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# **CARIBBEAN FOOD CROPS SOCIETY**

# **37**

**Thirty Seventh  
Annual Meeting 2001**

**Trinidad and Tobago**

**Vol. XXXVII**

**BEARING CHARACTERISTICS AND YIELD IN YOUNG TREES OF SELECTED CARIBBEAN BREADFRUIT [*ARTOCARPUS ALTILIS* (PARK.) FOSBERG] CULTIVARS**

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**ABSTRACT:** The most widely recognised breadfruit cultivars in the Caribbean are the ‘Yellow’ and the ‘White’. However, yield data are not available for these cultivars or for those that are less known. Four-year old trees of 12 cultivars, five from Jamaica, five from St. Vincent and two from Trinidad and Tobago growing in a germplasm collection at the University Field Station of the University of the West Indies in Trinidad, were evaluated. The results indicated that the cultivars differed in their time of bearing, yield, fruit number and fruit size. ‘Yellow’ was earlier, less seasonal and higher yielding than most of the other cultivars during early growth.

## INTRODUCTION

The first major introduction breadfruit to the Caribbean was made by William Bligh who landed 6 trees in St. Vincent and in Jamaica in December, 1793 and February, 1794, respectively. Most of the plants were of seedless varieties and had been obtained from Tahiti, but he also collected one seedless and one seeded type from Timor (Powell, 1977). He recorded having five “kinds” (Powell, 1977, p. 396 ) of breadfruit, not including the seeded variety, therefore, four of the seedless varieties appear to have originated from Tahiti. The curator of the botanical garden in St. Vincent, to whom the plants had been delivered also reported having six varieties growing there, with differing seasons of production and levels of yield (Howard, 1950).

Today, the most widely known breadfruit cultivars, are the ‘Yellow’ and the ‘White’ and where these distinctions are not made, the cultivar is designated as ‘Common’ or ‘Creole’. The recognition of other cultivars is greatest in St. Vincent, where Roberts-Nkrumah (1997) reported the existence some 22 cultivar names, and in Jamaica where more than one dozen types have been named (Roberts-Nkrumah, unpubl.). Prior to these listings, Leakey (1977) and Andrews (1991) reported four varieties in the English-speaking Caribbean, and six in St. Vincent, respectively. The author is currently undertaking descriptions of some of these varieties.

For more than two decades, the Caribbean has been the major exporter of breadfruit to North America and to the United Kingdom. Currently, commercial breadfruit production is very limited, and one major area in which information is needed to encourage this and in particular, year-round supply, is cultivar differences in bearing characteristics and yield. During the survey of the Vincentian germplasm, differences were identified but could not be confirmed due to intervening factors such as location, age and production systems (Roberts-Nkrumah, 1997). This study was undertaken to evaluate selected breadfruit germplasm existing in the Caribbean, for these characteristics when grown under the same environmental conditions.

## MATERIALS AND METHODS

In 1992, a breadfruit germplasm collection was established at the University Field Station, Valsayn, Trinidad. The soil type is River Estate Loam and the site receives approximately 1500 mm of rain annually with 85 - 90 %, occurring between May and December.

The cultivars, ‘Yellow’ and ‘White’ obtained from eastern Trinidad, were established in the collection and were represented by five and four trees, respectively. In 1996, one tree of each of five cultivars from St. Vincent and Jamaica cultivars were added to the collection as follows:

#### Vincentian accessions

Kashee  
Hog Pen  
Hope Marble  
Cocobread  
Creole

#### Jamaican accessions

Macca  
Common/Yellow Heart  
Timor/St. Kitts  
Cassava  
Yellow Heart

The management of the trees included mulching and irrigation during the dry season, fertiliser and Nematicides applications twice yearly, fungicidal applications especially during the rainy season, and regular mechanical weed control.

Data were recorded on harvesting periods for 'Yellow' and 'White' in four-year old trees in 1996, and for eight-year old trees in 2000 to compare the effect of age on bearing pattern. Harvested yield as total fruit mass/tree and the yield components, fruit number and mean fruit size were also recorded for four-year old trees of these cultivars and, in 2000, for the Vincentian and Jamaican germplasm. Statistical analyses were not attempted because most of the accessions were single tree specimens.

