

Collection and Commerce of the *Myracrodruon urundeuva* Allemão Bark in the Semi-Arid Region of Northeastern Brazil

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ABSTRACT

Given the importance of markets and fairs for the commerce of medicinal plants, an ethnobotanical study was undertaken at the Caruaru Fair (Pernambuco, northeastern Brazil). *Myracrodruon urundeuva* Allemão (“aroeira”), a species of great local importance that is threatened by extinction, was specifically analyzed. The objective of this communication was to estimate the monthly marketed bark stock quantity of *M. urundeuva* Allemão (aroeira). In addition, the study attempted to compare these results with the available quantities of this bark in one hectare of savanna vegetation. The Caruaru Fair is located in the 18 de Maio Park in the urban area of the city. It covers an area of 40,000 m² and is used by merchants who sell several types of products, such as supplies, handicrafts, clay and aluminum utensils, shoes, clothes and medicinal plants. To estimate the amount of *M. urundeuva* Allemão bark sold at the Caruaru Fair, the total weight (kg) of this species' bark was calculated from an arboreal caatinga fragment approximately 20 ha in size that belongs to IPA's experimental station in Caruaru. The diameter at breast height and the bark's thickness at breast height were measured (mm); for the latter, four parts of the bark were removed, and the mass was calculated. It was estimated that 1381.25 kg of *M. urundeuva* bark is sold each year at the Caruaru Fair. However, further studies are necessary to evaluate the demand for these plants and the scope and impact of this kind of commerce on the region's native species; only then will it be possible to make suggestions for public policies that effectively address this issue.

Keywords: Aroeira, Caatinga, ethnobotany, urban traditional markets

INTRODUCTION

Myracrodruon urundeuva Allemão is a tree species with extensive geographic distribution and is found in several Brazilian biomes, such as the caatinga and cerrado. In recent years, the declining population of this species has been noted, and one of the principal factors related to this decline is the expansion of the human population and a consequent carelessness in the plant's collection and use (Moraes *et al.* 2005; Freitas *et al.* 2006).

This plant presents a comprehensive medicinal indication, and marketing of the bark is very common in Northeastern Brazil (Almeida and Albuquerque 2002; Monteiro *et al.* 2006; Albuquerque *et al.* 2007a, 2007b). Although most knowledge pertaining to and use of this species is medicinal, its wood is also used for fuel and in the construction of houses. Due to its many uses, this species' *in situ* conservation is considered a high priority (Almeida and Albuquerque 2002; Vieira *et al.* 2002; Monteiro *et al.* 2006; Albuquerque *et al.* 2007a, 2007b; Ramos *et al.* 2008).

This species was selected because its bark is frequently used to treat a wide variety of disorders and to supply the phytotherapeutics industry. Information about the amounts of medicinal plants collected or sold at the Caruaru Fair, which was not available before these studies, may help to identify plants that are highly sought after and that might be collected too aggressively from their natural environment. Such information might also be used to provide support for local or regional species management proposals. The objective of this short communication was to estimate the quan-

tity of *M. urundeuva* Allemão (aroeira) bark that was monthly sold at the Caruaru Fair (an urban local market); these findings were also compared to the available quantity of this bark in one hectare of caatinga trees.

MATERIALS AND METHODS

Study area

The Caruaru Fair, where this study took place, is located in the 18 de Maio Park, Caruaru municipality, Pernambuco, Northeastern Brazil (Prefeitura de Caruaru 2008). A total of 17 medicinal plant vendors were present at the fair, and most had more than one market stall for storing barks, roots, seeds, and other plant parts. Some vendors sold the plants alongside religious products, such as necklaces and figurines. Some medicinal plant producers from the Caruaru region delivered their products, especially herbs, directly to vendors, without the aid of middlemen. The fair is open Monday through Saturday from 8 a.m. to 5 p.m. and in 2007, the Caruaru Fair was named a Brazilian Immaterial Cultural Heritage site by the National Historical and Artistic Heritage Institute (Instituto do Patrimônio Histórico e Artístico Nacional – IPHAN, 2008).

Collection and analysis of data

All of the 17 vendors were invited to participate in the research; however, 5 were not interested in collaborating, and 1 informant claimed that he lacked the time. These visits started around 9 a.m., and the vendors were invited to sign an informed consent form giving permission to participate in the study, following resolution

n° 196 of 10/10/1996 from the Brazilian National Health Council (Albuquerque *et al.* 2008).

The bark of *M. urundeuva* Allemão was weighed monthly using a mechanical scale. The entire stock the vendors had initially (March 2006) was weighed and, then each month they were asked if new material had been acquired. If the answer was yes, the new material was also weighed. This procedure was carried out through March 2007. However, it must be noted that a single vendor (for unformed reasons) did not agree to make the stock available for weighing; thus, a total of 11 stocks were weighed, as each vendor had a single warehouse that was not shared with other merchants.

