



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 3984-3987
© 2022 TPI
www.thepharmajournal.com
Received: 21-09-2022
Accepted: 24-10-2022

VV Dale
Department of Horticulture,
College of Agriculture, Dhule,
Maharashtra, India

SM Palghadmal
Department of Horticulture,
College of Agriculture, Dhule,
Maharashtra, India

SK Gajbhiye
Department of Horticulture,
College of Agriculture, Parbhani,
Maharashtra, India

AS Gawade
Department of Horticulture,
College of Agriculture,
V.N.M.K.V., Parbhani,
Maharashtra, India

CV Pujari
Department of Horticulture,
College of Agriculture, Dhule,
Maharashtra, India

Corresponding Author:
VV Dale
Department of Horticulture,
College of Agriculture, Dhule,
Maharashtra, India

Suitability of cultivars for making Banana chips

VV Dale, SM Palghadmal, SK Gajbhiye, AS Gawade and CV Pujari

Abstract

The investigation entitled “Suitability of cultivars for making Banana chips” was carried out during the year 2017-18 with the objectives to identify suitable variety of banana for chips preparation and to study their qualitative characters during storage. The experiment was conducted at College of Agriculture, Dhule in completely randomized design with three varieties of banana viz., 'Grand Naine', 'Shrimanti' and Phule Pride (BRS-13-3 clone) which were replicated seven times. Chips of 1.5 mm thickness were prepared and fried in refined sunflower oils at 155 to 160 °C for 5.0 minutes. These chips were stored for 60 days under ambient temperature (27±5 °C).

The proximate analysis of fried banana chips was carried out sensory evaluation for colour, crispiness and overall acceptability which shown that the parameters were influenced by varieties studied.

The results also revealed that Sensory evaluation shown that the variety Grand Naine secured highest score than the other two varieties. While the variety Shrimanti were recorded lowest values for colour, crispiness and overall acceptability. The variety Phule Pride (BRS-13-3) was exhibited moderate performance with respect to all the parameters studied.

The results revealed the variety Grand Naine was found to be superior cultivar for preparing fried chips as it was recorded overall acceptability both at initial and 60 days after storage. However, the treatment T₂ (cv. Shrimanti) recorded the highest BCR.

Keywords: Banana chips, cultivars, Grand Naine

Introduction

Banana (*Musa sp.*) is the fifth largest agricultural commodity in world trade after cereals, sugar, coffee and cocoa. India, Ecuador, Brazil and China alone produce half of total bananas of the world. The area under banana in India is 8,03,000 hectare with the production of 2,97,25,000 MT and productivity 37.0 mt/ha. According to FAO, India occupies the highest area under banana in the world which contributes 11 per cent in area under banana and 23% in production in the world. In India, Maharashtra is the leading banana growing state which occupies 83,000 ha area with the production of 24,83,060 MT and productivity 58.2 mt/ha. Besides Maharashtra, Tamil Nadu, Gujarat, Andhra Pradesh, Karnataka, Madhya Pradesh, Bihar, West Bengal, Assam, Odisha are also major banana growing states.

Conversely, considerable amount of production of this fruit is spoiled because of its highly perishable nature owing to its high moisture content and climacteric nature. Therefore, banana fruit has poor shelf life and cannot be preserved more than 7 days at room temperature (20 °C) from the initiation of ripening (Farid, 2003) [10]. The perishability of the fruit is attributed to immense physiological changes after harvest. Because of the accelerated physiological, chemical, and microbial processes, banana fruit invariably lead to deterioration and loss of wholesomeness. This will help to improve the market efficiency, and generate more income to the farmers on one hand and generate employment and provide diverse food to the consumer on the other hand. Further, reduction in post-harvest food losses is a critical component to ensure future global food security.

Banana fruit can be processed to a wide variety of products such as chips, flour, fig, clarified juice, puree, starch, vinegar, wine, stem candy and fermented products like ethanol, brandy and beer etc. (Voss and Hale, 1998) [30]. In Maharashtra, Grand Naine (AAA) and Shrimanti (AAA), belonging to dwarf Cavendish group are dominating the cultivation in the Maharashtra. Recently Mahatma Phule Krishi Vidyapeeth, has released the new variety Phule Pride (BRS-13-3) (AAA). Banana Chips available in local market are mostly made from the fruits of these two cultivars namely Grand Naine and Shrimanti. But there is no scientific data with respect to quality of chips made from these three cultivars. Keeping this in view, the present investigation is undertaken with the objectives, to study the suitability of cultivars for making chips and quality attributes of chips.

