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Medicinal and toxic plants from Muribeca Alternative Health Center (Pernambuco, Brazil): an ethnopharmacology survey

[Plantas medicinales y tóxicas del Centro de Salud Alternativa de Muribeca (Pernambuco, Brasil): un análisis etnofarmacológico]

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Abstract: Forty-four medicinal species are cultivated at CESAM (Muribeca Alternative Health Center). The most frequent uses cited are related to the respiratory, digestive, and nervous systems. The phytotherapics most sold at CESAM, based on *Justicia pectoralis* var. *stenophylla* and *Petiveria alliacea*, are listed as toxic. In addition to these, eight other species are noted by specialists as toxic. A procedure to minimise the undesirable effects of such plants is also described.

Keywords: Ethnobotany, Phytomedicines, Public health, Urban communities.

Resumen: Cuarenta y cuatro especies medicinales son cultivadas en CESAM (Muribeca Centro de Salud Alternativa). Los usos más frecuentes están relacionados con los aparatos respiratorio, digestivo y nervioso. Las hierbas más vendidas en CESAM, basadas en *Justicia pectoralis* var. *stenophylla* y *Petiveria alliacea*, también se consideran tóxicas. Además de éstas, otras ocho especies son identificadas por los especialistas del CESAM como tóxicas. En éste estudio, también se describe un procedimiento para reducir al mínimo los efectos indeseables de éstas plantas.

Palabras clave: Comunidades urbanas, Etnobotánica, Fitomedicina, Salud pública.

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INTRODUCTION

Brazil has one of the richest flora in the world and a population that has significant knowledge about alternative methods for curing several types of disease (Giulietti *et al*., 2005; Franco & Barros, 2006). However, this knowledge is threatened due to the direct influence of modern Western medicine and a lack of interest on the part of the youth of the communities, which disrupts the passing along of information from one generation to the next. This mainly occurs in urban communities in which people are highly influenced by modern means of communication and have easy access to industrialised medicines. Nevertheless, socioeconomic factors, the high costs and side effects of chemically synthesised drugs, and the quest for healthier lifestyles have restored interest in and the use of medicinal plants in these communities (Castro & Gavilanes, 2000; Sousa *et al.*, 2008).

Ethnobotanical studies on medicinal plants can be a valuable shortcut to discovering pharmaceuticals, as their traditional use can be viewed as a pre-screening tool in relation to therapeutic usefulness (Oliveira *et al*., 2000; Agra *et al*., 2007; Ribeiro *et al*., 2014). In contrast, plants also contain a large number of toxic constituents that produce adverse effect (Leitão *et al*., 2014). It is important to emphasize that some species named as "medicinal plants" are also "toxic plants". Some species plants mentioned in our study are employed as phytomedicine for treatment of disease, disorder or injury. On the other hand, these same plants can be toxic, depending on the organ used, form of ingestion, amount ingested, plant phenology, age and physiological condition of the patient. Here we highlight some of these findings.

Some ethnobotanical studies in urban environments have been performed in Brazil (Almeida & Albuquerque, 2002; Pinto & Maduro, 2003; Albuquerque *et al*., 2007; Oliveira *et al*., 2010; Oliveira *et al.*, 2011). Located in the city of Jaboatão dos Guararapes, state of Pernambuco, Brazil, CESAM (Muribeca Alternative Health Center - *Centro de Saúde Alternativa de Muribeca*) is a popular health centre that cultivates, processes, and sells plants for therapeutic purposes. Recently, two medicinal species indicated by CESAM as food and to prevent and treat osteoporosis were investigated (Oliveira *et al*., 2012), with the authors identifying a significant calcium content in the leaves of *Xanthosoma sagittifolium* Schott. (Araceae) and *Laportea aestuans* (L.) Chew (Urticaceae). These findings show the importance of the record of knowledge transmitted by CESAM.

Considering the importance of CESAM for the local urban community, there is an urgent need to standardise the activities performed there and to adjust them to the criteria of the National Sanitary Surveillance System (*Agência Nacional de Vigilância Sanitária* – ANVISA), the Brazilian agency that controls the handling, distribution, and commercialisation of food, cosmetics, herbal medicines, and allopathic drugs. According to Oliveira *et al*. (2012), the herbal drugs from CESAM fail to meet these standards because the most species are not scientifically validated as safe or effective. In addition, some species cultivated and sold at CESAM present active toxic principle. Thus, the aim of this study was to record for first time the therapeutic and toxicological indications and the ways of handling plants used for medicinal purposes at CESAM. Some aspects related the toxicity of the plants are also presented. Besides therapeutic and toxicological properties, the social work performed by the members of this centre was also recorded in this study.

