Herbal markets of the Pucallpa city, Peruvian Amazon

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Introduction

Urban environment usually provides dynamic exchange of plants and knowledge amongst different cultures and societies. This popular knowledge is studied by urban ethnobotany (Balick et al., 2000; Leitão et al., 2009). Especially local informal markets represent small-scale reproductions of region's cultural and biological diversity (de Albuquerque et al., 2007), and form important sources of ethnobotanical information. Ethnobotanical studies of these traditional centers could provide beside other information for conservation, sustainable management, or domestication programs (Cunningham, 2001; Gerique, 2006; Monteiro et al., 2010).

In the Peruvian Amazon, a wide variety of medicinal and other useful plants is traditionally used among both indigenous and mestizo populations (e.g. Luziatelli et al., 2010; Mejía and Rengifo, 2000). Pucallpa is the capital of the Ucayali region, and the second largest city of the Peruvian Amazon with more than 275 000 inhabitants. The city is located on the left bank of the Ucayali River providing market opportunities and abundance of natural resources. Numerous specialized stalls of plants, exudates, ointments, incenses, perfumes, essences, and amulets have emerged, scattered throughout the city. Many of them are concentrated in major markets and fairs. Medicinal and magical plants commercialized in informal local markets were studied in order to document and analyze their taxonomy, management status, plant parts and products used, indications, preparations and administration.

Material and methods

The study was carried out in the timespan of 2003-2008 and 2013-2016, in two major local markets of Pucallpa. Semi-structured interviews with 33 respondents were carried out (12 in the first and 21 in the latter period). The informant's age varied from 26 to 75 years (average 47.9 ± 12.8). Eighty percent of the respondents were women. Detailed information about all the unpackaged/unprocessed plants sold in the markets was collected including: life form, source, parts used, medicinal, social and magical uses and applications, preparation, and administration. Additionally, the traditional formulas and recipes and other information about the plants were recorded.

Voucher specimens were prepared from bought material and deposited at herbarium of *Instituto Veterinario de Investigaciones Tropicales y de Altura*, Pucallpa (*Universidad Nacional Mayor de San Marcos,* USM). Some living plant samples (e. g. tubers), were planted and grown into vegetative or reproduction phase at *Universidad Nacional de Ucayali* to enable the identification. Some barks, woods and lianas were conserved in ethanol in vitro and stored at herbarium of *Universidad Nacional Intercultural de la Amazonia*, Pucallpa.

The spelling of vernacular names is based on Duke and Vasquez (1994); Rutter (2008); and Soukup (1971). All medical attributions cited by the interviewees were grouped into 24 medical indication (corporal system) categories, according to Cook (1995). All socio-cultural uses were included in a special category. Each plant's relative importance (RI), based on Bennett and Prance (2000), was calculated.

Results and discussion

From collected material of 249 species, a total of 235 plants were determined to genus so far (169 to species) and 14 still remain unidentified (for details see Fig. 1.). They belong to 69 plant families; most common being Fabaceae with 10.8% (27 spp.) of all species, followed by Araceae, Moraceae, and Solanaceae (Fig. 2.). The majority of families (44) were represented by two species or less. Interestingly, in the recent review of medicinal plant markets across the Amazon, the largest number of species were Asteraceae, Fabaceae and Lamiaceae (Lima et al., 2016). However, our results show family Asteraceae represented by by 7 species only (2.8%). Furthermore, we found more Araceae and Moraceae compared to the studies from the review.

While Lima et al. (2016) and others noted a predominance of trees in the Amazonian pharmacopoeias, on the markets of Pucallpa, herbaceous species were the commonest with 48.1% (120 spp.), succeeded by trees 28.5% (71 spp.), shrubs 10.8% (27 spp.), and vines 9.2% (23 spp.). Other life forms include three palm species, two species of cacti, ferns and one cycad (Fig. 3.). Most used plant parts were leaves with 24% (82), and whole aerial parts 17.6% (60), than barks, bulbs/roots/rhizomes/tubers, and stems/wood (Fig. 4.). Other plant parts were flowers, fruits, seeds, and exudates such as resins or latexes.