Materials and Methods

The experiment was conducted at Horticulture Section, college of Agriculture Dhule. Experiment was set in Completely Randomized Block Design (CRD) with the treatments comprised of three varieties of banana, namely Grand Naine (T₁), Shrimanti (T₂) and Phule Pride (T₃) which were replicated three times. Fully mature fruits of each variety were used for the present study. Potassium Meta bisulphite, Sunflower oil, knife, sauce pan were used in the experiment. Following steps were involved in making the chips from banana fruit.

Procedure

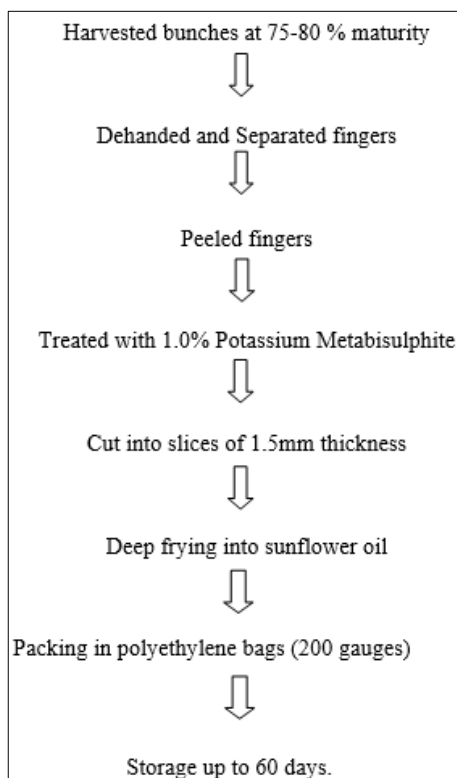


Fig 1: Schematic flowchart of preparation of banana chips

Physical characteristics of fruits

Average weight of fruit (g)

Ten banana fingers (fruit) of appropriate maturity of each cultivar were randomly selected and were weighed individually for recording their fresh weight. Then the average weight of finger (fruit) was worked out.

Peeling losses (%)

$$\text{Peeling loss (\%)} = \frac{\text{Wt. of fruit before peeling (g)} - \text{Wt. of fruit after peeling (g)}}{\text{Wt. of fruit before peeling (g)}} \times 100$$

Pulp to chips ratio

$$\text{Pulp: Chips ratio} = \frac{\text{Wt. of fruit after peeling (g)}}{\text{Wt. of chips (g)}}$$

Recovery (%)

A randomly selected 10 fruits per cultivar used under observed. The recovery per cent calculated by following formulae-

$$\text{Recovery (\%)} = \frac{\text{Total chips weight (g)}}{\text{Total mature fruit weight (g)}} \times 100$$

Packaging

Low grade and off-colour chips were removed and discarded. The chips were allowed to cool at room temperature before packaging. The high density polyethylene (200 gauge) opaque and transparent bags (size: 25 x 20 cm) were used for packaging. A net quantity of (100 g) fried banana chips were filled in bags and sealed by hand operated heat sealing machine and stored at room temperature. This chips so packed evaluated at 10 days interval for its quality.

The flowchart for preparation of fried banana chips is shown in Fig.1 (Narayana and Sathiamoorthy, 2006) [23].

Sensory evaluation of fried chips

The overall quality (acceptability) of fried chips was assessed organoleptically by a panel of judges who were well versed with the desired quality characteristics of the product. Each sample was given code. The scoring was done according to 9 point hedonic scale (Amerine *et al.*, 1965) [3]. Each judge scored separately for each quality parameters.

Economics of chips production

The economics of chips production has also been worked out as suggested.

Statistical analysis

The data obtained in the present investigation were subjected to statistical analysis as suggested by Panse and Sukhatme (1967) [25].

