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Non-Conventional Food Plants (Plantas Alimentícias Não Convencionais (PANC)) of the Petrópolis–Teresópolis Crossing, Serra dos Órgãos National Park, Rio de Janeiro, Brazil

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Simple Summary: A floristic survey of Non-Conventional Food Plants (Plantas Alimentícias Não Convencionais (PANC)), or wild food plants, in Serra dos Órgãos National Park, Brazil, was conducted for the registering and mapping of wild food plants with food potential. We collected, identified, and registered 90 food and potential food species, with these species belonging to 54 genera and being distributed in 34 families. The diversity of the PANC found demonstrates the potential for future domestication to produce food from native flora; also, the results could be used in educational activities and pedagogical tourism, highlighting the gastronomic dimension of the plant diversity present in protected areas.

Abstract: We conducted a floristic survey of Non-Conventional Food Plants (Plantas Alimentícias Não Convencionais (PANC)) on the trail of Travessia Petrópolis–Teresópolis in Serra dos Órgãos National Park, in the state of Rio de Janeiro, Brazil. Wild food plants with food potential were collected along a sinuous transect of 27 km in length and 3 m in width. The collected material was identified in virtual herbariums by specialists, and later, a literature review on the food use of the identified plants was carried out. Thus, 90 food and potential food species were identified, belonging to 54 genera and distributed in 34 families present along the trail, including the Asteraceae (10), Begoniaceae (9), Passifloraceae (8), Piperaceae (7), and Cactaceae (6) families, which showed the greatest species richness. We conclude that the diversity of the PANC found in a protected area demonstrates enormous potential for future domestication to produce food from the native flora of Brazil. Another potential use is in educational activities and pedagogical tourism, highlighting the gastronomic dimension of plant diversity present in protected areas.

Keywords: Atlantic Forest; nature conservation; agrobiodiversity; protected areas

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1. Introduction

Brazil is the country with the greatest diversity of plants on the planet [1], and the endemism level among seed plants in Brazil is also notable, being the only continental country where the endemic flora exceeds 50% [2]. However, little of this diversity is effectively known or used in our daily diet [3]. The vast majority of the Brazilian population are exposed to pesticides used in the production of commodities, directly and indirectly, via residues in food and water [4]. Most food species are grown in monoculture systems with dependence on chemical inputs, and this form of agriculture causes several environmental problems, such as the destruction of natural habitats and biodiversity losses worldwide [5], as well as social problems [6]. In addition, it also has consequences for the population's

health, with increasingly high obesity rates [7,8] and nutritional deficiencies connected to the intrinsic relationship with the ultra-processed food industry [8,9].

The consumption of Non-Conventional Food Plants (PANC, a Brazilian acronym), or wild food plants, is currently quite popular in Brazil. PANC are plants that have one or more edible parts, whether spontaneous or cultivated or native or exotic, and that are not included in our conventional daily diets [10,11]. The term PANC has been widely used in Brazil because it is euphonic (PANC in Portuguese sounds exactly like "Punk", providing a curious double meaning) and promotes the popularization of using these plants among the Brazilian population.

One of the policies adopted by the Brazilian government in order to value, recognize, and preserve the country's natural resources was to implement and regulate protected areas. Protected areas are important instruments for the in situ conservation of biodiversity throughout the world, meaning that they are fundamental areas for maintaining the integrity of species, populations, and ecosystems, including the traditional systems and means of survival for human populations [12]. However, considering that a protected area is not a closed circuit and that it interacts with surrounding ecosystems, forming part of a macrosystem, the buffer zones around protected areas also play an important role in the preservation of the biodiversity within a park's boundaries [13].

Serra dos Órgãos National Park (PARNASO) was the third national park created in Brazil in 1939, and it is located in the state of Rio de Janeiro. The park's management plan includes the objectives of the buffer zones: "disciplining productive activities, avoiding predatory practices and encouraging the use of sustainable techniques, associating economic development and conservation of natural resources" [14]. Thus, it is evident that in addition to the attention to the delimited protected area, it is also essential to act in the buffer areas through programs and policies which encourage the sustainable use of natural resources and that also respect local traditions and customs. However, it is necessary to first know the extent of the biodiversity existing in the protected area and to plan programs and policies which aim to replicate such biodiversity around the protected area [15,16].

Thus, this study aimed to collect and identify PANC from the Petrópolis–Teresópolis trail within Serra dos Órgãos National Park, recording species with food potential and thus contributing to phytodiversity knowledge and the potential future use of native flora.

2. Materials and Methods

The study was carried out in April 2019 in Serra dos Órgãos National Park (PARNASO), located between 22°23′ and 22°35′ South and 42°10′ and 42°58′ West (Figure 2), spanning the municipalities of Teresópolis, Magé, Guapimirim, and Petrópolis in the state of Rio de Janeiro, Brazil.

This study was carried out along the Petrópolis–Teresópolis Travessia trail, which is considered by mountaineers as the most famous crossing in Brazil (Figure 1), with the first record of someone completing the route coming from the 1930s [17]. The 27 km trail starts at 1153.67 m in Teresópolis, reaches its peak at 2263 m at Pedra da Luva, and ends at 1050 m in the Bonfim region in Petrópolis. There is a great altimetric variation along the trail, with a predominance of forest vegetation in the high slopes, while at the mountaintop, grassland is the main form of vegetation.

Figure 1. Altitudinal vegetation of Serra dos Órgãos National Park (PARNASO), Rio de Janeiro, Brazil.

