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VARIABILITY IN INDIGENOUS CUSTARD APPLE (*ANNONA SQUAMOSA* L.) GENOTYPES FOR FRUITING AND YIELD CHARACTERS AT DHARSIWA BLOCK OF CHHATTISGARH, INDIA

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ABSTRACT

The present study was conducted during 2022–2023 and 2023–2024 at different sites located at Dharsiwa block of Chhattisgarh. A total of 60 genotypes were identified, selected and evaluated for various fruiting and yield characters. These genotypes revealed wide variability in terms of fruiting characters like fruit length (5.10 cm to 8.13 cm), fruit diameter (5.42 cm to 8.47 cm), fruit weight (129.52 g to 330.78 g) , length of pericarp (1.44 cm to 3.17 cm), weight of pericarp (2.24 g to 4.33 g), seed length (9.97 mm to 17.04 mm), seed width (4.74 mm to 8.99 mm), seed weight (11.56 g to 25.48), number of seeds per fruit (23.37 to 35.37), pulp weight (66.17 g to 203.26 g) and yield of fruits per tree (5.84 kg to 16.86 kg).
Keywords **:** Custard apple, variability, yield and fruiting characters.

Introduction

Custard apple (*Annona squamosa* L.) belongs to the family 'Annonaceae' and is believed to be native to Central America but due to its widespread cultivation, its actual native origin is uncertain also it was distributed to Mexico and Tropical America (Popenoe, 1974). The important species of Annonaceae which contains edible fruit are *Annona reticulata* (bullock's heart), *Annona squamosa* (sugar apple), *Annona muricata* (soursop), *Annona cherimola* (cherimoya) and *A. cherimola x A. squamosa* (atemoya) Among all annonaceous fruits, custard apple is most favourite in India. It is widely known as Sharifa or Sitaphal in India (Thakur and Singh, 1967) while Sugar apple or Sugar sop in abroad. It is the sweetest Annona fruit, which has partially granular, creamy, sweet flesh that is either yellow or white and has an excellent flavour and low acidity. Over the course of roughly three months, the fruits mature at irregular intervals. This tropical fruit has a relatively short shelf life at room temperature, ranging from two to five days. Climacteric behaviour is displayed by it (Prasanna *et al*., 2000). Fruit set in India occurs after onset of rainy season (Thakur and Singh, 1967).

According to reports, the fruit contains 70.5g of moisture, 1.6g of protein, 0.4g of fat, 0.9g of minerals, 3.1g of fibre, 17.0 mg of calcium, 47.0 mg of phosphorus, 1.5 mg of iron, 0.07 mg of thiamine, 0.17 mg of riboflavin, 1.30 mg of niacin, 37.0 mg of vitamin C, and 104 kcal of calories. (Gopalan *et al*., 1987 and Singh, 1995). Because of its high carbohydrate content (23.0g/100g) and delicious flavour, custard apple fruits are used to make ice cream. (Maurya and Singh, 2006; Nath *et al*., 2008).

In India, Custard apple plants are found growing naturally and come up unattended in the states of Madhya Pradesh, Chhattisgarh, Bihar, Orissa, Gujarat, Rajasthan etc. Custard apple being a cross-pollinated crop has wide variation in its fruiting habits. This natural variability available within the species is often exploited to identify superior genotypes. Since, Chhattisgarh plains are home to several custard apple lines and land races, there is ample opportunity to choose the best of the many wild strains that are

accessible. Till date, Chhattisgarh has not conducted a systematic collection and evaluation of custard apple cultivars. Identification, characterisation, and assessment of high-yielding genotypes that can be successfully cultivated on a commercial basis in Chhattisgarh are therefore urgently needed.

Materials and Methods

This experiment of collection and evaluation of indigenous custard apple genotypes was carried out during 2022–2023 and 2023–2024 at various sites located at Dharsiwa block in Chhattisgarh. These genotypes were assigned accession number as DCA i.e. Dhasiwa custard apple (DCA-1 to DCA-60). The experiment was laid out in Randomized Complete Block Design (RCBD). The data for yield parameters *viz.* fruit yield (kg/plant) was recorded after harvesting of fruits at physiological maturity from each replication of each treatment. Mature fruits were collected from each treatment replication and utilised for recording various fruit physical characteristics. Fresh weight of fruit was recorded using digital balance. Vernier callipers were used to record the length and breadth of the fruit. The pulp was manually separated from the individual seeds and pulp weight and seed weight per fruit was recorded using electronic balance. The number of seeds per fruit was also recorded.

