academicJournals

Vol. 11(33), pp. 3154-3161, 18 August, 2016
DOI: 10.5897/AJAR2015.10678
Article Number: 2A882F760054
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Anthocyanin content, flavonoid, color and physicochemical characteristics of dried jabuticaba residue

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Received 23 November, 2015; Accepted 19 April, 2016

The search for alternatives to exploit nutritional and functional properties of agro-industrial by-products has stimulated the development of researches. Agro-industries have targeted different native fruits, such as jabuticaba, to produce juices or candies. Jabuticaba have high nutritional value, and its industrial residues can also contain nutritional compounds that may be recovered. The objective of this work was to verify storage effects on anthocyanin and flavonoid contents, color and physical-chemical features from agro-industrial by-products of two genotypes of jabuticaba (Clevelândia and Verê) and two industrial processes of juice extraction (crushing and steam). By-product samples were ground and the powder was packaged on vacuum, and was then stored during 135 days. The powdered peel of both Jabuticaba genotypes are rich in flavonoids and steam extraction was more effective to obtain the peel. Clevelândia genotype had higher anthocyanin content, but both genotypes showed high levels of this compound. Color quality is enhanced when dehydrated with attractive pigmentation for blends in food. Thus, jabuticaba peel has significant nutritional and functional levels, being a good source of fiber, ash, natural pigment and phenolic compounds. It can be used in food products such as bioactive ingredient.

Key words: *Myrciaria cauliflora*, shelf life, by-products.

INTRODUCTION

Jabuticaba (*Myrciaria cauliflora* Berg.) is a Brazilian native fruit, which spontaneously occurs all over the country, but its chemical contents are barely unknown (Lima, 2008; Sasso et al., 2010). It is a subtropical fruit, which contains high nutritional value, but its destination is still concentrated in *in natura* consumption (Marquetti,

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2004). Currently, there has been an increasing agro-industrial interest in this fruit due to its antioxidant activity, which is higher than grape's one, emphasizing that the fruit peel concentrates its higher bioactivity.

Agro-industrial activity generates huge amounts of residual biomass, which is a potential source of antioxidant compounds, including phenolic compounds (Schieber et al., 2001). Using agro-industrial residues as antioxidant source reduces destination costs and adds value to final product, representing an economically viable alternative. Phenolic compounds are secondary metabolites derived from fruit phenylpropanoid metabolic pathways (Randhir et al., 2004). As natural antioxidants, phenolic compounds may play important functional role in human organism, reducing oxidative stress at cell level (Balasundram et al., 2006; Othman et al., 2007; Babbar et al., 2011). Agro industrial residues consist of raw material remaining parts, such as peels and seeds. Researches have shown that peel is usually the part of fruit that concentrates the highest level of phenolic compounds (Marks et al., 2007; Ribeiro et al., 2008; Mikulic-Petkovsek et al., 2010).

Dehydration preserves vegetables and plays an important role in its final quality, but if done improperly, it may cause food decay and considerably change its physicochemical properties (Faroni et al., 2006). Jabuticaba is a dark colored fruit, rich in anthocyanin soluble pigments, which, through dehydrating, add color and nutritional value to other foods, which quality essentially relies on nutritional facts, and color is a relevant final aspect (Alves and Silveira, 2002). However, the stability of dehydrated products can be changed during storage, which alters their physico-chemical properties. Although anthocyanins are widely distributed in nature, their commercial use is restricted. Probably it is explained by its sensitivity to heat, which accelerates decay, loss of color (caused by the presence of ascorbic acid) and sugars (Bobbio, 2001). The influence anthocyanin degradation, according to Seravalli (2004), occurs due to several factors, among them are: pH, temperature, enzymes, ascorbic acid, oxygen, sulfur dioxide and metal ions (especially iron). These can occur during harvesting, the plant extraction, processing and storage of food. Preventive measures are necessary at all stages of obtaining such compound.

Due to the facts described above and to jabuticaba nutritional importance, the objective of this work was to evaluate storage effect on anthocyanin and flavonoid contents, color quality and physico-chemical features of juice extraction residues of two jabuticaba genotypes (Clevelândia and Verê) processes of crushing and steam.

