Queensland Journal of Agricultural and Animal Sciences Vol. 45 (2), 139-143 (1988)
Published by the Queensland Department of Primary Industries

Yield and plant characteristics of 21 banana cultivars in north Queensland

J. W. Daniells[1] and P. J. O'Farrell[2]

[1] South Johnstone Research Station, Department of Primary Industries, PO Box 20, South Johnstone, Q. 4859 Australia.

[2] Walkamin Research Station, Department of Primary Industries, Q. 4872, Australia.

Abstract

Data on the yield and plant characteristics of 21 banana cultivars were collected over three crop cycles, plant crop and two ratoons, at South Johnstone, north Queensland. (Lat 17° 38′ S). The cultivars were from the genomic groups AA, AAA, AAB and ABB.

Bunch weights of the Cavendish subgroup of cultivars were about twice those of the other cultivars. Productivity per unit height ('Harvest Index') as indicated by bunch weight:pseudostem height was also much higher. High yields of the Cavendish subgroup were a function of both high finger number per bunch and long fingers. None of the cultivars outside of the Cavendish subgroup was a satisfactory substitute for the commercial cultivar, Williams, because of low yields. Of the non-Cavendish cultivars, Pacific Plantain (dual dessert–cooking) and Lady Finger (dessert) have the best prospects for development to satisfy alternative consumer use.

INTRODUCTION

The banana industry in Queensland is based on the cultivars Williams,Mons Mari and Lady Finger. Williams and Mons Mari are both Giant Cavendish types and account for approximately 65% and 20% of the production area respectively. Mons Mari and Lady Finger are grown predominantly in southern Queensland.

Interest in new cultivars has gained momentum in recent years due to a new race of Panama disease (*Fusarium oxysporum* f. sp. *cubense* Race 4) in southern Queensland to which Williams, Mons Mari and Lady Finger are susceptible. There is also increasing awareness in Australia of alternative banana cultivars with distinct flavours and culinary uses and hence a potential new market.

Several cultivars have been in Australia for many years (Daniells 1986). However, until the recent work of Turner and Hunt (1984) little agronomic information on these varieties has been available. No evaluation of these varieties under north Queensland conditions has been published.

This study evaluated the yield and plant characteristics of 21 banana cultivars in the north Queensland environment.

MATERIALS AND METHODS

The study was conducted at South Johnstone, north Queensland (17° 38′ S) on a deep alluvial clay loam during 1982–86.

Data from 21 cultivars (Table 1) were collected over three crop cycles: plant crop, ratoon 1 and ratoon 2, except for Bluggoe and Blue Java in which ratoon 2 was abandoned

due to infection with Panama disease (Race 2). More detailed information on the 21 cultivars is provided by Turner and Hunt (1984) and by Daniells (1986). Mons Mari was not included as no planting material was available in north Queensland. Plant spacing was 5 m × 1.5 m (1333 plants/ha). Each cultivar was represented by a single row plot of 11 plants, the middle five of which were sampled. Interplot competition between cultivars was minimised by planting taller cultivars to one side (in order of their expected heights) and by using 5 m row spacing.

Table 1. Details of the 21 banana cultivars

Cultivar and genomic constitution*	Notes
AA group	
Sucrier (Pisang Mas)	Distinctive bright green leaves
AAA group	
Gros Michel	Former cultivar of the world export trade
Red Dacca (Red)	Distinctive red petioles, midribs and fruit
Green Dacca (Green Red)	Believed to be a tissue chimera originating from Red Dacca
CAVENDISH Subgroup (of AAA group)	
Dwarf Cavendish	Former commercial cultivar in Australia
Cavendish S (Queensland Cavendish)	Selection from S.E. Queensland
Cavendish N (Dwarf Mons)	Selection from S.E. Queensland
Cavendish C (Maroochy Mons)	Selection from S.E. Queensland
Williams	Commercial cultivar in N. Queensland
Hsien Jen Chiao	Introduction from Taiwan
Green Williams	Green pseudostem selection of Mr. L. Buglar, Tully, N. Qld
Large Williams	Tall pseudostem selection of Mr. L. Buglar, Tully, N. Qld
AAB	
Pisang Rajah	Dual purpose—dessert/cooking
Horn Plantain (Pisang Tandok)	Cooking type. Male flowering axis absent
Mysore	Distinctive pinkish—purple midribs
Lady Finger-Improved (Pacha Naadan)	Commercial cultivar in S.E. Queensland
Lady Finger-Old (Pome)	Former commercial cultivar in S.E. Queensland
Pacific Plantain† (Corne Plantain, Maia Maoli/ Popoulu type)	Dual purpose—dessert/cooking. Distinctive dark purple leaf bases
ABB	
Bluggoe	Cooking type. Very angular fruit
Ducasse (Pisang Awak)	Common home garden cultivar in N. Queensland
Blue Java	Distinctive silvery wax bloom on fruit

