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Effect of different times of pruning on growth, yield and quality of custard apple

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Abstract
The experiment entitled with effect of different times of pruning on growth, yield and quality of custard apple was carried out at Highway Block, CFN unit, Dr. PDKV, Akola, during year 2016-17 with the objectives to the effect of different time of pruning on growth, yield and quality of custard apple to find out the optimum times of pruning for obtaining maximum yield and quality of custard apple. The pruning was done on main shoot, subsequent secondary and tertiary shoots from top to end on whole plant. The data obtained were analyzed using FRBD model with four different severity treatment *i.e.Viz.*, are D_1 - 15th April, D_2 -30th April, D_3 -15th were replicated three times. Results revealed in respect to plant growth, plant volume, mean of plant spread, leaf area, was recorded Significantly maximum in D_2 -30th April. Minimum number of days required for flowering (78.5 days), Highest numbers of flowers per shoot (11.76) and yield and fruit attributes the highest fruit set (63 %), highest numbers of fruits per tree (73.00), maximum fruit yield was obtained (14.488kg), maximum fruit weight (229.5g), Maximum fruit diameter (9.18cm) in D_2 -30th April. Whereas, the results regarding seed weight, stem diameter and stony fruit percentage and Splitting Fruit Percentage were found to be non- significant.

Keywords: Custard apple, pruning, severity

Introduction
Custard apple (*Annona* squamosa L.) is tropical fruit crop, which belong to the family Annonaceae, having chromosome number 2n=14 and origin in tropical America. It is being cultivated in Philippines, West India, South Africa, Sri Lanka, Israel and Myanmar. Custard apple growing regions in India include Assam, Bihar, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh, Andhra Pradesh and Tamil Nadu. Approximately 55,000 hectares are dedicated to custard apple cultivation in India. Along with Maharashtra and Gurajat is another large custard apple growing state (Annon, 2014). In Maharashtra this fruit is mainly grown in the district Beed, Pune, Buldhana, Nagpur, Dhule, Aurangabad, Akola and Solapur. The climatic condition of Maharashtra is one of the most suitable for custard apple production in rainy season with minimum efforts and less expenditure. It is tolerant to drought, sandy loam soil but well structured clay loam are also suitable with good drainage. Also, no serious pests, diseases and disorders are found on this crop. Hence there is great scope to increase the area, production and productivity of custard apple. The custard apple tree is small, more or less shrub or tree, which sheds the leaves in winter. Young custard apple is vigorous and has poor precocity of bearing. The flowers are borne on current season growth (new emerging young shoots). Pruning in custard apple is one of the most important practice influencing the vigour, productivity and quality of fruits. Pruning improves not only the fruit quality but it also required at early stage to build up a strong framework in order to increased fruit bearing area of tree become weak and both fruit size and quality impaired. Thus regular annual pruning at bearing stage may help to induced good healthy shoots which will provide maximum fruit bearing area and good quality fruits (Bajpai *et al.*, 1973) [4]. Pruning is essential to develop a good crown and better yields over a long period of time. Without pruning, the plants become bushy and their bearing efficiency comes down. Hence, timely removal of misplaced limbs is necessary to build a strong framework. Selective and mild pruning of deadwood and very old branches is necessary to avoid congestion and encourage well-spaced branching. Yellowing of leaves starts as the harvesting season of fruits ends. The leaves begin to drop with the onset of winter and fresh growth occurs in spring. Therefore, considering bottleneck in the cultivation of custard apple, it is very necessary to standardize the pruning levels and time of operation to

develop for increasing the pollen viability, fruit set, yield and yield contributing characters and quality traits in custard apple under prevailing climatic conditions of Maharashtra.

Materials and Methods

The experiment entitled "Effect of severity of pruning on growth, yield and quality of Custard Apple *(Annona squamosa* L.*)* Will be conducted at Highway Block, CFN unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2016-2017.

Results and Discussion

The result obtained from the present investigation as well as relevant discussion have been summarized under following sub heads and given in Table. 1 and 2.