Additionally, to estimate the amount of *M. urundeuva* Allemão bark sold at the Caruaru Fair, the total weight (kg) of this species' bark was calculated from an arboreal *caatinga* plot approximately 20 ha in size that belonged to IPA (Empresa Pernambucana de Pesquisa Agropecuária) (Monteiro *et al.* 2006; Oliveira *et al.* 2007). Twenty-seven individuals found by Oliveira *et al.* (2007) within a sampled area of 1 ha were used in this present study.

The diameter at breast height and the bark's thickness at breast height were measured (mm); for the latter, four parts of the bark were removed. Height was standardized at two meters for all individuals (Cunningham 2001; Bitahiro *et al.* 2006). An equation taken from Bitahiro *et al.* (2006) was used to calculate the mass: $\log BM = 0.72118 (\log H) + 0.152919 (BW) - 0.11767 (BW \times \log D) + 0.037728 (BW \times \log H) - 2.04586$; where BM – bark mass (kg); D – diameter at breast height (cm); H – height (200 cm) and BW – bark width at breast height (mm).

After estimating the bark's average mass among *M. urundeuva* Allemão individuals, the mean number of individuals per hectare was calculated. Phytosociological data were used from 21 studies carried out in Northeastern Brazil. The information from 20 of these surveys was taken from a revision by Santos *et al.* (2008) and was added to the data of Oliveira *et al.* (2007). Based on this analysis, the following information was obtained: areas of *M. urundeuva* Allemão occurrence, sampled areas (ha), and number of individuals per area sampled. Thus, it was possible to estimate the average number of individuals of *M. urundeuva* Allemão per ha.

RESULTS AND DISCUSSION

A total of 216 kg of “aroeira” bark (*M. urundeuva* Allemão) was weighed between March 2006 and March 2007. It is important to note that six informants agreed to make their stock available only once a year, and four informants showed bags that weighed up to 3 kg, which is unrealistic considering the great commercial demand of this species' bark. A single informant had 81.25 kg in stock during the period analyzed. Therefore, the values reported are most likely underestimates. However, when estimating the average amount of bark sold annually to be 81.25 kg per vendor (the amount of bark of the largest stock), approximately 1381.25 kg of “aroeira” bark is sold in total every year at the Caruaru Fair by the 17 merchants.

It was estimated that a single “aroeira” individual produces an average of 0.755 ± 0.13 kg of bark. The phytosociological results of 21 studies carried out in different forest areas of Northeastern Brazil (Oliveira *et al.* 2007; Santos *et al.* 2008) indicated that an average of 26.86 individuals occur per ha. Thus, 1 ha of *caatinga* would be capable of producing 20.3 kg of bark. If this calculation is extended, 68.04 ha would be necessary to meet the yearly demand for *M. urundeuva* Allemão bark at the Caruaru Fair. It is important to note that this calculated value assumes the entire mass of the bark produced by the plant up to two meters high is harvested, which would result in the death of the plant.

Other authors have also noted that the amount of medicinal plants sold in fairs or markets is extremely hard to quantify due to the illegality of many of the transactions involved and insufficient government intervention (Cunningham and Mbenkum 1993; Botha *et al.* 2004). The numbers described above are the first and only records of the amount of bark from a specific species sold at the Caruaru

Fair. Nevertheless, some of the results presented here are limited; these limitations are addressed below.

CONCLUSIONS AND LIMITATIONS

While some vendor agreed to weigh their stock of bark, these values do not correspond to accurate figures, based upon our experience. The estimates of the quantity of commercialized bark sold at the Caruaru Fair were based upon the stock of only one informant and might not be accurate. Monthly weight measurements of the stock of a large number of informants were not possible.

Another limiting factor of estimating the quantity of bark at the fair is the possibility of confusing new and old supplies and the subsequent possibility of weighing the same material twice. To avoid this sampling error, the informants were questioned each month about the acquisition of new material, which did not occur with monthly regularity, and when they answered affirmatively, the material was weighed.

A final consideration is that estimating the mass of a species' bark (as well as the number of individuals per ha) is problematic, because mass values may vary according to each region's ecological and environmental characteristics.

Future studies are needed to document the volume and impact of this kind of commerce. This study of the amount of *M. urundeuva* Allemão bark sold is the first of its kind. It is important to develop public policies that control this species' commercial activity, such as regulating its sale in fairs and in the phytotherapeutics industry. We also suggest that special attention be given to the activity of middlemen, who are not governed by any kind of public regulations. These results may favor or help this species' sustainable management, because they constitute the first record of the volume of bark sold for “aroeira”. New studies are urgently needed that address the commerce of these endangered species.