*The genomic constitution is the genetic composition. Bananas are either diploid, triploid or tetraploid. The edible bananas are believed to have developed from two species, *Musa acuminata* (AA) and *Musa balbisiana* (BB). The letters A and B refer to the relative contribution made to the cultivar from those two species.

†We have given this cultivar a new name (formerly Corne Plantain) to distinguish it from the Corne Plantain type which it is not.

Plants received a banana mix fertiliser (11.1 : 1.7 : 17.6 NPK) at the rate of 300 kg/ha/month. Dolomitic limestone was applied at 1.2 t/ha at six monthly intervals. Drip irrigation ensured that water was freely available to plants throughout their growth. Leaf Spot caused by *Mycosphaerella musicola* Leach was controlled by application of mancozeb and miscible oil at fortnightly intervals. Red-shouldered leaf beetle (*Monolepta* sp.) was controlled by carbaryl sprays as required.

Bunches were harvested when they began to ripen in the field since little was known about the harvest times for many of the cultivars. The characteristics recorded at harvest were : bunch weight, finger number per bunch, pseudostem height, and finger length and caliper diameter on the third hand from the proximal end.

Results for each cultivar were averaged over three crop cycles. Confidence intervals (95%) were calculated from pooled variances over the three crop cycles.

RESULTS AND DISCUSSION

Since there was no replication, comparisons among cultivars should be made only with caution. The results indicate the likely performance of the cultivars in north Queensland at a density of 1333 plants per hectare. Only major differences are presented. Results are averages over the three crop cycles. Plants in the plant crop on average were much shorter than in the two ratoons (3.05 m versus 3.98 m and 4.21 m respectively). These shorter plants were associated with lower average bunch weight in the plant crop (24.7 kg) compared to the ratoons (35.1 kg and 34.5 kg). Lower bunch weight was a function of lower finger number per bunch (127 versus 165 and 164).

The average bunch weight per crop ranged from 9 kg for Sucrier to 51 kg for Williams (Figure 1a). The Cavendish subgroup had the heaviest bunch weights. Because the range in plant size amongst cultivars was large (Figure 2a) optimum densities to maximise yields of each cultivar need to be determined. Bunch weight: pseudostem height is a rough harvest index proposed by Turner and Hunt (1984). The Cavendish subgroup was the most efficient in producing fruit with 14 to 18 kg fruit/m pseudostem height (Figure 2b). Cultivars other than the Cavendish subgroup produced 3.5 to 9 kg fruit/m pseudostem height. If these cultivars are to be grown commercially they must command considerably higher prices per carton to be profitable. Harvest indices obtained in our trial were almost twice those obtained by Turner and Hunt (1984) in New South Wales. This was due to the more favourable conditions for fruit filling at South Johnstone and because we harvested fruit when it was larger and more mature.

For the reasons just mentioned the bunch weights were about twice those obtained by Turner and Hunt (1984). Turner and Hunt harvested bunches when there was a lack of angularity in the fingers. Our data give an indication of how large the fruit can grow (Figure 1b). Commercially, bunches would need to be harvested well before these diameters are obtained to ensure adequate greenlife. Actual finger diameters (fruit size) at which it is best to harvest commercially would require additional research. We compared averagefinger weight of Williams from this trial with fruit harvested from another trial (J. W. Daniells unpub.data 1984) at the same time of year but at a finger diameter of 37 mm which approximates a commercial harvest and provides adequate greenlife. Average finger weight of fruit harvested at 37 mm was 75% of that from our study. After correcting for bunch stem, an earlier harvest would have given a bunch weight approximately 77% of that which we obtained for Williams. We could therefore expect an earlier harvest of the cultivars, to give yields of the order of 77% compared to the yields we obtained.

