Heringeriana
Jardim Botânico de Brasília
https://revistas.jardimbotanicodf.org/index.php/heringeriana
ISSN 2359-165X

Original article

Knowledge of species *Psidium* L. (Myrtaceae) in Cerrado communities of Central Brazil with a history of migration

Letícia Zenóbia de Oliveira Campos[1], Jair Eustáquio Quintino de Faria Júnior[1], Ulysses Paulino Albuquerque[2], Carolyn Elinore Barnes Proença[1]

[1] *Universidade de Brasília, Campus Darcy Ribeiro, Instituto de Ciências Biológicas, Departamento de Botânica, Brasília-DF, Brazil*
[2] *Universidade Federal de Pernambuco, Laboratório de Ecologia e Evolução de Sistemas Socioecológicos, Recife-PE, Brazil*

*Corresponding author: leticia.zenobia@hotmail.com

Received 30 October 2024 | **Accepted** 4 August 2025 | **Published** 29 October 2025

Citação: Campos, L.Z.O., Faria, J.E.Q., Albuquerque, U.P. & Proença, C.E.B. (2025) "Knowledge of species *Psidium* L. (Myrtaceae) in Cerrado communities of Central Brazil with a history of migration" Heringeriana Special Issue Myrtaceae (2025): e918057. 10.70782/heringeriana.v19ib.918057

Abstract: In this work, we sought to investigate the Cerrado biome with emphasis on knowledge of natural resources. The objective was to evaluate the influence of migration on knowledge about species of the genus *Psidium* by polling informants who lived in different Cerrado regions and later migrated to Brasília, as well as to compare the knowledge of migrants with that of non-migrants from the Quilombola do Comunidade do Cedro, located in Mineiros, Goiás. In total, eight *Psidium* species were recognized by migrant informants and four species were recognized by the non-migrants. Gender, education and age did not influence the migrant informants' knowledge ($p>0.05$). Non-migrants recognized the complete total resource of *Psidium* present at the Comunidade do Cedro, while the migrants recognized many species, but did not mention species present in communities in which they live. The availability of *Psidium* to the non-migrant community influenced the knowledge of this genus. From these results it can be suggested that, during the migration process, people incorporated knowledge of known species of the genus *Psidium* into their repertoire.

Keywords: urban ethnobotany, traditional community, ethnobotany, food potential, fruits, Myrtaceae.

Resumo: (Conhecimento de espécies de *Psidium* L. (Myrtaceae) em comunidades do Cerrado do Brasil Central com histórico de migração.) Neste trabalho, buscou-se investigar o bioma Cerrado com ênfase no conhecimento sobre recursos naturais. O objetivo foi avaliar a influência da migração no conhecimento sobre espécies do gênero *Psidium* por meio da entrevista de informantes que viveram em diferentes regiões do Cerrado e posteriormente migraram para Brasília, bem como comparar o conhecimento dos migrantes com o dos não migrantes da Comunidade Quilombola do Cedro, localizada em Mineiros, Goiás. No total, oito espécies de *Psidium* foram reconhecidas pelos informantes migrantes e quatro espécies foram reconhecidas pelos não migrantes. Gênero, escolaridade e idade não influenciaram o conhecimento dos informantes migrantes ($p>0,05$). Os não migrantes reconheceram todos os recursos de *Psidium* presentes na Comunidade do Cedro, enquanto os migrantes reconheceram muitas espécies, mas não mencionaram aquelas presentes nas comunidades em que vivem. A disponibilidade de *Psidium* para a comunidade não migrante influenciou o conhecimento sobre esse gênero. A partir desses resultados, pode-se sugerir que, durante o processo de migração, as pessoas incorporaram o conhecimento de espécies conhecidas do gênero *Psidium* ao seu repertório.

Palavras-chave: etnobotânica urbana, comunidade tradicional, etnobotânica, potencial alimentício, frutos, Myrtaceae.

Introduction

To date, ethnobotanical studies have been performed in various cultural contexts, including urban environments as well as in traditional communities (Albuquerque & Holanda Cavalcanti Andrade, 2002; Florentino et al., 2007; Pieroni et al., 2007; Volpato & Godínez, 2004; Volpato, Godínez, & Beyra, 2009). Ceuterick et al. (2007) argue that studies in urban areas are important in observing how the use of or knowledge about resources is affected when this knowledge are transplanted from one culture to another.

This process can be defined as a cumulative

of knowledge regarding the practices and beliefs about the relationship between people and plants, which may develop due to adaptive processes and are passed through generations by oral transmission (Volpato, Godínez, & Beyra, 2009). The evolution of local knowledge can occur when a population adapts to new environments (Lee et al., 2001; Ososki et al., 2007; Voeks & Leony, 2004). This knowledge may differ significantly between individuals and between communities. And these variations are often difficult to study, but they may help demonstrate the dynamics and complexity of knowledge about plants, in addition to providing information about cultural changes (Ososki et al., 2007).

In this sense, the population growth and migration in areas that were not previously occupied increase human pressure on land, reducing the natural resources in the region (Taita, 2003). This may also influence the knowledge about natural resources. People migrate between rural and urban environments, and in this process, there may be an exchange of knowledge between them (Ososki et al., 2007).

Ethnobotanical investigations in the context of migration have increased, especially in the last decade (Pieroni et al., 2005; Pieroni et al., 2007; Volpato & Godínez, 2004; Volpato, Godínez, Beyra, & Barreto, 2009; Albuquerque et al., 2012). Studies using this approach are classified as the primary means by which plants, genetic material, knowledge and practices are spread around the world (Volpato, Godínez, & Beyra, 2009). In Brazil, however, works focusing on migration by studying the knowledge of a genus of plants are scarce or nonexistent.

In the case of Cerrado, studies from an ethnobotanical perspective are still discreet, especially when the objective is to try to understand the effect of the migration process on the knowledge of a certain resource. Despite that, the Cerrado is considered the most diverse savanna in the world (Ribeiro & Walter, 2008) Singh et al. 2008 due to its richness, high degree of endemism and intense human disturbance, this biome has been included among the 25 hotspots for World Conservation (Myers et al., 2000). However, it has suffered great losses of its genetic diversity due to high levels of devastation (Myers et al., 2000). The expansion of agriculture in the Cerrado makes it a vulnerable biome in Brazil (Goedert, 2007), and together with the loss of species, loss of knowledge about these species occurs. For this reason, it is necessary to determine the biodiversity in the Cerrado in order to propose ways to conserve this resource.

In this context, we highlight the Psidium species that are widely distributed within the country (Bezerra et al., 2006). These species can be found in different types of vegetation formations and are important producers of edible fruits. Some species have great importance in Cerrado areas (Campos et al., 2018). The rescue of cultural practices involving plants of the genus *Psidium*, through studies with individuals who migrated from different regions of the country, is necessary to assist in the preservation of knowledge about these species. Especially if we consider the important role that these species can play in being inserted and popularized in a context of food insecurity, as Cerrado food plants are also considered plants of the future (Coradin et al. 2018).

The scenario we selected to study the knowledge of plants of the genus in a migration context was Brasília.With the construction of Brasilia, the capital of Brazil, in the mid-1950s, there was a huge migration to this region (Queiroz, 2006). The capital was built in the central region of Cerrado, which presents an interesting setting for studies of migration processes. Along with the cultural diversity brought by immigrants, there is also a diversity of knowledge that should be cataloged.

