REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

COMPOSIÇÃO CENTESIMAL DE CINCO VARIEDADES DE ABACATE BRASILEIRO (*PERSEA AMERICANA* MILL.): UM ESTUDO COMPARATIVO

CENTESIMAL COMPOSITION OF FIVE VARIETIES OF BRAZILIAN AVOCADOS (*PERSEA AMERICANA* MILL.): A COMPARATIVE STUDY

COMPOSICIÓN CENTENSIMAL DE CINCO VARIEDADES DE AGUACATE BRASILEÑO (PERSEA AMERICANA MILL.): UN ESTUDIO COMPARATIVO

Carla Cristina João Nogueira-de-Almeida
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
carlanogueira@me.com

Carlos Alberto Nogueira-de-Almeida
Medical Department at Federal University of São Carlos, São Carlos-SP, Brazil
dr.nogueira@me.com

Fábio da Veiga Ued
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
fabioued@usp.br

Edson Zangiacomi Martinez
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
edson@fmrp.usp.br

Paula Payão Ovídio
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
ppayao@hotmail.com

Renata Cristina Lataro
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
recris@fmrp.usp.br

Alceu Afonso Jordao
Department of Health Sciences at Ribeirão Preto Medical School, University of Sao Paulo, Ribeirão Preto-SP, Brazil
aajordao@gmail.com

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

Resumo

O abacate (Persea) é uma fruta amplamente cultivada e consumida em território brasileiro, entretanto ainda são escassas informações sobre o perfil nutricional de variedades cultivadas no Brasil. O objetivo desse estudo foi quantificar e comparar os teores de proteína, lipídio total, umidade e cinzas de cinco variedades de abacate. A análise centesimal foi realizada nas variedades Breda, Fortuna, Geada, Margarida e Quintal. Os dados foram analisados estatisticamente através da diferença e comparações entre médias. Os resultados indicaram que o teor de proteínas da variedade Margarida foi maior do que os encontrados nos outros abacates. Quanto aos lipídios, o abacate Geada apresentou menor quantidade em comparação com as demais variedades. A umidade foi observada em menor quantidade no abacate Fortuna, seguido pelas variedades Breda, Margarida, Quintal e Geada. Os valores de cinzas foram menores nos abacates Geada, Margarida e Quintal e maiores na variedade Breda. Por fim, os dados apresentados mostram a inexistência de um padrão único de composição centesimal dos abacates, indicando a existência de variações relevantes no perfil nutricional das cinco variedades estudadas, ampliando as possibilidades do seu uso alimentar.

Palavras-chave: Persea; Valor Nutritivo; Óleos; Composição Centesimal; Alimento Funcional

Abstract

Avocado (Persea) is a fruit widely cultivated and consumed in Brazil, however there is still scarce information on the nutritional profile of varieties grown in Brazil. The objective of this study was to quantify and compare the protein, total lipid, moisture and ash contents of five avocado varieties. The centesimal analysis was carried out on the varieties Breda, Fortuna, Geada, Margarida and Quintal. The data were statistically analyzed through the difference and comparisons between means. The results indicated that the protein content of the Margarida variety was higher than those found in the other avocados. As for lipids, the Geada avocado presented a lower amount compared to the other varieties. Moisture was observed in smaller quantities in the Fortuna avocado, followed by the Breda, Margarida, Quintal and Geada varieties. The ash values were lower in the Geada, Margarida and Quintal avocados and higher in the Breda variety. Finally, the data presented show the inexistence of a single pattern of centesimal composition of avocados, indicating the existence of relevant variations in the nutritional profile of the five varieties studied, expanding the possibilities of their food use.

Keywords: Persea; Nutritive Value; Oils; Centesimal Composition; Functional Food

Resumen

El aguacate (Persea) es una fruta ampliamente cultivada y consumida en Brasil, aunque aún hay

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

poca información sobre el perfil nutricional de las variedades cultivadas en Brasil. El objetivo de este estudio fue cuantificar y comparar los contenidos de proteína, lípidos totales, humedad y ceniza de cinco variedades de aguacate. El análisis centesimal se realizó en las variedades Breda, Fortuna, Geada, Margarida y Quintal. Los datos se analizaron estadísticamente mediante la diferencia y comparaciones entre medias. Los resultados indicaron que el contenido proteico de la variedad Margarida era mayor que el encontrado en los otros aguacates. En cuanto a los lípidos, el aguacate Geada presentaba una cantidad menor en comparación con las otras variedades. Se observó humedad en cantidades menores en el aguacate Fortuna, seguida por las variedades Breda, Margarida, Quintal y Geada. Los valores de fresno eran más bajos en los aguacates Geada, Margarida y Quintal y más altos en la variedad Breda. Finalmente, los datos presentados muestran la inexistencia de un único patrón de composición centesimal de aguacates, lo que indica la existencia de variaciones relevantes en el perfil nutricional de las cinco variedades estudiadas, ampliando las posibilidades de su uso alimenticio.

Palabras clave: Persea; Valor Nutricional; Aceites; Composición Censemal; Alimentos Funcionales

1. Introduction

The avocado tree is a plant native to Central and South America (NASRI; HALABI; HAJIB; CHOUKRI *et al.*, 2023; STEPHEN; RADHAKRISHNAN, 2022) and the literature brings evidence of its cultivation in this region since the 8th century B.C. The coincidence of the temporal correlation between the discovery of the avocado and the discovery of the Americas guarantees the species the certificate of being a tropical native plant (RANADE; THIAGARAJAN, 2015). In Brazil, the first reports on avocado cultivation date back to 1787. And although the plant can be found throughout the Brazilian territory, due to the existence of climatic conditions and favorable soil for its cultivation, it was only from 1925 that avocado production began to have commercial relevance (DONADIO, 1995; NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018; PEREIRA, 2015; VALE, 2017).

The objective of the present study was to quantify and compare the protein, total lipid, moisture and ash contents of five varieties of Brazilian avocados, from a single crop located in the south of Minas Gerais, in order to expand the knowledge

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

about the avocados produced in this important producing region of the country, comparing the data with information from other regions and other national and international varieties.

2. Literature Review

A characteristic that attracted attention from the beginning of the discovery of the avocado on the American continent was the existence of different types of fruits, which presented what seemed to be variations of the same species. This observation and knowledge later allowed the grouping of fruits by similarity and origin, making it possible to classify them by races, more precisely three: *Mexican, Guatemalan (or Guatemalan) and Antillean*. It is known that the first two, *Mexican* and Guatemalan, can be associated with their center of origin, but *Antillean* is not originally from the Antilles, as it developed and evolved in the lowlands of Mexico and Central America (DONADIO, 1995; FORD; SPAGNUOLO; KRAFT; BAUER, 2023). In addition, each breed still encompasses many varieties of the fruit that, from the natural crossing between them, resulted in a substantial number of commercial varieties, therefore considered hybrids. For example, hybrid varieties of the *Antillean* and *Guatemalense* breeds are the cultivars Breda, Fortuna, Geada, Margarida, Ouro Verde and Quintal, typical species of Brazil (ALMEIDA; SAMPAIO, 2013; KRUMREICH; MENDONçA; BORGES; CRIZEL-CARDOZO *et al.*, 2024; NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018; PEREIRA, 2015). These hybrid species of the *Antillean* and *Guatemalan* breeds, produced in Brazil, are known worldwide as '*Tropical Avocados*', a name given in the international market to facilitate the differentiation from other varieties known only as "*Avocados*". The main characteristics of Brazilian fruits, in the literature, are: larger size, low or medium oil content and concentrated consumption in the domestic market (ALMEIDA; SAMPAIO, 2013; KRUMREICH; MENDONçA; BORGES; CRIZEL-CARDOZO *et al.*, 2024; NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018). Hass *and* Fuerte *avocados, on the other hand*, are hybrid varieties of the *Mexican* and *Guatemalan* breeds, typical species of Mexico, which are usually simply called "*Avocado*", serving as a synonym to

