



## Investigation of urban ethnoveterinary in three veterinary clinics at east zone of São Paulo city, Brazil



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### ABSTRACT

**Ethnopharmacological relevance:** Urban Ethnoveterinary should be further explored because of its value as it resists conventional medical care. In addition, the comparison between the resources used by Ethnoveterinary and Ethnopharmacology should be investigated in depth, increasing the availability of new bioactive potential in human and veterinary medicines. This project aimed to determine whether plants are used in the health care of dogs and/or cats in urban area and to compare its uses with other ethnoveterinary and ethnopharmacological data.

**Materials and methods:** Three veterinary clinics from east area of São Paulo city were selected, in order to record the offering of plants to pets by their owners. Individual interviews were conducted from May to November 2012 and consisted of application of semi-structured interviews and questionnaires. A literature search was performed to compare our findings with other ethnopharmacological and ethnoveterinarian data from the literature.

**Results:** A total of 273 people were interviewed and 46 (16.84%) of them utilize medicinal plants for their pets. Most plant species are exclusively home grown (57.9%). The plants most cited were *Plectranthus barbatus* Andrews, *Matricaria chamomilla* L. and *Foeniculum vulgare* Mill. The most frequent route of administration, part utilized and mode of preparation was oral (80.35%), leaves (89.47%) and infusion (61.90%), respectively. From 19 cited plants, 14 (73.7%) are mentioned in ethnoveterinary literature, whereas 11 (57.9%) are used for the same purposes. All plants reported in our study have at least one common use with ethnopharmacology.

**Conclusion:** The survey provided evidence of ethnoveterinary use of medicinal plants for dogs and/or cats in urban area of São Paulo, complementarily with the official veterinary, and showed that the plants used in pets are also used in humans with the same purposes and routes of administration, as well as in other animals.

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### 1. Introduction

The use of natural resources as animals, minerals and plants in health care is not restricted to the treatment of human diseases, being widely used in the treatment of animal diseases (Lans, 2007; Lans et al., 2001, 2008; Antonie-Moussioux et al., 2007; Jernigan, 2009; Raziq et al., 2010). The use of natural resources in the care of animal health is termed Ethnoveterinary. This term was first used by McCorkle (1986) to designate the “systematic research and

development which takes as its principal subject folk knowledge, practices, technology and resources, social organization and so forth pertaining to any aspect(s) of animal health among species raised or managed by human beings”. Most ethnoveterinary studies were conducted in rural or traditional communities in Asia, Africa, Central America, Europe and Middle East, focusing mainly in livestock, and therefore health issues as parasitic infections and skin diseases (Abbas et al., 2002; Tabuti et al., 2003; Githiori et al., 2005; Antonie-Moussioux et al., 2007; Lans, 2007; Lans et al., 2007c; Farooq et al., 2008; Gradé et al., 2009; Mwale and Masika, 2009; Raziq et al., 2010; González et al., 2011; Giday and Teklehaymanot, 2013; Yadav et al., 2014).

Very few ethnoveterinary studies involve dogs or cats. Jernigan (2009) reported that in Aguaruna, a traditional rural community in

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Peru that uses dogs for hunting purposes, 83% of the plants used for dogs are used in the treatment of human diseases as well, and 53% of them are used both by the natives and their dogs for the same purposes. Most ethnoveterinary studies regarding pets were conducted in rural areas. In British Columbia, Canada, it was documented the use of plants by farmers to treat dogs and cats with fleas, and also for ear infections (Lans et al., 2008), and also plants for reproductive health in these animals (Lans et al., 2009). In Trinidad and Tobago several plants are used to treat canine diseases (Lans et al., 2000) and hunters use the same plants for themselves and hunting dogs in the treatment of snake and scorpion bites and wounds, although some plants are of particular use for dogs (Lans et al., 2001).

In Brazil, ethnoveterinary studies regarding plants are scarce and were all performed in rural areas. Inhabitants of the Amazon region of Pará use several plants to treat diseases of dogs, cats, cows, horses, buffaloes, pigs and poultry, both in Marajo Island (Monteiro et al., 2011) and Colares Island (Ritter et al., 2012). In a study conducted in the rural community of Pombal, in northeast of Brazil, documented the use of garlic (*Allium sativum* L.), lemon (*Citrus* spp.) and mastruz (*Chenopodium ambrosioides* L.) to treat animals (Andrade et al., 2012). Silva et al. (2014) have conducted a survey at two rural communities regarding plants known or used by the population to treat endo- and ectoparasitic diseases in humans and animals in northeastern Brazil. Thus, we can notice the dearth of ethnoveterinary studies in Brazil referring to dogs and cats in the urban environment.

The aim of this study was to observe whether there is the herbal therapeutic treatment to dogs and/or cats by their owners in the urban area; to register this knowledge and compare it with data of ethnoveterinary and ethnopharmacology literature. Our hypotheses were: (1) the owners of dogs/cats, in urban area of São Paulo, Brazil, use medicinal plants for their pets, regardless of conventional veterinary, and (2) these plants are used for the same therapeutic purposes in humans.

## 2. Materials and methods

### 2.1. Study area

The three clinics selected are located in the districts of São Mateus, Vila Prudente and Mooca (Fig. 1) in the East Zone of São Paulo. The veterinarian Ronaldo Pedro Cláudio, author of this study, is the owner of one of the clinics and designated the other

two. It is believed that this link between researchers and collaborators – the owners of veterinary clinics – is advantageous, since it can improve the adherence of the pet owners to the study. Furthermore, the choice of these clinics considered their locations, assuming that the low-middle socioeconomic conditions of the region SEADE (2015) might encourage the use of alternative medical practices.

### 2.2. Selection of the respondents, interviews, and observations

The personal information of the respondents and relevant ethnoveterinary information were obtained using anthropological methods and techniques for field research (Bernard, 1988; Foote-Whyte, 1990; Malinowski, 1990) in the form of semi-structured interviews and questionnaires. After gathering the information, the respondents had the information confirmed using a checklist of questions to review the data provided.

This study was approved by the National Ethics Committee (CONEP) under the process number 5331. All respondents, pet owners, signed the Free, Prior and Informed Consent (FPIC), containing descriptive information about the pet owner; the question if he offered or offer any plant for the treatment of their pet; which plants; brief explanation of the purpose and methodology of the research and agreement to participate in it, stating name and address. During the interviews, an ethnoveterinary data sheet was filled, containing more specific information regarding plants, as popular name, part utilized, quantity, indication, mode of preparation, route of administration, dose, dosage, duration of use.

The interviews were conducted between May and November 2012, totaling six months of collection. During this period, one of the authors (RMS) remained four hours weekly in each veterinary clinic. Respondents who agreed to participate in the research were asked about the use of plants and to which diseases and symptoms they are offered to pets. The interviews were conducted in the local language, Portuguese. The plants indicated by the respondents were collected, identified (SH, botanist) and the voucher specimen material was deposited in the Municipal Herbarium (PMSP). The plants that the respondents claimed to buy in the market, in the form of packaged and labeled products, had already their species identification described on the label, a requirement in Brazilian legislation. Notwithstanding, only one plant indicated was obtained exclusively through trade, the other seven were also reported to be cultivated and are deposited in the above mentioned Herbarium. For this only plant obtained through trade, the voucher identification seen in Table 1 refers to previous collection.

