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Effect of different chemicals for control of flower and fruit drop in Custard Apple (*Annona squamosa* L.) cv. Dharur-6

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ABSTRACT

The present investigation entitled “Effect of different chemicals for control of flower and fruit drop in Custard Apple (*Annona squamosa* L.) cv. Dharur-6” was carried out at Custard Apple Research Station, Ambajogai, Dist. Beed, during the year 2025-26. The experiment was laid out in a Randomized Block Design with different chemical treatments. The treatments comprised Urea @ 0.5, 1.0 and 1.5 per cent, NAA @ 50, 100 and 200 ppm, GA_3 @ 30, 40 and 50 ppm, CPPU @ 30, 40 and 50 ppm and control. The results revealed that minimum flower drop (6.25 %), maximum fruit set (93.75 %), maximum number of fruits per plant (56.66) was recorded in treatment T_5 (NAA 100 ppm). Minimum fruit drop at pea stage (5.50 %) and marble stage (11.50 %) and maximum fruit diameter (8.87 cm) was recorded in T_9 (GA_3 50 ppm).

Keywords: Urea, NAA, GA_3 , CPPU, Flower drop, Fruit set

Introduction

The custard apple (*Annona squamosa* L.) is also known as Sugar apple, Sweet sop, Sitaphal and Sharifa. It belongs to the Annonaceae family and have their origin in tropical region of Tropical America. It is an important dryland fruit in India. Custard apple can be cultivated in tropical and warmer subtropical parts of India. Custard apple has 14 pairs of chromosomes $2n = 14$. More than 100 species are found in the genus *Annona*. The pulp of *Annona squamosa* is slightly granular, creamy yellow or white, sweet, with a pleasant flavour and low acidity. It is considered the sweetest of the *Annona* fruits (FAO, 1990) [1].

The custard apple is extensively cultivated worldwide in tropical, semi-arid and arid regions for its succulent fruit. In Maharashtra this fruit crop is mainly grown in Vidarbha, Western Maharashtra and Marathwada region. The major districts are Solapur, Pune, Nagpur, Dhule, Ch. Sambhaji Nagar, Beed, Dharashiv, etc. In year 2024-2025 the crop covers 61,000 ha nationwide, producing 583,000 metric tons. While in Maharashtra, custard apple covers 25380 ha, producing 244680 metric tons. (APEDA, 2025) [2]

The annonas are of tropical origin and prefer a warm climate with moderate winter and humidity. Temperature above 40 °C cause heavy flower drop in northern India. High temperature further affects the fruit growth and yield due to soil moisture stress. They can thrive well up to an elevation of 1000 meters above sea level. An annual rainfall of 50-75 cm is considered adequate for its growth and fruiting. Annonas can also tolerate adverse weather condition at the cost of growth and yield. Custard apple is one of the important fruit crops of India. It is easy to cultivate due to its hardy nature. However, flower drop, poor fruit setting and fruit retention are serious problems. Furthermore, the number of seeds in fruit is also unfavourable for consumption. Hence, it is urgent need to overcome the problems.

The custard apple is primarily a cross-pollinated crop with bisexual hermaphrodite flowers; however, effective self-pollination is limited since stigma receptivity and pollen release occur at different times. In custard apple, flowering extend from spring to the end of rainy season. A medium-sized tree bears 1000 to 1500 flowers in a season, but only 2 % flowers set and bear fruits. During the rainy season, fruit-set takes place. By that time the temperature is lower and the relative humidity is high. Higher percentage of fruit-set by hand pollination has been reported by various workers (Bose et al., 2001) [3].

Custard apple bears the flowers during the period from April to August. However, no fruit set occurs during spring and summer, and it begins only in the rainy season due to favourable climatic conditions. Due to high temperature, low atmospheric humidity, lack of irrigation water and natural stresses resulted less number of flowers, poor fruit setting and low yield and degraded quality of fruit too. (Patel et al., 2010 and Chaudhari et al., 2016) [4].

Custard apple is a rich source of carbohydrates, proteins, fiber, minerals such as calcium and iron, and vitamin C. It is a good source of energy, providing about 104 kcal per 100 g of fruit. It also contains 21.3 g of carbohydrates, 5.2 g of protein, 7.25 g of fiber, 60 mg of calcium, 80 mg of phosphorus, 105 mg of iron and 91 mg of Vit. C in 100 g edible portion and 70-80% of moisture. (Nair et al., 2017) [5].

