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Nutritional and functional potential of yellow variety peach palm oil (*Bactris gasipaes* Kunth)

Potencial nutricional e funcional do óleo da pupunha variedade amarela (*Bactris gasipaes* Kunth)

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The objective of this research was to evaluate the nutritional and functional profile of peach palm oil of the yellow variety (*Bactris gasipaes* Kunth). The methodological bases followed the American Oil Chemists' Society. The lipid profile was evaluated by gas chromatography (GC), and the triglyceride pattern was evaluated by the 1,3-random-2-random distribution, which predicts the triacylglycerol molar percentage present in oil. The results showed 12.95% oil, acidity index 1.03 mg KOH/g and peroxide 2.17 mEq/kg, indicative of good quality and conservation. Its functionality is expressed by the high concentration of carotenoids (629.46 µg/g) and unsaturated fatty acids (53.7%), with 29.94% for ω-9 and 20.77% for ω-6. The oil showed low indices of atherogenicity and thrombogenicity (0.85, 1.65), showing the cardioprotective potential of this oil. Its profile in triglycerides showed mixed compositions between saturated and unsaturated fatty acids with averages of 40.7% and 44.5%, respectively, with carbon equivalents ECN50 (35.08%) and ECN52 (32.74%) evidencing long chain triglycerides. The data evaluated in this research reveal the potential of this oil for dietary applications based on its nutritional and functional constituents that act in the prevention of cardiovascular diseases, in addition to contributing to the reduction of risk factors for other chronic noncommunicable diseases.
Keywords: yellow peach palm, oil, functionality.

O objetivo desta pesquisa foi avaliar o perfil nutricional e funcional do óleo da pupunha da variedade amarela (*Bactris gasipaes* kunth). As bases metodológicas seguiram a American oil chemists' society, o perfil lipídico foi avaliado por cromatografia gasosa (CG), e o padrão de triglicerídeos foi avaliado pela distribuição 1,3-aleatória-2-randomizada, que prediz a porcentagem molar de triacilglicerol presente no óleo. Os resultados mostraram 12,95% de rendimento em óleo, com índice de acidez médio de 1,03 mg kOH/g e peróxido 2,17 meq/kg, indicativo de óleo com boa qualidade e conservação. Sua funcionalidade é expressa pela alta concentração de carotenóides (629,46 µg/g) e ácidos graxos insaturados (53,7%), sendo 29,94% para ω-9 e 20,77% para ω-6. o óleo apresentou baixos índices de aterogenicidade e trombogenicidade (0,85, 1,65), mostrando seu potencial cardioprotetor aliado ao seu perfil em triglicerídeos com composições mistas entre ácidos graxos saturados e insaturados com médias de 40,7% e 44,5%, respectivamente, com carbono equivalente ECN50 (35,08%) e ECN52 (32,74%) evidenciando triglicerídeos de cadeia longa. Os dados avaliados nesta pesquisa revelam o potencial deste óleo para aplicações dietéticas com base em seus constituintes nutricionais e funcionais que atuam na prevenção de doenças cardiovasculares, além de contribuir para a redução de fatores de risco para outras doenças crônicas não transmissíveis.
Palavras-chave: pupunha amarela, óleo, funcionalidade.

1. INTRODUCTION

In the amazon region, the consumption of peach palm is common during its harvest season, where after cooking, it is consumed in a variety of ways. With its popularization, mainly of its palm heart for the rest of Brazil, it has been more studied and consumed in its most varied forms, being able to produce byproducts, such as flour for addition in gastronomy or the use of its oil for culinary and study purposes. Peach palm is found in the most diverse shapes and colors, where its chemical content varies according to the type of peach palm [1-3].

It is a fruit with a high content of lipids and carotenoids, with a striking flavor and exuberant color. It has a good adaptation to the most diverse soils, tropical and subtropical temperatures, contributing to the income of small farmers. In addition to being easily transformed into byproducts, such as flours, yellow peach palm can help in the prevention of several types of cancer and coronary diseases, as it is rich in vitamin C and provitamin A and has high antioxidant power given to carotenoids and polyphenols [4, 5].