## RESULTS AND DISCUSSION

### Bearing characteristics

Four-year old trees of both 'Yellow' and 'White' had a minor season in the early part of the year extending from January to February for 'White' and from February to March for 'Yellow'. The major production period, extended from May to August for 'White' and to mid September for 'Yellow' which also had another minor season in mid-November (Fig 1). Fruit were available for 20 weeks of the year. Eight-year old trees of both cultivars showed peak production during the July to August period with 'Yellow' having a more pronounced small early season lasting five weeks weeks in March to April, while there were a few single fruit harvests from 'White' between April and June. Both cultivars also had a minor season in October (Fig. 2). Fruits were available for 12 and 19 weeks in 'White' and in 'Yellow', respectively.

In contrast, the Vincentian cultivars were later bearing. The early minor season for 'Hope Marble' and 'Creole' occurred in July, for 'Kashee' in July to August and for 'Hog Pen' in August. The peak production period for these cultivars was from September to October, 'Hope Marble', 'Hog Pen' and 'Cocobread' peaking earlier than 'Kashee' and 'Creole' (Fig. 3). These peak periods extended only for three to four weeks.

Most of the Jamaican cultivars, except 'Cassava', were also later bearing than the 'Yellow' and 'White' and had an early minor season followed by a peak production period. The minor season extended for three to five weeks from July to early August and the peak season being August to September for 'Kashee' and October for the other cultivars. 'Cassava' had its major peak in July followed by a minor season in October.

While, the precise time of bearing differs annually, largely due to environmental variations, there are two important consequences of these cultivar differences in bearing pattern. Firstly, is that there is a spread in the peak production period for another two months into September and October. Barrau (1959) and Fownes and Raynor (1993) reported similar extension of breadfruit production through the differing bearing seasons. Secondly, the overlapping of major seasons of some cultivars with the minor seasons of others ensures the availability of a greater diversity of cultivars. This will facilitate a wider range of uses of the fruits but may not necessarily confer price advantages. Higher prices are possible during the November to May period, when only "Yellow" and "White" produce small harvests.

## Total Fruit Yield/Tree

At four years old, the highest yielders were 'Yellow', 'Macca', and 'Kashee' with annual production of 140 to 89 kg /tree (Table 1). At an estimated plant population of 70 trees/ha, the estimated yield potential is 9.8 MT/ha for young trees of the 'Yellow' breadfruit. 'Cocobread', 'Creole', 'Cassava', 'Timor' and 'Yellow Heart' were much lower yielding with only 50 to 30% of the production of the high yielders.

One factor that would have contributed to this difference was the duration of their availability. While differences in the relationship between yield and the yield components would most likely be another important contributor, the author suggests that differences in tree vigour and specifically branch production might limit the number of bearing sites available on a tree. At four years, 'Yellow' had more branches than the other cultivars. Fownes and Raynor (1993) found a closely correlation between tree size and canopy volume and yield in breadfruit. Another factor would be fruit number per branch. Given that by eight years, 'Yellow' was able to achieve over 300 kg/tree/year, it is important to determine how much of the yield differences identified in the study is attributable to random differences between individual trees, to genuine differences in cultivar yield potential and to adaptability to the environment. Yield potential would definitely influence choice of cultivar for commercial production.

## Fruit number/tree

Cultivars 'Yellow', 'Macca' and 'Hope Marble' (101 to 71) produced the most fruits while the fewest fruits (17 to 35) were produced by 'Cocobread', 'Common', 'Timor' and 'Yellow Heart' (Table 1), most of which were low yielders. Fruit number obviously contributed to high yield in 'Yellow' and 'Macca'. The relationship between fruit number and yield needs to be further investigated for each cultivar individually and would require a larger sample of trees. Apart from the possible factors identified above that might affect yield, another consideration that determines the number of fruits harvested would be the extent of pre-harvest drop.