Based on these considerations, this work was guided by the following questions: Do migration, gender, age and schooling influence the knowledge about plants of the genus *Psidium*? What factors influence the importance attached to plants and knowledge about them? Does the availability of resources influence the knowledge of *Psidium* species in the three communities studied?

Material and Methods

Selection of study areas

For this paper we studied two groups of migrants, composed of informants from the Viveiro of UnB, Brasília-DF, characterized by people who work at the Viveiro of UnB (migrants 1) and from the Assentamento Sobradinho, Brasilia-DF (migrants 2), and a group of non-migrants constituted of informants from the Comunidade do Cedro, Mineiros-Goiás.

Study areas

In the first decades of Brasilia's existence, there was an exacerbated population growth, with a 14.4% annual growth rate (Queiroz, 2006). Between 1960 and 1970, the Federal District's population almost quadrupled, receiving about 30,000 migrants per

year (Caiado, 2005).

The first community selected for this study was the "Viveiro of Universidade de Brasilia (UnB)" (Figure 1). The Viveiro is located at Brasilia University, and people working in this area have migrated from various regions where the vegetation is also Cerrado (Figure 2). There are 43 individuals in this community. The informants who were interviewed currently reside in different parts of the Federal District. This site was visited eight times to identify people interested in participating in the survey.

The other group studied was the Agrarian Reform Settlement 1, located in an Ecological Reserve known as Chapadão (15°35'30" S, 47º42'30" W) in Sobradinho, Federal District, which together with two fragments of natural areas comprise part of the Embrapa Cerrados Ecological Reserve (CPAC) (Figure 1). This settlement is about 20 km from the central region of Brasilia. This area is connected with the Ecological Station of Águas Emendadas in the east and is located within the Wealth Protected Area (APM) Mestre d'Armas and the Environmental Protection Area of the Central Plateau (Parron et al., 1998). This reserve was established to conserve samples of Cerrado vegetation types and areas susceptible to degradation due to the presence of features such as springs, wetlands and sandy soils.

Visits were performed to the Assentamento Sobradinho to find whether there were significant numbers of people to participate in the research. Noting the large number of people who migrated from areas where the vegetation is Cerrado, we contacted the settlement representative. At the time when the study started in the Assentamento Sobradinho, 50 families were found on the site. The leader of the Assentamento Sobradinho agreed to the research project and urged residents to attend a meeting in January 2009. The research objectives were explained to the residents and people who were willing to contribute gave their contact information so they could be interviewed.

The other community studied was the Quilombo[1] do Cedro (Figure 1). At the end of the last century, the slave Chico Moleque bought his freedom and founded the Comunidade do Cedro. All the residents are relatives of Chico Moleque. The community has a "Community Center of Medicinal Plants" organized and recognized by community residents and the city region as an important area for enhancing the use of medicinal plants. The "Community Center of Medicinal Plants" is directed by coordinators who manage the job of handling native and cultivated medicinal plants in the community. Products handled at the center meet the needs of people in the community and are marketed to the municipal population, in addition to being exposed and sold at various fairs throughout Brazil.

The Quilombola do Comunidade do Cedro (17°34'12.15"S, 52°34'34.59"W) lies 5 km from the urban center of Mineiros city, and the access roads to the city are not paved and there is no public transport to carry passengers.

Ethnobotanical survey

For the ethnobotanical survey, semi-structured interviews were conducted; this form of interview is considered the best option when there is only one opportunity to interview the informant (Albuquerque et al., 2013). Respondents who were born just outside of the Cerrado biome but had emigrated to this biome in infancy were likely to be interviewed (Figure 2). In the Viveiro of UnB migrant community, there were 22 interviews with people who formerly lived in Goiás (17), Maranhão (1), Minas Gerais (3) and Tocantins (1). We interviewed 2 women and 20 men.

In the "Assentamento da Reforma Agrária de Sobradinho" (migrants 2), 37 interviews were conducted. Only one representative from each house was interviewed. Interviewing older informants was prioritized; however, when they were not present for the visit, the people who were present and who had lived in the Cerrado region during part of his/her life were interviewed. Of the 37 interviewees, 19 were women and 18 were men who had previously resided in the following federation units: Distrito Federal (1), Goiás (19), Maranhão (3), Mato Grosso (3), Mato Grosso do Sul (1), Minas Gerais (7) and Tocantins (3). In the Assentamento Sobradinho, the search lasted four months.

A checklist-interview was used in the three studied communities (migrant and non-migrants). In "Comunidade do Cedro", non-migrants, including 26 families with 14 men and 12 women, were interviewed. In the interview, each informant was asked if he knew the species and if he used it effectively. The interview was divided into two parts. The first part consisted of questions that allowed us to delineate the socio-economic profile of the interviewee, such as gender, age and education level. The second part consisted of questions related to informants' knowledge about plants of the genus *Psidium*. In this part of the interview, visual stimuli were used for species recognition. This technique involves the use of herbarium specimens, photographs, drawings or fresh plants (Alexiades, 1996; Medeiros et al., 2008).

[1]Refuge site for Brazilian black slaves who escaped from their masters in the Brazilian colonial period (Brasil 2010).

