

**BROMELIADS: TRADITIONAL PLANT FOOD IN LATIN AMERICA
SINCE PREHISPANIC TIMES****Claudia T. Hornung-Leoni***Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo
Apartado Postal 69-1, Plaza Juárez Centro, Pachuca, Hidalgo, México.**Tel.: (52) 771 71 72000, Ext. 6655 Fax: 771 71 72000, Ext. 2112.**Correo electrónico: clauhl@gmail.com; hleoni@uaeh.edu.mx***ABSTRACT**

Bromeliads are monocots that have been consumed by natives in Latin America since pre-Hispanic times. The principal ways bromeliads are used as food sources include the whole fruit or another part of the plant. They are eaten as a vegetable or prepared in beverages (fermented or unfermented). This study includes local literature, personal observations and open interviews with people who know about the alimentary uses of bromeliads. The results cover ten countries and 24 species of bromeliads which have been reported and described as traditional foodstuffs. Of these, 76.9% have only a single use and 23.0% have two different uses. One species (*Bromelia pinguin*) has three different uses. Even in the present day these plants are still eaten as vegetables (12 sp.), used to prepare beverages (11 sp.) and/or consumed directly as fruits (nine sp.). It is important to note that contrary to expectations, in Latin America bromeliads are consumed more as vegetables than fruits.

Key words: Bromeliaceae, uses, food, Latin America.

RESUMEN

Las bromelias son monocotiledóneas que han sido consumidas por los nativos desde tiempos prehispánicos. Los principales usos de las bromelias como fuente alimenticia incluyen desde el fruto completo hasta una parte de la planta, consumidas como vegetales o en bebidas preparadas (fermentadas o no). Este trabajo incluye literatura local, observaciones personales y entrevistas abiertas a pobladores. Los resultados incluyen diez países y 24 especies de bromelias de las cuales se han registrado y descrito un uso tradicional alimenticio, de las cuales el 76.9% presenta un solo uso y el 23.0% dos usos diferentes, contrastando con una sola especie (*Bromelia pinguin*) que tiene tres usos diferentes. Estas plantas han sido consumidas, incluso en nuestros días, como vegetales (14 especies), para preparar bebidas (11 especies) y/o directamente como frutos (nueve especies). Es importante resaltar, que contrario a lo esperado, las bromelias son más consumidas en Latinoamérica como vegetales que como frutos.

Palabras clave: Bromeliaceae, usos, alimento, Latinoamérica.

INTRODUCTION AND METHODS

The Bromeliaceae are plants principally found in the neotropics (Benzing, 2000) and include about 3172 species in 58 genera (Luther, 2008). The family includes epiphyte species such as Spanish moss (*Tillandsia usneoides*), saxicolous species such as “guapilla” (*Hechtia glomerata*) and terrestrial species such as the pineapple (*Ananas comosus*) (Benzing, 2000). However Bromeliaceae is much more than a source of pineapple, house plants and fiber for traditional uses. Various cultures have been using bromeliads for thousands of years (Bennett, 2000). The Aztecs, Mayas, Incas, Quechuas, Yanomami and other peoples used them for food, fiber, ceremonies, medicine and ornamental plants (Bennett, 2000; Pierce 2000; Rondón, 2003), just as they are still used in the present day. Since their tissues accumulate water and nutrients, plants in this family have long been consumed by both humans and animals.

Bromeliads have been studied from various points of view since they have always been very important to ecosystems, due to their biological interactions and as food resources for animals. The aim of this study was to compile information on human consumption of bromeliads, because this a less well known use of the family. We compiled data from personal observations, open interviews with local people from various countries, and a literature review. This study is focused on the use of bromeliads as food, principally from an anthropocentric point of view.

The study summarizes an updated review of recent and local literature. It also includes open interviews with local people as well as personal observations carried out in the

