Biochemical characterization of Jjabuticaba (*Plinia cauliflora*) varieties

ABSTRACT

An experiment was conducted at the Department of Fruit Science, College of Agriculture, Vellayani, Kerala Agricultural University, to perform the biochemical characterization of Jjabuticaba (*Plinia cauliflora*). The Jjabuticaba tree, belonging to the Myrtaceae family and native to Brazil, has been introduced to Kerala, where several varieties have been identified through a survey. This study presents a detailed biochemical analysis of Jjabuticaba fruits, focusing on key parameters such as total soluble solids, acidity, ascorbic acid, reducing sugars, total sugars, flavonoids, and anthocyanins. The average TSS content in the Percoce variety was 18.8° Brix, indicating high natural sweetness. The fruit showed an acidity of 1.9% in the variety Red pouch and Aureana varieties. The ascorbic acid content in the Percoce variety was 167.10 mg/100g. The reducing sugar and total sugar high contents in the Percoce variety were 8.4% and 10% respectively. The Escarlate variety had the highest anthocyanin content in its skin, with 281.6 mg/100g^{-1}, while the Red crystal variety had the highest flavonoid content of 4.1 mg/100g^{-1}. These results emphasize Jjabuticaba's rich nutritional value and offer insights for farmers in selecting the best variety for cultivation.

Keywords:Jabuticaba, anthocyanin, flavanoid , biochemical analysis

1. INTRODUCTION

Jabuticaba scientifically, *Plinia cauliflora*belongs to the Myrtaceae family and it is native to the Brazilian South and Southeast subtropical regions.Jabuticaba, a fruit crop introduced to Kerala, is gaining significance today due to its nutraceutical properties. Commercial fruit production is low and restricted to certain homesteads of Kerala. However, the marketing potential of this fruit is great, due to its nutraceutical properties

which may arouse the interest of the food and pharmaceutical industries, because of the high contents of anthocyanins and flavonoids in the fruit.

Jabuticaba are very nutrient-dense and packed with important elements such as vitamin B, vitamin C and vitamin E. Additionally, minerals like magnesium, potassium, and calcium are present. Its strong antioxidant content, especially that of anthocyanins, helps fight oxidative stress and lowers the risk of chronic illnesses like heart disease and some types of cancer. Fruit is generally eaten raw, but it can also be processed to create vinegar, wine, liquor, juice, jam, jellies and marmalade.

Farmers have selected and adopted certain varieties of jabuticaba, which perform best in a particular locality. But these types show different performance when grown in different agro climatic conditions. Therefore, it will be desirable to select the best types to exploit the full yield potential of the fruit crop. No systematic study has been undertaken regarding the biochemical characterization of jabuticaba under Kerala conditions. So here an attempt is being made to locate jabuticaba varieties , which possess ~~give~~ high fruit quality under Kerala conditions. The evaluation of selected elite types will also help in the further crop improvement of jabuticaba and it is also a boon to the farmers. So. the present study is proposed for ~~the biochemical~~the biochemicalcharacterization of jabuticaba under Kerala conditions.

1. MATERIALS AND METHODS

The current study was conducted at College of Agriculture Vellayani during October 2023 to May 2024. A preliminary survey was conducted across Kerala to identify and to locate jabuticaba trees. The preparation involved reaching out to farmers, identifying the trees, and conducting a study and collection of fruit. A total of fifty five, including both fruit-bearing and non-bearing varieties, were identified across four districts.From these, twenty fruit-bearing trees were chosen from different locations in the districts of Kasaragod, Kannur, Kollam, and Trivandrum, and the fruits were subsequently collected for biochemical analysis.

2.1 Determination of total soluble solids (°Brix), acidity, ascorbic acid, total sugar and reducing sugar

Total soluble solids (TSS) were measured using digital refractometers (Atago: 0 to 53%) and expressed in degree brix (^{o} Brix). The acidity (AY) of the fruit pulp was assessed following the method, AOAC (1984). Ascorbic acid (AA) concentration was determined using the AOAC (1984) procedure, with results expressed in mg/100g. The total sugar (TS) and reducing sugar (RS) content in the fruit pulp was quantified using the method outlined by Lane and Eynon (Ranganna, 1991).