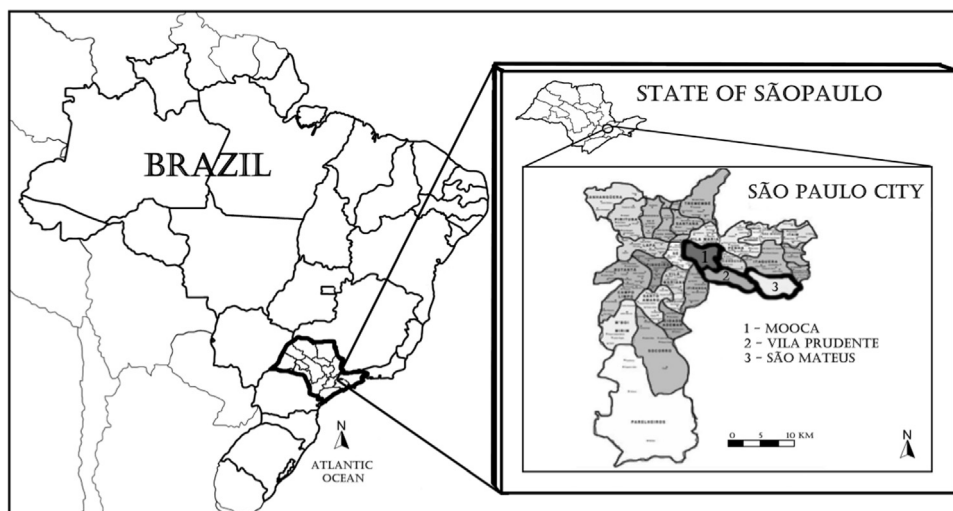


Fig. 1. Location of the three veterinary clinics: (1) Mooca; (2) Vila Prudente and (3) São Mateus, in the East Zone of São Paulo city, State of São Paulo, Brazil.

**Table 1**

Nineteen plant species indicated for the treatment of animal diseases, part utilized, mode of use and route of administration, recipe, ethnoveterinary uses mentioned in the present study, ethnoveterinary and ethnopharmacological uses from the literature.

Botanic and vernacular names, voucher	Part utilized, mode of preparation and route of administration	Recipe	Ethnoveterinary uses (animal; number of citations)	Other ethnoveterinary uses (animal-part of plant utilized)	Ethnopharmacological uses (humans)
1. <i>Aloe arborescens</i> Mill. [Xanthorrhoeaceae]–“babosa” PMSP 8569	Leaf/ <i>in natura</i> /topic	Slice the leaf lengthwise and use the inner gel directly to the skin	Skin allergy <sup>a</sup> (dog;1)	Gastro-intestinal parasites (goats–leaves) (Maphosa and Masika, 2010); to drench sick calves (cattle–leaves) (McGaw and Eloff, 2008); control of mastitis (livestock–leaves) (Avancini et al., 2008)	Skin lesions <sup>a</sup> and infectious diseases (Baptista et al., 2013; Cooposamy and Naidoo, 2013), parasitic diseases, respiratory system, digestive system, neoplasms (Baptista et al., 2013)
2. <i>Azadirachta indica</i> A. Juss. [Meliaceae]–“neem” <sup>c</sup> PMSP 13866 <sup>D</sup>	Leaf/infusion/oral and topic	Prepare the infusion of the leaves, allow to cool and wipe the body (fleas); add to the drinking water (soothing)	Flea repellent <sup>a,b</sup> (dog;1), soothing (dog;1)	Myiasis <sup>b</sup> , lice infestation, helminthiasis (livestock–leaves) (Farooq et al., 2008); ephemeral fever (ethnoveterinary purposes–leaves) (Naik et al., 2012)	Malaria (Giday et al., 2009), diabetes (Bieski et al., 2012), measles (Lans, 2007), insect repellent <sup>a</sup> (Mishra et al., 1995)
3. <i>Chenopodium ambrosioides</i> L. [Amaranthaceae]–“mastruz” PMSP 15774	Leaf/maceration/oral	Maceration of a few leaves along with milk, and give it to the dog to drink	Worm <sup>a,b</sup> (dog;1), pneumonia <sup>a</sup> (dog;1), bronchitis <sup>a</sup> (dog;1)	Anthelmintic <sup>b</sup> (dogs–leaves) (Lans et al., 2000); anthelmintic <sup>b</sup> for backyard (chickens–plant tops) (Lans et al., 2007a); anthelmintic <sup>b</sup> , cough, wound healing, anti-inflammatory, diarrhea (Monteiro et al., 2011); parasitic diseases <sup>b</sup> (cattle, goat, chicken, pig, sheep – leaf) (Silva et al., 2014)	Dewormer <sup>a</sup> , internal parasites <sup>a</sup> (Heinrich et al., 1992; Albuquerque et al., 2007; Gómez-Estrada et al., 2011; Silva et al., 2011), antibiotic, expectorant (Souza and Felfili, 2006), stomachache, inflammation, bronchitis <sup>a</sup> (Albuquerque et al., 2007, Garcia et al., 2010; Silva et al., 2011), liver (Garcia et al., 2010), diabetes (Bieski et al., 2012), gastrointestinal, immunological and respiratory problems <sup>a</sup> (Rodrigues, 2006)
4. <i>Coriandrum sativum</i> L. [Apiaceae]–“coentro” PMSP 15777	Leaf/ <i>in natura</i> /oral	Give the dog leaves to eat	Wound healing (dog;1), for the intestine <sup>a,b</sup> (dog;1)	Treatment and/or management of helminthes <sup>b</sup> (animals–seeds) (Hussain et al., 2008); genital prolapse (cattle and buffaloes–seeds) (Dilshad et al., 2008)	Flu (Bieski et al., 2012), weight loss, digestive problems <sup>a</sup> (Alzweiri et al., 2011), anti-inflammatory, kidney stone (Natale and Pollio, 2012)
5. <i>Costus spiralis</i> (Jacq.) Roscoe [Costaceae]–“caninha-do-brejo” PMSP 14253	Leaf/infusion/oral	Prepare the infusion of the leaves and add one tea spoon to the dog's drinking water every day	Kidney stone <sup>a,b</sup> (dog;1)	Kidney problems <sup>b</sup> (livestock–leaves) (Monteiro et al., 2011)	Genitourinary system <sup>a</sup> , parasitic and infectious diseases (Baptista et al., 2013)
6. <i>Cymbopogon citratus</i> (DC.) Stapf [Poaceae]–“capim-cidreira” <sup>c</sup> PMSP 15778	Leaf/ <i>in natura</i> /oral	Give the cat leaves to eat	Malaise, antiemetic <sup>a,b</sup> , hairball (cat;2)	Colic, diarrhea, anthelmintic, vomit <sup>b</sup> (canine, feline–leaves, root) (Ritter et al., 2012)	Antiemetic <sup>a</sup> , diarrhea, digestive (Silva et al., 2011), anxiolytic, contraceptive (Santos et al., 2012)
7. <i>Echinodorus grandiflorus</i> (Cham. & Schltdl.) Micheli [Alismataceae]–“chapéu-de-couro” PMSP 11735	Leaf/infusion/oral	Prepare the infusion of the leaves and add one tea spoon to the dog's drinking water every day	Kidney stone <sup>a</sup> (dog;1)	No data found	Gastro-intestinal system diseases; gynecology and urinary-tract diseases <sup>a</sup> (Bolson et al., 2015)
8. <i>Foeniculum vulgare</i> Mill. [Apiaceae]–“erva-doce” <sup>c</sup> PMSP 15213	Flower/infusion/oral and topic	Prepare the infusion of the leaves and add to the drinking water, or make a compress with a cotton cloth directly to the eyes of the dog	Antiemetic (dog;1), soothing <sup>a</sup> (dog;1), tear stains (dog;1), malaise <sup>b</sup> (dog, cat; 2)	Cold/rhinitis, diarrhoea, (camel–seeds) (Muhammad et al., 2005); anthelmintics (livestock – seeds) (Hussain et al., 2008); anestrous (cattle, buffaloes–seeds) (Dilshad et al., 2008); given if the animal stops eating <sup>b</sup> (milk yielding animal–fruit)	Stomachache, soothing <sup>a</sup> , constipation, (Albuquerque et al., 2007; Silva et al., 2011; Bieski et al., 2012), flatulence, abdominal cramps (Alzweiri et al., 2011), kidney, high blood pressure, liver (Albuquerque et al., 2007), nasal congestion, bronchitis (Calábria et al., 2008)
9. <i>Gossypium</i> cf. <i>hirsutum</i> L. [Malvaceae]–“algodão” PMSP 15780	Leaf/infusion/oral	Prepare the infusion of the leaves and add to the dog's drinking water	Anti-inflammatory <sup>a</sup> , for the femur (dog;1)	Bloody diarrhea (Cows, buffaloes–buds) (Mussarat et al., 2014)	Uterus infection and inflammation <sup>a</sup> (Brito and Senna-Valle 2011), anti-inflammatory <sup>a</sup> (Jesus et al., 2009; Garcia et al., 2010), muscle pain and headache (Di Stasi et al., 2002)

