Biological Forum – An International Journal **15(12): 357-360(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Influence of Time and Pruning Intensity on Growth and Yield Attributes in Custard Apple (*Annona squamosa* L.) cv. Balanagar

Sonika A.S.[1], Anil I. Sabarad[2*], Suhasini Jalawadi[3], Kirankumar Gorabal[4] and Prashantha A.[5]

[1]Department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi (Karnataka), India.
[2]Assistant Professor, Department of Fruit Science,
Kittur Rani Channamma College of Horticulture, Arabhavi (Karnataka), India.
[3]Associate Professor, Department of Fruit Science, College of Horticulture, Bagalkot (Karnataka), India.
[4]Assistant Professor, Department of Postharvest management,
Kittur Rani Channamma College of Horticulture, Arabhavi (Karnataka), India.
[5]Assistant Professor, Department of Plant Pathology,
Kittur Rani Channamma College of Horticulture, Arabhavi (Karnataka), India.

(Corresponding author: Anil I. Sabarad)*
(Received: 04 October 2023; Revised: 02 November 2023; Accepted: 05 November 2023; Published: 15 December 2023)
(Published by Research Trend)

ABSTRACT: Custard apple (*Annona squamosa* L.) is known as Sithaphal or Sugar apple or sweet sop, belongs to the family annonanceae. Addressing challenges in custard apple cultivation it is necessary to standardize of pruning techniques with effect of time and pruning intensity. A study was undertaken to investigate on "Influence of time and pruning intensity on growth and yield attributes in custard apple (*Annona squamosa* L.) cv. Balanagar" during 2022-23. The result revealed number of tertiary branches (158.33), shoots per branch (10.85), fruits per plant (35.22), fruit yield per plant (7.15 kg), yield per plot (14.31 kg) and yield per hectare (7.95 t) were found highest in T_3(January 15th pruning). The maximum number of tertiary branches (215.21), shoots per branch (12.62) was recorded in I_1 (20cm pruning intensity) and maximum plant height (2.56 m), East-West (2.72 m), North- South spread (2.67 m), number of fruits per plant (41.18), fruit yield per plant (8.55 kg), fruit yield per plot (17.11 kg) and fruit yield per hectare (4.48 t) was noticed in I_2 (30 cm pruning intensity). Number of tertiary branches (248.33), shoots per branch (14.00) were highest in T_3I_1 (January month pruning with 20 cm intensity). Number of fruits per plant (43.33), fruit yield per plant (9.39 kg), yield per plot (18.78 kg) and yield per hectare (10.43 t) were observed highest in T_3I_2 (January month pruning with 30 cm intensity).

Keywords: Custard apple, Balanagar, Pruning time and intensity, Growth, Yield.

INTRODUCTION

Custard apple (*Annona squamosa* L.) is known as Sithaphal or Sugar apple or sweet sop, belongs to the family annonanceae. This tropical fruit crop is extensively cultivated in various states of India including Assam, Bihar, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Andhra Pradesh, Telangana, and Tamil Nadu (Choudhary and Dhakare 2018). The area of 45,000 ha, production of 3.87(000 MT) in India (Anon., 2021). Beyond its culinary use, various parts of custard apple, including immature fruits, seeds, leaves, bark and roots, are utilized in medicinal applications. Pruning is the removal of any plant parts, particularly shoots, roots, buds or terminal branches. Pruning is an important tool in custard apple plantation management because, it helps to control production management, synchronize vegetative growth for more effective management, increase plantation productivity and stimulate precocious flowering of new plantations (Satpute *et al*., 2016).

MATERIAL AND METHODS

The present investigation was be conducted at Department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi District, Karnataka state during the year 2022-23. The experiment was laid out in Factorial Randomized Block Design (FRBD) with 3 replications.

Treatment details

Main treatments (04)	Sub treatments (04)
T_1- November 15th	I_1- 20 cm (from the tip of branch)
T_2- December 15th	I_2- 30 cm (from the tip of branch)
T_3- January 15th	I_3- 40 cm (from the tip of branch)
T_4- February 15th	I_4- No pruning

Plants were planted at a spacing of 3 m × 3 m and were 5 years old. As per the treatment, pruning was done in the month of November 15th -2022, December 15th, January 15th 2023 and February 15th -2023. The cultivation practices are done as per the package of practice. Observations on growth parameters and yield

parameters were recorded on selected plants in each replication of different treatments.

RESULT AND DISCUSSION

The results obtained from the present experiment and relevant discussions have been summarized in Table 1 and Table 2.

Plant height (m). The data on plant height at 6 months after pruning (MAP) was presented in Table 1. The data on plant height, influenced by pruning time, did not exhibit significant differences. However, the highest plant (2.43 m) was noted in January pruning (T_3), whereas the lowest (2.34 m) was recorded in December pruning (T_2). The maximum plant height was noticed in I_2 :30 cm pruning (2.56 m), whereas minimum (2.31 m) was recorded in I_3: 40 cm pruning. The interaction was found non -significant on plant height. However, highest plant height (2.72 m) was noticed in T_3 I_2 and lowest (2.17 m) was recorded in T_2 I_4.

