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Authors: ARIAS TOLEDO, B., COLANTONIO, S., and Galetto, L.

Source: Journal of Ethnobiology, 27(2) : 218-232

Published By: Society of Ethnobiology

URL: https://doi.org/10.2993/0278-0771(2007)27[218:KAUOEA]2.0.CO;2

Journal of Ethnobiology 27(2): 218–232 Fall/Winter 2007

KNOWLEDGE AND USE OF EDIBLE AND MEDICINAL PLANTS IN TWO POPULATIONS FROM THE CHACO FOREST, CÓRDOBA PROVINCE, ARGENTINA

B. ARIAS TOLEDO,[a] S. COLANTONIO, and L. GALETTO
Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba
[a] ⟨*barbaraarias@gmail.com*⟩

ABSTRACT.—We analyze and compare plant knowledge and uses of medicinal and edible plants of two rural communities located in different phytogeographic regions. We hypothesize that there are differences in the number of edible and medicinal plants that people know and use between these communities because of environmental constraints. In addition, because of cultural erosion, we expect to find (a) a higher number of plants that people know as useful in comparison with the number of plants they actually use, and (b) a decrease in the number of useful plants cited when comparing male/female and younger/older categories. Results show a higher range of knowledge of medicinal plants than edible plants, and medicinal use included mainly those used to treat digestive problems. Based on statistical analyses, we present comparisons between the communities, age groups, and genders, and discuss how differences in these regions (e.g., geographic, ecological, cultural, etc.) may explain of the variation in the knowledge on wild useful plants between the communities.

Key words: Chaco Serrano, ethnobotany, plant knowledge, diversity index.

RESUMEN.—Se analiza y compara el conocimiento y uso de plantas medicinales y alimenticias en dos comunidades rurales localizadas en diferentes regiones fotogeográficas. Se hipotetiza que existe diferencia en el número de plantas conocidas y usadas entre estas comunidades, debido a las diferencias ambientales. Asimismo, debido a la erosión cultural, se espera que (a) un alto número de plantas conocidas como útiles en comparación con las actualmente utilizadas, y (b) una disminución en el número de plantas útiles citadas al comparar hombres/mujeres y jóvenes/adultos mayores. Los datos se obtuvieron mediante encuestas (una persona por hogar) y se analizaron mediante MANOVA anidado. Existe un mayor número de plantas medicinales conocidas y usadas respecto a las alimenticias. El uso de plantas medicinales se halla muy difundido en ambas poblaciones, principalmente para tratar trastornos digestivos. Las plantas alimenticias son apreciadas en Chancaní, principalmente los algarrobos ((*Prosopis* spp.), no así en San Clemente. Aunque sin diferencias estadísticamente significativas, las mujeres y las personas de mayor edad nombraron un mayor número de plantas. Particularidades regionales (p.e. geográficas, ecológicas, culturales, etc) se mostraron relevantes para explicar las principales diferencias en el conocimiento de plantas silvestres útiles entre los pobladores de San Clemente y Chancaní.

RÉSUMÉ.—Cette étude analyse et compare le savoir botanique ainsi que l'emploi de plantes médicinales et comestibles de deux communautés rurales situées dans

différentes régions phytogéographiques. Notre hypothèse stipule qu'il existe des différences dans le nombre de plantes comestibles et médicinales que les gens connaissent et utilisent au sein des différentes communautés, et que ces différences sont le reflet de contraintes environnementales. Aussi, étant donné l'érosion culturelle, nous nous attendons à ce que (a) il y a un plus grand nombre de plantes connues pour être utiles que de plantes actuellement utilisées et (b) il y a une diminution du nombre de plantes utiles mentionnées lorsque l'on compare les catégories hommes/femmes et jeunes/âgés. Nos résultats indiquent que les plantes médicinales sont mieux connues que les plantes comestibles. Également, les plantes médicinales possèdent principalement des propriétés pouvant aider les personnes atteintes de problèmes digestifs. À l'aide d'analyses statistiques, nous avons comparé les communautés, les groupes d'âge, les genres (homme/femme) et nous avons discuté de la façon dont les différences dans ces régions (écologiques, géographiques, culturelles) peuvent expliquer la variabilité entre les communautés quant au savoir touchant les plantes utiles à caractère indigène.

