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Study of recovery attributes for making banana chips of different varieties

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Abstract
The investigation entitled "Study of Recovery Attributes for making Banana chips of different Varieties" 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-13-3clone) which were replicated seven times. Chips of 1.5 mm thickness were prepared and fried in refined sunflower oils at 155 to 160 ºC for 5.0 minutes.
The proximate analysis of fried banana chips was carried out for average fruit weight, peeling losses, pulp to chips ratio, recovery etc. which shown that the parameters were influenced by varieties studied. It was observed that, irrespective of the variety, there was increased moisture content, value as the period of storage increased. However, the increase was less in the variety Grand Naine.
The results also revealed that the cultivar Grand Naine registered the highest values for average fruit weight, While the variety Shrimanti were recorded highest values for peeling losses and lowest values for pulp to chips ratio, recovery, The variety Phule Pride (BRS-13-3) was exhibited moderate performance with respect to all the parameters studied. It was further observed that Phule Pride recorded significantly the highest recovery. Significantly the lowest recovery percent was observed in the Cultivar Shrimanti, whereas it was moderate in the cultivar Grand Naine.
Eshetu and Tola (2014) 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. However, the treatment Shrimanti recorded the highest BCR.

Keywords: Banana chips, Grand Naine, Shrimanti

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 8,0,3000 hectare with the production of 2,97,25000 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 (20^0C) 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. In Maharashtra, Grand Naine (AAA) and Shrimanti (AAA), belonging to dwarf Cavendish group are dominating the cultivation in the Maharashtra.

Recently Mahatma Phue 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

Green mature banana fruits

The fully matured green unripe banana bunches of the cultivars Grand Naine (AAA), Shrimanti (AAA) and Phule pride (AAA) were obtained from Research Farm of Horticulture Section, College of Agriculture Dhule. The bunches were brought to the laboratory and dehanded carefully and hands were washed with clean tap water to remove adhering soil particles, latex and exudates.

Refined sunflower oil

Chips were prepared by deep fat frying method. For frying, the refined 'Samrat Valina' sunflower oil was used for frying of banana slices under study. As suggested by Khanvilkar *et al.* (2016) [16] refined sunflower oil is most common and economically affordable. Further, this oil is rich in omega 9 and omega 6 fatty acid esters which constitutes 89% of the total lipids present.

Chemicals

The analytical grade chemicals used in the present investigation were obtained from M/s Qualigens Fine Chemicals Mumbai, and E.Merk (India), Mumbai.

Potassium Metabisulphite (KMS)

Potassium Metabisulphite obtained from Mittal Enterprises Delhi-6 was used for pre-treatment of peeled banana.

Methods

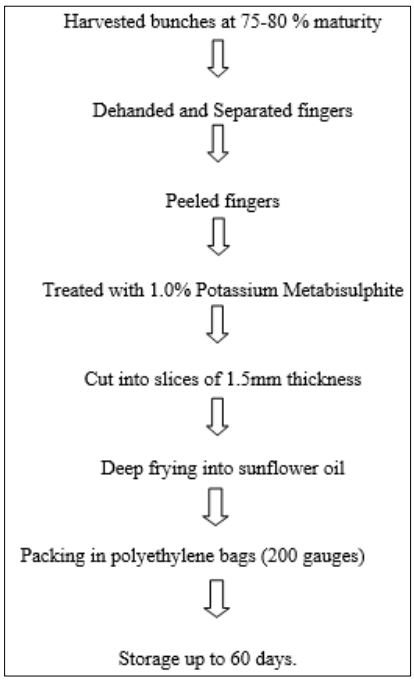

Fig 1: Schematic flowchart of preparation of banana chips

Average weight of fruit (g)

The data with respect to fruit weight (finger) has been depicted in Table 1 and illustrated graphically in Fig.1. As revealed from the table significant differences were observed with respect to the fruit weight and further, it was very clear that the treatment T_1 (cv. Grand Naine) recorded the significantly highest fruit weight of 138.3g. The treatment T_2 (cv. Shrimanti) and T_3 (Phule Pride) recorded fruit weight were 133.9g and 133.2g, respectively and were at par with each other.

