



QUALITY STUDIES IN DIFFERENT CULINARY CULTIVARS OF BANANA

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Abstract

The investigation on “Studies on quality of different culinary cultivars of banana” was carried out during 2013-14 at Horticultural Research Station, Kovvur (West Godavari District), Andhra Pradesh, India. The present study indicated significant differences in the fruit quality of different culinary banana cultivars. Kothia significantly recorded the high peel thickness, whereas pulp : peel ratio is highest in Burro Cemsa. Similarly, total starch percentage (DW) is highest in Kovvur Bontha. Comparatively, highest shelf life of 9.66 days was observed in Burro Cemsa and Cuba. The least shelf life was recorded in FHIA-03. The pulp dry matter content is high in Saba followed by FHIA-03. The time taken for cooking is less in case of FHIA-03 as compared to triploids and as such 80% firmness of tetraploid hybrids *i.e.*, FHIA-03 is lost within 5-10 minutes of cooking. The cultivar FHIA-03 and kovvur Bontha were observed to be best with regards to cooking quality. The good cooking quality may be due to high dry matter content. Similarly, in the organoleptic test also FHIA-03 and Kovvur Bontha scored well followed by Saba and Booditha Bontha Batheesa. Thus, an overall assessment of fruit quality projected the superiority of FHIA-03 and Kovvur Bontha whereas, FHIA-03 is not so good as compared to Kovvur Bontha due to its poor shelf life and difficulty in peeling.

Key words : Banana, fruit quality, randomized block design, peel thickness, starch content.

Introduction

Banana is one of the most important fruit crops majorly grown in India. In India, major producing states are Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Assam and Madhya Pradesh. Andhra Pradesh being one of the important states in India growing banana harbors a wide diversity of crop in both culinary and dessert cultivars. Almost all the south Indian states are having this culinary banana as a dish twice a week at their homes. Hence there is a growing demand for these culinary bananas nowadays. However, quality of the fruit is one of the important components to be considered. The cooking type banana reportedly forms a major staple in some countries like Tanzania (Seenepa *et al.*, 1986). It is also a raw material for processed foods. Therefore, the present study is undertaken to identify the culinary banana cultivar/hybrids with good quality among different culinary cultivars of banana.

Materials and Methods

The investigation on “Studies on quality of different culinary cultivars of banana” was carried out during 2013-

14 at Horticultural Research Station, Kovvur (West Godavari District), Andhra Pradesh, India. Eight culinary banana cultivars *viz.*, Bangrier, FHIA-03, Kothia, Burro Cemsa, Booditha Bontha Batheesa, Saba, Cuba and Kovvur Bontha were planted in randomized block design with three replications. The suckers were planted at 2 × 2 m spacing and biometrical observation on quality characters were recorded. Quality parameters such as peel thickness, pulp : peel ratio starch percentage (%), organoleptic test and cooking quality were recorded at green mature stage.

The peel thickness of five randomly selected fruits from each treatment was measured with the help of digital Vernier calipers and the average values were computed. 5 fingers from the second hand were taken and weighed. The fingers were peeled out. The weight of the pulp and peel were recorded in grams. Then the pulp and peel ratio was calculated. The starch percentage was estimated by anthrone method following the method of Mc Cready *et al.* (1950). 300mg dry powder sample was ground in a mortar and pestle with 5ml of 80 per cent ethanol and was kept aside for an hour. Later, it was centrifuged at 6500 rpm for 2 minutes at 27°C and the

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supernatant liquid was discarded and residue was extracted thrice with 80 per cent ethanol. Then place them in water bath at 45°C for 8 minutes later treated with 5ml of water and 6.5 ml of 52 per cent perchloric acid for two hours then again run centrifuge for 3 minutes at 0°C with 6500rpm. The supernatant was collected by filtering and repeated this step for twice. Supernatant is made upto volume of 100ml with distilled water. From this aliquot of 0.1 ml was pipetted out into a test tube to which 0.9ml of water and 4ml of freshly prepared 0.1 per cent anthrone reagent (200 mg dissolved in 200ml of concentrated sulphuric acid) was added slowly. It was kept in ice bath for five minutes and the content was later shaken well and brought to room temperature followed by immersion in warm water bath for ten minutes and cooling in tap water. The development of green color was measured in spectrometer at 630nm and the amount of sugars present was worked out from the standard graph prepared by plotting the absorbance to the corresponding known concentration of glucose. Then the value is multiplied with factor 0.9 to convert it into starch content. The results were expressed as percentage.