About 50% of the species were exclusively collected in the wild, 28% were both collected and managed or cultivated, and only 22% were exclusively managed (Fig. 5.). High proportion of species obtained from the wild is comparable to other studies; however we also found numerous species being eventually cultivated (cf. Sanz-Biset et al., 2009), which may signal declining availability. The majority of marketed species are native (at least 11 are endemic) to Amazonian lowlands habitats. Others were introduced from different regions of the world, including neighboring higher elevated montane forest, Andes mountain range and Pacific Coast. We also report for the first time (to our best knowledge) traditional medicinal uses of certain species in the Peruvian Amazon, e.g. *Guarea carinata* Ducke (Meliaceae), and *Platymiscium stipulare* Benth. (Fabaceae).

The most reported purely medicinal ailments were genitourinary system disorders, infections/infestations, and digestive system disorders. The remedy with the most cited uses was bark of chuchuhuasi (*Maytenus ebenifolia* Reissek/*M*. sp.) (75), followed by oleoresin of copaíba (*Copaifera paupera* (Herzog) Dwyer/*C. reticulata* Ducke) (71), and by leaves of *Jatropha gossypiifolia* L. (54). The species with most relative importance index value (RI) were chuchuhuasi (2), uña de gato (*Uncaria guianensis* (Aubl.) J.F.Gmel./*U. tomentosa* (Willd. ex Schult.,) DC. (1.69), and copaíba (1.59).

