



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(7): 899-903
Received: 19-04-2026
Accepted: 23-05-2026

I Arthi Sree
Ph.D. Scholar, Tamil Nadu
Agriculture University,
Coimbatore, Tamil Nadu, India

Saudamini Swain
AICRP on Fruits, Odisha
University of Agriculture and
Technology (OUAT),
Bhubaneswar, Odisha, India

Niranjan Chinara
AICRP on Fruits, Odisha
University of Agriculture and
Technology (OUAT),
Bhubaneswar, Odisha, India

Bandita Jena
Department of Soil Science and
Agricultural Chemistry, College of
Agriculture, OUAT, Bhubaneswar,
Odisha, India

Swarnalata Das
AICRP on Forage, OUAT,
Bhubaneswar, Odisha, India

Subas Chandra Swain
Department of Fruit Science,
College of Agriculture, OUAT,
Bhubaneswar, Odisha, India

Corresponding Author:
Saudamini Swain
AICRP on Fruits, Odisha
University of Agriculture and
Technology (OUAT),
Bhubaneswar, Odisha, India

Evaluation of the quality attributes of fruits and their chips of different banana genotypes

I Arthi Sree, Saudamini Swain, Niranjan Chinara, Bandita Jena, Swarnalata Das and Subas Chandra Swain

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i71.6035>

Abstract

A study was conducted to evaluate the performance of banana genotypes for quality attributes of fruits and their chips under Odisha conditions. For the study, seven banana genotypes were cultivated viz., Popoulu (AAB), Nendran (AAB), Manjeri Nendran (AAB), Budubale (ABB), Kaveri Kanchan (AAB), Patkapura (AAB) and Bantala (ABB). With respect to the quality parameters, TSS was higher in Nendran (24.64 °Brix). Manjeri Nendran was found to be superior among all the genotypes in case of reducing (18.55%) and total sugars (20.80%). Better shelf life (8.27 days) and lower moisture content was found in Popoulu (58.62%). Regarding higher recovery of chips for 100 g of pulp (41.95%), appearance (8.87), colour (8.77), taste (8.45), crispiness (8.82), flavour (8.37) and overall acceptability (8.95) the cultivar Popoulu recorded better scores which was followed by Kaveri Kanchan, Manjeri Nendran and Nendran. On the basis of results obtained from the present investigation, Popoulu can be popularised as a potential crop for making chips. The banana farmers of Odisha are mostly unaware of these introduced varieties like Popoulu, Manjeri Nendran, Nendran and Kaveri Kanchan which are suitable for making chips and there is almost no such chips making industry for banana in Odisha. So, there lies a huge potential for cultivation of these varieties which are suitable for chips making because of their firm and attractive orange yellow colour of the flesh.

Keywords: Popoulu, Nendran, Manjeri Nendran, Budubale, Kaveri Kanchan, Patkapura and Bantala.

Introduction

Banana is a tropical fruit belonging to the genus *Musa* under the family Musaceae. Banana is a popular and nutritious fruit with a pleasant flavor. They are high energy fruit rich in carbohydrates and also good source of potassium, iron, phosphorous, vitamin C and B6.

It is categorized as dessert, plantain and cooking type. The cooking banana or ripe banana as a fruit, is also used to produce beer and wine (Rishirumuhirwa, 2010) ^[1]. Varieties cooking type is one of the most important food crops cultivated and plays a major role in ensuring food security and rising incomes (Uazire *et al.*, 2008) ^[2]. It is a good source of energy with carbohydrates accounting for 22-32% of the fruit weight and rich in vitamins A, B₆, and C as well as minerals like potassium, magnesium, phosphorus, and folate (Chandler, 1995; Honfo *et al.*, 2007) ^[3, 4]. Faulty handling practices coupled with underdeveloped marketing systems results in postharvest losses to the extent of about 30%, leaving a little quality surpluses for export and processing (Anonymous, 2002) ^[5]. An advantageous way of processing bananas is preparation of chips. Chips processed from plantains (banana slices deep-fried in coconut oil) are popular in India and abroad as these serve as intermittent snacks between meals and can be preserved long and the value addition also fetches better revenue to the processors. The present work was undertaken to evaluate the performance of banana genotypes for quality attributes of fruits and their chips under Odisha conditions.