field in Venezuela (Andes, Mérida state; Caracas), Mexico (Jalisco and Hidalgo states), Peru (Huascarán, Huaráz) and Chile (Santiago and Valle de Aconcagua, and Valle de Colchagua). The first step was to use photographs of the plants to ask people if they knew the plants. They were asked about the uses they made of the plants. Afterwards the plants were examined in their environment so they could be identified. The interviewees were local people, usually farmers, with the exception of some urban people interviewed in capital cities, such as Caracas and Santiago. The results of the open interviews are cited in the text as “pers. comm. name” (the name of the informant). Materials of the collected species were deposited in Latin American herbaria: Peruvian species were deposited in USM (Universidad Nacional Mayor de San Marcos, Lima, Peru), Chilean species in HDCV and some duplicates in SGO (Museo Nacional de Historia Natural, Santiago, Chile). In Venezuela, vouchers were deposited in MERC (Universidad de Los Andes, Ciencias, Mérida, Venezuela), and in Mexico the material from Hidalgo was deposited in HGOM (Universidad Autónoma del Estado de Hidalgo, Centro de Investigaciones Biológicas, Mexico). Vouchers from USM, US (Smithsonian Institution, USA), F (Field Museum of Natural History, Chicago, USA) and VEN (Fundación Instituto Botánico de Venezuela, Caracas), with emphasis on *Puya*, were also reviewed, and only cases with ethnobiological information from herbarium specimen labels are mentioned in this study. Vouchers from herbariums reviewed are cited as “collector #, collector, herbarium!.” The exclamation point before the herbarium acronym indicates that the voucher was reviewed in the stated herbarium as referred to in taxonomical studies.

RESULTS AND DISCUSSION

Anthropocentric uses

Even though the better-known bromeliad uses are not gastronomic, as these plants are used principally as ornamentals and as a fiber resource (Hornung-Leoni, unpublished data), the goal of this paper is to show the importance of the family as food in different cultures. Bromeliads are an important source of protein in several ways; as fresh fruit, beverages, or vegetables. It is known that various people from different parts of Latin America eat parts of these plants; for example the Pima of Mexico occasionally eat *T. erubescens* and *T. recurvata* flowers, apparently attracted by the high sugar content (Laferriere *et al.*, 1991); and the shoot apices of *T. maxima* and *T. rubella* are consumed in Argentina and Bolivia (Benzing 1980). It is known that bromeliads have proteins and enzymes (e.g. bromelin, balansain), that could have medicinal uses (Benzing 2000; Pardo *et al.*, 2000).

Traditional alimentary uses have been reported from several different countries of Latin America for 19 species of six genera (Table 1). These results include plants in which only the fruit is consumed directly (11 species), some in which a vegetative part is used (10 species) and others used to prepare beverages (five species) (Fig. 1). It is worth noting that a single use is reported for 68.4% of the species and two different uses for 26.3%, while only one species (*Bromelia pinguin*) has three different uses.

Bromeliads have been consumed by humans since pre-Hispanic times. One of the first plants from this family to be identified was the pineapple (*Ananas comosus* L.), a South

American fruit known in Europe since the 1492 voyage of Christopher Columbus, when it was named “pineapple” because of its resemblance to the pine cone (Benzing, 2000; Betancur, 2001). In the Amazonian Tupi-Guaraní language, spoken over a region that includes several countries (Argentina, Bolivia, Brazil, Colombia, French Guiana, Paraguay, Peru, Uruguay and Venezuela), *Ananas* is a word in which *A* means “fruit” and *nanas* “exquisite” (Oliva-Esteva and Steyermark, 1987).

In the New World, bromeliads had been consumed by Latin American natives from different countries. In Venezuela indigenous coastal tribes ate the berry of *Bromelia chrysantha* Jacq. known as “maya”, a sour-tasting fruit with a sweet smell resembling pineapple, as a fruit or in beverages (fermented drinks used during ceremonies) (Hornung 1998; Oliva-Esteva 1987). In the Orinoco River region in Venezuela, both the wild fruits of *Ananas sativus*, a succulent pineapple consumed since the eighteenth century and *B. chrysantha*, a type of berry have been eaten fresh or roasted (Perera 2006). In Colombia it is documented that the wild fruit of *B. chrysantha* and *B. pinguin* are used as food (Rangel *et al.*, 1977).

The fruits of *Bromelia karatas* L. are red outside and white inside and are eaten or made into a soft drink in Venezuela (Pittier, 1978; Oliva-Esteva, 1987; Comité de Bromeliología, 2006) or a sweet conserve (Pittier, 1978). This fruit is also eaten abundantly in Chiapas, Mexico (Guess and Guess, 2001) and in Hidalgo, Mexico (Villavicencio and Pérez, 2005). In Hidalgo the fruit known as “timbiriche” is found in popular markets in the form of “agua de sabor,” a sweetened, diluted juice made

Table 1. Traditional plant uses in Latin America. None of the species listed here appear in The IUCN Red List (reviewed in II/2011).