The peach palm belongs to the arecaceae or palmaceae family of the species bactris gasipaes kunth, where its fruit varies between 3-7 cm in diameter with seeds, has a rounded or ovoid shape, is arranged in bunches that vary in the amount of fruits depending on the harvest and is mainly consumed in its red variety; however, it is found in green, yellow (Figure 1) and albino colors after cooking with water and salt. The most researched varieties show a high content of carotenoids, mainly β-carotene, a high profile of unsaturated fatty acids that give it organic functionality, in addition to having high levels of carbohydrates, fibers, lipids and proteins [4, 6].

*Figure 1: Yellow peach palm fruit (*Bactris Gasipaes *Kunth).*

Research has been carried out with different varieties of peach palms and their main products and by-products, with emphasis on their composition in the pulp, bark and extracts [7-12]. Its carotenoid contents and fatty acid profile [4, 5, 8, 12]. Greater attention has focused on red peach palm varieties based on their fatty acid profiles [5, 9, 11, 12]. The functionality of its lipid content has recently been related to the improvement of immune system function, acting as an agent of phagocytic activities (*natural killer*) and promoting the action of protective factors with interleukin 2 [5, 10-12].

Thus, in view of the above, this research aims to evaluate the nutritional and functional profile of peach palm oil of the yellow variety (*Bactris gasipaes* Kunth), inferring its potential as a cardioprotective, anti-inflammatory, hypocholesterolemic and antithrombogenic agent.

2. MATERIALS AND METHODS

2.1 Sample preparation

The samples were obtained from the Ver-o-Peso market located in the Metropolitan Region of the municipality of Belém, State of Pará (1°27′18″S, 48°30′9″W), referring to the harvest from September to December 2021. Access to the selected fruits was registered in the Brazilian National System for the Management of Genetic Heritage and Associated Traditional Knowledge (SisGen, AA5BEE7). The peach palm fruits were sanitized in a sodium hypochlorite solution (150 ppm) for 10 min before-cooking in water under pressure in a pressure cooker for 5 min, following the traditional procedure in Northern. The cooked pulps were manually separated from the peel and seed, freeze-dried (Solab, model SL-404, São Paulo, Brazil), ground in a knife mill (Tecnal, model Willye TE-650, São Paulo, Brazil), vacuum-packed and stored at -7 °C, protected from light, until use.

2.1 Extraction of pupunha oil

The solid–liquid extraction was carried out on Soxhlet-type equipment according to method No. 948.22 of AOAC [13] using *n*-hexane as a solvent extractor (Sigma with a 69 °C boiling point). In a period of 3 hours, at 60 °C, with an average drop of 50 drops per minute.

2.1.1 Oil extraction yield

The oil extraction yield (OY%) was investigated by dividing the extracted oil weight by the total fresh weight of the pupunha according to equation (1).

$$\mathrm{OY}\% = \frac{\mathrm{W_{oil}}}{\mathrm{W_{Pupunha}}} \times 100 \tag{1}$$

where: W_{oil} is the mass of oil; $W_{pupunha}$- Mass of pupunha.

2.2 Physicochemical quality of the pupunha oil

The physicochemical quality of the oils was determined according to the standard AOCS methods as follows: The acidity, peroxide index and saponification values were determined according to AOCS official methods Cd 3d-63, Cd 8-53. The refractive index was measured at 20 °C using an ABBE refractometer (Tecnal, model AR/200) according to Cc 7-25 AOACS [14]. All analyzes will be performed in triplicate and the results will be expressed as mean ± standard deviation.

2.3 Determination of Carotenoid Content

The determination of the carotenoid content of peach palm oil was carried out in a UV/VIS spectrophotometer, Kasuaki brand, model IL-592, according to the analytical methodology of separation and extraction of compounds with organic solvents, with absorbance reading performed at a wavelength of 450 nm using petroleum ether as solvent. The carotenoid content was expressed in micrograms (μg) of β-carotene [15] according to equation (2).

$$\beta\text{- carotene } (\mu g/g) = \frac{V \times A}{2592 \times m_0 \times 100} \times 10^6 \qquad (2)$$

where: V = Total volume (mL); m0 = Sample mass (g); A = Absorbance; 2592 = absorption coefficient in petroleum ether.