Table 1 (continued)

Botanic and vernacular names, voucher	Part utilized, mode of preparation and route of administration	Recipe	Ethnoveterinary uses (animal; number of citations)	Other ethnoveterinary uses (animal–part of plant utilized)	Ethnopharmacological uses (humans)
10. <i>Laurus nobilis</i> L. [Lauraceae]–“louro” PMSP 15773	Leaf/infusion/oral	Prepare the infusion using one leave, and give 3–4mL to the dog using a syringue, once in the day, for one week	Belly ache <sup>a</sup> (dog;1)	No data found	Stomach gases (Brito and Senna-Valle 2011), pancreas, liver and digestive problems <sup>a</sup> (Natale and Pollio 2012), cancer and skin problems (Alzweiri et al., 2011), headache, intestine (Di Stasi et al., 2002)
11. <i>Matricaria chamomilla</i> L. [Asteraceae]–“camomila” <sup>c</sup> PMSP 15776	Flower/infusion/oral	Prepare the infusion using the flowers, add to the drinking water, 2–3 times a day, or apply a compress directly to the skin after shearing	Skin allergy <sup>b</sup> (dog;1), stomach gas <sup>a,b</sup> (dog;1), diarrhea <sup>b</sup> (dog;1), belly ache <sup>a,b</sup> (dog;1), soothing <sup>a,b</sup> (dog; 2)	Ear infections (pets–flowers) (Lans et al., 2008); skin afflictions <sup>b</sup> and sores, gastrointestinal disorders <sup>b</sup> and metabolic dysfunctions, treatment of infertility and diseases of female genitals (livestock–flowers) (Disler et al., 2014), colic <sup>b</sup> , stress <sup>b</sup> and anxiety <sup>b</sup> (horses–flowers) (Lans et al., 2006)	Soothing <sup>a</sup> , cramps <sup>a</sup> , stomach <sup>a</sup> , fever, flu, insomnia (Heinrich et al., 1992; Di Stasi et al., 2002; Calábria et al., 2008; Cartaxo et al., 2012; Bieski et al., 2012)
12. <i>Melissa officinalis</i> L. [Lamiaceae]–“melissa” <sup>c</sup> PMSP 15783	Leaf/in natura/oral	Prepare the infusion of the leaves, allow to cool and add to the dog’s drinking water, or give the dog leaves to eat	Pain <sup>a</sup> (dog;1), antiemetic <sup>a</sup> (dog;1), soothing <sup>a,b</sup> (dog;3)	Toner, stop diarrhoea, gastroenteritis (pets and pigs–leaves) (Lans et al., 2007b); Calming <sup>b</sup> (ruminants–aerial parts) (Lans et al. 2007c); to treat fleas and flies (pets–aerial parts) (Lans et al., 2008)	Soothing <sup>a</sup> , high blood pressure, flu, indigestion (Di Stasi et al., 2002; Bieski et al., 2012), nausea <sup>a</sup> , stomach pain <sup>a</sup> (Silva et al., 2011)
13. <i>Mentha × piperita</i> L. [Lamiaceae]–“hortelã” <sup>c</sup> PMSP 15782 ( <i>Mentha</i> sp.) <sup>e</sup>	Leaf/infusion/oral	Prepare the infusion of the leaves, allow to cool and add to the drinking water	Worm <sup>a,b</sup> (dog;1), flu (dog;2)	For treating endo- and ectoparasites <sup>b</sup> (rabbits and poultry–whole plant) (Lans and Turner, 2011);	Tootache (Vieira et al., 2014); rheumatism, headache, diarrhea, dizziness, stomachache, vermifuge <sup>a</sup> (Juárez-Vázquez et al., 2013); antiseptic; eliminates parasites from digestive system <sup>a</sup> ; relieves headaches; hydrates and soothes the skin (Pereira et al., 2009)
14. <i>Phyllanthus tenellus</i> Roxb. [Phyllanthaceae]–“quebra-pedra” <sup>c</sup> PMSP 15779	Leaf/infusion/oral	Prepare the infusion of the leaves and add one tea spoon to the dog’s drinking water every day	Kidney stone <sup>a</sup> (dog;1)	No data found	Genito-urinary system <sup>a</sup> (Baptista et al., 2013; Bolson et al., 2015), musculoskeletal and joint diseases (Bolson et al., 2015); diarrhoea, earache, contraception (Chander et al., 2014); abortive, calculus of kidney <sup>a</sup> , sedative, cystitis, vaginal discharge, diuretic, stomachache/diarrhea, urinary pain, flatulence, urinary infection, bladder inflammation, laxative, not defined, hepatic problems, bladder problems, ovary problems, renal problems <sup>a</sup> , helminthiasis (de Medeiros et al., 2013)
15. <i>Piper umbellatum</i> L. [Piperaceae]–“pariparoba” PMSP 15781	Leaf/infusion/oral	Prepare the infusion of the leaves and add to the dog’s drinking water	Antiemetic <sup>a</sup> , malaise (cat;1)	No data found	Stomach, pneumonia, liver (Bieski et al., 2012), muscle pain relief, stomach cramps (Di Stasi et al., 2002), nausea <sup>a</sup> (Chartol, 1964)
16. <i>Plectranthus barbatus</i> Andrews [Lamiaceae]–“boldo” <sup>c</sup> PMSP 15775	Leaf/infusion or in natura/oral	Prepare the infusion of the leaves, allow to cool and give it using a syringue or add to the drinking water	Stomach gas <sup>a</sup> (dog;1), stomachache <sup>a,b</sup> (dog;8), antiemetic (dog;6)	Colic <sup>b</sup> (dogs – leaves) (Ritter et al., 2012); east coast fever (livestock – leaves) (Ole-Miaron, 2003)	Stomachache <sup>a</sup> (Bieski et al., 2012), liver, constipation <sup>a</sup> (Albuquerque et al., 2007), hangover, cramps <sup>a</sup> , prostate (Brito and Senna-Valle, 2011; Silva et al., 2011) malaise, hangover, anti-inflammatory (Jesus et al., 2009), headache (Cartaxo et al., 2012)
17. <i>Porophyllum ruderale</i> (Jacq.) Cass. [Asteraceae]–“arnica” PMSP 15772	Leaf/infusion/oral	Prepare the infusion of the leaves and add a few drops to the dog’s food	Anti-inflammatory <sup>a</sup> (cat;1)	No data found	Muscle pain (Garcia et al., 2010), bruises (Brito and Senna-Valle, 2011), anti-inflammatory <sup>a</sup> (Jesus et al., 2009)