INTRODUCTION

The perception and relative importance of useful plants are related to cultural factors such as human behavior, social and economics constraints, and several other factors (Pelto et al. 1989). In addition, patterns of plant use by human communities may depend on environmental constraints. For example, some patterns of plant use can be related to local species richness, or to the regional abundance of some useful plants. Studies conducted throughout the world (e.g., Arango Caro 2004; Benz et al. 2000; Hanazaki et al. 2000; Pfeiffer and Butz 2005), and in southern regions of Argentina (e.g., Ladio 2001; Ladio and Lozada 2003, 2004), have shown both that the distribution of the knowledge of useful plants is not uniform within a population, and that the patterns can be better understood when cultural, historical, and environmental factors are considered.

Many ecological diversity indices (e.g., Begossi 1996) have been used to evaluate and compare plant knowledge and actual plant use within or between communities (Benz et al. 2000; Figueiredo et al. 1993; Hanazaki et al. 2000; Ladio and Lozada 2004; Rosatto et al. 1999). Such comparisons between communities through an index allow a better comprehension of human-environment interactions, particularly when those communities are located in different regions of the world. In addition, these measures help us to evaluate intra-community variations, as well as to compare the diversity of plant use with the local or regional biodiversity.

In this study we analyze and compare plant knowledge and use by two rural communities located on different phytogeographic regions, one located on the eastern slope of the Sierras (San Clemente, approximately 70 km from Córdoba) and the other on the base of the western slope (Chancaní, approximately 200 km from Córdoba). We wanted to evaluate if the pattern of plant knowledge and present-day use is common or not for these communities, utilizing some indices derived from ecological theory. We hypothesize that there are differences in the number of edible and medicinal plants that people know and use between these

communities because of environmental constraints. In addition and independently of the community, as a result of cultural erosion we expect to find (a) a higher number of plants that people know as useful in comparison with the number of plants they actually use, and (b) a decrease in the number of useful plants cited when comparing male/female and younger/older categories.

STUDY AREA

The Chaco Serrano.—The province of Córdoba has a varied geography, with different ecosystems. The highest heterogeneity of environments is found to the west, in the Sierras Pampeanas, between 29° 30′ S and 33° 30′ S. With an altitude ranging from 400 to almost 3000 m a.s.l., the Sierras are located within the Chaco phytogeographic region. The Chaco Serrano forest, a particular region of this phytogeographic province, extends along the three main mountain ranges of the Sierras (Chicas, Grandes, and Pocho-Guasapampa), from 400 to 1300 m a.s.l. (Cabrera 1976). The eastern slope of the Sierras is more humid with higher plant diversity than the western slope, and is presently a mosaic of generally small patches of forest communities intermingled with shrubs and grasslands. The original vegetation has been drastically reduced due to deforestation and fire (Cabido et al. 1991; Cabido and Funes 1995), and has been replaced by large-scale agriculture fields or secondary forests of native and introduced species.

The vegetation of the western slope of the Sierras is comparatively less modified by human activities and is composed of a sparse tree layer and a continuous shrub layer (Cabido et al. 1991). The forests located at the eastern slope are within the Chaco Serrano phytogeographical region, while the forests located at the base of the western slope of the Sierras are within the arid Chaco. As a consequence, these communities are influenced by regional differences. In addition, the communities located on the eastern slope of the Sierras are near the city of Córdoba (population: 1.5 million) and other cities, while those located on the western slope are comparatively more isolated.

People have used natural resources of these ecosystems (e.g., edible and medicinal plants) for more than a century (Río and Achaval 1905), and they live grouped in small rural communities. In general, the ethnic origin of the people of the studied communities is dominated by European people who arrived to this region in 1573.

San Clemente.—The community of San Clemente (Departamento Santa María, Córdoba Province, Argentina) is composed by 230 inhabitants when nearby rural areas are considered (National Census 1991). The main sources of employment for the people are related to rural and government activities, tourism (maintenance, etc.), or small stores. Because a substantial percentage of employment is related to tourism, they show a marked seasonality; many people do not have year-round employment and 30.8% of the dwellings showed unsatisfied basic needs (INDEC 1991). There is only one elementary school, and the nearest high school is about 30 km away. The only health center is a dispensary, usually attended by a nurse and by a doctor, who comes twice a week.