The total carotenoid data were converted into vitamin A according to RDC 269, 09/22/2005 [16], which considers 1 µg of beta-carotene = 0.167 µg of retinol equivalent (RE).

2.4 Fatty acid profile

The profile of fatty acids was established by methyl esterification of fatty acids according to the procedure reported by the international standardization organization ISO 5509 [17]. After phase separation, the supernatant was collected and subjected to gas chromatography analysis. For that, a gas cromatographer (GC Varian 430) coupled to a microcomputer with Galaxie chromatography software under the following parameters was used: fused silica SP®-2560 capillary column (SUPELCO, USA) 100 m in length and 0.25 mm internal diameter containing 0.2 µm polyethylene glycol.

The operation conditions were as follows: split injection, ratio of 50:1; column temperature at 140 °C for 5 min programmed with an increasing rate of 4 °C/min up to 240 °C, helium as carrier gas, isobaric pressure of 37 psi, linear velocity of 20 cm/sec; helium at 29 mL min^{-1} as make up gas; injector temperature of 250 °C, model Varian CP8410 (Autosampler); detector temperature at 250 °C. The qualitative composition was determined by comparing the time of peak retention with their respective standards for fatty acids. The quantitative composition was determined by area normalization, expressed in mass percentage as established by the Ce 1-62 method AOCS [18].

2.4.1 Functional quality of the lipid fractions

The functionality of lipid fractions was established based on their respective chromatographic profiles using three composition indices: (eq. 3) atherogenicity index (AI), (eq. 4) thrombogenicity index (TI) according to Ulbricht and Southgate (1991) [19] and (eq. 5) the hypocholesterolemic/hypercholesterolemic ratio (HH) as defined by Santos-Silva et al. (2002) [20]. Results obtained for the fatty acid profile of the peach palm oils. The following equations were used to calculate the indices:

$$AI = \frac{[(C12{:}0)+(4XC14{:}0)+(C16{:}0)]}{(\Sigma\ MUFA+\Sigma\ \omega\text{-}6+\Sigma\ \omega\text{-}3)} \qquad (3)$$

$$TI = \frac{(C14{:}0+C16{:}0+C18{:})}{[\ (0{,}5\ X\ \Sigma\ MUFA)+(0{,}5\ X\ \Sigma\ \omega 6)+\big((3\ X\ \Sigma\omega 3)\big)+(\Sigma\omega 3/(\Sigma\ \omega 6))]} \qquad (4)$$

$$HH = \frac{(C18{:}1\omega 9+C18{:}2\omega 6+C20{:}4\omega 6+C18{:}3\omega 3+C20{:}5\omega 3+C22{:}5\omega 3+C22{:}6\omega 3)}{(C14{:}0+C16{:}0)} \qquad (5)$$

2.5 Triacylglycerol composition

The oil triacylglycerol composition was estimated using PrOleos software based on the hypothesis of a 1,3-random-2-random distribution, which predicts the triacylglycerol molar percentage present in oil, from the fatty acid composition Antoniasi Filho et al. (1995) [21] by a random distribution using MATLAB R2015a (The MathWorks, Inc., Natick, MA USA).

3. RESULTS AND DISCUSSION

3.1 Quality parameters of peach palm

The average oil content of the cooked pulp of the yellow peach palm flour (Figure 2) was 12.95% higher than that found in the study by Matos et al. (2019) [3] with peach palm *in natura* (8.22%) and lower than that reported in the research by Souza et al. (2018) [22], with an average of 17.5%. All research cited as a comparative basis referenced peach palm species of the red variety applying extraction methods with the Soxhlet apparatus.

The identification of the physical-chemical quality parameters is necessary to verify if the fruit oil is adequate to the current norms and thus direct to the use and/or replacement of some commonly used oil; these data are expressed in Table 1.