18. <i>Ruta graveolens</i> L. [Rutaceae]—"arruda" PMSP 15475	Leaf/infusion/topic	Prepare the infusion of the leaves and make a compress directly to the eyes of the dog	Conjunctivitis <sup>a</sup> (dog:1)	Roundworms, tapeworms (pets and pigs—aerial parts) (Lans et al., 2007b)	Intestinal cramps, insect repellent, kidney diseases (Natale and Pollio, 2012), conjunctivitis <sup>a</sup> (Garcia et al., 2010; Bieski et al., 2012), stomachache (Henrich et al., 1992; Rodrigues, 2006), nausea, laxative, muscle pain (Garcia et al., 2010; Bieski et al., 2012), diarrhea, stomach gases, evil eye, headache, anti-inflammatory (Rodrigues, 2006; Silva et al., 2006; Jesus et al., 2009; Silva et al., 2011), fever (Brito and Senna-Valle, 2011), gastritis (Bieski et al., 2012), skin (Gómez-Estrada et al., 2011)
19. <i>Sedum dendroideum</i> Moc. & Sessé ex DC. [Crassulaceae]—"bálsamo" PMSP 7399	Leaf/maceration/topic	Maceration of a few leaves and apply directly to the skin of the dog	Anti-inflammatory, wound healing <sup>a,b</sup> (dog:1)	Cuts and wounds <sup>b</sup> , eye disease (live-stock—leaves) (Souza et al., 2014)	Gum diseases (Rosas-Pinón et al., 2012), wound healing <sup>a</sup> (Schmidt et al., 2009).

<sup>a</sup> The matches between our ethnoveterinary data and ethnopharmacological uses from literature

<sup>b</sup> The matches between our ethnoveterinary data and other ethnoveterinary uses from literature

<sup>c</sup> Plants obtained from trade

<sup>d</sup> Voucher identification refers to material previously collected

<sup>e</sup> Voucher identification refers to home cultivated *Mentha* sp., collected; correlations with ethnopharmacological uses described for *Mentha x piperita* as indicated in labelled products

The popular names of plants in Portuguese, as cited, were indicated in quotes in Table 1 and throughout the manuscript.

### 2.3. Literature search

Between February and May 2015, a literature search was performed using the PubMed, Web of Science and Scopus databases to identify studies that investigated the ethnopharmacological and ethnoveterinarian uses of the species provided, considering the same purposes and routes of administration.

## 3. Results and discussion

### 3.1. Respondents and ethnoveterinary knowledge

In total 273 people were interviewed, including 74 men (27.11%) and 199 women (72.89%). From these, only 46 (16.84%) knew at least one application of plants for veterinary purpose and offered it to their pets, and their age varied from 34 to 63 years old (mean age  $51 \pm 7.8$ ). From the 46 people, 38 were women (82.60%), and a similar result is also found in other ethnoveterinary studies in Brazil (Monteiro et al., 2011; Ritter et al., 2012) and abroad (Mwale and Masika, 2009; Sharma et al., 2012), although Mathias and McCorkle (2004) argue that the ethnoveterinary knowledge is more often reported by men. We believe that our findings may reflect the fact that women are the largest attending at the veterinary clinics, probably because they are more connected with tasks related to animal health as also pointed by Mathias and McCorkle (2004).

Regarding the overall number of respondents the ones that offer plants to animals, it was observed that the clinic located in Mooma had 132 respondents, 22 (16.66%) of these offer plants to their pets; the clinic located in Vila Prudente had 75 respondents, 12 (16%) of these offer plants to their pets, and the clinic located in São Mateus had 66 respondents, and 12 (18.18%) of these offer plants to their pets. Also, it was not observed difference between the number of respondents who uses medicinal plants to their pets in the three clinics, since the chi-square test showed no significant difference between them ( $p=0.9392$ ), suggesting a similar use of plants in the region studied.

From the 19 plants offered to pets, most are obtained exclusively through home cultivation (11 plants; 57.9%), whilst seven (36.8%) are obtained by trade and home grow and only one (5.3%: *Azadirachta indica* A. Juss.—"neem") is obtained exclusively from trade. Other ethnoveterinary studies report that plants are obtained through cultivation, but mostly collected in forest areas (Yineger et al., 2007; Shah et al., 2008; Shen et al., 2010; Sharma et al., 2012), being the purchase of medicinal plants an unusual practice. In this study a large proportion was obtained by trade (42.1%), probably because the urban context encourages purchasing. It is noteworthy that according to Brazilian legislation, plant based products must have their species referred by the botanical name indicated on the label.

According to the respondents, the ethnoveterinary knowledge was transmitted vertically, from their parents, also being transmitted horizontally, mainly by friends. In addition, many respondents treat their pets with plants because they use it in themselves and believe they will achieve the same therapeutic effect on their animals, as one interviewee reported: "I give *pariparoba* [*Piper umbellatum* L.] to my dog because I use it when I feel discomfort".