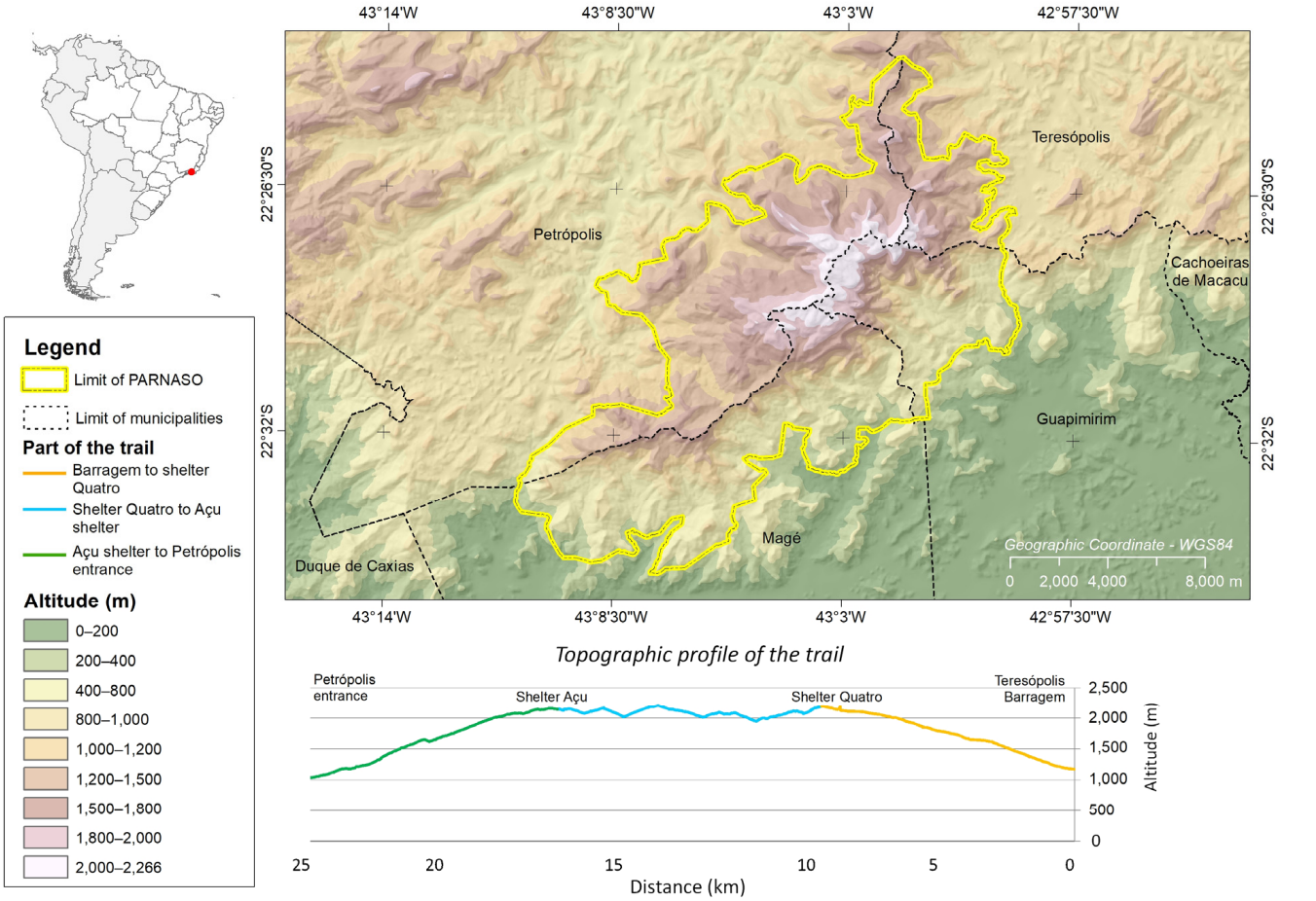

Figure 2. Location and delimitation of Serra dos Órgãos National Park (PARNASO) and Petrópolis–Teresópolis trail, along with its topographic profile (Rio de Janeiro, Brazil). Note that the altitude data was obtained from the *Shuttle Radar Topography Mission* (SRTM) [18] and limits from IBGE [19].

Non-Conventional Food Plants (PANC) were collected along a 27 km long and 3 m wide winding transect of the Petrópolis–Teresópolis crossing trail. Species of all habits were sampled during the collection: trees, shrubs, sub-shrubs, lianas, and terrestrial and epiphytic herbs. Plants along the trail with food potential were identified based on the scientific literature [10], the knowledge and experience of specialists on families and/or botanical genera, and ethnobotanical aspects. The list of PANC along the trail may be underestimated simply because there are plants that we do not yet know are edible, or this knowledge has been lost. The used parts of the plants and the categories of the species used were defined based on other works [10,20]. The usage categories of the species are not exclusive, meaning that a species can belong to more than one usage category; for example, a species can be consumed in the form of a vegetable (VEG) or as a pseudocereal (CER). The collected material was pressed and herborized. A Garmin 60CS navigation GPS with the UTM and Datum WGS84 projection system was used to prepare species location maps, which were then elaborated using the ArcGIS 10 program.

The collected material was herborized, and the exsiccates were deposited in the RBR Herbarium of the Department of Botany of the Federal Rural University of Rio de Janeiro. The species were subsequently identified in a JABOT virtual herbarium [21] by specialized botanists and through consultations with specialized bibliographies on PANC in a search for citations about each edible plant. The scientific names were revised in consultation with Flora do Brasil 2020 [22].

3. Results

A total of 90 PANC species were identified, representing 3.1% of the total species present in the Flora List of the PARNASO [14]. The 90 species were identified as belonging to 34 botanical families and 54 genera (Table 1, Figure 3). Of this total, two families of Pteridophytes were registered, represented by the *Pecluma pectinatiformis* (Lindm.) M.G.Price and *Pteridium esculentum* (G. Forst.) Cockayne species (Figure 4). The rest of the families and species (88) were angiosperms (Figure 5). The families with the highest species richness were Asteraceae (10 spp. of different genera), Begoniaceae (9 spp. of Begonia), Passifloraceae (8 spp. of wild passion fruit), Piperaceae (7 spp. of Piper), and Cactaceae (6 spp., including epiphytic species).

Table 1. List of food species identified on the Petrópolis–Teresópolis crossing trail.

	Family	Scientific Name	Herbarium No. (RBR)	Popular Name in Brazil	Uses	Parts Used	Habits
1	Acanthaceae	*Mendoncia puberula* Mart.	46398	mijo-de-gatopintado	FRU	FRU	LIA
2	Amaranthaceae	*Celosia grandifolia* Moq.	46449	bredo-domato *	VEG CER	LV SEED	SUB
3		*Chamissoa altissima* (Jacq.) Kunth	46447	erva-das-pombas	VEG CER	LV SEED	LIA
4	Apiaceae	*Eryngium fluminense* Urb.	46452	gravatá	VEG	LV FLO	H
5	Asteraceae	*Achyrocline alata* (Kunth) DC.	46450	macela	VEGDR	LV FLO	H
6		*Bidens squarrosa* Kunth	46367	picão-amarelo, picão-da-praia	VEG	LV	LIA
7		*Bidens pilosa* L.	46416	picão-preto	VEG	LV	H
8		*Conyza bonariensis* (L.) Cronquist	46381	buva, rabo-de-foguete	VEG	LV	SUB
9		*Erechtites valerianifolius* (Wolf) DC.	46417	capiçoba	VEG	LV	H
10		*Galinsoga quadriradiata* Ruiz & Pav.	46391	guasca, picão-branco	VEG	LV	H
11		*Hypochaeris* sp.	46375	almeirão-do-mato *	VEG	LV	H
12		*Soliva anthemifolia* (Juss.) Sweet	46394	cuspe-de-tropeiro, roseta	VEG	LV	H
13		*Tilesia baccata* (L.) Pruski	46424	olho-de-camarão	FRU	FRU SEED	S