Materials and Methods

The present experiment was conducted at AICRP on Fruits (Banana) located in Horticultural Research Station, OUAT, Bhubaneswar during 2024-25. For the study, seven banana genotypes were cultivated viz., Popoulu, Nendran, Manjeri Nendran, Budubale, Kaveri Kanchan, Patkapura and Bantala. These genotypes were maintained at a spacing of 2.2 × 2.2 m in randomized block

design with four replications. Bunches were harvested and fruit samples were brought to the laboratory immediately for further analysis. The data on quality attributes of fruits and their chips were recorded and statistically analysed.

Physicochemical characteristics of fruits

The peel and pulp weights (g) were determined by separating the peel and the pulp by hand peeling and weighing the peel and pulp separately. Pulp-to-peel ratio was obtained by dividing the pulp weight by the peel weight. The total soluble solid (TSS) was estimated using a digital refractometer and expressed in °Brix. TTA was estimated by titrating 0.01M NaOH against 10ml of filtered juice using phenolphthalein indicator and expressed in percentage. The ratio of TSS to TTA was determined by dividing TSS value by TTA value. Moisture (%) was determined using oven drying method. Fruit quality characters like total sugar content, reducing sugar and non-reducing were estimated after harvest of fruits on ripening. Shelf life (yellow) was taken at ambient room temperature from ripening to decay.

Chips preparation

Hands were separated from the bunch and representative fruit samples were drawn from the second and third hand from the base. Fully matured fruits were chosen and washed with clean water. After peeling the outer skin to remove the latex, the fruits were cut into slices. Then slices were weighed and fried in refined sunflower oil. When these slices turned to light yellow in colour these were taken out and served hot.

Recovery of chips for 100 g of pulp

Initial weight of green fruit with peeling (pulp 100 g) and weight of fried chips of same were recorded for individual genotypes.

Then chips recovery percentage was calculated by weight difference as

Chips recovery (%) = Weight of fried chips / Initial weight of the fruit (100 g pulp) x 100

Sensory evaluation

Sensory evaluations of the freshly prepared chips were done by 20 taste testing panel. Coded samples of different genotypes with a score sheet were presented to each panellist and requested to evaluate chips for appearance, colour, crispiness, taste, flavour and overall acceptability using hedonic scoring scale of 1 to 9 (Molla *et al.*, 2009) [6].

Results and Discussion

Quality parameters of fruit

In the present investigation, the quality parameter studied include pulp weight, peel weight, pulp to peel ratio, TSS, acidity, TSS to acid ratio, moisture content, shelf life, reducing, non-reducing and total sugar. The values for pulp weight ranged between 54.14 g to 242.76 g and peel weight 18.60 g to 49.35 g among the different genotypes. Pulp to peel ratio ranged from 3.00 in Bhodibale to 9.75 in Popoulu (Table 1). Higher pulp weight (242.76 g) and higher pulp to peel ratio (9.75) are desirable attributes for processing, which were observed in Popoulu. Peel weight was lower in the genotypes Bhodibale (18.60 g) and Popoulu (25.20 g). Higher pulp to peel ratio (9.75) was observed in Popoulu indicating the pulp recovery would be high and is highly suited for preparation of chips. This is in line with the studies of Ravi and Mustaffa (2013) [10], Kuchi *et al.* (2017) [8], Jena *et al.* (2020) [9] and Manju *et al.* (2022) [7].