MATERIALS AND METHODS

Samples

This study made use of Jabuticaba (*Plinia cauliflora*) fruits identified as Cl genotype, from a farm in Clevelândia, Paraná, and VR genotype from a farm in Verê, in the same state. Manual parcel harvest occurred in the morning, and the fruits were immediately wrapped in 36 x 55,5 x 31 cm high density polyethylene to be transported to UTFPR-DV agro industry where they were processed on the same day. In the process, jabuticabas were classified, and those fruits without physical damage or decay were selected. Afterwards, they were washed in tap water and sanitized with 100-ppm sodium hypochlorite solution. Then, the fruits were washed in distilled water and drained for 10 min.

Jabuticaba process and residue obtaining

There were tests to evaluate jabuticaba juice residues resulting from both crushing and forced steam extraction methods. The flowchart (Figure 1) demonstrates jabuticaba extraction process and residue dehydrating (stage 1), and powder residue storage. The equipment used to extract jabuticaba juice through steam had 40 kg h^{-1} maximum capacity, and extraction temperature was 70°C. Both genotype residues are composed of peels and about 3% seeds. Obtained peels were drained, eliminating juice that remains after steam extraction, then they were stored in a -18°C freezer, until analyses and its dehydration. Crushing process happened in a stainless steel fruit de-pulping machine with polished aluminum nozzles whose capacity was up to 100 kg h^{-1}. The same hygiene procedures were performed, separated and drained peels right after storage in a -18°C, until the analyses and dehydration.

Residue drying and storage

The obtained residues were dehydrated in a forced-air dryer, heated by liquefied petroleum gas (LPG). Drying temperature was 70°C until samples reached 10% base humidity. Author's preliminary studies determined this drying temperature. In this work, jabuticaba sample showed no significant change on total phenolic content or physico-chemical features until this drying temperature.

A semi-industrial blender (Skymsen, modelo LV -1,5) grinded the dehydrated peels for five minutes, then 60-mesh sifts sifted powder, separating bigger particles. Vacuum package (PP plastic transparent) wrapped all the powder and researchers placed packages on stainless steel shelves under room temperature without incidence of direct light. The analyses were performed at initial time, then at 45 and at 135 days.

Physicochemical analyses

Total titratable acidity

Acidity was measured by potentiometric method, Adolfo Lutz Institute (2008) is indicated in the case of dark or strongly colorful solutions. 2.5 g of samples were weighed in a 100 mL Becker and diluted it 50 mL ultrapure water. Then, the electrode was immersed in the solution and began titrating the sample with NaOH 0.1 M until 8.2- 8.4 pH level. 100 g^{-1} citric acid was expressed result, using citric acid equivalent = 64, according to Lima et al. (2008).

pH

pH was determined and previously calibrated with 4.0 and 7.0 pH buffer solution pH meter (IAL 2008).