MATERIALS AND METHODS

Study area

The study was conducted at Muribeca Center of Alternative Health (CESAM), located in the community of Muribeca, a low-income neighbourhood in the city of Jaboatão dos Guararapes (8° 6′ 46″ S, 35° 0′ 54″ W) on the southern coast of the state of Pernambuco, Northeast Region of Brazil. This municipality is located in the central-eastern portion of metropolitan Recife (the state capital) and is considered one of the region's most important cities. With a population of 581,556 inhabitants (98% in urban areas and 2% in rural areas), Muribeca still has small-town characteristics, with older, low-income housing in different quarters (IBGE, 2001).

CESAM: human aspects

CESAM was started by a group of women from the community who came to the conclusion that medicine accounted for one of the highest costs in family budgets. The idea gained the support of the local Catholic Church, and advice was received from the Northeast Center of Popular Medicine (*Centro Nordestino de Medicina Popular* - CNMP), a non-

governmental organisation (NGO) located in the city of Olinda, Pernambuco. The goal was to cultivate and process medicinal plants in an appropriate place, sell them to the local community as inexpensive medicine, and raise income for the group. CESAM currently has its own office, which includes a yard that is approximately 300 m^2 where the plants are cultivated. There is also a small laboratory for the processing of the medicinal plants.

The CESAM members consist of six women between 33 and 62 years of age (only one of them is under 50 years of age), with little formal instruction: three finished high school, and the other three did not finish elementary school. The women are homemakers who divide their time between domestic affairs and CESAM, and they receive some income from the centre to assist in the family budget. With the exception of one, who was born in metropolitan Recife, the women were born and raised in the countryside of northeastern Brazil. Their knowledge of medicinal plants was acquired from parents or close relatives – a cultural heritage that was enhanced after the establishment of the centre through courses and training received on plant handling and processing (especially offered by CNMP).

Interviews and data collection

The fieldwork consisted of weekly visits to the study area. Four initial visits were intended for becoming acquainted with the CESAM group and obtaining formal permission to conduct the study. The group was receptive and showed interest in receiving a primer with the scientific names of the species cultivated and used there to exchange information with other groups that address medicinal plants. They also proposed that a study be performed with certain species to confirm their therapeutic indications. Information on the knowledge of the medicinal plants cultivated and manipulated, the ways they are used, and their therapeutic and toxic indications were obtained through semi-structured individual interviews and informal conversations exchanged throughout the period of the study. The species cited as medicinal and/or toxic were collected with the help of the informants and later identified; vouchers were deposited at the UFP Herbarium (Department of Botany, Federal University of Pernambuco).

Corporeal systems and relative importance (RI)

The plants processed and sold at CESAM were listed according to their use. Those considered toxic and used for therapeutic purposes were also listed separately. The therapeutic indication of the medicinal plants was classified into the following corporeal systems (Almeida & Albuquerque, 2002): infectious diseases (ID); parasite-related diseases (PRD); diseases of the endocrine glands, nutrition, and metabolism (DENM); diseases of the blood and haematopoietic organs (DB); diseases of the skeletal, muscle, and connective tissues (DSMO); diseases of the skin and subcutaneous cellular tissues (DSSC); problems of the visual system (PVS); problems of the nervous system (PNS); problems of the circulatory system (PCS); problems of the respiratory system (PRS); problems of the digestive system (PDS); problems of the genitourinary system (PGUS); undefined pains and illnesses (UPI); and sexually transmitted diseases (STD).

The relative importance (RI) of the species cited was calculated based on protocol of Bennett and Prance (2000), whereby two is the maximum score that a given species can obtain. The species with the highest scores are considered the most versatile and are indicated for a greater number of corporeal systems. This technique allows the identification of the most important species with regard to their versatility. Thus, the most versatile species are those that have the greatest number of medicinal properties in the community. They are the most important species. The relative importance (RI) was obtained by equation: RI = NCS + NP, where RI = relative importance; NCS = number of corporeal systems and NP = number of properties attributed to a specific species (Silva & Albuquerque, 2004).