Table 1 - Quality parameters of the yellow peach palm oil.

Analysis	Yellow peach palm	Red peach palm*	Legislation*
Acidity level (mg KOH/g)	1.03 ± 0.41	2.45	4.00
Peroxide index (mEq/kg)	2.17 ± 1.25	5.47	15.00
Refractive index	1.44	ND	ND

*ND - Not determined. ***Parameters defined by Codex Alimentarius [23] end Brazilian law [24].*
*The results are expressed as the mean ± standard deviation. *Dos Santos et al. (2020) [4].*

When an oil has high levels of acidity and peroxide above those recommended by legislation, it is possible to say that it is in the process of deterioration and rancidity, indicating the oxidation state of the sample. The elevation of these indices induces the formation of triglycerides and free fatty acids, with emphasis on the presence of saturated fatty acids, which are considered harmful to human health. However, when both indices are below the current legislation, they are considered adequate for food application [23, 24].

Compared with the research by Dos Santos et al. (2020) [4], the acidity and peroxide values of red peach palm oil were higher than those of the yellow variety, thus inferring better estimates of quality parameters and conservation of the material analyzed and obtained in this research. Regarding the regulations in force in Brazil, the National Health Surveillance Agency (ANVISA) provides in its technical regulation that the maximum value allowed for human consumption and quality in terms of acidity is 4.0 mg KOH/g and 15 meq/kg in the peroxide index for unrefined oils and fats. In the present study, 1.03 mg KOH/g and 2.17 meq/kg were found for the acid value and peroxide index, respectively, thus being in accordance with the regulations [23, 24].

In comparison with the study by Alves et al. (2021) [25], which analyzed 5 varieties of red peach palm fruit oils at different stages of maturation, the acidity values ranged from 1.26 to 5.22 (mg KOH/g), all of which were higher than the results of this search. In a study involving oils from other Amazonian sources, such as Buriti, an average acidity of 1.67 mg KOH/g and a peroxide index of 6.20 meq/kg were found. De Moura et al. (2019) [26]. Fonseca et al. (2021) [27] evaluated bacaba oil at different times and showed average acidity and peroxide indices of 14.66 mg KOH/g and 26.25 meq/kg, respectively. Both Amazonian species had superior results in relation to the oxidative state of the yellow peach palm oil evaluated in this research.

In the study by Alves et al. (2021) [25], red peach palm fruit oils obtained similar values in the refractive index (1.4545; 1.4635; 1.4690; 1.4510 and 1.4550), close to that found in the present study (1.44). The similarity of the values is due to the degree of saturation of the oil, as well as its nutritional quality.

3.2 Nutritional and functional quality of peach palm oil

3.2.1 Carotenoids

The concentrations obtained in β-carotene were converted to the retinol equivalent (RE) according to the recommendations of RDC No. 269 of September 29, 2005, which considers 1 µg of beta-carotene = 0.167 of RE [16].

The carotenoid content was expressed as β-carotene and converted into RE contained in the yellow peach palm oil. It was on average 105.11 µg/100 g. Supplying approximately 30% of the daily needs of the ER (pro-vitamin A) in the age groups of children from 1 to 10 years of age [16].

In the study by Matos et al. (2019) [3], it was observed that the carotenoid content is higher in the peel of the red peach palm fruit compared to its pulp; however, the pulp contains sufficient amounts to reach the target of daily consumption of vitamin A, where it was identified that β-carotene is the most present carotenoid. Making an analysis with the present study and with that of Britton and Khachik (2009) [28] apud Matos et al. (2019) [3], where a classification of the amount of carotenoids was made, being low at approximately 0-100 µg/100 g, moderate between 100-500 µg/100 g, high at 500-2000 µg/100 g and finally very high at approximately ≥ 2000 µg/100 g, it was possible to classify that peach palm oil with yellow peel has high amounts of carotenoids (629.46 µg/100 g). According to Rodriguez-Amaya et al. (2001) [15], a food rich in carotenoids must have at least 20 µg/g, thus concluding that the peach palm with yellow skin in the present study can be considered a fruit rich in carotenoids.