Table 1: Performance of banana genotypes w.r.t pulp weight, peel weight, pulp to peel ratio, shelf life and moisture

Treatments	Pulp weight (g)	Peel weight (g)	Pulp to peel ratio	Shelf life (days)	Moisture (%)
T ₁ – Popoulu (AAB)	242.76	25.20	9.75	8.27	58.62
T ₂ – Nendran (AAB)	151.64	40.40	3.67	7.58	60.77
T ₃ – Manjeri Nendran (AAB)	169.58	42.75	4.15	6.52	59.97
T ₄ – Bhodibale (ABB)	54.14	18.60	3.00	5.05	66.25
T ₅ – Kaveri Kanchan (AAB)	148.45	41.55	3.59	5.88	62.16
T ₆ – Patkapura (AAB)	160.62	25.70	6.31	5.75	67.22
T ₇ – Bantala (ABB)	165.55	49.35	3.46	3.27	64.49
C.D. at 5%	9.68	1.54	0.15	0.10	3.25
SE(m)	3.23	0.51	0.05	0.03	1.08
C.V.	4.14	2.97	2.14	1.17	3.46

There were notable variations in the screened genotypes total soluble solids (TSS) content. The maximum value for TSS (24.64°Brix) was observed in the Nendran and minimum value (18.85°Brix) was observed in Bantala. Acidity percentage ranges

from 0.18 to 0.54 per cent in Manjeri Nendran and Popoulu. Higher TSS to acid ratio was found Manjeri Nendran (153.95) and lower in Bantala (42.12). The result is consistent with previous findings for different banana genotypes by Kuchi *et al.* (2017) [8].

Table 2: Performance of banana genotypes w.r.t TSS, titratable acidity and TSS to acid ratio

Treatments	TSS (°Brix)	Titrateable acidity (%)	TSS to acid ratio
T ₁ – Popoulu (AAB)	22.96	0.54	42.41
T ₂ – Nendran (AAB)	24.64	0.34	72.84
T ₃ – Manjeri Nendran (AAB)	23.68	0.18	153.95
T ₄ – Bhodibale (ABB)	21.76	0.28	75.25
T ₅ – Kaveri Kanchan (AAB)	23.12	0.24	100.88
T ₆ – Patkapura (AAB)	23.62	0.25	92.89
T ₇ – Bantala (ABB)	18.85	0.44	42.12
C.D. at 5%	0.07	0.01	1.06
SE(m)	0.02	0.03	0.35
C.V.	0.20	2.10	0.85

The genotype Manjeri Nendran recorded maximum reducing and total sugar of 18.55% and 20.80% respectively, whereas, minimum reducing 9.29% and total sugar 13.80% were observed

in Popoulu (Table 3). And the genotype Patkapura (1.82%) recorded minimum non-reducing sugars.

Table 3: Performance of banana genotypes w.r.t total sugar content, reducing sugar and non-reducing sugar

Treatments	Total sugar content (%)	Reducing sugar (%)	Non-reducing sugar (%)
T ₁ – Popoulu (AAB)	13.80	9.29	4.30
T ₂ – Nendran (AAB)	15.26	11.68	3.38
T ₃ – Manjeri Nendran (AAB)	20.80	18.55	2.35
T ₄ – Bhodibale (ABB)	16.25	13.82	2.14
T ₅ – Kaveri Kanchan (AAB)	17.17	15.06	1.94
T ₆ – Patkapura (AAB)	16.15	14.30	1.82
T ₇ – Bantala (ABB)	14.27	10.85	3.37
C.D. at 5%	0.13	0.09	0.10
SE(m)	0.04	0.03	0.03
C.V.	0.53	0.48	2.64

Moisture content ranges from 58.62 to 67.22 per cent in Popoulu and Patkapura. After frying, there was a strong positive correlation between the fresh bananas' breaking force and moisture content. Wanna Ammawath *et al.* (2001) ^[13] found that fresh bananas with higher water content had less crispness. A range of 3.27 to 8.27 days with respect to shelf life was recorded (Table 1). Popoulu (8.27 days) and Nendran (7.58 days) had better shelf life as compared to others. Similar variations were also found by Sarkar *et al.* (2005) ^[11], Uma *et al.* (2006) ^[12], Jena *et al.* (2020) ^[9] and Manju *et al.* (2022) ^[7].

Quality parameters of chips

Recovery of chips for 100 g of pulp ranges from 28.56 to 41.69 per cent (Table 4). The cultivar 'Popoulu' recorded significantly higher chips recovery (41.95%). Popoulu produces large fruits yielded less wastage. The higher finger weight, finger girth resulted in higher pulp recovery and thus recorded the maximum chips recovery. Varietal variation in chips recovery was reported in the earlier studies by Belayneh *et al.* (2014) ^[14] and K.T. Naveena Kumara *et al.* (2020) ^[15].

