

CONSUMER PREFERENCE FOR TWO FHIA HYBRIDS (FHIA-01 AND FHIA-25) AND CAVENDISH BANANAS IN GHANA

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Abstract

Bananas are increasingly important to export diversification. A comparatively short post-harvest shelf-life of banana coupled with a dearth of sufficient and good quality transportation as well as storage facilities leads to perishing of 35-40% of this highly nutritious fruit before it reaches the consumer. One effective method of reducing this huge loss is to extract the juice and preserve it. As of now, no commercially established process is available to achieve this in Ghana. A study was conducted to develop and assess the quality of natural fruit drink of two FHIA hybrid bananas and local Cavendish banana in Ghana. Physiologically matured fruits harvested from the banana orchard of the Crops Research Institute at Fumesua near Kumasi was supplied to an industrialist for processing. Sensory evaluation was conducted using untrained panelist. The sugar content of FHIA-01 (hybrid) was 20% compared to 11% for the local banana (Cavendish) and FHIA-25 (hybrid). The sedimentation of FHIA-01 was 50% less compared to the local banana. FHIA-01 was superior to Cavendish and FHIA-25 in terms of flavour. Based on the overall acceptability, results indicated that the two hybrids were excellent for juice production. Correlation analysis of the results showed that though sweetness ($r = 0.046$; $P < 0.0001$) and colour ($r = 0.23$; $P < 0.0001$) were important for consumers, aroma ($r = 0.56$; $P < 0.0001$) and taste ($r = 0.63$; $P < 0.0001$) were the most important factors for the overall acceptance of the juice. This implied that less amount of commercial sugar was needed for sweetening FHIA-01 juice for acceptability as compared to the local banana, which required higher amount of sucrose. The sedimentation inferred that FHIA-01 was lighter with fewer residues than the local banana.

Keywords: Musa, banana, hybrids, fruit juice, processing

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1. INTRODUCTION

Nearly 90% of the total banana produced worldwide (63 million tonnes) are consumed locally in the producing countries leaving only 10% for export (CGIAR, 1992, 1993). Bananas are also a very important staple commodity for many developing countries, together with wheat, rice or corn, hence the relevance of bananas for food security (UNCTAD, 2007). Bananas are also very important sources of rural income (Ortiz and Vuylsteke, 1996).

Banana is a famous tropical fruit, which is widely favoured for its abundant nutrition, cheerful flavour and aroma. Bananas are currently the third leading horticultural export crop from Ghana. Banana exports play a small but growing role in Ghana's export trade. Bananas constitute about 13 percent of

horticultural exports but only about half of one percent of total exports by value. Bananas are among the cheapest foods to produce in Ghana. A comparatively short post-harvest shelf-life of banana coupled with a dearth of sufficient and good quality transportation as well as storage facilities leads to perishing of 35-40% of this highly nutritious fruit before it reaches the consumer. One effective method of reducing this huge loss would be to extract the juice out of the fruit before it perishes and preserve it. As of now, no commercially established process is available to achieve this.

The banana industry is more conducive to large scale plantation agriculture. It is more efficient for production and harvesting to operate large contiguous tracts of land rather than many small separate parcels. Due to the extremely competitive nature of the international banana industry, there is no room

for error in terms of a missed crop protectant application or cultural practice that may occur with smallholder farmers. Therefore, other than possible small-scale organic production, it is highly unlikely there will be smallholder production of bananas for export in Ghana. Nevertheless, the economic impact of establishing several thousand hectares of banana production by multi-national firms will be huge in terms of direct employment and job creation.

While bananas have lesser importance as a basic food item, they have become an important export commodity. Bananas provide jobs and significant incomes for hundreds of plantation workers. Bananas are also increasingly important to export diversification. A comparatively short post-harvest shelf-life of banana coupled with a dearth of sufficient and good quality transportation as well as storage facilities leads to perishing of 35-40% of this highly nutritious fruit before it reaches the consumer. One effective method of reducing this huge loss would be to extract the juice out of the fruit before it perishes and preserve it. As of now, no commercially established process is available to achieve this.

The moisture content of banana is in bound form as against that in many other fruits like apples and citrus fruits. The remaining pulp can be converted into fine banana powder through freeze-drying followed by grinding. Therefore, developing processed banana products would be a method for reducing the loss of fresh fruit during storage and distribution. Clear banana juice, with highly acceptable aroma, can be used in various foods and drinks. The mechanism of browning and second sedimentation of the juice indicates the direction of further work.