According to Roca et al. (2015) [29], peach palm oil has a value of β-carotene of approximately 150.9 µg/100 g, which is almost 5 times higher than that of the present work. However, in the study by Hempel et al. (2014) [30], the β-carotene content found in the pulp of the yellow peach palm from a market located in Costa Rica was between 450-1270 µg/100 g, so the peach palm in the present study is within the values found by the authors. In the same study, peach palm with orange–red skin was analyzed with values between 3800-7130 µg/100 g of β-carotene, a result superior to that of peach palm with yellow skin. The authors state that this difference is due to the concentration of the pigment, where the more pigmented the fruit is, the greater its amount of carotenoids.

The regular consumption of β-carotene implies a series of benefits for the organism and avoids possible pathologies due to its antioxidant capacity. In addition to promoting eye, skin, nail and hair health, this carotenoid is important due to its potential to fight free radicals, delaying and/or preventing the development of some types of cancer, obesity, diabetes, platelet aggregation, thrombosis and cardiovascular diseases. Because of this function, β-carotene can be considered a bioactive compound [28-30].

Lima et al. (2020) [31] in their work elaborated breads using peach palm flour with the objective of enriching a food consumed daily by the population because the fruit has a high bioavailability of carotenoids, where the value of 71.53 µg was identified in the whole dehydrated peach palm pulp/g, a value much lower than that found in the present work.

In comparison with the studies by Silva et al. (2018) [32] using tucumã, an average of 60.44 µg/100 g of β-carotene was obtained. Thus, yellow peach palm oil has a higher value than these two Amazonian matrices, providing a rich source of this carotenoid.

3.3 Composition of the oil of the yellow peach palm

3.3.1 Fatty acid profile of yellow peach palm oil

The fatty acids obtained in the analysis of the yellow peach palm oil are expressed in Table 2.

Table 2 - Fatty acid profile of yellow peach palm oil.

Picos	Fatty acids	Mean %
1	Myristic acid (C14)	0.787
2	Palmitic acid (C16)	42.843
3	Palmitoleic acid (C16:1 ω-7)	2.745
4	Stearic acid (C18)	1.943
5	Oleic acid (C18:1 ω-9)	29.941
6	Linoleic acid (C18:2 ω-6)	20.325
7	Linolenic acid (C18:3 ω-3)	0.243
8	Arachdonic acid (C20:4 ω-6)	0.443
∑ saturated fatty acids	45.573	
∑ unsatuatred fatty acids	53.697	
∑ Monoinsaturados	32,686	
∑ Polinsaturados	21.011	
∑ ω-6	20.768	
Total	**100**	

Data represent the mean ± standard deviation of the duplicates analyses.

After analyzing the fatty acids present in the yellow peach palm oil, it is possible to identify a greater presence of unsaturated fatty acids (53.69%) than saturated fatty acids (45.57%), with a higher prevalence of monounsaturated fatty acids than polyunsaturated fatty acids. In the study by Dos Santos et al. (2020) [4], the analysis of red peach palm oil was performed, which showed a higher content of saturated fatty acids (53.74%) than unsaturated fatty acids (46.25%) and a prevalence of monounsaturated fatty acids. (39.66%) than polyunsaturated (6.59%).

Monounsaturated and polyunsaturated fatty acids have several health benefits due to their antioxidant activity, thus fighting reactive oxygen species, which can prevent the development of some chronic noncommunicable diseases, such as cancer and obesity, in addition to having cardioprotective effects. Therefore, yellow peach palm oil holds these benefits. On the other hand, when the oil has a higher content of saturated fatty acids, it is indicative of cardiovascular risk, as it contributes to the development of atheromatous plaques and platelet aggregation [33, 34]. Given the above, it is possible to understand that yellow peach palm oil is beneficial for health.