Table 4: Performance of banana genotypes w.r.t recovery of chips and sensory analysis of processed chips from selected banana genotypes (9 point Hedonic scale)

Treatments	Recovery of chips for 100 g of pulp	Appearance (Sensory value)	Colour (Sensory value)
T ₁ – Popoulu (AAB)	41.95	8.87	8.77
T ₂ – Nendran (AAB)	39.25	6.87	7.25
T ₃ – Manjeri Nendran (AAB)	39.35	8.37	7.80
T ₄ – Bhodibale (ABB)	28.56	4.40	4.30
T ₅ – Kaveri Kanchan (AAB)	36.52	5.67	6.40
T ₆ – Patkapura (AAB)	32.75	3.80	3.52
T ₇ – Bantala (ABB)	36.37	5.17	5.27
C.D. at 5%	0.73	0.11	0.17
SE(m)	0.24	0.03	0.05
C.V.	1.34	1.22	1.89

Popoulu recorded better scores in terms of appearance (8.87), colour (8.77), taste (8.45), crispiness (8.82), flavour (8.37) and overall acceptability (8.95) followed by Manjeri Nendran and

Nendran cultivars. The least scores were obtained by cultivars Bhodibale and Patkapura (Table 5).

Table 5: Sensory analysis of processed chips from selected banana genotypes (9 point Hedonic scale)

Treatments	Taste	Crispiness	Flavor	Overall Acceptability
T ₁ – Popoulu (AAB)	8.45	8.82	8.37	8.95
T ₂ – Nendran (AAB)	6.77	6.85	6.25	8.17
T ₃ – Manjeri Nendran (AAB)	7.30	7.50	7.60	8.82
T ₄ – Bhodibale (ABB)	3.67	5.17	4.17	5.72
T ₅ – Kaveri Kanchan (AAB)	5.37	6.67	5.82	7.80
T ₆ – Patkapura (AAB)	3.50	4.85	3.85	5.67
T ₇ – Bantala (ABB)	4.37	5.75	4.80	6.20
C.D. at 5%	0.18	0.13	0.14	0.14
SE(m)	0.06	0.04	0.04	0.04
C.V.	2.18	1.38	1.63	1.29

Wanna Ammawath *et al.* (2001) ^[13] found that the moisture content after frying had a strong negative link with the sensory

score and a strong positive correlation with the chips breaking force.



Fig 1: Chips prepared from different banana genotypes

Among the seven genotypes evaluated, the chips prepared from cv. Popoulu scored better than all the other cultivars for all sensory parameters including overall acceptability, followed by Manjeri Nendran and Nendran for most of the sensory parameters. Several researchers have previously reported similar differences in the sensory evaluation scores of banana chips like Molla *et al.* (2009) ^[6], Belayneh *et al.* (2014) ^[14], Kuchi *et al.* (2017) ^[8], K.T. Naveena Kumara *et al.* (2020) ^[15], VM Rajenimbalkar *et al.* (2021) ^[16] and Asmare Dagnew *et al.* (2021) ^[17].

Conclusion

The present experiment generated useful information for selecting genotype that is suitable for chips industry. The results indicated that the higher bunch yield (17.05 kg/plant) and fruit weight (272.00 g), which contributed to higher recovery of chips (41.95%) with higher sensory scores such as chips appearance, attractive colour, shape, size, crispness, taste, flavour with overall acceptability and as well as short crop duration (310.22 days), makes Popoulu as the best suitable option over Nendran for processing into chips and thus maximizing the growers returns. Popoulu being king of fruit for making chips due to its larger chips size and attractive orange yellow colour of chips. There is an immense potential for the cultivation and subsequently being used for chips making in industries and thereby can enhance the financial potential of the farmers of Odisha. So Popoulu followed by Manjeri Nendran, Nendran and Kaveri Kanchan can be grown by the farmers of Odisha in large scale which are used in chips making industries.

