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Variability in custard apple (*Annona squamosa* L.) genotypes for qualitative characters in Chhattisgarh plains

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Abstract

Eighteen custard apple genotypes viz., BSPCA-1, BSPCA-2, BSPCA-3, BSPCA-4, BSPCA-5, BSPCA-6, BSPCA-7, BSPCA-8, BSPCA-9, MSCA-1, MSCA-2, MSCA-3, MSCA-4, MSCA-5, MSCA-6, MSCA-7, MSCA-8 and MSCA-9 were evaluated. All 18 genotypes were evaluated for physico-chemical aspects. The results revealed a great variability for various characters which helped to identify the most promising genotypes. Observations on qualitative traits viz., TSS, titrable acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugar were recorded. The variation was observed for fruit chemical characters viz., TSS (20.19 to 25.22 °B), acidity (0.32 to 0.45%), ascorbic acid (32.4 to 37.8 mg/100 g pulp), total sugar (13.01 to 18.20%), reducing sugar (10.80 to 14.50%) and non-reducing sugar (2.10 to 3.70%). On the basis of performance of individual genotype, BSPCA-1, BSPCA-4, BSPCA-8, MSCA-1 and MSCA-5 was identified as promising genotypes.

Keywords: Custard apple, genotypes, TSS, acidity

Introduction

Custard apple (*Annona squamosa* L.) a member of the Annonaceae family, is a tropical and subtropical fruit tree which is widely distributed in Asia, Africa and the America (Nakasone and Paul, 1998) [11]. Annonaceae family has 40 to 50 genera and 119 species, of which only six species are of commercial importance (Popenoe, 1974 and Geurts, 1981) [14, 3]. It is widely distributed in Asia and the America and is most widely known as sugar apple, sweetsop and custard apple. Among Annonaceous fruits, custard apple is most favorite in India. In India, it is also known as *Shariffa*, *Sitaphal* (Thakur and Singh, 1967) [18]. In India, custard apple is grown in an area of 29.87 thousand hectare with an annual production of 228.37 million tonnes. Chhattisgarh is one of the states in which custard apple is produced in 7.99 thousand hectare having annual production 39,730 metric tonnes (Anon., 2014) [1]. *Annona squamosa* L. is a small, semi-deciduous tree, 3-7 m in height, with a broad, open crown or irregularly spreading branches. The custard apple flower is hermaphroditic and exhibit Protogynous Dichogamy. Flowers greenish-yellow, fragrant, on slender hairy stalks, produced singly or in short lateral clusters about 2.5 cm long, 2-4 flowers but not at the base of the leaves. Fruit is round, heart shaped, ovate or conical, 5-10 cm in diameter, with many round protuberances; greenish-yellow when ripe, with a white, powdery bloom; the pulp is white, edible and sweetly aromatic; in each carpel is embedded a seed, oblong, shiny and smooth, blackish or dark brown, 1.3-1.6 cm long, numerous. The custard apple fruits are high in calories and are a good source of iron. The leaves are rich in aporphine (Salluja and Santani, 1990) [15] and fruit contains terpenoids, whereas bark contains acetogenins (Chao-Ming *et al.*, 1997 and Hopp *et al.*, 1997) [2, 7]. Custard apple is a nutritive fruit due to the fact that its 100 gram edible portion contains 1.5 per cent of protein, 23.5 per cent carbohydrates, 17 mg calcium, 47 mg phosphorus, 1.5 mg iron, 0.07 per cent thiamine, 0.17 mg riboflavin, 1.3 mg niacin and 37 mg ascorbic acid (Shrivastava and Kumar, 1998) [17].

Material and Methods

The experiment was carried out in the Department of Fruit science, College of Agriculture, IGKV, Raipur through the survey conducted in the different villages of district Bilaspur and Mahasamund, during the year 2016-17. Bilaspur district is situated between 22.09° N latitudes and 82.15° E latitudes and Mahasamund is situated in the central part of Chhattisgarh and lies 21.1° N latitude and 82.1° E longitude. For present investigation, nine genotypes collected from Bilaspur district viz., BSPCA-1, BSPCA-2, BSPCA-3, BSPCA-4, BSPCA-5, BSPCA-6,

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BSPCA-7, BSPCA-8 and BSPCA-9 as well as nine genotypes collected from Mahasamund district viz., MSCA-1, MSCA-2, MSCA-3, MSCA-4, MSCA-5, MSCA-6, MSCA-7, MSCA-8 and MSCA-9 were evaluated. Observations on qualitative traits viz., TSS, titrable acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugar were recorded.