Total soluble solids

In the determination of total soluble solids (SST), the verification

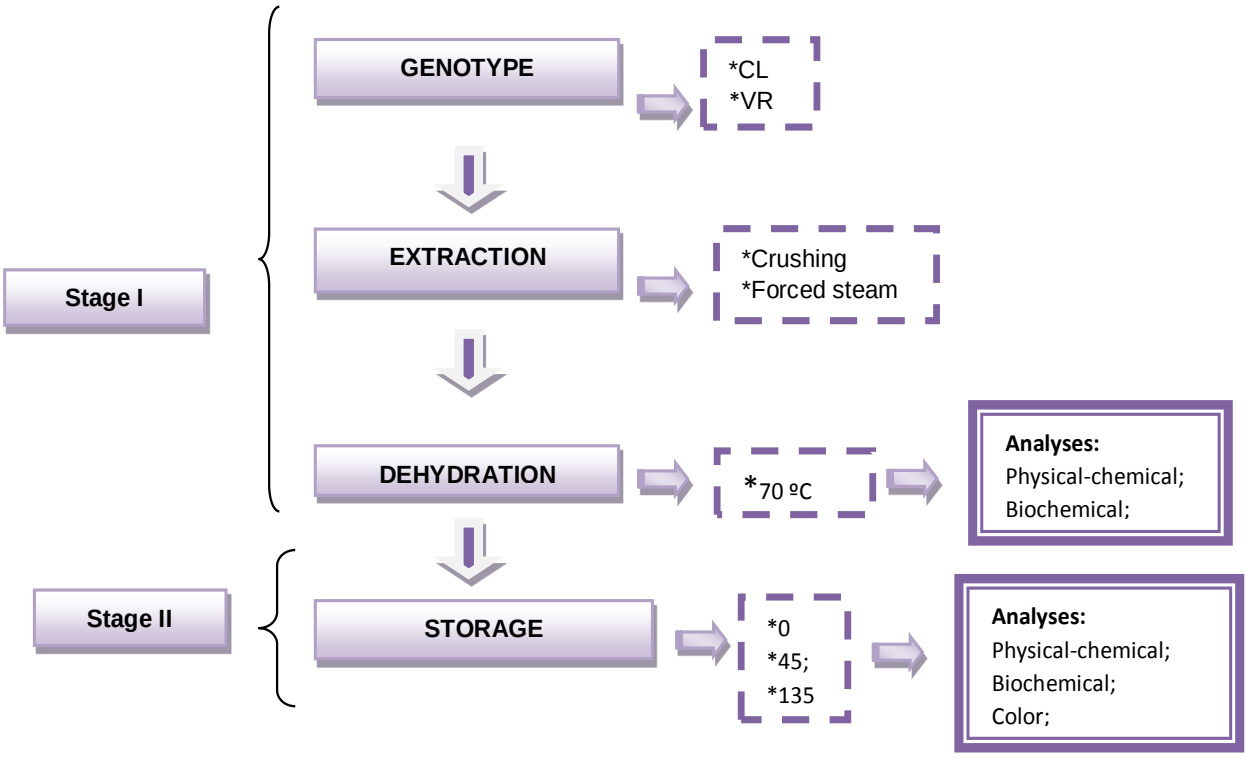


Figure 1. Jabuticaba processing flowchart, dehydration and residue storage.

was according to Instituto Adolfo Luz methodology, the results are expressed in °Brix by digital refractometer. Samples were performed in triplicate.

Ash

Ash was determined by gravimetric method, according to Instituto Adolfo Lutz's physicochemical methods to analyze foods (2008). 5.0 g sample were weighed in a previously dried crucible of known mass. Firstly, the samples were heated to 550°C kiln to incinerate during four hours, then cooled under room temperature in desiccators and once again weighed. The results were expressed in g 100 g^{-1}.

Humidity content

Humidity content was determined by gravimetric method in a 105°C oven until constant mass of dry mass, according to Adolfo Lutz Institute (2008). 2.0 g samples were weighed in a previously weighed porcelain vessel. After that, samples went to an oven with air circulation until constant weight (six hours average). The results were expressed in g $100g^{-1}$.

Flavonoids and total anthocyanins

Extract preparation

The extracts were obtained by cold hydro alcoholic extraction method, according to Vedana (2008). 1 g sample was immersed in 10 mL 80% ethanol weighed, placed in a 15 mL falcon, then placed in an ultrasound for 20 min. Afterwards, each sample was taken to 3500 rpm centrifuging for 20 min. Supernatants were transferred to another falcon and kept under -18°C temperature until the analyses was performed ten days later.

Total flavonoids

They were determined according to Chang et al. (2002), with some changes. In 0.5 mL extract, there was the addition of 4.3 mL 80% ethanol in water (v/v), 0.1 mL $AlCl_3$ (10% w/v) and 0.1 mL potassium acetate (20% w/v). A parallel control series was performed with 80% ethanol replacing $AlCl_3$. After 40 min in darkness under room temperature, absorbance was measured at 415 nm. The results were expressed in mg g^{-1} of fresh weight, equivalent quercetin (EQ), adjustment of calibration curve for quercetin was calculated.