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There are also encouraging results due the use of chemicals, such as a means of NAA, GA₃ in custard apple with respect to improvement in fruit set, fruit retention and fruit size. However, research work on this aspect in custard apple is very scanty and sporadic. Moreover, growth regulators like CPPU and Brassinosteroids are available in markets which are widely used in grapes for increasing size and high-quality yield but their suitability in the custard apple needs to be assessed. Being a hardy crop, its cultivation of is increasing in Maharashtra, considering the importance and future scope of this crop the present experiment was carried out.

Materials and Methods

The experiment was conducted during 2025-26 at the Custard Apple Research Station, Ambajogai, Dist. Beed, which is situated on an elevation of 631 m above the mean sea level between 18.75° North latitude and 76.37° East longitude. Eight-year-old custard apple trees with uniform growth were selected for the experiment. The trees were planted at a spacing of 4 m × 4 m. Thirteen treatments were evaluated in a Randomized Block Design (RBD) with two replications. Each treatment consisted of three plants, resulting in a total of 78 experimental plants. In June 2025, the experiment was started. Chemicals were applied in the form of foliar spray as per treatments. The treatments comprised Urea @ 0.5, 1.0 and 1.5 per cent, NAA @ 50, 100 and 200 ppm, GA₃ @ 30, 40 and 50 ppm, CPPU @ 30, 40 and 50 ppm and control. Harvesting of fruits was done at full maturity stage.

The basal dose of fertilizer i.e. N:P:K (250:125:125 g/plants) and well decomposed FYM @ 10 kg/tree was applied as per recommendation of VNМКV, Parbhani. The full dose of P and K and half dose of N through different sources viz., urea, single super phosphate and mure of potash was applied as per treatment along with FYM per tree. All the cultural operations like weeding, inter culturing and irrigation were adopted uniformly to all experimental plants.

During the experimental period, harvestings were done periodically in 3-4 pickings in the month of October-November. The following parameters were measured:

Flower drop (%), Fruit set (%), Fruit drop (%) at pea stage, Fruit drop at marble stage (%), Number of fruits per plants, Fruit diameter (cm).

Results and Discussion

Flower drop (%): The result regarding number of flowers drop is presented in Table 1. Minimum flower drop was recorded in treatment (T₅) NAA 100 ppm (6.25) and was statistically at par with (T₄) NAA 50 ppm (6.85) followed by (T₉) GA₃ 50 ppm (11.11), (T₈) GA₃ 40 ppm (14.10) and (T₆) NAA 200 ppm (16.67). While maximum

flower drop was recorded in control T₁₃ (32.11). The reason for reduced flower dropping in these treatments could be attributed to the role played by bioregulators in maintaining a proper hormonal balance within the plant. Proper hormonal balance makes it easier for the flowers to remain attached to the plant, and reducing the formation of abscission zones, hence increased flower retention. The above result was in agreement with findings of Mahmood (2025) [6] in Kagzi Lime.

Fruit set (%): The percentage of fruit set in custard apple as influenced by different chemical treatments is presented in Table 1. Maximum fruit set was recorded in treatment (T₅) NAA 100 ppm (93.75) which was at par with (T₄) NAA 50 ppm (93.15) followed by (T₉) GA₃ 50 ppm (88.89), (T₈) GA₃ 40 ppm (85.90) and (T₆) NAA 200 ppm (83.33). While minimum fruit set was recorded in control T₁₃ (67.79). Increase in fruit set percent, might be due to the fact that substances like naphthalene acetic acid induces cell division, cell elongation, cell enlargement and ultimately leads to better growth of fruit. The above results were in agreement with those of Memane *et al.*, (2013) [7], Bidwe *et al.*, (2019) [8], Rathod *et al.*, (2024) [9] in Custard apple.