Table 1. *Cont.*

	Family	Scientific Name	Herbarium No. (RBR)	Popular Name in Brazil	Uses	Parts Used	Habits
14		*Vernonanthura polyanthes* (Sprengel) Vega & Dematteis	46432	assa-peixe	VEG	LV	S
15	Balsaminaceae	*Impatiens walleriana* Hook.f.	46378	beijinho, maria-vergonha	VEG CER	FLO SEED	H
16	Basellaceae	*Anredera tucumanensis* (Lillo & Hauman) Sperling	46395	bertalha	VEG	LV	LIA
17	Begoniaceae	*Begonia angularis* Raddi	46441	begônia	VEG	LV	SUB
18		*Begonia angulata* Vell.	46431	begônia	VEG	LV	SUB
19		*Begonia edmundoi* Brade	46444	begônia	VEG	LV	SUB
20		*Begonia huegelii* (Klotzsch) A.DC.	46377	begônia	VEG	LV	SUB
21		*Begonia incisoserrata* (Klotzsch) A.DC.	46366	begônia, couve-da-montanha *	VEG	LV	SUB
22		*Begonia luxurians* Scheidw.	46439	begônia	VEG	LV	SUB
23		*Begonia pulchella* Raddi	46403	begônia	VEG	LV	SUB
24		*Begonia semidigitata* Brade	46412	begônia, couve-da-montanha *	VEG	LV	SUB
25		*Begonia solananthera* A.DC.	46413	begônia	VEG	LV	LIA
26	Berberidaceae	*Berberis laurina* Billb.	46389	espinho-de-são-joão	FRU	FRU	S
27	Bignoniaceae	*Handroanthus chrysotrichus* (Mart. ex DC.) Mattos	46386	ipê-amarelo	FRU	FLO	T
28	Cactaceae	*Rhipsalis juengeri* Barthlott & N.P.Taylor	46368	cacto-macarrão, cacto-caviar	VEG	CLA FRU	EPI
29		*Rhipsalis olivifera* N.P.Taylor & Zappi	46414	cacto-caviar	VEG FRU	CLA FRU	EPI
30		*Rhipsalis pachyptera* Pfeiff.	46451	cacto-caviar	VEG	CLA FRU	EPI
31		*Rhipsalis pulchra* Loefgr.	46371	cacto-macarrão; cacto-caviar	VEG	CLA FRU	EPI
32		*Schlumbergera rosea* (Lagerh.) Calvente & Zappi	46374	flor-de-maio-serrana	VEG	CLA FLO FRU	EPI
33		*Schlumbergera truncata* (Haw.) Moran	46365	flor-de-maio	VEG	CLA FLO FRU	EPI
34	Cannabaceae	*Celtis iguanaea* (Jacq.) Sarg.	46380	grão-de-galo, esporão-de-galo	FRU	FRU	LIA
35	Clusiaceae	*Garcinia gardneriana* (Planch. & Triana) Zappi	46425	bacupari	FRU	FRU	T
36	Commelinaceae	*Dichorisandra thyrsiflora* J.C.Mikan	46415	gengibre-azul	VEG	ROOT FLO	H
37		*Tradescantia fluminensis* Vell.	46393	Trapoeraba	VEG	LV FLO	H
38		*Tripogandra diuretica* (Mart.) Handlos	46400	trapoeraba	VEG	LV FLO	H
39	Cucurbitaceae	*Melothria cucumis* Vell.	46442	pepinho-do-mato, pepino-silvestre	VEG	FRU	LIA
40	Dennstaedtiaceae	*Pteridium esculentum* (G. Forst.) Cockayne	46392	samambaia	VEG	SH	S
41	Dioscoriaceae	*Dioscorea therezopolensis* Uline ex R.Knuth	46396	cará-do-mato	VEG	ROOT	LIA
42	Ericaceae	*Gaylussacia brasiliensis* (Spreng.) Meisn.	46448	camarinha-da-serra, mirtilo-brasileiro	FRU	FRU	S
43	Euphorbiaceae	*Plukenetia serrata* (Vell.) L.J.Gillespie	46383	sacha-inchi-serrana *	OIL	SEED	LIA
44	Fabaceae	*Erythrina falcata* Benth.	46430	mulungu, corticeira-da-serra	VEG	FLO	T
45		*Inga marginata* Willd.	46405	ingá	FRU	FRU SEED	T
46		*Inga sessilis* (Vell.) Mart.	46421	ingá	FRU	FRU SEED	T
47		*Inga* sp.	46370	ingá	FRU	FRU SEED	T
48	Lamiaceae	*Hedeoma crenatum* Irving	46401	poejo-da-montanha *	FLADR CON	LV	H
49	Malvaceae	*Ceiba speciosa* (A.St.-Hil.) Ravenna	46423	paineira	VEG	LV FLO FRU SEED	T