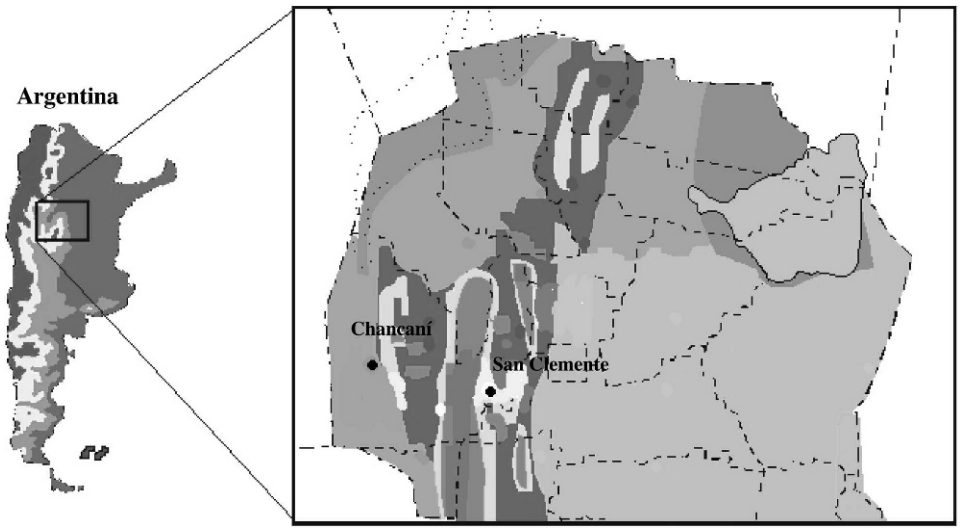

FIGURE 1.—Map of the study area showing the location of San Clemente and Chacaní.

San Clemente is located on the southeastern slopes of the Sierras (Figure 1), within the Chaco Serrano phytogeographic region (Cabrera 1976). The mean annual precipitation of 800 mm is concentrated from October to April. Original vegetation is composed by forests dominated by *orco-quebracho* (*Schinopsis marginata* Engler), *molle de beber* (*Lithraea molleoides* (Vell.) Engler), *coco* (*Zanthoxylum coco* Gill.), and *tala* (*Celtis tala* Gill. ex Planch.) (Bono et al. 2004). Presently, this community is surrounded by secondary forests of native species, shrub vegetation, or by exotic pine forestations.

Chancaní.—The community of Chancaní (Departamento Pocho, Córdoba Province, Argentina) is composed by 196 inhabitants, most of them living in rural areas (National Census 1991). The main sources of employment for the people are related to the government or with rural activities, cattle or goat breeding, land management, or work as woodcutters for timber or charcoal (Karlin et al. 1994). More than half of the homes showed unsatisfied basic needs (UBN, National Census 1991). Although Chancaní is near the main city (70 km from Villa Dolores) of the region, it is isolated because the bad condition of the roads. There is only one educational institution with elementary and high school.

Chancaní is placed on a plain located at the western slopes of the Sierras de Pocho (Figure 1), within the arid Chaco phytogeographic region (Cabrera 1976). The arid Chaco is characterized by xerophilous forests dominated by *Aspidosperma quebracho-blanco* Schltdl. The annual precipitation of 300–500 mm is concentrated mainly during the summer.

METHODS

Data were collected through semi-structured interviews (one person per family). In San Clemente, 25 interviews were conducted (100% of the

population), and in Chancaní we conducted 33 interviews (80% of the population). Each family made the decision of who was to be interviewed. In both communities, residents also participated in the collection and identification of plants for voucher specimens. In general, plants were collected near their residences.

To generate the interviews, ethnographic methods were employed (Capparelli and Raffino 1997) combined with research techniques in social sciences (Bernard 1995; Padua 1994). The interviews had a semi-standardized (Padua and Ahman 1994) or semi-structured section (Bernard 1995) for the socioeconomic characterization relative to economic, geographic and knowledge access to plant resources, their use, preparation, value, as well as the transference of the knowledge on their use. Interviews also had a structured section (Bernard 1995) designed to gather data on knowledge and effective use of the wild plant resources applying the free list method.

The data obtained from the interviews were analyzed mainly through quantitative methodology, which allows the comparison between different communities. Diversity measurements and quantitative analysis were applied separately for edible and medicinal plants. Simpson and Shannon-Wiener diversity indices were selected to perform comparisons, as follows:

$$\text{Simpson} : D = \sum pi^2$$

$$\text{Shannon} - \text{Wiener} : H' = -\sum pi \log pi$$

where pi is the proportion of the individuals found in the ith species (i.e., the ''proportional abundance''). An increase in the value of the Simpson Index represents a decrease in diversity. Thus, this index usually is presented as $1/\lambda = 1/p_i^2$, which expresses a measure of dominance. Both indices allow a quantitative characterization of the knowledge and use of plants and simplify comparisons between populations. We have estimated the ''proportional abundance'' of each species as the frequency of times a plant was mentioned (i.e., number of citations) out of the total number of interviews. This proportion is assumed as a measure of the relative importance of each plant within the community.