1. Plant Height (m): Data presented in Table 1 indicated that effect of pruning time on plant height was recorded the significant differences among all the treatments. The significantly maximum plant height (2.92 m) was found in treatment D_2 (30th April) which were found statistically at par with treatment D_3 (2.62 m) However, lowest plant height (2.59 m) was recorded in treatment D_1 (15th April). This is might be due to number of branch per pruned shot was least when pruned on 31st December at 120 cm similarly no of nodes, effective nodes per branch were also influenced by different combination dates and intensity of pruning. The result of present finding are agreement with the finding Ghunake (1981), Singh, (2001) [18] in guava, Kohn *et al.* (2001) in custard apple.

2. Plant Spread (m): Data presented in Table 1 showed that, significantly the maximum plant spread (2.74 m) was found in treatment D_2 (30th April) which were followed by with treatment D_3 (2.73 m) and However, lowest plant spread (2.57 m) was recorded in treatment D_1 (15th April). Similar results were reported by Lal and Mishra, (2008) [10] who observed that the plant spread (E-W and N-S) was recorded greater in control which was found at par with fifth order pruned trees in Mango. These results was also of present finding are in line with the finding of Basu *et al*. (2007), Jadhav *et al.* (2002) in guava.

3. Plant Volume (cm^3): Data presented in Table 1 showed that, significantly the maximum plant volume (16.83 m^3) was found in treatment D_2 (30th April) which was found statistically at par with treatment D_3 (16.09 m^3) However, lowest plant volume (15.46 m^3) was recorded in treatment D_1 (15th April. This might be due to fact that after deep dormancy it gets better availability of sunlight, water and nutrients was optimum which resulted in increased synthesis of photosynthetic that have resulted into better canopy volume. These results of present findings are in line with Ingle *et al.* (1999) [7] in acid lime, Dhaliwal and Kumar (2003) and Singh *et al*. (2007) in guava.

4. Leaf Area (cm^2): The data presented in Table 1 indicate that, the leaf area was found significant due to different dates. The leaf area was significantly maximum (39.18 cm^2) recorded in treatment D_2 (30th April) which was found at par with treatment D_1 (36.54 cm^2) and treatment D_3 (15th May) which was recorded minimum leaf area (36.43 cm^2). These results of present findings are in line with Rao and Reddy (1989) in Phalsa and Ingle *et al.* (1999) [7] in acid lime, Shiva *et al* (2015) in guava.

5. Days Required For First Flowering: The data presented in Table 2 revealed that, significantly maximum (87.12) days required to flowering in treatment D_1 (15th April) which was found at par D_2 (78.50) and minimum days (78.13) required to flowers in treatment D_3 (15th May). This is might be due to pruning early flowering, it was also observed that more number of flowers per branch result if pruning is practiced in first week of May. The results of present findings are in accordance with the findings of Singh and Sandhu (1984) and Gupta *et al*. (1990) in ber Dhaliwal and Kaur (2003) in guava, Naseem *et al*. (2016) [14] in ber.

6. Number of Flower per Shoot: The data presented in Table 2 showed that, significantly maximum flowers per shoot (11.76) were found with treatment D_2 (30th April) and at par with the treatment D_3 (11.4) However, time of pruning which was D_1 (15th April) showed minimum flowers per shoot (10.74). The possible reasons may be that, due to nourishment to trees it might have lead to maximum reproductive growth i.e. number of flowers per shoot Due to proper boosting the plants grows more vigorously and become stout and more resistant to adverse climatic conditions, disease and pest results into more flower formation. Results obtained are in accordance with Singh *et al*. (2001) [18] in guava, Shiva *et al*. (2015) in guava.

