# Food Composition Data: Edible Plants in Pantanal

**Ieda Maria Bortolotto, Rita de Cássia Avellaneda Guimarães, Raquel Pires Campos, Mariana Rodrigues da Silva Lopes, Laleska Pâmela Rodrigues da Silva, Rosa Helena Silva, Geraldo Alves Damasceno-Junior, Arnildo Pott, and Priscila Aiko Hiane**

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## 1 Introduction

The Pantanal is one of the largest wetlands on Earth, the most part in Brazil, besides Bolivia and Paraguay (Adámoli 1982). The vegetation is represented by a mosaic of physiognomies that occur in floodable and flood-free areas, with influence from

I. M. Bortolotto (✉) · R. H. Silva · G. A. Damasceno-Junior · A. Pott
Programa de Pós-Graduação em Biologia Vegetal, Instituto de Biociências, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil

R. de Cássia Avellaneda Guimarães · M. R. da Silva Lopes · L. P. R. da Silva
Programa de Pós-Graduação em Saúde e Desenvolvimento na Região Centro-Oeste, Faculdade de Medicina, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil
e-mail: rita.guimaraes@ufms.br

R. P. Campos · P. A. Hiane
Faculdade de Ciências Farmacêuticas, Alimentos e Nutrição, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil
e-mail: raquel.campos@ufms.br; priscila.hiane@ufms.br


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Cerrado, Chaco, and Amazon Forest (Prance and Schaller 1982), with over 2500 catalogued species of angiosperms (Pott and Pott (in press)). Hundreds of native species have a potential for alimentary use for both human and animals (Pott and Pott 1986, 1994; Pott et al. 2004; Bortolotto et al. 2018). Among them, circa 70 species were recorded as part of the diet and culture of the human populations living in indigenous and traditional communities in the western edge of the Pantanal (Bortolotto et al. 2015; Bortolotto et al. 2019). Among them, there are some species associated with rich traditional knowledge on their use in the diet, relevant in the past, were abandoned, or have low use value now.

Nuts and pulps of fruits, leaves, rhizomes, and other parts of food plants native to the Pantanal have relevant nutritional value with high levels of fibers, sugars, proteins, minerals, fatty acids, vitamins, and carotenoids (Hiane et al. 2006; Ramos et al. 2008; Prates et al. 2015; Arakaki et al. 2020). Besides, they have bioactive compounds with antioxidant action, and their inclusion in the diet protects the organism from several chronic diseases associated with oxidative stress (Pereira and Cardoso 2012).

The consumption of wild foods, free of agrochemicals, is also associated with sustainable actions, being beneficial for health and the environment. The inclusion of regional foods and native fruits in the diet of the population can be an economical and sustainable way of preventing diseases associated with malnutrition and represents an alternative for consumers, constituting a new source of foods, raw materials, new products, and wealth for the country (Marin 2006; Silva et al. 2010).

Several epidemiological studies indicate that the high ingestion of plant products is associated with a reduced risk of a variety of chronic diseases such as atherosclerosis and cancer, effects that have been particularly attributed to the compounds in antioxidant activity: vitamins C and E, phenolic compounds, especially flavonoids, and carotenoids (Silva et al. 2010). The antioxidants ingested in the human diet, such as vitamin C and phenolic compounds, can prevent carcinogenesis for scavenging the free radicals and impeding the linkage of the carcinogens to DNA (Valko et al. 2006).

Some native food species have edible parts with peculiar organoleptic characteristics, which make them distinct and can be included in new compounds potentially toxic to human beings (Pinela et al. 2017). Thus, the native food plants with traditional use deserve a distinct value since they offer the necessary security to indicate their alimentary use proven over centuries by the people consuming them frequently (Pardo de Santayana et al. 2012). Many species with high cultural value have an essential role in the human diet for being functional foods, capable of providing benefits to health, besides nutritional value, and being strategic for food and nutrition security and food sovereignty (Wittman 2012). The native food plants can also be useful as supplementary, seasonal, or subsistence sources in many cultural groups and play an essential role in fighting food shortage (Lulekal et al. 2011). Additionally, the fruits of native species from Brazil have nutraceutical properties for their characteristics being comparable to commercial drugs (dos Santos et al. 2017).

This chapter compiles nutritional information about 11 traditional native food species of the Pantanal abundant in natural plant physiognomies that have great potential for sustainable use associated with food and nutrition security and food sovereignty. The species were selected among those with the highest use value by two ethnobotanical studies (Bortolotto et al. 2015; Bortolotto et al. 2019) developed in the municipalities of Corumbá and Porto Murtinho, in the State of Mato Grosso do Sul, in the extreme west of the Brazilian Pantanal, besides one traditionally used in the past in this region. For each species, we searched published information on their nutritional composition, traditional uses, distribution, and phenological and abundance data around the communities.

This region has an altitudinal gradient varying between 80 m on the plain and 1064 m in areas of the Urucum-Amolar hills (Borges et al. 1997). Besides aquatic and wetland plants present in water bodies, riparian forests, and floodplain, there is high species richness in the vegetation of Cerrado and in seasonal deciduous and semideciduous forest (Prance and Schaller 1982; Damasceno-Junior et al. 2017) in more elevated areas. The municipality of Porto Murtinho, in the southernmost portion of the Pantanal, contains an area with Chaco vegetation, distributed in Argentina, Paraguay, Bolivia, and Brazil, in Mato Grosso do Sul (Prado et al. 1992). Porto Murtinho has 15,372 inhabitants, being 5313 habitants in the rural and 10,059 in the urban zone; the municipality of Corumbá has a population of 103,772 inhabitants, being 93,452 in the urban zone and 10,251 in the rural area (IBGE 2010). The study of Porto Murtinho includes persons who live in rural and urban area, while the study of Corumbá includes only persons of an indigenous community and three traditional in the rural area.

## 2 Characteristics, Main Uses, and Nutritional Composition of the Food Plants Native to the Pantanal

The 11 wild food species traditionally utilized by the human populations of the urban and rural area along the Paraguay River in the Pantanal (Brazil) selected for this work are presented in Table 1. We included three species of Arecaceae, two Fabaceae, and one representative of Rubiaceae, Sapotaceae, Poaceae, Lamiaceae, Malpighiaceae, and Myrtaceae. Except for *Byrsonima cydoniifolia* A. Juss., mentioned only for the municipality of Corumbá, *Oryza latifolia* Desv. (that was in disuse), and *Inga laurina* (Sw.) Willd only for Porto Murtinho, the other species were cited for both municipalities.