In order to analyze if the known and used species are similar between the communities, we utilized the Jaccard similarity index. This index was calculated considering the presence or the absence of the plants in these communities, and relating the number of species in common respect to the total number of species:

$$\text{Jaccard JSI} = (c/a+b+c)\ 100$$

where c is the number of species in common, a is the number of unique species for the community A, and b is the number of unique species for the community B. We ran a nested MANOVA to evaluate differences between and within populations. The inter-population analysis compares the number of edible and medicinal plants cited as known and/or used, whereas the intra-population analysis evaluates such variables with respect to gender (male/female) and age groups (15–45 vs. ≥46). All the assumptions were checked and met.

RESULTS AND DISCUSSION

Knowledge and Use of Edible Plants.—Only a few number of edible species were frequently mentioned in San Clemente: watercress (*Nasturtium officinale* R. Br.) cited by 50% of the population, and two mushrooms species (*hongos del pino* or brown-yellow boletus, *Boletus luteus;* and *hongos del coco, Phlebopus bruchii*), both cited by 25% of the people. Although the mushrooms are not plants, we decided to report these species because they play a similar role in people's diets. These results have shown that these wild edible resources are scarcely used, and some of the interviewed persons pointed out that they do not utilize wild plants as a food source.

In addition, results from San Clemente suggest an important erosion process on the knowledge of edible plants, because Río and Achaval (1905) had reported the use of many wild edible plants for this phytogeographic region. This reduction in the number of edible plants used can be due to ecological and cultural factors. For example, this region has been profoundly modified by human activities (fires, pine forestations, etc.) during the last century (Gravier and Bucher 2004). Thus, many wild edible resources have disappeared or their populations have been severely reduced. On the other hand, young people leave the region due to economic or education reasons, and rarely return. This concurrence of human behavior and ecological constraints may determine a consequent erosion in the knowledge on wild resources.

The opposite trend was observed in Chancaní. Although only five edible species were mentioned, these were known and frequently used by a significant percentage of the population. Eighty-two percent of the interviewees stated that they know and use the fruits of *algarrobo* (*Prosopis* spp.); the fruits of *mistol* (*Ziziphus mistol* Griseb) (78%); the fruits of *chañar* (*Geoffroea decorticans* Gillies ex Hood & Arn.) (36%); and the fruits of *piquillín* (*Condalia microphylla* Cav.) and *tunas* (Prickly Pear - *Opuntia* spp.) (30%). It is interesting to note that people only consume fruits, but not leaves or roots that are available within the native vegetation.

Among the most common tree species occurring in the Dry Chaco, the *algarrobo* has an outstanding importance for the local people. This particular consideration among the different trees of the forest is pointed out when they name *Prosopis* species as ''the Tree'' or ''Father,'' a sign of the magnitude of its value. Local people eagerly wait for the month of January, when the ripened fruits of the *algarrobo* are ready to be collected and consumed. They said that *algarrobo* fruits are ''the best vitamin'' [*sic*], particularly for children, elderly and sick people, because they believe these fruits are excellent to use for human nutritional requirements. In addition, they mentioned ''a handful of these fruits is enough to perform daily rural tasks.'' *Algarrobo* fruits can be consumed fresh or they can be manufactured in different ways, such as *arrope* (a jelly made with the juice of boiled fruits), *patay* (a ''bread'' made with dried and pulverized fruits; i.e., ''*algarroba* flour''), *añapa* (a fresh juice obtained when *algarroba* flour is soaked with water), and tablets (made with *algarroba* flour and dried orange peel). During droughts, when almost no other fruits in the forest are available, animals (i.e., cattle, goats, horses, etc.) are fed with *algarrobo* ''so that they can survive to

TABLE 1.—Edible plant species used in San Clemente and Chancaní.