RESULTS AND DISCUSSION

CESAM diagnosis

At CESAM, all of the material processed – in addition to the *in natura* material – is sold where it is produced, in the houses comprising CESAM and at handicraft fairs. A pharmacist from CNMP supervise and direct the process of developing to ensure that the medicines are correctly manipulated and produced. Thus, all medicines have a label that lists the name of the plant, its therapeutic indication, and the manner in which it should be used. In addition to the work with plants, the group holds free meetings on Saturdays at CESAM (once again, with the aid of a CNMP pharmacist), speaking to local teenagers and youths

about health, food, and nutrition. The group gives demonstrations and teaches food preparation to promote awareness of the importance of being healthy in a poor community by taking advantage of affordable, easy to obtain foods, such as vegetables.

During all of the visits to CESAM, the constant presence of young women accompanied by small children, purchasing the remedies produced there, particularly syrups indicated for problems of the respiratory system, was observed. This shows how the young population is interested in using medicinal plants and is most likely due to the meetings at CESAM directed at youths and the information on nutrition and health that is transmitted. Moreover, Muribeca is poor community that is far from downtown Recife and has only one pharmacy that sells allopathic drugs and no other enterprise that sells medicines formulated from plants. Thus, the centre is becoming a site of support to the primary healthcare of the local population through advice, information, and sales of plant-based remedies that are cheaper than conventional drugs.

CESAM phytomedicines

Using semi-structured interviews and laboratory botanical identification, a list was compiled of the 44 species, distributed among 29 families, cultivated at CESAM; among these, Lamiaceae (8 spp.) and Asteraceae (6 spp.) were prominent (Table 1). Of the species cited, 25 are originally from Tropical or South America, 12 are native to Brazil, 14 are Asian, four are African, and three are European, including *Symphytum officinale* L. and *Momordica charantia* L. (both native to Africa and Asia). As they are indicated for the treatment of diseases that affect several corporeal systems, *Petiveria alliacea* L. (RI = 2.0) and *Ocimum selloi* Benth. (RI = 1.6) had high values of relative importance and were considered the most versatile species cultivated at CESAM.

Leaves were found to be one of the most-used plant parts (30 spp.), followed by stems (5 spp.) and flowers (3 spp.). This predominance of leaf usage is commonly found in studies on medicinal plants (Castellucci *et al*., 2000), and a likely explanation is that these plant parts are easier to obtain and are available for most of the year in such locations as the Muribeca community. Among the 44 medicinal plant species cultivated at CESAM, 25 are sold *in natura*, normally for tea preparation. The remaining 19 species are handled manually in a small laboratory and sold to the community as herbal remedies in the form of ointments, tinctures, syrups, a medicinal beverage, a shampoo, and soaps. The ointments, tinctures, and soaps are prepared using a single plant, whereas two or more species comprise the syrups, medicinal beverage, and shampoo. The phytotherapics that are most sold at CESAM are the "chambá" syrup (*Justicia pectoralis* var. *stenophylla* Leon.), which is an expectorant that acts as a bronchodilator, followed by the "atipim" (*P. alliacea*) ointment and the "mentrasto" (*Ageratum conyzoides* L.) ointment/tincture, which are used primarily for joint pain.

Such species as *P. alliacea*, *Ageratum conyzoides*, *S. officinale* L., *Schinus terebinthifolia* Raddi, *Solidago chilensis* Meyen, and *Hyptis suaveolens* (L.) Poit. are prepared as ointments for external use, especially for joint pain, such as rheumatism and arthrosis, and also for inflammation and wound healing. The tinctures (prepared with ethyl alcohol) are also for external purposes, and the plants used in this way are *S. terebinthifolia*, *S. chilensis*, and *H. suaveolens*; in contrast, grain alcohol tinctures are for internal use, such as those prepared with *A. conyzoides*, *Alpinia zerumbet* (Pers.) L. Burtt. and R.M. Sm., and *Ocimum basilicum* L. B.