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

designate the fruits of this species (FORD; SPAGNUOLO; KRAFT; BAUER, 2023; PEREIRA, 2015). The main characteristics of these varieties are: small fruits, much smaller than the "*Tropical Avocados",* but which have a high oil content and vast dominance of the international trade of the fruit (CAMPOS, 1985; DONADIO, 1995; FRANCISCO; BAPTISTELLA, 2005; KOLLER, 1984; NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018).

In Brazil, there is a preference for the consumption of fruit *in natura* or in sweet preparations, with the addition of sugar, milk, lemon or honey, in the form of desserts (DAIUTO; VIEITES; TREMOCOLDI; VILEIGAS, 2010; NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018). And although it is a native fruit, with several cultivars produced and widely marketed in the country, there is little information available about the varieties usually planted and marketed in Brazil (Breda, Fortuna, Geada, Margarida and Quintal) (ALNASAN, 2019). So much so, that the Brazilian Food Composition Table (TACO) brings the reference of the composition of avocado, in general, without any specification or differentiation of the variety, while for banana, for example, there are eight different species listed (NEPA, 2011). Another example is in the table of nutritional composition of foods consumed in Brazil by the Brazilian Institute of Management and Statistics (IBGE) used in the household budget survey published in 2019, where the avocado reference used was avocado, described as green-skinned, Florida-type (IBGE, 2011).

Of all the properties present in avocados, it is its high lipid content that arouses the greatest search for scientific knowledge, especially in the Brazilian varieties that are beginning to be studied for this purpose (NOGUEIRA-DE-ALMEIDA; UED; ALMEIDA; ALMEIDA *et al.*, 2018; PIO; PEREIRA; ZAMBON; SILVA *et al.*, 2025; VARGAS VARGAS; CORTES ROJO, 2024). A peculiarity of the fruit is that this amount of lipids is contained in greater concentration in the pulp, although there is oil, in smaller quantities, in peel and seed (TANGO; CARVALHO; SOARES, 2004; TANGO; TURATTI, 1992). In addition, there is an inverse relationship between lipid content and moisture (GONDIM; MOURA; DANTAS; MEDEIROS *et al.*, 2005; LUCCHESI; MONTENEGRO, 1975; TANGO; CARVALHO; SOARES, 2004),

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

sometimes, the high moisture content in the pulp of some cultivars can be a problem for obtaining oil, resulting in low extraction yield with the consequent increase in production costs (TANGO; CARVALHO; SOARES, 2004).

3. Methods

Raw materials

Samples were collected from five Brazilian varieties of avocado: Breda, Fortuna, Geada, Margarida and Quintal. All the samples, used for the extraction of the fruit pulp, which belong to a single plantation, were provided by a private property, located in the rural area of Sacramento/MG, whose geographic coordinates are: latitude 20o09'49" S, longitude 47o03'20" W and 1,245.15 m altitude, distant 50km from Sacramento: latitude 19o51'55" S, longitude 47°26'24" W and 832 m altitude. The collection of avocados followed the harvest calendar of each variety, that is, the fruits of the Geada variety were harvested in April, the Quintal variety in July and those of the Breda, Fortuna and Margarida varieties in October 2022. About ten fruits of each variety were randomly harvested from the plantation. Of these, three avocados of each cultivar that were at the appropriate level of ripeness on the date of pulp removal were selected in order to enable the sample collection procedure. The performance of laboratory analyses of foods using three independent samples, randomly collected from different fruits, and analyzed in triplicate, is described as the gold standard of quality in methodological practice, aiming to ensure reliability, reproducibility and accuracy of the experimental results. The degree of ripeness was determined manually, pressing the fruit and determining if it was soft enough for consumption (LUCCHESI; MONTENEGRO, 1975; WOOLF; WONG; EYRES; MCGHIE *et al.*, 2009). This technique, widely described in the literature, is used in scientific work carried out with avocado, and there is no other way of standardization in the extraction of samples.

The samples were separated by variety, stored in glass, and transported to the Nutrition and Metabolism Laboratory of the Department of Health Sciences of FMRP-USP, where they were frozen and stored without contact with light for

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

subsequent analysis of the components of the fruit pulp. All analyses were performed in triplicate.

Centesimal composition

The quantification of crude protein in the food was done by determining the total nitrogen of the sample, according to the method proposed by Kjeldahl (GOYAL; SINGH; JINDAL; KAUR *et al.*, 2022). With 0.1 g of avocado, the sample was digested in concentrated sulfuric acid, with subsequent distillation of the ammonia in a receiving solution and quantification of the ammonia by titration by volumetry with a standard solution. At the end of the analysis, the result obtained from the total nitrogen content in the sample is multiplied by a conversion factor for crude protein, of 6.25, which is used for most foods (CECCHI, 2003). The results were expressed in g/100g.

Total lipid was determined according to the method proposed by Bligh and Dyer (BLIGH; DYER, 1959). The homogenization of 500 mg of avocado pulp was performed with 0.8 mL of distilled water, in 10 mL tubes. Then, 2 mL of methanol and 1 mL of chloroform were added and the samples were subjected to vortex shaking for 1 minute. After the addition of 1mL of water and 1mL of chloroform, they were subjected to a new stirring for 2 minutes and then centrifuged at 1000 rpm for 5 minutes, to separate the chloroform from the aqueous phase. The lower phase (chloroform), approximately 1.4 mL, was transferred to a test tube containing 1g of anhydrous sodium sulfate to remove traces of water. The 0.5 mL aliquot of the water-free chloroform phase was transferred to a beaker, previously weighed, and taken to the oven, with forced air circulation, at a temperature of 45ºC for evaporation of all the chloroform and new weighing of the beaker. The calculation was obtained by differentiating the beaker weighing's in relation to the initial mass of the tissue used. The results were expressed in g/100g.

For moisture determination, 15 Petri dishes were identified and marked in an overhead projector pen, before weighing, to perform the triplicate analysis of the 5 avocado varieties. The plates were heated for half an hour in the oven at 105°C and, subsequently, weighed on an analytical scale, recording the initial mass m1.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

In each plate, 5 g of avocado pulp were placed and, again, one by one, the plates were weighed, noting the mass with the m2 pulp. Then, they were placed in the greenhouse at 105°C for 24 hours. After the deadline, the plates were removed from the greenhouse, waiting for it to cool completely and, once again, they were weighed to obtain the mass m3 (LUTZ, 2008; MORETTO, 2003).
The percentage of moisture (mean and standard deviation) was calculated using the formula below and the results were expressed in g/100g.