Table 1. *Cont.*

	Family	Scientific Name	Herbarium No. (RBR)	Popular Name in Brazil	Uses	Parts Used	Habits
50		*Sida acrantha* Link	46404	guanxuma, vassoura	VEG	LV FLO	S
51	Melastomataceae	*Leandra carassana* (DC.) Cogn.	46418	pixirica	FRU	FRU	S
52		*Leandra quinquedentata* (DC.) Cogn.	46372	pixirica	FRU	FRU	S
53		*Leandra strigilliflora* (Naudin) Cogn.	46437	pixirica	FRU	FRU	S
54	Moraceae	*Sorocea bonplandii* (Baill.) W.C.Burger et al.	46445	falsa-espinheira-santa, cincho	FRU	FRU	T
55	Myrtaceae	*Campomanesia xanthocarpa* (Mart.) O.Berg	46427	guabiroba	FRU	FRU	T
56		*Myrciaria tenella* (DC.) O.Berg	46390	jabuticaba-montana	FRU	FRU	S
57	Onagraceae	*Fuchsia regia* (Vell.) Munz	46408	brinco-de-princesa	VEG FRU	FRU FLO	S
58	Passifloraceae	*Passiflora alata* Curtis	46384	maracujá-doce	FRU	FRU	LIA
59		*Passiflora amethystina* J.C.Mikan	46419	maracujá-da-serra	FRU	FRU	LIA
60		*Passiflora campanulata* Mast.	46443	maracujá	FRU	FRU	LIA
61		*Passiflora deidamioides* Harms	46433	maracujá	FRU	FRU	LIA
62		*Passiflora imbeana* Sacco	46446	maracujá	FRU	FRU	LIA
63		*Passiflora miersii* Mast.	46410	maracujá	FRU	FRU	LIA
64		*Passiflora porophylla* Vell.	46402	maracujá	FRU	FRU	LIA
65		*Passiflora suberosa* L.	46435	maracujá-rabo-de-baleia	FRU	FRU	LIA
66	Piperaceae	*Peperomia arifolia* Miq.	46385	erva-de-jabuti-da-pedra *	VEG	LV	H
67		*Peperomia augescens* Miq.	46436	erva-de-jabuti-da-pedra *	VEG	LV	H
68		*Peperomia corcovadensis* Gardner	46382	erva-de-jabuti-da-pedra *	VEG	LV	H
69		*Peperomia galioides* Kunth	46428	erva-de-jabuti-da-pedra	VEG	LV	H
70		*Peperomia megapotamica* Dahlst.	46399	erva-de-jabuti-da-pedra *	VEG	LV	H
71		*Peperomia rhombea* Ruiz & Pav.	46440	erva-de-jabuti-da-pedra *	VEG	LV	H
72		*Peperomia subretusa* Yunck.	46397	erva-de-jabuti-da-pedra *	VEG	LV	H
73	Plantaginaceae	*Plantago australis* Lam.	46429	tanchagem	VEG DR CER	LV SEED	H
74	Polypodiaceae	*Pecluma pectinatiformis* (Lindm.) M.G.Price	46376	samambaia-doce	SW	LV	H
75	Rosaceae	*Potentilla indica* (Andrews) Th.Wolf	46409	morango-de-altitude *	VEG	LV FLO FRU	H
76		*Rubus brasiliensis* Mart.	46438	amora-silvestre	FRU	FRU	SUB
77		*Rubus erythroclados* Mart. exHook.f.	46411	amora-verde	FRU	FRU	S
78		*Rubus rosifolius* Sm.	46406	moranguinho-do-mato	FRU	FRU FLO LV	H
79	Smilacaceae	*Smilax campestres* Griseb.	-	salsaparrilha, japecanga	VEG FRU	SH FRU	LIA
80		*Smilax elastica* Griseb.	-	salsaparrilha, japecanga	VEG	SH	LIA
81		*Smilax muscosa* Toledo	-	salsaparrilha, japecanga	VEG	SH	LIA
82		*Smilax stenophylla* A.DC.	-	salsaparrilha, japecanga	VEG	SH	LIA
83		*Smilax subsessiliflora* Duhamel	-	salsaparrilha, japecanga	VEG	SH	LIA
84	Solanaceae	*Solanum americanum* Mill.	46422	erva-moura, maria-pretinha	VEG	LV FRU	H
85		*Solanum corymbiflorum* (Sendtn.) Bohs	46426	tomate-verde-de-árvore	FRU	FRU	S
86		*Solanum didymum* Dunal	46434	-	FRU	FRU	S
87	Urticaceae	*Boehmeria caudata* Sw.	46379	urtiga-mansa, assa-peixe, lixa-da-folha, folha-de-santana	VEG	LV	S

Table 1. *Cont.*

	Family	Scientific Name	Herbarium No. (RBR)	Popular Name in Brazil	Uses	Parts Used	Habits
88		*Phenax sonneratii* (Poir.) Wedd.	46387	urtiga-do-brejo	VEG	LV	SUB
89		*Pilea hyalina* Fenzl	46453	urtiga-de-vidro, urtiga-d'água *	VEG	LV	H
90	Winteraceae	*Drimys brasiliensis* Miers	46407	casca-d'anta, cataia	CON	LV	T

Uses: FLA—flavoring, DR—drink, CON—condiment, SW—sweetener, VEG—vegetable, FRU—fruit, CER—cereal or pseudocereal, and OIL—oil. Parts used: LV—leaves, FRU—fruits, FLO—flowers, SEED—seeds, ROOT—tuberous roots, CLA—cladodes, and SH—shoots. Habits: S—shrub, T—tree, SUB—sub-shrub, H—herb, EPI—epiphyte, and LIA—liana. Based on the book *Plantas Alimentícias Não-Convencionais (PANC) no Brasil* [10] and the knowledge and experience of specialists about families and/or botanical genera, and etnobotanical aspects were also considered. * popular names proposed in the present study.

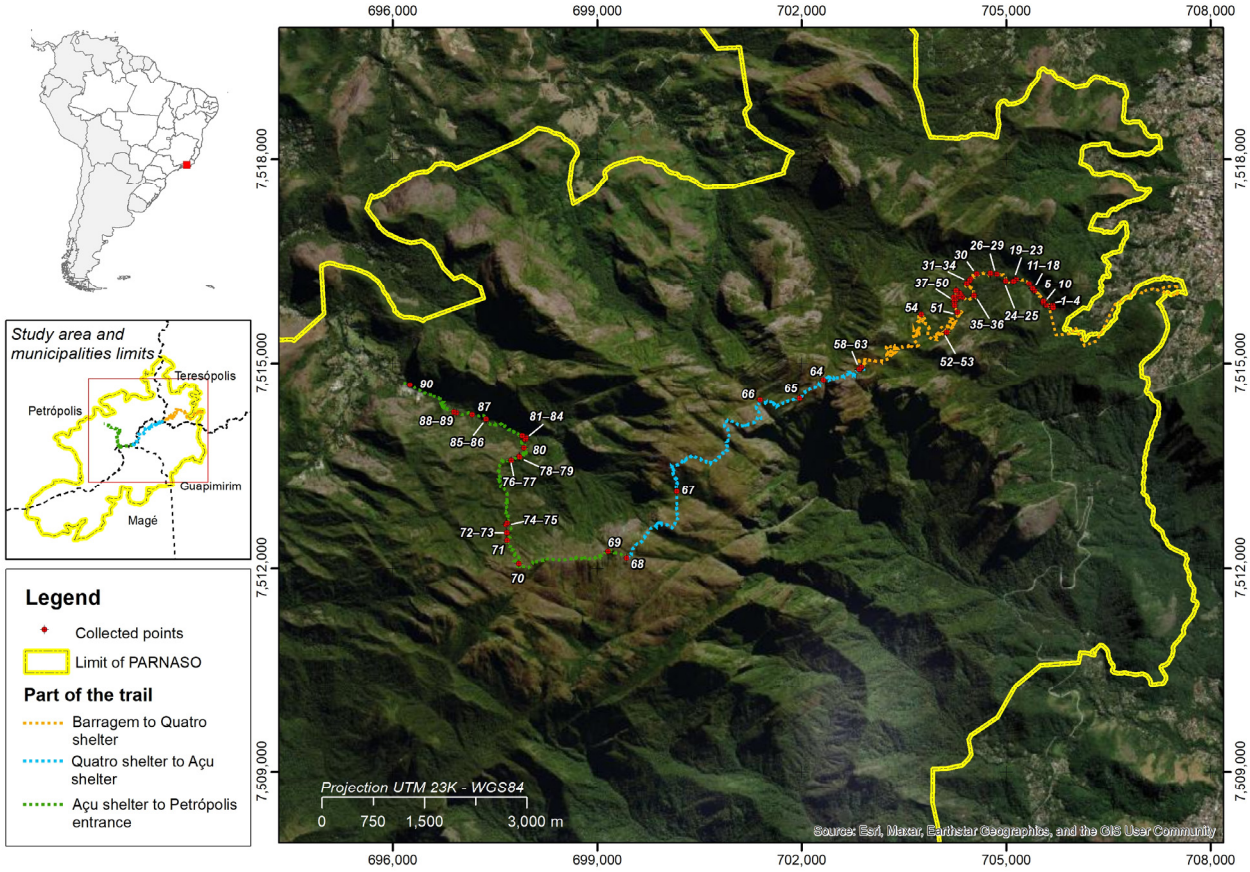

Figure 3. Location of the collection points on the Petrópolis–Teresópolis trail and a Vivid image from Oct 2019 highlighting the distribution of forests, mountaintop grassland, and outcrops of rocks. Limits obtained from IBGE [19].

