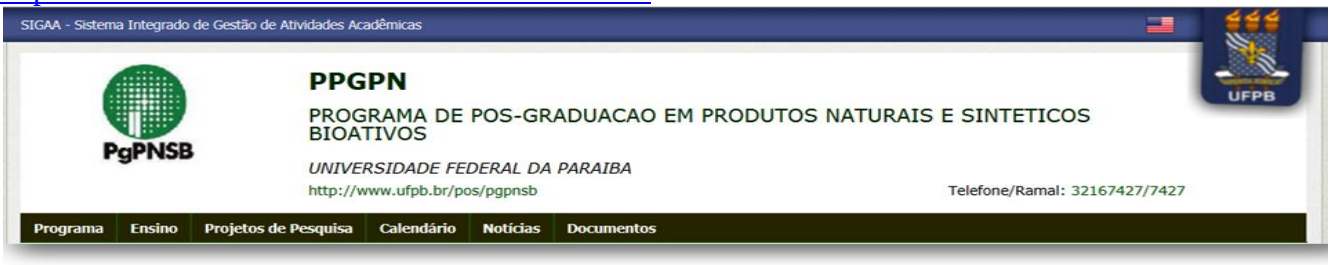

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Phytochemical study of *Psidium araçá* Raddi

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Abstract: Species of the Myrtaceae family are widely distributed in the southern hemisphere and include species of high economic value, such as "eucalipto" (*Eucalyptus* spp.), "goiaba" (*Psidium guajava*), and others still less exploited, such as *Psidium araça* Raddi (araçá), species studied in the present work. Previous nutritional evaluations have shown that the araçá fruits, appreciated as food, have low caloric value, high humidity and high levels of calcium and fibers. Its leaves are traditionally used in antidiarrheal preparations, as diuretic, against indigestion and in slurries, due to the high content of tannins. Despite the medicinal and food use, there are only preliminary phytochemical studies with the species. The present work aimed to isolate and identify secondary metabolites of *P. araça* species. For this purpose, the aerial parts of *P. araça* were collected in Areia city – PB, identified by Prof. Leonardo P. Félix. The material was dried, ground and macerated with hexane, ethyl acetate and methanol, followed by evaporation of each solvent in a rotary evaporator to obtain the hexane, ethyl acetate and methanol extracts. The methanol extract was chromatographed successive times in Sephadex column using methanol as mobile phase. The obtained fractions were analyzed in thin layer chromatography to combine fractions or to evaluate their purity. From this procedure two fractions were purified and submitted to NMR analysis using deuterated DMSO and acetone. The obtained compounds were identified as the flavonoids quercetin and kaempferol, reported for the first time in the studied specie.

Keywords: *Psidium araça*; Myrtaceae; quercetin; kaempferol.

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1. Introduction

Plants have been used historically for diverse purposes, mainly due to the presence of secondary metabolites in their composition[1]. These metabolites are usually bioactive and can be useful as medicines, fragrances, pesticides, agrochemicals, among others. Thus, the chemical research has become very interested in isolating and identifying compounds from plant secondary metabolism.

The Myrtaceae family is widely distributed in the southern hemisphere and integrates 4,630 species and 144 genera, with 1,034 species and 23 genera in Brazil[3]. From Myrtaceae family there are reports of species that have economic value, such as 'eucalipto' (*Eucalyptus* spp.), used because of its wood and to produce flavorings; the 'goiabeira' (*Psidium guajava*), produces appreciated fruits, with high levels of C vitamin and antioxidant compounds [4]. There are also other types of native Brazilian Myrtaceae that provide edible fruits, however they are not well economically explored, such as 'pitangueira' (*Eugenia uniflora* L.), 'jabuticabeira' (*Plinia* spp.) and 'araçazeiro' (*Psidium araça* Raddi) [5].

Psidium araça (Syn. *Psidium guineense*) is popularly known as 'araçá', 'araçazeiro', 'araçá-comum' and 'araçá-mirim'. It is a shrub well distributed in Brazil, mostly in Zona da Mata Northeastern region of and it blooms almost all year. Its fruits are yellowish, juicy, and are very appreciated to prepare juices and jellies. Studies have shown that its fruits have low caloric value, high humidity and interesting levels of calcium and high fibers [6]. Its leaves are traditionally used to treat digestive problems, diarrhea and as diuretic. The barks are used in tanneries because of the high content of tannins[7], however there are few phytochemical studies on this specie reporting of preliminary phytochemical screenings, which point out the presence of tannins, flavonoids and anthocyanins in the extracts from *P. araça* [8,9].