7. Fruit Set (%): Data presented in Table 2 show that, significantly maximum fruit set was found in D_2 (79.39%) were found with (30th April) which was found at par with D_1 (75.28 %) and minimum fruit set was in D_3 (75.01 %). This might be attributes to fact that, early pruned plants flowered 48 earlier in time when climatic conditions were favorable but as the pruning was delayed the flowering also delayed which coincided with the heavy rains that caused flower drop and fruit drop which ultimately resulted in less fruit percentage. Jawadagi *et al*. (1996). The results of present findings are in agreement with the findings of Singh and Sandhu (1984) and Gupta *et al*. (1990) in ber. Mohamed et at. (2010) [12] in custard apple.

8. Number Of Fruit Per Plant: The data presented in Table 2 showed the significant maximum number of fruits per plant harvested (73.00) were found with treatment D_2 (30th April) which are at par with D_1 (66.50) and minimum (64.00) in treatment D_3 (15th May). Due to fruits per plant increase with time of pruning might be due to fact that, better availability of food material to all plant parts at better time of pruning and activation of enzymes due to better time of pruning which not only promotes the metabolic activities of plant but trees remained dormant up to first week of March due to low temperature. The vegetative and floral buds started to sprout just after this period before this it gives low yield Chandra and Govind (1995). The results of present findings are in agreement with the findings of Ingle *et al* (1999) [7] in acid lime, Gorakh Singh *et al.* (2001) [18] in guava, Ali *et al.* (2009) [1] in guava.

9. Number of Seeds: The data presented in Table 2, showed that significantly, maximum number of seeds (35.50) found in treatment D_2 (30th April) which was found at par with treatment D_1 (33.50). However, minimum number of seeds per (33.50) was found with D_3 (15 May). This might due to fact that, better availability of food material to all plant parts and activation of enzymes which act as catalase activity and chlorophyll content of leaves increase in carbohydrates

synthesis resulted increased yield and quality of fruit. (Singh and Singh, 2001) [18]. The results of present findings are in agreement with the findings of Dhaliwal and Kumar (2003) in guava.

10. Fruit Yield Per Plant (Kg/Tree): The data regarding yield per plant in kg as influenced by time and severity of pruning was recorded and presented in Table 2 noted significantly maximum yield per plant (14.88 kg/plant) was recorded with treatment D_2 (30th April), followed by D_3 (14.55 kg/plant). Whereas, minimum yield per plant (12.95 kg/plant) was noted in treatment D_1 (15th April). Trees pruned on 30 April gives higher yield this may be due to higher amount of reserve metabolies such as carbohydrates. starch end sugar which are generally accumulated during deep dormancy. During inductive phase accumulation of such material could just initiate and must have been used In the process of secondary shoot sprouting. (Kumar and Rattanpal. 2010) [9]. The results of present findings are in agreement with the findings of Singh and Sandhu (1984) in ber, Gorakh Singh *et al.* (2001) [18] and Shiva *et al*. (2015) in guava.

Table 1: Effect of different times of pruning on growth, yield and quality of custard apple.

Treatment	Plant heights (m)	Plant spread (m)	Plant volumes (m^3)	Leaf area (cm^2)	No days required flowering	No of flower / shoot	Fruit set (%)	No. of fruit / plant
D_1. 15 April	2.59	2.57	15.46	36.54	87.12	10.74	75.28(60.18)	66.50
D_2 30 April	2.92	2.74	16.83	39.18	78.5	11.76	79.39(63.00)	73.00
D_3 15 May	2.62	2.73	16.09	36.43	78.13	11.4	75.01(60.00)	64.00
F Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	0.03	0.02	0.17	0.24	0.91	0.07	0.35	0.86
CD at 5%	0.08	0.04	0.49	0.72	2.66	0.21	1.02	2.44

Note-Figures in parenthesis denote the arc sign transformations value.

11. Fruit Weight (gm): The data presented in Table 2, showed that The effect of pruning time showed significant effect on fruit weight. it was observed that, the highest fruit weight was observed with(30th April) (229.5 gm) which was found at par with treatment D_1 (217.5 gm). and lowest in D_3 (217.00 mg) was observed in treatment (15th May). Pruning on 30th April gives maximum fruit weight was obtained because of maximum availability of metabolites and nutrients to the developing fruits and variation may be due to climatic variability. Serrano (2008) in guava. The results of present findings are in agreement with the findings of Gupta *et al*. (1990), Kundu et at. (1995) in ber, Dhaliwal and Kaur (2003), Ali *et al.* (2009) [1], Shiva *et al*. (2015) in guava, Naseem *et al*. (2016) [14] in ber.