The eastern stretch of the trail begins in a town called Barragem in the municipality of Teresópolis, and it ends at the Quatro shelter in the Pedra do Sino mountain. This section presents a vast richness of food species, of which 56 PANC species are registered. These data were acquired using a research methodology in which repeated plants were not collected. Another factor is the great altimetric variation within this section, with almost 1000 m of unevenness (Figure 2) and forest vegetation predominating across almost the entire route. The mountaintop grassland vegetation predominates only in the final stretch, close to the Quatro shelter (2200 m) (Figure 3). The stretch between the Quatro shelter and the Açu shelter is mainly characterized by high-altitude grassland vegetation outcrops of rock and remains between altitudes of 1800 and 2260 m (Figures 2 and 3). This vegetation

naturally has less PANC diversity when compared to the surrounding forests. A total of 10 food species were identified in this section. Then, 24 species were identified between the Açu shelter and the Petrópolis entrance. This stretch, like the first one, has an elevation difference of about 1000 m and a more forested section. Some food species found in this stretch were not counted as they had already been collected from previous stretches. The sum of the different categories exceeded the total number of species, totaling 101 categories. The usage category with the largest number of species was vegetable (VEG), with 57 species, followed by fruit (FRU), with 32 species. Four species were categorized as a pseudocereal (CER), three as a drink (DR), and two as a condiment (CON). The oil (OIL), flavoring (FLA), and sweetener (SW) categories presented one species each (Table 1).

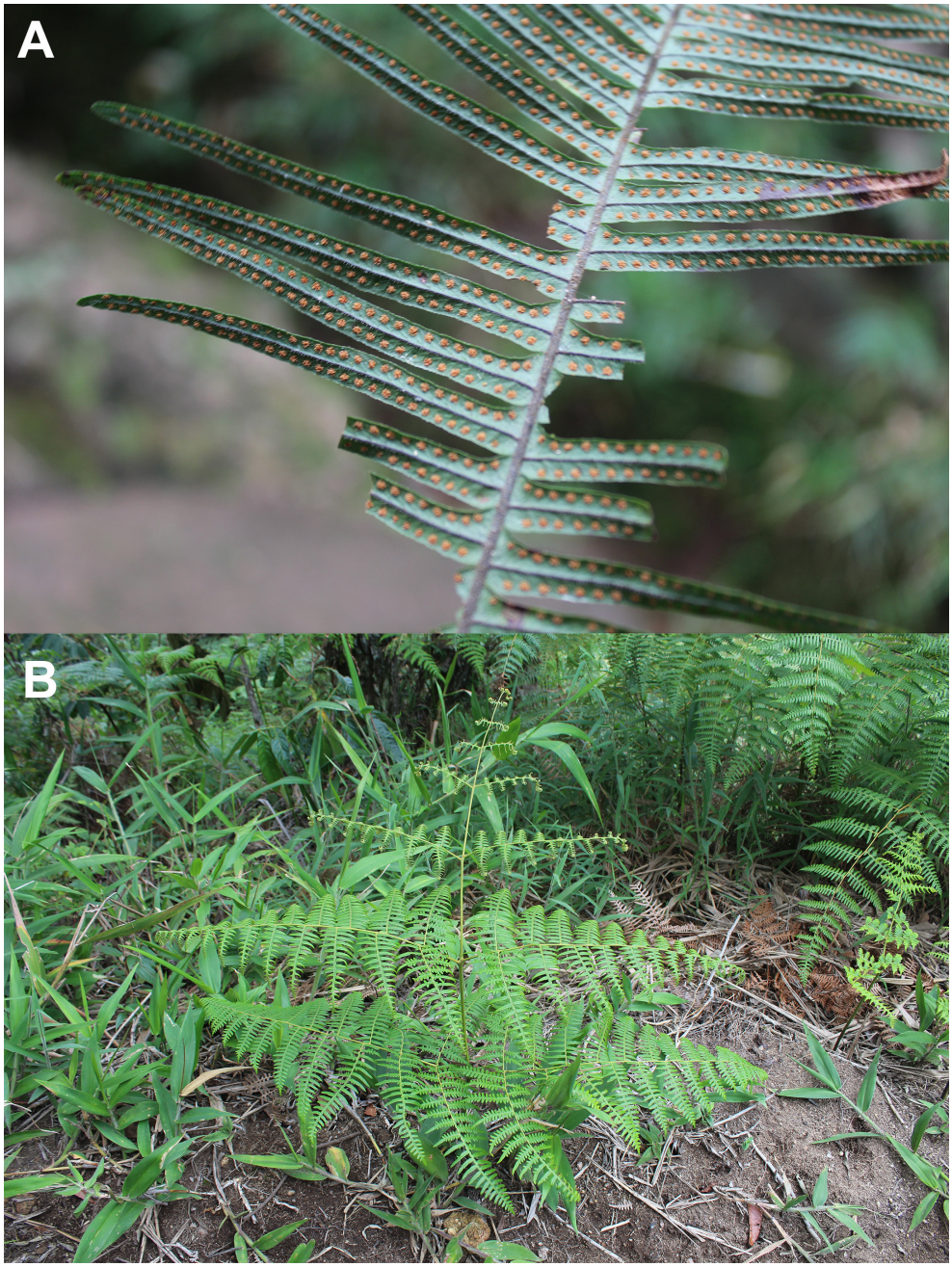

Figure 4. The ferns species: (**A**) *Peclumapectinatiformis* (Lindm.) M.G.Price and (**B**) *Pteridium esculentum* (G. Forst.) Cockayne. Serra dos Órgãos National Park (PARNASO), Rio de Janeiro, Brazil.