Total anthocyanins

Anthocyanins were determined through differential pH methodology proposed by Lee et al. (2005), which consisted firstly of preparing pH 1 (KCl 0.025 M) and 4.5 pH ($C_2H_3NaO_2$ 0.4 M) buffer solutions. After preliminary dilution tests, 1 ml extract and 19 mL of respective buffers were added. 20 min later, the absorbance levels of both were measured at 510 and 700 nm. The white one was prepared with ultrapure water. The level of total anthocyanins (AT, mg Ci-3-Gly L^{-1}) was obtained through equation 1 level and expressed in 100 g jabuticaba peels:

$$TA = (A \times MW \times DF \times 10^3) \div (\in \times I) \quad (1)$$

Where, A = (A_{510nm}- A_{700nm}) pH 1 – (A_{510nm}- A_{700nm}) pH 4.5; MW = 449.2 g mol^{-1} for cianidine-3-glicoside; DF = dilution factor; l = light path in cm; ε = 26.900 molar extinction coefficient (L x mol^{-1} x cm^{-1}) ; 10^3 = g to mg conversion factor.

Color

Color was determined by direct reading of L*, a* and b* coordinate reflectance, applying CIELAB scale in a Konica Minolta CR-410 tristimulus colorimeter to 10º/D_{65} in triplicate measurements. Color angle or tone (H*), calculated by Equation 2, is the most familiar color aspect that can be described and identifies colors as red, green, blue or yellow. It starts on +a*axis and expressed in degrees: 0° for red (+a*), 90° for yellow (+b*), 180° for green (-a*) and 270° for blue (-b*). Chroma index (C*), calculated by Equation 3, indicates tone intensity or purity, independently on how light or dark the color is. The higher its tone, the more intense the color is, or highly chromatic seeming luminous or concentrated, the levels.

$$H^* = tan^{-1}\left(\frac{b^*}{a^*}\right) \quad (2)$$

$$C^* = \sqrt{[(a^*)^2 + (b^*)^2]} \quad (3)$$

Sample color location and even statistics are not enough to express if color differences are visually distinguishable. These color differences (ΔE^*_{ab}) are important to evaluate numerical and visual relations (CIE, 1995) and may be calculated by the distance between the two spots in tridimensional room defined as colorimetric parameter a*, b*, c* and L* mathematically described by Equation 4.

$$\Delta E^*_{ab} = \sqrt{(\Delta L^*)^2} + (\Delta a^*)^2 + (\Delta b^*)^2 \quad (4)$$

Statistical analysis

The experiment was conducted according to a wholly randomized outlining. A variance analysis was applied and a Tukey test was applied on the parameters, and the results were significant for F test. Every analysis used $p<0.05$ significance level and SISVAR statistical package.

RESULTS AND DISCUSSION

Acidity, pH, soluble solid content (SST), ash and humidity results of Jabuticaba peels (both genotypes) subjected to steam and crushing treatments followed by dehydration are shown in Table 1.

It was observed that independent of the way fruit is processed, Verê jabuticaba residue showed higher ATT than Clevelândia sample residue. At the end of storage (135 days), residues from both genotypes demonstrated an increase of titratable acidity, but this occurred just for those resulting from steam extraction. Most likely, this increase occurred due to microbial activity, because higher humidity levels may have led to its development. pH result between Verê and Clevelândia genotypes in steam process and crushing process differed statistically, indicating that Verê genotype has less acid peel showing a more elevated acidity than Clevelandia genotype. Regarding storage time, it presented itself stable at initial time (0) until 135 days (from 2.99 upto 3,50 average between genotypes) (Table 1). It is emphasized that Vere genotype residue is more acid. However, it suffered changes in total titratable acidity, when the peel was separated by crushing at the time of 45 days and peel obtainment through steam separation at the time of 135 days. There is a notion that this may relate to humidity level in the value results above 15%, throughout times in study.

There were lower levels for jabuticaba peel (0,71 g citric acid 100 g^{-1}) in a work developed by Silva et al. (2013). However, contents verified by Marquetti (2014) (3.77 g citric acid 100 g^{-1}) in the peel flour and by Boari Lima et al. (2008) in jabuticaba Paulista and Sabará fresh pulp (1.37 and 1.67 g citric acid 100 g^{-1}) are similar to the obtained in this study for dehydrated residue.

