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## Evaluation of custard apple genotypes

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### Abstract

The present investigation entitled “Evaluation of custard apple genotypes” was carried out at Satpuda Botanical Garden, Horticulture Section, College of Agriculture, Nagpur during 2022 to 2023 with the objective to find out the desirable custard apple genotypes and to study the yield and quality parameters of custard apple genotypes. The experiment was laid out in t-test with non-replicated trial with 22 genotypes of custard apple and Balanagar (check). All the genotypes were evaluated based on yield parameters. In respect of yield parameters, the maximum number of fruits were recorded in genotype NCA-16 i.e., 102 fruits/plant and the maximum yield/plant (15.52 kg) and yield/ha (15.52 t) was recorded in genotype NCA-3. The fruit quality parameters like fruit weight, peel weight, pulp weight was maximum (315.5 g, 160.50 g and 141.2 g respectively) in genotype NCA-3 with pulp content (46.02%), pericarp content (48.01%) and seed content (5.92%). The maximum length and breadth of fruit (13.60 cm and 13.30 cm) was recorded in genotype NCA-3 and NCA-15 respectively. The minimum number of seeds and seed weight (8.90 and 8.20 g) was recorded in genotype NCA-22.

**Keywords:** *Annona squamosa* L., Custard apple, Genotypes, NCA, Growth parameters, Nagpur, Evaluation

### 1. Introduction

Custard apple (*Annona squamosa* L), is a tropical fruit in the Annonaceae family with chromosome number  $2n=14$ . It is also known as sugar apple, sweetsop, and soursop are other names for it. Custard apple is one of the commercially grown fruit crop in India. It is a native of tropical region of West Indies and Americas (Porwal *et al.* 2011) <sup>[10]</sup>. The custard apple tree is a small to medium-sized deciduous tree that grows to be approximately 4 to 8 meters tall. It has broad, glossy green leaves and bears fruit all year. The genus *Annona* consists of 166 species of which six species produce edible fruits, *viz.* *Annona squamosa* L, (Sitaphal, Sharifa, Sugar apple, Sweet sop), *A. reticulata* (Bullock’s Heart), *Cherimoya (A. cherimola)*, *A. muricata* (Guanabana or soursop), *A. atemoya* (a natural hybrid of *A. squamosa* x *A. cherimola*) and *A. glabra* (pond apple) (Larranaga and Hormaza 2015) <sup>[6]</sup>. The fruit is oval or heart-shaped, with a green, scaly and rough skin on the outside. The skin is thin but robust, shielding the inside soft and creamy flesh. When the fruit is ripe, it changes color from green to yellowish-green to brownish. Custard apples are not only tasty, but they also provide a number of health advantages. It is a crop of high nutritional value which harbours many important nutritional traits such as high amount of essential minerals (calcium, potassium and they are an excellent source of dietary fiber and other minerals like magnesium and phosphorous), calories, vitamin C and carbohydrate contents (Bharad *et al.* 2009) <sup>[2]</sup>.

### 2. Materials and Methods

The field experiment entitled “Evaluation of Custard Apple genotypes” was undertaken during the year 2022-2023. The survey was conducted during 2007-08, 22 genotypes were collected from Nagpur, Bhandara and Chandrapur districts and these genotypes were planted during 2009-10 at Satpuda Botanical Garden, Horticulture section, College of Agriculture, Nagpur. Research was carried out to identify and study the superior custard apple genotypes. Twenty two genotypes of custard apple and Balanagar (check) all of 12 years age grown in Satpuda Botanical Garden were used in this study, for evaluating the yield and quality parameters in non-replicated trial.

Observations on yield characters *viz.*, number of fruits per tree, fruit yield per tree, fruit yield per hectare, fruit weight and physical quality parameters like fruit size, pericarp weight, pulp weight, seed weight, number of seeds per fruit were recorded.

