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Studies on performance of different custard apple (*Annona squamosa* Linn) grown in red laterite zone of West Bengal

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ABSTRACT

A study was conducted in red laterite zone of West Bengal with the view to find out suitable custard apple cultivars for the zone. Five year old nine cultivars viz., Atemoya x Balanagar, Pink Mammoth, Washington, Atmoya, Iceland Gem, Chance Seedling, Arka Sahan, Balanagar and Red Sitaphal were undertaken for the study which were planted at spacing of 3 m x 3 m following randomized block design having 3 replications with 4 plants in each replication. Results of 3-consecutive years of study clearly indicated that Island Gem gave significantly highest yield (10.7 kg/ plant) followed by Balanagar (6.1 kg/plant). Maximum fruit weight (162.0g) was recorded from Arka Sahan followed by Balanagar (128.0 g). Fruit quality in terms of TSS and acidity was good in most of the cultivars except Atemoya. Arka Sahan produced maximum sizeable fruits having highest pulp content (52.0%) maximum TSS (24.8^{0}Brix), less acidity (0.17%) highest total sugar (22.4%) with less plant mortality (0.17%). Considering over all performance, the cultivars Balanagar and Iceland Gem are recommended for commercial cultivation in red laterite zone of West Bengal or in similar agro-climatic condition. The cultivar Arka Sahan may also be recommended but special care should be taken for fruit setting and retention.

INTRODUCTION

Custard apple (*Annona squamosa* Linn), popularly called ata or sitaphal in West Bengal and Bangladesh, is commercially cultivated in dry treats of Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Bihar, Madhya Pradesh etc. The fruit prized a high demand due to its delicious taste and nutritive values (Gopalen *et al.*, 1987 and Singh, 1995). Fruits have also high demand in the industry for preparation of ice-cream and others due to richness in carbohydrates (Maurya and Singh, 2006; Nath *et al.*, 2008). The custard apple is considered as a crop of wasteland and can successfully be grown in sandy, rocky, gravel, heavy and even in saline soil (Singh, 1992). The custard apple can successfully be grown in tropical, sub-tropical, arid and semi-arid region and best performed where there is less rainfall. It is established fact that successful cultivation of any crop mainly depends on suitable cultivar/s in an area or zone and selection or recommendation of such cultivar/s require through scientific investigation. In different parts of India suitable or selected cultivars are grown (Girwani *et al.*, 2011; Bhatnagar, 2012; Rymbai *et al*., 2014 ; Ghosh, 2017). In West Bengal practically the red laterite zone, where rainfall is less as compared to other parts of the state, no such varietal recommendation is available. Thus a study was undertaken towards this direction.

MATERIALS AND METHODS

The investigation was carried out during the year 2011-2013 on five year old grafted custard apple plants *viz.*, Atemoya x Balanagar hybrid (Hybrid-1), Pink Mammoth, Washington, Atmoya, Icland Gem, Chance Seedling, Arka Sahan, Balanagar and Red Sitaphal. Original source of the cultivars was from Fruit Research Station, Sangareddy, Andhra Pradesh. The cultivars were planted at 3 m x 3 m spacing in a private Farm at Jhargram, Paschim Medinipur, West Bengal in a randomized black design having 3 replications and 3 plants in each replication. The soil of the orchard was laterite with pH 5.5. The area receives annual precipitation of about 1100-1600 mm mainly during June to September. Fruits yield was recorded at harvest The physico-chemical characteristics of fruits were noted from 5 matured fruits, collected from each

Table 1: Evaluation of different cultivars of custard apple grown in West Bengal

Cultivar	*Fruit yield / plant (kg)	**Fruit weight (g)	**Fruit length (cm)	**Fruit diameter (cm)	**Pulp content (%)	**Seed content (%)	**Skin content (%)	**TSS (°B) (%)	**Acidity (%)	**Total sugar (%)	**Plant Mortality (%)
Atemoya x Balanagar	5.9	87	5.9	6.9	33.8	4.8	61.4	20.2	0.13	18.3	86
Pink Mamonth	1.9	110	6.6	7.2	42.7	7.3	50.0	17.2	0.15	15.3	76
Washington	3.4	122	7.1	7.2	46.7	8.5	44.8	19.8	0.16	18.7	86
Atmoya	1.1	120	7.6	7.6	36.5	4.4	59.1	11.4	0.18	8.3	57
Island Gem	10.7	114	6.8	7.1	49.2	4.5	46.3	22.5	0.14	19.3	62
Chance Seedling	0.7	124	7.6	7.0	49.1	5.0	45.9	21.8	0.16	19.0	90
Arka Sahan	1.6	162	8.7	7.6	52.0	3.5	44.5	24.8	0.17	22.4	20
Balanagar	6.1	128	7.7	7.4	51.8	3.6	44.6	17.2	0.11	13.8	15
Red Sitaphal	1.6	122	7.2	7.5	47.6	5.5	46.9	16.8	0.12	15.8	81
C.D. at 5%	0.7	3.2	0.2	0.3	1.2	0.6	0.8	4.8	0.02	2.2	5.2