Species name	Reported in	Uses categories		
		In beverage	as vegetable (or vegetative part)	Fresh Fruit
1. <i>Aechmea distichantha</i>	Latin America			√
2. <i>Aechmea magdalenae</i>	Latin America, Ecuador	√		√
3. <i>Ananas comosus</i>	Latin America, Venezuela, Ecuador	√		√
4. <i>Ananas sativus</i>	Venezuela, Orinoco			√
5. <i>Aechmea corymbosa</i>	Colombia, Amazonia			√
6. <i>Bromelia alsodes</i>	Latin America	√		
7. <i>Bromelia chrysantha</i>	Venezuela, Colombia	√		√
8. <i>Bromelia hemisphaerica</i>	Latin America	√		
9. <i>Bromelia karatas</i>	Venezuela, México	√		√
10. <i>Bromelia nidus-puellae</i>	Latin America	√		
11. <i>Bromelia pinguin</i>	Colombia, Ecuador, México, Puerto Rico, Venezuela	√	√	√
12. <i>Greigia sphacelata</i>	Chile			√ fresh or dried
13. <i>Hechtia montana</i>	México		√	
14. <i>Puya aristeguietae</i>	Venezuela		√	
15. <i>Puya berteroniana</i>	Chile		√	
16. <i>Puya chilensis</i>	Chile		√	
17. <i>Puya hamata</i>	Ecuador, Latin America	√	√	
18. <i>Puya raimondii</i>	Perú	√	√	
19. <i>Puya</i> sp.	Ecuador		√ cooked	
20. <i>Tillandsia complanata</i>	Venezuela		√	
21. <i>Tillandsia erubescens</i>	México		√ inflorescence is consumed	
22. <i>Tillandsia fendleri</i>	Venezuela		√	
23. <i>Tillandsia imperialis</i>	México	√		
24. <i>Tillandsia maxima</i>	Bolivia, Argentina		√	
25. <i>Tillandsia recurvata</i>	México		√ inflorescence is consumed	
26. <i>Tillandsia rubella</i>	Bolivia, Argentina		√	

from *Bromelia karatas* (pers. obs.). In Jalisco (Mexico) the fruit of *B. karatas* (Fig. 1), known as “piñuelas”, “cocuixtle” or “jocuixtle,” is commonly found in subtropical areas between April and May and it is eaten directly or used to prepare a sauce for tacos; this fruit it is also consumed in Zacatecas where it is transported from the state of Jalisco (pers. comm. Pablo Carrillo). In Peru, juice is sucked from the fruit of *Bromelia plumieri* (E. Morr.) L.B.Sm. Its flavor resembles pineapple (van der Eynden *et al.*, 1999).

The delicious fruits of *Greigia sphacelata* Regel, an endemic plant from Chile, (bayas alargadas), have a fleshy white base, which is the part that is eaten. Called “chupones,” they are eaten fresh or dried, or toasted to make flour (Rapoport *et al.*, 2003). In the Colombian Amazon, fruits of *Aechmea corymbosa* Mez, known as “sacha piña,” (wild pineapple) and *A. rubiginosa* Mez “piña de monte” (mountain pineapple) are eaten (Cárdenas-López and López-Camacho 2000).

In Argentina, the fruit of *Aechmea distichantha* Lam., known as “payo” or “choclo choclo” is eaten by local children directly in the fields where it grows as a delicacy (Hilgert 1999). In Ecuador and Venezuela “piñuelas” (fruits of *Bromelia pinguin*) are consumed in the countryside (Manzanares 2002) in spite of their sour flavor (Pittier, 1978; Oliva-Esteva, 1987; pers. obs.). In Mexico, this species is known locally in the Huasteca and Otomí-Tepesua regions as “timbiriche” (Villavicencio and Pérez, 2005). In the same region, the floral peduncle of *T. imperialis* (Fig. 1) is the part of the plant which is consumed (Villavicencio and Pérez, 2005).

