



ISSN: 2525-815X

Journal of Environmental Analysis and Progress

Journal homepage: www.ufrpe.br/jeap

SCIENTIFIC NOTE

<http://dx.doi.org/10.24221/jeap.1.1.2016.988.106-110>



Physical, physicochemical and taxonomic characterization of *Psidium araca* Raddi

Maria do Rosário de Fátima Padilha^a, Neide Kazue Sakugawa Shinohara^b, Emanuella de Paula Rodrigues Ferreira^d, Rejane Magalhães de Mendonça Pimentel^c, Samara Alvachian Cardoso Andrade^e, Fábio Henrique Portella^f, Allan Victor Souza Bernardino^d

^a Profa. Dra. da Universidade Federal Rural de Pernambuco-UFRPE, Departamento de Tecnologia Rural-DTR, Área de Gastronomia e Segurança Alimentar, Rua Dom Manoel de Medeiros, s/n, Dois Irmãos. CEP: 52171-900, Recife-PE, Brasil. E-mail: padilhamrf@gmail.com; shinoharanks@yahoo.com.

^b Profa. Dra. da UFRPE, DTR, Área Tecnologia de Alimentos.

^c Profa. Dra. da UFRPE, Departamento de Biologia, Área de Botânica.

^d Bacharelandos do Curso de Gastronomia da UFRPE-DTR.

^e Profa. Dra. da Universidade Federal de Pernambuco, Avenida Professor Moraes Rego, 1235, Cidade Universitária, CEP: 50670-901, Recife-PE, Brasil.

^f Prof. MSc. da Faculdade Joaquim Nabuco, Avenida Guararapes, 233, Santana. CEP: 50010-460, Recife-PE, Brasil.

ARTICLE INFO

Received 29 Sep 2016

Accepted 30 Sep 2016

Published 13 Oct 2016

ABSTRACT

New research has stimulated a substantial reevaluation of species related regards to the use of fruits from native plants. Araçá (a small Brazilian guava-like fruit) is found scattered in the wild in Pernambuco/Brazil. There is a scarcity of detailed studies on such regional fruit trees, especially the *Psidium araca* Raddi species, whereas there is an enormous possibility to explore the potential offered by these fruits, such as in the field of gastronomy, where the search for new ingredients and exotic flavors associated with functional properties has been increasing. This article aimed to evaluate the physical, physicochemical and taxonomic characterization of araçá obtained from different agricultural regions of Pernambuco to investigate the possibility of developing new products from this native fruit. The taxonomic identification confirmed that all collected material belonged to the species *P. araca* Raddi. An average weight of 7.45 g/fruit was observed. On pH, values between 3.17 and 3.48 were found, and the acidity as a percentage of citric acid was on order of 0.96% to 0.99%. It was shown that the *P. araca* Raddi fruit has a desirable quality for the food industry, presenting excellent conditions for the development of formulations of high commercial value and promising application in the national gastronomy.

Keywords: *Psidium araca* Raddi, taxonomy of native fruits, natural ecosystems, gastronomy.

Introduction

Large concerns over climate change have caused many people to adopt green habits. The degradation of flora, which is important in the maintenance of fauna, has become a threat to the survival of man, thus encouraging human measures that promote the preservation of natural ecosystems. Many exotic fruits that are used regionally, including for medicinal purposes, are also part of the diet of the population but have not

been well studied. Studies have provoked a substantial reevaluation of these species to gather information on the use of fruits from native plants (Kinupp, 2014).

Psidium araca Raddi, a synonym of *P. guineense* Sw. (Morton, 1987), also known as araçá-azedo or araçá-do-campo in Portuguese, is a spontaneously occurring shrub native to South American and belonging to the Myrtaceae family. Individuals of this species reach heights varying

from seventy centimeters to ten meters, have a sparse canopy, and bear fruits possessing a smooth flakey peel that are harvested between February and April (Donadio, 2002). However, the production of these fruits may occur during the entire year (Gonzaga Neto & Bezerra, 2000). It grows in clayey, sandy soils and shows the proper potential for development in poorly drained soils (Silva & Tassara, 1996).