Plant spread (East-West and North-South canopy spread (m)). The data related to canopy spread in East-West and North-South direction at 6 months after pruning (MAP) are presented in Table 1. The interpretation of data for East-West and North-South as affected by pruning time revealed non-significant differences. Among the pruning intensities, the maximum East-West and North-South spread (2.72 and 2.67 m) was noticed in I_2 :30 cm pruning and minimum (2.30 and 2.33 m) was observed in I_4: no pruning. There was a non-significant differences for East-West and North-South canopy spread as affected by interaction effect. However, highest East-West and North-South canopy spread of (2.78 and 2.81 m) was recorded in T_4I_2 and T_1 I_2, and lowest (2.15 and 2.13 m) was recorded in T_3I_4 and T_3I_3. The current findings align with those of Jadhav *et al*. (2002). The mild pruning, which allowed the plants to have a sufficient rest period before pruning and irrigation, resulting in vigorous growth. These findings are consistent with the perspectives of Singh and Singh (2001).

Number of tertiary branches per plant. The data regarding the number of tertiary branches per plant was presented in Table 1. Maximum number of tertiary branches per plant (158.33) was found in (T_3) January pruning and lowest was recorded in (T_1) November pruning (139.71). The Maximum number of tertiary branches per plant (215.21) was found in I_1: 20 cm pruning and minimum was recorded in I_4: no pruning (57.42). In interaction effect T_3 I_1 was recorded the highest number of tertiary branches per plant (248.33) which was at on par with T_4 I_1 (220.67) and lowest was recorded in T_1 I_4 (51.67). Pruning stimulated increased vegetative growth by activating a greater number of lateral buds on the growing shoots. This, in turn, resulted in the production of a maximum number of productive secondary and tertiary branches. These findings are consistent with the observations of Sundarajan and Muthuswamy (1964) in guava.

Number of shoots per branch. The data regarding the number of shoots per branch was presented in Table 1. The maximum number of shoots per branch (10.85) was found in T_3: January pruning and lowest was recorded in T_1: November pruning (9.08). Highest number of shoots per branch (12.62) was found in I_1: 20 cm pruning and lowest was recorded in I_4: No pruning (5.63). In interaction effect T_3 I_1 was recorded the highest number of shoots per branch (14.00) which was at on par with T_4 I_1 (13.20) and lowest was recorded in T_2 I_4 (4.67). These results align with findings reported by Dalkilic *et al*. (2014) in peach. This is because the removal of more apical growth reduces auxin content in the branches, delaying the emergence of vegetative shoots.

Yield parameters. The data pertaining to number fruits per plant, fruit yield in kg per plant, kg per plot and tonnes per hectare are presented in Table 2. The highest number fruits per plant, fruit yield per plant, fruit yield per plot and fruit yield tonnes per hectare (35.22, 7.15 kg, 14.31 kg and 7.95 t/ha) was recorded in T_3 (pruning during January 15th), whereas lowest was recorded in T_1 ((30.91, 5.93 kg, 11.86 kg and 6.59 t/ha) (pruning during November 15th). With respect to pruning intensity maximum number of fruits per plant, fruit yield per plant, fruit yield per plot and fruit yield tonnes per hectare (41.18, 8.55 kg, 17.11 kg and 9.50 t/ha) was recorded in I_2: 30 cm pruning, whereas lowest (25.81, 4.03 kg, 8.06 kg and 4.48 t/ha) was recorded in I_4: no pruning. In interaction the highest number fruits per plant, fruit yield per plant, fruit yield per plot and fruit yield tonnes per hectare (43.33, 9.39 kg, 18.78 kg and 10.43 t/ha) was recorded in T_3I_2 followed by T_4I_2, whereas, minimum (24.83, 3.77 kg, 7.55 kg and 4.19 t/ha) was recorded in T_2I_4. These findings align with the results of Adhikari and Khandel *et al*. (2015) in guava. The decrease in the number of fruits per shoot with increasing pruning intensity is a result of the loss of bearing area in trees. This effect might occur because pruning compels the tree to invest more energy in producing fructose rather than cellulose. Pruning enhances the tree's ability to absorb water, carbon dioxide, and sunlight to create carbohydrates or sugars, ultimately encouraging increased fruit production (Jadhav *et al*., 1998).

Table 1: Effect of time and pruning intensity on growth parameters.