Maximum acidity in flours, according to Brazilian laws, is 2.0 mL NaOH N 100 g^{-1}, but most samples of this experiment are not in these parameters because it varied from 2.02 to 4.91 mL NaOH N 100 g^{-1}. On the other hand, according to Soares et al. (1992), most bacteria, moulds and yeast grow in pH higher than 4.5.

SST showed higher contents in Clevelândia genotype peel (Table 1). For crushing process, no significant differences were observed between genotypes. Furthermore, steam process showed higher SST values if compared with crushing, indicating that crushing assisted in greater losses of solids. Nevertheless, SST may imply lower post-harvest potential of conservation, due to higher fermentation (Barros et al., 1996). For powdered peel humidity content, at genotype zero time both showed contents below recommendation by Brazilian law, which is below 15%.

Marquetti (2014) observed 8.63 humidity content in the preparation of cookie flour, close to residual contents seen in this study, corresponding to Verê genotype peel powder (9.80%) and Clevelândia (10.60%), at the beginning of storage. Also, the results is similar to that of Boekel et al. (2011), where rice and soy flours showed 8.60 and 10.3% humidity. Although, after 45 days of storage, humidity level increased (from 17.79 to 15.89%) to both genotypes and separation methods. This time variation was gradual and stable. However, samples stored for 135 days obtained stability closer to the control in its humidity, that is, the product (jabuticaba peel powder) from Clevelândia by steam method (14.41%) as well as powder obtained by crushing both genotypes (Verê 14.26% and Clevelândia 14.51%). There was a slight increase in humidity content, when compared with initial time, getting close to limit value of flours, because humidity contents above 14% may form lumps (Fernandes et al. 2008). Thus, after 135 days, powder residue obtainment kept its humidity content within Brazilian parameters (Brasil, 1978), which range from 5 to 15% humidity, making this product viable to be used in food mixes.

Ash content of the peel differed statistically ($p<0.05$),

Table 1. pH averages, total titratable acidity (ATT), soluble solids (SST), *in natura* peel humidity, jabuticaba peel ash stored for 135 days.

Physical-chemical	Storage (days)	Process residues			
		Steam		Crushing	
		Verê	Clevelândia	Verê	Clevelândia
Total titratable acidity (% citric acid)	0	3.53[a]	1.81[b]	3.74[a]	2.02[b]
	45	3.64[a]	1.80[b]	4.21[a]	2.32[b]
	135	4.91[a]	3.60[b]	3.65[a]	2.65[b]
Soluble solids (°Brix)	0	2.70[b]	3.21[a]	2.75[a]	2.56[a]
	45	3.03[b]	3.51[a]	2.61[a]	2.59[a]
	135	2.93[b]	4.26[a]	2.61[a]	2.63[a]
pH	0	3.06[b]	3.50[a]	3.10[b]	3.40[a]
	45	3.04[b]	3.50[a]	3.15[b]	3.35[a]
	135	2.99[b]	3.43[a]	3.15[b]	3.34[a]
Ashes (%)	0	5.75[a]	2.62[b]	4.96[a]	3.45[b]
	45	5.98[a]	3.51[b]	5.29[a]	3.73[b]
	135	2.64[a]	2.25[a]	3.39[a]	1.89[b]
Humidity content (% humid base)	0	11.89[a]	12.20[a]	9.80[a]	10.60[a]
	45	17.79[a]	17.93[a]	15.89[a]	15.98[a]
	135	18.43[a]	14.41[b]	14.26[a]	14.51[a]

between genotypes and Verê (Table 1), presenting higher values. After 135 days, both genotypes suffered losses and forms to obtain residues (steam and crushing), expected factor, but the expectation was that it remained stable. Perhaps there was interference that caused the oxidation of sulfates, carbonates, phosphates and silicates (mineral residues) that still remained in the samples up to that period. Regarding Verê genotype, it is noticeable that from 0 to 45 storage days, both crushing and forced steam resulting peel showed better results in comparison with Clevelândia genotype. This genotype had inverse response regarding peel obtainment form, since it is more favorable to crushing, after being stable for the first 45 days.