Currently, araçá is systematically cultivated in small areas of the Brazilian state of Rio Grande do Sul. Interest in the species has expanded due to the discovery of its high nutritional value, with a presence of vitamin C that is three to seven times greater than that found in other citrus fruits (Manica, 2000). Pioneering research with this fruit has resulted in the selection and use of genetic material with important productive characteristics (Voltolini et al., 1996). The hybrid cultivars of the araçá plant available from Embrapa Clima Temperado include the “Yacy” with a yellow peel and “Irapuã” with a red peel. These cultivars are planted in commercial orchards, but only on a small scale (Franzon, 2004).

Despite the significant dispersion of araçá in areas with tropical climates (Franzon, 2004), the araçá has undergone little economic exploration (Clement, Muller & Flores, 1982; Bezerra et al., 1990). However, it has enormous potential due to the possibility of either commercializing the fruit *in natura* or promoting industrialization due to the ease of development of the species in poor soils; at two years of age, large fruits that are rich in pulp and aroma can begin undergoing production, which is ideal for the grower (Cavalcante, 1976).

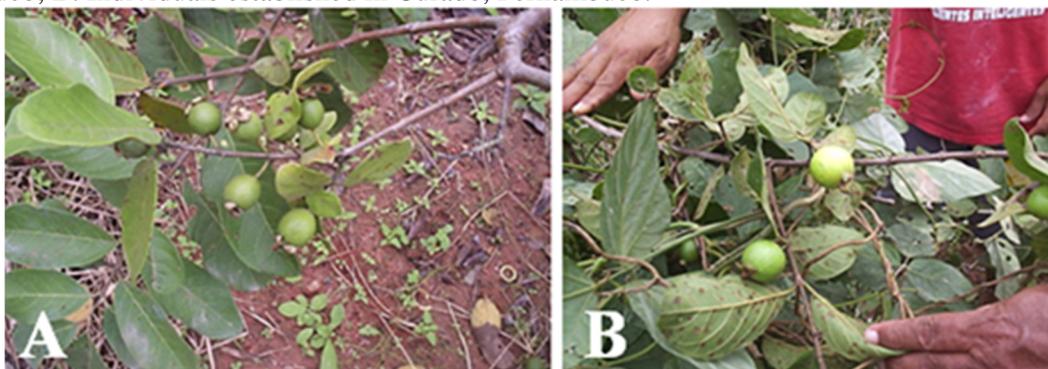
In the Brazilian state of Pernambuco, types of fruit, such as *P. araca* Raddi, are encountered dispersed in the wild. However, in 1989, the Empresa Pernambucana de Pesquisa Agropecuária (Agricultural Research Company of Pernambuco-IPA (1987)) began a project of genetic prospection and germplasm collection from native and exotic fruit species, including the araçá plant, by means of seminiferous dissemination (sexual propagation), to analyze and characterize the superior specimens to establish commercial cultivars and preserve those threatened by extinction (Bezerra et al., 1990; Reis Silva et al., 2008).

Studies are needed due to the scarcity of in-depth information regarding regional fruit species, especially *P. araca* Raddi, and the significant potential contributions offered by these fruits to gastronomy, where the search for new ingredients and exotic flavors is constantly growing. The objective of this study was the physical, physicochemical and taxonomic characterization of the araçá encountered in the metropolitan region of Recife, Brazil, intended to stimulate the investigation of the possibly economically viable products based on this native fruit.

Material and Methods

The fruits of araçá (Figure 1) were harvested during the period from August to September of 2014 at three different locations in the state of Pernambuco: a) in the fruit plantation near the Terminal Integrado de Passageiro (TIP) in Recife, Curado district; b) in the municipality of Vitória de Santo Antão; and c) on the beach of Catuama, in the municipality of Goiana, 72 km from Recife (capital of Pernambuco State).

Figure 1. A-B. Vines of *Psidium araca* Raddi: A. Individuals established in Vitoria de Santo Antão, Pernambuco; B. Individuals established in Curado, Pernambuco.



From each of the three locations, three samples of whole, ripe fruits presenting no physical damage were randomly collected (average of 0.5 kg per sample). Immediately after harvest, the fruits were transported to the Food Laboratory of the Departamento de Tecnologia Rural (DTR) of the

Universidade Federal Rural de Pernambuco (UFRPE), where they were sorted and cleaned.