Various drinks, both fermented and not, are prepared from different fruits. Examples are *Aechmea magdalenae* André ex Baker, *Bromelia alsodes* St. John, *B. hemisphaerica* Lamarck, *B. nidus-puellae* (André) André ex Mez, *B. pinguin* L. and *B. karatas* (Bennett, 2000). In the páramos, the bleak alpine grasslands of Ecuador, people obtain a sweet drink called “jugo de aguaronge” from the soft leaf base and stem tissues of immature specimens of *Puya hamata* L.B.Sm. (Benzing, 1980); this species is known in Chota-Cajamarca (Peru) as “achupala” (Sagastegui 12881, F!). A similar soft drink called “guarapo de piña” is prepared in Venezuela (pers. obs.) from the skin of pineapple (*Ananas comosus*) which is boiled with panela (blocks of unrefined cane sugar) and spices (e.g. cinnamon, and cloves). Another variation, using the pulp instead, is prepared in the Venezuelan Andes: this is “chicha de piña”, a thick beverage fermented in a clay vessel. A similar thick drink, but to which rice is added, is prepared in Colombia (pers. comm. Liliana Ojeda), and in Mexico a more liquid drink with pineapple called tepache (pers. obs.) has recently been industrialized.

In the coastal region of Ecuador, the juice is sucked from the fruit of *Aechmea magdalenae* (“piña, piñuela”); in the same region, the pineapple *Ananas comosus* known as piña silvestre, “sacha piña, piña de monte” (wild pineapple, mountain pineapple) is eaten raw or as juice or in a fermented beverage called “chicha” prepared by boiling pineapple peel with roasted, ground corn in water with basil leaves, cloves, cinnamon and panela sugar. Yeast is added when the liquid is cooled and the beverage is left to ferment overnight (van der Eynden *et al.*, 1999).

In Peru, the giant *Puya raimondii* Harms is known as “cagua” (Leiva 292, Sagastegui 14510, F!) or “ckara” (Cerrate 2072; USM!); the ash of the burned core of the inflorescences mixed with sugar and called “tocra” or “illipta” is used by coca-leaf consumers (Hornung and Sosa 2004). In some places, people dry out the center of the inflorescence and use it in powdered form for flavoring (Leiva *et al.*, 1991; Hornung and Sosa, 2004). In Huarochí and Huascarán (Peru) the pulp of its inflorescence is roasted and made into a fermented beverage called chichi (Leiva *et al.*, 1991; Hornung and Sosa, 2004). Some leaves and meristems are eaten in South America as well, such as *Puya hamata* L.B.Sm. The soft leaf base is prepared in salads (Bennett, 2000). Similar uses are made of *Puya chilensis* Molina and *P. berteroniana* Mez in Chile (Fig. 1) known both as cardon or “chagual”. The tender central cabbage-like leaves of the rosette are grated and prepared in salads; even today they can be found in modern supermarkets in Santiago (Chile) when in season (T. Adriazola pers. comm.). Muñoz (2001) reports the use of *P. chilensis* and less often *P. berteroniana* as a salad prepared only with the terminal meristem. In Venezuela, the fleshy central part of the “piñuela” or “piñuela piton” (*Puya aristeguietae* L.B.Sm.) is eaten in the Alpine grasslands of the state of Trujillo (Aristeguieta 3539, TYPE, US!). In Ecuador the heart of the inflorescence of *Puya* sp. known as “aguarongo” is cooked and eaten (van der Eynden *et al.*, 1999).

In Puerto Rico, the axis of the inflorescence of *Bromelia pinguin* is eaten as a fresh or cooked vegetable (Benzing 1980). In Bolivia and Argentina, buds of *Tillandsia maxima* Strangew. and *T. rubella* Baker are eaten by the local people, who say that the “heart” of

this species is similar to the palm heart eaten in several parts of South America (Benzing 1980).

In Mexico, *Hechtia montana* Brandege, known as “hichiconi” in the Guarijío region of southwest Sonora or chicana in Tarmaaras southwest of Chiguagua, have been eaten since pre-Hispanic times. The heart is extracted after the plant has been burned (Felger, 2000). Another vegetative part of some bromeliads which have a culinary use is the leaves, which are used to prepare “bollitos de maíz” or “carabinas”, a kind of tamale made in the Venezuelan Andes. They are prepared with a dough made of corn, filled with cheese or seasoned meat and wrapped in bromeliad leaves, then steamed in a pot over wood fires (A. Rangel pers. comm.). The species employed for this use in the state of Mérida (Venezuela) are *Tillandsia fendleri* Mez (an endemic species, Fig. 1) and *T. complanata* E. Morr.