### 3.2. Ethnoveterinary practices

It was observed a total of 20 uses in veterinary medicine corresponding to 19 plant species belonging to 15 different families

(Table 1). The therapeutic uses with the highest number of plant species indicated were “soothing” and “antiemetic”, each with five species mentioned. Besides, the plants with the largest number of therapeutic uses were “camomila” (*Matricaria chamomilla* L.), “erva-doce” (*Foeniculum vulgare* Mill.), and “mastruz” (*Chenopodium ambrosioides* L.). Also, the plants mentioned by a greater number of respondents were “boldo” (*Plectranthus barbatus* Andrews), cited by 12 respondents; and *M. chamomilla* and *F. vulgare*, both cited by five respondents each. These plants were mentioned for more than one use by some respondents, e.g. *P. barbatus* was mentioned 15 times, to three uses (stomach gas, stomachache and antiemetic), by 12 respondents; *M. chamomilla* was mentioned six times, to five uses by five respondents; and *F. vulgare* was mentioned five times to four uses by five respondents (Table 1). Some ethnoveterinarian uses reported in this study are similar to other studies, for instance, all uses reported for “camomila” (*M. chamomilla*) coincide with other studies with horses and livestock (see Table 1). From 19 cited plants, 14 (73.7%) are mentioned in ethnoveterinary literature, whereas 11 (57.9%) are used for the same purposes according to the literature. We believe that the scarcity of ethnoveterinary studies prevent us from finding more congruence between ethnoveterinary uses, since the plants used for animals in our study are widely used medicinally for humans in the urban context, which can be seen by the congruence with ethnopharmacological data (Table 1).

The used part most frequently cited was leaves (89.47%) and the predominant mode of preparation was tea (infusion) – with 14 citations. The most common route of administration was oral (80.35%) followed by topical (19.64%). Both the prevalence of leaves as the part utilized and infusion (tea) as the form of use are common findings in ethnoveterinary and ethnopharmacology studies, as well as the oral administration as preferential route (Heinrich et al., 1992; Di Stasi et al., 2002; Rodrigues, 2006; Monteiro et al., 2011; Ritter et al., 2012).

Dose and dosage may vary. Converging with other ethnoveterinary studies (Giday et al., 2009; Monteiro et al., 2011; Ritter et al., 2012), most respondents do not follow standard dose/dosage for acute treatments and medication is given at random with the use of single plant. In our findings, the extract can be diluted, as one to three teaspoons put in the animal water, or can be put directly in the pot. The use of syringe was mentioned, in the cases the animal does not take it willingly. Most respondents do not follow a standard dose/dosage for acute treatment of the diseases, as the medication is given at random and using a single plant. The exception is kidney stone, which the treatment is chronic and medication is prepared as a formula, (multi-ingredient). The use of formulas reflects the idea of synergy, where the association of plants may result in increased efficacy of treatment, which is commonly used traditionally in Chinese and Tibetan Medicines and by the Quilombolas in Brazil (Rodrigues and Carlini, 2004; Giday et al., 2007; Antonio et al., 2013).

### 3.3. Ethnoveterinary and ethnopharmacology

Table 1 lists the plant species cited by the respondents in alphabetical order according to their botanical names. Each species is presented with their respective botanical family, vernacular names, in Portuguese and English, herbarium voucher, ethnoveterinary uses, part utilized, route of administration, mode of use, recipe, and is compared with other ethnoveterinary and ethnopharmacological uses (Human folk use) from literature. Of the 19 plants cited by respondents, 15 were indicated to treat canine diseases, one for dogs and/or cats, and three for cats. According to the literature search, all the 19 plants reported have at least one common therapeutic use for both humans and animals. On the other hand, two plants have at least one therapeutic use specific to

pets. They are: “erva-doce” (*F. vulgare*), used to treat tear strains in dogs and “capim-cidreira” (*Cymbopogon citratus* (DC.) Stapf), used to expel hairball in cats.

Merging our findings with ethnopharmacological knowledge, chamomile and fennel were also the plants most often cited in studies conducted in rural and urban areas in Vale do Ribeira, São Paulo State (Di Stasi et al., 2002) and in the rural community of Pato Branco, Paraná State (Marchese et al., 2009) respectively, and “boldo” (*P. barbatus*) the second most cited in Datas, Minas Gerais State (Arnous et al., 2005). These three plants are very popular in Brazil, both in ethnopharmacology as ethnoveterinary. “Neem” (*A. indica*) used in dogs as flea repellent was also mentioned as antiseptic and antimicrobial in several ethnoveterinary studies in Brazil and abroad (Lans et al., 2000; Tabuti et al., 2003; Sori et al., 2004; Farooq et al., 2008; Monteiro et al., 2011; Araújo et al., 2012; Sharma et al., 2012) and is also used by humans for the similar purposes (Jabbar et al., 2006; Kadir et al., 2012; Nagendrappa et al., 2013). Indeed, comparing our data with the literature (Table 1), all plants cited are also used by humans, mostly for similar purposes.

Finally, the veterinarian Ronaldo Pedro Cláudio, author of this study, released three hypotheses that try to explain why the owners of dogs and/or cats use medicinal plants despite having the availability of veterinary clinics in urban environments, they are: (1) lack of financial condition to take the animal to the vet; (2) The pets owners believe that the medicinal plants are “natural” and therefore prefer to provide this treatment to them in some circumstances, particularly when they realize that certain plants have beneficial effects in themselves; and finally (3) the veterinarian has exhausted all possibilities of healing because the disease is severe, thus, the owners of pets use the plants as a last hope. We believe that novel ethnoveterinarian investigations in the urban context could gain from exploring the outcomes of the treatment of cats and dogs using both folk and conventional cares, in a more in depth investigation.

## 5. Conclusion

This ethnoveterinary survey revealed that the folk use of medicinal plants in dogs and cats in urban area, noted the East Zone of São Paulo, Brazil, actually occur concomitant with the conventional veterinary treatment. The plants listed are quite common in urban areas and are also used by other animals, including the rural context, and by ethnopharmacology mostly with the same therapeutic effects and routes of administration. This finding suggests that people offer medicinal plants for their animals as they use the plants themselves.

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## References

- Abbas, B., Al-Qarawi, A.A., Al-Hawas, A., 2002. The ethnoveterinary knowledge and practice of traditional healers in Qassim Region, Saudi Arabia. *J. Arid Env.* 50, 367–379.
- Albuquerque, U.P., Monteiro, J.M., Ramos, M.A., Amorim, E.L.C., 2007. Medicinal and magic plants from a public market in northeastern Brazil. *J. Ethnopharmacol.* 110, 76–91.