Another important aspect of yield is yield per unit time (t/ha/yr). Most cultivars cycled every 10 to 12 months over the three crops (Figure 2c). Sucrier, however, took only 7.4 months, Gros Michel and Pisang Rajah, 14 months, and Green Dacca and Red Dacca, 16 months. Thus the latter four cultivars were considerably less productive. Crop cycles were about 3 months shorter than in the cooler environment in New South Wales (Turner and Hunt 1984).

Sucrier took only 2.4 months for bunch filling which is approximately half that for the Cavendish subgroup which uniformly required about 4.7 months (Figure 2d). Pisang Rajah, Pacific Plantain and Horn Plantain also had shorter bunch filling periods (3.3 to 4.2 months). The Lady Finger cultivars took approximately one month longer to fill than the Cavendish subgroup.

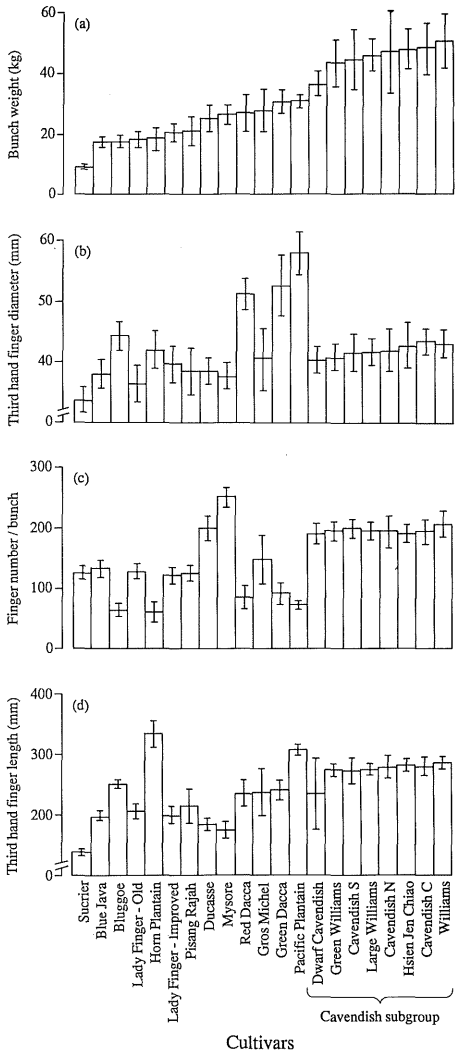

Figure 1. Effect of cultivar on (a) Bunch weights; (b) Third hand finger diameter; (c) Finger number per bunch and (d) Third hand finger length.

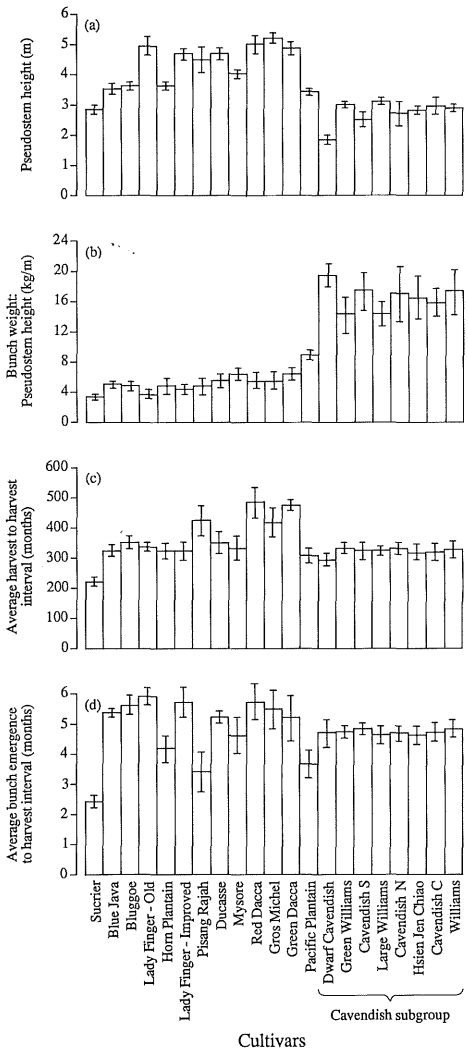

Figure 2. Effect of cultivar on (a) Pseudostem height; (b) Bunch weight: pseudostem height; (c) Average harvest to harvest intervals and (d) Average bunch emergence to harvest interval.