For taxonomic identification of the species under study, images were taken with a digital camera (Olympus D-395) for comparison with registered photographs from previous studies of the

species (Eder-Silva, 2006; Caldeira et al., 2004), as well as for comparison with material deposited in the Professor Vasconcelos Sobrinho Herbarium (PEUFR) of the Departamento de Biologia, Área de Botânica of the UFRPE. The confirmation of the species nomenclature and authorship was done by consulting the homepage of Tropicos® of the Missouri Botanical Garden (Tropicos.org, Missouri Botanical Garden. 20 Mar 2010 <http://www.tropicos.org>).

The samples were stored at $-18 \pm 2^\circ\text{C}$ in a vertical freezer until the initial analyses; low storage temperatures delay disorders in the internal structure of the araçá fruit (Araújo et al., 1996).

Physical analyses were made using 40-g portions of the fruits were separated and evaluated individually. Entire fruits were weighed on a semi-analytical digital scale, and the pulp yield was obtained by the ratio between the weight of a whole fruit and that of its pulp. The pulps of the fruits were ground in an industrial blender, forming a

homogeneous sample that was analyzed with three repetitions.

Determinations of the moisture content, acidity and total soluble solids (TSS) were performed according to the methodologies utilized by the Adolf Lutz Institute (2005). The data were evaluated using an analysis of variance (ANOVA) using the Duncan test for comparison at the level of 5% significance. To verify the relationship between the originating locations of araçá and the physicochemical parameters, a Principal Component Analysis (PCA) was performed. The data were evaluated using the Statistica for Windows 6.0.

Results

The araçá species (Table 1) presented a pH varying from 3.17 to 3.48 and elevated acidity with a percentage of citric acid between 0.96% and 0.99%.

Table 1. Physicochemical characterization of fruits *in natura* of *Psidium araca* from different locations in the State of Pernambuco.

Locations	Weight (g)	Moisture (%)	pH	Acidity*(%)	TSS (%)
V	6,30±0,58b	73,98±0,18a	3,32±0,05b	0,98±0,006a	9,57±0,06a
CA	6,95±0,89b	62,52±2,03b	3,48±0,0a	0,96±0,006b	9,77±0,06a
C	9,11±1,21a	73,92±0,0a	3,24±0,12b	0,99±0,006a	10,00±0,0a

TSS: Total soluble solids (%); V: Vitória de Santo Antão; Ca: Catuama (coast); C: Curado; *:As a percentage of citric acid. Averages in the same row followed by the same letter do not differ at the significance level of 5% by the Duncan test.

It can be observed in Table 1 that the moisture content of the araçá from Catuama (Ca) differed significantly ($p < 0.05$) from that of those from Vitória de Santo Antão (V) and Curado (C).

The average weight of the fruits was 7.45 g (Table 1). A yield of 90% was verified after removing the sepals and maintaining the seeds. The latter were maintained with the objective of using the fruit to add value to culinary preparations.

The analysis of the first principal component (PC1) (Figure 2), with a result of 60.07%, showed that it was found that araçá originating from Curado has positive values, characterized by greater moisture content and acidity, while the araçá from Catuama presented negative values, characterized by higher pH values. These results are summarized in Table 1.

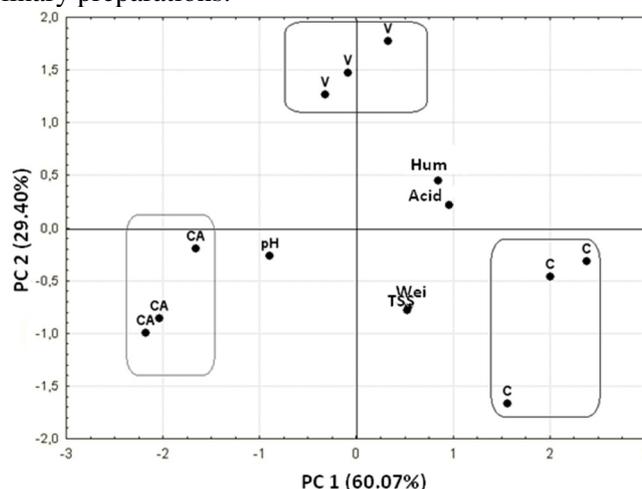


Figure 2. Bi-dimensional Principle Components Analysis of the physicochemical parameters and the originating locations of araçá. V = Vitória de Santo Antão; Ca = Catuama (coast); C = Curado.