Local name	Latin binomial	Family	Part used
cardo	*Carduus* spp.	Asteraceae	all
diente de león	*Taraxacum officinale* Weber ex F.H. Wigg.	Asteraceae	leaf
hongos pino	*Boletus luteus* L. or *Suillus luteus* (L. ex Fr.) S. F. Gray	Boletaceae	all
berro	*Nasturtium officinale* R. Br.	Brassicaceae	leaf
tuna	*Opuntia ficus-indica* (L.) Mill.	Cactaceae	fruit
tala	*Celtis ehrenbergiana* (Klotzsch) Liebm.	Celtidaceae	fruit
algarrobo	*Prosopis* spp.	Fabaceae	fruit
chañar	*Geoffoaea decorticans* (Gillies ex Hook. & Arn.) Burkart	Fabaceae	fruit
hongos coco	*Phlebopus bruchii* (Speg.) Heinem. & Rammeloo	Gyrodontaceae	all
albarillo	*Ximena americana* L.	Olacaceae	fruit
granadilla	*Passiflora caerulea* L.	Passifloraceae	fruit
mistol	*Ziziphus mistol* Griseb.	Rhamnaceae	fruit
piquillín	*Condalia microphylla* Cav.	Rhamnaceae	fruit
zarzamora	*Smilax campestris* Griseb.	Smilaceae	fruit
uvita del campo	*Salpichroa origanifolia* (Lam.) Baill.	Solanaceae	fruit

the next year.'' This means that people have to be deprived of this food plant to fed animals. Considering that meat is the main item of people diet during the whole year, *algarrobo* fruits constitute an important economic resource for the community of Chancaní because these fruits allow the survival of their animals during dry years.

The fruits of the other four plant species mentioned above are also consumed as *arrope*. Many persons said that wild fruits are preferred to any other fruits usually offered in the market, because of both their pleasant taste and their claimed nutritional properties. Table 1 provides a summary of the data.

Despite the depicted value of these edible plants, moderate cultural erosion can also be suggested for the community of Chancaní considering that a third of the population stated that they have consumed these fruits abundantly in their childhood but not at present. Furthermore, people of Chancaní stated that in the past the fruits of these five species were frequently used. However, most of the interviewed persons, educators, and children pointed out their intention to re-value these wild edible plants as important resources for their subsistence as well as for the conservation of the Chaco dry forest.

People know and use a low number of edible species in the Chaco from central Argentina. On the other hand, a comparatively high richness of edible plants was reported for southern (e.g., Ladio 2001; Ladio and Lozada 2001, 2004) and northern regions of Argentina (Hilgert 1999).

Knowledge and Use of Medicinal Plants.—The situation was quite different regarding medicinal plants, since an important number of species was known and used, and their properties appreciated in both communities. A total of 70 medicinal plants species was recorded for San Clemente and Chancaní, with 31 species in common. Table 2 provides a complete list of species, including their

scientific and vernacular names, botanical family, and disease or disorder treated.

Medicinal plants are mainly used to treat digestive disorders and secondary as diuretics, febrifuge, and antitussive. In both populations few species are occasionally used as disinfectant, analgesic, abortive, contraceptive, anti-inflammatory, depurative, sedative, and cardiotonic, among other applications. Although people reported ''all plants can be used for something,'' some of the interviewed persons of San Clemente have a wider knowledge on different uses for medicinal plants than those from Chancaní. In Chancaní, approximately 60% of the population knew plants only with digestive properties, whereas in San Clemente 83% of the population knew at least three disorders that can be treated with medicinal plants. People appreciate medicinal plants and their uses co-exist with Western medicine. Idoyaga Molina (2000) pointed out that this circumstance can be possible because cultural representations of rural people about diseases (diagnosis, therapy, etc.) are closer to traditional than to scientific medicine. Although traditional therapies are not always successful in the studied communities, they are preferred to initiate the treatment of many diseases. This pattern can be related to both the ease access to medicinal plants and the simplicity of their use and preparation.

In general, the most common preparation with plants used as digestive are infusions or leaves of medicinal plants preventively added to the *mate* (traditional infusion prepared with *Ilex paraguariensis* leaves). The remaining medicinal plants are also prepared as infusions, as ''*agua pasta*'' (prepared as infusions, or as a macerate of leaves in water, but consumed cold), or as a topically applied ointment.

Quantitative Comparison by Population, Age and Gender.—The quantitative analysis of the knowledge and use of plants in both populations also showed a differential pattern of use between populations. A nested MANOVA was performed with known species because most plants are used (with the exception of edible plants of San Clemente). In the comparison of the number of known edible and medicinal plants between San Clemente and Chancaní, the analysis showed significant differences between both populations (Table 3). These differences are due to the higher number of medicinal plants known per inhabitant in the locality of San Clemente, as well as to the higher use of edible plants by the inhabitants of Chancaní (Table 4).