The syrups, such as those prepared with *J. pectoralis* var. *stenophylla*, *Plectranthus amboinicus* (Lour.) Spreng, *Malpighia glabra* L., and *Acanthospermum hispidum* DC., are typically used for diseases of the respiratory system. However, the syrup made from *Mentha x villosa* Huds. is indicated for worms, and that of *Kalanchoe blossfeldiana* Poelln. is used for gastritis and stomach ulcers. According to the information provided by the women at CESAM, *P. amboinicus* is added to all the syrups to prevent bacterial growth, whereas *Ocimum selloi* Benth. or *Ocimum gratissimum* L. is added for flavouring.

Only one type of medicinal beverage is made at CESAM, consisting of a combination of *K. blossfeldiana*, *P. amboinicus*, and *Punica granatum* L, and is indicated for uterine and ovarian inflammation; there are informal records of community women who were cured of uterine myomas. Indeed, the mixing of different plants in a single medicine is common in different cultures, with the belief that the combination cures diseases (Ayyanar *et al*., 2005).

A shampoo for hair loss is prepared at CESAM with *Aloe vera* L. and *S. officinale* leaves. The first is very well known and is popularly used in

Brazil for hair loss, haemorrhoids, and skin burns. Although the latter plant is highlighted for its wound-healing properties (Castellucci *et al*., 2000; Pinto *et al*., 2000; Lorenzi & Matos, 2002; Alcântara Júnior *et al*., 2005), no records were found in the literature regarding the use of *S. officinale* for hair loss.

The soap prepared with *S. terebinthifolia* bark is indicated for gynoecological problems and wound healing, whereas the soap prepared with *Momordica charantia* L. leaves is used for scabies. The antiseptic properties and use for kidney problems of *S. terebinthifolia* have been recorded in the literature (Vieira & Martins, 2000; Medeiros *et al.*, 2004), whereas and *M. charantia* is reported to be used for skin allergies and parasite infestations (Castellucci *et al*., 2000; Pinto *et al*., 2000).

Two medicinal species (*Laportea aestuans* (L.) Chew and *Xanthosoma sagittifolium* Schott) are recommended by CESAM as food and to reduce the symptoms of osteoporosis. The knowledge of the CESAM members with regard to *X. sagittifolium* was acquired through family tradition, whereby the plant was consumed as food. The women of CESAM believe *X. sagittifolium* is good for the bones and that it can be used by people with osteoporosis, yet they stress that it should be boiled before consumption to eliminate the toxins. Despite its being a food species that is widely used in Brazil and other countries (Iwuoha & Kalu, 1995; Pinto *et al*., 1999), a survey of the literature revealed no information on the use of *X. sagittifolium* and *L. aestuans* for the treatment of osteoporosis. Nonetheless, according to Oliveira *et al*. (2012), the use of these species for the prevention and treatment of osteoporosis, as suggested by CESAM, is in agreement with the free calcium content found.

Several illnesses are treated with the herbs available at CESAM and can be classified into 13 corporeal systems (Table 1). The most reported medicinal uses are problems of the respiratory system (12 spp.), problems of the digestive system (9 spp.), and problems of the nervous system (7 spp.). Research conducted in other Brazilian communities also found that many plant species are cited mainly for the treatment of problems related to the respiratory and digestive systems (Amorozo, 2002; Begossi *et al*., 2002; Medeiros *et al*., 2004; Leitão *et al*., 2009). However, unlike the findings of the present study, only a few plants from the lists of species presented in these articles are indicated for problems of the nervous system, especially being considered as calming. Because Muribeca is an urban community, it is possible that its population is more influenced by the stress of modern life and that these people seek a healthier and cheaper way to treat such illnesses by using plants.

Table 1
List of species cultivated and used for medicinal purposes at CESAM, Jaboatão dos Guararapes, Pernambuco state, Brazil

Family/species (Voucher*)	Local name	Therapeutic indication	RI	CS	Parts used	How to prepare
Acanthaceae						
Justicia pectoralis var. *stenophylla* Leon. (43703)	Chambá	Bronchodilator	0.53	PRS	Stems	Infusion, syrup
Amaranthaceae						
Celosia cristata L. (43740)	Crista-de-Galo	Anti-hemorrhagic	0.53	DB	Flowers	Infusion
Anacardiaceae						
Schinus terebinthifolia Raddi (43742)	Aroeira-da-Praia	Wound healing, anti-inflammatory, gynecological	1.27	DSSC, PGUS	Inner bark	Tincture, ointment, bath, soap
Annonaceae						
Annona muricata L. (43701)	Graviola	To lose weight, hypoglycemiant	1.07	DENM, DB	Leaves	Infusion