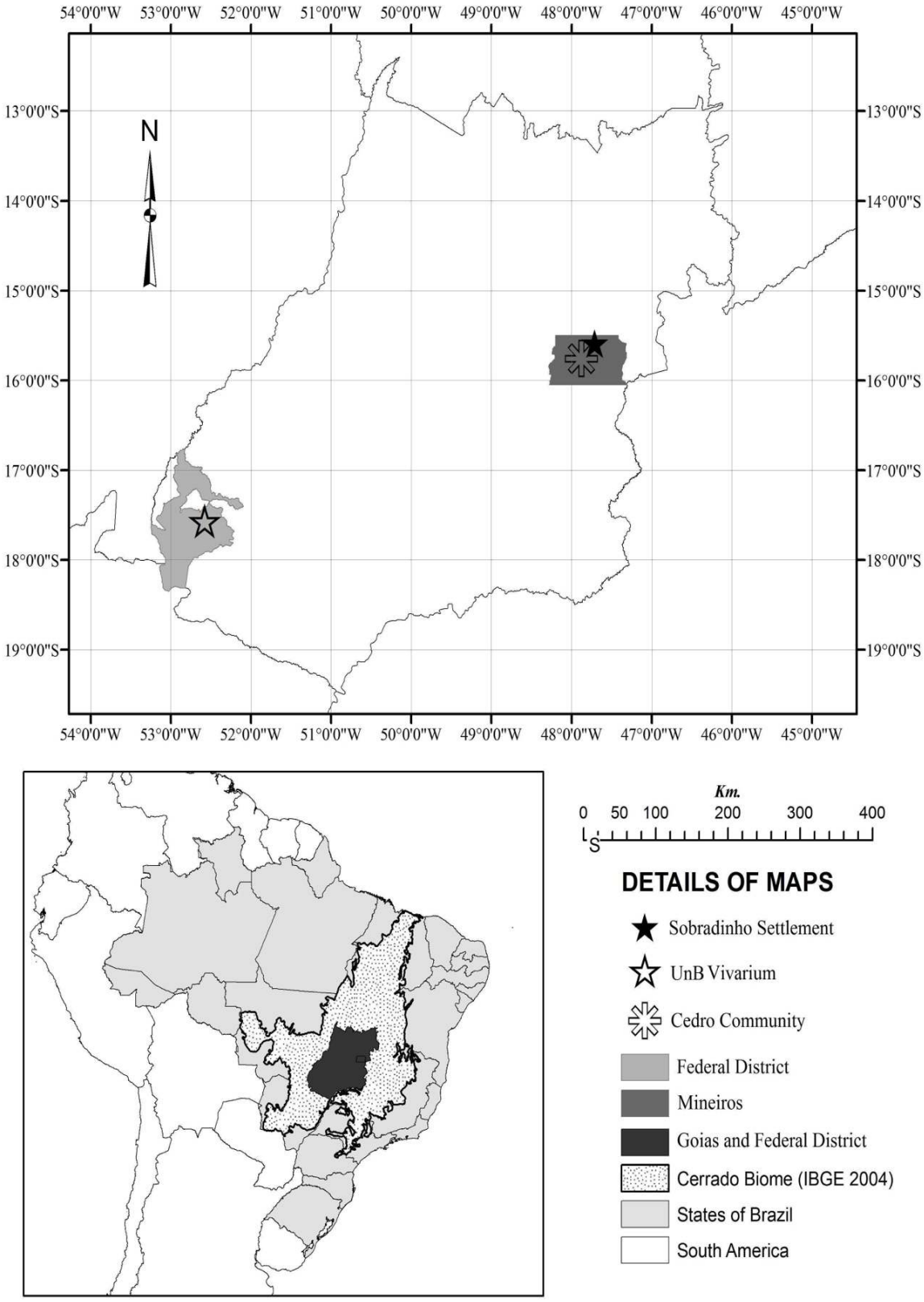

Figure 1. Location of the three study areas selected for study. Viveiro of Universidade de Brasilia (UnB) - Federal District. Assentamento Sobradinho, Federal District and the Comunidade do Cedro, Mineiros - Goiás, Brazil.

Herbarium specimens that were 25 cm long and 19 cm wide were prepared for the most common *Psidium* species in the Cerrado regions. The checklist consisted of 11 species . That are widely distributed and have already. Photos of species, including vegetative and reproductive structures (Figure 3), were printed and assembled into a field folder. Species of the genus *Psidium* found in the vicinity were collected prior to the interviews and taken to communities. When the visual stimulus was presented to the informant, the following questions were asked: Do you know this plant? What is its name? For what purpose can it be used? What is the size of this plant? What is the color of its flowers? What is the fruit's flavor?

Data analyses

For quantitative analysis, the relationships between the level of knowledge about cited plants and factors such as gender, age and educational level were examined. The degree of knowledge mentioned here is related to the number of plants recognized by informants. The educational level was determined by schooling years completed by each informant, ranging from illiterate to college graduates.

Regarding the age of respondents, the age classes used in ethnobotanical studies are twofold: the first consisted of people younger than 40 years of age and the second was comprised of people above age 41 (Figueiredo et al., 1993; Rossato et al., 1999; Hanazaki, 2003; Miranda & Hanazaki, 2008). However, for this study, three distinct age groups were adopted: people from 21 to 40 years old, 41-60 years old and people over 61 years old. We chose to use age classes based on 20-year increments because most of respondents in this study fit into the categories 41-60 years old and over 61 years old.

We applied the Spearman correlation (Sokal & Rohlf, 1995) to test the relationship between the age of the informants and the number of listed species, as well as that between education degree and number of species mentioned by informants from the three areas. The Kruskal-Wallis test was used to detect significant differences between gender, age, educational level, and number of plants mentioned by men and women in the sampled regions (Zar, 1996). When the pattern of variation was gender, analyses were only performed among male respondents of the three communities. The numbers of plants mentioned among women were not compared, as only two women were interviewed in the Viveiro of UnB (migrant 1), making statistical comparisons not recommended. For all analyses we used the software package BioEstat (Ayres et al., 2007).

Results

Richness of species and knowledge

The information presented here is related to the knowledge of *Psidium* and not to the specific use of species. This differentiation was made because a resource being quoted does not always imply effective use. In the three communities studied, eight different species of the genus *Psidium* and a variety of P. *guineense*, to be treated here as P. *guineense*[2], were recognized by informants. The migrant population 1 recognized eight species, while in the migrant population 2 community six species were recognized, and four species were recognized in the non-migrant community.

Concerning the frequency of recognized species, only P. *guajava* was cited by 100% of informants in the three communities studied. On average, non-migrant informants were the ones who cited the most plants of the genus *Psidium* (2.9 ± 0.65), followed by migrant population 1 (2.5 ± 1.1) and migrant population 2 (2.3 ± 0.66) informants. There were no significant differences between migrant population 1 migrants 1 and non-migrants or between migrant population 1 and migrant population 2 ($p > 0.05$). The only significant difference was seen in the results for the quantity of plants mentioned by non-migrants and migrants 2 ($H = 12.4$, $p < 0.05$); non-migrants were the ones who most *Psidium* species individually. The species with the highest numbers of citations were P. *guajava*, P. *firmum* and P. *guineense*[1] (Table 1). Informants from migrant communities were the ones who most cited *Psidium* species (Table 1). The greatest diversity of *Psidium* species mentioned in these communities needs to be analyzed.

Looking at the richness of citations for *Psidium* species in the categories stipulated in this work, the greatest richness of knowledge about *Psidium* is related to its use as food. All species were cited in this category, receiving citations for fresh fruits consumption as well as for making jams, jellies and juices (Table 2). In the medical category, informants from three communities (migrants and non-migrants) mentioned use of *Psidium* species to treat dysentery. Migrants 1 and 2 cited species for healing and stomachaches. Only migrants 1 cited *Psidium* species for treatment of toothache (Figure 4). Although there was little mention of use as firewood in all areas, *Psidium* species received at least one indication (Table 2).

Concerning the categories of knowledge and specific knowledge of a species for a particular purpose, it cannot be said that species cited in larger numbers of categories are those with larger numbers of citations for a specific purpose (Table 2). The species cited most often in the categories of knowledge in the three areas were *P. guajava*, *P. guineense*[1], *P. myrsinites* and P. *firmum*.

P. guajava and *P. guineense*[1] were listed in three categories of knowledge by migrants 1. Among the citations of migrants 2, the only species mentioned in the three categories was *P. myrsinites*. No species was cited in three categories by non-migrants. Regarding the specific purposes of the species, *P. guajava* received the highest number of citations followed by *P. firmum P. guineense*[1] and *P. myrsinites* (Table 2).