Results and Discussion

Data showed that genotypes differed significantly with respect to their qualitative characters was recorded in terms of TSS ($^{\circ}$ Brix), acidity (%), ascorbic acid (mg/100 g pulp), total sugar (%), reducing sugar (%), non-reducing sugar (%). Total soluble solids in different genotypes of custard apple are presented in Table 1. Genotype BSPCA-1 (25.22 $^{\circ}$ B) recorded significantly highest TSS, which was followed by MSCA-1 (24.8 $^{\circ}$ B) and BSPCA-4 (24.38 $^{\circ}$ B), whereas the lowest TSS was recorded in genotype BSPCA-6 (20.19 $^{\circ}$ B) followed by BSPCA-2 (20.23 $^{\circ}$ B) and MSCA-4 (21.31 $^{\circ}$ B), respectively. The observation regarding to titrable acidity in different genotypes of custard apple are presented in Table 1. The minimum titrable acidity was found in genotypes BSPCA-4 and BSPCA-8 (0.32%) which was at par with BSPCA-1 (0.33%), followed by BSPCA-2 (0.34%), MSCA-4 and MSCA-8 (0.35%), whereas maximum titrable acidity was observed in MSCA-1 (0.45%) followed by MSCA-6 (0.43%), BSPCA-3 and MSCA-7 (0.42%), respectively. The data pertaining to ascorbic acid in different genotypes of custard apple (Table 1) indicated that the maximum ascorbic acid was

found in genotype BSPCA-6 (37.8 mg/100 g pulp) and at par with BSPCA-1 (37.5 mg/100 g pulp), BSPCA-7 (37.4 mg/100 g pulp) and MSCA-3 (37.2 mg/100 g pulp) followed by MSCA-5 (36.7 mg/100 g pulp) and BSPCA-4 (36.40 mg/100 g pulp), whereas the minimum ascorbic acid was noted in BSPCA-2 (32.4 mg/100 g pulp) followed by BSPCA-5 (33.5 mg/100 g pulp) and BSPCA-9 (33.6 mg/100 g pulp), respectively. The data related to total sugars of different custard apple genotypes under study are presented in Table 1. The genotype BSPCA-1 recorded significantly highest total sugar (18.20%) followed by MSCA-1 (17.80%) and BSPCA-4 (17.70%), whereas the lowest total sugar was recorded in genotype MSCA-2 (13.01%) followed by BSPCA-6 (13.10%) and MSCA-3 (13.80%). The data pertaining to reducing sugar of different custard apple genotypes (Table 1) showed that the genotype BSPCA-1 was recorded significantly maximum reducing sugar (14.50%) followed by BSPCA-8 (14.30%) and MSCA-5 (14.19%), whereas the minimum reducing sugar was recorded in genotype BSPCA-6 (10.80%) followed by MSCA-2 (10.90%) and MSCA-3 (11.30%). The observation related to non-reducing sugar of different custard apple genotypes under study are presented in Table 1. The genotype BSPCA-1 recorded significantly maximum non-reducing sugar (3.70%) followed by BSPCA-4 (3.59%), MSCA-5 (3.6%) and BSPCA-3 (3.5%), whereas the minimum non-reducing sugar was recorded in genotype MSCA-2 (2.1%) followed by BSPCA-6 (2.6%) and MSCA-3 (2.4%).

Table 1: Qualitative parameters (TSS, Titrable acidity and Ascorbic acid) of *in-situ* custard apple genotypes

S. No.	Genotypes	TSS ($^{\circ}$ Brix)	Titrable acidity (%)	Ascorbic acid (mg/ 100 g)
1.	BSPCA-1	25.3	0.33	37.5
2.	BSPCA-2	20.6	0.34	32.4
3.	BSPCA-3	23.4	0.38	34.1
4.	BSPCA-4	24.7	0.32	36.4
5.	BSPCA-5	22.3	0.41	33.5
6.	BSPCA-6	20.1	0.37	37.8
7.	BSPCA-7	22.5	0.42	37.4
8.	BSPCA-8	23.3	0.32	35.6
9.	BSPCA-9	24.2	0.36	33.6
10.	MSCA-1	24.8	0.45	34.9
11.	MSCA-2	21.4	0.39	36.1
12.	MSCA-3	23.4	0.42	37.2
13.	MSCA-4	21.3	0.35	35.2
14.	MSCA-5	23.8	0.37	36.7
15.	MSCA-6	22.7	0.43	33.8
16.	MSCA-7	21.9	0.36	35.7
17.	MSCA-8	21.5	0.35	34.1
18.	MSCA-9	22.6	0.40	35.2
	S.E.m \pm	0.033	0.005	0.155
	C.D. at 5%	0.095	0.014	0.446

Table 2: Qualitative parameters (Total sugar, Reducing sugar and Non- reducing sugar) of *in-situ* custard apple genotypes

S. No.	Genotypes	Total sugar (%)	Reducing sugar (%)	Non - reducing sugar (%)
1.	BSPCA-1	18.20	14.50	3.70
2.	BSPCA-2	15.80	12.60	3.20
3.	BSPCA-3	16.90	13.40	3.50
4.	BSPCA-4	17.70	14.10	3.60
5.	BSPCA-5	15.10	12.30	2.80
6.	BSPCA-6	13.10	10.80	2.30
7.	BSPCA-7	16.70	13.80	2.90
8.	BSPCA-8	17.60	14.30	3.30
9.	BSPCA-9	14.90	11.82	3.10
10.	MSCA-1	17.80	14.20	3.60
11.	MSCA-2	13.00	10.90	2.10
12.	MSCA-3	13.80	11.40	2.40

13	MSCA-4	15.00	11.80	3.20
14.	MSCA-5	16.00	12.60	3.20
15.	MSCA-6	15.70	12.60	3.10
16.	MSCA-7	16.90	13.80	3.10
17.	MSCA-8	14.90	12.40	2.50
18.	MSCA-9	16.10	13.30	2.80
	S.E.m±	0.007	0.006	0.008
	C.D. at 5%	0.019	0.002	0.023

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