2.2 Anthocyanin (mg 100g-1)

Estimation of anthocyanin (ANC) content was done using the spectrophotometric method described by Abdel-Aal *et al*. (2006)

2.3 Flavanoid (mg 100g-1)

Flavonoid content (FLVD) Lin and Tang's (2007) method was applied to determine FLVD.

2.4 Statistical analysis

Principal Component Analysis (PCA) was used to evaluate and understand the relationships among various biochemical parameters (Gopinath *et al*., 2020).

3. RESULT AND DISCUSSION

3.1 Total soluble solids *(°Brix)*

The total soluble solids ranged from 7.4º B to 18.8º B across the varieties, with an average of 13.06º B and a coefficient of variation of 0.296 percent. The highest level was observed in the Percoce variety, while the lowest was found in the

PhitranthaBranca variety. A similar result was observed in Danner *et al.* (2011) observed that the total soluble solids (TSS) content in jabuticaba germplasm was 17%. Lima (2009)found TSS levels of 14.90º B in the Paulista variety and 14.13º B in the Sabará variety.Lima *et al*. (2008) report that soluble solids content is one of the most important tools for estimating fruit quality because it represents the concentration of sugars, organic acids, and other minor constituents. Bindu and Renjan (2022) reported wide variability in TSS content of traditional juicy mangoes.

3.2 Acidity(%)

The acidity content ranged from 0.6% and 1.9%. The maximum value was recorded in variety Red pouch and Aureana (1.9%), while the minimum value was recorded in variety Branca and Red hybrid (0.6%). The total acidity in jabuticaba was reported to be high values when compared to other fruits, Oliveira *et al.* (2003). Bindu *et al*., (2022) noted wide variability exists in table purpose traditional mangoes and they exhibited moderate acidity level. Guedes *et al*. (2014) reported an average total acidity of 0.85% citric acid per $100g^{-1}$.

3.3 Ascorbic acid(*mg* $100g^{-1}$)

The ascorbic acid content in jabuticaba exhibited significant variation, ranging from 16.3 mg/100 g^{-1} to 167.10 mg/100 g^{-1}, with a mean of 63.205 percent and a coefficient of variation of 0.38%. The Percoce variety recorded the highest ascorbic acid content at 167.10 mg/100 g^{-1}, while the Aureana variety had the lowest at 16.3 mg/100 g^{-1}. Similarly, Sabara variety, as described by Lima *et al*. (2023), demonstrated an even greater ascorbic acid content of 167.54 mg/100 g, highlighting the considerable variability in nutritional composition among jabuticaba varieties. Bindu (2018) noted an ascorbic acid content of 40 mg/100 g^{-1} in papapya.

3.4 Total sugar(%)

The total sugar content in this study ranged from 4.2 percent to 10 percent, with an average of 6.88 percent and a coefficient of variation of 0.218 percent. The Percoce variety had the highest total sugar content at 10 percent, while the Saupacia variety had

the lowest at 4.2 percent. These results are similar to the findings of Prakash *et al.* (2007) in Jamun and Bindu (2021) in Karpooram mango. Henrique *et al*. (2015), reported that the total sugar content in the Sabara variety of jabuticaba was lower than the values found in this study, which was 1.3 percent. The higher sugar content observed in this study suggests that jabuticaba fruits may exhibit considerable variability in their sugar composition, influenced by environmental conditions, varietal differences, and the ripeness of the fruit at the time of harvest.

3.5 Reducing sugar(%)

The reducing sugar content in this study varied between 0.8% and 8.4%, with an average of 2.925%. The Percoce variety had the highest reducing sugar content at 8.4%, while the White Esalq variety had the lowest at 0.8%. These results are similar to those reported by Babu *et al*. (2019) in jamun and Bindu (2021) in Karpooram mango. However, another study by Henrique *et al. (*2015) reported a lower reducing sugar content in jaboticaba of 0.9%, which is closer to the minimum value observed in this study. The variation in reducing sugar content between studies may be explained by differences in varietal characteristics, environmental conditions, and the methodologies used for sugar analysis.