Many migrant informants, from both communities 1

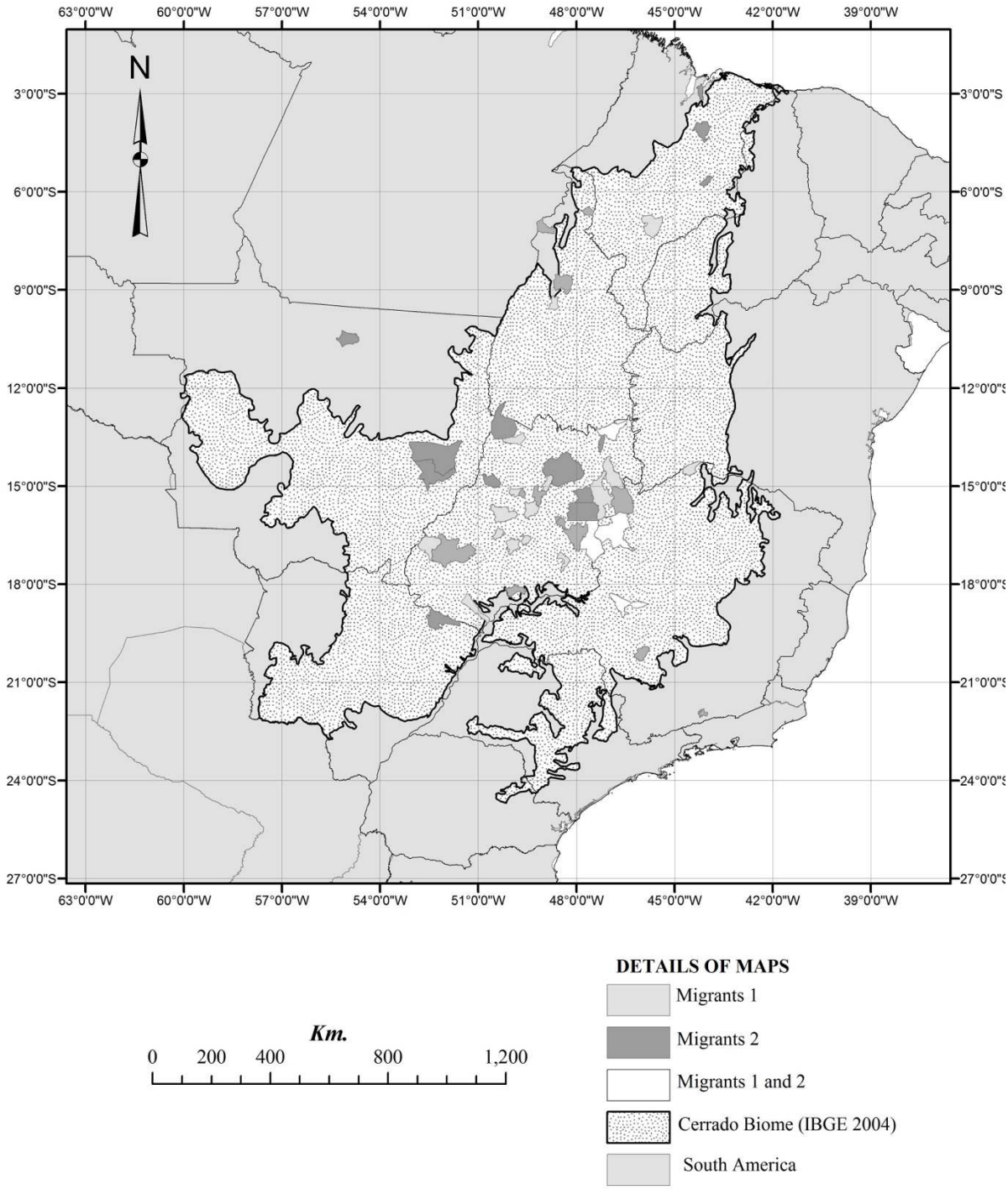

Figure 2. Locations where migrants population 1 (Viveiro of UnB) and migrants population 2 (Assentamento Sobradinho) lived before migrating to the Federal District-DF, Brazil.



Figure 3. Species used in the checklist interview. A. *Psidium australe* Cambess. B. *Psidium firmum* O.Berg. C. *Psidium guineense* Sw. D. *Psidium laroutteanum* Cambess. E. *Psidium myrsinites* DC. F. *Psidium rufum* Mart. ex DC. Photo credits: A, B, E – Stephen A. Harris; C - Maurício Mercadante; D, F – Carolyn E.B. Proença.

Table 1. List of the frequency of citations of the genus Psidium known by migrants (Viveiro of UnB, Assentamento Sobradinho, Brasília - DF) and non-migrants interviewed (the Comunidade do Cedro, GO, Brazil).

Species	Popular name	Viveiro UnB	Assentamento Sobradinho	Comunidade do Cedro
P. australe	araçá-rasteiro; araçá-do-campo	9.09%	10.81%	-
P. firmum	araçazinho; goiabinha-do- cerrado	50%	29.72%	-
P. guajava	goiaba	100%	100%	100%
P. guineense[1]	araçá; araçá-verdadeiro; araçá-maior	50%	43%	100%
P. guineense[2]	araçá-menor	-	-	73.07%
P. laruotteanum	araçá-cascudo ou araçá-grosso	4.54%	-	-
P. luridum	araçá-amarelo	13.63%	8.11%	-
P. myrsinites	araçá-do-campo; araçá-verdadeiro, goiabinha	15.38%	18.18%	15.38%
P. rufum	araçá-amargo	4.54%	-	-

Table 2. The nine Psidium species cited by 85 migrant informants (Viveiro of UnB, Assentamento Sobradinho, Brasília - DF) and by non-migrants (Comunidade do Cedro, Mineiros - GO, Brazil), with the number of categories and the respective number of purposes known in each area.

Species	Categories				Number of Purposes			
	Viveiro	Sobradinho	Cedro	Total	Viveiro	Sobradinho	Cedro	Total
P. australe	1	2	-	3	1	2	-	3
P. firmum	2	2	-	4	4	5	-	9
P. guajava	3	2	2	8	6	6	5	17
P. guineense[1*]	3	2	3	8	3	2	3	8
P. guineense[2*]	-	-	2	2	-	-	2	2
P. laruotteanum[**]	1	-	-	1	1	-	-	1
P. luridum	1	1	-	2	2	1	-	3
P. myrsinites	1	3	1	5	1	3	1	5
P. rufum[**]	1	-	-	1	1	-	-	1

and 2, recognized many *Psidium* species only in the food category. Non-migrant informants, however, cited use of the species for practically the same purpose. One example is knowledge of the use of plants of the genus *Psidium* for medicinal purposes. When citing plants in this category, non-migrant informants only mentioned the species for the treatment of dysentery. The firewood category was the least cited by this group of informants

Availability versus knowledge

In this study, it was observed that the availability of *Psidium* species interfered with non-migrants' knowledge (Table 3). Many species that were not cited by non-migrants were collected only in relatively remote locations in the state of Goiás. *Psidium* species that were found closer to the non-migrants community but were not mentioned include *P. australe* and *P. luridum*, which are both from 28 km away from the community (Table 3). All species that were found in the non-migrants community were recognized. The species most difficult to access in the non-migrants community (*P. myrsinites*) was mentioned by only four respondents. The other three species were recognized by most respondents in this community.

Likewise, we performed a survey of plants of the genus *Psidium* found in the community where migrants 2 reside, specifically in places where informants collect plants (Table 3). In this area, both species that are not found in the region and species no longer found in abun-

[*] *P. guineense*[1] and *P. guineense*[2] are ethnotaxa, possibly chromosomal races (Costa & Forni-Martins, 2006).
[**] Species mentioned by only one informant from the migrant community 1.