### 3. Results and Discussion

#### 3.1 Yield parameters

**3.1.1 Fruit weight (g):** The data presented in table 1 revealed that, fruit weight in custard apple genotypes was varied from 60.5 g to 315.5 g. The significantly maximum fruit weight (315.5 g) was recorded in genotype NCA-3 followed by NCA-15 (301.5 g), NCA-20 (292.4 g) and NCA-5 (278.20) which are significantly superior over Balanagar (check) and above mean value. Maximum fruit weight in genotype NCA-3 might be due to environmental conditions, genetic makeup of genotype and the higher plant height which accumulates higher photosynthates in fruit to attain optimum fruit size. Similar results were also reported by Dikshit *et al.* (2008)<sup>[4]</sup> and in custard apple.

#### 3.1.2 Number of fruits per plant

Data regarding number of fruits per plant given in table 1 showed the variation in total number of fruits per plant in different genotypes and it was varied from 32 to 102. The maximum number of fruits per plant was observed in the genotype NCA-16 (102) followed by NCA-19 (95) and were recorded significantly superior over Balanagar (check) and above mean value. Whereas, minimum number of fruits per plant was found in genotype NCA-7 (32). The variation in number of fruits per tree might be due to genetic diversity amongst number of branches, its length and number of flowers per branch of different genotypes as well as due to climatic conditions and pollination efficiency of an insect. These findings are in accordance with the earlier reports of Loksha *et al.* (2022)<sup>[7]</sup> in custard apple.

**3.1.3 Yield per plant (kg):** Data related to fruit yield tabulated in table 1 showed significant variation in fruit yield among different genotypes. The fruit yield was varied from 4.72 kg to 15.52 kg per plant. The highest yield per plant was observed in the genotype NCA-3 (15.52 kg) which is significantly superior over Balanagar (check). Whereas, lowest yield per plant was found in the genotype NCA-7. The significant variation in yield per plant might be due to number of fruits retained per branch, fruit retention percentage and average fruit weight. Higher plant height and high canopy spread might also contributed for the maximum fruit yield in genotype NCA-3. These results are in line with the reports of Dikshit *et al.* (2008)<sup>[4]</sup> in custard apple.

#### 3.1.4 Yield per hectare (t)

Data pertaining to fruit yield (t ha<sup>-1</sup>) presented in table 1 showed significant variation in fruit yield among different genotypes. The fruit yield was varied from 4.72 t to 15.52 t ha<sup>-1</sup>. The highest yield (t ha<sup>-1</sup>) was observed in the genotype NCA-3 (15.52 t) followed by NCA-15 (13.37 t) and NCA-20 (13.08 t) which are significantly superior over Balanagar (check). Whereas, lowest yield (t ha<sup>-1</sup>) was found in the genotype NCA-7 (4.72 t). The significant variation in yield (t ha<sup>-1</sup>) might be due to number of fruits retained per tree, fruit retention percentage and average fruit weight. Yield per kg per tree and number of fruits might be responsible for variations found in estimated yield per ha in different

custard apple genotypes. These results are in line with the reports of Parsana *et al.* (2023)<sup>[9]</sup>.

### 3.2 Physical quality parameters

#### 3.2.1 Fruit size (cm)

**a. Fruit length (cm):** The data presented in table 2 revealed that, the fruit length in custard apple genotypes was varied from 5.20 cm to 13.60 cm. The maximum fruit length (13.60 cm) was found in genotype NCA-3 followed by NCA-15 (13.40 cm) and NCA-20 (12.90 cm) which are significantly superior over Balanagar (check) and above mean value. The minimum fruit length (5.20 cm) was recorded in NCA-22 followed by NCA-21 (6.70 cm). The difference in the fruit length was found might be due to the environmental conditions and genetic makeup of these genotypes.

**b. Fruit breadth (cm):** The data presented in table 2 revealed that, the fruit breadth in custard apple genotypes varied from 4.60 cm to 13.30 cm. The maximum fruit breadth (13.30 cm) was found in genotype NCA-15 followed by NCA-3 and NCA-20 (13.20 cm). The minimum fruit breadth (4.60 cm) was recorded in NCA-22 followed by NCA-21 (6.02 cm) which are significantly superior over Balanagar (check) and above mean value. The difference in the fruit breadth was found might be due to the environmental conditions and genetic makeup of the genotypes. The present findings are in close agreement with Chandel *et al.* (2018)<sup>[3]</sup> and Handique *et al.* (2022)<sup>[5]</sup> in custard apple genotypes.