Fruit drop (%)

Fruit drop at pea stage (%): The data regarding percentage of fruit drop at pea stage as affected by various different chemical treatments is presented in Table 1. Minimum fruit drop at pea stage was observed in treatment (T₉) GA₃ 50 ppm (5.50) which was statistically at par with (T₅) NAA 100 ppm (6.67) followed by (T₈) GA₃ 40 ppm (7.18), (T₁₂) CPPU 50 ppm (7.53), (T₄) NAA 50 ppm (7.84) and (T₆) NAA 200 ppm (8.95). While maximum fruit drop at pea stage was recorded in control T₁₃ (14.86). Gibberellic acid (GA₃), which improves sink strength, delays the formation of the abscission layer, improves endogenous hormone balance, and encourages improved fruit retention, may be responsible for the decrease in fruit drop at pea stage. The results are in agreement with the findings reported by Chaudhari *et al.*, (2016) [4], Thorat *et al.*, (2018) [10] and Rathod *et al.*, (2024) [9] in Custard apple.

Fruit drop at marble stage (%): The data regarding percentage of fruit drop at marble stage as affected by various different chemical treatments is presented in Table 1. Minimum fruit drop at marble stage was observed in treatment (T₉) GA₃ 50 ppm (11.50) which was statistically at par with (T₅) NAA 100 ppm (12.39) and (T₈) GA₃ 40 ppm (12.82) followed by (T₄) NAA 50 ppm (13.44), (T₁₂) CPPU 50 ppm (13.72) and (T₆) NAA 200 ppm (14.73). While maximum fruit drop at marble stage was recorded in T₁₃ (20.43). Gibberellic acid reduces fruit drop at the

Table 1. Effect of different chemicals flower drop (%), fruit set (%), fruit drop at pea stage (%), fruit drop at marble stage (%), number of fruits per plant and fruit diameter (cm) of Custard apple cv. Dharur-6.

Tr. no.	Treatments	Flower drop (%)	Fruit Set (%)	Fruit drop at pea stage (%)	Fruit drop at marble stage (%)	No. of fruits per plant	Fruit diameter (cm)
T ₁	Urea 0.5 %	31.10	68.90	13.41	18.96	37.66	6.73
T ₂	Urea 1.0 %	29.49	70.51	11.76	17.28	35.67	6.96
T ₃	Urea 1.5 %	29.57	70.43	12.33	17.91	37.67	7.13
T ₄	NAA 50 ppm	6.85	93.15	7.84	13.44	54.34	8.60
T ₅	NAA 100 ppm	6.25	93.75	6.67	12.39	56.66	8.65
T ₆	NAA 200 ppm	16.67	83.33	8.95	14.73	48.33	8.16
T ₇	GA ₃ 30 ppm	17.36	82.64	9.40	15.46	45.33	7.85
T ₈	GA ₃ 40 ppm	14.10	85.90	7.18	12.82	52.00	8.71
T ₉	GA ₃ 50 ppm	11.11	88.89	5.50	11.50	55.33	8.87
T ₁₀	CPPU 30 ppm	29.90	70.10	11.34	17.07	35.00	7.54
T ₁₁	CPPU 40 ppm	26.70	73.30	10.50	16.66	40.00	8.37
T ₁₂	CPPU 50 ppm	20.18	79.82	7.53	13.72	48.00	8.51

(continued on next page)

Tr. no.	Treatments	Flower drop (%)	Fruit Set (%)	Fruit drop at pea stage (%)	Fruit drop at marble stage (%)	No. of fruits per plant	Fruit diameter (cm)
T ₁₃	Control	32.11	67.79	14.86	20.43	32.33	6.58
	S.E.m ±	0.84	0.95	0.46	0.46	0.41	0.33
	C.D. at 5 %	2.58	2.93	1.42	1.42	1.27	1.01

marble stage by maintaining hormonal balance, enhancing cell division and elongation, improving sink strength, and delaying the development of the abscission layer, resulting in increased fruit retention. The results are in agreement with the findings reported by Chaudhari *et al.*, (2016) [4], Thorat *et al.*, (2018) [10] and Rathod *et al.*, (2024) [9] in Custard apple.

Number of fruits per plants: The findings presented in Table 1 showed that maximum number of fruits per plant was recorded in (T₅) NAA 100 ppm (56.66) followed by treatment (T₉) GA₃ 50 ppm (55.33), (T₄) NAA 50 ppm (54.34), (T₈) GA₃ 40 ppm (52.00) and (T₆) NAA 200 ppm (48.33). While the minimum number of fruits per plant was recorded in treatment (T₁₃) control (32.33). Increase in number of fruits per plant in the present investigation might be due to the corresponding significant increase in the number of flowers per branch and fruit set percentage. The results are in agreement with the findings reported by in Kulkarni *et al.* (1996) [11] and Patel *et al.* (2010) [12] in Custard apple.