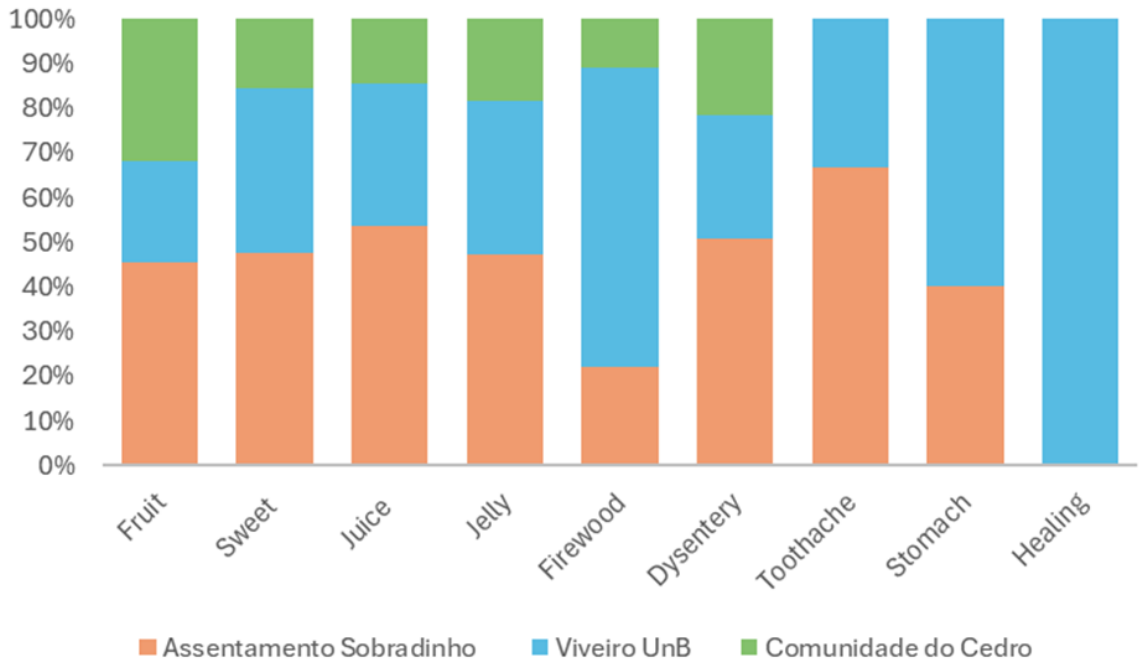

Figure 4. Number of purposes assigned to *Psidium* species in migrant communities (Viveiro of UnB, Assentamento Sobradinho, Brasília, DF) and non-migrants (Comunidade do Cedro, Mineiros, GO, Brazil).

dance were recognized. Many informants from the migrants groups (1 and 2) considered the "araçás" to be "plants they recognized from childhood time"

Psidium species that were recognized but not found in regions where the migrants live originated in regions from which the informants had migrated. Figure 4 shows the distribution of *Psidium* species cited by informants. It is observed that the most cited are those that are widely distributed (*P. guajava* and *P. guineense*) (Sobral et al., 2010), while others, such as *P. firmum*, were widely cited and had distributions that are restricted to some parts of the midwest (Goiás and Federal District), southeast (Minas Gerais and São Paulo) and Bahia (Sobral et al., 2010). *P. luridum* was a seldom-mentioned species in both regions, and it was not found on Assentamento Sobradinho. *Psidium rufum* and *P. laruotteanum* were mentioned by only one informant from the migrant 1 community. *Psidium rufum* may be more commonly found in the southeast and some in areas of the Goiás state and Federal District (Sobral et al., 2010). *Psidium laruotteanum* is well-distributed in the states of the Midwest and also occurs in the Cerrado enclaves in the Southeast and Paraná (Sobral et al., 2010).

Table 3. Distributional and ecological profile of Psidium species that occur in the Federal District and Goiás, and their citations in the study. PMP = nearest population recorded in the database herbarium UB (Herbarium of the Brasilia University).

Species	**Occurrence in Cedro (GO) Non-migrants**	**Viveiro UnB (DF) Migrants 1**	**Assentamento Sobradinho** (DF) **Migrants 2**	**Ecological amplitude (GO e DF)**	**Geographic amplitude (GO e DF)**
	Real	**Real**	**Real**	**N. of samplings & environment**	**N. of cities**
P. australe	- (PMP: 28 Km in GO)	Yes (Campos, L.Z.O. 48. UB)	Yes (Campos, L.Z.O. 52. UB)	34 GO/ 31 DF Campo, Cerrado	16 GO + DF
P. cattleyanum	Not found	Not found	Not found	1 sample from DF	
P. firmum	(PMP:480 Km in GO)	Yes (Campos, L.Z.O. 46 UB)	Yes (Campos, L.Z.O. 50. UB)	22 GO/ 87 DF Cerrado	6 GO + DF
P. guajava	Yes-subspontaneous	Yes (Campos, L.Z.O. 45. UB)		Anthropic areas	Widely Cultivated
P. guineense 1	Yes (Campos, L.Z. O.18 UB)	(PMP: 40 km) Not sampled	Not sampled	18 GO/3 DF Mata seca	12 GO + DF Cultivated sporadically
P. guineense 2	Sim (Campos, L.Z.O.20 UB)			unquantifiable	unquantifiable

Table 4. Number of knowledge citations by male and female migrants (Viveiro of UnB, Assentamento Sobradinho, Brasília - DF) and non-migrants (Comunidade do Cedro, Mineiros - GO, Brazil).

Knowledge	Viveiro UnB		Sobradinho		Cedro	
	Men	Women	Men	Women	Men	Women
Fruits *in natura*	54	2	41	37	36	39
Candies	27	0	18	19	9	12
Juices	27	2	18	19	8	10
Jams	12	2	10	8	5	7
Firewood	5	0	1	1	1	0
Dysentery	17	2	16	17	14	14
Healing	2	0	2	0	0	0
Stomach	3	0	2	0	0	0
Toothache	2	0	0	0	0	0

The influence of gender, age and educational level on knowledge about *Psidium*

For the present study, three different age group were used: Class 1 (21-40 years), Class 2 (41-60 years) and Class 3 (over 61 years). In the migrants 1 community, the average amount of plants recognized by men and women was, respectively 2.6 ± 0.9 and 1.65 ± 0.7 (Table 4); there was no significant differences between these values ($p > 0.05$). The average numbers of plants recognized by informants in each age class were: Class 1, 2.5 ± 1.3; Class 2, 2.5 ± 0.94; Class 3, 2.5 ± 0.7. There were no statistical differences in knowledge of informants in the three age classes ($p>0.05$). The level of education did not affect the number of plants cited by migrants 1 ($p>0.05$). There was a slight correlation between age and number of plants cited by informants ($rs = 0.074$, $p<0.05$). There was no correlation between educational level and number of plants mentioned ($rs = -0.03$, $p > 0.05$).

The average number of plants recognized by men and women in the Assentamento Sobradinho (migrants 2) were: men: 1.95 ± 0.7, women 1.65 ± 0.7; these values had no statistically significant difference ($p > 0.05$). The average numbers of plants cited by each age class were: Class 1, 1.75 ± 0.95; Class 2, 2.2 ± 0.73; Class 3, 2.2 ± 0.78. Age and education level did not influence the informants' knowledge about plants of the genus *Psidium* ($p > 0.05$).

In the non-migrant community, the average number of plants cited by men was 3.08 ± 0.6 and 2.3 ± 0.57 by women, showing no significant difference ($p>0.05$). The level of education did not affect the knowledge of the respondents ($p>0.05$). Analyzing the mean numbers of plants mentioned in the three age classes, the following was found: Class 1, 2.1 ± 0.4; Class 2, 3.14 ± 0.37; Class 3, 3.15 ± 0.55. There were significant differences between classes 1 and 3 ($H = 9.0$, $p<0.05$) and between classes 1 and 2 ($H = 8.35$, $p<0.05$). In both cases presented in which there were significant differences, older informants recognized a greater number of plants of the genus *Psidium*. There were no significant differences among informants of age classes 2 and 3 ($p>0.05$). There was no significant correlation between age and the number of plants cited ($rs = 0.37$, $p>0.05$) or between the educational level and the number of plants mentioned ($rs = -0.22$, $p>0.05$). There were differences in the number of plants of the genus *Psidium* cited among migrants 1 men and migrants 2 and between migrants 1 and non-migrants ($p>0.05$). The significant differences in the number of plants cited were based only on data obtained from migrants 2 and non-migrants ($H = 10.8$, $p<0.05$); non-migrants recognized more species of the genus *Psidium*. Additionally, there were no significant differences among the respondents with different educational levels ($p > 0.05$).