* Average of 3 years ** Average of 2 years

plant separately following standard procedure (A.O.A.C., 1990). Plant mortality was observed 5 years after planning.

RESULT AND DISCUSSION

Fruit yield

The data presented in Table 1 reveal that fruit yield among the cultivars was significantly varied. Highest fruit yield (10.7 kg/plant) was recorded from the cultivar Island Gem followed by Balanagar (6.1 kg/plant) and Atemoya x Balanagar hybrid (5.9 kg/plant). Rest cultivars particularly chance seedling, Red Sitaphal, Arka Sahan, Atemoya and Pink Mammonth gave poor yield (0.7 kg to 1.9 kg/plant). Arka Sahan, a promising hybrid from Indian Institute of Horticultural Research (Jalikop and Sampath Kumar, 2000), showed poor performance in respect of fruit production. The cultivars which were not performing well in the present area, however, they were reported to be good in other areas for which they have been 'named' (Rymbai *et al.*, 2014). The unsatisfactory performance of few cultivars in the studied area was mainly due to varied agro-climatic condition. Besides, fruit set and its retention are greatly affected by climatic variation and tree physiological factors (Rymbai, *et al.*, 2014).

Fruit weight and size

Fruit weight and size in custard apple are very important for consumer's acceptability. Consumer's preference is always towards larger size fruit. In the present study, the cultivar Arka Sahan significantly produced largest size fruit (162 g weight and 8.7 x 7.6 cm size) followed by Balanagar (128 g in weight). Lowest fruit weight (87 g) and size (5.9 x 6.9 cm) was recorded from the cultivar Atemoya x Balanagar hybrid (Table 1).

Pulp Content

Pulp content in custard apple is considered as one of the important selection criteria for varietal development or recommendation. In most of the local types pulp content is very poor irrespective of the fruit size/weight. From the cultivars under study, maximum pulp content was recorded from Arka Sahan (52.0%) closely followed by Balanagar (51.8%) and Iceland Gem (49.2%).

Seed Content

Seed content was highest in Washington (8.5%) followed by Pink Mammonth (7.3%) and lowest in Arka Sahan (3.5%) and Balanagar (3.6%) (Table 1).

Skin Content

Highest skin content (61.4%) was recorded from Atemoya x Balanagar hybrid followed by Atemoya (59.1%) and lowest from Arka Sahan (44.5%) closely followed by Balanagar (44.6%) (Table 1).

Fruit quality

Different quality parameters have been presented in Table 1. Significantly highest TSS was recorded from the cultivar Arka Sahan (24.8 ^{0}B) and minimum in Atemoya (11.4 ^{0}B). Acidity content in different cultivars was estimated from 0.11% (Balanagar) to 0.18% (Atemoya). Total sugar content was highest in Arka Sahan (22.4%) followed by Iceland Gem (19.3%). Variation in quality parameters among the cultivars may be due to their genetic make up which determine the ability to absorb nutrients from 'source' and their metabolism for synthesis of sugars and other products for the sink. It was interesting to note that fruit quality in respect of TSS and acidity was better in most of the cultivars as compared to the different land races of custard apple, reported by Bahatnagar *et al.* (2012).

Plant Mortality

Incidence of bacterial wilt is a common problem in many areas which lead to plant death. First symptoms were noticed as sudden yellowing of leaves followed by gradual wilting of plants which lead to ultimate death of plant. The cultivars in the present investigation showed different degree of resistance against bacterial wilt that causes plant death. Highest mortality of plant was noticed in the cultivar Chance Seedling (90%) followed by Atemoya x Balanagar and Washington (86%) and Red Sitaphal (81%). Lowest plant mortality was noticed in Balanagar (15%) followed by Arka Sahan (20%) (Table-1).

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