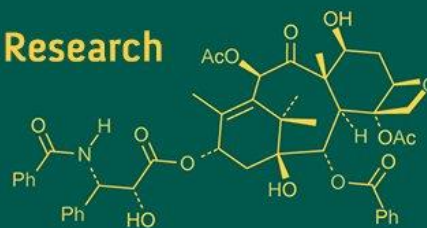
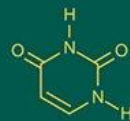


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(6): 357-359
www.biochemjournal.com
Received: 02-03-2026
Accepted: 05-04-2026

Bhagya D Kartha
Department of Fruit Science,
College of Agriculture,
Vellanikkara, Kerala
Agricultural University,
Thrissur, Kerala, India

Anupama TV
Fruits Crops Research Station,
Vellanikkara, Kerala
Agricultural University,
Thrissur, Kerala, India

Asish I Edakkalathur
Department of Plant Breeding
and Genetics, College of
Agriculture, Vellanikkara,
Kerala Agricultural
University, Thrissur, Kerala,
India

Preetha R
Centre for Plant Biotechnology
and Molecular Biology, College
of Agriculture, Vellanikkara,
Kerala Agricultural
University, Thrissur, Kerala,
India

Resmi Paul
Department of Fruit Science,
College of Agriculture,
Vellanikkara, Kerala
Agricultural University,
Thrissur, Kerala, India

Zahida PM
Department of Fruit Science,
College of Agriculture,
Vellanikkara, Kerala
Agricultural University,
Thrissur, Kerala, India

Corresponding Author:
Bhagya D Kartha
Department of Fruit Science,
College of Agriculture,
Vellanikkara, Kerala
Agricultural University,
Thrissur, Kerala, India

Effect of ripening stage and fruit shape on shelf life and quality of abiu (*Pouteria caimito* Radlk.)

Bhagya D Kartha, Anupama TV, Asish I Edakkalathur, Preetha R, Resmi Paul and Zahida PM

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i6Se.8619>

Abstract

Abiu (*Pouteria caimito* Radlk), a tropical fruit belonging to Sapotaceae family is gaining popularity in India, particularly in Kerala State. Abiu has prospects and potential in diversification of homestead farming and also provide an additional source of income for farmers. Though abiu fruits contain many beneficial bioactive compounds, its economic value is limited by short shelf life and rapid browning. Hence fruit quality of abiu at two harvest stages (fully ripe and half ripe) of two shapes (round and oval) were evaluated at the Department of Fruit Science, Kerala Agricultural University, Thrissur. The experiment consisted of four treatments based on fruit maturity and shape: T₁ (half-ripe, oval-shaped), T₂ (half-ripe, round-shaped), T₃ (fully ripe, oval-shaped), and T₄ (fully ripe, round-shaped).

The study revealed that moisture content, total carbohydrates, total phenols, vitamin C, and shelf life of abiu fruits were higher in half ripe stage than at fully ripe stage; whereas total sugars, reducing sugars, TSS and total carotenoid contents were higher at fully ripe stage. Significant differences were not observed between oval shaped and round shaped fruits for the quality. Among the four combinations, half ripe oval-shaped fruits had maximum acidity, total carbohydrates, total phenols, ascorbic acid whereas TSS and total carotenoid contents were maximum in full ripe round fruits. Round fruits had slightly longer shelf life than oval shaped fruits. Organoleptic evaluation revealed maximum overall acceptability score for half-ripe round fruits and full ripe oval fruits; and the lowest for full ripe round fruits. According to the studies, post-harvest methods for improving the quality and shelf life of half-ripe fruits should be developed in order to take advantage of the commercial opportunities.

Keywords: Fruit maturity, postharvest quality

Introduction

Abiu (*Pouteria caimito* Radlk), also known as yellow sapote belonging to Sapotaceae family is an exotic tropical fruit that is recently gaining popularity in India, particularly in Kerala. Abiu is well adapted to the warm and humid climate of Kerala. Its early bearing habit, hardy nature, ability to thrive in a variety of soil types, less incidence of diseases and insect pests make the abiu suitable for commercial cultivation in Kerala.