Result and Discussion

Yield character

The present investigation entitled "Studies on preparation of banana (*Musa spp* L.) chips" was set in the Completely Randomized Design with three cultivars of banana, namely Grand Naine (T₁), Shrimanti (T₂), Phule Pride (BRS Clone - 13-3) (T₃) as a treatments with seven replications. The objectives were identify the suitable cultivar of banana for making chips and to study the quality characteristics of the chips. Observations were recorded on the Organoleptic evaluation of the chips was also carried.

Recovery (%)

The values with respect to recovery have been depicted in Table 1 and graphically in Fig.1. This character was significantly influenced by the cultivars. It was further observed that the treatment T₃ (cv. Phule Pride) recorded significantly the highest recovery which was 30.44 per cent. Significantly the lowest recovery percent (21.45%) was observed in the Cultivar Shrimanti (T₂), whereas it was moderate (27.37%) in the cultivar Grand Naine (T₁). Eshetu and Tola (2014) [9] while evaluating five plantain varieties did find significant differences in the production of chips. The highest recovery in the Phule Pride might be due to low peeling losses.

Sensory properties of chips

The mean scores for color, crispiness and overall acceptability of chips prepared from different varieties of banana are shown in the Table 1, 2, and 3, respectively.

Colour of chips

As observed from the Table 1, the color of chips was significantly influenced by all the treatments. It was clearly observed that decrease in color score as period increased. Highest score (8.0) was recorded in T₁ (Grand Naine) followed by T₃ (cv. Phule Pride) (7.6). Lowest score (6.8) was recorded in T₂ (cv. Shrimanti).

The highest score for color to Grand Naine (T₁) might be due better pulp quality of this cultivar (Moll *et al.*, 2009)^[22].

Table 1: Changes in color of chips during storage

Treatments	Color of chips							
	Initial	10	20	30	40	50	60	Mean
T ₁	8.1	8.0	8.0	7.8	7.8	7.7	7.7	8.0
T ₂	7.6	7.3	7.4	7.2	7.1	7.1	7.0	6.8
T ₃	8.0	8.0	7.8	7.6	7.5	7.2	7.1	7.6

Crispiness

As observed from the Table 2, the crispiness was significantly influenced by all the treatments. It was clearly observed that decrease in crispiness score as period increased. Highest score (7.9) was recorded in T₁ (cv. Grand Naine) followed by T₃ (cv. Phule Pride) (7.1). Lowest score (6.9) was recorded in T₂ (cv. Shrimanti).

Table 2: Effect on crispiness of chips during storage

Treatments	Crispiness (mean)							
	Initial	10	20	30	40	50	60	Mean
T ₁	8.4	8.2	8.0	7.8	7.8	7.6	7.5	7.9
T ₂	7.5	7.1	7.0	7.0	6.8	6.4	6.5	6.9
T ₃	7.7	7.4	7.3	7.1	7.0	6.8	6.6	7.1

The highest score for crispiness observed in Grand Naine (T₁) might be due lower moisture content even 60 days after the storage (Molla *et al.*, 2009)^[22].

Overall acceptability

As observed from the Table 2, the overall acceptability was significantly influenced by all the treatments. It was clearly observed that the quality of chips i.e. overall acceptability decreased linearly with time. Highest mean score (7.11) was recorded in T₁ (cv. Grand Naine) followed by T₃ (cv. Phule Pride) (6.2). Lowest score (5.62) was recorded in T₂ (cv. Shrimanti). The results are in agreement with Eshetu and Tola (2014)^[9].

The highest score for overall acceptability observed in Grand Naine (T₁) might be due highest score for both color and crispiness 60 days after the storage.

Table 3: Effect on overall acceptability during storage

Treatments	Overall acceptability							
	Initial	10	20	30	40	50	60	Mean
T ₁	7.6	7.6	7.5	7.3	6.9	6.6	6.3	7.11
T ₂	6.8	6.6	6.7	6.6	5.5	3.8	3.4	5.62
T ₃	7.2	7.0	7.0	6.8	6.4	5.6	3.4	6.2

Economics of production of banana chips

The economics of banana chips were worked out for the all the treatments and presented in the Table 4.