Results and Discussion

Fruit Characters

The data pertaining to the fruiting characters were recorded and illustrated in the Table No. 01 and found statistically significant.

Fruit length (cm)

On the basis of two-year pooled data analysis, the maximum fruit length was recorded in the genotype, DCA-34 (8.13 cm) followed by DCA-23 (7.44 cm) and DCA-41 (7.41 cm) respectively while, the minimum fruit length was noted in the genotype, DCA-46 (5.10 cm) followed by DCA-52 (5.39 cm) and DCA-10 (5.47 cm) respectively. Similar results were also reported by Mathakar (2005) and Bakane *et al.* (2015) as the quantity of fruits on the tree, the amount of photosynthates produced, the soil's moisture content, and the fertility of the soil all had an impact on the difference in fruit size. These elements may be crucial for producing fruit of the ideal size and preserving its quality. Gibberellins generated in the seeds may also affect the fruit's size.

Fruit diameter (cm)

On the basis of two-year pooled data analysis, the maximum fruit diameter was recorded in the genotype, DCA-34 (8.47 cm) followed by DCA-35 (8.13 cm) and DCA-59 (7.79 cm) respectively while, the minimum fruit diameter was noted in the genotype, DCA-8 (5.42 cm) followed by DCA-46 (5.50 cm) and DCA-12 (5.54 cm) respectively. Similar results were also reported by Thakur and Singh (1967) and Mathakar (2005) in custard apple as the fruit size and quality were affected by both climatic and edaphic conditions. Maximum fruit width may also result from the aggregation of the most seeds in the fruit's horizontal plain. Growth may also be influenced by gibberellin production in the seeds, which likewise affects fruit size.

Fruit weight (g)

On the basis of two-year pooled data analysis, the maximum fruit weight was recorded in the genotype, DCA-34 (330.78 g) followed by DCA-41 (283.59 g) and DCA-35 (259.96 g) respectively while, the minimum fruit weight was noted in the genotype, DCA-16 (129.52 g) followed by DCA-46 (137.78 g) and DCA-42 (151.61 g) respectively. Similar results were also reported by Ghosh *et al*. (2001) and Singh *et al*. (2006) which stated that apart from age and vigour of plant other environmental conditions may also affect weight of fruit such as large canopy area and pollination due to the proximity with other crops.

Length of pericarp (cm)

On the basis of two-year pooled data analysis, the maximum length of pericarp was recorded in the genotype, DCA-40 (3.19 cm) followed by DCA-34 (2.90 cm) and DCA-46 (2.86 cm) respectively while, the minimum length of pericarp was noted in the genotype, DCA-4 (1.44 cm) followed by DCA-25 (1.59 cm) and DCA-57 (1.71 cm) respectively. Similar results were also reported by Mathakar (2005), Dikshit *et al.* (2008) in custard apple.

Weight of pericarp (g)

On the basis of two-year pooled data analysis, the maximum weight of pericarp was recorded in the genotype, DCA-40 (4.33 g) followed by DCA-42 (4.13 g) and DCA-17 (4.12 g) respectively while, the minimum weight of pericarp was noted in the genotype, DCA-29 (2.24 g) followed by DCA-25 (2.34 g) and DCA-37 (DCA-21 g) respectively. Similar results were also reported by Mathakar (2005), Dikshit *et al.* (2008) in custard apple.

Seed, Pulp and Yield Characters

The data pertaining to the seed, pulp and yield characters were recorded and illustrated in the Table No. 02 and found statistically significant.

Seed length (mm)

On the basis of two-year pooled data analysis, the maximum seed length was recorded in the genotype, DCA-51 (17.04 mm) followed by DCA-47 (16.27 mm) and DCA-45 (16.26 mm) respectively while, the minimum seed length was noted in the genotype, DCA-21 (9.97 mm) followed by DCA-6 (10.10 mm) and DCA-14 (10.74 mm) respectively. Similar results were also reported by Anon (1987) and Saraswat *et al.* (2006) in custard apple.