#### 3.2.2 Pulp (%)

The data presented in table 2 showed that, the weight of pulp in custard apple was ranged from 24.4 g to 150.2 g. The maximum pulp weight (150.2 g) was found in genotype NCA-3 followed by NCA-15 (140.7) and NCA-20 (136.2) significantly superior over Balanagar (check) and above mean value. The minimum pulp weight (24.4 g) was found in genotype NCA-22. There is significant variation in the pulp % of different genotypes. Higher pulp weight is essential character for fruit to fetch higher market price. There are many factors which attributes to higher pulp weight *viz.*, fruit weight, fruit size and a smaller number of seeds. These results are in accordance with the findings of Yadav *et al.* (2017)<sup>[11]</sup> and Chandel *et al.* (2018)<sup>[3]</sup> in custard apple.

#### 3.2.3 Pericarp (%)

The data tabulated in table 2 varied from 27.9 g to 151.5 g and shown that, the maximum pericarp weight (151.5 g) was found in genotype NCA-3 with pericarp percent 48.01%. The minimum pericarp weight was recorded in NCA-22 (27.90) followed by NCA-21 (48.4 g) with pericarp percent 46.11% and 48.88% respectively. As pericarp is the outer layer of the fruit which is not an edible part in custard apple, hence the minimum peel weight of an utmost is importance for selecting the superior genotype, so as to have more pulp weight in the fruit. The present findings are in close agreement with the reports of Yadav *et al.* (2017)<sup>[11]</sup> and Chandel *et al.* (2018)<sup>[3]</sup> in custard apple.

#### 3.2.4 Seed (%)

The perusal data presented in table 2 revealed that, the weight of seeds in custard apple genotypes found was varied

from 8.20 g to 17.60 g. The maximum seed weight was found in genotype NCA-11 i.e., 17.60 g (13.08%) followed by NCA-5 and NCA-12 (16.80 g) which are at par with Balanagar (check). The minimum seed weight (8.20 g) was recorded in NCA-22 followed by NCA-21 (8.40 g) i.e.,

21.81% and 13.53% seeds respectively. The data indicated that the seed weight increases as the fruit size increases, but this was not always true. These findings are in accordance with the work of Mathakar (2005)<sup>[8]</sup> and Dikshit *et al.* (2008)<sup>[4]</sup> in custard apple.

**Table 1:** Yield performance of different custard apple genotypes

Sr. No.	Genotypes	Fruit weight (g)	Number of fruits/plant	Yield/plant (kg)	Yield/ha (t)
1	NCA-1	241.10	45.00	6.50	6.50
2	NCA-2	212.10	72.00	9.16	9.16
3	NCA-3	315.50	82.00	15.52	15.52
4	NCA-4	183.20	57.00	6.26	6.26
5	NCA-5	278.20	76.00	12.68	12.68
6	NCA-6	147.50	88.00	7.78	7.78
7	NCA-7	142.00	32.00	4.72	4.72
8	NCA-8	144.10	94.00	8.12	8.12
9	NCA-9	174.50	67.00	7.01	7.01
10	NCA-10	240.60	82.00	11.83	11.83
11	NCA-11	172.70	80.00	8.28	8.28
12	NCA-12	256.10	89.00	12.74	12.74
13	NCA-13	204.70	45.00	7.52	7.52
14	NCA-14	245.30	84.00	12.36	12.36
15	NCA-15	301.50	78.00	13.37	13.37
16	NCA-16	191.00	102.00	11.68	11.68
17	NCA-17	247.80	72.00	10.70	10.70
18	NCA-18	220.40	81.00	10.71	10.71
19	NCA-19	198.20	95.00	11.29	11.29
20	NCA-20	292.40	73.00	13.08	13.08
21	NCA-21	99.00	88.00	6.22	6.22
22	NCA-22	60.50	82.00	4.97	4.97
23	Balanagar	223.48	64.80	8.69	8.69
	GM	208.34	75.17	9.62	9.62
	Range	60.5-315.5	32-102	4.72-15.52	4.72-15.52
	S.E.(m) ±	13.32	4.02	0.85	0.85
	C.D. at 5%	52.32	15.80	3.35	3.35