The analyses by age and gender were performed considering medicinal and edible plants separately. Although there are differences in the mean number of plants obtained for each variable between these communities (Table 4), no significant differences were detected (Table 3). In general, women knew a high number of medicinal plants (Table 4). This tendency was reported for other South American communities (Arango Caro 2004; Figueiredo et al. 1993; see also Rosatto et al. 1999). It is possible that the higher knowledge of medicinal plants by women can be related to their social role in health attention of family members, as was previously suggested by Benvenuto and Sánchez (2002).

Regarding edible resources, women have mentioned a higher number of plants per person than men in San Clemente, and a lower number in Chancaní

TABLE 2.—Medicinal plant species used in San Clemente and Chancaní.

Family	Latin binomial	Local name	Recorded use
Amaranthceae	*Alternanthera pungens* Kunth	*yerba del pollo*	treatment of backaches, diuretic
Anacardiaceae	*Schinus areira* L.	*aguaribay*	digestive aid
	Lithraea molleoides (Vell.) Engl.	*molle*	digestive aid
Apiaceae	*Petroselinum crispum* (Mill.) Nyman ex A.W. Hill	*perejil*	abortive, contraceptive
Apocynaceae	*Aspidosperma quebracho-blanco* Schltdl.	*quebracho blanco*	anti-inflammatory, treatment of liver problems
Asclepiadaceae	*Morrenia odorata* (Hook. & Arn.) Lindl.	*tasi*	used to remove skin boils
Asteraceae	*Artemisia annua* L.	*ajenjo*	digestive aid, treatment of liver problems
	Schkuhria pinnata (Lam.) Kuntze	*canchalagua*	digestive aid
	Baccharis crispa Spreng.	*carqueja*	digestive aid
	Baccharis articulata (Lam.) Spreng.	*carquejilla*	digestive aid
	Xanthium spinosum L.	*cepa caballo*	n/a
	Trixis divaricata (Kunth) Spreng.	*contrayerba*	treatment of backaches
	Matricaria recutita L.	*manzanilla*	digestive aid, anti-inflammatory, sedative
	Artemisia douglasiana Bess.	*matico*	treatment of heartburn, digestive aid
	Cyclolepis genistoides D. Don	*palo azul*	treatment of backaches
	Tagetes minuta L.	*suico*	antitussive
	Achyrocline satureoides (Lam) De Candolle	*vira-vira*	digestive aid
	Jungia polita Griseb.	*zarzaparrilla*	depurative agent
Asteraceae Buddlejaceae	*Conyza* sp. Buddleja cordobensis Griseb.	*pulmonaria*	treatment of respiratory problems
Brassicaceae	*Coronopus didymus* (L.) Sm.	*quimpe*	depurative agent, antitussive
Capparaceae	*Capparis atamisquea* Kuntze	*atamisqui*	treatment of tooth pain, sore thoat, and pasmo
Celtidaceae	*Celtis ehrenbergiana* (Klotzsch) Liebm.	*tala*	digestive aid
Chenopodiaceae	*Chenopodium ambrosoides* L.	*paico*	digestive aid
Ephedraceae	*Ephedra triandra* Tul. emend. J.H. Hunz	*tramontana*	treatment of circulation problems
Equisetaceae	*Equisetum giganteum* L.	*cola de caballo*	treatment of backaches; diuretic
Euphorbiaceae	*Euphorbia serpens* Kunth	*yerba meona*	treatment of backaches, diuretic

TABLE 2.—Continued.

Family	Latin binomial	Local name	Recorded use
Fabaceae	*Geoffroea decorticans* (Gill ex Hook et Arn.) Burkart	*chañar*	antitussive
	Acacia caven (Mol.) Mol.	*espinillo*	disinfectant
	Bauhinia forficata Link	*pezuña de vaca*	antidiabetic
	Senna spp.	*sen*	digestive aid
Gentianaceae	*Gentianella* spp	*genciana*	tonic
Hypericaceae	*Hypericum connatum* Lam.	*cabo torilo*	treatment of heart conditions
Lamiaceae	*Ocimum basilicum* L.	*albahaca*	digestive aid
	Mentha spp.	*menta*	digestive aid
	Origanum vulgare L.	*orégano*	digestive aid
	Minthostachys mollis (Kunth.) Griseb.	*peperina*	digestive aid
	Rosmarinus officinalis L.	*romero*	digestive aid
	Salvia officinalis L.	*salvia*	digestive aid
	Thymus vulgaris L	*tomillo*	digestive aid
	Melissa officinalis L.	*toronjil-melisa*	treatment of heart conditions, digestive aid
	Mentha spp.	*veramota*	n/a
	Marrubium vulgare L.	*yerba del sapo*	
	Mentha spp.	*yerbabuena*	digestive aid
Lamoriopsidaceae	*Elaphoglossum gayanum* (Fée) T. Moore	*calaguala*	depurative agent
Liliaceae	*Aloe* spp.	*aloe vera*	treatment of skin problems
Lycopodiaceae	*Huperzia saururus* (Lam.) Trevis.	*cola de quirquincho*	aphrodisiac
Malvaceae	*Sphaeralcea cordobensis* Krapov.	*malva*	anti-inflammatory
Myrtaceae	*Eucalyptus* spp.	*eucaliptus*	treatment of colds
Passifloraceae	*Passiflora caerulea* L.	*pasionaria*	sedative
Plantaginaceae	*Plantago major* L.	*llantén*	disinfectant
Poaceae	*Tritucum spp., Paspalum* spp.	*gramilla*	treatment of backaches
Polygonaceae	*Polygonum* spp.	*sanguinaria*	depurative agent
Rosaceae	*Prunus persica* (L) Batsch	*durazno (hoja)*	digestive aid
	Eriobotrya japonica (Thunb.) Lindl.	*níspero*	antitussive