Fruit diameter: The fruit diameter of custard apple is influenced by different chemical treatments is presented in Table 1 showed maximum fruit diameter was recorded in (T₉) GA₃ 50 ppm (8.87) and was statistically at par with (T₈) GA₃ 40 ppm (8.71), (T₅) NAA 100 ppm (8.65) and (T₄) NAA 50 ppm (8.60) respectively. While minimum fruit diameter was recorded in treatment (T₁₃) control (6.58). Increase in fruit size may be due to GA₃ might have stimulated cell division and cell elongation resulting in larger fruit size. The results are in agreement with the findings reported by Patel *et al.*, (2010) [12], Chaudhari *et al.*, (2016) [4] in Custard apple.

Conclusion: The present investigation clearly revealed that application of different chemicals had a considerable influence on flowering behaviour and fruit retention of custard apple cv. Dharur-6. Among treatments, NAA @ 100 ppm (T₅) was found to be most effective in reducing flower drop and improving fruit retention, as it recorded the minimum flower drop, maximum fruit set and maximum number of fruits per plant. However, GA₃ @ 50 ppm (T₉) was most effective in reducing fruit drop at pea and marble stages, also recorded maximum fruit diameter among the treatments.

References

- Food and Agriculture Organization of the United Nations. Utilization of tropical food fruits and leaves. FAO Food and Nutrition Paper. 1990;47:10–14.
- Agricultural and Processed Food Products Export Development Authority. Production of horticulture crops: Custard apple. 2025.
- Bose TK, Mitra SK, Sanyal D, editors. Fruits: Tropical and sub-tropical (Vol. 1, 3rd ed.). Calcutta: Naya Udyog; 2001.
- Chaudhari JC, Patel KD, Yadav L, Patel UI, Varu DK. Effect of plant growth regulators on flowering, fruit set and yield of custard apple (*Annona squamosa* L.) cv. Sindhan. *Advances in Life Sciences*. 2016;5(4):1202–1204.
- Nair R, Agrawal V. A review on the nutritional quality and medicinal value of custard apple—an underutilized crop of Madhya Pradesh, India. *International Journal of Current Microbiology and Applied Sciences*. 2017;6(9):1126–1132.
- Mahmood M. Effect of bioregulators on fruit and flower drop of kagzi lime (*Citrus aurantifolia* Swingle) under Jammu sub-tropics (Master's Thesis). Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Main Campus, Chatha, Jammu; 2025.
- Memane YS, Pujari CV. Effect of different plant growth regulators on fruit set, yield and quality of custard apple (*Annona squamosa* L.) (Master's Thesis). Mahatma Phule Krishi Vidyapeeth, Rahuri; 2013.
- Bidave SR. Effect of different chemicals on flowering, yield and quality of custard apple (*Annona squamosa* L.) cv. Dharur-6 (Master's Thesis). Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani; 2019.
- Rathod SK, Jadhav GG, Deshmukh RN, Laharia PG, Lalge PM. Effect of different growth substances on fruit set, yield and quality of custard apple (*Annona squamosa* L.). *International Journal of Advanced Biochemistry Research*. 2024;8(Special Issue 10):910–915.
- Thorat UK, Dheware RM, Jadhav AR. Influence of growth regulators on quality and fruit attributes of custard apple (*Annona squamosa* L.) cv. Balanagar. *International Journal of Economic Plants*. 2018;5(3):151–153.
- Kulkarni SS, Desai UT, Masalkar SD, Desale SB. Effect of cultural and chemical treatments on yield and physicochemical characteristics of custard apple. *Journal of Maharashtra Agricultural University*. 1996;21(3):474–475.
- Patel NM, Patel DK, Patel MM. Effect of cultural and chemical treatments on fruit set and fruit yield of custard apple. *The Asian Journal of Horticulture*. 2010;5(2):498–502.
- Patel NM, Patil DK, Verma LR, Patel MM. Effect of cultural and chemical treatments on fruit set and fruit yield of custard apple (*Annona squamosa* L.) cv. Sindhan. *The Asian Journal of Horticulture*. 2010;5(2):498–502.

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