In total, 130 plant species (52% of all), were found to treat culture-bound syndromes and/or had other magical or social use (such as psychoactive, shamanism etc.). Some of these practices were described by Bussmann and Sharon (2007); Jauregui et al. (2011); and Sanz-Biset et al. (2009). Flowering baths/perfumes (*baños/perfumes de florecimiento*) are widely practiced in local population. People use this remedy in order to attract other humans, business, friendship, love, money, work etc. Other important remedies are spiritual cleansing baths (*baños de limpieza/limpieza espiritual*). Most of these baths are made by maceration of various fresh mashed plant parts (usually leaves, flowers and tubers) in cold water, while perfumes are made by maceration of plants in cologne or other alcohol. Other presented syndromes were: *daño/maldad* ("damage/evilness"), *mal aire* ("bad air"), *mal de ojo* ("evil eye"), *susto* ("fear"), *protección* ("protection"), *saladera* etc. There are also certain alcoholic preparations popularly known as *sieteraíces* ("seven roots") and *veinteraíces* ("twenty roots"). These preparations are elaborated using mixes of assorted roots, barks, and trunks, macerated in *aguardiente*, an alcoholic distillate of sugar cane.
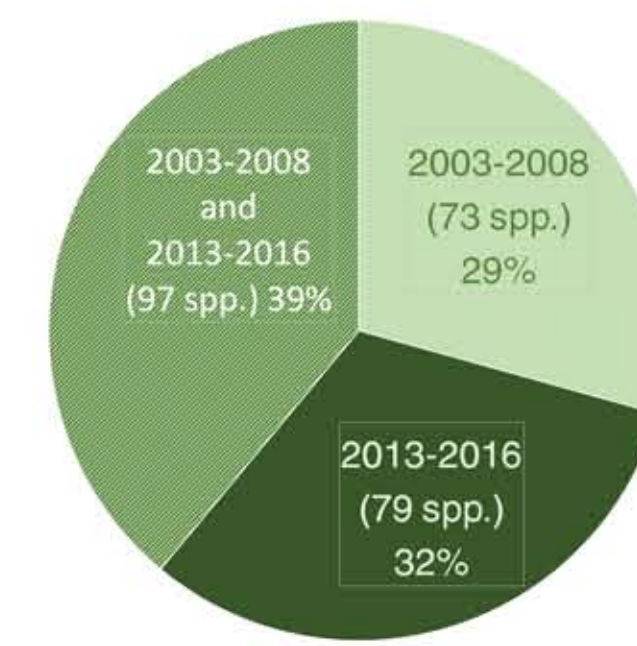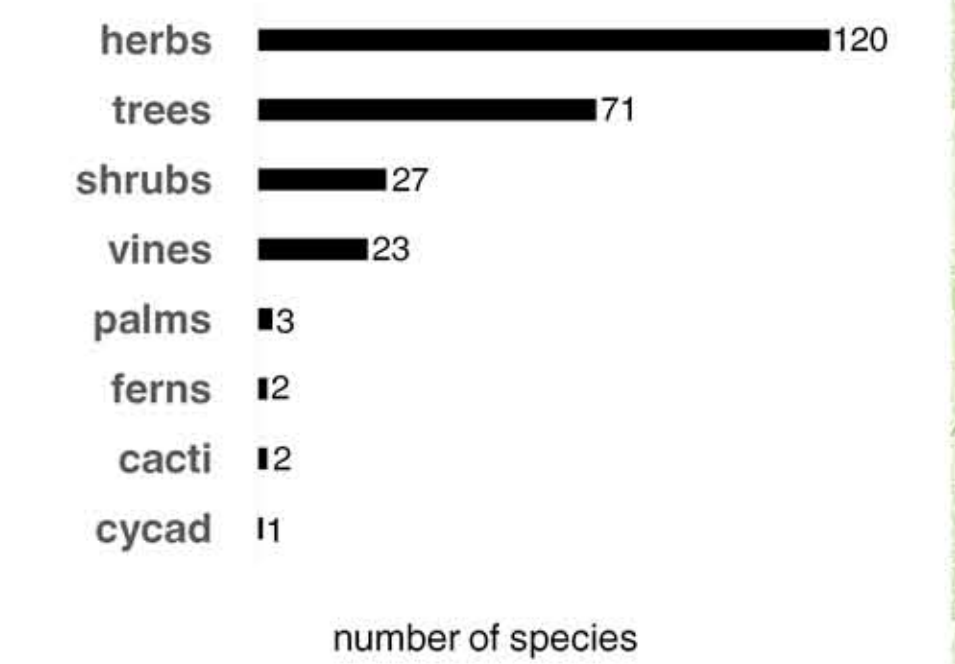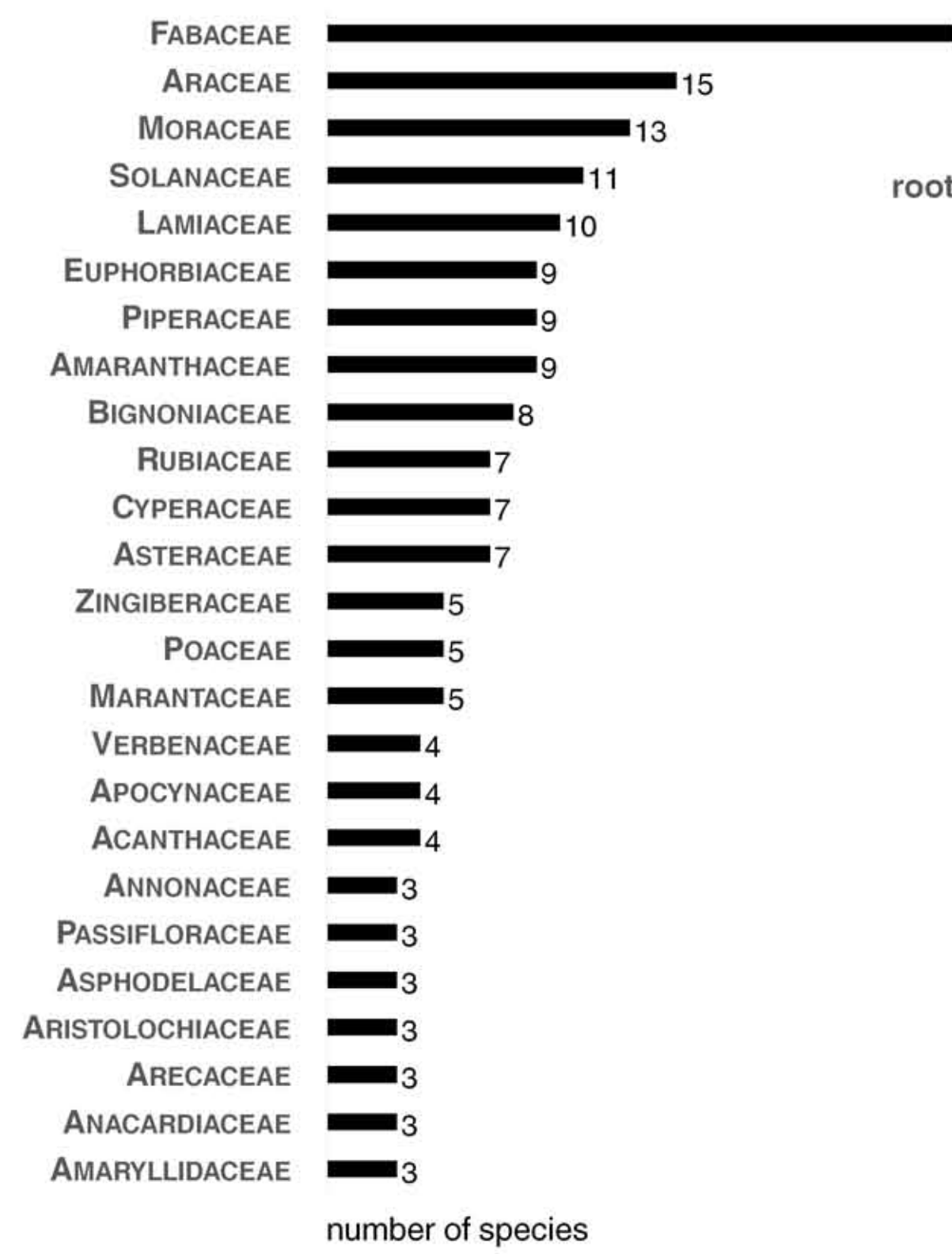