3.6 Anthocyanin(mg 100g-1)

Anthocyanin content ranged from 4 to 281.60 mg $100g^{-1}$, with an average of 128.760 mg $100g^{-1}$and a coefficient of variation of 0.842 percent. The highest anthocyanin levels were found in the Escarlate, variety, reaching up to 281.60 mg $100g^{-1}$, while the Green Crystal variety had the lowest content at 4 mg $100g^{-1}$.Similar result was found by Mattos *et al.*(2022) ranges 58.92 to 284.09 mg $100g^{-1}$in Red , black and followed purple colour skin and Pantelidis *et al*. (2007) found similar result in yellow raspberry (cv. Fallgold) and gooseberry (cv. White Smith) cultivars, as well as the red currant cultivars, were characterised by the lowest anthocyanin content (1.3–7.8 mg $100g^{-1}$).

3.7 Flavanoid (mg $100g^{-1}$)

Flavonoid content of jabuticaba varieties ranged from 0.9 to 4.1 mg/$100g^{-1}$, with an average of 2.05 percent and a coefficient of variation of 0.523%. The Red Crystal

variation displayed the highest flavonoid content, while the Red Hybrid, Novak Phitrantha, Plinia Grandifolia, and Peach Phitrantha varieties exhibited the lowest levels. These findings align partially with previous studies. For instance, Guedes *et al*. (2014) reported a flavonoid content of 1.16 mg/100g^{-1}, and Pinto *et al*. (2011) found a flavonoid content in the pulp ranging from 2.96 mg/100g^{-1}, both of which are lower than the values observed in this study.

4. Conclusion

Through, the assessment of varietiesyusing based on recorded biochemical observations, the following varieties were ɣ identified as elite among the twenty are Percoce, Sabara, Red crystal variation, Escarlate, Red pouch, Aureana, Novakphitrantha, White esalq and Red hybrid.

Table no-1 Biochemical parameters of Jabuticaba varieties

SL.No	Variety	TSS(Brix^{0})	Acidity(%)	Ascorbic acid (mg 100g-^{1})	Total sugar (%)
1	Sabara	17	1.5	67.4	7.7
2	Red hybrid	18.7	0.8	160.2	9
3	Percoce	18.8	1.7	167.1	10
4	Escarlate	18.6	1.8	57	4.9
5	Aureana	10.2	1.9	16.3	7.4
6	White esalq	12.2	1.1	57.4	7.6
7	Novak phitrantha	10.3	1.5	28.6	6.7
8	Lemon grass	16.9	0.7	25.2	6.8
9	Green crystal	17.5	1.1	69.6	7.4

10	Red pouch	10.7	1.9	28.8	6.7
11	Saupacia	13.4	0.7	89.1	4.2
12	Branca	10	0.6	54.8	6.6
13	Acupaulista	7.7	1.5	86.3	4.6
14	Pingo de mel	10.2	1.3	88.1	6.3
15	Red crystal variation	17.5	1.6	28.9	6.7
16	Red hybrid variation	11.8	0.6	57.5	9.7
17	Phitranthabranca	7.4	0.9	80.7	5.8
18	Branca mel	10.3	0.8	35.7	6.1
19	Plinia grandifolia	10.2	1	35.6	6.6
20	Peach phitrantha	11.8	0.8	29.8	6.8

Table no: 2 Reducing sugar, anthocyanin and flavonoid content inJabuticabavarieties

SL.No	Variety	Reducing sugar(%)	Anthocyanin(mg $100g^{-1}$)	Flavonoids(mg $100g^{-1}$)
1	Sabara	2.7	280.5	2
2	Red hybrid	3.9	230	1.6
3	Percoce	5.4	177.7	1.7
4	Escarlate	2.7	281.6	1.4
5	Aureana	2.6	7.3	3.6
6	White esalq	0.8	6.5	1.9
7	Novak phitrantha	3.5	280.9	0.9
8	Lemon grass	2.6	7.4	4
9	Green crystal	1.5	4	3.6
10	Red pouch	3.2	160.4	1.2
11	Saupacia	1.8	199.5	2
12	Branca	2.8	7.1	3.2
13	Acupaulista	1.9	151.4	1.5
14	Pingo de mel	3.4	105.3	1.8
15	Red crystal variation	3.2	7.6	4.1
16	Red hybrid variation	4.9	280.4	0.9
17	Phitranthabranca	3.1	59.4	1.4
18	Branca mel	3.2	7.3	2.4