Regarding informants' age, there were significant differences between the numbers of plants cited by migrants 2 and non-migrants from 41-60 years old ($H = 8.82$, $p<0.05$) and over 61 years old ($H = 8.00$, $p<0.05$).

Discussion

Richness and knowledge of *Psidium* species

According to Reyes-Garcia et al. (2005), there is a great difference between knowing and using. Albuquerque (2006) treats knowledge of plants that are not used as "stored knowledge" that is only accessed for use when really needed to make use of a given resource. In this survey on *Psidium* species, participants were asked whether they recognized plants, not whether they used them.

It was observed that informants often recognized, but did not mention that they used, plants of the genus *Psidium*. For example, one migrant reported that: "when we were children, my mother would frequently ask us to fetch firewood, and when we could not find the trees she recom-

mended, we would collect araçás." This shows that informants might have knowledge of the plants, but they might not use them because they do not need a particular kind at that time. The species are often known, but have no priority of use or are replaced by other species present in the regions where they live.

In relation to stimuli used for data collection (checklist interview), it was found that informants often used touch to separate one species from another. This was noted because many informants asked to touch leaves to find whether they could recognize the hairiness of leaves and their morphological variability.

Most informants cited the *Psidium* species as a food. Many also cited the species as medicinal and some as firewood. Similar results were found in a study in southern Brazil for *Acca sellowiana* species, which belong to the Myrtaceae family (Santos et al., 2009). In the medicinal category, *Psidium* species were most often cited for treatment of dysentery. Several studies on medicinal plants have reported the use of *Psidium* species as traditional medicine for the treatment of gastrointestinal system disorders (Guarim Neto & Morais, 2003; Silva & Proença, 2008; Crepaldi & Peixoto, 2010).

The least-mentioned category in this study was the knowledge of species that can be used for firewood. Men were more likely to cite species of the genus *Psidium* in this category, though differences were not significant. Ethnobotanical studies claim that men have greater knowledge of the use of plants in this category, being in closer contact with forest areas than women (Taita, 2003; Sá e Silva et al., 2009).

Availability versus knowledge

The ability to recognize plants can be influenced by an individual's environment and by the availability of resources in the areas studied (Pieroni et al., 2007; Lozada et al., 2006). Vandebroek et al. (2007), working on medicinal plants, found that geographic isolation was positively correlated with the highest number of plants mentioned, while communities close to urban centers knew fewer plants. These results corroborate what was found in this study because the area where non-migrant informants live is more isolated than areas where migrants live. However, in the region where migrant informants were interviewed, more species of the genus *Psidium* were recognized. The number of species recognized by non-migrants was influenced by the availability of resources in the community or by the persistence of learning in childhood and youth. It is important to emphasize that non-migrants recognize all *Psidium* species in the community where they live, unlike migrant 2 informants, who have available resources that are not recognized and others that are recognized but not present in the community.

Migration can positively or negatively affect traditional practices adopted by a particular group of informants (Volpato, Godínez, Beyra, & Barreto, 2009). Migrants come into contact with new environments in which plants that they used previously may no longer be available. The lack of previously-used resources and the presence of new ones influence the maintenance or introduction of new habits in the traditional practices of migrants. Many resources that are not available in the environment are replaced by others that are present in regions where they are currently living (Pieroni et al., 2005; Volpato et al., 2007).

For example, some informants said, "many of the araçás are plants from my childhood and are only found where we lived." Perhaps the informants keep in mind the fact that migration to a different region interferes with the availability of species of a particular vegetation type, despite the fact that in the region to which they have migrated the species present in the regions from which they have emigrated can be found. (Santos et al., 2009), found similar results with respect to food plants. In the communities where they worked, informants said that they ate plants when they were children. Over time they ceased to use them for this purpose, and their descendants were usually not interested in learning and continuing to cultivate those habits.

The most-cited *Psidium* species in this study were those to which access was easiest. If the geographic distribution is observed, several of these species are present in many areas of Cerrado in Brazil. P. *guajava*, the most cited species, is a cultivated species, and subspontaneous P. *guineense* is a widely distributed species, found in all Brazilian biomes and cultivated in many parts of the country for its fruits (Bezerra et al., 2006).

It seems that the migration process influenced the informants' knowledge about species of the genus Psidium. Volpato et al. (2009) analyzed changes and adaptations of practices of a group of people who migrated from Haiti to Cuba. It was observed that the contact with a different cultural context interfered with traditional practices of this group of migrants. This result allows us to infer that many migrants learned about these species when they migrated to the Federal District. The knowledge of these species may have been enlarged after migration. However, knowledge of some species that were cited by informants as not being found in the region where they live now, may be the result of little knowledge and exploration of places to which these individuals have migrated.

The influence of gender, age and educational level on knowledge about plants of the genus *Psidium*

Lozada et al. (2006) argued that the knowledge about plants can be influenced by gender, age and other sociocultural factors that may cause variability in a given environment. However, in this study, gender, age and educational level did not affect migrants' knowledge about *Psidium* species.

Santos et al. (2009), studying *Acca sellowiana* (Myrtaceae), found similar results, suggesting that knowledge is homogeneously distributed among informants. When the pattern of variation is gender, several authors have found the same trends Miller et al. 2006 (Lozada et al., 2006; Lins Neto et al., 2010). However, it is common to

find ethnobotanical studies in which older people have the greatest knowledge of plants; however, one must be cautious not to generalize this statement. Other factors, such as exposure of older people to traditional culture, may be related to greater knowledge (Voeks & Leony, 2004). Thus, young people would still be in the process of exposure to culture and therefore still forming their knowledge about plants.

However, in Comunidade do Cedro (non-migrants), only age influenced informants' knowledge of *Psidium* species. Age, in different cultural contexts, is linked to learning and accumulation of traditional knowledge (Pieroni et al., 2005). Lozada et al. (2006), in work performed in Patagonia, found that respondents' knowledge about food plants increased with age. Analyzing the knowledge of native plants, Pieroni & Quave (2005) observed a rapid decline in informants' knowledge with decreasing age and concluded that younger respondents were more interested in work related to factories than in work related to rural activities.

Most of the youngest non-migrants were involved in activities in the municipality of Mineiros. In a way, they maintain greater contact with modernization. This factor may be interrupting the transfer of knowledge from older individuals in the community where they live. Pieroni (2003) states that the new generation has learned traditional knowledge. It can be said that even though the non-migrant group was relatively "isolated", this does not prevent it from suffering from the impacts of the modern world.

In many ethnobotanical studies, differences in knowledge are found to be linked to gender. Lozada et al. (2006) argued that gender is a factor that often (general statement). However, this study did not find significant differences in knowledge between individual men and women. Similar results were found in other studies (Kristensen & Balslev, 2003; Lozada et al., 2006) Miller et al. 2006. According to Lozada et al. (2006) this may indicate that, throughout their lives, although men and women have played different roles, they had the opportunity to gain personal experience with similar species. Thus, changes in behavior and use of natural resources are influenced by migration (Taita, 2003). Observing the distribution of knowledge between the two groups, knowledge is evenly distributed among non-migrants, while among it migrants it is differently distributed.

