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SCIENTIFIC COMMUNICATION

CHEMICAL CHARACTERIZATION AND ANTIOXIDANT CAPACITY OF GUAPEVA[1]

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ABSTRACT- Fruits of the Brazilian cerrado usually have typical flavor and high levels of nutrients; however, many of these fruits are little known and marketed. The aim of this study was to chemically and bioactively characterize guapeva fruit, according to standard methodologies. Guapeva has high moisture (65 %) and minerals (1%) content and significant content of phenolic compounds (220 GAE/100g) and consequent antioxidant activity (329.29 µmol/ Trolox eq). This fruit has desirable features to compose a healthy diet and should be further explored in research and economically.
Index terms: bioactives, cerrado, fruits, *Pouteria gardneriana*.

CARACTERIZAÇÃO QUÍMICA E CAPACIDADE ANTIOXIDANTE DA GUAPEVA

RESUMO- Os frutos do cerrado em geral apresentam sabores próprios e elevados teores de nutrientes, no entanto, grande parte desses frutos ainda é pouco conhecida e comercializada. O objetivo deste estudo foi caracterizar química e bioativamente o fruto da guapeva, de acordo com metodologias padronizadas, para colaborar com a literatura e contribuir a título de informação, socialmente. A guapeva possui alto teor de umidade (65%) e de minerais (1%) além do teor expressivo de fenólicos (220 GAE/100 g) e consequente atividade antioxidante (329,29 µmol/ Trolox eq). Esse fruto tem características desejáveis para compor uma dieta saudável e deve ser mais explorado tanto em pesquisa quanto economicamente.
Termos para indexação: bioativos, cerrado, frutas, Pouteria gardneriana.

The study of the chemical composition of native foods contributes to a better understanding of the relationship between nutrition and biodiversity, especially in terms of the process of food production for human nutrition. Information about the chemical characteristics and nutritional value of native fruits of the Brazilian cerrado contributes to add value and enhance the commercial and industrial use of these foods and are basic tools to evaluate and encourage consumption and for the formulation of new products (CABRAL et al., 2013; ROCHA et al., 2013).

Among the multiplicity of native fruits of the cerrado, those of greatest economic and / or social interest have already been widely studied such as baru and mangaba, for example. However, there is still a great number of cerrado fruits under study, and with little information in literature that can serve as reference or social information, and in this context, guapeva (*Pouteria gardneriana* Radlk) and its technological application stand out.

The aim of this study was to determine the chemical composition, the total phenolic content and the antioxidant capacity of guapeva pulp, peel and seed, important data to suggest the use of the fruit in human food and to establish the chemical value of guapeva fruit.

Fruits were collected in the southeastern region of the state of Goiás (17º29'10"S and 48º12'38"W and 697 meters asl), during the harvest season, in December. About 100 fruits were randomly

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collected from different trees, which were mature and without physical damage. Fruits were stored at an average temperature of 4°C. The experiment was conducted at the laboratory of physicochemical analysis of the Federal University of Goiás, Faculty of Nutrition.

The centesimal composition was determined in triplicate by means of the following analyses: Moisture; Total nitrogen, according to the micro-kjeldahl method; Total lipids, by Soxhlet, and ash (AOAC, 2010). Carbohydrates (c) were estimated by difference, according to the equation: c = 100- (lipid + protein + ash). Based on data of the centesimal composition, the energy value of samples was estimated considering the Atwater conversion factors of 4, 4 and 9 for protein, carbohydrate and lipid, respectively (MERRIL; WATT, 1973).

An ethanolic extract of each fruit part, peel, pulp and seed was elaborated in a refrigerated environment and protected from light to determine total phenolics and antioxidant capacity. Total phenolics were determined according to the Folin-Ciocalteu method (GENOVESE et al., 2008). Gallic acid was used as a spectrophotometric standard (Varian spectrophotometer, model Cary 50 scan) and the total phenolic content was expressed as gallic acid equivalent (GAE / 100G fresh sample) at 750 nm. The antioxidant capacity was determined by capture of the free radical 2,2-diphenyl-1-picryl-hydrazyl (DPPH) (BRAND-WILLIAMS et al., 1995) using the DPPH stable radical. Reading was performed in a UV spectrophotometer (Varian, model Cary 50 scan) at 515 nm.

After being submitted to Cochran (Homoscedasticity) and Lilliefors tests (data normality), data were analyzed by analysis of variance, and the means were compared by the Tukey test at 5% probability.

Regarding fruit composition, it was observed that guapeva pulp had moisture content higher than that of its peel and seed, as expected for fleshy type fruits (Table 1). The moisture content of guapeva pulp was similar to that of other native fruits such as curriola (70.68 $g.100g^{-1}$), gabiroba (77.02 $g.100g^{-1}$) and murici (70.90 $g.100g^{-1}$) (MORZELLE et al., 2015). The water content has importance in the microbiological and enzymatic stability of fruits, as well as in the technological performance of the product and its storage stability. The high wager content of guapeva is also a sensory advantage, as juicy fruits, in general, have good acceptability.