**Table 2:** Quality performance of (Pulp, Pericarp and seed) different custard apple genotypes

Sr. No.	Genotypes	Fruit length (cm)	Fruit breadth (cm)	Pulp		Pericarp		Seed	
				(g)	(%)	(g)	(%)	(g)	(%)
1	NCA-1	11.60	10.40	113.60	45.04	117.60	48.77	9.90	6.18
2	NCA-2	11.20	10.10	79.70	35.21	118.50	55.86	13.90	8.91
3	NCA-3	13.60	13.20	150.20	46.02	151.50	48.01	13.70	5.92
4	NCA-4	8.30	7.90	75.80	38.64	93.50	51.03	13.90	10.31
5	NCA-5	12.20	11.80	116.30	40.00	145.10	52.15	16.80	7.83
6	NCA-6	8.50	8.60	63.90	39.93	68.30	46.30	15.30	13.76
7	NCA-7	8.40	8.00	59.70	38.52	67.20	47.32	15.10	14.15
8	NCA-8	8.60	8.20	64.20	41.08	66.00	45.80	13.90	13.11
9	NCA-9	8.90	8.50	76.40	40.91	85.50	48.99	12.60	10.08
10	NCA-10	11.40	10.80	114.80	45.63	114.90	47.75	10.30	6.35
11	NCA-11	8.80	8.50	77.10	41.74	77.90	45.10	17.60	13.08
12	NCA-12	11.70	11.30	114.40	42.71	124.90	48.77	16.80	8.51
13	NCA-13	10.80	10.60	93.80	43.38	97.10	47.43	13.80	9.18
14	NCA-14	11.50	11.20	111.50	43.41	117.20	47.77	16.60	8.80
15	NCA-15	13.40	13.30	140.70	43.01	144.30	47.86	16.50	7.13
16	NCA-16	9.10	9.40	76.40	37.38	100.90	52.82	13.70	9.79
17	NCA-17	11.70	11.30	107.60	41.40	123.80	49.95	16.40	8.63
18	NCA-18	10.70	10.50	87.90	37.61	118.20	53.62	14.30	8.75
19	NCA-19	8.90	9.30	82.60	39.15	101.80	51.36	13.80	9.48
20	NCA-20	12.90	13.20	136.20	44.87	144.20	49.31	11.80	5.74
21	NCA-21	6.70	6.20	42.20	37.57	48.40	48.88	8.40	13.53
22	NCA-22	5.20	4.60	24.40	32.06	27.90	46.11	8.20	21.81
23	Balanagar	11.02	10.47	93.30	40.10	112.56	50.36	16.34	9.54
	GM	10.22	9.89	91.42	40.58	102.71	49.19	14.11	10.10
	Range	5.20-13.60	4.60-13.30	24.40-150.20	32.06-46.02	27.90-151.50	45.10-55.86	8.20-17.60	5.92-21.81
	S.E.(m) ±	0.47	0.60	10.92	0.83	6.57	0.23	2.99	1.03
	C.D. at 5%	1.87	2.38	42.89	3.29	25.82	0.93	11.76	4.07

#### 4. Conclusion

From the findings of the present investigation, it may be concluded that the different genotypes varied in yield and physical quality parameters of fruits. As regards physical parameters, highest fruit weight and pulp weight was found in NCA-3 followed by NCA-15 and NCA-20, and was found significantly superior over Balanagar (check). It is clearly concluded from the study that custard apple genotype NCA-3 was found most promising for further multiplication.

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