After being dried, the samples accompanied by their respective obtained residues from both extraction methods suffered losses during storage, but in spite of losses, it contains a higher residual ash content than that found by Silva et al. (2013) (0.51 g $100g^{-1}$). However, Lima et al. (2008) expressed higher values which were close to that found in this present work for jabuticaba Sabará (4.40 g 100 g^{-1} dry mass) and Paulista (2.88 g $100g^{-1}$) peels. Lenquiste et al. (2012) observed 3.52 g 100 g^{-1} in freeze-dried peels and the process applied in this work is efficient. Besides, ash values indicate quantity of mineral residue present in the peel (Marquetti, 2014). This process is also an alternative source of this element.

Jabuticaba peel demonstrated that it contains higher levels of flavonoids, differing statistically between cultivars when extracted by steam and crushing methods, and flavonoid contents reduced gradually from 0 to 135 days, showing oscillation on the 45^{th} day in Clevelândia genotype by steam method, which is attributed to humidity. The degradation of these compounds is due to the conditions of high temperatures and humidity, as well as light, pH and others. All necessary measures have been taken so that these interfering conditions did not cause any damage to analysis. However, with the advent of drying, there is a sign that these compounds are concentrated (Figure 1). The highest flavonoid contents were in Clevelândia genotype when extracted by steam method with 16.81 mg g^{-1}, during 45 days of storage.

The differences between genotypes can be justified by the greater exposure of these peels to environmental factors, leading to greater incentives for the production of these secondary metabolites related to protection against abiotic stress, making them present higher or lower concentrations of flavonoids (Araújo, 2011). In a work performed by Marquetti (2014) with jabuticaba peel, the author emphasized that even after drying and dehydration, a great deal of these compounds remained and could be transferred to foods where they may work as bioactive ingredient. Abe et al. (2012), while evaluating various fruits as potential sources of bioactive compounds, observed lower contents (33.0 mg CE $100g^{-}$

Table 2. Parameter average using CIELAB scale, to analyze jabuticaba color.

Treatments	TA	L*	C*	H*	ΔEab Color
In natura VR		23.46[a]	10.18[a]	7.04[b]	25.47[a]
In natura CL		20.25[b]	4.89[b]	171.13[a]	20.98[b]
GVRE	0	28.40±1.17[a]	12.53±3.39[a]	11.47±0.51[a]	31.11±2.43[a]
	45	28.62±0.98[a]	11.48±0.99[a]	12.01±0.57[a]	31.13±1.21[a]
	135	28.32±1.09[a]	13.57±2.71[a]	14.45±0.85[a]	32.91±2.06[a]
GCLE	0	26.88±1.15[b]	12.32±4.61[a]	10.75±4.42[a]	29.69±2.69[a]
	45	27.06±0.08[b]	10.43±2.22[a]	9.23±1.31[a]	29.00±0.83[a]
	135	26.43±0.64[b]	13.33±2.62[a]	13.19±2.25[a]	30.61±0.56[a]
Steamed					
GVRV	0	27.45±1.63[a]	11.77±1.35[a]	12.27±1.55[a]	29.91±2.34[a]
	45	26.67±0.68[b]	8.56±0.95[a]	16.61±3.28[a]	28.01±0.58[b]
	135	27.12±0.50[a]	11.70±1.71[a]	16.22±0.19[a]	29.62±0.92[a]
GCLV	0	24.83±0.26[b]	8.98±0.36[a]	0.87±0.28[b]	26.41±0.35[b]
	45	25.19±1.09[b]	10.28±2.78[a]	1.49±1.57[b]	27.24±1.35[b]
	135	24.02±0.63[b]	11.20±1.76[a]	3.57±1.43[b]	29.62±0.35[a]