The results are in accordance with the Eshetu and Tola (2014) [9] who evaluated five varieties of banana from Jaimca University for their processing quality (chips and vegetable) and physical attributes. The differences in the fruit might be due to the genetic character of the particular variety.

Table 1: Fruit weight, peeling losses, pulp to chips ratio and recovery percentage

Treatments	Av. fruit weight (g)	Peeling losses (%)	Pulp: chips ratio	Recovery (%)
T_1	138.3	42.2	2.18	27.37
T_2	113.9	47.2	2.06	21.45
T_3	113.2	36.1	2.42	30.44
S.E.(Mean)±	1.32	0.76	0.017	0.307
C.D.at 5%	3.92	2.26	0.051	0.913

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 (%)

The randomly selected ten banana fingers as mentioned were used to calculate peeling losses. These fruits were peeled and the weight of peeled fruit and peel was recorded separately. The peeling loss was worked out by using following formulae and was expressed in per cent

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

As evident from Table 1 and Fig. 1., the treatment T_3 (Phule Pride) recorded significantly the lowest peeling losses and it was 36.1 per cent. Significantly the highest peeling losses (47.2%) were observed in the cultivar Shrimanti (T_2). In the cultivar Grand Naine (T_1) peeling losses were moderate (42.2%) as compared to T_3 and T_1.

No literature is available on this aspect. The lowest peeling losses in Phule Pride (T_3) might be due fruit weight as compared to Gran Naine (T_1) and Shrimanti (T_2).

Pulp to chips ratio

The weight of pulp (peeled fruit) and chips weightn were recorded separately. Then the chips of 1.5 mm thickness were prepared by using stainless steel hand slicer from the peeled fruits as mentioned above. The ratio was calculated by dividing the weight of fruit after peeling and the weight of chips.

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

The data with respect to pulp to chips ratio has been presented

in the Table 1 and graphically in Fig.1. It was very explicit from the table that the treatment T_3 (cv. Phule Pride) recorded significantly the highest pulp to chips ratio and it was 2.42. Significantly the lowest pulp to chips ratio (2.06) was observed in the cultivar Shrimanti (T_2). In the cultivar Grand Naine (T_1) pulp to chips ratio was moderate i.e. 2.18, as compared to T_1 andT_3. The results are more or less in similar lines with Ogazi (1990) and Eshetu and Tola (2014) [9]. Results suggest that chips production from Shrimanti and Grand Naine may be economical.

Recovery (%)

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

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

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 T_3 (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 (T_2), whereas it was moderate (27.37%) in the cultivar Grand Naine (T_1).

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

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 (T_1), Shrimanti (T_2), Phule Pride (BRS Clone - 13-3) (T_3) 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 physical characteristics of fruits *viz*. fruit weight, peeling losses, pulp: chips ratio and recovery; and biochemical characteristics of chips *viz*. moisture content, ash content, carbohydrate contents, starch content, peroxidase value, free fatty acids, crude fiber, protein and crude fat. Organoleptic evaluation of the chips was also carried. The results so obtained are presented in this chapter under appropriate headings. The results are also interpreted and discussed in this chapter.

Economics of production of banana chips

The economics of banana chips were worked out for the all the treatments. and presented in the Table 2.

Table 2: 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 & for100 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	
1	Recovery of dried chips	
	T_1= 27.37	
	T_2= 21.45	
	T_3= 30.44	
2	Gross Returns @ Rs.	
	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
3	Net returns (Rs.))	
	T_1=	
	T_2=	
	T_3= Rs.	
4	Benefit cost ratio	
	T_1	2.25:1
	T_2	2.97:1
	T_3	2.24:1

As revealed from the Table, T_2 (cv. Shrimanti) recorded the highest BCR of 2.97 followed by T_1 (cv. Grand Naine) and T_3 (cv. Phule Pride) which recorded 2.25 and 2.24 BCR, respectively. However, the cultivar T_1 (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 (T_1)>Phule Pride (T_3)>Shrimanti (T_2). 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 T_2 (cv. Shrimanti) recorded the highest BCR.

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