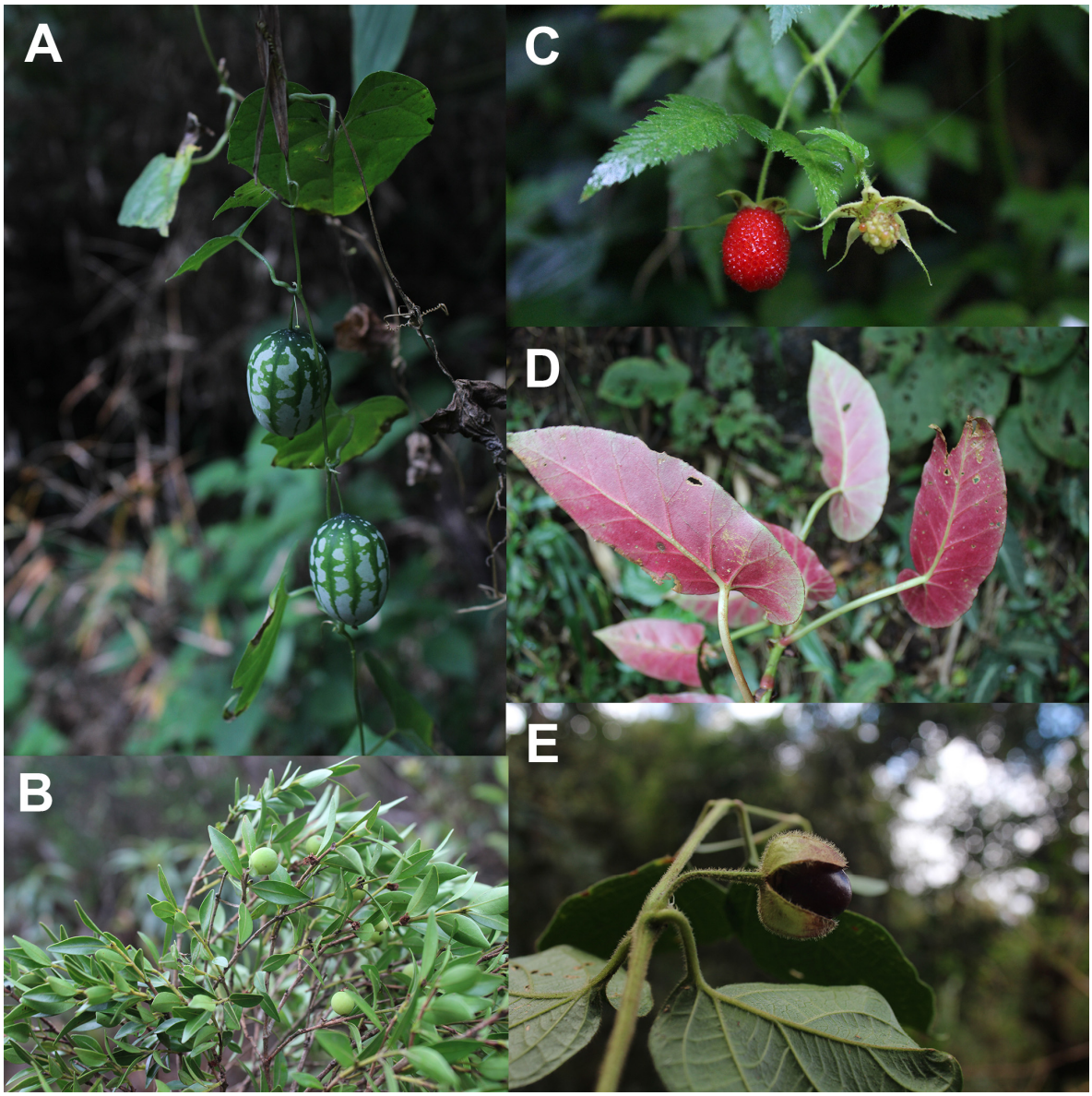

Figure 5. Examples of angiosperm species: (**A**) *Melothria cucumis* Vell., (**B**) *Myrciaria tenella* (DC.) O.Berg, (**C**) *Rubus rosifolius* Sm., (**D**) *Begonia angularis* Raddi, and (**E**) *Mendoncia puberula* Mart. Serra dos Órgãos National Park (PARNASO), Rio de Janeiro, Brazil.

The indications of the parts of the plants used also are not exclusive, meaning that one species can have more than one part used; thus, the sum of the different categories of parts in use exceeded the total number of species, totaling 122 parts used. The most common part used among the registered plants were the leaves (LV), with 43 records, followed by fruits (FRU), with 40 records; flowers (FLO), with 15 records; seeds (SEED), with 10 records; shoots (S) and cladodes (CLA), with 6 records each; and tuberous roots (ROOT), with 2 records (Table 1).

Considering the characteristics of the PANC species in Table 1, 25 terrestrial herbs (H), 22 lianas (LIA), 15 shrubs (S), 12 sub-shrubs (SUB), 10 trees (T), and 6 epiphytes (EPI) were recorded. The vast majority of the identified plants grow in a shaded environment, thus signaling the possibility of the future cultivation of these species in agroforestry systems.

4. Discussion

Some authors consider that an average of 6 to 21% of the total plant species of any plant formation are edible [23]. The transect area selected in the present study represents

only 0.04% of the total PARNASO area (20,020.75 ha), suggesting that the number of food species present in the park may reach higher rates than found. However, this average increases significantly in environments altered by humans, varying from 17% to 33% [23,24]. Considering that human beings are vectors for introducing species by accidentally carrying small seeds from one place to another, and since the trails are some of the most anthropized places in the park, the possibility of a greater number of PANC along the trails and near the shelters is evident in contrast to well-preserved environments.

The PANC life forms recorded in this study reflect the diversity of the environments and vegetation physiognomies along the trail. The most recorded life forms were terrestrial herbs (28%), which vegetate along forest trails and in high-altitude fields, followed by lianas (24%), shrubs (17%), sub-shrubs (13%), trees (11%), and epiphytes (7%). The trail section between the Quatro shelter and the Açu shelter (Figure 2) is mainly characterized by mountaintop grassland vegetation and outcropping rocks (Figure 1), and it represents approximately 23% of all PANCs sampled. This highland vegetation naturally has less floristic diversity when compared to the surrounding forests. However, high-altitude grasslands have a high degree of endemism [25].

Studies carried out in other regions have highlighted the woody and arboreal element as important for PANC-producing species, as was the case in a study carried out in the Congo Basin in Cameroon in collaboration with the Baka people, which found 91 PANC [26]. When classifying the plants by life form, most were trees (46%), followed by vines (27%), herbs (20%), and shrubs (7%). Furthermore, 65 food plants were identified in a systematic review conducted in the semi-arid region of Brazil. Of this total, 15 species were ranked according to their chemical composition and ethnobotanical data. Considering the life forms of the five main species, they found vine (one sp.), palm tree (one sp.), and trees (three spp.) [27].