% humidity = (m2 – m1) – (m3 – m1) / (m2 – m1) x 100

To determine the ashes, 15 crucibles were identified and marked with pencils, before weighing, to perform the triplicate analysis of the 5 avocado varieties. The crucibles were heated for half an hour in the oven at 105°C and, subsequently, weighed on an analytical scale, noting the initial mass m1.
Subsequently, 0.5 g of avocado pulp were placed in the crucibles and, again, one by one, they were weighed, noting the dough with the pulp m2. Then, the crucibles were placed in the muffle furnace preheated to 550oC and left until the residue turned white, or light gray, or showed constant weight. Finally, the crucibles were removed from the muffle furnace and placed in a desiccant for complete cooling and, once again, they were weighed to obtain the mass m3 (AOAC, 1997).
The percentage of ash was calculated using the formula below and the results were expressed in g/100g.

Cinzas = (m3 – m1) / (m2 – m1) x 100

Statistical analysis

To estimate the means of the dosage values, a linear regression model was used, including the species (Breda, Fortuna, Geada, Margarida and Quintal) as an independent variable (in the form of indicator variables or "dummy")(DRAPER; SMITH, 1998). Comparisons between species were based on contrasts, using the "lsmeans" package of the R program.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

4. Results and Discussion

Table 1 shows the compilation of the results regarding the mean and standard deviation of the protein, lipid, moisture and ash analyses of the five avocado varieties studied.

Table 1 – Protein, lipid, moisture and ash content in g/100g of avocado in samples of Breda, Fortuna, Geada, Margarida and Quintal avocado varieties (mean ± standard deviation).

	Breda	Fortune	Geada	Margarida	Quintal
Proteins	1,99 ± 0,48	1,65 ± 0,40	1,88 ± 0,24	3,01 ± 0,10	1,32 ± 0,17
Lipids	22,87 ± 2,98	21,73 ± 0,75	14,94 ± 3,38	24,71 ± 1,69	29,93 ± 2,8
Moisture	73,37 ± 0,98	70,69 ± 0,97	86,28 ± 0,73	73,32 ± 0,46	78,07 ± 0,70
Ashes	0,81 ± 0,05	0,47 ± 0,09	0,17 ± 0,22	0,17 ± 0,02	0,39 ± 0,02

Figure 1 shows the comparison between the means of the observed values of proteins, lipids, moisture and ashes according to the species (Breda, Fortuna, Geada, Margarida and Quintal).

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

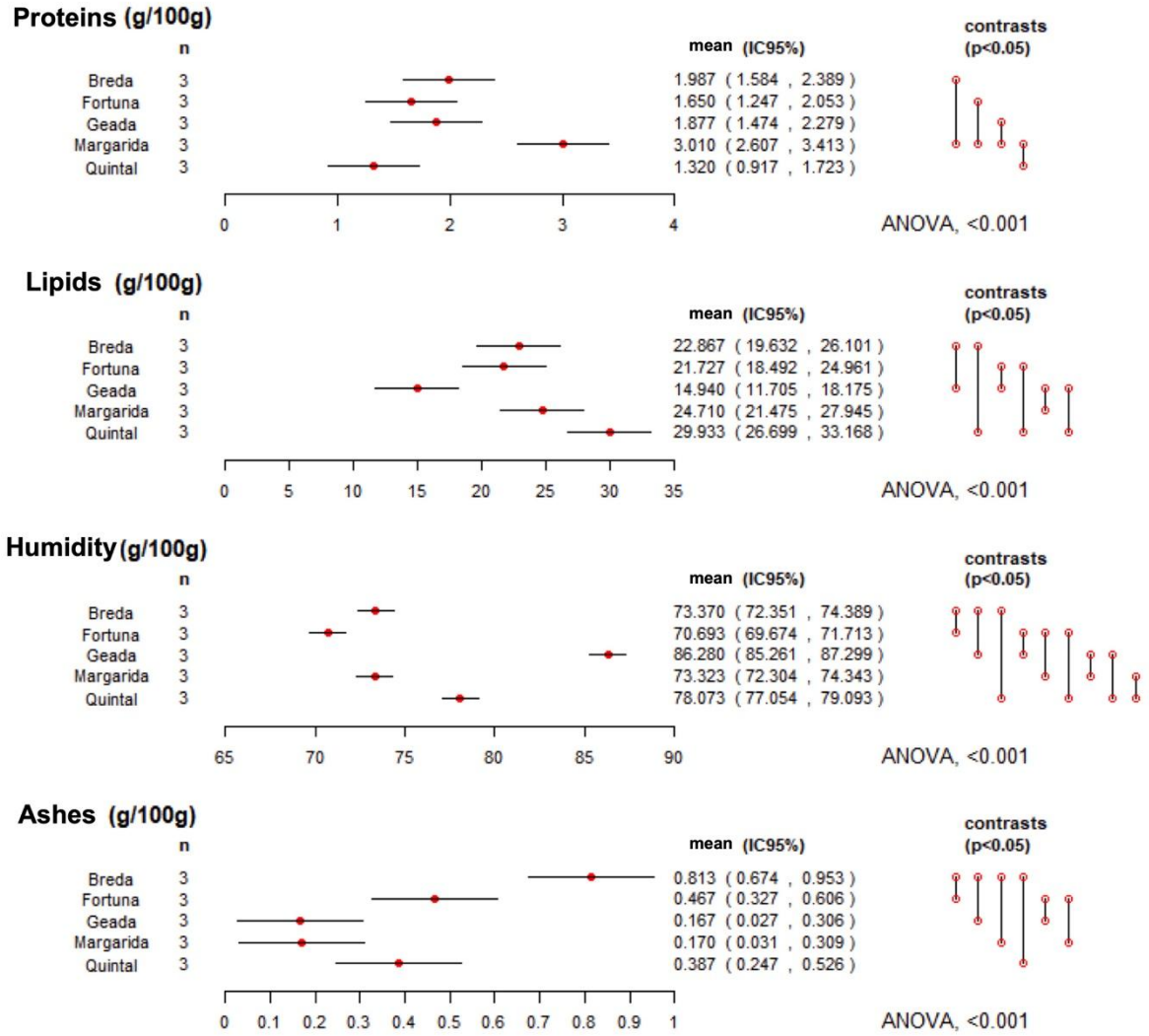

Figure 1: Comparison of the protein, lipid, moisture and ash content in the samples of the Breda, Fortuna, Geada, Margarida and Quintal avocado varieties with the corresponding 95% confidence intervals (95%CI). The vertical bars to the right of the figures indicate evidence of differences between the means, according to contrast tests ($p<0.05$).

Regarding proteins, the Margarida variety was the one with the highest protein content. The other varieties Breda, Fortuna, Geada and Quintal did not show any difference between them. As for lipids, the variety that proved to be discrepant from all the others was the Geada avocado, which has the lowest amount of lipids. The

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

comparison between pairs highlighted that the lipid value of the Breda avocado is higher, when compared to Geada, and lower when compared to Quintal. The Fortuna avocado was different from the Geada and Quintal varieties, having more lipids in relation to the first and less, when compared to the second. The Margarida avocado, in turn, was different only from the Geada variety, with a higher lipid value. Finally, the Quintal avocado proved to be different from the Breda, Fortuna and Geada species, with its lipid content being higher than them. Regarding moisture, the Fortuna variety was the one with the least amount of water. Next, the Breda and Margarida avocados showed similar moisture, with the second highest amount of water present in the fruits. The Quintal variety appears next as the third place in the ranking, behind only the Geada avocado, which proved to be the variety with the highest water content. Regarding the ash values, the Geada, Margarida and Quintal varieties are similar, having lower residue values. And, although the Fortuna avocado maintains similarity with Quintal, this parity was not observed in relation to the Geada and Margarida varieties.