TABLE 2.—Continued.

Family	Latin binomial	Local name	Recorded use
Rutaceae	*Citrus limon* (L.) Burm.	*limón*	digestive aid
	Citrus sinensis (L.) Osbeck	*naranjo (leaves)*	sedative
	Ruta chalepensis L.	*ruda*	digestive aid; also used in magic
Scizaceae	*Aneimia tomentosa* (Savigny) Sw.	*doradilla*	used as an antitussive
Tiliaceae	*Tilia* spp.	*tilo*	sedative
Urticaceae	*Urtica urens* L.	*ortiga*	depurative agent
Usneaceae	*Usnea hieronymi* Kremp.	*barba de piedra*	treatment sore throat
Verbenaceae	*Aloysia citriodora* Palau	*cedrón*	treatment of heart conditions
	Lippia integrifolia (Griseb.) Hieron.	*incayuyo*	digestive aid
	Aloysia gratissima (Gill. et Hook.) Troncoso	*palo amarillo*	digestive aid
	Aloysia polystachya (Griseb.) Mold.	*poleo de burro*	digestive aid
	Lippia turbinata Griseb.	*poleo del campo*	digestive aid
Zygophyllaceae	*Larrea divaricata* Cav.	*jarilla*	used as a febrifuge
n/a	n/a	*cambalacho*	digestive aid
n/a	n/a	*chofitol*	digestive aid
n/a	n/a	*mimosa*	digestive aid
n/a	n/a	*yerba del castillo*	n/a

TABLE 3.—Nested MANOVA results for useful plants of San Clemente and Chancaní. The inter-population analysis compares the number of edible and medicinal plants cited as known and/or used, whereas the intra-population analysis evaluates such variables with respect to gender (male/female) and age groups (15-45 vs. ≥46).

Factors	Variables	*F*	*p*
Community	edible	6.908	0.011
	medicinal	4.638	0.036
Sex (community)	edible	2.620	0.820
	medicinal	0.713	0.494
Age (community)	edible	0.162	0.861
	medicinal	0.432	0.652

(Table 4). Although the scarce knowledge of edible plants preclude us to both report patterns and interpret clearly these results, we propose an explanation for the higher mean number of edible plants mentioned by men in Chancaní. Most rural tasks performed by men are within the forest, thus they frequently consume and collect wild edible fruits. Pfeiffer and Butz (2005) have reported many cases about the differential use plants between men and women due to both the resource access and their social role, among other factors.

The comparison between age groups did not show significant differences (Table 3). In general, older people know a high mean number of useful plants, but the differences were slight. In both communities, the most frequently used medicinal plants were mentioned by all the interviewed persons, independent of their sex or age. However, plants used for not usual treatments are mainly known by women and older people. A deeper knowledge and greater use of wild plants by older people were mentioned for other regions (e.g., Hanazaki et al. 2000, Phillips and Gentry 1993), and also for other communities of the Chaco Serrano (Martinez 2002).

Ecological Indices.—Simpson (5.8 and 4.5 for edible plants and 27.7 and 20 for medicinal plants, in San Clemente and Chancaní, respectively) and Shannon-Wiener diversity indices (0.88 and 0.72 for edible plants and 1.54 and 1.46 for medicinal plants, in San Clemente and Chancaní, respectively) were higher for medicinal plants in both populations. These results can be related with the natural plant diversity of these regions considering that most of the medicinal

TABLE 4.—Mean number of edible and medicinal plants known by an interviewed person by community, sex, and age.