Seed width (mm)

On the basis of two-year pooled data analysis, the maximum seed width was recorded in the genotype, DCA-51 (8.99 mm) followed by DCA-45 (8.25 mm) and DCA-47 (8.11 mm) respectively while, the minimum seed width was noted in the genotype, DCA-21 (4.74 mm) and DCA-12 (4.84 mm) and DCA-9 (4.89 mm) respectively. Similar results were also reported by Anon (1987) and Saraswat *et al.* (2006) in custard apple.

Seed weight (g)

On the basis of two-year pooled data analysis, the maximum seed weight was recorded in the genotype, DCA-49 (25.48 g) followed by DCA-39 (24.54 g) and DCA-18 (24.01 g) respectively while, the minimum seed weight was noted in the genotype, DCA-2 (11.56 g) followed by DCA-32 (11.82 g) and DCA-40 (12.15 g) respectively. Similar results were also reported by Mathakar (2005), Dikshit *et al.* (2008) and Rao and Subramanyam (2010) in custard apple minimum seed weight in certain genotypes might be due to the accumulation of lesser photosynthates into the seeds.

Number of seeds per fruit

On the basis of two-year pooled data analysis, the maximum the number of seeds per fruit was recorded in the genotype, DCA-49 (35.37) followed by DCA-14 (33.87) and DCA-10 (33.62) respectively while, the minimum number of seeds per fruit was noted in the genotype, DCA-32 (23.37) followed by DCA-12 (26.12) and DCA-48 (26.12) respectively. Similar results were also reported by Shete *et al.* (1991), Jalikop and Kumar (2000), Mathakar (2005) and Kumar (2015) in custard apple, might be due to higher pulp per cent in the genotypes.

Pulp weight (g)

On the basis of two-year pooled data analysis, the maximum pulp weight was recorded in the genotype, DCA-34 (203.26 g) followed by DCA-35 (178.68 g) and DCA-41 (159.28 g) respectively while, the minimum pulp weight was noted in the genotype, DCA-16 (66.17 g) followed by DCA-8 (71.02 g) and DCA-46 (72.21 g) respectively. Similar results were also reported by Mathakar (2005) and Dikshit *et al.* (2008) in custard apple that fruit weight, fruit size, and lesser seeds are some of the various factors that contribute to a higher pulp weight.

Yield of fruits per tree (Kg)

On the basis of two-year pooled data analysis, the maximum yield of fruits per tree was recorded in the genotype, DCA-34 (16.86 Kg) followed by DCA-35 (13.02 Kg) and DCA-56 (12.86 Kg) respectively while, the minimum yield of fruits per tree was noted in the genotype, DCA-42 (5.84 Kg) followed by DCA-46 (6.08 Kg) and DCA-16 (6.38 Kg) respectively. Similar results were also reported by Shete *et al*. (1991) in custard apple as both reproductive and vegetative traits influence yield, which is a polygenic and complicated trait.

Table 1: Mean performance on Fruit characters of Custard apple genotypes (Pooled analysis)

SR. No.	Genotypes	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Length of pericarp (cm)	Weight of pericarp (g)
1	DCA-01	6.97	7.36	190.84	2.49	3.05
2	DCA-02	7.26	6.53	202.81	1.84	2.45
3	DCA-03	6.32	7.01	200.33	2.76	3.12
4	DCA-04	5.69	5.75	199.40	1.44	2.38
5	DCA-05	5.93	5.68	239.84	1.84	2.54
6	DCA-06	6.74	6.48	220.00	2.10	3.18
7	DCA-07	6.71	7.08	195.28	1.76	2.38
8	DCA-08	5.74	5.42	150.59	2.10	2.36
9	DCA-09	6.60	7.18	157.66	2.63	3.55
10	DCA-10	5.47	5.91	160.93	2.49	3.53
11	DCA-11	6.16	6.40	198.55	2.05	2.50
12	DCA-12	6.30	5.54	157.04	2.44	3.75