High finger number per bunch and long fingers both contributed to the heavier bunch weights of the Cavendish subgroup (Figure 1c and 1d). Mysore and Ducasse also had high finger number, but fingers were very short. Pacific Plantain and Horn Plantain had the longest fingers (310 to 330 mm) but finger number per bunch for both these cultivars was very low. There was a large range (1.85 to 5.21 m) in pseudostem heights among the cultivars (Figure 2a). Shorter cultivars generally are favoured commercially for ease of crop management. There is also a tendency for taller cultivars to be more susceptible to wind damage. However, Lady Finger, Ducasse and Pacific Plantain were notable exceptions and were strong plants well able to support their bunches without assistance. Pseudostem heights were generally 0.5 to 1.0 m greater than those obtained in New South Wales by Turner and Hunt (1984).

Determination of cultivar susceptibility to pests and diseases was not a major objective of the study, the onus being on control to allow expression of yield potential. We suspect that the Panama disease was introduced to the site by infected planting material of Bluggoe in a guard row and spread to sample rows. According to Simmonds (1962) it is highly unlikely that any of the other cultivars apart from Bluggoe and Blue Java are susceptible to Race 2 of Panama disease. Red-shouldered leaf beetle was noted preferentially attacking the cultivars Blue Java, Bluggoe, Ducasse, Lady Finger, Pisang Rajah, Horn Plantain and Mysore.

This trial was a preliminary comparison of cultivars. A replicated trial would be necessary to separate the Cavendish subgroup representatives as only small differences appear to exist among this group. Williams, the commercial cultivar in north Queensland, had the greatest bunch weights in our trial. Dwarf Cavendish and Cavendish S had shorter pseudostems which may be an advantage in some situations. However, their shorter stature was associated with greater incidence of 'choke throat' (Mobbs 1961) in our trial. The susceptibility of all the cultivars to all major diseases is not yet known. However, the yield information indicates that there are no satisfactory replacements for the Cavendish subgroup from those evaluated in this study.

With the current interest in exotic tropical fruits the opportunity exists for cultivar diversification to satisfy culinary and taste preferences of consumers. Our impression is that Pacific Plantain (cooking) and Lady Finger (dessert) have the best prospects for development when yield, fruit quality and plant characteristics are considered. There is also some minor potential for Red Dacca, Ducasse, Horn Plantain, Mysore, Bluggoe and Pisang Rajah.

We are optimistic about Lady Finger bananas despite their susceptibility to Race 1 of Panama disease and the historical spread of this disease through southern Queensland and northern New South Wales growing areas. If new production areas are selected and established with tissue cultured plants and quarantine procedures enforced, Lady Finger bananas can be grown successfully for many years to come. The same holds true for Red Dacca, Ducasse and Mysore which are also susceptible to Race 1 of Panama disease. The presence of Race 4 of Panama disease in southern Queensland which attacks a wide range of cultivars means that all growers of all cultivars need to ensure planting material is free of Panama disease and practice quarantine to keep the disease from entering their properties.

ACKNOWLEDGEMENTS

Thanks are due to staff of Queensland Department of Primary Industries South Johnstone Research Station for assistance in the conduct of the trial and to Mr J. C. Mulder for assistance in the analysis of results.

References

Daniells, J. W. (1986), Banana cultivars in Australia, *Queensland Agricultural Journal* **112**, 75–84.

Mobbs, J. A. (1961), Cavendish or Mons Mari, *Queensland Agricultural Journal* **87**, 766–68.

Simmonds, N. W. (1966) *Bananas*, Longman, London.

Turner, D. W. and Hunt, N. (1984), *Growth, yield and leaf nutrient composition of 30 banana varieties in subtropical New South Wales*, Technical Bulletin 31. Department of Agriculture New South Wales Sydney.

(Accepted for publication 14 September 1988)