The transfer of knowledge can be compromised by various aspects such as cultural realities, urbanization and modernization of resources (Luoga et al., 2000; Begossi et al., 2002; Ososki et al., 2007). The fact that the elderly serve as a reference regarding the knowledge of plants may be related to the deterioration of traditional knowledge, which is mainly influenced by the age of responders (Lozada et al., 2006). Osoki et al. (2007) argued that migration can lead to erosion or to acquisition of knowledge about plants. Making reference to this work with plants of the genus *Psidium*, it can be stated that migration had a positive influence on knowledge. The transmission of knowledge between distinct social groups needs to be valued so that rich local history is not erased with the passing years (Pieroni et al., 2005).

Conclusions

Individual knowledge among non-migrants is greater than the individual knowledge among migrants. Gender, age and educational level did not influence the knowledge of migrants. The only variable that influenced the understanding of non-migrants was age, and the higher the age, the higher the number of plants of the genus *Psidium* cited. Migrant communities do not recognize all of the *Psidium* species diversity in the region in which they currently live. The non-migrant community recognizes all *Psidium* species present at the Quilombola do Comunidade do Cedro. There was no high variation in equitability values, especially among migrants, reinforcing the point that knowledge is not evenly distributed among informants in these areas. However, with respect to general knowledge, migrant communities know the most species. The resource availability in the area of the non-migrant community influenced the knowledge of *Psidium* species. Studies are needed in traditional communities and migrant communities to assess the status of knowledge of species that are present in the Brazilian Cerrado and to improve understanding of how knowledge is distributed across resources in this region so in need of studies.

Acknowledgements

We would like to thank the research participants for their attention and collaboration throughout the study. We also thank CAPES (Coordination for the Improvement of Higher Education Personnel) for granting the postgraduate scholarship to the first author.

References

Albuquerque, U. P. (2006). Re-examining hypotheses concerning the use and knowledge of medicinal plants: a study in the Caatinga vegetation of NE Brazil. *Journal of Ethnobiology and Ethnomedicine*, *2*, 30. https://doi.org/10.1186/1746-4269-2-30

Albuquerque, U. P., Cooper, E. L., Medeiros, M. F. T., Alves, R. R. N., & Ladio, A. H. (2012). Medical Ethnobiology and Ethnopharmacology in Latin America. *Evidence-based Complementary and Alternative Medicine: eCAM*, *2012*, 379160. https://doi.org/10.1155/2012/379160

Albuquerque, U. P., & Holanda Cavalcanti Andrade, L. (2002). Uso de recursos vegetais da Caatinga: o caso do agreste do estado de Pernambuco (Nordeste do Brasil). *Interciência*, *27*(7), 336–346.

Albuquerque, U. P., Ramos, M. A., Lucena, R. F. P., & Alencar, N. L. (2013). Methods and techniques used to collect ethnobiological data. In *Methods and techniques in ethnobiology and ethnoecology* (pp. 15–37). Springer. https://doi.org/10.1007/978-1-4614-8636-7_2

Alexiades, M. N. (1996). Collecting ethnobotanical data: an introduction to basic concepts and techniques. In *Selected guidelines for ethnobotanical research: A field manual* (pp. 53–94, Vol. 10). The New York Botanical Garden.

Ayres, M., Ayres Junior, M., Ayres, D. L., & Santos, A. d. A. d. (2007). *BioEstat: Aplicações estatísticas nas áreas das ciências biomédicas*.

Begossi, A., Hanazaki, N., & Tamashiro, J. Y. (2002). Medicinal plants in the Atlantic Forest (Brazil): Knowledge, use, and conservation. *Human Ecology*, *30*(3), 281–299. https://doi.org/10.1023/A:1016564217719

Bezerra, J. E. F., Lederman, I. E., Silva Júnior, J. F., & Proença, C. E. B. (2006). Araçá. In *Frutas nativas da região centro-oeste do brasil* (pp. 42–62). Embrapa Recursos Genéticos e Biotecnologia.

Caiado, M. C. S. (2005). Estruturação intra-urbana na região do Distrito Federal e entorno: a mobilidade e a segregação socioespacial da população. *Revista Brasileira de Estudos de População*, *22*(1), 55–88.

Campos, L. Z., Nascimento, A. L. B., Albuquerque, U. P., & Araújo, E. L. (2018). Use of local ecological knowledge as phenology indicator in native food species in the semiarid region of Northeast Brazil. *Ecological Indicators*, *95*, 75–84. https://doi.org/10.1016/j.ecolind.2018.07.016

Ceuterick, M., Vandebroek, I., Torry, B., & Pieroni, A. (2007). The use of home remedies| for health care and well-being by spanish-speaking latino immigrants in london. *Traveling Cultures, Plants and Medicines: The Ethnobiology and Ethnopharmacy of Migrations. Berghahn, New York*, 145–165.

Costa, I. R., & Forni-Martins, E. R. (2006). Chromosome studies in Brazilian species of /textitCampomanesia Ruiz & Pávon and /textitPsidium L. (Myrtaceae Juss.) *Caryologia*, *59*(1), 7–13. https://doi.org/10.1080/00087114.2006.10797891

Crepaldi, M. O. S., & Peixoto, A. L. (2010). Use and knowledge of plants by "Quilombolas" as subsidies for conservation efforts in an area of Atlantic Forest in Espírito Santo State, Brazil. *Biodiversity and Conservation*, *19*, 37–60. https://doi.org/10.1007/s10531-009-9700-9

Figueiredo, G. M., Leitão-Filho, H. F., & Begossi, A. (1993). Ethnobotany of Atlantic Forest coastal communities: Diversity of plant uses in Gamboa (Itacuruçá Island, Brazil). *Human Ecology*, *21*(4), 419–430. https://doi.org/10.1007/BF00891142

Florentino, A. T. N., Araújo, E. d. L., & Albuquerque, U. P. d. (2007). Contribuição de quintais agroflorestais na conservação de plantas da Caatinga, Município de Caruaru, PE, Brasil. *Acta Botanica Brasilica*, *21*(1), 37–47. https://doi.org/10.1590/S0102-33062007000100005

Goedert, C. d. O. (2007). Histórico e avanços em recursos genéticos no Brasil. In L. L. Nass (Ed.). Embrapa Recursos Genéticos e Biotecnologia: Brasília, DF.

Guarim Neto, G., & Morais, R. G. d. (2003). Recursos medicinais de espécies do Cerrado de Mato Grosso: Um estudo bibliográfico. *Acta Botanica Brasilica*, *17*(4), 561–584. https://doi.org/10.1590/S0102-33062003000400009

Hanazaki, N. (2003). Comunidades, conservação e manejo: o papel do conhecimento ecológico local. *Biotemas*, *16*(1), 23–47.