Fig. 1. Proportion of collected species.

2003-2008 (73 spp.) 29%
2003-2008 and 2013-2016 (97 spp.) 39%
2013-2016 (79 spp.) 32%

Fig. 3. Life forms of plants.

herbs 120
trees 71
shrubs 27
vines 23
palms 3
ferns 2
cacti 2
cycad 1
number of species

Fig. 2. Most common plant families.

FABACEAE 27
ARACEAE 15
MORACEAE 13
SOLANACEAE 11
LAMIACEAE 10
EUPHORBIACEAE 9
PIPERACEAE 9
AMARANTHACEAE 9
BIGNONIACEAE 8
RUBIACEAE 7
CYPERACEAE 7
ASTERACEAE 7
ZINGIBERACEAE 5
POACEAE 5
MARANTACEAE 5
VERBENACEAE 4
APOCYNACEAE 4
ACANTHACEAE 4
ANNONACEAE 3
PASSIFLORACEAE 3
ASPHODELACEAE 3
ARISTOLOCHIACEAE 3
ARECACEAE 3
ANACARDIACEAE 3
AMARYLLIDACEAE 3
number of species

Fig. 4. Parts of commercialized plants.

leaves 82
whole aerial part 60
bark 51
roots/rhizomes/tubers etc. 50
stems/wood 31
flowers 19
fruits 18
exudates 18
seeds 11
seed oil 1
■ number of plant parts
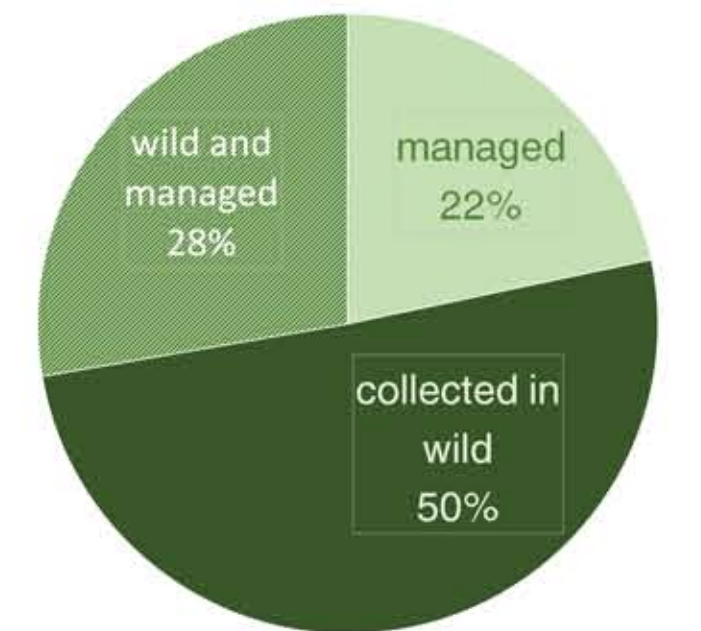
Fig. 5. Source of commercialized plants.

wild and managed 28%
managed 22%
collected in wild 50%

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motelo huasca *Bauhinia* sp.
abuta *Abuta* sp.
ubos *Spondias mombin* L.
tahuari amarillo *Handroanthus serratifolius* (Vahl) S.O.Grose
chuchuhuasi *Maytenus ebenifolia* Reissek / *M.* sp.
congonita hembra *Peperomia rotundifolia* (L.) Kunth
ajo macho *Allium* sp.
piri-piri *Cyperus* sp.
yahuar piri-piri *Eleutherine bulbosa* (Mill.) Urb.
aji pukunucho *Capsicum chinense* Jacq.
cebolla *Allium cepa* L.
huito *Genipa americana* L.
kion *Zingiber officinale* Roscoe
jergon sacha *Dracontium* sp.
cashahuasha *Imperata brasiliensis*

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