12. Length of Fruit (cm): The data presented in Table 2, showed that effect of pruning time on length of fruit was found significant. The D_2 (30th April) treatment produced significantly maximum length of fruit (7.81 cm) which was which followed by treatment D_3 (7.42 cm). However, minimum length of fruit (6.02 cm) was recorded from D_1 (15th May) treatment. Fruits produced on pruned plants recorded maximum fruit size. This might because by pruning the apical bud the sink is changed to developing fruits which draw more food materials from the leaves and increase in size. Whereas the unpruned trees the apical bud dominates and draws all the nutrients for its growth. The results of present finding are in agreement with the findings of Jadhao *et al* (1998), Singh and Singh (2001) [18] in guava.

13. Fruit Diameter (cm): The data presented in Table 2, showed significant maximum diameter of fruit (9.18 cm) was found with D_2 (30th April), which was recorded at par with treatment D_3 (8.48 cm). However minimum diameter of fruit (7.54 cm) was found in treatment D_1 (15 April). The maximum size of fruit was found associated with April time of pruning. This might be due to the fact that, This time is better for pruning which act as increase in metabolic and physiological processes of plant results in maximum length of fruit Singh *et al*. (1995). The results of present findings are in agreement with the findings of Shatat (1993), Jadhao *et al.* (1998), Singh and Singh (2001) [18] in guava.

14. Total Soluble Solids (B^0): The data regarding total soluble solids as influenced by time of pruning recorded and are presented in Table 2 indicated that the treatment D_2 (30th April) recorded significantly maximum total soluble solids (18.64B^0), which were followed by with treatment D_1 (18.36 B^0). However, minimum total soluble solids (18.00 B^0) were recorded under D_3 (15 May). The maximum soluble solids of fruit was found associated with pruning on 30th April this might due to the fact that, time of pruning increase more rapid photosynthesis resulted in increase total soluble solids. (Rant, 1995). The results of present findings are in agreement with the findings of Singh and Singh (2001) [18], Dhaliwal and Kumar (2003) in guava, Ingle *et al.* (1999) [7] in acid lime, Naseem *et al.* (2016) [14] in ber.

15. Titratable Acidity (%): The data presented in Table 2 showed that, significantly maximum acidity was recorded significantly was found in D_2 (30th April) produced significantly maximum Ascorbic acidity (0.22%) which was found at par with D_3 (0.19). whereas minimum Titratable acidity **(**0.18) was recorded under treatment D_1 (15th April).
Due to the pruning at 120 cm from ground level on 31st December and it was significantly lower than most other levels of date and intensity of pruning. The result of present findings are in arrangement with the finding are in agreement with the finding of Shatat (1993) in guava, Kundu *et al.*(1995) in ber, Ingle *et al*. (1999) [7] in acid lime, Meghwal *et al*. (2006) in Phalsa.

Table 2: Effect of severity of pruning on growth, yield and quality of custard apple.

Treatment	No of seed / fruit	Fruit yield (kg/ tree)	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Seed weight (g)	TSS (^{0}B)	Acidity (%)
D_1. 15 April	33.50	12.95	217.5	7.42	7.54	10.96	18.36	0.18
D_2 30 April	35.50	14.88	229.5	7.81	9.18	13.07	18.64	0.22
D_3 15 May	30.50	14.55	217.0	6.02	8.48	11.17	18.00	0.22
F Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	0.30	0.18	0.67	0.14	0.13	0.08	0.14	0.01
CD at 5%	0.89	0.54	1.97	0.41	0.39	0.24	0.41	0.03

Note-Figures in parenthesis denote the arc sign transformations value.

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