13	DCA-13	7.11	6.32	198.70	2.29	3.56
14	DCA-14	6.22	6.05	190.88	2.07	3.48
15	DCA-15	7.20	6.09	186.99	2.78	3.88
16	DCA-16	5.83	6.05	129.52	2.50	3.20
17	DCA-17	6.17	6.16	169.09	3.13	4.12
18	DCA-18	5.82	7.29	194.84	2.66	3.81
19	DCA-19	6.58	6.37	266.12	2.51	3.45
20	DCA-20	6.80	6.45	234.61	2.23	3.53
21	DCA-21	7.01	6.37	231.27	1.81	2.37
22	DCA-22	6.01	6.50	168.19	2.21	3.07
23	DCA-23	7.44	7.05	228.97	2.41	3.32
24	DCA-24	6.42	6.31	163.79	1.79	2.37
25	DCA-25	6.49	6.32	177.42	1.59	2.34
26	DCA-26	6.87	6.00	165.15	2.54	2.76
27	DCA-27	7.20	6.80	185.04	2.54	2.38
28	DCA-28	6.64	5.96	167.96	2.36	2.80
29	DCA-29	7.28	6.41	184.82	2.26	2.24
30	DCA-30	5.75	6.50	153.60	2.38	2.65
31	DCA-31	5.84	7.32	165.22	1.84	2.41
32	DCA-32	6.62	6.93	176.84	1.89	2.86
33	DCA-33	5.90	6.36	168.72	2.36	3.10
34	DCA-34	8.13	8.47	330.78	2.90	3.69
35	DCA-35	6.65	8.13	259.96	2.81	3.46
36	DCA-36	7.00	7.77	188.99	2.70	3.05
37	DCA-37	6.30	6.62	237.95	2.15	2.94
38	DCA-38	6.37	6.62	191.58	2.31	3.28
39	DCA-39	7.30	7.29	210.66	2.54	3.36
40	DCA-40	6.97	7.29	169.15	3.19	4.33
41	DCA-41	7.41	7.37	283.59	2.14	3.25
42	DCA-42	6.30	5.97	151.16	2.71	4.13
43	DCA-43	7.23	7.29	221.82	2.25	3.42
44	DCA-44	6.89	6.34	222.01	2.63	3.73
45	DCA-45	5.96	6.26	169.74	2.41	3.44
46	DCA-46	5.10	5.50	137.78	2.86	3.96
47	DCA-47	5.49	6.24	152.98	2.77	3.39
48	DCA-48	6.35	6.09	165.89	2.39	3.58
49	DCA-49	7.20	6.91	187.75	2.59	3.61
50	DCA-50	6.92	6.80	211.16	2.71	3.65
51	DCA-51	6.44	6.52	180.73	2.45	3.23
52	DCA-52	5.39	5.99	160.94	2.21	2.80
53	DCA-53	6.69	6.63	169.21	2.58	3.55
54	DCA-54	6.01	6.59	180.20	2.24	3.54
55	DCA-55	7.32	6.31	228.43	2.15	3.48
56	DCA-56	6.53	6.36	239.33	2.29	3.12
57	DCA-57	5.75	6.12	219.79	1.71	2.51
58	DCA-58	6.30	7.15	185.22	2.24	3.42
59	DCA-59	7.03	7.78	257.03	2.60	3.68
60	DCA-60	6.04	6.54	210.98	2.47	3.88
S.E (m)		**0.18**	**0.19**	**4.62**	**0.07**	**0.08**
C.D @ 5%		**0.54**	**0.52**	**13.88**	**0.21**	**0.25**
C.V (%)		**6.01**	**5.64**	**5.11**	**6.29**	**5.58**

Table 2: Mean performance on seed, pulp and yield characters of Custard apple genotypes (Pooled analysis)