Finally, the Breda species was the only one that was different from the others, with higher residue values compared to the other avocados.

The rationale of the present discussion is centered not only on the comparison between the varieties, but also on the attempt to correlate their characteristics with a similar fruit (*Avocado Hass*) and with some foods that can be used as a reference for certain characteristics. With regard to Hass, the justification for this comparison is due to the fact that it is the most consumed and studied variety worldwide (RAMOS-AGUILAR; ORNELAS-PAZ; TAPIA-VARGAS; GARDEA-BéJAR *et al.*, 2021), in addition to being the main cultivar marketed in several countries for export or industrialization (ALNASAN, 2019; RANADE; THIAGARAJAN, 2015). In Brazil, which is an extensive country, and produces several avocado cultivars, the most cultivated, according to Alnasan et al. (2019), are the varieties: Breda, Fortuna, Geada, Margarida and Quintal (ALNASAN, 2019; PEREIRA, 2015).

The analysis of the protein content of the five avocado varieties studied revealed a variation in values that comprises a range between 1.32 and 3.01 g/100g, with the highest content being observed in the Margarida variety. Study conducted by

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

Krumreich *et al.* (2024), with Brazilian avocados of the Margarida variety, found a protein value of 1.85 g/100g (KRUMREICH; MENDONçA; BORGES; CRIZEL-CARDOZO *et al.*, 2024). In the present study, the percentage of protein found in this same variety was higher, in the order of 3.01 g/100g, and this cultivar was even the one that differed from the others in this regard. Gouveia et al., in turn, claim that the protein content in the fruit pulp varies from 1 to 2%. In the Breda variety, which was analyzed by the authors, the content found was 1.73 g/100g (GOUVEIA; SCHAUN; MASKE; SCHEIK *et al.*, 2015), apparently slightly lower than that observed in the present study (1.99 g/100g) in the same variety. In the Fortuna avocado, protein values in the order of 1.12 g/100g have already been found by Oliveira et al. (2013) (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013), while the data of the present study showed a content of 1.65 g/100g for a similar cultivar, a higher value when compared to the mentioned work. In Hass avocado, the protein content, described in the literature, is 1.96 g/100g, according to USDA data, 2011 (DREHER; DAVENPORT, 2013; FORD; SPAGNUOLO; KRAFT; BAUER, 2023). Observing our studied varieties, the results found indicate that the avocados Quintal (1.32 g/100g), Fortuna (1.65 g/100g) and Geada (1.88 g/100g) have lower protein content when compared to Hass. However, the species Breda (1.99 g/100g) and Margarida (3.01 g/100g) showed more proteins in their composition.

Some possible explanations for the differences in results between the present study and those mentioned above may be related to the differences between the varieties, which have different genetic material, and also to aspects related to the crop, such as climate, temperature, water variation, soil compounds or even UV radiation. Additionally, altitude seems to be another factor that can influence the nutrient composition of the fruit (CARVALHO; BERNAL E; VELáSQUEZ; CARTAGENA V, 2015), indicating that its quality undergoes changes related to these variables.

Another relevant observation is that Oliveira et al. (2013) claim that there is a positive relationship for protein and lipid contents. Thus, the analyses of these authors revealed that the cultivars with the highest lipid contents were the ones that also stood out in the amounts of proteins. In this sense, the variety that presented the highest lipid content was the Quintal avocado with 29.93 g/100g, but its protein

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

content was 1.32 g/100g. At the other extreme, the cultivar with the lowest lipid content was the Geada avocado with 14.94 g/100g, but its protein content was 1.88 g/100g, that is, higher in crude values when compared to the Quintal avocado that has twice as many lipids, in raw values, when compared to the latter.

As a parameter of comparison, in a broader analysis of protein contents in the vegetable kingdom, the plant reference with the highest consumption in the Brazilian population is beans (COELHO, 1991). In this sense, a study that compared eleven varieties of beans found protein levels in the order of 18.17 to 25.93 g/100g (PIRES; OLIVEIRA; CRUZ; MENDES *et al.*, 2005), evidencing values higher than those found in the different avocado cultivars, so that, according to our data, avocado can be considered only a complementary source of vegetable protein, without the same nutritional capacity as a protein source found in beans. When compared to other fruit species, it is noted that the protein content of avocado is sometimes higher than those found, for example, in the "*Tommy Atkins*" mango (0.44 g/100g) (MARQUES; CHICAYBAM; ARAUJO; MANHãES *et al.*, 2010), guava (0,40 g/100g) (MENEZES; DORNELLES; DE OLIVEIRA FOGAçA; BOLIGON *et al.*, 2016), blueberry (0,44 g/100g) (CONCENçO; STRINGHETA; RAMOS; DE OLIVEIRA *et al.*, 2014) and kiwi (1,23 g/100g) (SOUSA, 2018) and, at other times, lower, when compared, for example, to banana varieties (Ambrosia 3.65 g/100g, Bucaneiro 4.35 g/100g and Calypso 4.62 g/100g) (AMORIM; OLIVEIRA; VIEIRA; FRANCESCHINA, 2015).

Regarding the lipid portion of the fruit, this seems to be the fraction that arouses the greatest interest in the scientific community, being, therefore, the one with the largest number of published studies. And this interest is mainly based on the information that avocados accumulate oil during their ripening, while most fruits accumulate sugars (FORD; SPAGNUOLO; KRAFT; BAUER, 2023). In fact, this content is quite high, with a variation of 5.9% to 43.5% of the pulp, depending on the variety evaluated and the sample, and some authors report lipid levels between 60% and 88% of the total calories, indicating that avocado has about 20 times more fat than the average of other fruits (NAVEH; WERMAN; SABO; NEEMAN, 2002; ORHEVBA; JINADU, 2011).