- Alzweiri, M., Sarhan, A.A., Mansi, K., Hudaib, M., Aburjai, T., 2011. Ethnopharmacological survey of medicinal herbs in Jordan, the Northern Badia region. *Journal of Ethnopharmacology* 137 (1), 27–35.
- Andrade, S.E.O., Maracajá, P.B., Silva, R.A., Freires, G.F., Pereira, A.M., 2012. Estudo etnoveridário de plantas medicinais na comunidade Várzea Comprida dos Oliveiras, Pombal, Paraíba, Brasil. *Rev. Verd.* 7, 193–198.
- Antonie-Moussiak, N., Faye, B., Vias, G.F., 2007. Tuareg ethnoveterinary treatments of camel diseases in Agadez area (Niger). *Trop. Anim. Health Prod.* 39, 83–89.
- Antonio, R.L., Kozasa, E.H., Galduróz, J.C.F., Dawa, Dorjee, Y., Kalsang, T., Norbu, T., Tenzin, T., Rodrigues, E., 2013. Formulas used by Tibetan doctors at Men-Tese-Khang in India for the Treatment of Neuropsychiatric disorders and their correlation with pharmacological data. *Phytother. Res.* 27, 552–563.
- Araújo, F.A.D., Leite, D.T., Sousa, L.C.F.S., Fernandes, A.A., 2012. Etnobotânica and ethnoveit in Jacu Settlement in municipality of Pombal–Paraíba–Brazil. *Rev. Verde Agroecol. Desenvolv. Sustent.* 6, 149–156.
- Arnous, A.H., Santos, A.S., Beininger, R.P.C., 2005. Plantas medicinais de uso caseiro–conhecimento popular e interesse por cultivo comunitário. *Rev. Espaço. Para Saúde* 6, 1–6.
- Avancini, C., Wiest, J.M., Dall'Agnol, R., Haas, J.S., von Poser, G.L., 2008. Antimicrobial activity of plants used in the prevention and control of Bovine Mastitis in Southern Brazil. *Latin Am. J. Pharmacy* 27, 894–899.
- Baptista, M.M., Ramos, M.A., de Albuquerque, U.P., Coelho-de-Souza, G., Ritter, M.R., 2013. Traditional botanical knowledge of artisanal fishers in southern Brazil. *J. Ethnobiol. Ethnomed.* 9, 54.
- Bernard, H.R., 1988. *Research Methods in Cultural Anthropology*. Sage, New-Bury Park, Califórnia.
- Bieski, I.G.C., Santos, F.R., Oliveira, R.M., Espinosa, T.O., Macedo, M., Albuquerque, U. P., Martins, D.T.O., 2012. Ethnopharmacology of Medicinal Plants of the Pantanal Region (Mato Grosso, Brazil). *Evid.-Based Complement. Altern. Med.*
- Bolson, M., Hefler, S.R., Dall'Oglio Chaves, E.I., Gasparotto Junior, A., Cardozo Junior, E.L., 2015. Ethno-medicinal study of plants used for treatment of human ailments, with residents of the surrounding region of forest fragments of Paranaá, Brazil. *J. Ethnopharmacol.* 161, 1–10.
- Brito, M.R., Senna-Valle, L., 2011. Plantas medicinais utilizadas na comunidade caçara da Praia do Sono, Paraty, Rio de Janeiro. *Acta Bot. Bras.* 25, 363–372.
- Calábria, L., Cuba, G.T., Hwang, S.M., Marra, J.C.F., Mendonça, M.F., Nascimento, R.C., Oliveira, M.R., Porto, J.P.M., Santos, D.F., Silva, B.L., Soares, T.F., Xavier, E.M., Damasceno, A.A., Milani, J.F., Rezende, C.H.A., Barbosa, A.A.A., Canabrava, H.A.N., 2008. Levantamento etnobotânico e etnofarmacológico de plantas medicinais em Indianapolis, Minas Gerais, Brasil. *Rev. Bras. Plantas Med.* 10, 49–63.
- del Carmen Juárez-Vázquez, M., Carranza-Álvarez, C., Alonso-Castro, A.J., González-Alcaraz, V.F., Bravo-Acevedo, E., Chamorro-Tinajero, F.J., Solano, E., 2013. Ethnobotany of medicinal plants used in Xalpatlahuac, Guerrero, Mexico. *J. Ethnopharmacol.* 148, 521–527.
- Cartaxo, S.L., Souza, M.M.A., Albuquerque, U.P., 2012. Medicinal plants with bioprospecting potential used in semi-arid northeastern Brazil. *J. Ethnopharmacol.* 131, 326–342.
- Chander, M.P., Kartick, C., Gangadhar, J., Vijayachari, P., 2014. Ethno medicine and healthcare practices among Nicobarese of Car Nicobar – an indigenous tribe of Andaman and Nicobar Islands. *J. Ethnopharmacol.* 158, 18–24.
- Chartol, A., 1964. An insect repellent derived from *Piper umbellatum*. *Med. Trop.* 24, 743–747.
- Coopossamy, R.M., Naidoo, K.K., 2013. A comparative study of three Aloe species used to treat skin diseases in South African rural communities. *J. Altern. Complement. Med.* 19, 425–428.
- Dilshad, S.M.R., Iqbal, Z., Muhammad, G., Iqbal, A., Ahmed, N., 2008. An inventory of the ethnoveterinary practices for reproductive disorders in cattle and buffaloes, Sargodha district of Pakistan. *J. Ethnopharmacol.* 117, 393–402.
- Disler, M., Ivmeyer, S., Hamburger, M., Vogl, C.R., Tesic, A., Klarer, F., Walkenhorst, M., 2014. Ethnoveterinary herbal remedies used by farmers in four north-eastern Swiss cantons (St. Gallen, Thurgau, Appenzell Innerrhoden and Appenzell Ausserrhoden). *J. Ethnobiol. Ethnomed.* 10, 32.
- Di Stasi, L.C., Oliveira, G.P., Carvalhaes, M.A., Queiroz-Junior, M., Kakinami, S.H., Reis, M.S., 2002. Medicinal plants popularly used in the Brazilian Tropical Atlantic Forest. *Fitoterapia* 73, 69–90.
- Farooq, Z., Iqbal, Z., Mushtaq, S., Muhammad, G., Iqbal, M.Z., Arshad, M., 2008. Ethnoveterinary practices for the treatment of parasitic diseases in livestock in Cholistan desert (Pakistan). *J. Ethnopharmacol.* 118, 213–219.
- Foot-Whyte, W., 1990. *Treinando a observação participante*, 3rd ed. In: Guimarães, A.Z. (Ed.), *Desvendando Máscaras Sociais* 3. Francisco Alves, Rio de Janeiro, pp. 77–86.
- Garcia, D., Domingues, M.V., Rodrigues, E., 2010. Ethnopharmacological survey among migrants living in the Southeast Atlantic Forest of Diadema, São Paulo, Brazil. *J. Ethnobiol. Ethnomed.* 6, 29.
- Giday, M., Teklehaymanot, T., Animut, A., Mekonen, Y., 2007. Medicinal plants of the Shinasha, Agew-awi and Amhara peoples in northwest Ethiopia. *J. Ethnopharmacol.* 110, 516–525.
- Giday, M., Zemede, A., Zerihun, W., 2009. Medicinal plants of the Meinit ethnic group of Ethiopia: an ethnobotanical study. *J. Ethnopharmacol.* 124, 513–521.
- Giday, M., Teklehaymanot, T., 2013. Ethnobotanical study of plants used in management of livestock health problems by Afar people of Ada'ar District, Afar Regional State, Ethiopia. *J. Ethnobiol. Ethnomed.* 9, 1–10.
- Githiori, J.B., Höglund, J., Waller, P.J., 2005. Ethnoveterinary plant preparations as livestock dewormers: practices, popular beliefs, pitfalls and prospects for the future. *Anim. Health Res. Rev.* 6, 91–103.