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REFERENCES

- Albuquerque UP, Oliveira RF (2007) Is the use-impact on native *Caatinga* species in Brazil reduced by the high richness of medicinal plants? *Journal of Ethnopharmacology* **113**, 156-170
- Albuquerque UP, Monteiro JM, Ramos MA, Amorim ELC (2007a) Medicinal and magic plants from a public market in Northeastern Brazil. *Journal of Ethnopharmacology* **110**, 76-91
- Albuquerque UP, Medeiros PM, Almeida ALS, Monteiro JM, Lins EMF, Melo JG, Santos JP (2007b) Medicinal plants of the caatinga (semi-arid) vegetation of NE Brazil: A quantitative approach. *Journal of Ethnopharmacology* **114**, 325-354
- Albuquerque UP, Lucena RFP, Alencar NL (2008) Métodos e técnicas para coleta de dados etnobotânicos. In: Albuquerque UP, Lucena RFP, Cunha LVFC (Ed) *Métodos e Técnicas na Pesquisa Etnobotânica* (2nd Edn), Recife. Comunigraf Editora/NUPEEA, pp 41-72
- Alcoforado-Filho FG, Sampaio EVSB, Rodal MJN (2003) Florística e fitosociologia de um remanescente de vegetação caducifolia espinhosa arbórea em Caruaru, Pernambuco. *Acta Botanica Brasilica* **17**, 287-303
- Almeida CFCBR, Albuquerque UP (2002) Uso e conservação de plantas e animais medicinais no Estado de Pernambuco (Nordeste do Brasil): Um estudo de caso. *Interciencia* **27**, 276-285
- Bitariho R, Mcneillage A, Babaasa D, Barigiyira R (2006) Plant harvest impacts and sustainability in Bwindi Impenetrable National Park, S.W. Uganda. *African Journal of Ecology* **44**, 14-21
- Botha J, Witkowski ETF, Shackleton CMA (2004) Market profiles and trade in medicinal plants in the Lowveld, South Africa. *Environmental Conservation* **31**, 38-46
- Cunningham AB (2001) *Etnobotânica Aplicada. Pueblos, Uso de Plantas Silvestres y Conservación*, Pueblos y Plantas 4, Nordan Comunidad, 311 pp
- Cunningham AB, Mbenkum FT (1993) Sustainability of Harvesting *Prunus africana* Bark in Cameroon: A Medicinal Plant in International Trade, People and Plants Working Paper 2, UNESCO, Paris
- Freitas MLM, Aukar APA, Sebbenn AM, Moraes MLT, Lemos EGM (2006)

- Varição genética em progênies de *Myracrodruon urundeuva* f.f. & m.f. Allemão em três sistemas de cultivo. *Revista Arvore* **30**, 319-329
- Instituto do Patrimônio Histórico e Artístico Nacional (IPHAN/2008)** Available online:
<http://portal.iphan.gov.br/portal/montarPaginaInicial.do?jsessionid=EFB932F71F5C250A25356CB21B9CD721>
- Monteiro JM, Albuquerque UP, Lins Neto EMF, Araújo EL, Amorim ELC** (2006) Use patterns and knowledge of medicinal species among two rural communities in Brazil's semi-arid northeastern region. *Journal of Ethnopharmacology* **105**, 173-186
- Moraes MLT, Kageyama PY, Sebbenn AM** (2005) Diversidade e estrutura genética espacial em duas populações de *Myracrodruon urundeuva* fr. All. sob diferentes condições antrópicas. *Revista Arvore* **29**, 281-289
- Oliveira RLC, Neto EMFL, Araújo EL, Albuquerque UP** (2007) Conservation priorities and population structure of woody medicinal plants in an area of caatinga vegetation (Pernambuco State, NE Brazil). *Environmental Monitoring Assessment* **132**, 189-206
- Prefeitura Municipal de Caruaru** (2008) Available online:
<http://www.caruaru.pe.gov.br/>
- Ramos MA, Medeiros PM, Almeida ALS, Feliciano ALP, Albuquerque UP** (2008) Use and knowledge of fuelwood in a area of Caatinga vegetation in NE Brasil. *Biomass and Bioenergy* **32**, 510-517
- Santos JP, Araújo EL, Albuquerque UP** (2008) Richness and distribution of useful woody plants in the semi-arid region of northeastern Brazil. *Journal of Arid Environments* **72**, 652-663
- Vieira RF, Silva SR, Alves RBN, Silva DB, Wetzel MMVS, Dias TAB, Udry MC, Martins RC** (2002) *Estratégias para Conservação e Manejo de Recursos Genéticos de Plantas Medicinais e Aromáticas: Resultados da 1ª Reunião Técnica*. Embrapa/lbama/CNPq, 184 pp