Bananas are known to be a great source of calcium, vitamins A, B1, B2, B3, B6, C and minerals such as potassium and phosphorous. Ripe mashed plantain is an excellent food for babies after the six month exclusive breast feeding. This advantage is due to the easy digestibility and the mineral and vitamin content. For elderly people, the fruit can be consumed in large quantities without being

fattening or causing digestive disturbances (Asian Online Recipes, 2003).

Banana is known to be low in sodium (Chandler, 1995). It contains very little fat and no cholesterol; therefore it is useful in managing patients with high blood pressure and heart disease. They are free from substances that give rise to uric acid therefore, they are ideal for patients with gout or arthritis. Due to the low sodium and protein content, plantain is used in special diets for kidney disease sufferers. The capacity of the plantain to neutralize free hydrochloric acid suggests its use in peptic ulcer therapy (Asian Online Recipes, 2003).

A fully ripe banana mixed with milk powder is especially recommended for ulcer patients. For patients with gastritis and gastroenteritis, banana is one of the first foods to be introduced after nausea and vomiting are brought under control. The low lipid/high palatability combination is ideal for the diet of obese people (Asian Online Recipes, 2003). The plantain plant has also some medical properties. The leaves can be pounded and applied to the wound to suppress bleeding.

2. MATERIAL AND METHODS

Physiologically matured green fruits of FHIA-01 and FHIA-25 were harvested from the banana orchard of the Crops Research Institute at Fumesua near Kumasi in Ghana. Cavendish was purchased from a banana selling spot near Kwame Nkrumah University of Science and Technology (KNUST) also in Kumasi. The fruits were given to an industrialist to process into fruit juice. The fruits were store in an aerated room and allowed to ripen naturally.

Two kilograms each of the ripe fruits of FHIA-01, FHIA-25 and Cavendish were washed thoroughly, peeled and blended with a kitchen blender. To avoid blackening, the pulps were placed in water. The slurry thus formed was diluted with warm water. The puree and water were in the ratio of 1:3. The warm water was added while straining with straining cloth.

Table 1. Hedonic scoring for the assessment of consumer acceptability of banana juice

| Scale | Taste | Colour | Flavour/Aroma | Sweetness | Overall acceptability |
|-------|-----------------|----------------|---------------|------------|-----------------------|
| 1 | Excellent | Excellent | Excellent | Very sweet | Excellent |
| 2 | Very acceptable | Like very much | Very Good | Sweet | Very good |
| 3 | Good | Good | Good | Not sweet | Good |
| 4 | Fair | Pale | Fair | Fair | Fair |
| 5 | Poor | Poor | Poor | Bitter | Poor |

The juice produced was stored in plastic cool chambers. The brix of the juice produced was determined. Acetic acid and other preservatives were added to prolong the shelf-life of the juice produced. The products were bottled and stored in a cool place until the sensory evaluation. One batch was stored to determine the shelf life of the juice so produced.

A taste panel of 20 untrained judges, 11 males and 9 females, selected from Kumasi, Ghana, participated in the evaluation process. The descriptive testing approach (scoring) was used. Assessors were asked to compare the two coded samples on the bases of taste, colour, aroma, sweetness and overall acceptability, using the hedonic descriptive scale of 1-5 (Table 1). The panelists were asked to inspect, smell or taste, then score on a scale 1 to 4 (1 = Very good, 2 = Good; 3 = fair; 4 = poor) the coded samples of the juice for appearance (the physical look of the juice), flavour (the smell or aroma), and taste. All the panelists evaluated samples of each juice at the same time. After scoring each juice on the four criteria, they were asked to give an overall rating of each of the juice preparations. After tasting each coded sample they washed their mouths before moving on to the next sample. Shelf-life was determined by placing the bottled juices in a cool place at room temperature. Samples were taken on monthly interval for tasting for nine months when the colour of the juice changes.