- Gómez-Estrada, H., Díaz-Castilho, F., Franco-Ospina, L., Mercado-Camargo, J., Guzmán-Ledezma, J., Medina, D.J., Gaitán-Ibarra, R., 2011. Folk medicine in the northern coast of Colômbia: na overview. *J. Ethnobiol. Ethnomed.* 7, 1–11.
- González, A.J., García-Barruso, M., Amich, F., 2011. Ethnoveterinary medicine in the Arribes del Duero, western Spain. *Vet. Res. Commun.* 35, 283–310.
- Gradé, T.J., Tabuti, S.R.J., Damme, V.P., 2009. Ethnoveterinary knowledge in pastoral Karamoja, Uganda. *J. Ethnopharmacol.* 122, 273–293.
- Heinrich, M., Rimpler, H., Barrera, N.A., 1992. Indigenous phytotherapy of gastrointestinal Disorders in a lowland Mixe community (Oaxaca, Mexico): ethnopharmacologic evaluation. *J. Ethnopharmacol.* 36, 63–80.
- Hussain, A., Khan, M.N., Iqbal, Z., Sajid, M.S., 2008. An account of the botanical anthelmintics used in traditional veterinary practices in Sahiwal district of Punjab, Pakistan. *J. Ethnopharmacol.* 119, 185–190.
- Jabbar, A., Raza, M.A., Iqbal, Z., Khan, M.N., 2006. An inventory of the ethnobotanicals used as anthelmintics in the southern Punjab (Pakistan). *J. Ethnopharmacol.* 108, 152–154.
- Jernigan, K.A., 2009. Barking up the same tree: a comparison of ethnomedicine and canine ethnoveterinary medicine among the Aguaruna. *J. Ethnobiol. Ethnomed.* 5, 33.
- Jesus, N.Z.T., Lima, J.C.S., Silva, R.M., Espinosa, M.M., Martins, D.T.O., 2009. Levantamento etnobotânico de plantas popularmente utilizadas como antiúlcera e antiinflamatórias pela comunidade de Pirizal, Nossa Senhora do Livramento-MT, Brasil. *Rev. Bras. Farmacogn.* 19, 130–139.
- Kadir, M.F., Bin Sayeed, M.S., Mia, M.M., 2012. Ethnopharmacological survey of medicinal plants used by indigenous and tribal people in Rangamati, Bangladesh. *J. Ethnopharmacol.* 144, 627–637.
- Lans, C., 2007. Comparison of plants used for skin and stomach problems in Trinidad and Tobago with Asian ethnomedicine. *J. Ethnobiol. Ethnomed.* 3, 1–12.
- Lans, C., Georges, K., Brown, G., 2007a. Non-experimental validation of ethnoveterinary plants and indigenous knowledge used for backyard pigs and chickens in Trinidad and Tobago. *Trop. Anim. Health Prod.* 39, 375–385.
- Lans, C., Harper, T., Georges, K., Bridgewater, E., 2000. Medicinal plants used for dogs in Trinidad and Tobago. *Prev. Vet. Med.* 45, 201–220.
- Lans, C., Harper, T., Georges, K., Bridgewater, E., 2001. Medicinal and ethnoveterinary remedies of hunters in Trinidad. *BMC Complement. Altern. Med.* 1, 10.
- Lans, C., Turner, N., 2011. Organic parasite control for poultry and rabbits in British Columbia, Canada. *J. Ethnobiol. Ethnomed.* 7, 1–10.
- Lans, C., Turner, N., Brauer, G., Khan, T., 2009. Medicinal plants used in British Columbia, Canada for reproductive health in pets. *Prev. Vet. Med.* 90, 268–273.
- Lans, C., Turner, N., Brauer, G., Lourenço, G., Georges, K., 2006. Ethnoveterinary medicines used for horses in Trinidad and in British Columbia, Canada. *J. Ethnobiol. Ethnomed.* 2, 31.
- Lans, C., Turner, N., Khan, T., 2008. Medicinal plant treatments for fleas and ear problems of cats and dogs in British Columbia, Canada. *Parasitol. Res.* 103, 889–898.
- Lans, C., Turner, N., Khan, T., Brauer, G., 2007b. Ethnoveterinary medicines used to treat endoparasites and stomach problems in pigs and pets in British Columbia, Canada. *Vet. Parasitol.* 148, 325–340.
- Lans, C., Turner, N., Khan, T., Brauer, G., Boepple, W., 2007c. Ethnoveterinary medicines used for ruminants in British Columbia, Canada. *J. Ethnobiol. Ethnomed.* 3, 11.
- Malinowski, B., 1990. O Objeto, Método e Alcance dessa pesquisa. In: Guimarães, A. Z. (Ed.), *Desvendando Máscaras Sociais* 3. Francisco Alves, Rio de Janeiro, pp. 39–76.
- Maphosa, V., Masika, P.J., 2010. Ethnoveterinary uses of medicinal plants: A survey of plants used in the ethnoveterinary control of gastro-intestinal parasites of goats in the Eastern Cape Province, South Africa. *Pharm. Biol.* 48, 697–702.
- Marchese, J.A., Ming, L.C., Franceschi, L., Camocheña, R.C., Gomes, G.D.R., Paladini, M.V., Capelin, D., Marchese, C., 2009. Medicinal plants used by “Passo da Ilha” rural community in the city of Pato Branco, southern Brazil. *An. Acad. Bras. Ciênc.* 81, 691–700.
- Mathias, E., McCorkle, C.M., 2004. Traditional livestock healers. *Rev. Sci. Tech. (Int. Off. Epizoot.)* 23, 277–284.
- McCorkle, C.M., 1986. An Introduction to ethnoveterinary research and development. *J. Ethnobiol.* 6, 129–149.
- McGaw, L.J., Eloff, J.N., 2008. Ethnoveterinary use of southern African plants and scientific evaluation of their medicinal properties. *J. Ethnopharmacol.* 119, 559–574.
- de Medeiros, P.M., Ladio, A.H., Albuquerque, U.P., 2013. Patterns of medicinal plant use by inhabitants of Brazilian urban and rural areas: A macroscale investigation based on available literature. *J. Ethnopharmacol.* 150, 729–746.
- Mishra, A.K., Singh, N., Sharma, V.P., 1995. Use of neem oil as a mosquito repellent in tribal villages of Mandla District, Madhya Pradesh. *Indian J. Malariol.* 32, 99–103.
- Monteiro, M.V.B., Bevilacqua, C.M.L., Palha, M.D.C., Braga, R.R., Schwanke, K., Rodrigues, S.T., Lameira, O.A., 2011. Ethnoveterinary knowledge of the inhabitants of Marajó Island, Eastern Amazonia, Brazil. *Acta Amazon.* 41, 233–242.
- Muhammad, G., Khan, M.Z., Hussain, M.H., Iqbal, Z., Iqbal, M., Athar, M., 2005. Ethnoveterinary practices of owners of pneumatic-cart pulling camels in Faisalabad City (Pakistan). *J. Ethnopharmacol.* 97, 241–246.
- Mussarat, S., Amber, R., Tariq, A., Adnan, M., AbdElsalam, N.M., Ullah, R., Bibi, R., 2014. Ethnopharmacological Assessment of Medicinal Plants Used against Livestock Infections by the People Living around Indus River. *BioMed Research International*.
- Mwale, M., Masika, P.J., 2009. Ethno-veterinary control of parasites, management and role of village chickens in rural households of Centane district in the Eastern Cape, South Africa. *Trop. Anim. Health Prod.* 41, 1685–1693.
- Nagendrappa, P.B., Naik, M.P., Payyappallimana, U., 2013. Ethnobotanical survey of malaria prophylactic remedies in Odisha, India. *J. Ethnopharmacol.* 146, 768–772.