**Arecaceae**
***Acrocomia aculeata* (Jacq.) Lodd ex. Mart.**

*Acrocomia aculeata* is a palm locally known as *bocaiuva* or *macauba* (Table 1). It has a wide distribution in South and Central America, except Amazonia (Table 1). The drupaceous fruit is rounded with a diameter of 2.5–5.0 cm. The kernel is resistant and dark (black). The pulp color varies from yellow to orange (Fig. 1a, b) with a slightly sweetish taste. In the Pantanal, *A. aculeata* has several traditional uses in

**Table 1** List of the 11 species of food plants of the Pantanal, Mato Grosso do Sul, Brazil, with botanical family, species, local name, edible part used and mode of consumption, fructification season, and occurrences

| Family/species | Local name | Edible parts and traditional consumption mode in Pantanal | Fruiting season (maturation) | Occurrences |
|---|---|---|---|---|
| Arecaceae *Acrocomia aculeata* (Jacq.) Lodd. | Bocaiuva, macauba | Palm heart roasted or baked; fruit (pulp and almonds), ripe pulp (mesocarp), used to make bocaiuva flour, drink (liquor, fresh or fermented juice), almonds eaten raw or toasted; used to make oil (1, 2, 3) | September to December (4) | South and Central America, from Argentina to México (5); Brazil, except in the Amazon (6); Pantanal: An, De, Sd, Ce, Rf (1); Ms |
| *Attalea phalerata* Mart. ex Spreng. | Acuri, bacuri | Pulp unripe or ripe fruits eaten cooked, palm heart baked (1); ripe pulp (mesocarp) used to make acuri flour (3); almonds eaten raw; used to make oil (1, 3) | April to October (2) | South America, from Brazil to Peru (5); Brazil, Cerrado and Pantanal (6); Pantanal, An, De, Sd, Ce, Rf (1); Ms (2) |
| *Copernicia alba* Morong | Carandá | Heart palm and ripe fruit (in natura) | February to May (2) | South America, Brazil, Bolivia, Paraguai and Argentina (5); Brazil, Pantanal, in Rf; Ms |
| Fabaceae *Inga laurina* (Sw.) Will. | Ingá | Sarcotest seed consumed fresh (7) | November to March (8) | South and Central America, from Mexico to Paraguay and Argentina (5); Brazil, Amazônia, Caatinga, and Cerrado (6); Pantanal, Sd, Rf |
| Fabaceae *Prosopis ruscifolia* Griseb. | Algarrobo | Fruits to make algarrobo flour, to prepare breads, cakes, and an alcoholic drink (chicha) (7) | November to February (9) | South America, Argentina, Paraguay, Bolivia, and Brazil (5); Brazil, Pantanal and Caatinga (6); Pantanal, De, Ce, Ch (1) |
| Lamiaceae *Vitex cymosa* Bertero ex Spreng. | Tarumã | Ripe fruits (pulp) eaten fresh (1), used to make jams (3) | November to February (2) | South and Central America (5); Brazil, Amazônia, Caatinga, Cerrado, Mata Atlântica and Pantanal (6); Pantanal, Rf, Sd (1) |

(continued)

**Table 1** (continued)

| Family/species | Local name | Edible parts and traditional consumption mode in Pantanal | Fruiting season (maturation) | Occurrences |
|---|---|---|---|---|
| Malpighiaceae *Byrsonima cydoniifolia* A. Juss. | Canjiquinha, canjiqueira | Ripe fruits (pulp) eaten fresh (1), juice (acid) (3) | September to March (3) and April (com. Pess.) | Bolivia and Brazil (5); Brazil, Caatinga, Cerrado and Pantanal (6); Pantanal, Rf, Fl (1); Ms |
| Myrtaceae *Plinia cauliflora* (DC.) Kausel | Jabuticaba | Ripe fruits eaten fresh, like a jam and vinegar (1), liquor | October to December (2) | South, Central, and North America, as well as records in Australia and South Africa (6); Brazil, Mata Atlântica (5); Pantanal, De, An |
| Poaceae *Oryza latifolia* Desv. | Arroz-do-pantanal, arroz-do-campo | Seeds: galinhada (rice and jerk chicken) (3) | May to June (2) | South and Central America, from Brazil to México (5); Brazil, Amazônia, Cerrado, Mata Atlântica, and Pantanal (6); Pantanal, Fl (1); Ms |
| Rubiaceae *Genipa americana* L. | Jenipapo | Ripe fruits (pulp) used to make jams and liquor (1) and juice (3) | October to December (2) | South and Central America, from Argentina to México (5); Brazil Amazônia, Caatinga, Cerrado, Mata Atlântica and Pantanal (6); Pantanal, An, Rf |
| Sapotaceae *Pouteria glomerata* (Miq.) Radlk. | Laranjinha-de-pacu | Ripe fruits (pulp) eaten fresh (1) | January to August (2) | South and Central America, from Brazil to México (5); Brazil, Amazônia, Cerrado, and Mata Atlântica (6); Pantanal, Rf |

Sources: (1) Bortolotto et al. (2015), (2) Pott and Pott (1994), (3) Damasceno-Junior and Souza (2010), (4) Salis and Mattos (2009), (5) GBIF.org (2018), (6) Flora do Brasil (2020), (7) Bortolotto et al. (2019), (8) Pennington (1997), (9) de Matos Alves (2014)

*De* Deciduous forest, *Sd* semideciduous forest, *Ce* Cerrado, *Rf* riparian forest, *Fl* floodplains, *Ch* Chaco, *An* anthropogenic, and *Ms* monodominant stands

the diet, utilizing the pulp, heart of palm, and nut (Table 1). The fruit pulp is used for consumption in natura and in cakes, ice creams, and flour; the nut has several alimentary uses in natura, in preparing coconut sweet and milk mix, and in the production of edible oil (Bortolotto et al. 2017) and jams (da Silva et al. 2017). It has excellent yield (each bunch produces 6.32 kg of pulp and 1.36 kg of endosperm (nut) (Sanjinez-Argandoña and Chuba 2011)). In Corumbá, the flour obtained from the dehydrated pulp is commercialized (Dias and Galvani 2017).

The stipe and the roots contain starch (Peña 1976), but their uses were not observed in the Pantanal. The flour obtained from the processed amylaceous fibers


**Fig. 1** Fruits and seeds of wild food plants from the Pantanal. (**a**) *A. aculeata* (fruits); (**b**) *A. aculeata* (pulp); (**c**) *A. phalerata* (fruits); (**d**) *A. phalerata* (seeds); (**e**) *C. alba* (fruits); (**f**) *I. laurina* (fruit); (**g**) *P. ruscifolia* (fruits); (**h**) *V. cymosa* (fruits); (**i**) *Byrsonima cydoniifolia* (immature fruits); (**j**) *Plinia cauliflora* (immature fruit); (**k**) *O. latifolia* (grains; (**l**) *G. americana* (fruit); (**m**) *P. glomerata* (fruits). (Pictures by Paulo Robson de Souza, except **f** (A. Pott) and **b**, **d**, and **m** (Ieda Maria Bortolotto))

of *A. aculeata* stipes was recorded for the Ayoreo people of the Paraguayan Chaco (Schmeda-Hirschmann 1994). Women of the Terena indigenous ethnicity in Mato Grosso do Sul consumed the heart of palm of *Acrocomia* spp. after childbirth to stimulate milk production (Oberg 1949). In general, the main alimentary uses are the fruits and heart of palm. It is the species with the highest use value in rural communities in the western edge on the Pantanal (Bortolotto et al. 2015).