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

In the present study, lipid levels ranged from 14.94 to 29.93 g/100g. The results indicate that, among cultivars planted in the same crop, which is to say the same soil and altitude, the lipid contents that make up the fruit are different and specific to each variety. For the same varieties, planted in different soils, in the same way, this uniqueness has also been observed. In a comparative analysis with the Breda cultivar, a Brazilian study by Gouveia et al. found an oil rate of 15.8 g/100g (GOUVEIA; SCHAUN; MASKE; SCHEIK *et al.*, 2015). In the present study, the cultivar had a lipid content equivalent to 22.87 g/100g, a result higher than that reported by the authors. Another example of difference is the study conducted by Oliveira et al., which analyzed the total fat composition of the fruits of the Fortuna, Margarida and Quintal avocados, finding lipid content values equivalent to 6.43, 8.74 and 10.95 g/100g (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013). For these same varieties, the values found in the present study were 21.73, 24.71 and 29.93, respectively, levels that are equivalent to double or even triple those mentioned. The literature reviewed presents very discrepant rates of fat contents, with values ranging from 5.9 to 43.5 g/100g, depending on the cultivar studied and the sample (NAVEH; WERMAN; SABO; NEEMAN, 2002; ORHEVBA; JINADU, 2011) or between 5 and 35 g/100g (GOUVEIA; SCHAUN; MASKE; SCHEIK *et al.*, 2015). Numerous articles attest to this discrepancy, such as the study conducted by Oliveira et al. (2013), which investigated eleven species of avocados, including the Hass and Fuerte varieties, called avocados, finding values between 5.7 and 26.12 g/100g of lipids. In this case, the highest lipid levels were observed in the fruits of Hass and Fuerte avocados (21.07 and 26.12 g/100g, respectively) (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013), in line with the literature, which indicates that these are the most abundant varieties in oil. On the other hand, Bora et al. (2001), analyzing the Fuerte variety, from João Pessoa, Paraíba, found lipid content of 15.39 g/100g (BORA; NARAIN; ROCHA; QUEIROZ PAULO, 2001). In Venezuela, in turn, the analysis carried out by Gómez-López (2002), with thirteen varieties of Venezuelan avocados, found oil levels between 11.23 and 18.80 g/100g (COSTAGLI; BETTI, 2015; GóMEZ-LóPEZ, 2002). While in Moroccan avocados, in an analysis carried out with eight varieties, the lipid contents remained between 8.41 and 30.44 g/100g

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

(NASRI; HALABI; HAJIB; CHOUKRI *et al.*, 2023). In Mexico, Espinosa et al., conducted an analysis to compare six Mexican native varieties with the Hass variety and the lipid values found ranged from 18.28 to 26.77 g/100g, with the Hass species showing the lowest crude values 18.28 g/100g (ESPINOSA-ALONSO; PAREDES-LóPEZ; VALDEZ-MORALES; OOMAH, 2017).

Studies that analyzed the same variety, but produced in different soils, also showed that the oil content contained in the fruits is discrepant, reinforcing the importance of considering external variables related to planting to answer this question. In this sense, for example, Hass avocados, from six different locations, were analyzed in Colombia, and the lipid content values were in the order of 7.8 to 18.9 g/100g of oil (CARVALHO; BERNAL E; VELáSQUEZ; CARTAGENA V, 2015). The possible explanation for different amounts in the same species of fruit is supported by the argument that the composition, not only of macronutrients, but also of the profile of bioactive compounds of avocado seems to undergo changes due to the influence of variables such as: soil, UV radiation, temperature, altitude, among others (CARVALHO; BERNAL E; VELáSQUEZ; CARTAGENA V, 2015; OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013; ORHEVBA; JINADU, 2011).

It is known that another important issue related to oil deposition in the fruit is directly associated with its degree of ripeness, because as the fruit ripens there is an increase in lipid content and a decrease in moisture (CARVALHO; BERNAL E; VELáSQUEZ; CARTAGENA V, 2015) and there is an inversely proportional combination between lipids and moisture in the fruit (GONDIM; MOURA; DANTAS; MEDEIROS *et al.*, 2005; LEE; YOUNG; SCHIFFMAN; COGGINS, 1983; LUCCHESI; MONTENEGRO, 1975; OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013; TANGO; CARVALHO; SOARES, 2004). Woolf et al. (2009) and Di Stefano et al. (2017) consider this to be one of the most notable characteristics of the avocado, as the fruit ripens while attached to the avocado tree and continues its ripening process after harvesting, that is, from the removal of the fruit from the tree. These two cycles of fruit maturity are called physiological and commercial ripening, respectively (DI STEFANO; AVELLONE; BONGIORNO; INDELICATO *et al.*, 2016; WOOLF; WONG; EYRES; MCGHIE *et al.*, 2009). From that moment on, the

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

complete ripening of the fruit can take 3, 4, 6, 10, 18 or even 21 days, deadlines that are, once again, influenced by the cultivar, in addition to other external factors, such as storage time and temperature (WOOLF; WONG; EYRES; MCGHIE *et al.*, 2009).

Finally, the literature has long associated the similarity of avocado oil to olive oil (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013), not only highlighting the similarity of the raw material for extracting the oils, as both are extracted from fruit pulp, but, and mainly, due to the fact that both oils seem to have similar physicochemical properties, with potential beneficial effects on the health of the consumer (FERRARI, 2015; OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013; TANGO; CARVALHO; SOARES, 2004; TANGO; TURATTI, 1992). In terms of lipid content, it appears that the oil values of olives, likewise, resemble those of avocados. Thus, an analysis carried out by Pestana-Bauer et al. (2011), in Brazilian olives, planted in the region of Rio Grande do Sul, found oil values in the percentage of 19.79%. The authors also cite references from other studies, indicating that the percentage of oil found in olives, worldwide, is around 18 to 30 percent (PESTANA-BAUER; GOULARTE-DUTRA; ZAMBIAZI, 2011).

The most scientifically relevant information of the present study may be the indication that the lipid levels existing in the Brazilian varieties may be similar and, in some cases, higher than those of the Hass and Fuerte avocados, called "*Avocados*". This calls into question the knowledge, until then, that the Brazilian varieties, called *Tropical Avocados*, were not equal to the Hass and Fuerte avocados in this regard (TANGO; CARVALHO; SOARES, 2004). On the contrary, even the Geada cultivar, whose oil contents were lower, has a lipid content like the Hass avocado from Mexico or the Fuerte variety. Such results imply the affirmation that Brazilian avocados can occupy the same space, currently reserved for the Hass and Fuerte varieties, in the national and world market, as a lipid source.

The moisture content of avocado, as previously mentioned, is inversely proportional to the lipid levels of the fruit. This is because the largest fraction of the fruit is composed of the pulp, which basically contains lipids, as a macronutrient, and water (GONDIM; MOURA; DANTAS; MEDEIROS *et al.*, 2005; LEE; YOUNG;

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

SCHIFFMAN; COGGINS, 1983; LUCCHESI; MONTENEGRO, 1975; OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013; TANGO; CARVALHO; SOARES, 2004). In the observation of the results obtained, in fact, the Geada variety was the one with the lowest lipid content (14.94 g/100g) and the highest moisture content (86.28 g/100g), in line with the literature (GONDIM; MOURA; DANTAS; MEDEIROS *et al.*, 2005; LEE; YOUNG; SCHIFFMAN; COGGINS, 1983; LUCCHESI; MONTENEGRO, 1975; OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013; TANGO; CARVALHO; SOARES, 2004). High moisture content makes the fruit susceptible to greater proliferation of fungi and, consequently, greater deterioration. Additionally, considering avocado as an important nutritional source of lipids, its commercial value can be reduced in very "wet" fruits. On the other hand, moisture values between 50 and 60 g/100g are associated with an increase in the shelf life of the fruit, since they retard the growth of microorganisms (NASRI; HALABI; HAJIB; CHOUKRI *et al.*, 2023; WOGU, 2014).