## Mean Fruit Mass

The heaviest and largest fruits were those of 'Cocobread', 'Common' and 'Kashee' (2 – 1.78kg), in comparison with the small fruits of 'Cassava', 'Yellow Heart', 'Creole' and 'White' (1.17 to 1.29 kg). The other cultivars were approximately 1.4 to 1.6 kg (Table 1).

Fruit mass at harvest is influenced by the duration of the fruit growth period, the suitability of growing conditions, including the presence of disease. Since all fruit were harvested at maturity, environment and disease were the major factors that could have affected size. It is well known that breadfruit grown in high rainfall areas tend to be larger than those grown in drier areas. Roberts-Nkrumah (1997) also reported larger fruit mass for cultivars such as 'Hog Pen' (2.7 kg) and 'Creole' (2.3 kg) in St. Vincent than those obtained in this study. A high incidence of fruit rot was also observed in the field in 2000.

Again, there is need to establish the relationship between fruit mass and yield. Large mass did not compensate for low fruit number in 'Cocobread' and 'Common' but it contributed along with fruit number to high yield in 'Kashee'.

## CONCLUSIONS

At four years old, 'Yellow' from Trinidad was superior to the other breadfruit cultivars under the conditions at the University Field Station. It was not only earlier-bearing and gave three harvest seasons, two minor and one major, as did 'White', but it gave the highest yields because it produced a large number of medium-sized fruits over a longer period. The season of breadfruit availability could be extended by two months by planting a mixture of the Trinidadian, Jamaican, and Vincentian cultivars.

The relationships between yield and fruit number and fruit mass should be investigated for each cultivar although from this study, high fruit number was more commonly associated with high yield than large fruit mass. Since environment influences bearing pattern, tree vigour and the yield components, a multi-locational with larger tree samples per cultivar is required to obtain a more conclusive evaluation of the commercial potential of the less known cultivars in Trinidad.

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Table 1. Total fruit yield/tree, number of fruits, and mean mass of harvested fruit of four-year old trees of selected Caribbean breadfruit cultivars

CULTIVAR	YIELD (kg)	FRUIT NO.	MEAN MASS (kg)
Yellow (TT)	140.39	105	1.44
White (TT)	70.14	67	1.29
Kashee (SV)	88.5	55	1.78
Hog Pen (SV)	79.8	48	1.58
Hope Marble (SV)	74.85	71	1.42
Cocobread (SV)	35.45	17	2
Creole (SV)	52.4	44	1.25
Macca (J)	101.9	82	1.45
Common (J)	62.4	27	1.84
Timor/St. Kitts (J)	34.13	28	1.41
Cassava (J)	50.6	47	1.17
Yellow Heart (J)	42.25	35	1.25

J = Jamaica, TT = Trinidad and Tobago, SV = Saint Vincent.

Fig. 1 Pattern of Fruit Production in Breadfruit Cultivars Yellow and White in 1996