The second principal component (PC2), represented by 29.40% of the information, the araçá originating from Curado were found to be heavier and presenting a greater concentration of soluble solids; however, there was no significant difference between this location and the others ($p>0.05$), as shown in Table 1.

Discussion

The comparing of the fresh araçá material collected in the field with specimens from Prof. Vasconcelos Sobrinho Herbarium (PEUFR) and images of the plants in the field with those published in previous articles, the authenticity of the samples was confirmed as belonging to the species *Psidium araca* Raddi. The nomenclature and authorship of the species were confirmed by consulting the TROPICOS® website of the Missouri Botanical Garden.

Its pH values provide a greater intrinsic barrier against biological contamination of the foods, making araçá a desirable fruit for the food industry (Gomes, 2007). In another study by Chisté et al. (2008), when formulating a jelly from araçá-boi, they encountered a citric acid acidity percentage of 0.49% and a pH of 3.40. Thus, the acidity of the fruit is directly related to the species involved, which causes variations in this index even within the same genus, as is the case for *Psidium*. According to Oliveira et al. (2005), the fruit from the araçá plant possesses a flavor similar to that of guava, but it is slightly more acidic and has a more accentuated aroma.

Considering the moisture, Andrade et al. (1993), evaluating araçá-pêra (*Psidium angulatum*), founded a content of 85.85%, obtained contradictory results.

The Total Soluble Solids (TSS) value is used in the food industry to maintain the quality control of the final product by controlling the process and ingredients, such as in sweets, juices, and nectar. It is also an index of the ripeness of some fruits and indicates the quantity of substances dissolved in the juice, most of which are sugars (Gomes et al., 2002). The principal sugars in fruits are glucose and fructose, which vary in proportion according to the species. According to these authors, fruits with seeds contain 8% to 15% of TSS. This information corroborates the values found in this investigation, which varied from 9.5% to 10% (Table 1).

Conclusion

The characteristics of the fruit under study give excellent support to the development of formulations using its pulp, which may be considered of commercial value with good

potential for utilization in the gastronomy field. Especially because they are native fruits that need to be valorized to not disappear from the local culture.

References

- ANDERSEN, O.; ANDERSEN, V. U. 1988. As frutas silvestres brasileiras, 1º edição. Rio de Janeiro: GLOBO.
- ANDRADE, J. S.; ARAGÃO, C. G.; FERREIRA, S. A. N. 1993. Caracterização física e química dos frutos de araçá pêra (*Psidium acutangulum* D.C.). Acta Amazônica, v.23, n.2-3, p.213-217.
- ARAÚJO, P. J.; NACHTIGALL, G. R.; HELBIG, V. E. 1996. Ponto de colheita e temperatura de armazenamento refrigerado de frutas de araçá (*Psidium cattleianum*). In: Congresso Brasileiro de Fruticultura, Curitiba, PR. Resumos Londrina: IAPAR, pp.56.
- BEZERRA, J. E. F.; LEDERMAN, I. E.; PEDROSA, A. C.; PEREIRA, R. C. A.; MELO NETO, M. L. 1990. Coleta e preservação de espécies frutíferas tropicais nativas e exóticas em Pernambuco. In: Simpósio Latino-Americano Sobre Recursos Genéticos de Espécies Hortícolas, Campinas, SP. Fundação Cargil, n.1, p.140-147.
- CALDEIRA, S. D.; HIANE, P. A.; RAMOS, M. I. L.; RAMOS FILHO, M. M. 2004. Caracterização físico-química do araçá (*Psidium guineense* Sw.) e do tarumã (*Vitex cymosa* Bert.) do estado de Mato Grosso do Sul. B. CEPPA, v.22, n.1, p.145-154.
- CAVALCANTE, P. B. Mirtácea. In: CAVALCANTE, P. B. 1976. Frutas comestíveis da Amazônia. Belém, INPA, pp.103-110.
- CHISTÉ, R. C.; CARDOSO, R. C. D.; MOREIRA, D. K. T.; MOURA, J. A. A.; BRAGA, F. E. B. Caracterização físico-química, microbiológica e sensorial da geléia elaborada com araçá-boi (*Eugenia stipitata* McVaugh). Rev. Bras. Frutic., v.34, n.4, p.1154-116.
- CLEMENT, C. R.; MULLER, C. H.; FLORES, W. B. C. 1982. Recursos Genéticos de espécies frutíferas nativas da Amazônia Brasileira. Acta Amazônica, v.12, n.4, p.677-695.
- DONADIO, L. C. 2002. Frutas Brasileiras. Novos Talentos: Jaboticabal, 288 p.
- ÉDER-SILVA, E. 2006. Frutíferas nativas do Nordeste: qualidade fisiológica, morfologia e