The variability of moisture contents, as well as lipids, are widely described in the literature. A Moroccan study, carried out with eight varieties of local avocados, found moisture values between 57.88 and 84.71 g/100g (NASRI; HALABI; HAJIB; CHOUKRI *et al.*, 2023). In the work produced by Oliveira et al. (2013), with eleven varieties of avocado, including Fortuna, Margarida and Quintal, moisture values for these species were found to be 81.38, 81.20 and 75.20 g/100g, respectively (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013). For these same varieties, the present study found moisture contents of 70.69, 73.32 and 78.07 g/100g, respectively. From these results, it can be inferred that the moisture values of the Fortuna and Margarida avocados, in the present study, were lower than those found by the authors, however, in relation to the contents of the Quintal variety, the comparison showed similar values. Regarding the Breda cultivar, Gouveia et al. (2015), reported having found a moisture content of 78.18 g/100g (GOUVEIA; SCHAUN; MASKE; SCHEIK *et al.*, 2015), This value is different from that found in the present study, which was 73.37 g/100g for the same species. Regarding the Hass and Fuerte varieties, the moisture values presented by the authors were 62.11 and 60.97 (OLIVEIRA; SILVA; GONçALVES, 2014), values lower than those found in national varieties. On the other hand, a study conducted by Bora et al. (2001), with the

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

Fuerte cultivar, from João Pessoa, Paraíba, found moisture values of 78.24 g/100g for this species of fruit (BORA; NARAIN; ROCHA; QUEIROZ PAULO, 2001). A study carried out by Carvalho et al. (2015), analyzing six varieties of the Hass avocado at different altitudes, in Colombia, showed moisture contents between 69.3 and 81 g/100g (CARVALHO; BERNAL E; VELáSQUEZ; CARTAGENA V, 2015), once again attesting to the discrepancy in values, even among the most studied variety and with the highest consumption in the world. In this case, it seems that the factor that led to the difference was the altitude.

In relation to ashes, fruits, in general, have a variable content, between 0.3 and 2.1 g/100g (MENEZES; PURGATTO). In a comparative analysis, the varieties Fortuna, Margarida and Quintal studied by Oliveira et al. (2013), presented ash values in the order of 1.00, 0.81 and 0.83 g/100g, respectively (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013). In the present study, these same avocado species presented values of 0.47, 0.17 and 0.39 g/100g, respectively, values below those found in the study. Regarding the cultivar Breda, it was the only one that was different from the others, with higher residue values compared to the other avocados, in a total of 0.81 g/100g. When this variety was studied by Gouveia et al. (2015), the ash values found by the authors were 0.58 g/100g (GOUVEIA; SCHAUN; MASKE; SCHEIK *et al.*, 2015). Regarding Moroccan avocados, Nasri et al. (2023) found ash contents ranging from 0.57 to 1.37 g/100g (NASRI; HALABI; HAJIB; CHOUKRI *et al.*, 2023). The varieties Hass and Fuerte, in turn, presented ash values equivalent to 2.40 and 1.30 g/100g, respectively (OLIVEIRA; PIO; RAMOS; LIMA *et al.*, 2013). Compared to these varieties, analyzed in the aforementioned study, Brazilian avocados have lower ash contents, which may presuppose that they are richer in substances with energy potential.

5. Conclusion

Avocados can be complementary sources of protein, especially Margarida. All of them showed significant amounts of lipids. Regarding ashes, Brazilian avocados studied have lower levels compared to varieties from other countries The

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

natural inexistence of a single pattern of centesimal composition of the avocados evaluated, with relevant differences in the nutritional profile of the five varieties, especially proteins and lipids, expands the possibilities of their dietary use. Additionally, the present study brings to light unpublished data on crop varieties in Brazil.

References

ALMEIDA, G.; SAMPAIO, A. **O Abacate no mundo, no Brasil e na CEAGESP de São Paulo**. São Paulo, 2013. Disponível em: https://www.todafruta.com.br/wp-content/uploads/2018/08/ABACATE-4.pdf.

ALNASAN, Z. Characteristics of the oil of different varieties of avocado grown in Brazil and a new methodology for extra-virgin avocado oil extraction. **Agricultural and Food Sciences**, 2019. http://repositorio.unb.br/handle/10482/35041

AMORIM, T. P.; OLIVEIRA, V. R. D.; VIEIRA, M. D. M.; FRANCESCHINA, C. S., 2015, Bento Gonçalves, RS. **Composição química de polpa e cascas de cultivares de banana desidratadas**. Disponível em: https://lume.ufrgs.br/bitstream/handle/10183/182184/001076883.pdf.

AOAC. **Official methods of analysis**. 16 ed. Washington, DC: Aoac, 1997. 850 p.

BLIGH, E. G.; DYER, W. J. A Rapid Method of Total Lipid Extraction and Purification. **Canadian Journal of Biochemistry and Physiology**, 37, n. 8, p. 911-917, 1959. https://doi.org/10.1139/o59-099

BORA, P. S.; NARAIN, N.; ROCHA, R. V. M.; QUEIROZ PAULO, M. Characterization of the oils from the pulp and seeds of avocado (cultivar: Fuerte) fruits. **Grasas y Aceites**, 52, n. 3-4, p. 171-174, 2001. https://doi.org/10.3989/gya.2001.v52.i3-4.353

CAMPOS, J. S. **Cultura racional do abacateiro**. São Paulo: Icone, 1985.

CARVALHO, C. P.; BERNAL E, J.; VELáSQUEZ, M. A.; CARTAGENA V, J. R. Fatty acid content of avocados (Persea americana Mill. cv. Hass) in relation to orchard altitude and fruit maturity stage. **Agronomía Colombiana**, 33, n. 2, p. 220-227, 2015. https://doi.org/10.15446/agron.colomb.v33n2.49902

CECCHI, H. M. **Fundamentos teóricos e práticos em análise de alimentos**. UNICAMP, 2003. 206 p. 9788526814721.

COELHO, R. G. Considerações sobre as proteínas de feijão. **Revista de Nutrição**, 4, n. 1-2, 1991. https://puccampinas.emnuvens.com.br/nutricao/article/view/9020

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

CONCENçO, F. I. G. D. R.; STRINGHETA, P. C.; RAMOS, A. M.; DE OLIVEIRA, I. H. T. *et al.* CARACTERIZAÇÃO E AVALIAÇÃO DAS PROPRIEDADES FÍSICO-QUÍMICAS DA POLPA, CASCA E EXTRATO DE MIRTILO (Vaccinium myrtillus). **Revista Brasileira de Tecnologia Agroindustrial**, 8, n. 1, p. 1177-1187, 2014. https://doi.org/10.3895/s1981-36862014000100004

COSTAGLI, G.; BETTI, M. Avocado oil extraction processes: method for cold-pressed high-quality edible oil production versus traditional production. **Journal of Agricultural Engineering**, 46, n. 3, p. 115-122, 2015. https://doi.org/10.4081/jae.2015.467

DAIUTO, É. R.; VIEITES, R. L.; TREMOCOLDI, M. A.; VILEIGAS, D. F. Estabilidade físico-química de um produto de abacate acondicionado em diferentes embalagens e conservado pelo frio. **Alimentos e Nutrição**, 21, n. 1, p. 97-105, 2010. http://hdl.handle.net/11449/137729

DI STEFANO, V.; AVELLONE, G.; BONGIORNO, D.; INDELICATO, S. *et al.* Quantitative evaluation of the phenolic profile in fruits of six avocado (Persea americana) cultivars by ultra-high-performance liquid chromatography-heated electrospray-mass spectrometry. **International Journal of Food Properties**, 20, n. 6, p. 1302-1312, 2016. https://doi.org/10.1080/10942912.2016.1208225

DONADIO, L. C. **Abacate para exportação: aspectos técnicos da produção**. 2 ed. Ministério da Agricultura, do Abastecimento e da Reforma Agrária., 1995. 53 p.