Considering the ethnopharmacological and ethnobotanical importance of the species, the present work aims to isolate and identify compunds from secondary metabolism of *P. araça.*

2. Results and Discussion

The compound Pa-1 was purified as yellow powder. Its ^{1}H NMR spectra showed a deshielded proton at δ 12.16 indicating a chelated proton. Two doublets at δ 8.15 and δ 7.01 coupling *ortho* with J = 8.0 Hz, showing with integration value for 2 H, indicated the presence of a *para* substituted aromatic ring. A couple of *meta* coupling doublets at δ 6.54 (1H) and δ 6.27 (1H) pointed up the occurrence of an additional ring in the molecule, compatible with flavonoid. The ^{13}C NMR spectra showed signals for 15 carbons. The *para* substituted B ring of flavonoids was confirmed by two high intensity signals at δ 130.5 and δ 116.4. By analyzing the 2 D it was possible to identify the positions of hydroxyl groups at 3, 5, 7 and 4'. The compound

Pa-1 was identified as kaempferol, a natural occurring flavonoid widely produced by plants[10].

The compound Pa-2 was also purified as yellow powder. It was analyzed by ^{1}H NMR using DMSO. The spectra showed a deshielded proton at δ 12.92 indicating a bonded proton. An ABX substituted aromatic ring could be detected by the signals at δ 7.62 (*dd*, J= 8.5 and 2.2 Hz), δ 7.57 (*d*, J= 2.2 Hz) and δ 6.1 (*d*, J= 8.5 Hz). Two protons coupling *meta* were seen at δ 6.38 (J= 2.1 Hz, 1H) and δ 6.17 (J= 2.0 Hz, 1H). The pattern of substitution of Pa-2 suggested that the compound has the same protons as quercetin, a widely occurring flavonoid. The ^{13}C NMR showed signals for 15 carbons and by analyzing the 2D spectra it was possible to confirm its structure as Quercetin[10].

Quercetin and kaempferol are flavonoids well studied that have showed several biological activities such as antimicrobial, antioxidant, antidiarrheal and anti-inflammatory activities. Thus, the presence of these compounds may justify the medicinal use of *P. araça* leaves.

3. Materials and Methods

The leaves of the species *Psidium araça* were collected in the city of Areia-PB and identified by Prof. Dr. Leonardo P. Félix, of the Centro de Ciências Agrárias (CCA), Universidade Federal da Paraíba (UFPB). A voucher specimen was deposited in the Jayme Coelho de Moraes Herbarium, CCA - UFPB under code 11827. The botanical material was oven dried and grounded. The obtained was submitted to maceration with hexane, ethyl acetate and methanol, separately. The extractive solutions obtained from each extraction were concentrated in a rotary evaporator, obtaining the hexane, ethyl acetate and methanolic extracts.

A sample from methanolic extract (2 g) was chromatographed in Sephadex column using methanol as eluent.

From the procedure, 30 fractions were collected. The obtained fractions were analyzed by analytical thin layer chromatography (TLC) on silica plates (Merk) to be combined and rechromatographed. The TLCs were read under a UV/VIS light (254 and 365 nm).

Fractions 10 to 27 were combined and submitted to Sephadex column using the same methodology. From this procedure the fractions fractions 11 to 23 were combined and rechromatographed to purify the fractions 16-19 (Pa-1) and 28 (Pa-2).

For structural identification the purified compounds were submitted to ^{1}H and ^{13}C Nuclear Magnetic Resonance (NMR - Bruker Avance AV500. See Brochure attached) analysis, using deuterated solvents.

4. Conclusions

The work led to isolation of two flavonoids from leaves of *P. araça*, identified as quercetin and kaempferol, reported for the first time in the studied specie. These flavonoids have been related to antimicrobial and antidiarrheal activity, justifying the popular use of *P. araça*.

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Author Contributions
Authors 1 to 6 contributed the experimental work. Authors 7 and 8 supervised the work.
Conflicts of Interest
The authors declare no conflict of interest.

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