SR. No.	Genotypes	Seed length (mm)	Seed width (mm)	Seed weight (g)	Number of seeds per fruit	Pulp weight (g)	Yield of fruits per tree (Kg)
1	DCA-01	11.69	5.71	14.49	26.87	90.68	8.82
2	DCA-02	11.29	5.24	11.56	27.25	112.97	7.87
3	DCA-03	11.31	5.33	21.39	32.87	99.03	8.89
4	DCA-04	12.61	6.09	14.91	28.49	105.89	7.89
5	DCA-05	12.28	4.90	20.13	30.12	130.97	11.49
6	DCA-06	10.10	5.11	17.48	28.75	127.11	10.01
7	DCA-07	14.43	5.89	15.31	27.49	100.32	9.15
8	DCA-08	15.29	6.85	15.69	29.50	71.02	9.58
9	DCA-09	11.01	4.89	21.73	32.75	85.07	10.00
10	DCA-10	11.32	4.91	22.95	33.62	88.94	7.16
11	DCA-11	12.73	5.31	20.91	29.37	91.08	9.55
12	DCA-12	11.08	4.84	19.46	26.12	87.06	7.64
13	DCA-13	14.58	6.04	23.15	29.12	110.59	10.33
14	DCA-14	10.74	5.29	24.23	33.87	104.41	8.30
15	DCA-15	12.61	5.05	22.38	31.74	98.59	9.28
16	DCA-16	13.45	6.12	22.48	29.12	66.17	6.38
17	DCA-17	11.48	5.07	21.81	28.12	83.07	8.11
18	DCA-18	12.13	5.43	24.01	33.37	115.05	9.83
19	DCA-19	13.01	5.28	19.32	30.12	145.99	12.23
20	DCA-20	14.02	6.68	18.99	30.87	136.31	11.95
21	DCA-21	9.97	4.74	16.03	27.12	134.62	10.11
22	DCA-22	11.00	5.23	22.72	32.62	97.56	9.06
23	DCA-23	13.49	5.85	23.32	32.87	132.85	10.89
24	DCA-24	13.96	6.57	19.75	30.12	93.03	8.34
25	DCA-25	12.83	5.92	16.84	26.75	101.61	7.51
26	DCA-26	12.24	6.07	22.21	27.12	90.61	7.24
27	DCA-27	11.53	5.29	20.00	26.37	117.2	9.62
28	DCA-28	12.86	5.87	15.58	27.75	89.51	9.49
29	DCA-29	11.79	5.01	22.08	32.12	112.11	9.49
30	DCA-30	14.62	5.20	17.63	29.12	81.05	7.58
31	DCA-31	15.63	6.99	13.91	26.37	91.64	8.09
32	DCA-32	15.13	6.34	11.89	23.37	87.92	9.64
33	DCA-33	12.37	5.99	21.81	30.87	83.85	9.93
34	DCA-34	13.18	6.03	15.72	26.74	203.26	16.86
35	DCA-35	15.81	7.00	20.31	30.12	178.68	13.02
36	DCA-36	11.84	5.41	13.79	26.37	123.43	9.20
37	DCA-37	12.97	5.05	14.61	28.62	148.39	11.84
38	DCA-38	13.36	6.01	21.10	31.37	115.14	10.63
39	DCA-39	13.81	5.96	24.54	33.37	122.92	10.90
40	DCA-40	13.04	5.11	12.15	26.12	92.16	8.95
41	DCA-41	13.96	6.08	15.39	28.62	159.28	11.77
42	DCA-42	13.09	7.16	16.76	26.50	79.35	5.84
43	DCA-43	15.64	7.95	19.88	31.37	100.88	9.88
44	DCA-44	12.91	5.39	19.14	28.12	106.34	10.80
45	DCA-45	16.26	8.25	21.77	33.37	93.19	10.29
46	DCA-46	14.03	6.48	21.10	33.25	72.21	6.08
47	DCA-47	16.27	8.11	21.24	30.62	80.38	8.65
48	DCA-48	15.29	7.63	13.86	26.12	102.85	8.16