	Community	Sex	Age
Edible	SC = 1.83 (*SD* = 1.63)	M = 1.2 (*SD* = 1.14)	≤45 = 1.75 (*SD* = 2.19)
		W = 2.3 (*SD* = 1.82)	≥46 = 1.88 (*SD* = 1.36)
		M = 3.5 (*SD* = 1.51)	≤45 = 2.84 (*SD* = 1.89)
	CH = 2.97 (*SD* = 1.53)	W = 2.65 (*SD* = 1.50)	≥46 = 3.17 (*SD* = 0.83)
Medicinal	SC = 9.75 (*SD* = 5.05)	M = 8.7 (*SD* = 5.48)	≤45 = 8.63 (*SD* = 3.34)
		W = 10.5 (*SD* = 4.78)	≥46 = 10.31 (*SD* = 5.74)
		M = 6.0 (*SD* = 4.39)	≤45 = 7.0 (*SD* = 4.14)
	CH = 6.75 (*SD* = 4.10	W = 7.2 (*SD* = 3.97)	≥46 = 6.5 (*SD* = 4.36)

SC: San Clemente; CH: Chancaní; M: Men; W: Women.

plants are herbaceous, while the edible fruits are obtained from trees, which are under increased human pressure.

Begossi (1996) pointed out that diversity indices allow us to evaluate the homogeneity/heterogeneity aspects on the use of plants ''inside'' a population. Less intra-homogeneity indicates a high diversity of plant uses, while a high intra-homogeneity indicates that only the most important plants are mentioned by the people. Thus, the lower value of the index for edible plants from Chancaní may be reflecting a high intra-homogeneity in the knowledge within this community. In this community, the low value of the diversity index can be explained because people know and use only five species, with a high preference on *algarrobos*. Also, a low diversity on the use of plants may represent some loss of local knowledge.

The values of the Shannon-Wiener diversity index for medicinal plants obtained in this study are close to those reported by Begossi (1996) for many communities throughout the world. This indicates that a significant portion of the knowledge on medicinal plants by these rural communities is currently available. Factors such as community geographic isolation; a close relationship between people and natural resources; a scarce access to the Western medicine because of economic and geographic reasons; or a high esteem of some plant species, are some of the reasons that could be favoring the maintenance of traditional knowledge on plant uses within these communities. On the other hand, the knowledge on edible plants would be more vulnerable to cultural erosion because the comparative lower consideration within the community (i.e., in San Clemente).

Finally, similarity indices showed that the main differences are between communities ($J = 0.51$; index value for sex and age were $J = 0.64$ and $J = 0.66$, respectively). These results are in accordance with that of the nested MANOVA. Thus, regional particularities (e.g., geographic, ecological, cultural, etc.) seem to be relevant to explain the main differences in the knowledge on wild useful plants between the people of San Clemente and Chancaní. Nevertheless, ''community'' as a factor is very complex to be disentangled because it includes the culture (e.g., people origin and identity), geography (e.g., isolation), economy (e.g., income), environment (e.g., local plant diversity), among other aspects.

CONCLUSIONS

The knowledge and use of wild plants reflect the coexistence of cultural guidelines and environmental factors modulating the social decisions. Thus, habitual use of medicinal plants indicates the existence of a traditional medical system, coincident with representations of health by people. In addition, the tendency to a greater knowledge of medicinal plants by women in both populations, and of edible plants by men in Chancaní, is a sign of prevalence of differential social role by gender. The lower use of edible plants, and the preference and cultural value of the *algarrobas* could be indications of the existence of underlying cultural guidelines to the wild food use. Also, this lower use is related with the smaller environmental availability. Finally, it is important to emphasize the utility of the use of ecological and quantitative methods in

ethnobiological studies, since they allow the determination of the existence of factors affecting the relation between people and environment. This information is not only useful for the social characterization, but also for the development of re-valuation programs and environmental management plans.

ACKNOWLEDGEMENTS

We want to express our gratitude to the people from San Clemente and Chancaní for their kind hospitality and collaboration. Also, we extend our thanks to Diana Abal Solís for her collaboration with the design of the map. We acknowledge two anonymous reviewers for their ideas and useful suggestions on early versions of our manuscript, and Secretaría de Ciencia y Técnica de la Universidad Nacional de Córdoba for the financial support. BAT has a Doctoral fellowship from the CONICET and SC and LG are researchers from the same institution.

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