Other Latin American uses: Animals

Bromeliads also offer nectar and pollen rewards to bird, arthropod and bat pollinators (Benzing, 2000). Several species are eaten not only by humans, but also by animals such as the Andean bear (*Tremarctos ornatus*) called the “spectacled bear” in the north of South America; this mammal eats the terrestrial plants known as “achupaya” or piñuela, but on occasion it also consumes epiphytes that have fallen to the ground (Pérez-Torres, 2001). The “piñuelas” grown in the páramos, the alpine grasslands of the Andes, are species of the *Puya* genus; among them *P. sodiroana* (Bennett, 2000), *P. raimondii* (Fig. 1) have been documented in Peru (Hornung and Sosa, 2004), and some *Puya* species (Goldstein, 1990) have been

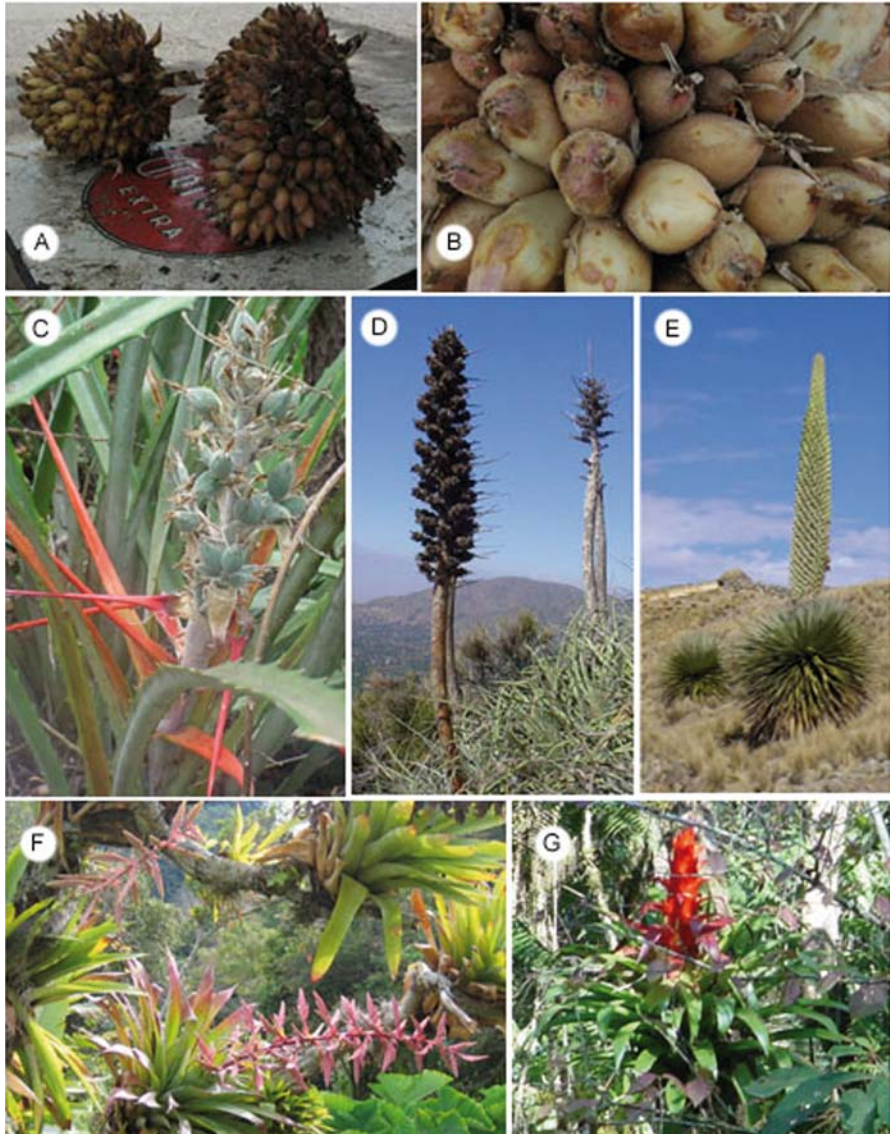


Fig. 1. Bromeliad species used as food in Latin America: A, infructescence and B, details of fruits of *Bromelia karatas* from a popular market in Jalisco, Mexico (©Carrillo, 2010); C, immature fruits of *Bromelia pinguin* (Veracruz, Mexico) (©Hornung, 2005); D, plants of *Puya berteroniana* in the Coastal Cordillera, Chile (©Hornung, 2003); E, plant of *Puya raimondii* in Huascarán National Park, Peru (©Hornung, 2003); F, *Tillandsia fendleri* blooming in Mérida, Venezuela (©Hornung, 2007); G, *Tillandsia imperialis* in a forest of Hidalgo State, Mexico (©Hornung, 2009).