Treatments	Plant height (m)	Plant spread E-W (m)	Plant spread N-S (m)	Number of tertiary branches	Number of shoots/branch
Pruning time (month)					
T_1- November 15th	2.41	2.53	2.54	139.71	9.08
T_2- December 15th	2.34	2.62	2.55	140.08	9.51
T_3- January 15th	2.43	2.41	2.30	158.33	10.85
T_4- February 15th	2.42	2.50	2.53	153.33	9.69
S. Em±	0.04	0.07	0.08	2.52	0.17
CD at 5%	NS	NS	NS	7.26	0.50
Pruning intensity					
I_1- 20 cm (from the tip of branch)	2.41	2.56	2.54	215.21	12.62
I_2- 30 cm (from the tip of branch)	2.56	2.72	2.67	162.00	11.00
I_3- 40 cm (from the tip of branch)	2.31	2.48	2.39	156.83	9.88
I_4- No pruning	2.32	2.30	2.33	57.42	5.63
S. Em±	0.04	0.07	0.08	2.52	0.17
CD at 5%	0.12	0.20	0.23	7.26	0.50
Interactions					
$T_1 I_1$	2.40	2.43	2.42	184.17	11.72
$T_1 I_2$	2.53	2.73	2.81	145.00	10.30
$T_1 I_3$	2.28	2.51	2.63	178.00	8.97
$T_1 I_4$	2.43	2.46	2.29	51.67	5.33
$T_2 I_1$	2.38	2.60	2.73	207.67	11.55
$T_2 I_2$	2.49	2.77	2.72	150.00	11.17
$T_2 I_3$	2.31	2.72	2.33	151.33	10.67
$T_2 I_4$	2.17	2.38	2.42	51.33	4.67
$T_3 I_1$	2.46	2.56	2.43	248.33	14.00
$T_3 I_2$	2.72	2.62	2.47	190.33	12.07
$T_3 I_3$	2.27	2.33	2.13	130.00	10.00
$T_3 I_4$	2.28	2.15	2.19	64.67	7.33
$T_4 I_1$	2.40	2.67	2.57	220.67	13.20
$T_4 I_2$	2.49	2.78	2.70	162.67	10.46
$T_4 I_3$	2.38	2.35	2.45	168.00	9.90
$T_4 I_4$	2.42	2.22	2.42	62.00	5.20
S. Em±	0.08	0.14	0.16	5.03	0.35
CD at 5%	NS	NS	NS	14.53	1.00

Table 2: Effect of time and pruning intensity on yield parameters.

Treatments	Number of fruits per plant	Fruit yield (kg/plant)	Fruit yield (kg/plot)	Fruit yield (t/ha)
Pruning time (month)				
T_1- November 15th	30.91	5.93	11.86	6.59
T_2- December 15th	32.03	6.03	12.05	6.70
T_3- January 15th	35.22	7.15	14.31	7.95
T_4- February 15th	33.29	6.61	13.22	7.34
S. Em±	0.46	0.12	0.24	0.13
CD at 5%	1.34	0.34	0.68	0.38
Pruning intensity				
I_1- 20 cm (from the tip of branch)	37.78	6.83	13.65	7.59
I_2- 30 cm (from the tip of branch)	41.18	8.55	17.11	9.50
I_3- 40 cm (from the tip of branch)	26.68	6.31	12.62	7.01
I_4- No pruning	25.81	4.03	8.06	4.48
S. Em±	0.46	0.12	0.24	0.13
CD at 5%	1.34	0.34	0.68	0.38
Interactions				
$T_1 I_1$	33.17	5.82	11.64	6.47
$T_1 I_2$	39.11	7.94	15.88	8.82
$T_1 I_3$	26.53	5.86	11.72	6.51
$T_1 I_4$	24.83	4.09	8.19	4.55
$T_2 I_1$	35.73	6.40	12.81	7.12
$T_2 I_2$	40.80	8.01	16.02	8.90
$T_2 I_3$	26.17	5.91	11.83	6.57
$T_2 I_4$	25.40	3.77	7.55	4.19
$T_3 I_1$	43.13	7.99	15.97	8.87
$T_3 I_2$	43.33	9.39	18.78	10.43
$T_3 I_3$	27.33	6.97	13.95	7.75
$T_3 I_4$	27.07	4.26	8.53	4.74
$T_4 I_1$	39.08	7.10	14.20	7.89
$T_4 I_2$	41.48	8.87	17.75	9.86
$T_4 I_3$	26.67	6.48	12.97	7.20
$T_4 I_4$	25.93	3.98	7.96	4.42
S. Em±	0.93	0.24	0.47	0.26
CD at 5%	2.68	0.68	1.36	0.76

CONCLUSIONS

Finally, it is summarized that pruning in January month with an intensity of 30 cm pruning from tip gave good vegetative growth and maximum yield contributing parameters, and also well suited for commercial fruit production.

Acknowledgement. The author is highly thankful to College of Horticulture Arabhavi, UHS, Bagalalkot (Karnataka) for providing essential facilities and support during the experiment.

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How to cite this article: Sonika A.S., Anil I. Sabarad, Suhasini Jalawadi, Kirankumar Gorabal and Prashantha A. (2023). Influence of Time and Pruning Intensity on Growth and Yield Attributes in Custard Apple (*Annona squamosa* L.) cv. Balanagar. *Biological Forum – An International Journal, 15*12): 357-360.