Table 4: The economics of production of banana chips

Sr. No.	Particulars	Amount (Rs.)
Expenditure details		
1	Cost of 100 kg banana fruits @Rs. 15.00 per kg	1500.00
2	Cost of chemicals (Potassium metabisulphite 300 g @ Rs. 250.00 per kg)	75.00
3	Sunflower refined oil @100 ml for 1.0 kg & for 100 kg 10 lit. @ Rs. 80.000 per liter	800.00
4	Electricity charges (per unit @ of Rs. 5.00 for 40 hours)	200.00
5	LPG gas for 100 kg 3.0 kg gas @ 54.35 per kg	163.00
6	Cost of packaging and sealing (0.5 kg packs 100 nos., 50 paise per pack)	50.00
7	Cost of labour @ Rs. 250=00 per day, 4 nos.	1000.00
8	Miscellaneous charges	
Total Expenditure (Rs.)		3788.00
Returns details		
Recovery of dried chips		
1	T ₁ = 27.37	
	T ₂ = 21.45	
	T ₃ = 30.44	
Gross Returns @ Rs.		
2	T ₁ = 200.00 per Kg= (5474.00-3788.00)	1686.00
	T ₂ = 190.00 per kg= (4075.00-3788.00)	1273.00
	T ₃ = 180.00 per kg=5479.00-3788.00)	1691.00
Net returns (Rs.)		
3	T ₁ =	
	T ₂ =	
	T ₃ = Rs.	
Benefit cost ratio		
4	T ₁	2.25:1
	T ₂	2.97:1
	T ₃	2.24:1

As revealed from the Table, T₂ (cv. Shrimanti) recorded the highest BCR of 2.97 followed by T₁ (cv. Grand Naine) and T₃ (cv. Phule Pride) which recorded 2.25 and 2.24 BCR, respectively. However, the cultivar T₁ (cv. Grand Naine) has got the highest rate.

It was clearly noted that chips made from all the varieties followed the same pattern in the order of Grand Naine (T₁)>Phule Pride (T₃)>Shrimanti (T₂). Considering the score for color, crispiness and overall acceptability, the chips made from Grand Naine were found to be of better quality as compared to Phule Pride and Shrimanti. However, the treatment T₂ (cv. Shrimanti) recorded the highest BCR.

References

- Adeva LV, Gopez MD, Payumo EM. Studies on of banana the preparation and storage qualities chips. Philippines Journal of Science. 1968;97:27-35.
- Agunbiade SO, Olanlokun JO, Olaofe OA. Quality of chips produced from rehydrated dehydrated plantain and banana. Pakistan Journal Nutr. 2006;5(5):471-473.
- Amerine MA, Pangborn RM, Roessler EB. Principles of Sensory Evaluation of Food. New York: Academic Press; c1965.
- Ammawath W, Rahman RA. Effect of variety and stage of fruit ripeness on the physicochemical and sensory characteristics of deep fat fried banana chips. Journal Science of Food and Agriculture. 2001;81:12-16.
- Ammawath W, Che Man YB, Yusof S, Rahman RA. Effects of type of packaging material on physicochemical and sensory characteristics of deep-fat fried banana chips.