**Nutritional Composition Data**

The edible portion composed of pulp and nut of *A. aculeata* represents circa 48% of the total fruit weight; the pulp is rich in total lipids, carbohydrates, fibers, and β-carotene, with considerable concentration of potassium, calcium, and phosphorous, showing to be a fruit with excellent yield and nutritive value for consumption in natura or in culinary (Prates et al. 2015). The pulp oil has an intense orange color characterized by the presence of carotenoids and high concentration of oleic acid (Hiane et al. 2005; Ramos et al. 2007). The nut oil is transparent, with a predominance of oleic and lauric fatty acids (Prates et al. 2015). The oils of both pulp and nut are also utilized for consumption or in pharmaceutical and cosmetic industries (Ciconini et al. 2013).

Regarding its nutritional composition, *A. aculeata* fruit pulp contains 52.99% moisture, 22.10% of carbohydrates, 8.14% of lipids, 1.50% of protein, 13.76% of fibers, and 167.67 calories in 100 g of pulp. The fresh pulp presents high concentrations of calcium 61.96 mg/100 g, phosphorous 36.70 mg/100 g, and potassium 766.37 mg/100 g and lower concentrations of sodium 3.74 μg/g, iron 7.81 μg/g, manganese 138 μg/g, zinc 6.02 μg/g, and copper 2.43 μg/g. This fruit is also rich in β-carotene (49.0 μg/g of pulp), contributing to the enrichment of the regional diet (Ramos et al. 2008).

***Attalea phalerata* Mart. ex Spreng.**
**Characteristics and Traditional Uses**

*Attalea phalerata* is a palm locally known as *acuri* or *bacuri* (Table 1). It is widespread from Brazil to Peru, occurring in several physiognomies in the Pantanal, mostly in monodominant formations called *acurizal* (Table 1). The fruit is an ellipsoid drupe of approximately 5 cm long, green when immature and yellow when ripe (Fig. 1c). The fruits have fleshy mesocarp, yellowish when ripe (Fig. 1d).

The pulp (ripe or green), as well as the nut of the fruits, is edible; the oil obtained from the nut, the flour made from the mesocarp, and the heart of palm have traditional uses in the diet (Table 1). The coco water of immature fruits can also be consumed (Pott and Pott 1994). The edible oil extracted from the nut was not mentioned in recent ethnobotanical works in the Pantanal but has economic importance in Bolivia (Moraes et al. 1996). The use of fruits (nut and pulp) and heart of palm in the diet and the utilization of *chicha*, an alcoholic drink (used only in the past), is associated with the Guató and Bororo indigenous culture in the Pantanal (Schmidt 1942; Hartmann 1967; de Oliveira 1996).

**Nutritional Composition Data**

The potential of the nut protein (de Lima Mendes Ramos et al. 2017) and the pulp oil (de Lima et al. 2016, 2018) of *A. phalerata* fruit has been explored in experimental research. The ripe fruits of *A. phalerata* have a pulp rich in carotenoid pigments (pro-vitamin A), copper, and magnesium (Hiane et al. 2010). Additionally, the pulp lipidic fraction presents fatty acids with a predominance of oleic and palmitic acids, which can have considerable anti-inflammatory effects with potential nutraceutical properties (Freitas de Lima et al. 2017); it also has cytoprotective activity, probably for its capacity to inhibit the action of free radicals (de Lima et al. 2018). The fruit nut has high oil content and is rich in phosphorous and a source of iron (Hiane et al. 2010). The oleic and lauric fatty acids were the main compounds found in the nut oil (da Silva Baldivia et al. 2018). In Bolivia, the oil extracted from the nut (60–70% of dry weight) is rich in lauric and myristic fatty acids, comparable with other tropical oil crops (Moraes et al. 1996).

Regarding nutritional composition, the pulp of *A. phalerata* presents 56.90 g/100 g of moisture, 35.13 g/100 g carbohydrates, 5.97 g/100 g lipids, and low levels of ashes (1.25 g/100 g) and protein (0.75 g/100 g) (Siqueira et al. 2016).

***Copernicia alba* Morong**

**Characteristics and Traditional Uses**

*Copernicia alba* is a palm locally known as *carandá* (Table 1). It has occurrence in Brazil, Bolivia, Argentina, and Paraguay in South America (Table 1). In Brazil, it occurs only in the Pantanal, mostly in monodominant formations called *carandazal* (Table 1). The fruit is globous to ovoid, of approximately 1.2 cm in diameter, green when immature and black when ripe, with one seed (Moraes 2014). The fruits have a fleshy mesocarp, dark brown or almost black when ripe (Fig. 1e). The fruits ripen over an extended period, between April and November; some trees keep fruits until January (Silva 2018). The fruit production is considered high, more than 20 t/ha (Silva 2018).

The ripe pulp and the heart of palm have traditional uses in the diet in Porto Murtinho (Table 1). *C. alba* is gathered by the Ayoreo of the Paraguayan Chaco; the heart of palm is eaten raw or cooked in water or in ashes, and the palm ashes were used as a salt substitute (Schmeda-Hirschmann 1994; Peña-Chocarro et al. 2006), made from the burned spathe; the heart of palm is also consumed baked or ground as a flour (Peña-Chocarro et al. 2006). The Toba and Whichí of the Paraguayan Chaco consume the fresh fruits, and the Lengua-Maskoy ferment them to prepare *aloja* (Peña-Chocarro et al. 2006). The apex extracted from the local palm *C. alba* was mentioned for use by the Chorote Indians in Argentina although unexploited at present (Arenas and Scarpa 2007). A liquor was developed from the pulp of fruits harvested (Silva 2018).

**Nutritional Composition Data**

In the pulp of *C. alba* collected in Corumbá and Porto Murtinho, a moisture content of 54.12%; good levels of total carbohydrates (27.92%), lipids (6.03%), and proteins (3.39%); energetic value of 232.8 Kcal/100 g; and considerable content of ashes (3.71%), with considerable potential for food products (Silva 2018). The contents of lipids are around 48% in seeds of ripe fruit and 40% in the immature; in contrast, the peel of the ripe has a lower fat level (0.5%) than in the immature fruit (0.8%), and in the pulp, both values are very low (0.1%) (Silva 2018). The fruit contains bioactive phenolic and medicinal compounds and unsaturated fatty acids (Silva 2018). Furthermore, the fruit has high vitamin C content, of 20.5 mg/100 g, equivalent in the peel and the pulp (Silva 2018), thus, a valuable raw matter for functional foods as an antioxidant source.