As the moisture content, the ash content in food is considered a quality parameter because it shows the contribution of minerals that the food can offer. Guapeva peel presented higher ash content in relation to its pulp and seed (Table 1). The ash content is higher than that found for edible peels of plum (0.51$g.100g^{-1}$), guava (1.07$g.100g^{-1}$), apple (0.3$g.100g^{-1}$) and pear (0.33$g.100g^{-1}$) (STEFANELLO, ROSA, 2012).

Guapeva seed has protein and lipid content higher than that found for its pulp and bark (Table 1), corroborating what has already been described in literature regarding the considerable amounts of lipids and proteins for seeds and nuts that, as a result, are good energy sources (NOGUEIRA et al., 2014).

The estimated total carbohydrate content (Table 1) was higher in guapeva seed and was similar to that of raw pequi seed (35 $mg.100g^{-1}$) and higher than that of raw baru nut (DANIANI et al., 2013; SIQUEIRA et. al., 2015). Carbohydrates are considered the main food source responsible for the production of energy in the human body and, in general, are more concentrated in fleshy pulps than in seeds, largely represented by sugars and starch.

Guapeva seed and bark, fruit parts normally neglected during fresh consumption or in the formulation of processed products, showed the highest total phenolic compounds (Table 1). Guapeva pulp; however, has higher total phenolic content than that of caraguatá (27.36 $mg.100g^{-1}$), araçá (33.43 $mg.100g^{-1}$), pateiro (10.93 $mg.100g^{-1}$) and saputá pulps (48.10 $mg.100g^{-1}$), being expressed as mg of gallic acid (SILVA et al., 2010). Guapeva peel and seed presented higher values of total phenolics when compared to the peel and seed of cerrado fruits caraguatá, araçá, pateiro and saputá. The high phenolic content in foods is usually related to good antioxidant activity.

The antioxidant capacity of guapeva peel was higher than that of pulp and seed (Table 1). However, guapeva pulp showed higher antioxidant capacity than that reported for gabiroba pulp (77.3 μmol / Tolox eq) (ALVES, 2013). Antioxidants present in food play a key role in human health against free radicals produced by the body. When there is an imbalance between the production of free radicals and the mechanisms of antioxidant defense, there is the so-called "oxidative stress", which can cause damage to health, such as cardiovascular diseases, degenerative diseases, tumors, premature aging, among others.

It is worth mentioning that inedible portions of fruits and vegetables, such as peels and seeds, are traditionally discarded, generating large amounts of organic waste and these "wastes" could be important sources of nutrients and bioactive compounds as found in this study for guapeva.

In view of the proposed objective and the content exposed throughout the study, the consumption of guapeva and the insertion of guapeva peel and seed in the preparation of food for human consumption are recommended. Foods made with these fruit parts can contribute to the daily intake of antioxidants and protect the body against oxidative damage and with increased nutrient density in healthy diets. The dissemination of guapeva can also contribute to the conservation of the cerrado biome.

TABLE 1 - Mean and standard deviation of the values of macronutrients, total energetic value (TEV), total phenolics and antioxidant capacity of guapeva pulp, peel and seed in fresh weight (FW).

Macronutrient ($g.100g^{-1}$)	Guapeva			
	Pulp	Peel	Seed	Average composition
Moisture	78.32 ± 3.07^{a}	73.34 ± 0.30^{b}	43.64 ± 0.31^{c}	65.10
Ash	0.47 ± 0.08^{c}	1.46 ± 0.09^{a}	1.09 ± 0.21^{b}	1.01
Protein	1.88 ± 0.39^{c}	2.99 ± 0.22^{b}	6.23 ± 0.26^{a}	3.70
Lipids	7.1 ± 0.69^{b}	5.63 ± 0.43^{c}	17.41 ± 0.02^{a}	10.05
Carbohydrates [1]	12.23^{c}	16.58^{b}	31.36^{a}	20.06
TEV (Kcal) [2]	120.34	128.95	308.13	185.81
Total Phenolics (GAE/100g)	79.00 ± 8.5^{c}	474.10 ± 15.45^{a}	106.99 ± 5.44^{b}	220.00
Antioxidant capacity (µmol /Trolox eq)	399.31 ± 50.19^{b}	452.61 ± 12.76^{a}	136.26 ± 8.52^{c}	329.39

[1] Carbohydrates estimated by difference.
[2] TEV - total energy value, estimated by means of conversion factor of 4, 4 and 9 for proteins, carbohydrates and lipids, respectively (MERRIL AND WATT, 1973).
[a, b, c] Means followed by the same letter in the row do not differ statistically by the Tukey test at 5% probability.

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