- Journal Science of Food and Agriculture. 2002;82:1621-1627.
6. Betewulign Eshetu, Yetenayet Bekele Tola. Evaluation of selected plantain varieties for chips and a vegetable. *American Journal of Food Technology*. 2014;9(6):325-329.
 7. Borah PP, Nayak PK. Quality Characteristics of Dried Jahaji banana Chips after deep fat frying. *International Journal of Agriculture and Food Science Technology*. 2013;9(4):901-908.
 8. Elkhalfifa Abd Elmoneim O, Ayat M Hassan, Mha E Abu Zai. Analytical quality and acceptability of baked and fried banana chips. *Journal of Human Nutrition and Food Science*. 2014;2(4):1052-1055.
 9. Eshetu Betewulign, Yetenayet Bekele Tola. Quality evaluation of selected plantain varieties (Musa species) for Chips and vegetables. *American Journal of Food Technology*. 2014;9(6):325-329.
 10. Farid HAR. Effect of various treatments on banana ripening. *Ahfad Journal*; c2003. <http://www.thefreelibrary.com>.
 11. Fetuga GO, Adebowale AA, Oriaghan AH., Osakuec E. Effect of packaging material and storage on chemical composition and sensory quality of sweet potato crisps. *African Journal of Root and Tuber Crops*. 2014;11(1):34-40.
 12. Godavari Bai S, Narayanarao M. The use of packaging and antioxidants in banana chipping. *J Food Science and Technol*. 1969;6:169-172.
 13. Jain NL, Nair KG, Siddappa GS, Girdhari Lal. Studies to improve the keeping quality of fried salted banana chips. *Journal of Food Science*. 1962;11:335-338.
 14. Ikpeme CAE, Eneji CA, Essiet U. Storage stability and sensory evaluation of taro chips fried in palm oil, palmolein oil, groundnut oil, soybean oil and their blends. *Pakistan Journal of Nutrition*. 2007;6:570-575.
 15. Imam Muhadjir. Some studies on dehydrated banana chips and jack fruit bar. M.Sc. Thesis University of Mysore, Mysore; c1977.
 16. Khanvilkar AM, Kamble AB, Ranveer RC, Ghosh JS, Sahoo AK. Effect of frying media and primary packaging material on shelf life of banana chips. *International Food Research Journal*. 2016;23(1):284-288.
 17. Kutty SK, Bhat AV, Varkey AG, Menon KGK, Mookerji KK. Deep fat frying of banana chips: A critical study of factors governing quality production of Nendran banana chips. In: Symposium on oils and fats in relation to food products and their preparations held at Central Food Technological Research Institute, Mysore on 3rd and 4th June; c1976. p. 75-78.
 18. Kutty SK, Bhat AV, Varkey AG. Determination of the optimum stage of maturity of Nendran bananas for the preparation of deep-fat fried chips. *Journal of Food Science and Technology*. 1978;15:68-71.
 19. Kutty SK, Varkey GA, Bhat AV, Dhanaraj S, Shanti Narasimhan. Packaging and storage studies of deep - fat fried Nendran banana chips. *Journal of Food Science and Technology*. 1981;18:104-108.
 20. Manikantan MR, Rajiv Sharma, Kasturi R, Varadharaju N. Storage stability of banana chips in polypropylene based nanocomposite packaging films. *Journal of Food Science Technology*. 2014;51(11):2990-3001.
 21. Mohapatra D, Mishra S, Singh CB, Jayas DS. Post-Harvest processing of Banana; Opportunities and Challenges. *Food Bioprocess technology*. 2011;4:327-339.
 22. Molla MM, Nasrin TAA, Islam M Nazrul. Study on the suitability of banana varieties in relation to preparation of chips. *Journal Agriculture Rural Development*. 2009;7(1&2):81-86.
 23. Narayana CK, Sathiamoorthy S. Value Added Products from Banana. *Extension Bulletin No.1. ICAR-National Research Center for Banana, Trichy (TN); c2006. p. 1-6.*
 24. Narayana CK, Shivshankar S, Mustaffa MM, Sathiamoorthy S. Studies on suitability of varieties of banana and frying medium for production of chips. *Beverage and Food World*. 2002;29(6):29-30.
 25. Panse VG, Sukhatme PV. *Statistical method for Agricultural Workers*, 4th Edition. I. C. A. R., New Delhi; c1995. p. 58-152.
 26. Purohit C, Rajyalakshmi P. Quality of products containing defatted groundnut cake flour. *Journal Food Science Technology*. 2011;48:26-35
 27. Rampal Singh, Prabhakar JV. Studies on some commercially deep fat fried foods. Symposium on oils and fats in relation to food products and their reparations held at Central Food Technological Research Institute, Mysore on 3rd and 4th June; c1976. p. 65-70.
 28. Sonia NS, Mini C, Geethalekshmi PR. Potency of banana peel application and packaging in enhancing shelf life of banana chips. *International Journal of Applied and Pure Science and Agriculture*. 2015;1(5):58-66.
 29. Sultana SN, Sen DP. Studies on deep fat frying - changes during heating of oil. *Journal Food Science and Technology*. 1979;16:208-213.
 30. Voss DH, Hale WN. A comparison of three editions of the royal horticultural society colour chart. *Horticulture Science*. 1998;33:13-17.