In a province in Argentina, the values found in this fruit seem discrepant, consisting in 4.70% moisture, 82.80% total carbohydrates, 24.30% crude fiber, 1.90% lipids, 8.60% proteins, and 6.70% ashes. The fruit was rich in minerals such as sodium (31.13 mg/100 g), potassium (856.83 mg/100 g), magnesium (54.96 mg/100 g), calcium (98.73 mg/100 g), and expressive levels of iron (1.37 mg/100 g), manganese (0.72 mg/100 g), and zinc (0.29 mg/100 g) (Gorostegui et al. 2011). However, because the analyses in the Brazilian study were expressed on a fresh basis and the Argentinian one on a dry basis, the discrepant values of nutritional composition between the studies are justified and also can be further explained by differences between regions where the fruits were collected since factors such as soil and climate influence its composition.

**Fabaceae**
***Inga laurina* (Sw.) Willd.**
**Characteristics and Traditional uses**

*Inga laurina*, known as *ingá*, is a tree species widely distributed in South and Central America (Table 1). Its fruits are plane to convex pods (flat to convex) (Fig. 1f), margins slightly raised or not, glabrous, and yellowish to green-yellowish color (Pennington 1997), which varies with the degree of ripening (Martins et al. 2014). The edible part of the fruit is a white sarcotest, commercialized in El Salvador (Pennington 1997), and has sweetish taste. In the Pantanal, they are consumed in natura (Table 1). It has potential for various culinary uses (Kinupp and Lorenzzi 2014), as well as other species of the genus, such as *I. vera* Willd. (Bortolotto et al. 2017). *I. vera* is a species that also occurs in the Pantanal, even more common and more abundant than *I. laurina*, forming monodominant populations especially in the riparian forests of the Paraguay River and affluents, with fruits mainly in the flood season (Damasceno-Junior et al. 2005). However, nutritional data are yet lacking on *I. vera*.

**Nutritional Composition Data**
The fruit of *I. laurina* has the shape of a slightly curved pod; the peel is thin, with green-yellow color, which varies with the degree of ripening (Schulz et al. 2014). The fruits of *I. laurina* are constituted by pulp (41%), peel (39%), and seed (20%). For industrial use, higher pulp yields are obtained when optimizing the selection for more fresh mass and fruit length, once they are good indicators of the high association of these characteristics with pulp yield (da Silva Oliveira et al. 2019).

Regarding nutritional values, *I. laurina* fruit has high moisture content (85.39%); thus, it is more prone to deterioration. It has 81.91 Kcal/100 g of energy value; low contents of proteins (0.13 g/100 g), lipids (0.0007 g/100 g), and ashes (0.14 g/100 g); and expressive values of carbohydrates (13.52 g/100 g). For containing high levels of phenolic compounds (110.67 mg GA 100 g) and considerable quantities of vitamin C (1.60 mg AA 100 g), the fruit can be considered having a promising antioxidant potential (de Lima and Portari 2019).

When compared with the conventional apple (*Malus domestica* Borkh.), widely commercialized in Brazil, *I. laurina* contains high levels of phenolic content. Moreover, for its functional properties to health, it is advisable to stimulate the development of products by pharmaceutical and food industries and to promote the sustainable utilization of native fruits in areas with easier access, for both consumers and industries (de Siqueira et al. 2013).

### *Prosopis ruscifolia Griseb.*
### Characteristics and Traditional Uses

*Prosopis ruscifolia*, known as *algarrobo*, is a tree species, also belonging to the Fabaceae family. It has occurrence in Brazil, Bolivia, Argentina, and Paraguay in South America (Table 1). In Brazil, it occurs in the Caatinga and in the Pantanal (de Souza-Lima et al. 2017) (Table 1). The fruit is a drupaceous loment (Noguchi et al. 2009) (Fig. 1g) ripe in the dry months (Table 1). The sweetish fruits (Pott et al. 2004) have known traditional food uses for production of flour, preparation of bread and cakes, and an alcoholic drink (*chicha*) (Table 1). These were mentioned as food when going to the field, for example, and are used sporadically (Bortolotto et al. 2019). The seeds of *P. ruscifolia* are edible, roasted, and grinded (Boeri 2016). Other three species with edible fruits, *P. alba* Griseb, *P. nigra* Hieron., and *P.* Hassl., were also recorded for the Brazilian Chaco in the municipality of Porto Murtinho (Sartori et al. 2018). An *algarroba* beer prepared from fruits of *P. alba*, the "*aloja de algarroba*" (in local Spanish), is an ancient alcoholic drink of the Whichís (Argentina and Bolivia) (Cano et al. 2020) and other indigenous peoples from the Gran Chaco in South America (Arenas and Scarpa 2007).

### Nutritional Composition Data

The fruit of *P. ruscifolia* is an excellent source of proteins (12.7 g/100 g) and has high content of carbohydrates (78.5 g/100 g), lipids, (4.32 g/100 g) and fibers (17.8 g/100 g) (Freyre et al. 2003) (Table 2). It has been shown (Freyre et al. 2003) (Table 2) that the pulp flour contains a nutritional complement of adequate amino acids; thus, it is a fruit with high biological value proteins as a food and also for enrichment of food products. For the digestibility nearly complete in the gastrointestinal tract, the flour has a low allergenic potential (Mamone et al. 2019).

Regarding micronutrients, the seeds have an excellent content of iron (4.57 mg/100 g), zinc (3.89 mg/100 g), considerable values of calcium (1.528 mg/100 g), phosphorous (4.719 mg/100 g), and potassium (5.887 mg/100 g) (Freyre et al. 2003). For its high iron content, the fruit can be consumed with other foods (lemon, orange, and guava) that have ascorbic or citric acid to increase the availability of iron, thus, helping in an adequate and healthy diet (Bernardi et al. 2004).

**Lamiaceae**
***Vitex cymosa* Bertero ex Spreng**
**Characteristics and Traditional Uses**

*Vitex cymosa*, known as *tarumã*, is a tree belonging to the family Lamiaceae, with wide occurrence in Brazil and several countries of South and Central America (Table 1). The fruit is a globous drupe, with dark red or purple color at ripening (Fig. 1h). Its pulp is mucilaginous and juicy and has a sweetish taste. The fruits are abundant and cover the ground at maturity time (November to February) (Table 1). Besides traditional uses in the diet, for consumption in natura or as jam (Table 1), the ripe fruit has a potential to aromatize salty dishes, especially meats (Damasceno-Junior and Souza 2010). Although the fruit has a very strong sour-sweetish smell, unpleasant to some people, from it can be produced a syrup with economical potential for use in the cover of ice creams and cakes.