Acknowledgement

The authors are thankful to ICAR-AICRP on Fruits (Banana) and Odisha University of Agriculture and Technology for providing the facilities and supporting the work.

References

1. Rishirumhirwa T. Agrobiotec: Clean planting material micropropagation for improved crop production in Burundi. In: IV International Symposium on Banana: International Conference on Banana and Plantain in Africa: Harnessing Int. 2008;879:567-570.
2. Uazire AT, Ribeiro CM, Mussane CRB, Pillay M, Blomme G, Fraser C, et al. Preliminary evaluation of improved banana varieties in Mozambique. *African Crop Science Journal*. 2008;16(1):17-25.
3. Chandler S. The nutritional value of bananas. In: *Bananas and plantains*. Dordrecht: Springer; 1995. p. 468-480.
4. Honfo FG, Kayode APP, Coulibaly O, Tenkouano A. Relative contribution of banana and plantain products to the nutritional requirement for iron, zinc and vitamin A of infants and mothers in Cameroon. *Fruits*. 2007;62:267-277.
5. Anonymous. Group Workers Meeting of AICRP on PHT of horticultural crops: Trial data of 2000-2001 presented in workshop held at Konkan Krishi Vidyapeeth, Dapoli from 5th to 7th March 2002. 2002.
6. Molla MM, Nasrin TAA, Islam MN. Study on the suitability of banana varieties in relation to preparation of chips. *Journal of Agriculture and Rural Development*. 2009;81-86.
7. Manju PR, Pushpalatha PB. Evaluation of exotic banana germplasm for growth and yield attributes under Kerala conditions. *Journal of Tropical Agriculture*. 2022;60(1).
8. Kuchi VS, Kabir J, Bouri FK, Gupta R, Dhua RS. Characterization of quality parameters during drying and frying of banana chips. *International Journal of Agricultural Engineering*. 2017;10(2):416-422.
9. Jena P, Swain S, Pradhan BP, Sahu PP, Rath S. Evaluation of new banana (*Musa* spp.) genotypes under Odisha conditions. *International Journal of Chemical Studies*. 2020;8(3):1091-1097.
10. Ravi I, Mustaffa MM. Starch and amylose variability in some banana cultivars. *Indian Journal of Plant Physiology*. 2013;18(1):83-87.
11. Sarkar SK, Bauri FK, Misra DK, Bandyopadhyay B. Varietal evaluation of silk mysore and pome subgroup bananas for yield and post-harvest attributes including diseases and pests. *The Orissa Journal of Horticulture*. 2005;33(2):20-24.
12. Uma S, Saraswathi MS, Sathiamoorthy S, Durai P, Natarajan R. Evaluation of indigenous and exotic banana (*Musa* spp.) hybrids for subsistence cultivation in India. *Indian Journal of Agricultural Sciences*. 2006;76(12):747-749.
13. Ammawath W, Man C, Yaakob B, Yusof S, Rahman RA. Effects of variety and stage of fruit ripeness on the physicochemical and sensory characteristics of deep-fat-fried banana chips. *Journal of the Science of Food and Agriculture*. 2001;81(12):1166-1171.
14. Belayneh M, Workneh TS, Belew D. Physicochemical and sensory evaluation of some cooking banana (*Musa* spp.) for

- boiling and frying process. *Journal of Food Science and Technology*. 2013;51(12):3635-3646.
15. Kumara KTN, Kavitha C, Jeyakumar P, Balakrishnan S, Soorianathasundaram K. Popoulu: A promising plantain banana could strengthen the banana chips industry in India. *Asian Journal of Dairy and Food Research*. 2020;39(4):338-343.
 16. Rajenimbalkar VM, Budgujar CD, Shaikh NB. Screening of Dwarf Cavendish (AAA) banana varieties for chips production. *International Journal of Farm Sciences*. 2021;11(1-2):57-60.
 17. Dagnew A, Assefa W, Kebede G, Ayele L, Mulualem T, Mensa A, et al. Evaluation of banana (*Musa* spp.) cultivars for growth, yield and fruit quality. *Ethiopian Journal of Agricultural Sciences*. 2021;31(3):1-25.