- citogenética/Erellens Éder Silva. Areia, PB: CCA/UFPB.
- EMBRAPA-CPACT. 1997. Cultivar de Araçá Irapuã. Boletim Informativo. 4 p.
- FRANZON, R. C. 2004. Caracterização de mirtáceas nativas do sul do Brasil. Rio Grande do Sul/RS, 99 p. Dissertação (Mestre em Fruticultura de Clima Temperado), Faculdade de Agronomia Eliseu Maciel, Universidade Federal de Pelotas.
- GOMES, P. M. A., FIGUEIRÊDO, R. M. F., QUEIROZ, A. J. M. 2002. Caracterização e isotermas de adsorção de umidade da polpa de acerola em pó. Revista Brasileira de Produtos Agroindustriais, v.4, n.2, p.157-165.
- GOMES, R. P. 2007. Fruticultura Brasileira. São Paulo: Editora Nobel.
- GONZAGA NETO, L.; BEZERRA, J. E. F. 2000. Novas variedades brasileiras de frutas, Jaboticabal: Sociedade Brasileira de Fruticultura, pp. 26-27.
- INSTITUTO ADOLFO LUTZ. 2005. Normas analíticas do Instituto Adolfo Lutz: métodos químicos e físicos para análises de alimentos. 3. ed. São Paulo: Instituto Adolfo Lutz.
- KINUPP, V. F. 2014. Plantas Alimentícias não convencionais (PANC) no Brasil. Guia de identificação, aspectos nutricionais e receitas ilustradas. São Paulo Instituto Plantarum de estudos da Flora.
- MANICA, I. 2000. Frutas nativas, silvestres e exóticas 1: técnica de produção e mercado. Porto Alegre: Cinco Continentes.
- MARTINS-DA-SILVA, R. C. V. 2002. Identificação de espécimes botânicos. Embrapa Amazônia Ocidental. Belém-PA. 31 p.
- MATIAS, L. Q. 2008. Coleta, herborização e o registro de material botânico. Taxonomia e Morfologia Vegetal. Universidade Federal do Ceará. Departamento de Biologia. Disponível em: http://www.biologia.ufc.br/monitoria/TaxoVeg/arquivos/Coleta%20e%20ident_angiosper.pdf. Acesso em: Outubro de 2008.
- MORTON, J. 1987. Brazilian Guava. In: MORTON, J. F. Fruits of warm climates, Miami, FL, pp.365-367.
- OLIVEIRA, G. R.; ASSIS, L. M.; RODRIGUEZ, A. F.; ZAMBIAZI, R. C. 2005. Elaboração de geléia de araçá e avaliação de sua aceitabilidade. Departamento de Ciência e tecnologia agroindustrial-FAEM/UFPel.
- REIS SILVA, M.; LEMOS LACERDA, D. B. C.; GEBRIM SANTOS, G.; DE OLIVEIRA MARTINS, D. M. 2008. Caracterização química de frutos nativos do cerrado. Ciência Rural, v.38, n.6, p.1790-1794.
- SILVA, J. A.; TASSARA, H. 1996. Frutas no Brasil. São Paulo: Empresa das Artes.
- VOLTOLINI, J. A.; FACHINELLO, J. C. 1996. Influência do sombreamento em plantas matrizes para produção de mudas de araçazeiro (*Psidium cattleianum* Sabine) multiplicadas por estacas no inverno. Congresso Brasileiro de Fruticultura, 14. Curitiba, PR. Londrina: IAPAR. 561 p.