DRAPER, N. R.; SMITH, H. **Applied regression analysis**. John Wiley & Sons, 1998. 0471170828.

DREHER, M. L.; DAVENPORT, A. J. Hass avocado composition and potential health effects. **Crit Rev Food Sci Nutr**, 53, n. 7, p. 738-750, 2013. https://doi.org/10.1080/10408398.2011.556759

ESPINOSA-ALONSO, L. G.; PAREDES-LóPEZ, O.; VALDEZ-MORALES, M.; OOMAH, B. D. Avocado oil characteristics of Mexican creole genotypes. **European Journal of Lipid Science and Technology**, 119, n. 10, p. 1600406, 2017. https://doi.org/10.1002/ejlt.201600406

FERRARI, R. A. Nota Científica: Caracterização físico-química do óleo de abacate extraído por centrifugação e dos subprodutos do processamento. **Brazilian Journal of Food Technology**, 18, n. 1, p. 79-84, 2015. https://doi.org/10.1590/1981-6723.4014

FORD, N. A.; SPAGNUOLO, P.; KRAFT, J.; BAUER, E. Nutritional Composition of Hass Avocado Pulp. **Foods**, 12, n. 13, p. 2516, Jun 28 2023. https://doi.org/10.3390/foods12132516

FRANCISCO, V. L. F. D. S.; BAPTISTELLA, C. D. S. L. Cultura do abacate no Estado de Sâo Paulo. **Informações econômicas**, 35, n. 5, p. 27-41, 2005. https://iea.agricultura.sp.gov.br/ftpiea/ie/2005/tec3-0505.pdf

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

GóMEZ-LóPEZ, V. M. Fruit characterization of high oil content avocado varieties. **Scientia Agricola**, 59, n. 2, p. 403-406, 2002. https://doi.org/10.1590/s0103-90162002000200030

GONDIM, J. A. M.; MOURA, M. D. F. V.; DANTAS, A. S.; MEDEIROS, R. L. S. *et al.* Composição centesimal e de minerais em cascas de frutas. **Food Science and Technology**, 25, n. 4, p. 825-827, 2005. https://doi.org/10.1590/S0101-20612005000400032

GOUVEIA, H.; SCHAUN, J.; MASKE, A.; SCHEIK, L. *et al.* **Abacate da variedade breda: características físico-químicas e teor de lipídios**. Bento Gonçalves: Sociedade Brasileira de Ciência e Tecnologia de Alimentos, 2015. 5 p. (Anais do 5º Simpósio de Segurança Alimentar – Alimentação e Saúde.

GOYAL, K.; SINGH, N.; JINDAL, S.; KAUR, R. *et al.* Kjeldahl method. **Advanced Techniques of Analytical Chemistry**, 1, n. 1, p. 8, 2022.

IBGE. **Tabela de composição nutricional dos alimentos consumidos no Brasil**. Rio de Janeiro: IBGE, 2011. 345 p.

KOLLER, O. C. **Abacaticultura**. UFRGS, 1984. 138 p.

KRUMREICH, F. D.; MENDONçA, C. R. B.; BORGES, C. D.; CRIZEL-CARDOZO, M. M. *et al.* Margarida avocado oil: Effect of processing on quality, bioactive compounds and fatty acid profile. **Food Chemistry Advances**, 4, p. 100617, 2024. https://doi.org/10.1016/j.focha.2024.100617

LEE, S.; YOUNG, R.; SCHIFFMAN, P.; COGGINS, C. Maturity studies of avocado fruit based on picking dates and dry weight. **J. Amer. Soc. Hort. Sci**, 108, n. 3, p. 390-394, 1983. http://209.143.153.251/Journals/ASHS/ASHS_1983_108_PG_390-394.pdf

LUCCHESI, A. A.; MONTENEGRO, H. W. S. Determinação prática do teor de óleo na polpa do abacate (Persea americana Miller) através da correlação com o teor de água. **Anais da Escola Superior de Agricultura Luiz de Queiroz**, 32, n. 0, p. 339-352, 1975. https://doi.org/10.1590/s0071-12761975000100028

LUTZ, I. I. A. **Métodos físico-químicos para análise de alimentos**. 4 ed. São Paulo: 2008. 1020 p.

MARQUES, A.; CHICAYBAM, G.; ARAUJO, M. T.; MANHãES, L. R. T. *et al.* Composição centesimal e de minerais de casca e polpa de manga (Mangifera indica L.) cv. Tommy Atkins. **Revista Brasileira de Fruticultura**, 32, n. 4, p. 1206-1210, 2010. https://doi.org/10.1590/s0100-29452010005000117

MENEZES, E. W.; PURGATTO, E. **Determinação de cinzas em alimentos**. 2016. Disponível em: https://d1wqtxts1xzle7.cloudfront.net/61490884/Aula_de_CINZAS_201620191211-52290-14p79gw-libre.pdf?1576130431=&response-content-disposition=inline%3B+filename%3DDISCIPLINA_BROMATOLOGIA_BASICA_FBA_201_U.pdf&Expires=1757698942&Signature=YZ6fkthTFT-x3nPpEKqqzwg8TPh-zr7jkYOLYMeHsPz~AXE3-mDWaw9tU-pCh5wK1qcqy8ti2bgBf5nN3J7l4mQn-t~2pu1-

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

El6qnhvXiMG0YwvgxpUUcRt1QbVZBYwKd7RvMBf7I9Nqj0HpgwrGtn5c3KKxA2moAWT8FkOwaomdIKdP0rlM~8Yh9hvaCJm81fcZRC7SFkUiQNmb0e8BGi8AxrjmwJOkVnh7Xh0t7RyJHJ~4p2oCMN4a541a3aLzfAL2Xlmuj--w~zZlUqq9IzifuVHhD9P5Mjiww0IGP4lmrznBIG0QF3nMQrdk2aPA7PZTLCT852aet7CgXO9G6w__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA.

MENEZES, P. E.; DORNELLES, L. L.; DE OLIVEIRA FOGAçA, A.; BOLIGON, A. A. *et al.* Composição centesimal, compostos bioativos, atividade antioxidante e caracterização fenólica da polpa de goiaba. **Disciplinarum Scientia| Saúde**, 17, n. 2, p. 205-217, 2016. https://doi.org/10.37777/2030

MORETTO, E. **Introdução à ciência de alimentos**. 1 ed. Ed. da UFSC, 2003. 256 p. 9788532802132.

NASRI, C.; HALABI, Y.; HAJIB, A.; CHOUKRI, H. *et al.* Proximate composition, lipid and elemental profiling of eight varieties of avocado (Persea americana). **Sci Rep**, 13, n. 1, p. 22767, Dec 20 2023. https://doi.org/10.1038/s41598-023-50119-y

NAVEH, E.; WERMAN, M. J.; SABO, E.; NEEMAN, I. Defatted avocado pulp reduces body weight and total hepatic fat but increases plasma cholesterol in male rats fed diets with cholesterol. **J Nutr**, 132, n. 7, p. 2015-2018, Jul 2002. https://doi.org/10.1093/jn/132.7.2015

NEPA. **Tabela brasileira de composição de alimentos (TACO)**. Núcleo de estudos e pesquisas em alimentação (NEPA/UNICAMP), 2011.

