and fruiting of guava cv. Allahabad Safeda. *Pharma Innov J*. 2016;10(9):225-228.
- Sonika AS, Sabarad AI, Jalawadi S, Gorabal K, Prashantha A. Influence of time and pruning intensity on growth and yield attributes in custard apple (*Annona squamosa* L.) cv. Balanagar. *Biol Forum Int J*. 2023;15(12):357-360.
- Trewavas AJ. Nitrate as a plant hormone. In: Jackson MB, editor. *Interaction between Nitrogen and Growth Regulators in the Control of Plant Development*. Wantage: British Plant Growth Regulator Group; 1983. p. 97-110.
- Valmayor RV. *The Mango: Its Botany and Production*. Wallingford, UK: Centre for Agriculture and Bioscience International; 1962.
- Vinay GM, Chithiraichelvan R. Induction of off-season flowering in custard apple (*Annona squamosa* L.) cv. Balanagar. *J Hortic Sci*. 2015;10(1):13-17.