Kristensen, M., & Balslev, H. (2003). Perceptions, use and availability of woody plants among the Gourounsi in Burkina Faso. *Biodiversity and Conservation*, *12*(8), 1715–1739. https://doi.org/10.1023/A:1023614816878

Lee, R. A., Balick, M. J., Ling, D. L., Sohl, F., Brosi, B. J., & Raynor, W. (2001). Cultural dynamism and change: An example from the Federated States of Micronesia. *Economic Botany*, *55*(1), 9–13. https://www.jstor.org/stable/4256387

Lins Neto, E. M. d. F., Peroni, N., & de Albuquerque, U. P. (2010). Traditional knowledge and management of umbu (/textitSpondias tuberosa, Anacardiaceae): an endemic species from the semi–arid region of Northeastern Brazil. *Economic Botany*, *64*, 11–21. https://doi.org/10.1007/s12231-009-9106-3

Lozada, M., Ladio, A., & Weigandt, M. (2006). Cultural transmission of ethnobotanical knowledge in a rural community of northwestern Patagonia, Argentina. *Economic Botany*, *60*, 374–385. https://doi.org/10.1663/0013-0001(2006)60[374:CTOEKI]2.0.CO;2

Luoga, E. J., Witkowski, E. T., & Balkwill, K. (2000). Differential utilization and ethnobotany of trees in Kitulanghalo forest reserve and surrounding communal lands, eastern Tanzania. *Economic Botany*, *54*(3), 328–343. https://doi.org/10.1007/BF02864785

Medeiros, P. M., Almeida, A. L. S., Lucena, R. F. P., & Albuquerque, U. P. (2008). The role of visual stimuli in ethnobotanical surveys: An overview. In U. P. Albuquerque & M. A. Ramos (Eds.), *Current Topics in Ethnobotany* (pp. 125–137). Research Signpost.

Miranda, T. M., & Hanazaki, N. (2008). Conhecimento e uso de recursos vegetais de restinga por comunidades das ilhas do Cardoso (SP) e de Santa Catarina (SC), Brasil. *Acta botanica brasílica*, *22*, 203–215. https://doi.org/10.1590/S0102-33062008000100020

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Fonseca, G. A., & Kent, J. (2000). Biodiversity Hotspots for Conservation Priorities. *Nature*,

403(6772), 853–858. https://doi.org/10.1038/35002501

Ososki, A. L., Balick, M. J., & Daly, D. C. (2007). Medicinal plants and cultural variation across Dominican rural, urban, and transnational landscapes. *Traveling Cultures and Plants The Ethnobiology and Ethnopharmacy of Human*, 14–39.

Parron, L. M., Sousa-Silva, J., & Camargo, A. J. A. (1998). *Reservas Ecológicas da Embrapa Cerrados: Caracterização e Zoneamento*. Embrapa Cerrados.

Pieroni, A. (2003). Wild food plants and Arbëresh women in Lucania, Southern Italy (P. Howard, Ed.), 66–82.

Pieroni, A., Houlihan, L., Ansari, N., Hussain, B., & Aslam, S. (2007). Medicinal perceptions of vegetables traditionally consumed by South-Asian migrants living in Bradford, Northern England. *Journal of Ethnopharmacology*, *113*(1), 100–110. https://doi.org/10.1016/j.jep.2007.05.009

Pieroni, A., Muenz, H., Akbulut, M., Başer, K. H. C., & Durmuşkahya, C. (2005). Traditional phytotherapy and trans-cultural pharmacy among Turkish migrants living in Cologne, Germany. *Journal of Ethnopharmacology*, *102*(1), 69–88. https://doi.org/10.1016/j.jep.2005.05.018

Queiroz, E. P. d. (2006). A migração intrametropolitana no Distrito Federal e Entorno: o consequente fluxo pendular e o uso dos equipamentos urbanos de saúde e educação. *XV Encontro Nacional de Estudos Populacionais: Caxambú/MG*.

Reyes-García, V., Vadez, V., Huanca, T., Leonard, W., & Wilkie, D. (2005). Knowledge and Consumption of wild plants: A comparative study in two Tsimane' villages in the Bolivian Amazon. *Ethnobotany Research and Applications*, *3*, 201–208.

Ribeiro, J. F., & Walter, B. M. T. (2008). As principais fitofisionomias do bioma Cerrado. In S. M. Sano, S. P. Almeida, & J. F. Ribeiro (Eds.), *Cerrado: ecologia e flora* (p. 406). Embrapa Cerrados.

Rossato, S. C., LeitãO-Filho, H. F., & Begossi, A. (1999). Ethnobotany of Caiçaras of the Atlantic Forest coast (Brazil). *Economic Botany*, *53*(4), 387–395. https://doi.org/10.1007/BF02866716

Sá e Silva, I., Marangon, L., Hanazaki, N., & Albuquerque, U. (2009). Use and knowledge of fuelwood in three rural caatinga (dryland) communities in NE Brazil. *Environment, Development and Sustainability*, *11*(4), 833–851. https://doi.org/10.1007/s10668-008-9146-3

Santos, K. L., Peroni, N., Guries, R. P., & Nodari, R. O. (2009). Traditional knowledge and management of feijoa (*Acca sellowiana*) in southern Brazil. *Economic Botany*, *63*(2), 204–214. https://doi.org/10.1007/s12231-009-9076-5

Silva, C. S. P. d., & Proença, C. E. B. (2008). Uso e disponibilidade de recursos medicinais no município de Ouro Verde de Goiás, GO, Brasil. *Acta botânica brasílica*, *22*(2), 481–492. https://doi.org/10.1590/S0102-33062008000200016

Sobral, M., Proença, C., Souza, M., Mazine, F., & Lucas, E. (2010). Myrtaceae in Lista de Espécies da Flora do Brasil. Jardim Botânico do Rio de Janeiro.

Sokal, R. R., & Rohlf, F. J. (1995). *Biometry*. Macmillan.

Taita, P. (2003). Use of woody plants by locals in Mare aux Hippopotames Biosphere Reserve in western Burkina Faso. *Biodiversity & Conservation*, *12*(6), 1205–1217. https://doi.org/10.1023/A:1023045316329

Vandebroek, I., & Pieroni, A. (2007). *Traveling cultures and plants: The Ethnobiology and Ethnopharmacy of Human Migrations* (Vol. 7). Berghahn Books.

Voeks, R. A., & Leony, A. (2004). Forgetting the forest: Assessing medicinal plant erosion in eastern Brazil. *Economic Botany*, *58*(1), 294–306. https://doi.org/10.1663/0013-0001(2004)58[S294:FTFAMP]2.0.CO;2

Volpato, G., Emhamed, A. A., Saleh, S. M. L., Broglia, A., & di Lello, S. (2007). Procurement of traditional remedies and transmission of medical knowledge among Sahrawi people displaced in southwestern Algerian refugee camps. In *Traveling Plants and Cultures: The Ethnobiology and Ethnopharmacy of Human Migrations* (pp. 245–269). Oxford: Berghahn.

Volpato, G., & Godínez, D. (2004). Ethnobotany of Pru, a traditional Cuban refreshment. *Economic Botany*, *58*(3), 381–395. https://doi.org/10.1663/0013-0001(2004)058[0381:EOPATC]2.0.CO;2

Volpato, G., Godínez, D., & Beyra, A. (2009). Migration and Ethnobotanical Practices: The case of Tifey among Haitian immigrants in Cuba. *Human Ecology*, *37*(1), 43–53. https://doi.org/10.1007/s10745-008-9211-4

Volpato, G., Godínez, D., Beyra, A., & Barreto, A. (2009). Uses of medicinal plants by Haitian immigrants and their descendants in the Province of Camagüey, Cuba. *Journal of Ethnobiology and Ethnomedicine*, *5*(1), 16. https://doi.org/10.1186/1746-4269-5-16

Zar, J. (1996). *Biostatistical Analysis* (Vol. 3rd). Prentice-Hall, Nova Jersey.

This is an open-access article distributed under the terms of the Creative Commons Attribution License.