Araceae						
Xanthosoma sagittifolium Schott (43815)	Taioba	Osteoporosis	0.53	DSMO	Leaves	Cooked leaves ingested
Asteraceae						
Acanthospermum hispidum DC. (43813)	Espinho-de-Cigano	Bronchodilator	0.53	PRS	Root	Syrup
Ageratum conyzoides L. (43712)	Mentrasto	Antirheumatic, anti-arthrosis, antispasmodic (during menstruation)	1.27	DSMO, PGUS	Stem	Ointment, grain tincture
	Artemísia	For menstrual pain and uterine problems	0.73	PGUS	Leaves	Infusion and medicinal beverage
Lactuca sativa L.	Alface	Calming	0.53	PNS	Leaves with attached stem	Decoction
Solidago chilensis Meyen (43706)	Erva-Lanceta	Swelling in general, sprains	0.73	UPI	Leaves	Tincture, ointment
Vernonia condensata Baker (43710)	Falso Boldo	Stomachic, liver problems, to lose weight	1.27	PDS, DENM	Leaves	Infusion
Begoniaceae						
Begonia reniformis Hooks. (43812)	Caapeba	Kidney problems	0.53	PGUS	Leaves	Infusion
Boraginaceae						
Symphytum officinale L.	Confrei	For wound healing, for hair loss	0.73	DPTS	Leaves	Ointment, shampoo
Caesalpiniaceae						
Senna occidentalis (L.) Link (43711)	Manjerioba	Psychological problems	0.53	PNS	Leaves	Infusion
Chenopodiaceae						
Chenopodium ambrosioides L. (43707)	Mastruz	Expectorant, for coughing, for worms	1.27	PRS, PRD	Leaves	Infusion, juice
Crassulaceae						
Kalanchoe blossfeldiana Poelln. (43739)	Corama	Gastritis and problems related to the uterus and ovaries	1.27	PDS, PGUS	Leaves	Syrup, medicinal beverage, juice
Costaceae						
Costus spiralis (Jacq.) Roscoe (43738)	Cana-de-macaco	Kidney problems	0.53	PGUS	Stems	Decoction
Cucurbitaceae						

Momordica charantia L. (43715)	Melão-de-são-caetano	Scabies	0.53	DSSC	Stems	Soap and cataplasm
Euphorbiaceae						
Phyllantus amarus Schumach. (43743)	Quebra-pedra	Kidney problems	0.53	PGUS	Stems	Decoction
Lamiaceae						
Hyptis suaveolens (L.) Poit. (43814)	Samba-caitá	Wound healing	0.53	DSSC	Leaves	Tincture, ointment
Mentha arvensis L. (43741)	Hortelã-pimenta	Throat inflammations	0.53	PRS	Leaves	Eaten fresh
Mentha x villosa Huds.	Hortelã-da-folha-miúda	Worms	0.53	PRD	Leaves	Syrup, juice
Ocimum basilicum L. (43827)	Manjericão	Sinusitis, eye inflammations	1.07	PRS, PVS	Leaves	Infusion/inhalation, cataplasm and tincture
Ocimum gratissimum L. (43722)	Alfavaca-de-caboclo	Anti-diarrheic, for colds	1.07	PDS, PRS	Leaves	Bath, syrups
Ocimum selloi Benth (43720)	Alfavaca-branca	Speck in the eye, anti-diarrheic, for colds	1.60	PVS, PDS, PRS	Seeds and leaves	Bath, syrups, place the seed in the eye
Plectranthus amboinicus (Lour.) Spreng (43817)	Hortelã-da-folha-larga	Expectorant, bactericide, throat inflammations	1.27	PRS, ID	Leaves	Infusion, Syrup
Plectranthus barbatus Andrews (36270)	Sete-dores	Digestive	0.53	PDS	Leaves	Infusion
Liliaceae						
Aloe vera L. (43872)	Babosa	Anti-inflammatory, hair loss	0.73	DSSC	Leaves	Cataplasm, shampoo
Malpighiaceae						
Malpighia glabra L. (43704)	Acerola	For coughing	0.53	PRS	Fruit	Syrup
Myrtaceae						
Eugenia uniflora L. (43702)	Pitanga	Anti-diarrheic	0.53	PDS	Shoots	Infusion
Psidium guajava L. (43870)	Goiabeira	Anti-diarrheic	0.53	PDS	Shoots	Infusion
Passifloraceae						
Passiflora edulis Sims (43718)	Maracujá	Calming	0.53	PNS	Leaves	Infusion
Phytolaccaceae						
Petiveria alliacea L.	Atipim	Antirheumatic, anti-	2.0	UPI,	Leaves	Ointment