**Nutritional Composition Data**
*Vitex cymosa* fruit has a high moisture content (83.74g/100 g) that can cause fast deterioration since the proliferation of microorganisms is favored and consequently hinders fruit quality. In 100 g of whole fruits, low content of lipids (0.03%) and proteins (0.49%) were observed; however, it presents considerable values of total carbohydrates (9.34%) and fibers (4.66%). The fruit of *V. cymosa* is considered a food of low caloric value (36.6 kcal/100 g). However, the fruit is rich regarding micronutrients, potassium (287.8 mg/100 g), phosphorous (21.1 mg/100 g), and iron (0.43 mg/100 g), as well as vitamin C for children of 1–3 years of age and a source of fiber for children and adults (Caldeira et al. 2004). That was corroborated by results of fruits analyzed in Ecuador, showing that phosphorous and potassium were the main macro-minerals found in natura fruits (Guevara et al. 2020).

**Malpighiaceae**
***Byrsonima cydoniifolia* A. Juss.**
**Characteristics and Traditional Uses**

*Byrsonima cydoniifolia*, locally known as *canjiqueira*, is shrub or treelet that belongs to the Malpighiaceae. It occurs in several countries of South and Central America and most of Brazil (Table 1). It occurs in monodominant formations in the Pantanal (Pott and Pott 1994) and the Araguaia wetland (Brazil) (Marimon and de Souza Lima 2001). The fruits are globose, drupaceous, and juicy and measure circa 2 cm diameter, with color varying from yellow to orange when ripe (Fig. 1i). Besides the traditional consumption of the fruit pulp in natura in the Pantanal (Table 1), it can be used to prepare liquor, jam, ice cream, and sweets.

**Nutritional Composition Data**
The fruit composition of *B. cydoniifolia* revealed 655.5 g/kg moisture, 47.42 g/kg carbohydrates, and 252.6 g/kg de lipids; furthermore, the fruit presented 45.9 g/kg carotenoids and 1.82 g/kg ascorbic acid, showing to be a fruit with high antioxidant

**Table 2** Nutritional value of wild food plants of the Pantanal, Mato Grosso do Sul, Brazil

| Taxon | Local name | Moisture (g/100 g) | Carbohydrate (g/100 g) | Lipids (g/100 g) | Protein (g/100 g) | Fiber (g/100 g) | Total caloric value (kcal/100 g) | Reference |
|---|---|---|---|---|---|---|---|---|
| **Arecaceae** *Acrocomia aculeata* (Jacq.) Lodd. | Bocaiuva | 52.99 | 22.10 | 8.14 | 1.50 | 13.76 | 167.67 | Ramos et al. (2008) |
| *Attalea phalerata* Mart. *ex* Spreng. | Acuri; bacuri | 56.90 | 35.13 | 5.97 | 0.75 | – | – | Siqueira et al. (2016) |
| *Copernicia alba* Morong | Carandá | 54.12 | 27.92 | 6.03 | 3.39 | – | – | Silva (2018) |
| **Fabaceae** *Inga laurina* (Sw.) Willd. | Ingá | 85.39 | 13.52 | 0.0007 | 0.13 | – | 81.91 | de Lima and Portari (2019) |
| *Prosopis ruscifolia* Griseb. | Algarrobo | – | 78.5 | 4.32 | 12.7 | 17.8 | – | Freyre et al. (2003) |
| **Lamiaceae** *Vitex cymosa* Bertero *ex* Spreng. | Tarumã | 83.74 | 9.34 | 0.03 | 0.49 | 4.66 | 36.60 | Caldeira et al. (2004) |
| **Malpighiaceae** *Byrsonima cydoniifolia* A. Juss. | Canjiqueira; Canjiquinha | 65.55 | 4.74 | 25.26 | – | – | – | Marcelino et al. (2018) |
| **Myrtaceae** *Plinia cauliflora* (DC.) Kausel | Jabuticaba | 83.6 | 15.30 | 0.10 | 0.60 | 2.30 | 58.00 | UNICAMP (2011) |
| **Poaceae** *Oryza latifolia* Desv. | Arroz-do-pantanal; arroz-do-campo | 9.62 | 64.51 | 2.05 | 9.83 | 13.15 | 315.81 | Barbosa et al. (2017) |
| **Rubiaceae** *Genipa americana* L. | Jenipapo | 70.00* – 80.42** | 14.57** – 22.10* | 0.00* – 1.60** | 0.5* – 1.59** | 1.09** – 6.30* | 79.04** – 90.4* | *Pacheco et al. (2014) ** Hamacek et al. (2013) |
| **Sapotaceae** *Pouteria glomerata* (Miq.) Radlk. | Laranjinha-de-pacu | 85.22 | 10.93 | 0.32 | 0.69 | – | 49.36 | Nogueira et al. (2018) |

activity (Marcelino et al. 2018). These results show that knowing the nutritional properties of native fruits allows indicating their consumption in natura or as culinary ingredients; besides, the regular consumption of fruits with a considerable content of antioxidant compounds, such as *B. cydoniifolia*, prevents chronic non-communicable diseases (Gonzalez 2006).

Chemical analyses of the fruit composition of *B. cydoniifolia* showed derivatives of flavonoids and stilbenes, such as trans-piceatannol and resveratrol as the main secondary metabolites, demonstrating their anti-inflammatory and anti-hyperalgesic effect and sustaining its potential as a nutraceutical food (dos Santos et al. 2017). The fruits of *B. cydoniifolia* have potential as functional ingredients, and the oil has potential for edible uses (Marcelino et al. 2018). The pulp and the seed are significant sources of potassium and sodium, the seed having higher concentrations of calcium, copper, iron, manganese, magnesium, selenium, and zinc (Arakaki et al. 2020). Jam is an excellent alternative for the utilization of *B. cydoniifolia* fruits, due to the reduction of antinutritional factors and retention of bioactive compounds in processing this product (Prates et al. 2015).

**Myrtaceae**
***Plinia cauliflora* (DC.) Kausel**
**Characteristics and Traditional Uses**

*Plinia cauliflora* (*Myrciaria cauliflora* (Mart.) O. Berg), the *jabuticaba*, is a treelet circa 6 m tall, of the Myrtaceae family, and occurs in South, Central, and North America (Table 1), often grown in home gardens. Many Neotropical Myrtaceae have edible fruits. The fruit is a globose berry with approximately up to 5 cm in diameter (Fig. 1j), green when immature and purple when ripe. The pulp is whitish, soft, and sweet. The fruits have traditional consumption in natura and also as jams, vinegar, and liquor (Table 1). The fruits must be harvested fully ripe (soft), but for transport and storage, it is necessary to harvest them just before ripening (Damasceno-Junior and Souza 2010).

**Nutritional Composition Data**

For being widely consumed in Brazil, the nutritional composition of *P. cauliflora* is shown in the nutritional table of UNICAMP (2011); 100 g of fruit have contents of energy of 58 kcal, 0.6 g proteins, 0.1 g lipids, 15.3 total carbohydrates, and 2.3 g fibers. Regarding micronutrients, the fruit presents a high level of potassium (130 mg) and considerable levels of calcium (8 mg) and phosphorous (15 mg) (UNICAMP 2011).