The end of the shelf life was decided when more than 50 per cent of the fruits started shrivelling, which was judged by visual scoring.

Dry weight of banana pulp was estimated by taking 100g of uniform size fresh pulp cut into small chips. Chips were air dried and then oven dried at 60°C till constant weight was obtained and their dry weight were recorded.

Organoleptic test was done by observing the color, texture, taste and flavour of the boiled banana fingers for each treatment, which was judged manually. Cooking quality was studied in terms of cooking time. The freshly harvest mature green fingers of uniform size and weight are peeled off and cut into small pieces and allowed for boiling. Time of cooking was noted when the pieces achieved transparent cooked appearance and when the texture of pieces become smooth (edible texture).

Results and Discussion

The quality parameters observed in the study is furnished in table 1.

Peel thickness (mm)

Peel thickness was significantly recorded highest in Kothia (4.20 mm) and on par with Booditha Bontha Batheesa (4.15 mm), Burro Cemsa (4.12), FHIA-03 (4.08 mm), Cuba (3.98 mm), Bangrier (3.95 mm) and Saba (3.91 mm). The lowest peel thickness was recorded in Kovvur Bontha (3.07 mm).

Pulp peel ratio

Pulp : peel ratio ranges from 1.98 to 2.68 among different cultivars. It was recorded highest in Burro Cemsa (2.68) and it was on par with Kothia (2.47). Saba (2.27), Cuba (2.24), Bangrier (2.18), FHIA-03 (2.10) and Kovvur Bontha (2.06) recorded intermediate values and were statistically on par with each other. Minimum pulp : peel ratio was recorded in Booditha Bontha Batheesa (1.98).

Starch percentage (%)

Starch content of different banana cultivars was recorded in the range of 70.74% to 76.11%. The highest starch content was recorded in Kovvur Bontha (76.11%) and it was on par with Saba (75.45%). Lowest starch percentage was recorded in Kothia (70.74%). Remaining cultivars *viz.*, Bangrier (72.99%), Burro Cemsa (72.21%), FHIA-03 (72.03%) and Booditha Bontha Batheesa (71.33%) recorded intermediate values which were at par with each other.

Shelf life (days)

Significance difference was observed among the treatments in case of shelf life. Comparatively Burro Cemsa and Cuba (9.66 days) had better shelf life and they were at par with Kovvur Bontha (9.33 days), Saba (8.00 days) and Bangrier (7.66 days). FHIA-03 (4.00 days) recorded significantly lower shelf life than others.

Pulp dry matter content (g)

Pulp dry matter content was recorded in the range of 21.00 to 29.16g among the cultivars. Significant difference were observed among the cultivars and maximum pulp dry matter content is in Saba (29.16g) followed by FHIA-03 (29.00g), Cuba (28.50g) and Kothia (28.00g), which were at par with each other. Minimum pulp dry matter is in Bangrier (21.00g).

Cooking quality

Cooking quality details of different banana cultivars are presented in table 2. Time taken for cooking is less in FHIA-03 (7 mins) and it was followed by Bangrier (8 mins), Burro Cemsa (8 mins). The other cultivars Kovvur Bontha, Kothia and Saba recorded 10-10.5 minutes for cooking. Cuba took maximum time for cooking.

Organoleptic evaluation

Organoleptic evaluation details of different banana cultivars are presented in table 3. Organoleptic evaluation for color, flavour, texture and taste was conducted. The panelists tasted the boiled samples and scoring was given accordingly. Among different cultivars tested, with regards to color the cultivars Burro Cemsa and Saba scored the

Table 1 : Quality parameters of different culinary banana cultivars.