Studies by Marklund et al. (2019) [35] point out that the presence of oleic acid favors the reduction of cardiovascular complications since, by having omega-9 in its chain, it helps to reduce LDL and total cholesterol. Thus, yellow peach palm oil is shown to be a beneficial source of functional food for cardiovascular health, as it has a content of this fatty acid of approximately 29.94%, combined with other levels of unsaturated fatty acids [4, 23].

In the research by Dos Santos et al. (2020) [4], where an analysis was carried out on red peach palm oil, which obtained values of 36.27% for oleic acid, 5.18% for linoleic acid and 1.1715% for linolenic acid, it can be inferred that red peach palm oil has more oleic and linolenic acid; on the other hand, yellow peach palm oil has higher amounts of linoleic acid (20.325%), so yellow peach palm oil has more omega 6 than omega 3 and omega 9.

The amount of omega 6 evidenced in this study is higher than that of babassu, buriti and macaúba oil [36] One of the benefits of regular consumption of omega-6 is that it promotes the health of the skin, hair and bone strengthening, currently being studied in prevention and treatment of osteoporosis [33, 34]. On the other hand, studies on the benefits of omega 6 in relation to chronic noncommunicable diseases, with a focus on cardiovascular diseases, are still uncertain; however, in Marklund et al. (2019) [35] this fatty acid demonstrated efficacy in the prevention and control of cardiovascular diseases, especially in relation to mortality and stroke. The study adds that these benefits are due to the ability of omega 6 to reduce cholesterol, focusing on HDL and triglycerides, in addition to reducing insulin resistance and reducing visceral and liver fat.

FAO [37] makes a recommended daily intake of omega 3 fatty acids per day for children aged 2-18 years ranging from 0.2% to 0.3% and adults from 2.5 to 9%. For omega 6, the averages for children aged 2-18 years with values <3% and for adults of 0.5-2%.

Evaluating the data obtained in this research and those indicated by the FAO [37], it is possible to verify that the concentration of omega 6 in the yellow peach palm oil (20.76%) is higher for both age groups, so it is not necessary to consume high amounts of oil to obtain the benefits of omega 6. On the other hand, the value of omega 3 in yellow peach palm oil (0.243%) is lower than the minimum amount recommended for adults and in agreement for children aged 2-18 years.

The peach palm oil has essential constituents for the human body, which must be obtained from the daily diet, having anti-inflammatory capacity, reducing triglycerides, cardioprotective effects and in relation to oxidative stress [3, 4, 34-36].

3.4 Quality of the lipid fractions of the yellow peach palm oil

The results of the peach palm oil quality indices are shown in Table 3.

Table 3 - Functional quality indices of yellow peach palm oil.

Functional quality index	Yellow peach palm	Red peach palm*
P/S	0.46	0.12
AI	0.85	1.10
TI	1.65	2.04
HH	1.16	0.84

P/S= Polyunsaturated/saturated; atherogenicity index (AI), thrombogenicity index (TI), hypocholesterolemic/hypercholesterolemic ratio (HH). Source: Dos Santos et al. (2020) [4].*

The functional quality indices of the oil expressed in Table 5 determine the beneficial effects that the consumption of an oil can have for the body at the cardiovascular level and the prevention of the development of chronic noncommunicable pathologies. With regard to the P/S index, Mesquita et al. (2020) [9] recommends that the result of this index be below 1.0. In view of the above, the yellow peach palm oil is in accordance with the proposed (0.46).

The atherogenicity index (AI) and the thrombogenicity index (TI) determine the functionality of the oil related to platelet aggregation and thus the development of atherosclerosis and thrombosis, so the lower the indices, the better your response against heart disease [4]. In the present research, 0.85 was obtained for AI and 1.65 for TI. When compared to the red pupunha variety (Table 6), this research showed lower results.

The hypocholesterolemic and hypercholesterolemic ratio index is used as a parameter for aspects that promote cardiovascular health, directly influencing cholesterol, thus contributing to the protection and treatment of coronary diseases, and the higher this index, the better its contribution to health, with the oil being nutritionally adequate and having a good quality [38]. Thus, the yellow peach palm oil shows a good H/H value (1.16), indicating that this oil is potentially cardioprotective.