Currently, little is known about the great productive potential of wild PANC. This is being revealed in studies, such as one carried out in Spain, in which 15 PANC species were evaluated for their spontaneous productivity. The authors suggested that species with low production rates should be cultivated in organic systems, and species with high production rates should be collected in the wild, with the management of natural populations [28]. In a bibliographic review of PANC used in the Czech Republic, 175 species of vascular plants were found among native and naturalized plants used since the 16th century. The parts of the plant used, the usage category, and the consumption mode were provided for each listed species. Rosaceae, Asteraceae, and Ericaceae were the most represented botanical families [29]; these families were also represented by the species in the present study.

Regarding the used parts of the plants in the present study, the most commonly registered parts were the leaves, followed by the fruits, flowers, seeds, shoots, cladodes, and tuberous roots (Table 1). This large number of parts used reflects the possibilities with respect to forms of consumption; therefore, we suggest exploring the development of gastronomy programs and recipes to enhance the consumption of PANC, for example, by producing publications on the topic that could popularize the use of plants [10,30,31]. Other studies have highlighted the cultural and regional importance of consuming fruits, seeds, and leaves [26,27,32–35].

PANC consumption is one of the pillars of sustainable diets, providing an adequate and abundant supply of nutrient-rich, safe, and affordable foods produced without depleting or contaminating the vital natural resources of water, air, and soil. There is ample evidence of their potential use and safety, which supports formulating food and agricultural policies, as well as sustainable diet guidelines, based on local plants [27,36,37]. We highlight the importance of correctly identifying PANC before consumption and also knowing which parts are edible and how to prepare and consume them, avoiding misidentification. Another consideration is that future exploratory research and studies must evaluate calories or other eating aspects, as well as the viability of the reproduction and potential cultivation of such species.

5. Conclusions

Published works in Brazil that address the gastronomic aspects of the phytodiversity present in protected areas are not known. In this sense, this is a pioneering study, although its reach is small in view of the size of the Brazilian territory. A considerable number of Non-Conventional Food Plants (PANC) were found in a relatively small area of Serra dos Órgãos National Park, showing the great potential of Brazilian flora that have not yet been explored for food consumption. However, some of these species are threatened with extinction, and these plants, although edible, must be protected. Encouraging the propagation of unconventional food plants beyond the borders of protected areas and stimulating their production on an agroecological basis could be an important conservation strategy, as well as an economic one. Therefore, there is a need to develop research and experiments on agroecological crops with these plants. Non-Conventional Food Plants have enormous potential to be explored for their use in educational activities and educational tourism, highlighting the gastronomic dimensions of the plant biodiversity present in protected areas and strategic projects in the park's buffer areas.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/wild1010002/s1, KMZ with the collected points locations of each PANC.

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References

1. Forzza, R.C.; Baumgratz, J.F.A.; Bicudo, C.E.M.; Canhos, D.A.L.; Carvalho, A.A., Jr.; Coelho, M.A.N.; Costa, A.F.; Costa, D.P.; Hopkins, M.G.; Leitman, P.M.; et al. New Brazilian floristic list highlights conservation challenges. *BioScience* **2012**, *62*, 39–45. [CrossRef]
2. Zappi, D.C.; Filardi, F.L.R.; Leitman, P.; Souza, V.C.; Walter, B.M.T.; Pirani, J.R.; Morim, M.P.; Queiroz, L.P.; Cavalcanti, T.B.; Mansano, V.F.; et al. Growing knowledge: An overview of Seed Plant diversity in Brazil. *Rodriguésia* **2015**, *66*, 1085–1113. [CrossRef]
3. Souza, A.M.; Pereira, R.A.; Yokoo, E.M.; Levy, R.B.; Sichieri, R. Alimentos mais consumidos no Brasil: Inquérito Nacional de Alimentação 2008–2009. *Rev. Saúde Pública* **2013**, *47*, 190–199. [CrossRef] [PubMed]
4. Lopes-Ferreira, M.; Maleski, A.L.A.; Balan-Lima, L.; Bernardo, J.T.G.; Hipolito, L.M.; Seni-Silva, A.C.; Batista-Filho, J.; Falcao, M.A.P.; Lima, C. Impact of Pesticides on Human Health in the Last Six Years in Brazil. *Int. J. Environ. Res. Public Health* **2022**, *19*, 3198. [CrossRef] [PubMed]
5. Scherr, S.J.; Mcneely, J.A. *Farming with Nature: The Science and Practice of Ecoagriculture*; Island Press: Washington, DC, USA, 2012.
6. Porto, M.F.; Soares, W.L. Modelo de desenvolvimento, agrotóxicos e saúde: Um panorama da realidade agrícola brasileira e propostas para uma agenda de pesquisa inovadora. *Rev. Bras. Saúde Ocup.* **2012**, *37*, 17–31. [CrossRef]