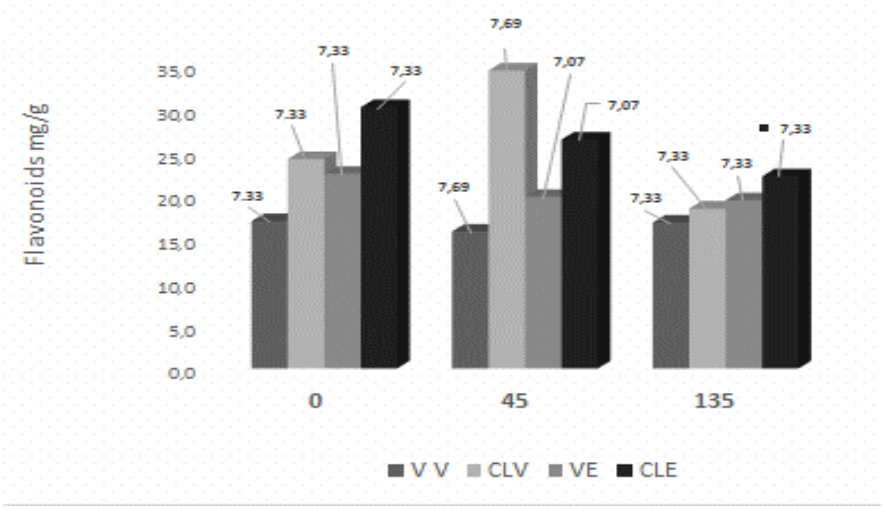
Averages followed by the same letter, in the column, do not differ significantly, at a 5% probability level by Tukey Test. TA = Storage time (Days); C= Control; VR = Verê genotype- CL= Clevelândia genotype; GVRE= Crushed Verê genotype; GCLE= Crushed Clevelândia genotype; GVRV= Steamed Verê genotype; GCLV= Steamed Clevelândia genotype.

^{1}) for jabuticaba and camucamu (*Plinia dubia)* (31.0 mg CE 100g^{-1}). Dessimoni-Pinto et al. (2011) used jabuticaba from Diamantina – MG, from whose peel, there was production of jelly (87.80 mg CE 100 g^{-1} fresh mass) and considered as rich in flavonoids.

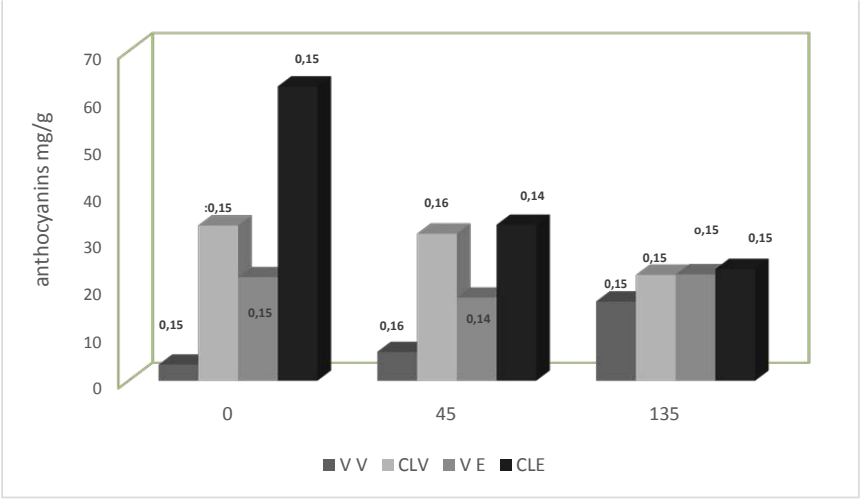
Total anthocyanin content found in Clevelândia genotype peel powder differed statistically ($p<0.05$) from Verê genotype (Figure 2), during storage and between extraction methods. Clevelândia genotype have higher concentrations of anthocyanins and such color is related to the hydroxyl, methoxyl and glycol groups present in these structures (Lee et al., 2005). Such contents demonstrated that both genotypes contain elevated concentrations of this compound. Due to jabuticaba peel color (pigmented, dark purple color), it could be predicted (Santos and Meirelles, 2009; Veggi et al., 2011). a positive association between the Verê genotype's SSC was also observed in steam extraction with their anthocyanin values, showing lower SSC concentrations and lower concentrations of anthocyanins. Anthocyanins are rarely found free in plant, being connected to various sugars (Francis, 2000). Therefore, this method of extraction may have been responsible for smaller anthocyanin values due to loss of organic compounds by temperature process. Previous studies, which looked forward to testing tropical fruits that were not traditional in Brazil reported better results of anthocyanin content for jabuticaba Paulista (58.1 mg Cy-3-glicoside 100 g^{-1}) (Rufino et al., 2010). In recent work, Böger (2013) while analyzing different ethanoic extracts of jabuticaba peel, obtained values that were similar to those present in this work (27.02 and 60.32 mg Cy-3-glicoside 100g^{-1}), in same analytical conditions.