Allied to its fatty acid profile and functional quality indices is its triglyceride levels, shown in Table 4.

Table 4 - Triacylglycerol composition of the Pupunha yellow oil.

Triacylglycerol ECN	Pupunha Yellow Oil (% Normalized)
PPP (C48:0)	8.468
MOP (C48:1)	0.824
PPoP (C48:1)	1.772
SPP (C50:0)	1.182
POP (C50:1)	17.724
PLP (C50:2)	11.993
POPo (C50:2)	2.473
PLPo (C50:3)	1.673
SOP (C52:1)	1.649
SLP (C52:2)	1.116
POO (C52:2)	12.366
PLO (C52:3)	16.735
PoOO (C52:3)	0.863
SLO (C54:3)	0.778
OOO (C54:3)	2.876
OLO (C54:4)	5.838
OLL (C54:5)	3.950
LLL (C54:6)	0.891

ECN - Equivalent carbon number; M - Myristic acid; P - Palmitic acid; Po - Palmitoleic acid; S - Stearic acid; O -Oleic acid; L - Linoleic acid.

The composition of triacylglycerols (TAG's) presented in Table 4 had its cutoff point defined in amounts greater than 0.5% of the total molecules (% Normalized). We noticed predominant percentages in TAGs with fatty acids with mixed compositions between saturated and unsaturated fatty acids, with emphasis on POP (C50:1), POP (C50:2), POP_O (C50:2), PLPo (C50:3), SOP (C52:1) and SLP (C52:2), among others representing an average of 40.7%. The composition shows high relevance in TAGs of unsaturated chains, with higher contents for POO (C52:2), PLO (C52:3), OLO (C54:4), and OLL (C54:5), representing approximately 44.5% of the total expressed in the table. The remainder is represented by the predominance of saturated acids such as PPP (C48:0) and unsaturated acids such as OOO (C54:3) and LLL (C54:6).

Compared with the composition in TAG'S of the oil of another Amazonian species, Uxi (Endopleura uchi), the greatest highlights were the ECN OOO, POO, SOO and PSO, forming more than 70% of the composition of these TAG'S [39]. Similarities to the compounds are evidenced, given the high content of oleic and palmtic acid in the compositions and the presence of atriolein (OOO) present in the oil of the yellow peach palm variety (Table 4).

Triacylglycerols are storage forms of fatty acids in the human body. mainly in adipose tissue. In this research, the predominant formations of TAGs showed formations of ECN 50 (35.08%), followed by ECN52 (32.74%), ECN54 (14.44%) and ECN48 (11.07%). The distribution presented shows an oil with a predominance of long-chain triacylglycerols (LCT), compounds of great functionality in the formation of the immunological defense system of the human organism. This constitution has been linked in several studies that present diets rich in these compounds (LCT) as a functional source to cardiovascular health directly associated with the reduction of the emergence of noncommunicable chronic diseases, especially cardiovascular diseases.

4. CONCLUSION

The nutritional and functional composition of the yellow peach palm oil presents good quality status, with low levels of acidity and peroxide. Its functionality was expressed by its high levels of carotenoids, with a focus on β-carotene. Its fatty acid profiles are mostly made up of unsaturated fatty acids, with emphasis on the ω-9 and ω-6 fractions, directly influencing the P/S, AI, IT and HH and in their levels of triacylglycerols consisting predominantly of long-chain TAG'S (TCL) that confirm their cardioprotective potential.

Thus, it is possible to infer that the oil of yellow peach palm has potential health benefits, especially with regard to cardiovascular diseases, due to the exposed results that are directly linked to the prevention of the formation of atheromatous plaques, platelet aggregation, reduction and control of serum cholesterol, and cardioprotective functions. Thus, making this oil an option for food manufacturing and encouraging the consumption of the fruit by the population to diversify the sources of pro-vitamin A, in addition to promoting benefits linked to socioeconomic and environmental issues for the Amazon region.

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