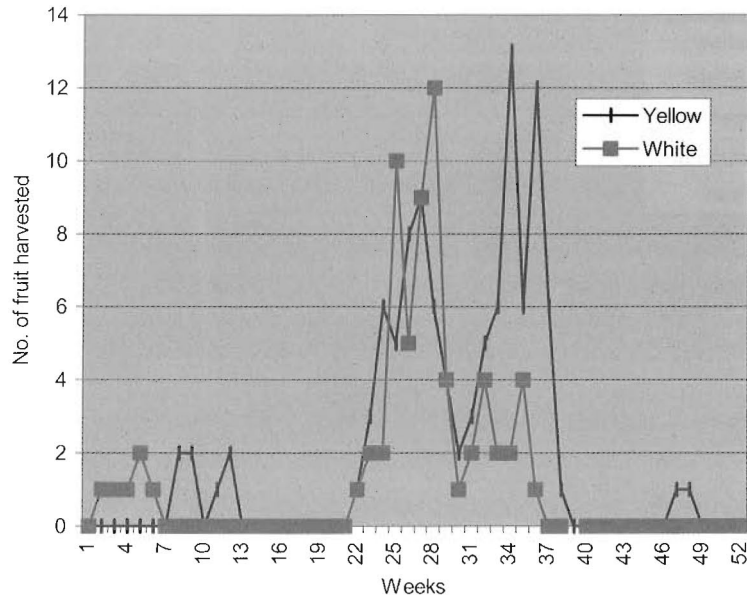


Fig. 2 Pattern of Fruit Production in cv Yellow and cv White in 2000

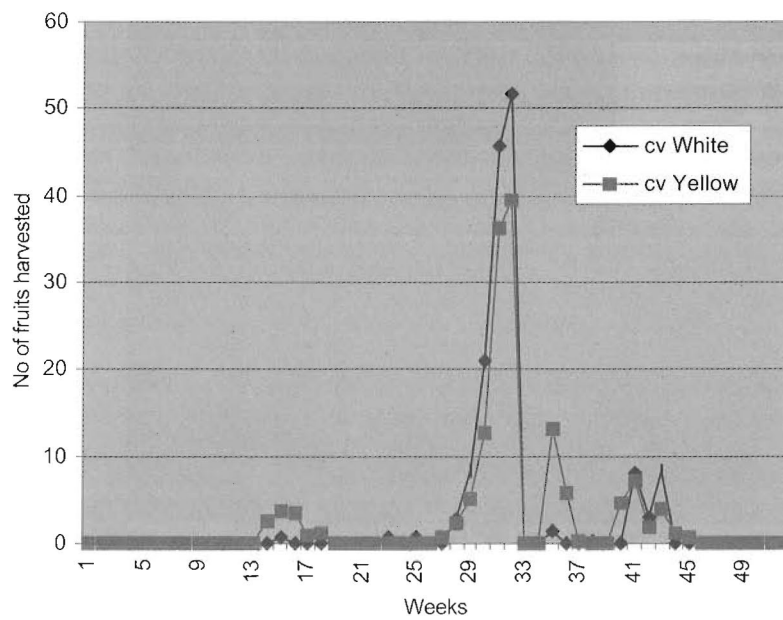


Fig. 3 Pattern of Fruit Production in Vincentian Breadfruit Cultivars in 2000

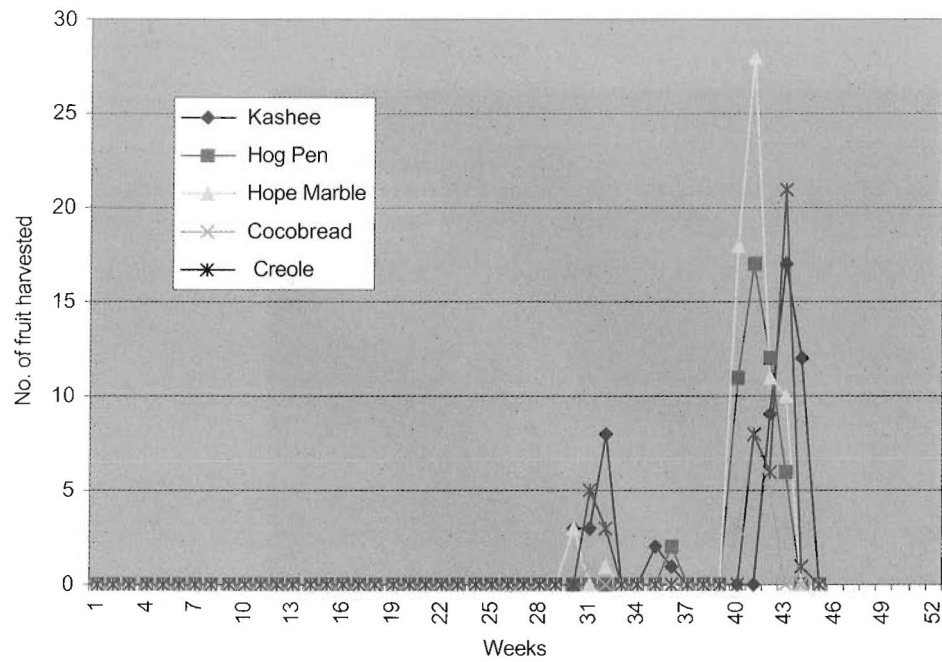


Fig. 4 Pattern of Fruit Production of Jamaican Breadfruit Cultivars in 2000