Treatments	Peel thickness (mm)	Pulp peel ratio	Starch percentage (%)	Shelf life (Days)	Pulp dry matter content (g)
Bangrier (T ₁)	3.95	2.18	72.99	7.66	21.00
FHIA-03 (T ₂)	4.08	2.10	72.03	4.00	29.00
Kothia (T ₃)	4.20	2.47	70.74	7.33	28.00
Burro Cemsa (T ₄)	4.12	2.68	72.21	9.66	26.83
Booditha Bontha Batheesa (T ₅)	4.15	1.98	71.33	6.66	25.00
Saba (T ₆)	3.91	2.27	75.45	8.00	29.16
Cuba (T ₇)	3.98	2.24	71.97	9.66	28.50
Kovvur Bontha (control) (T ₈)	3.07	2.06	76.11	9.33	21.66
SE m ±	0.12	0.13	0.68	0.70	0.70
CD (P=0.05)	0.36	0.40	2.09	2.16	2.15

Table 2 : Cooking quality of different culinary banana cultivars.

Treatments	Cooking time (minutes)
Bangrier (T ₁)	8 min
FHIA-03 (T ₂)	7 min
Kothia (T ₃)	10 min
Burro Cemsa (T ₄)	9 min
Booditha Bontha Batheesa (T ₅)	9 min
Saba (T ₆)	10.5 min
Cuba (T ₇)	11 min
Kovvur Bontha (control) (T ₈)	10 min

score was registered in FHIA-03 and Kovvur Bontha followed by Saba. Thus, the cultivar FHIA-03 is seemed to present nearly the same cooking qualities as that of Kovvur Bontha particularly in respect of flavour (apple flavour), texture and taste.

The present study indicated that significant difference in the fruit quality of different culinary banana cultivars. Kothia significantly recorded the high peel thickness, pulp : peel ratio is highest in Burro Cemsa, total starch percentage (DW) is highest in Kovvur Bontha. Comparatively, highest shelf life of 9.66 days was observed in Burro Cemsa and Cuba. The least shelf life

Table 3 : Organoleptic evaluation of different culinary banana cultivars.

Treatments	Color	Texture	Taste	Flavour	Total score
Bangrier (T ₁)	3	3	3	4	13
FHIA-03 (T ₂)	3	4	5	5	17
Kothia (T ₃)	3	3	3	3	12
Burro Cemsa (T ₄)	4	3	3	2	12
Booditha Bontha Batheesa (T ₅)	2	5	4	3	14
Saba (T ₆)	4	3.5	4	3	14.5
Cuba (T ₇)	2.5	3	3	3	11.5
Kovvur Bontha (control) (T ₈)	3	4	4	5	16

maximum whereas the minimum score was recorded in Booditha Bontha Batheesa and Cuba. The remaining cultivars recorded intermediate score. Similarly, in case of texture highest score was recorded in Booditha Bontha Batheesa followed by Kovvur Bontha and FHIA-03 whereas Saba, Bangrier, Burro Cemsa, Kothia and Cuba registered average score. In case of taste FHIA-03, Kovvur Bontha, Saba and Booditha Bontha Batheesa registered higher score as compared to other cultivars. In flavor, higher score was observed in FHIA-03 and Kovvur Bontha whereas the lowest score was observed in Burro Cemsa and remaining cultivars recorded intermediate values. In organoleptic evaluation highest

was recorded in FHIA-03. The pulp dry matter content is high in Saba followed by FHIA-03. The time taken for cooking is less in case of FHIA-03 as compared to triploids and as such 80% firmness of tetraploid hybrids *i.e.*, FHIA-03 is lost within 5-10 minutes of cooking. Such a remarkable differences in firmness loss may be due to inherent differences in cell size and structure as well as chemical composition before cooking. Studies by other researches have revealed that a loss of firmness or softening in fruit as a result of cooking or heating, involves a loss of turgor, a series of chemical changes in the cell polysaccharide matrix, along with starch swelling and gelatinization (Van Buren and Pitifer, 1992; Fuchigami,

1987a, b; Palmer, 1971).