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19	Plinia grandifolia	2.8	160.5	0.9
20	Peach- phitrantha	2.5	160.4	0.9

Table no:3 Summary statistics for biochemical parametersJabuticabavarieties

Descriptives	TSS (°B)	Acidity(%)	Ascorbic acid (mg/100g)	Total sugars (%)	Reducing sugar(%)	Anthocyanin(mg100g-1	Flavonoids(mg 100g -1)
Minimum value	7.4	0.6	16.3	4.2	0.8	4	0.9
Maximum value	18.8	1.9	167.10	10	5.4	281.60	4.1
Range	11.4	1.3	150.8	5.8	4.6	277.60	3.2
Mean	13.06	1.19	63.205	6.88	2.925	128.760	2.05
SE(M)	0.865	0.101	9.234	0.335	0.236	24.240	0.24
SD	3.871	0.452	41.297	1.497	1.056	108.406	1.072
CV (%)	0.296	0.38	0.653	0.218	0.361	0.842	0.523

Fig 1: Scree plot of PCA based on 7 biochemical parameters

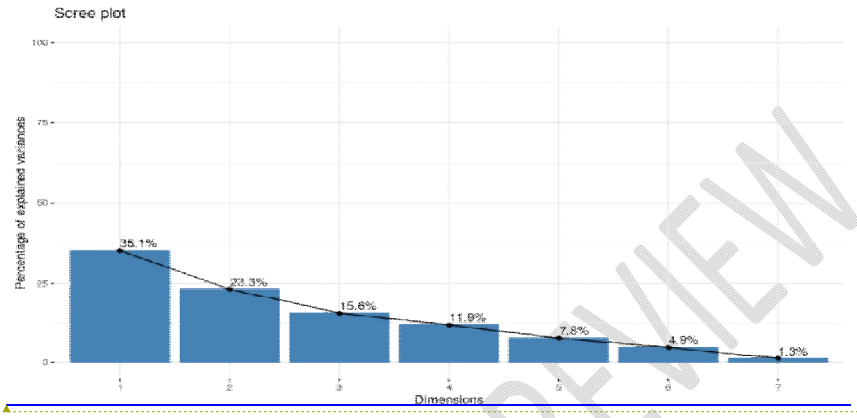

Fig2: PCA Biplot based on 7 biochemical parameters

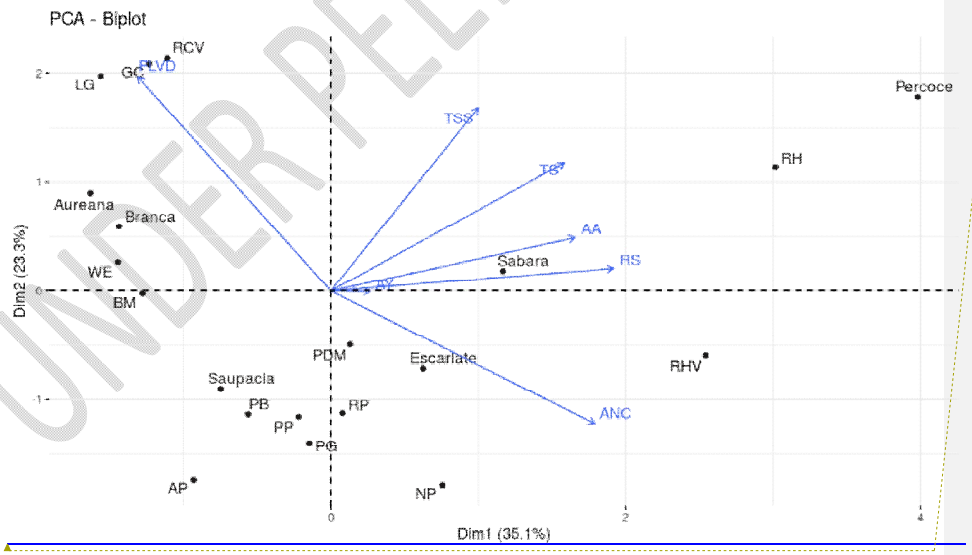

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Fig 3 :Jabuticaba tree with fruits

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