3. RESULTS AND DISCUSSION

The results showed that the sugar content of FHIA-01 was 20% compared with 10-12% for the local banana (Cavendish) and FHIA-25. This implied that less amount of commercial sugar was needed for sweetening FHIA-01 juice to reach the acceptable level as compared to the local banana, which required higher amount of sucrose. The sedimentation of the hybrids (FHIA-01 and FHIA-25) was 50% less than that of the local banana; which inferred that the hybrids were lighter with fewer residues than the local banana. FHIA-01 was superior to Cavendish and FHIA-25 in terms of flavour. The banana flavour of FHIA-25 could only be felt beyond stage 7 of ripening. The colour of the juice from FHIA-25 was pale compared to that of FHIA-01 and Cavendish

There was no significant difference between the nutritional values of the varieties. Clear juice with a yield of up to 55%(w/w) was obtained without addition of any enzymes and can be stored up to one year on the shelf at room temperature (25⁰C) when preservatives are added. The juice is clear and viscous liquid with a distinct banana flavour. The composition of the juice obtained from fully ripened Cavendish Banana is- sugar 25 to 35 %, solids 25 to 27%, specific gravity 1.07 to 1.14 and the pH ranging from 3.58. to 4.8.

Table 2. Nutritional Values of juice from some banana varieties

| | FHIA-01 | FHIA-25 | Cavendish |
|--------------------|---------|---------|-----------|
| Total Carbohydrate | 20mg/ml | 21mg/ml | 20mg/ml |
| Total protein | 1.6 % | 1.7% | 1.6% |
| Total ash | 1.77% | 1.68% | 1.77% |
| Total acid | 2.49% | 2.50% | 2.48% |
| pH | 4.58 | 4.58 | 4.58 |

Table 3. Comparative sensory evaluation of fruit juices of hybrid bananas (FHIA-01, and FHIA-25) and Cavendish

| Hybrid/cultivar | Sensory quality features | | | | |
|-----------------|--------------------------|-------|--------|-----------|-----------------------|
| | Flavour/Aroma | Taste | Colour | Sweetness | Overall acceptability |
| FHIA-01 | 4.62a | 4.62a | 4.24a | 3.67a | 4.54a |
| FHIA-25 | 4.31b | 3.84b | 3.67b | 2.01b | 3.31b |
| Cavendish | 4.62a | 4.62a | 4.24a | 3.67a | 4.51a |

Letters in common within columns were not significantly different at the 1% level.

The results showed that the blackening of banana during processing can be overcome. One kilogram of banana could produce an average of four liters of natural drink.

The nutritional values of the juice showed that there was no difference in the carbohydrate and protein levels in the three varieties used (Table 2). The juice produced from banana was quite acidic (pH 4.58).

The consumer preference results showed that FHIA-01 compared favourably with the Cavendish banana (Table 3). The flavour of the drink was an important component in the processing business. Of the 20 panelists who participated in the sensory evaluation studies 100% indicated their acceptance of the flavour for FHIA-01 and 60% for FHIA-25. The banana aroma was very high for FHIA-01 and the Cavendish banana. FHIA-25 scored low and the banana aroma was observed at stage 6 of ripening. The sugar content for FHIA-25 was also very low. However the juice from the two hybrids was accepted by consumers. The sweetness is important to consumers. The panelists were thus asked to compare the sweetness based on the hedonic scoring scale of 1-5 (Table 1). A total of 70% indicated that juice from FHIA-25 was sweet compared to 100% for FHIA-01 and Cavendish banana. In a similar study in Nigeria and Ghana, hybrids were most preferred when processed (Ferris et al., 1996, Dadzie, 1998; Dzomeku et al., 2006). Based on the overall acceptability results indicated that the two hybrids were excellent for juice production. Correlation analysis of the results showed that though sweetness ($r=0.046$; $P<0.0001$) and colour ($r=0.23$; $P<0.0001$) were important for consumers, aroma ($r=0.56$;

$P<0.0001$) and taste ($r=0.63$; $P<0.0001$) were the most important factors for the overall acceptance of the juice.

4. CONCLUSIONS

Hybrid bananas (FHIA-01 and FHIA-25) could be processed into fruit juice to prolong the shelf life. The sugar content of FHIA-01 was twice as high as that of the local Cavendish banana and FHIA-25. Less amount of commercial sugar is therefore needed for sweetening FHIA-01 juice for acceptability as compared to the local banana. The sedimentation of the FHIA hybrid bananas (FHIA-01 and FHIA-25) were 50% less than that of the local banana; which inferred that they were lighter with less residues than the local banana. The banana aroma was highest in FHIA-01 compared to FHIA-25 and Cavendish banana.

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