The cultivar FHIA-03 and kovvur Bontha were observed to be best with regards to cooking quality. The good cooking quality may be due to high dry matter content. Similarly, in the organoleptic test also FHIA-03 and kovvur Bontha scored well followed by Saba and Booditha Bontha Batheesa. Thus an overall assessment of fruit quality projected the superiority of FHIA-03 and Kovvur Bontha. Whereas FHIA-03, is not so good as compared to Kovvur Bontha due to its poor shelf life and difficulty in peeling. Similar variations in quality parameters among different cultivars was also reported by Ferris *et al.* (1997), Ngalani and Tchango (1998), Shivashankar (1999), Biswal *et al.* (2004), Sarkar *et al.* (2005), Ravi and Musthaffa (2013).

Conclusion

Comparatively all other cultivars, with respects to the quality, peel thickness was highest in Kothia, whereas pulp:peel ratio is highest in Burro Cemsa. Starch percentage is more in Kovvur Bontha. FHIA-03 is evaluated organoleptically as good. With regards to cooking quality FHIA-03 is best, pulp dry matter content is more in Saba and on par with FHIA-03. However, it is poor in shelf life. Comparatively the highest shelf life was recorded in Burro Cemsa and Cuba than other cultivars.

References

- Biswal, M. K, P. C. Lenka and D. K. Dash (2004). Evaluation of culinary banana genotypes. *The Orissa Journal of Horticulture*, **32(1)**.
- Ferris, R. S. B, R. Ortiz, U. Chukwu, Y. O. Akalumhe, S. Akele, A. Ubi and D. Vuylsteke (1997). The introduction and market potential of exotic black sigatoka resistant cooking banana cultivars in West Africa. *Q. Journal of International Agriculture*, **36** : 141-52.
- Fuchigami, M. (1987a). Relationship between pectic composition and the softening of the texture of Japanese radish roots during cooking. *Journal of Food Science*, **52** : 1317-320.
- Fuchigami, M. (1987b). Relationship between maceration and pectic substances of vegetables during cooking. *J. Home Econ. Jpn.*, **38** : 465-73.
- Mc Cready, R. M., J. Guggloz, V. Silviera and H. S. Owens (1950). Determination of starch and amylose in vegetables. *Analytical chemistry*, **22** : 1156.
- Ngalani, J. A. and J. T. Tchango (1998). Cooking qualities and physiochemical changes during ripening in some banana and plantain hybrids and cultivars. *Acta Horticulture*, **490** : 571-76.
- Palmer, J. K. (1971). The banana. Biochemistry of fruits and their products (A.C. Hulme, ed.) Academic press, London. (2) : Pp 65-105.
- Ravi, I. and M. M. Mustaffa (2013). Starch and amylose variability in some banana cultivars. *Indian Journal of Plant Physiology*, **18(1)** : 83-87.
- Sarkar, S. K, M. M. Bauri, D. K. Misra and B. Bandyopadhyay (2005). Varietal evaluation of silk mysore and pome sub group bananas for yield and post-harvest attributes including diseases and pests. *The Orissa Journal of Horticulture*, **33(2)**.
- Seenappa, M., H. S. M. Laswai and S. P. F. Ferando (1986). Availability of L-ascorbic acid in Tanzanian banana. *Journal of Food Science Technology*, **23** : 293.
- Shivashankar, S. (1999). Post harvest evaluation of banana accessions for shelf life and quality parameters. *Indian Journal of Horticulture*, **56(2)** : 112-16.
- Van Buren, J. P. and L. A. Pitifer (1992). Retarding of vegetable softening by cold alkaline pectin deesterification before cooking. *Journal of Food Science*, **57** : 1022-023.