49	DCA-49	13.40	5.24	25.48	35.37	117.22	9.08
50	DCA-50	14.49	7.41	23.35	32.74	122.30	10.44
51	DCA-51	17.04	8.99	20.17	30.87	97.02	8.39
52	DCA-52	14.24	6.22	17.09	27.12	84.19	8.78
53	DCA-53	13.33	5.85	21.30	27.75	104.04	7.98
54	DCA-54	13.50	6.75	22.89	33.37	108.55	9.80
55	DCA-55	13.44	5.66	21.24	30.62	147.23	11.94
56	DCA-56	15.34	6.87	18.54	27.37	136.91	12.86
57	DCA-57	12.83	6.17	19.64	28.37	130.81	10.19
58	DCA-58	14.05	6.23	21.73	31.62	91.39	9.96
59	DCA-59	13.036	6.15	23.37	30.12	158.52	12.29
60	DCA-60	10.91	5.71	16.51	28.62	128.27	9.86
S.E (m)		**0.34**	**0.15**	**0.46**	**0.83**	**2.79**	**0.36**
C.D @ 5%		**1.04**	**0.45**	**1.40**	**2.50**	**8.37**	**1.08**
C.V (%)		**5.68**	**5.42**	**5.22**	**6.07**	**5.49**	**8.06**

References

Anonymous (1987). All India Coordinated Research Project on Arid Zone Fruits Tech. Doc., No. 20.

Bakane, P.H., Borkar, P.A., Gajabe, M., Khakare, M. (2015). Physical properties of custard apple fruit *(Annona squamosa L.). In. J Agric. Sci. Res*., **5**(4), 343- 352.

Dikshit, N., Bharad, S.G., Badge, M.P. (2008). Diversity in custard apple Germplasm Collections from Maharashtra. *J. Plant Genetic Resource*. **21**(1), 95-96.

Ghosh, S.N., Mathew, B. and Manna, B. (2001). Studies on physico-chemical characteristics of fruit of custard apple growth under rainfed region of West Bengal. Orissa *J. of Hort.,* **29**(1), 66-68.

Gopalan, C., Rama Shastri, B.V. and Balasubramanian, S.C. (1987). Nutritive value of Indian Foods. NIN, ICMR, Hyderabad, pp, 93.

Jalikop, S.H., Kumar, S.P. (2000). New fruit varieties for arid regions –pomegranate 'Ruby' and custard apple 'Arka Sahan'. *Indian Hort*. **45**(2),19-20.

Kumar, K. (2015). Evaluation of *Annona* genotypes for recipe standardization of nectar and RTS (ready-to-serve) beverages. M. Sc. (Ag.) thesis. I.G.K.V., Raipur.

Mathakar, T.D. (2005). Assessment of custard apple (*Annona squamosa* L.) hybrids. M.Sc. (Agri.) thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra), India, 2005.

Maurya, I.B. and Singh, D.K. (2006). Custard apple, In Advances in Arid Horticulture, Eds. Saroj, P.L. and Awasthi, O.P., IBDC, Lucknow, pp, 129-141.

Nath, V., Kumar, D. and Pandey, V. (2008). *Fruits for the future*, Vol.1. SSPH, Delhi, pp, 285-299.

Popenoe, J. (1974). Status of Annona Culture in South Florida.proc. *Florida State Hort. Soc*. **87**, 342-344.

Prasanna, K.N.V., Sudhakar, R.D.V. and Krishnamurthy, S. (2000). Effect of storage temperature on ripening and quality of custard apple (*Annona squamosa* L.) fruits. *Journal of Horticultural Science and Biotechnology,* **75**(5), 546–550.

Rao, K.D., Subramanyam, K. (2010). Growth and yield performance of custard apple germplasm under scarce rainfall zone. *Indian J Agric. Res*., **45**(2),156-160.

Saraswat, K.S., Rajagopalan, G. and Ravi, G.V. (2006). Pivotal evidence of custard-apple, evocative of some pre-columbian network of contact between asia and America. Paper presented in the international seminar on the 'first farmer in global perspective,' Lucknow, India, 18-20 January, 2006.

Shete, M.B., Karale, A.R., Keskar, B.G. and Kale, P.N. (1991). Seedling selection in the custard apple. *J. Maharashta Agric. Univ.* **16**(2), 271-273.

Singh, P., Jain, V., Agarawal, S. (2006). Studies on variability in physico-chemical characters of newly selected strains of custard apple Prog. *Hort*. **38**(1), 6-62.

Singh, S.P. (1995). *Commercial fruits*, Kalyani Publishers, Ludhiana, pp, 289.

Thakur, D.R. and Singh, R.N. (1967). Pomological description and classification of some Annonas. *Indian Journal of Horticulture,* **24**, 11–19.