- Naik, R., Venugopalan, V., Kumaravelayutham, P., Krishnamurthy, Y.L., 2012. Ethnoveterinary uses of medicinal plants among the Lambani community in Chitradurga district, Karnataka, India. *Asian Pacific Journal of Trop. Biomed.* 2, S470–S476.
- Natale, D.A., Pollio, A., 2012. A forgotten collection: the Libyan ethnobotanical exhibits (1912–14) by A. Totter at the Museum O. Comes at University Federico II in Naples, Italy. *J. Ethnobiol. Ethnomed.* 8, 4.
- Ole-Miaron, J.O., 2003. The Maasai ethnodagnostic skill of livestock diseases: a lead to traditional bioprospecting. *J. Ethnopharmacol.* 84, 79–83.
- Pereira, Z.V., Mussury, R.M., de Almeida, A.B., Sangalli, A., 2009. Medicinal plants used by Ponta Porã community, Mato Grosso do Sul State. *Biol. Sci.* 31, 293–299.
- Raziq, A., Verdier, K., Younas, M., 2010. Ethnoveterinary by dromedary camel herders in the Suleiman Mountainous Region in Pakistan: an observation and questionnaire study. *J. Ethnobiol. Ethnomed.* 6, 16.
- Ritter, R.A., Monteiro, M.V.B., Monteiro, F.O.B., Rodrigues, S.T., Soares, M.L., Silva, J.C.R., Palha, M.D.C., Biondi, G.F., Rahal, S.C., Tourinho, M.M., 2012. Ethnoveterinary knowledge and practices at Colares island, Pará state, eastern Amazon, Brazil. *J. Ethnopharmacol.* 144, 346–352.
- Rodrigues, E., 2006. Plants and animals utilized as medicines in the Jaú National Park (JNP), Brazilian, Amazon. *Phytother. Res.* 20, 378–391.
- Rodrigues, E., Carlini, E.A., 2004. Plants Used by a *Quilombola* Group in Brazil with Potential Central Nervous System Effects. *Phytother. Res.* 18, 748–753.
- Rosas-Piñón, Y., Mejía, A., Díaz-Ruiz, G., Aguilar, M.I., Sánchez-Nieto, S., Rivero-Cruz, J.F., 2012. Ethnobotanical survey and antibacterial activity of plants used in the Altiplane region of Mexico for the treatment of oral cavity infections. *J. Ethnopharmacol.* 141, 860–865.
- Santos, J.F.L., Pagani, E., Ramos, J., Rodrigues, E., 2012. Observations on the therapeutic practices of riverine communities of the Unini River, AM, Brazil. *J. Ethnopharmacol.* 142, 503–515.
- Schmidt, C., Fronza, M., Goettert, M., Geller, F., Luik, S., Flores, E.M., Bittencourt, C.F., Zanetti, G.D., Heinzmann, B.M., Laufer, S., Merfort, I., 2009. Biological studies on Brazilian plants used in wound healing. *J. Ethnopharmacol.* 122, 523–532.
- SEADE – Portal de estatísticas do estado de São Paulo. (<http://produtos.seade.gov.br/produtos/perfil/perfilMunEstado.php>), (accessed April, 2015).
- Shah, R., Pande, P.C., Tiwari, L., 2008. Traditional veterinary herbal medicines of western part of Almora district, Uttarakhand Himalaya. *Indian J. Tradit. Knowl.* 7, 355–359.
- Sharma, R., Manhas, R.K., Magotra, R., 2012. Ethnoveterinary remedies of diseases among milk yielding animals in Kathua, Jammu and Kashmir, India. *J. Ethnopharmacol.* 141, 265–272.
- Shen, S., Qian, J., Ren, J., 2010. Ethnoveterinary plant remedies used by Nu people in NW Yunnan of China. *J. Ethnobiol. Ethnomed.* 6, 24.
- Silva, F.D.S., Albuquerque, U.P., Costa Júnior, L.M., Nascimento, A.L.B.D., Monteiro, J.M., 2014. An ethnopharmacological assessment of the use of plants against parasitic diseases in humans and animals. *J. Ethnopharmacol.* 155, 1332–1341.
- Silva, M.P.L., Junior, A.A.A., Silva, F., Silva, M., 2011. Levantamento Etnobotânico e Etnofarmacológico de Plantas Mediciniais Utilizadas por Comunidades Rurais de Mutuípe-BA. *Agricultura Familiar e Ruralidade, Universidade Federal do Recôncavo da Bahia*.
- Silva, M.S.S., Antonioli, A.R., Batista, J.S., Mota, C.N., 2006. Plantas medicinais usadas nos distúrbios do trato gastrintestinal no povoado Colônia Treze, Lagarto, SE, Brasil. *Acta Bot. Bras.* 20, 815–829.
- Sori, T., Bekana, M., Adgna, G., Kelbessa, E., 2004. Medicinal Plants in the Ethnoveterinary Practices of Borana Pastoralists, Southern Ethiopia. *Int. J. Appl. Res. Vet. Med.* 2, 220–225.
- Souza, A., Souza Junior, J.B., Teixeira, E.J.R., Len, L.S., Mouro, G.F., Monteiro, V., 2014. Ethnoveterinary in the region of Ivaiporã-PR: popular knowledge contributing for the building of more sustainable animal production systems. *Cad. Agroecol.* 9, 1–5.
- Souza, C.D., Felfili, J.M., 2006. Uso de plantas medicinais na região de Alto Paraíso de Goiás, GO, Brasil. *Acta Bot. Bras.* 20, 135–142.
- Tabuti, J.R.S., Dhillon, S.S., Lye, K.A., 2003. Ethnoveterinary medicines for cattle (*Bos indicus*) in Bulamogi county, Uganda: plant species and mode of use. *J. Ethnopharmacol.* 88, pp. 279–286.
- Vieira, D.R., Amaral, F.M., Maciel, M.C., Nascimento, F.R., Libério, S.A., Rodrigues, V.P., 2014. Plant species used in dental diseases: ethnopharmacology aspects and antimicrobial activity evaluation. *J. Ethnopharmacol.* 155, 1441–1449.
- Yadav, S.S., Bhukal, R.K., Bhandoria, M.S., Gulia, S.K., Raghav, T.B.S., 2014. Ethnoveterinary medicinal plants of Tosham block of district Bhiwani (Haryana) India. *J. Appl. Pharm. Sci.* 4, 040–048.
- Yineger, H., Kelbessa, E., Bekele, T., Lulekal, E., 2007. Ethnoveterinary medicinal plants at Bale Mountains National Park, Ethiopia. *J. Ethnopharmacol.* 112, 55–70.