At 135 days, crushing extraction of Clevelândia genotype had lower levels in comparison with its early days. This degradation may occur by different mechanisms during storage, leading to formation of insoluble dimming products or colorless soluble products (Francis, 2000), but visually the samples showed no differences in this period.

CIELAB system attribute evaluation was performed due to the fact that Verê and Clevelândia genotype peels extracted by steam and crushing were subjected to dehydration under 70°C and stored at 0, 45 and 135 days (Table 2). Values of light coordinates (L*) vary from 0 to 100, where dark is close to 0 and light is close to 100. There was statistical difference in this parameter among fresh peels from Verê and Clevelândia with 23.46 and 20.25 light successively (in a 0 to 100 scale) determined by L* parameter. Where Verê's tone is closer to white, in other words it is lighter, if compared with Clevelândia. Color intensity close to Verê, as defined by C parameter was 10.18 and Clevelândia 4.89, showing another statistical difference, showing that Verê has a more intense color when fresh, but when dehydrated by steam and crushing methods, did not differ statistically until 135



a)



b)

Figure 2. Bioactive compounds of jabuticaba peel powder after dehydration and 135 days storage. VV= Verê Steam; VE= Crushed Verê; CLV= Clevelândia Steam; CLE= Clevelândia Crushing.

storage days.

Tone parameter defined by H* parameter was 7.04 for Verê, however, for Clevelândia it was 171.13 which besides differing statistically, showed a quite elevated tone. Ariais (2000) observed similar results (180.58) in tomatoes (*Lycopersicon esculentum* cv. Laura) in different levels of maturation. But in general, none of the genotype peels showed loss in color tone, light intensity in any of the treatments, when dehydrated, but, regarding light (L*) and color tone of Verê dehydrated peels extracted by crushing and steam differed statistically as compared to Clevelândia, where Verê had a lighter peel.

H* parameter lower values in this same treatment (Verê/steam) demonstrated a reduction of fruit tone after dehydration, when compared with the same process applied to Clevelândia genotype. In a work performed with peppermint leaves, Gasparin et al. (2014) claimed that Chroma index (C*) indicates tone intensity or purity. If values are higher, color is more chromatic and brighter and when values are lower, the color is achromatic and opaque. However, authors presented higher values for fresh leaves, differing statistically from fresh leaves when subjected to drying, the opposite of what happened in this experiment.

According to Silva et al. (2007), ΔE values above 0.2-0.5 may express color differences in the two juxtaposed samples, with a very small perception. When ΔEab values are above 6.0, it is classified as a very big perception, according to DIN 6174 norm (1979), which establishes relationship with human eye. This way, ΔEab

results shown in Table 2, demonstrate that all treatments, when compared with the control, both fresh and dry peels dehydrated and stored for both genotypes, showed color changes, which are noticeable by the human eye.

Conclusion

Vere is more acid and has higher ash content than Clevelândia genotype with is indicative of residual minerals in this product, thus adding value. Clevelândia genotype has higher SSC and is less acidic being more suitable for *in natura* consumption. Product humidity should remain lower than 14%, to increases its lifetime. The peel powder of both Jabuticaba genotypes are rich in flavonoids and steam extraction was more effective. Clevelândia genotype has higher amount of anthocyanins, but both genotypes showed high levels of this compound. The storage for 135 days demonstrated high levels of phenolic and anthocyanin compounds despite occurrence of losses. Color quality is enhanced when the peel is dehydrated with attractive pigmentation for blends in food. Both genotypes are suitable for food processing industries.

Conflict of Interests

The authors have not declared any conflict of interests.

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