7. World Health Organization. *WHO Estimates of the Global Burden of Foodborne Diseases*; Technical report; WHO: Geneva, Switzerland, 2015.
8. Elizabeth, L.; Machado, P.; Zinöcker, M.; Baker, P.; Lawrence, M. Ultra-Processed Foods and Health Outcomes: A Narrative Review. *Nutrients* **2020**, *12*, 1955. [CrossRef] [PubMed]
9. Ribeiro, H.; Jaime, P.C.; Ventura, D. Alimentação e sustentabilidade. *Estud. Avançados* **2017**, *89*, 185–198. [CrossRef]
10. Kinupp, V.F.; Barros, I.B.I.D. Teores de proteína e minerais de espécies nativas, potenciais hortaliças e frutas. *Food SciTechnol.* **2008**, *28*, 846–857. [CrossRef]
11. Kinupp, V.F.; Lorenzi, H. *Plantas Alimentícias Não-Convencionais (PANC) no Brasil: Guia de Identificação, Aspectos Nutricionais e Receitas Ilustradas*; Plantarum: Nova Odessa, Brazil, 2014.
12. Ervin, J. Protected areas assessments in perspective. *BioScience* **2003**, *53*, 819–822. [CrossRef]
13. Beiroz, H. Zonas de amortecimento de Unidades de Conservação em ambientes urbanos sob a ótica territorial: Reflexões, demandas e desafios. *Desenvolv. Meio Ambiente* **2015**, *35*, 275–286. [CrossRef]
14. Ministério do Meio Ambiente. *Plano de Manejo do Parque Nacional da Serra dos Órgãos*; Instituto Chico Mendes de Biodiversidade: Brasília, Brazil, 2007. Available online: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/mata-atlantica/lista-de-ucs/parna-da-serra-dos-orgaos/arquivos/Encarte_1___PM_PARNASO.pdf (accessed on 21 July 2024).
15. Medeiros, R.; Young, C.E.F.; Pavese, H.B.; Araújo, F.F.S. *Contribuição das Unidades de Conservação Brasileiras Para a Economia Nacional*; UNEP-WCMC: Brasília, Brazil, 2011. Available online: https://www.researchgate.net/profile/Bruna-Stein-Ciasca/publication/348603178_Contribuicao_das_Unidades_de_Conservacao_para_a_Economia_Nacional/links/6006fe60299bf14088a8b79e/Contribuicao-das-Unidades-de-Conservacao-para-a-Economia-Nacional.pdf (accessed on 21 July 2024).
16. Frank, A.S.K.; Schäffler, L. Identifying Key Knowledge Gaps to Better Protect Biodiversity and Simultaneously Secure Livelihoods in a Priority Conservation Area. *Sustainability* **2019**, *11*, 5695. [CrossRef]
17. Lucena, W.M. *História do Montanhismo no Rio de Janeiro: Dos Primórdios aos Anos 1940*; Montanhar: Rio de Janeiro, Brazil, 2006.
18. Farr, T.G.; Rosen, P.A.; Caro, E.; Crippen, R.; Duren, R.; Hensley, S.; Kobrick, M.; Paller, M.; Rodriguez, E.; Roth, L.; et al. The shuttle radar topography mission. *Rev. Geophys.* **2007**, *45*. [CrossRef]
19. IBGE (Brazilian Institute of Geography and Statistics). *Base Cartográfica Contínua do Estado do Rio de Janeiro, Escala 1:25.000*; IBGE: Rio de Janeiro, Brazil, 2018.
20. Kinupp, V.F. Plantas Alimentícias Não-Convencionais da Região Metropolitana de Porto Alegre. Ph.D. Thesis, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, 2007. Available online: https://lume.ufrgs.br/bitstream/handle/10183/12870/000635324.pdf?sequence=1&isAllowed=y (accessed on 21 July 2024).
21. Estevao, L.A.; Fraga, C.N.; Almeida, T.M.H.; Gonzales, M.; Lima, R.O.; Rocha, M.S.; Bellon, E.; Ribeiro, R.S.; Oliveira, F.A.; Clemente, L.S.; et al. Jabot—Sistema de Gerenciamento de Coleções Botânicas: A experiência de uma década de desenvolvimento e avanços. *Rodriguésia* **2017**, *68*, 391–410.
22. Flora do Brasil. Jardim Botânico do Rio de Janeiro. Database: Floradobrasil. 2020. Available online: http://floradobrasil.jbrj.gov.br (accessed on 10 February 2021).
23. Rapoport, E.H.; Ladio, A.; Raffaele, E.; Ghermandi, L.; Sanz, E.H. Malezas comestibles—Hay yuyos y yuyos. *Cienc. Hoy* **1998**, *9*, 30–43. Available online: https://www.researchgate.net/profile/Luciana-Ghermandi/publication/301326913_Malezas_comestibles_Hay_yuyos_y_yuyos/links/57e03af308aece48e9e1f1a7/Malezas-comestibles-Hay-yuyos-y-yuyos.pdf (accessed on 21 July 2024).
24. Díaz-betancourt, M.; Ghermandi, L.; Ladio, A.; López-Moreno, I.R.; Raffaele, E.; Rapoport, E.H. Weeds as a source for human consumption: A comparison between tropical and temperate Latin America. *Rev. Biol. Trop.* **1999**, *47*, 329–338. Available online: http://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S0034-77441999000300004&lng=en&nrm=iso (accessed on 21 July 2024). [CrossRef]
25. Safford, H.D. Brazilian páramos IV: Phytogeography of the campos de altitude. *J. Biogeogr.* **2007**, *34*, 1701–1722. [CrossRef]
26. Gallois, S.; Heger, T.; Henry, A.G.; van Andel, T. The importance of choosing appropriate methods for assessing wild food plant knowledge and use: A case study among the Baka in Cameroon. *PLoS ONE* **2021**, *16*, e0247108. [CrossRef]
27. Jacob, M.C.M.; Araújo de Medeiros, M.F.; Albuquerque, U.P. Biodiverse food plants in the semiarid region of Brazil have unknown potential: A systematic review. *PLoS ONE* **2020**, *15*, e0230936. [CrossRef]
28. Molina, M.; Tardio, J.; Aceituno-Mata, L.; Morales, R.; Reyes-Garcia, V.; Pardo-de-Santayana, M. Weeds and food diversity: Natural yield assessment and future alternatives for traditionally consumed wild vegetables. *J. Ethnobiol.* **2014**, *34*, 44–67. [CrossRef]
29. Simkova, K.; Polesny, Z. Ethnobotanical review of wild edible plants used in the Czech Republic. *J. Appl. Bot. Food Qual.* **2015**, *88*, 49–67. [CrossRef]
30. Nunes, H. *PANC Gourmet: Ensaios Culinários*; Plantarum: Nova Odessa, Brazil, 2017.
31. Jacob, M.C.M.; Cintra, M.; Almeida, A. *Culinária Selvagem: Saberes e Receitas de Plantas Alimentícias não Convencionais*; Edurfn: Natal, Brazil, 2020.
32. LaRochelle, S.; Berkes, F. Traditional ecological knowledge and practice for edible wild plants: Biodiversity use by Rarámuri, in the Sierra Tarahumara, Mexico. *Int. J. Sustain. Dev. World Ecol.* **2003**, *10*, 361–375. [CrossRef]

33. da Silva Souza, L.V.; Marques, J.; Campos, L.Z.O.; Lins Neto, E.M.F. Socioeconomic factors infuencing knowledge and consumption of food plants by a human group in a mountainous environment in the semiarid region of Bahia, Northeast Brazil. *J. Ethnobiol. Ethnomed.* **2022**, *18*, 44. [CrossRef]
34. Motti, R. Wild Plants Used as Herbs and Spices in Italy: An Ethnobotanical Review. *Plants* **2021**, *10*, 563. [CrossRef] [PubMed]
35. Panyadee, P.; Wangpakapattanawong, P.; Inta, A.; Balslev, H. Very High Food Plant Diversity among Ethnic Groups in Northern Thailand. *Diversity* **2023**, *15*, 120. [CrossRef]
36. Stark, P.B.; Miller, D.; Carlson, T.J.; de Vasquez, K.R. Open-source food: Nutrition, toxicology, and availability of wild edible greens in the East Bay. *PLoS ONE* **2019**, *14*, e0202450. [CrossRef]
37. Pawera, L.; Khomsan, A.; Zuhud, E.A.M.; Hunter, D.; Ickowitz, A.; Polesny, Z. Wild Food Plants and Trends in Their Use: From Knowledge and Perceptions to Drivers of Change in West Sumatra, Indonesia. *Foods* **2020**, *9*, 1240. [CrossRef]