Biazotto et al. (2019) evidenced in *P. cauliflora* high contents of carotenoids (326.70 μg/100 g) and total phenolics (109.65 mg GAE/100 g EF). Thus, their study demonstrated that this fruit represents an excellent resource with a technological and economic potential of bioactive compounds found in the Brazilian biodiversity of unexplored fruits, mainly in the nutritional and pharmaceutical areas.

An analysis of two cultivated varieties of *P. cauliflora* in Minas Gerais (Brazil) showed high contents of minerals, 2.75 g/100 g in Paulista and 3.82 g/100 g in

Sabará; in both, the component of insoluble fibers of 2.57 g/100 g and 3.30 g/100 g is higher than the soluble ones (de Lima et al. 2008).

**Poaceae**
***Oryza latifolia* Desv.**
**Characteristics and Traditional Uses**

*Oryza latifolia* is an emergent aquatic herb, approximately 2 m tall, perennial, belonging to Poaceae, the grass family (Pott and Pott 2000). This wild rice occurs in several countries of South and Central America (Table 1). In the Pantanal, it occurs in monodominant stands called *arrozal* in the floodplain of the Paraguay River (Bertazzoni and Damasceno-Júnior 2011). The grains are of the "agulhinha" type, small and reddish (Fig. 1k), with almond-like flavor. The rice ripens at the flood peak in the Pantanal (Table 1). Its cultural alimentary value is associated with indigenous people (Guató) from the Pantanal, but it has no longer been used in their diet (Bortolotto et al. 2015).

It is a species that can occupy extensive areas over the floodplain of the Paraguay River in years of more intense flooding. There are other four species of *Oryza* in the Pantanal: *O. alta* Swallen, *O. glumaepatula* Steud., and *O. grandiglumis* (Döll) Prod. (Filgueiras et al. 2015; Flora do Brasil 2020). Among these, *O. glumaepatula* presents high levels of total fractions of protein, albumin, and glutelin (protein, albumin, and glutelin fractions) (Santos et al. 2013).

**Nutritional Composition Data**
Its whole grain contains 9.62% moisture, 2.05% lipids, 9.83% proteins, 64.51% starch, 13.15% fibers, and 315.81 kcal of energy; these values are similar to *Oryza sativa* L., the commercial rice, a staple food in Brazil (Barbosa et al. 2017).

**Rubiaceae**
***Genipa americana* L.**
**Characteristics and Traditional Uses**

*Genipa americana*, *jenipapo*, is a tree belonging to the Rubiaceae family (Table 1). It has a wide distribution in Central and South America, including most of Brazil (Table 1). It is a dioecious species, i.e., only the female plant fructifies. The fruit is an oval berry (Fig. 1l) circa 8 cm, brownish when ripe. The pulp is spongy, juicy, and sweet, traditionally consumed in natura and as for sweets and juices (Table 1).

For being an easily perishable fruit, with peculiar sensorial characteristics that reduce its acceptability in natura, thus, aiming to avoid losses and increase the potential of its consumption, strategies that help its conservation and acceptance are searched, such as drying by osmotic dehydration using an osmotic agent, such as sugar, increasing the shelf life, palatability, and acceptance in comparison with the in natura fruit (Andrade et al. 2003).

**Nutritional Composition Data**
Regarding chemical composition, *G. americana* presents 70% moisture, 22.1% carbohydrates, 0.0% lipids, 0.5% proteins, and 6.3% alimentary fibers, besides

2.0 mg/100 g de vitamin C, 176.3 mg/100 phenolic compounds, and 70.2% of antioxidant capacity (Pacheco et al. 2014). Another nutritional study that also assessed the *G. americana* fruit found 80.42 g/100 g moisture, 14.57 g/100 g carbohydrates, 1.60 g/100 g lipids, 1.59 g/100 g protein, 1.09 g/100 g fibers, and total energetic value of 76.92 kcal/100 g (Hamacek et al. 2013). Thus, *G. americana* is a fruit with considerable nutritional values, besides high antioxidant capacity, and its inclusion in the regional diet is indicated. The fruit contains essential oil, tartaric acid, and glucose (Prance 1989).

**Sapotaceae**
***Pouteria glomerata* (Miq.) Radlk.**
**Characteristics and Traditional Uses**

*Pouteria glomerata* is a tree of the Sapotaceae family, locally known as *laranjinha-de-pacu* (Table 1), in allusion to its use as fishing bait. It occurs in several countries of South and Central America, frequently found in Pantanal riparian forests (Table 1). The fruits are fleshy, globose berries, with green peels when immature and yellow when ripe. It can present the shape of a squash pumpkin (undulated), and so it also receives the name of *moranguinha* (Fig. 1m). The edible part is the pulp, with a pleasant acid taste, traditionally consumed in natura (Table 1). For its acidity (presence of tartaric and malic acids) and pectin content, it forms a gel, being excellent to prepare jams. It has been utilized for the production and commercialization of frozen pulp for juices, popsicle, ice cream, and jams (Bortolotto et al. 2017) or sold in natura (Damasceno-Junior and Souza 2010).

**Nutritional Composition Data**
The pulp of this fruit contains 85.22% moisture, 10.93% carbohydrates, 0.32% lipids, 0.69% proteins, 0.64% ashes, 4.94% tilted acidity, and 3.19 pH (Nogueira et al. 2018). *P. glomerata*, besides vitamin C (34.87 mg/100 g), can be considered an excellent source of bioactive compounds, with antioxidant potential attributed to its phenolic compounds, anthocyanins (0.65 mg/100 g), carotenoids (0.93 mg/100 g), and flavonoids (9.63 mg/100 g), with beneficial effects on human health (Teixeira et al. 2020).

## 3 Discussion

The results show that the selected food plants in this work have rich nutritional values, wide geographical distribution, and abundance in the native physiognomies, with available nutrients spread over the year (Table 1). These species have been the target of projects that incentivize their utilization in communities of various municipalities. The combination of vast populations of the native species here presented with high production of fruits and high nutritional value offers support to nutritional security most of the year.

### *3.1 Nutritional Value*

The three species of the Arecaceae family, *A. aculeata, A. phalerata,* and *C. alba*, have abundant fruits over a great part of the year and wide distribution in the Pantanal (Table 1), besides the heart of palm, little used. The endosperms of the *A. aculeata* and *A. phalerata* represent excellent sources of calories and edible oil for the local diet (Table 2), especially of the oleic and lauric fatty acids (Hiane et al. 2005; da Silva Baldivia et al. 2018). *A. aculeata* is rich in Mn, Cu, P, Mg (nut), Cu, and pro-vitamin A (pulp) (Hiane et al. 2010), what certainly justifies its broad use by the human populations, with the highest value of local use among the native food species, either in the present or in the past (Herberts 1998; Bortolotto et al. 2015).