The taste and quality of fruits depend on the maturity stage at harvest. The harvest index of the abiu fruit is the colour change of the peel from green to light green to bright or pale lemon yellow. But fruits with dark or strong golden colour are considered over ripe. Fruits picked before full maturity contains a large amount of sticky, white latex, which makes its consumption unpalatable. As the fruit matures the latex disappears from the pulp and it remains only in the peel; and the translucent flesh becomes jelly like with a pleasant caramel flavoured pulp (Chandra, 2022) [2]. Full ripening occurs in one to five days after harvest, when the fruit pulp and skin loses the sticky latex; and the fruit can be stored at 50°F with a shelf life of 7-14 days (Love and Paul, 2011) [4]. Abiu fruits contain many beneficial bioactive compounds. However, its economic value is limited by a short shelf life and rapid browning (Susanto *et al.*, 2023) [5]. Post-harvest storage of abiu fruits is significantly influenced by the stage of harvest or maturity and storage conditions. The abiu fruit is climacteric showing a steep respiration peak and high levels of ethylene production, which limits its shelf life (Arif *et al.*, 2022) [1]. Peel browning is a major problem for fruit storage affecting shelf life. Browning can cause for more than 50% of fruit industry losses (Jaeger *et al.*, 2018) [3]. The shelf life of a freshly harvested fully ripe abiu fruit is roughly six days, and after two days of storage, it undergoes a significant increase in browning (Arif *et al.*, 2022) [1]. These qualities limit the market demand and distribution of abiu fruit. So it is important to develop and So it is important to develop and standardize suitable methods to

increase the shelf life and post-harvest quality of the fruit. Hence the study envisages analysis of the post-harvest behaviour of abiu also. With this background, investigations were carried out at the Department of Fruit Science, Kerala Agricultural University, Thrissur to study the influence of harvest stage and fruit shape of abiu fruits on their post-harvest characteristics.

Materials and Methods

Freshly harvested abiu fruits of two shapes (round and oval shape), each at two different stages of maturity (full ripe and half ripe) were stored at ambient conditions of temperature of 30°C temperature and 69% relative humidity. The oval-shaped fruits exhibited a nipple-like protrusion at stylar end, whereas it was absent in the round fruits. Treatments of the experiment are furnished in Table 1. Their physio-chemical parameters such as physiological loss in weight, Total Soluble Solids (TSS), acidity, carbohydrates, total sugars, reducing sugars, total carotenoids, total phenols, vitamin C and shelf life of fruits (days) were recorded to assess the post-harvest behaviour. The experiment was conducted in a completely randomised design with five replications. The results obtained are furnished in Table 2. Organoleptic evaluation of the treated fruits was performed on a 10 - point Hedonic scale for different characters like appearance, colour, flavour, texture, taste, after-taste, and overall acceptability and the data are furnished in kruskal –wallis test Table 3.

Table 1: Treatments of the experiment

Treatments	Stages of maturity and Shape of the fruit
T1	Half ripe- Oval shape fruits
T2	Half ripe- Round shape fruits
T3	Full ripe- Oval shape fruits
T4	Full ripe- Round shape fruits

Results

The results indicated that all the quality parameters and shelf life of the fruits were significantly influenced by the maturity stage and shape of fruits.

There were significant differences between half ripe and full ripe fruits. While TSS (12.90 ° Bx), acidity (0.28%), total sugars (4.34%), reducing sugars (3.15%), and carotenoids (0.023 mg/100g) were significantly higher in full ripe fruits. With respect to the shape of fruits, TSS, carbohydrate content, total sugars and non-reducing sugars did not differ significantly; whereas moisture (77.67%), acidity (0.30%), total phenols (921.78 mg/100g) and vitamin C (9.83

mg/100g) contents were significantly higher in oval shaped fruits and carotenoids (0.018 mg/100g) and shelf life (9.80 days) were higher in round shaped fruits.