identified by the author in Venezuela as *P. aristeguietae* L.B. Sm. and *P. venezuelana* L.B.Sm.; this last species is known in the state of Mérida (Venezuela) as “piñaton” (Steiermark 56285, F!) or as “piñuela” (pers. obs.). Bennett (2000) reported at least 21 species consumed by wild or domestic animals (e.g. *Aechmea tessmannii* Harms, *A. tillandsioides* Baker, *A. zebrina* L.B.Sm., *Guzmania acuminata* L.B.Sm., *G. eduardii* Mez and *G. monostachya* Rusby ex Mez). It has also been recorded that some simians include young inflorescences in their diet and drink the water that collects in the rosette. On the mountains of Mérida in Venezuela, cattle have also been observed to eat the leaves of the rosette (pers. obs.).

In Ecuador, *Puya gummifera*, known as “achupalla”, is the Andean bear’s favorite food and its stems are fed to pigs and “cuys” (guinea pigs), as recorded in W.H. Camp 5198 for Azuay province (VEN 32969).

CONCLUSIONS

It is important to note that non-food uses for bromeliads are more well-known due to their wide use for ornamental, medicinal and fiber production purposes. However, this family of plants has been used for food by indigenous cultures and has remained in our Latin American traditions, despite the wild plants being less accessible. New natural resource management and exploitation strategies are being developed to conserve traditions and preserve biodiversity.

As noted in this work, various uses have been made of bromeliads in Latin America from pre-Hispanic times to the present, however traditional foods made from these plants vary by locality. Bromeliad crops show different

trends depending on the region or area of Latin America, many of them influenced by national and/or regional guidelines. For example, the use of crops such as pineapple (*Ananas comosus*) for local consumption and exportation is common, but cultivars of other bromeliads are less common today. People from Ancash in Peru refer to harvesting the resource for local consumption but without cultivating the plants. Customs of bromeliad consumption are conserved but on a small scale, not from cultivars, and harvesting mostly from the environment.

However, in recent decades some initiatives have been developed to recover traditional customs. Although some people have mentioned that their interest is not in growing bromeliads specifically, they incorporate traditions which employ non-wood products that include bromeliads. One such case is the rescue of Amazonian fruit crops (among which are the bromeliads) as part of efforts to restore traditions in the Colombian Amazon (Cárdenas-López and López-Camacho, 2000). A further part of the effort is focused on post-harvest technology to produce and market traditional products such as jams, sweets and sauces from 15 native species from different families under the Amazon Cooperation Treaty. Similar efforts have been developed under the FES foundation which has a handicraft supply agreement with Artesanías de Colombia and the Alexander von Humboldt Biological Resources Research Institute (Cárdenas-López and López-Camacho, 2000). Bolivia is investing in bio-products among which are bromeliad fruits (Saucedo, 2005).

In Santiago de Chile, the center of the rosette of *Puya* species is sold in supermarkets for use in salads (pers. obs.), and is indicated as

being from cultivars, showing the presence of a sizeable bio-commerce in Chile in certain species.

Finally, it is worth noting that even though this family has been widely employed as food in different parts of Latin America by our natives since immemorial times, some of these food uses have been maintained up to the present day, and none of the species appears to be in the risk category (IUCN Red List).

ACKNOWLEDGMENTS

The author extends grateful thanks to the Red Latinoamericana de Botánica for awarding her a doctoral scholarship and providing funds to carry out the field work for project RLB D1-02. I am grateful to a grant from the International Association for Plant Taxonomists for financial support for visiting areas in Chile, to PROMEP (Programa de Mejoramiento del Profesorado) for financial support in Hidalgo State for my project at UAEH, to “Diversidad biológica del Estado de Hidalgo (Mexico)” project number 95828 (Conacyt) for support in the second phase, to three anonymous reviewers for their suggestions which improved the final version of the manuscript, to Anna M. Leoni and Margaret Schroeder for reviewing the English version of this paper; and finally, I am very grateful to the Latin American people who contributed to this study with their information about the uses of bromeliaceae.

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