Vitamin A is an essential component in the diet, and its deficiency still is a public health problem in several places in the world (Greiner 2013). Its availability to the rural human populations is a relevant health factor. A recent study evaluated the deficiency of vitamin A (DVA) in children and the associated factors, including all Brazilian regions, including the Central-West where the Pantanal is, in both rural and urban areas (Lima et al. 2018). Those authors found that DVA prevailed in the urban zone, even that the population resident in the rural zone presents a higher vulnerability to nutritional deficiencies at the world level. Considering that the precursors of vitamin A, mainly β-carotene, are found in the fruits of *A. aculeata* and *A. phalerata*, their continuity in the diet ought to be stimulated. Moreover, the fatty acids found in nuts of *A. phalerata* are important regulators of the metabolism and are frequently associated with a reduction of serum cholesterol and body fat and a lower risk of developing cardiovascular diseases (da Silva Baldivia et al. 2018).

In general, the fruits of *V. cymosa*, *G. americana*, *I. laurina*, and *P. glomerata* present nutritional compositions with reduced values of lipids and considerable quantities of ashes, moisture, and carbohydrates. *B. cydoniifolia* has slightly higher contents of lipids than those fruits. *O. latifolia* contains a higher protein level, and the palms *A. aculeata* and *A. phalerata* show significant values of proteins and lipids, plus other constituents. Besides these nutrients, all fruits exhibit phenolic compounds and vitamin C and carotenoids, especially the orangish fruits, which contain bioactive compounds with antioxidant properties. For the antioxidant action to occur, it needs to inhibit or impede the auto-oxidative process caused by free radicals, besides having stability about their intermediate compounds formed (Finco et al. 2012). *P. ruscifolia* fruit has a high alimentary and technological potential for the traditional communities of the Chaco since its nutritional composition is rich in several nutrients that help in the human body organic functions, besides the food security of communities more susceptible to nutritional deficiencies.

It is known that a diet containing essential nutrients and with the addition of substances of nutraceutical potentials, in a healthy lifestyle, can exert a fundamental role in prevention and or treatment of non-communicable diseases (Pereira and Cardoso 2012) and other illnesses, e.g. severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) caused by the coronavirus 2019 (COVID-19) (de Faria Coelho-Ravagnani et al. 2020).

The nutritional status of people infected by SARS-CoV-2 is indispensable to indicate a better prognostic and can influence the severity of the condition. The supplementation from a diet rich in probiotics, vitamins, and minerals does not act preventively neither in the treatment of the infection by COVID-19 but can improve the immune response in an auxiliary way. As such, the intake of vitamins C and D, zinc, and selenium is beneficial to individuals with or under risk of viral respiratory infections (de Faria Coelho-Ravagnani et al. 2020).

In Brazil, the most immediate consequence of the health crisis caused by COVID-19 pandemic is the worsening of food insecurity due to income restrictions limiting food access (da Silva Filho and Gomes Júnior 2020). Thus, incentives are needed to the consumption and valuation of native fruits available locally since most contain considerable quantities of vitamin C and other vital nutrients. With the social distance to slow the spread of COVID-19, the search for local products is being driven by economic reasons in evaluating the consumption of seasonal and regional foods, once these fruits are available to the local community.

### *3.2 Geographic Distribution and Abundance of WFP in Native Vegetation*

Most food species of this chapter occur in several phytogeographic domains in South and Central America (Table 1) and are part of the food culture there, besides the Pantanal. That is especially evident in the neighboring countries Bolivia and Paraguay, with similar recorded uses to the mentioned for the Pantanal for species such as *A. aculeata* and *A. phalerata*, with production of oil, flours, and other products (Schmeda-Hirschmann 1994; Moraes et al. 1996). The fruits as the most important species culturally can be obtained over all months of the year (Table 1), what is strategic in terms of food and nutrition security and food sovereignty for the local populations.

Moreover, several species mentioned here as the most important culturally have high nutritional value and are abundant in the Pantanal. *B. cydoniifolia*, *A. phalerata*, *C. alba*, and *O. latifolia* grow as monodominant formations (Table 1), besides the occurrence of *Inga vera*. Monodominant formations are vegetation types characterized by the dominance of a single species, generally over 50% of the individuals or the cover (Hart 1990). One of the causes of monodominance in wetlands is the flood (Hart 1990). The names of these formations are associated with the local names of the species names: *canjiqueiral*, the formation of *B. cydoniifolia*, *acurizal* of *A. phalerata*, *carandazal* of *C. alba*, and *arrozal* of *O. latifolia* (Damasceno-Junior et al. (in press)). *B. cydoniifolia* is a pioneer species with high capacity to colonize open environments such as grasslands, a process called encroachment (Barbosa da Silva et al. 2016). Many ranchers control such species that take over native grasslands, e.g., *B. cydoniifolia* is cut before the flood or pulled down by tractors (Pott and Pott 1994). The occupation of *A. phalerata* and the abundance of *A. aculeata* are also associated with disturbed areas.

Indeed, all these species seem monocultures for the characteristics of their occurrence. Given their nutritional value, they constitute a great opportunity for utilization as a source of alternative income for rural properties and for local communities. Every year these species produce tons of products such as fruits and grains without an associated productive chain yet. As an aggravating factor, stands of valuable plants are eliminated in favor of grasslands. The use of these species by traditional communities and rural properties can configure an excellent opportunity for conservation of these ecosystems, as well as can offer unique products and could receive the denomination of origin, for example.

### *3.3 Products and Services Associated with Conservation (Sustainable Use) and Innovation*

The use of wild foods, especially in low-income rural communities, which still have access to the biodiversity and detain knowledge on how to use it, is a strategy that can be very important for the food security under risks of climatic changes (Smith et al. 2019) and to improve health in the face of the COVID-19 pandemics, as mentioned earlier. Knowledge on the nutritional value of these fruits gives support to public policies that promote the sustainability for their subsistence, mainly in the aspect of food security of the Pantanal riverine communities.

Despite abandoning the use of traditional (*O. latifolia*) or neglected species (e.g., oil of palms), considering their abundance and wide distribution, they can still supply the daily dietary needs of the populations, especially those under food shortage. The situation of neglected food species and the need for initiatives to improve the acceptance of wild foods is under discussion in ethnobotanical studies (do Nascimento et al. 2013). In Brazil as well as in other South American countries, there are already advances aiming to conserve the culture and biodiversity associated with incentives to the use of native flood plants (May and da Vinha 2013; Depenthal and Meitzner Yoder 2017).

The Universidade Federal de Mato Grosso do Sul and several partners have projects in this line such as the program "Sabores do Cerrado & Pantanal" (Bortolotto et al. 2017) to strengthen technological practices to aggregate value in the income of traditional riverside communities, besides promoting knowledge in the academic area, qualification of the external community, symposia, and courses on the valuation of food plants of the Cerrado and Pantanal. Research and extension actions were developed in the last 15 years to incentive the consumption of native species abundant in the Pantanal, with cultural bound and with potential to improve the income of small communities (Damasceno-Junior and Souza 2010; Bortolotto et al. 2017). Thereby, the utilization commercialization (to obtain income) in small communities of the Pantanal was awakened and started a process of cultural rescue with incentives to the use in the local diet that has to be associated with the conservation of biodiversity and sustainable development (Candil et al. 2007).