Among the four treatment combinations or interaction of fruit maturity and fruit shape, half-ripe, oval shaped fruits recorded the highest acidity (0.31%), while half ripe, round fruits and full ripe oval fruits were on par with each other, and it was the lowest in full ripe, round shaped fruit (0.19%). Total carbohydrate content was the highest in half ripe, oval shaped fruits (3288.90 mg/100 g), followed by half ripe, round shaped fruits (3231.78 mg/100g); and it was the lowest in full ripe, oval shaped fruits and full ripe- round shaped fruit and these were at par with each other. Maximum total phenol content was also observed in half ripe, oval shape fruits (1161.12 mg/ 100g), whereas the lowest was recorded in full ripe, round shape fruits. Fruit maturity and fruit shape did not significantly influence the ascorbic acid content, but half ripe, oval shaped fruits recorded the highest (10.14 mg/100 g). Total soluble solids (13.6 °Brix) and total carotenoid content (0.024 mg/100 g) were the highest in full ripe, round shaped fruits, and full ripe, oval shaped fruits was found to be on par with full ripe, round shaped fruits in terms of TSS. Total sugars, and reducing sugars were the highest in full ripe, round shape fruits was on par with full ripe- oval shaped fruits while the lowest was found in half ripe- round shaped fruits and was on par with Half ripe, oval shaped fruits. Total carbohydrates content shown a sharp decline as the fruit moves from half-ripe to full ripe, dropping by roughly 40%. Whereas the TSS exhibited a steady upward trend as the fruit ripens due to conversion of starches to sugars. Shelf Life dropped significantly once the fruit reaches the "Full ripe" stage, especially in the full ripe, oval shaped fruit where it dropped from 10.8 to 5.2 days. Moisture was at its peaks in the half ripe, round shaped fruits (82.24%) and came to its lowest point in the full ripe, round shaped fruit (65.74%). Round fruits had slightly longer shelf life than oval shaped fruits. The influence of maturity stage and shape of fruits on quality parameters is furnished in table 2. Organoleptic quality evaluation (table 3) revealed no significant statistical difference between the four treatments of fruits for appearance, colour, flavour, texture, taste, and after-taste; but it differed for overall acceptability. Maximum overall acceptability score of 7.20 was recorded for T₂ (half-ripe round fruits) and T₃ (full ripe oval fruits) and they were at par with each other. The lowest acceptability was for T₄ (full ripe round fruits).

Table 2: Influence of maturity stage and shape of fruits on quality parameters

	Moisture (%)	TSS (°Brix)	Acidity (%)	Carbo-hydrates (mg/100 g)	Total sugars (%)	Reducing sugars (%)	Carote-noids (mg/100g)	Total phenols (mg/100g)	Vit C (mg/ 100g)	Shelf life (days)
FACTOR- A										
Half ripe fruits	80.60 ^a	10.60 ^b	0.24 ^b	3260.3 ^a	3.3 ^b	2.35 ^b	0.012 ^b	1010.93 ^a	9.79 ^a	11.78 ^a
Full ripe fruits	71.06 ^b	12.90 ^a	0.28 ^a	1952.9 ^b	4.34 ^a	3.15 ^a	0.023 ^a	653.46 ^b	7.93 ^b	6.10 ^b
CD	1.71	1.11	0.02	46.87	0.63	0.49	0.001	18.32	1.26	1.79
FACTOR- B										
Oval shape fruits	77.67 ^a	11.8	0.30 ^a	2614.4	3.84	2.78	0.016 ^b	921.78 ^a	9.83 ^a	8.00 ^b
Round shape fruits	73.99 ^b	11.7	0.22 ^b	2598.9	3.80	2.72	0.018 ^a	742.61 ^b	7.89 ^b	9.80 ^a
CD (p= 0.05)	1.71	NS	0.02	NS	NS	NS	0.001	18.32	1.26	1.79
INTERACTIONS										
T ₁ : Half ripe -Oval	78.95 ^b	11.40 ^b	0.31 ^a	3288.90 ^a	3.68 ^{bc}	2.43	0.011	1161.12 ^a	10.14	10.80 ^a
T ₂ : Half ripe -Round	82.24 ^a	9.80 ^c	0.24 ^b	3231.78 ^b	2.92 ^c	2.27	0.012	860.74 ^b	9.43	12.60 ^a
T ₃ : Full ripe -Oval	76.38 ^c	12.20 ^{ab}	0.28 ^b	1939.86 ^c	3.99 ^{ab}	3.12	0.022	682.44 ^c	9.51	5.2 ^c
T ₄ : Full ripe -Round	65.74 ^d	13.60 ^a	0.19 ^c	1966.05 ^c	4.68 ^a	3.17	0.024	624.48 ^d	6.35	7.00 ^c
CV %	2.37	9.98	12.73	1.15	17.33	18.59	4.48	2.32	14.96	21.17
CD (P=0.05)	2.42	1.57	0.05	40.22	0.88	NS	NS	25.90	NS	1.78