NOGUEIRA-DE-ALMEIDA, C. A.; UED, F. D. V.; ALMEIDA, C. C. J. N. D.; ALMEIDA, A. C. F. *et al.* Perfil nutricional e benefícios do azeite de abacate (Persea americana): uma revisão integrativa. **Brazilian Journal of Food Technology**, 21, n. 0, 2018. https://doi.org/10.1590/1981-6723.21417

OLIVEIRA, A.; SILVA, L.; GONçALVES, E. Extração de óleo de abacate por centrifugação. 199. GERAIS, E. D. P. A. D. M. Belo Horizonte: Empresa de Pesquisa Agropecuária de Minas Gerais. 199**:** 5 p. 2014.

OLIVEIRA, M. C.; PIO, R.; RAMOS, J. D.; LIMA, L. C. O. *et al.* Fenologia e características físico-químicas de frutos de abacateiros visando à extração de óleo. **Ciência Rural**, 43, n. 3, p. 411-418, 2013. https://doi.org/10.1590/s0103-84782013000300006

ORHEVBA, B.; JINADU, A. Determination of physico-chemical properties and nutritional contents of avocado pear (Persea americana M.). **Academic Research International**, 1, n. 3, p. 372-380, 2011. http://www.savap.org.pk/journals/ARInt./Vol.1(3)/2011(1.3-38).pdf

PEREIRA, P. A. **Evolução da produção mundial e nacional de abacate**. 2015. 55 f. Trabalho de Conclusão de Curso (Graduação em Agronomia) - Faculdade de Agronomia e Medicina Veterinária, Universidade de Brasília, Brasília.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

PESTANA-BAUER, V. R.; GOULARTE-DUTRA, F. L.; ZAMBIAZI, R. Caracterização do fruto da oliveira (variedade Carolea) cultivada na região Sul do Brasil. **Alim. Nutr., Araraquara**, 22, n. 1, p. 79-87, 2011. https://d1wqtxts1xzle7.cloudfront.net/83482739/1071-libre.pdf?1649458569=&response-content-disposition=inline%3B+filename%3DCARACTERIZACAO_DO_FRUTO_DA_OLIVEIRA_VARI.pdf&Expires=1757699543&Signature=SfWrntPHCNwGqheEEIINT88mjc5R9CLSB~M~21e7j892CuotONT5litw8blHcLF65PvACKi-Pyw4G8M2x~MzXSYybs1x8D9Z-Z8Bfx36qsfqFFzIY9cR6ERXj5LzZ1IglY~WLglhFN-5PLP-K1oHlTdyUIPjqhKKkYhNAHlosGMAtMzVQH1KcgKZuz4HlMv1QCTmn60ArTW2PxFVYWnPtXjujv~fXUW7Sfmrw3nN37ucNI8HHTQowyVumS14VomZ9NISst96Y5bjCPQbryvFoDAMRokwrGXwUAWCM8cX5znLliSgrgBWspZyR6em07OsjfGOi8EJ41IOrboMW1Sg9Q__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

PIO, R.; PEREIRA, C. D. S.; ZAMBON, C. R.; SILVA, L. F. D. O. D. *et al.* Fruit production and oil quality of avocado cultivars in a high-altitude subtropical region. **Bragantia**, 84, 2025. https://doi.org/10.1590/1678-4499.20240286

PIRES, C. V.; OLIVEIRA, M. D. A.; CRUZ, G.; MENDES, F. Q. *et al.* Composição físico-química de diferentes cultivares de feijão (Phaseolus vulgaris L.). **Alimentos e Nutrição, Araraquara**, 16, n. 2, p. 157-162, 2005. https://www.researchgate.net/profile/Fabricia-Mendes-3/publication/49599864_COMPOSICAO_FISICO-QUIMICA_DE_DIFERENTES_CULTIVARES_DE_FEIJAO_Phaseolus_vulgaris_L/links/56321e9108ae0530378f0f8a/COMPOSICAO-FISICO-QUIMICA-DE-DIFERENTES-CULTIVARES-DE-FEIJAO-Phaseolus-vulgaris-L.pdf

RAMOS-AGUILAR, A. L.; ORNELAS-PAZ, J.; TAPIA-VARGAS, L. M.; GARDEA-BéJAR, A. A. *et al.* Comparative study on the phytochemical and nutrient composition of ripe fruit of Hass and Hass type avocado cultivars. **Journal of Food Composition and Analysis**, 97, p. 103796, 2021. https://doi.org/10.1016/j.jfca.2020.103796

RANADE, S. S.; THIAGARAJAN, P. A Review on Persea americana Mill.(Avocado)-Its Fruits and Oil. **Int. J. PharmTech Res**, 8, n. 6, p. 72-77, 2015. https://www.researchgate.net/profile/Shruti-Ranade/publication/283777915_A_review_on_Persea_Americana_Mill_Avocado-_Its_fruit_and_oil/links/57a6ba9f08aee07544bc7188/A-review-on-Persea-Americana-Mill-Avocado-Its-fruit-and-oil.pdf

SOUSA, R. B. M. D. **Determinação de macronutrientes no kiwi (Actinidia deliciosa)**. Orientador: E., M. F. N. 2018. 46 f. TCC (Graduação) - Centro de Ciências Exatas e Tecnologia - Curso de Química, Universidade Federal do Maranhão, São Luis, MA. Disponível em: http://hdl.handle.net/123456789/2418.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 11/03/2026
Vol: 13.02
DOI: 10.61164/9pfzes42
Pages: 1-24

STEPHEN, J.; RADHAKRISHNAN, M. Avocado (Persea americana Mill.) fruit: Nutritional value, handling and processing techniques, and health benefits. **Journal of Food Processing and Preservation**, 46, n. 12, p. e17207, 2022. https://doi.org/10.1111/jfpp.17207

TANGO, J. S.; CARVALHO, C. R. L.; SOARES, N. B. Caracterização física e química de frutos de abacate visando a seu potencial para extração de óleo. **Revista Brasileira de Fruticultura**, 26, n. 1, p. 17-23, 2004. https://doi.org/10.1590/S0100-29452004000100007 link

TANGO, J. S.; TURATTI, J. M. Óleo de abacate. *In*: **Abacate: cultura, matéria-prima, processamento e aspectos econômicos**. Campinas: ITAL, 1992. p. 156-192.

VALE, B. S. D. **Análise da viabilidade econômica da produção de abacate**. 2017. 50 p.

VARGAS VARGAS, M. A.; CORTES ROJO, C. Aceite de aguacate: El verdadero oro verde contra las enfermedades crónicas. **Milenaria, Ciencia y arte**, n. 23, p. 26-28, 2024. https://doi.org/10.35830/mcya.vi23.454

WOGU, M. D. Microorganisms associated with the spoilage of avocado pear, Persea Americana fruits. **AFRREV STECH: An International Journal of Science and Technology**, 3, n. 2, p. 244-258, 2014. https://doi.org/10.4314/stech.v3i2.15

WOOLF, A.; WONG, M.; EYRES, L.; MCGHIE, T. *et al.* Avocado oil. *In*: **Gourmet and health-promoting specialty oils**: Elsevier, 2009. p. 73-125.