Although neglected in the past century by the big market and without attention from public policies aiming their scientific study until the middle of the 1980 decade, the native species have gained importance over the last years, following a worldwide movement related to the use of wild food plants (Termote et al. 2011; Menendez-Baceta et al. 2012; Molina et al. 2012; Smith et al. 2019; Cano et al. 2020). However, they still need to be better explored in the nutritional aspect. Most are present in preparations of flours and oils or are tasty ingredients of ice creams, preserves, and other products. Thus, they deserve more attention as potential sources of nutrients, mainly in natura, and also as an income source for the population. The production of flours and oils is an essential strategy of the local populations to store foods for periods with low availability of the resources and for commercialization and to improve income.

The pulp flour *A. phalerata*, for example, is utilized for cakes, bread, and sauces; from the nut can be made coco sweet and extract edible oil. The pulp flour arises high interest for its nutritive value, consistency, taste, and flavor of excellent quality (Damasceno-Junior and Souza 2010). Recent studies showed that the pulp and the nut of *A. phalerata* are adequate ingredients for the formulation of müsli since they demonstrated improvement in the characteristics of color, texture, and nutritional and energetic value of the product compared with the analyzed commercial granola (Mendoza et al. 2016). *I. laurina* has functional properties for health, being important to stimulate the development of products in pharmaceutical and food industries, with sustainable use of the fruits (de Siqueira et al. 2013). Similarly, *P. ruscifolia* as well as other species of *Prosopis* have a high potential for food utilization (Boeri 2016). *C. alba* fruit has an excellent nutritional value with high vitamin C and represents a great potential for new food products (Silva 2018).

Despite this potential for traditional utilization in the Pantanal and potential for innovation, the products are still not conventional in the big markets and somehow neglected, called unconventional food plants (UFP) (Kinupp and Lorenzzi 2014). An UFP can be exemplified by *B. cydoniifolia*, with relevant nutritional and nutraceutical value, but has been neglected. With adoption of sustainable technologies, it will be possible to innovate and to valorize the use of traditional wild food plants of the Pantanal and to conserve both biodiversity and culture. The identification of challenges and solutions able to influence practices in the chains of local supplies can favor the sustainability of the global production ecosystem (Tomas et al. 2019). The collaboration of scientific research represents an important role to play, besides actors outside the academy encompassing local communities, indigenous groups, manager agencies, *non-government organizations* or NGOs, big transnational corporations, and governmental actors. The consumers can also be influent in the promotion of sustainability, guiding their purchases with sustainable thinking (Nyström et al. 2019).

The market trend for growth of sustainable production and consumption stands out, besides some emergent questions ending up to insert, influence, or press for transformations in the ways of relationship with the environment, the form to produce, transform, and consume the foods (da Veiga Dias et al. 2015). Some actions were suggested to strengthen the initiative "Plants for the Future" of the Ministry for Environment: the incentive to actions that stimulate people to consume products from the native biodiversity, creating demand for new products and diversifying the diet of the families; the increase and promotion of the use of these species, also in school diets; and stimulation to higher participation of components of the native biodiversity in strengthening the national gastronomy (MMA 2016).

Family agriculture is conceived as the guardian of the biological diversity, being responsible for the introduction of new species of products from the native biodiversity in the commercial circuits of the agro-alimentary system, as well as supplier for cosmetic and pharmaceutical industries (Mendes et al. 2014). From the utilization of fruits of the Pantanal, new rural family enterprises and the traditional and extractivist communities can stand out in food production and increase their income, with increased quality of life and the potential of regional sustainable development. The socioeconomic and cultural potential of native plant species of the Pantanal is valuable, and it can contribute to the supply of new products with nutritional and functional quality, bringing benefit to consumer health.

The combination of large populations of the species with the high production of fruits with high nutritional value offers nutritional security in most part of the year. Considering only these 11 species (Tables 1 and 2), it is noticeable that the availability of fruits over the year can provide essential nutrients in nearly all months.

## 4 Final Considerations

Until recently, most morphotypes of *bocaiuva* palms were identified as *A. aculeata*, while *A. totai* was considered a synonym. Later, both species became valid again, with occurrence in Central Brazil (including Pantanal) (Lorenzi 2010). However, a morphometric and molecular investigation showed the species occurring in the Pantanal is *A. totai*, besides the very rare and newly described *A. corumbaensis* (Vianna and Campos-Rocha 2020). The scientific works about nutritional data compiled in this chapter refer to *A. aculeata*, most times to an herbarium voucher, but that has not been updated in herbaria, to differentiate *A. aculeata* from *A. totai*.

The botanical collection of palms is not a simple task, demanding a specific training; however, there is a strong recommendation that a voucher shall be deposited in herbarium to allow tracking the data. Studies on food plants or with food potential included in genera such as *Oryza*, *Hymenaea*, *Campomanesia*, *Passiflora*, and *Arachis* (Bortolotto et al. 2018) represented in the Pantanal by various species ought to fulfill this requirement. *O. alta*, for example, is considered a synonym of *O. latifolia*, but it is still accepted as a distinct species. Such taxonomic controversies are frequent until they are settled among specialists. Since many native species have gained visibility recently, by a function of the results of studies on the nutritional value of wild food plants so far neglected, there is still a need for taxonomic revisions of species with doubtful identification. Also, care should be taken when searching a plant in the literature since it may have been reported with a name that became a synonym and so is not retrieved, e.g., *Scheelea phalerata*, now *Attalea phalerata*.

However, such situation is not restricted to palms either to our work. Many reports on nutritional value did not indicate a herbarium specimen, despite the recommendations. The use of wild plants for food and nutrition requires precise data, reliable and accessible about their composition as the data users must be sure about the reliability of the identification and naming of flood plants (Nesbitt et al. 2010). Those authors analyzed the identification and nomenclature of plants in 50 articles referring to 502 sampled species, each one associated with one or more nutritional data. They noted that from the 502 sampled plants, only 36 followed the best practices for plant identification and recommend that researchers should identify, name, and publish the species correctly.

Given the relevance of the Central-West native species destined to food and health, generally produced and commercialized by small farmers and local communities, we suggested to research funding organs to direct resources and incentives to the priority native species in the scope of the initiative "Plants for the Future," including public policies, as well as to maximize the application of resources in multidisciplinary and multi-institutional network efforts (MMA 2016). We point out that among the 11 species selected for this chapter, only *A. aculeata*, *P. cauliflora*, *G. americana*, and *O. latifolia* were included in the proposed "Plants for the Future," demonstrating the need to improve knowledge about species of the Pantanal, which also have widespread occurrence and high food potential.

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