Table 3: Mean score for organoleptic evaluation of fruits of different maturity and shapes

Treatments	Appearance	Colour	Flavour	Texture	Taste	After taste	Overall acceptability
T ₁ : Half ripe – Oval	6.00	6.40	5.60	5.60	6.00	5.60	5.80 ^{ab}
T ₂ : Half ripe – Round	6.60	7.20	6.60	6.80	7.20	6.40	7.20 ^a
T ₃ : Full ripe – Oval	7.40	7.60	6.60	7.40	7.20	6.20	7.20 ^a
T ₄ : Full ripe – Round	4.20	4.80	5.00	6.20	5.40	5.40	4.80 ^b
Chi sq. test	NS	NS	NS	NS	NS	NS	7.92*
p value (0.05)	0.09	0.11	0.40	0.13	0.44	0.59	0.05

Discussion

The study confirmed reports of Arif *et al.*, (2022) ^[1] indicating that the abiu fruit harvested at half-ripe stage had a better harvest maturity with good quality and longer shelf life. We also observed a similar trend. stated that abiu fruit harvested at the maturity stage of 50% green and 50% yellow were preferred for consumption by consumers. The abiu fruit harvested at the half ripe stage could delay browning disorder so that its shelf life was 3-4 days longer than for the full ripe stage. Abiu fruit harvested when half ripe had a moderately sweet taste, yellow color, shelf life of 9–10 days and having occurrence of browning at a slow rate. Considering the results of major post- harvest quality parameters mentioned above, the abiu fruit harvested when half-ripe maturity stage had better quality and longer shelf life (Arif *et al.*, 2022) ^[1].

Conclusion

The results showed that half-ripe abiu fruits had higher moisture content, total carbohydrates, total phenols, vitamin C, and longer shelf life compared to fully ripe fruits, whereas fully ripe fruits exhibited higher Total Soluble Solids (TSS), total sugars, reducing sugars and total carotenoid content. Differences between oval and round shaped fruits in terms of quality and shelf life were minimal and at par with each other. Among the treatments, half-ripe oval-shaped fruits recorded the highest acidity (0.51%), total carbohydrates, total phenols and ascorbic acid (10.14 mg/100 g). In contrast, fully ripe round-shaped fruits showed the highest TSS (13.6 °Brix) and total carotenoid content (0.024 mg/100 g). Round-shaped fruits had a slightly longer shelf life than oval-shaped fruits. Sensory evaluation indicated that half-ripe round-shaped and fully ripe oval-shaped fruits achieved the highest overall acceptability, while fully ripe round-shaped fruits received the lowest scores. Overall, the findings highlight the importance of developing post-harvest strategies to improve the shelf life and quality of half-ripe fruits.

Acknowledgments

The authors are highly grateful to the Department of Fruit Science, College of Agriculture, Vellanikkara, Kerala Agricultural University, India for providing the necessary facilities to conduct the experiment

References

1. Arif AB, Susanto S, Siti M, Deden D. Effect of ripening stage on postharvest quality of abiu (*Pouteria caimito*) fruit during storage. *Agric Nat Resour.* 2022;56(3):441-445.
2. Chandra R. Abiu fruits and its cultivation prospects in Kerala. *Kerala Karshakan* [Internet]. 2022 [cited 2026 Apr 3]. Available from: https://fibkerala.gov.in/sites/default/files/inline-files/kke_august_2022-23.pdf
3. Jaeger SR, Machin L, Witzel JA, Antunez L, Harker FR, Ares G. Buy, eat or discard? A case study with

apples to explore fruit quality perception and food waste. *Food Qual Prefer.* 2018;69:10-20.

4. Love K, Paull RE. Abiu. In: *Fruits and Nuts*. Honolulu: University of Hawaii; 2011. p. 1-6.
5. Susanto S, Arif AB, Widayanti SM, Matra DD. Ascorbic acid extends the shelf-life of abiu (*Pouteria caimito*) fruit by maintaining quality and delaying browning symptoms. *Hortic J.* 2023;92(3):216-226.