(43708)		arthrosis, headaches, antiallergic, boils		DSMO, DSSC		
Piperaceae						
Peperomia pellucida (L.) Kunth (43723)	Língua-de-sapo	Hypocholesterolemiant	0.53	DB	Leaves	Infusion, eating it fresh
Plantaginaceae						
Plantago major L. (43716)	Transagem	Throat inflammations, anti-diarrheic	1.07	PRS, PDS	Leaves and flowers	Infusion
Poaceae						
Cymbopogon citratus (DC) Stapf (35697)	Capim-santo	Calming, anti-diarrheic	1.07	PNS, PDS	Leaves	Infusion
Portulacaceae						
Talinum paniculatum (Jacq.) Gaertn. (43713)	Bredo	Problems in the skeletal system (bones)	0.52	DSMO	Leaves	Eaten fresh
Punicaceae						
Punica granatum L. (43705)	Romã	Throat inflammations	0.53	PRS	Fruit	Decoction/gargle
Rutaceae						
Citrus aurantium L. (43871)	Laranjeira	Calming	0.53	PNS	Leaves	Infusion
Urticaceae						
Laportea aestuans (L.) Chew (43709)	Urtiga-vermelha	Osteoporosis	0.53	DSMO	Leaves	Dry leaves Ingested
Verbenaceae						
Lippia alba (Mill.) N.E.Br (43738)	Erva-cidreira	Calming, hypocholesterolemiant	1.07	PNS, DB	Leaves	Infusion
Vitaceae						
Cissus verticillata (L.) Nicholson & C.E. Jarvis (43719)	Insulina-vegetal	Hypoglycemiant	0.53	DB	Leaves	Infusion
Zingiberaceae						
Alpinia zerumbet (Pers.) B.L. Burtt. & R.M. Sm. (43714)	Colônia	Calming, hypertension	1.07	PNS, PCS	Flowers and leaves	Infusion, grain tincture
Zingiber officinale Roscoe (43816)	Gengibre	Throat inflammations, anti-arthrosis	1.07	PRS, DSMO	Root	Eaten, cataplasm

RI = Relative importance (Bennett and Prance, 2000)
CS = Corporeal systems (Almeida and Albuquerque, 2002)
***UFP Herbarium.**

Toxic plants at CESAM

The CESAM group considers ten of the 44 species cultivated as toxic if not used correctly and advises that most can only be used for skin problems, wound healing, or joint pain. Interestingly, the two phytotherapics most sold at CESAM are based on *J. pectoralis* var. *stenophylla* and *P. alliacea*, which are also listed as toxic. An infusion and syrup from *J. pectoralis* var. *stenophylla* stems are indicated as bronchodilators, whereas an ointment from *P. alliacea* leaves has been indicated as an antirheumatic, anti-arthrosis, and antiallergic and is also used for headaches and boils. Despite being indicated as toxic, *P. alliacea* presented higher values of relative importance (Table 1). The ten species cited as toxic by specialists are listed in Table 2.

Confirming the information provided by the CESAM group, some authors mention the possibility of haemorrhage due to the use of *J. pectoralis* var. *stenophylla* and recommend caution when using this species (Pinto, 2000; Lorenzi & Matos, 2002). It is known that the active components of *J. pectoralis* are coumarin and umbelliferone (Lino *et al*., 1997; Oliveira *et al*., 2000), and some studies have shown that coumarin (2H-1-benzopyran-2-one) is a human liver co-mutagen (Goeger *et al*., 1999) and is hepatotoxic in rats, mice, and dogs (Lake, 1999). However, according to some authors, the rat is not an ideal model for human comparison. Baboons, Syrian hamsters, and certain mice strains have also failed to demonstrate any hepatotoxicity induced by coumarin (Lacy & O'Kennedy, 2004). Coumarin and its metabolites are also non-mutagenic according to Ames and micronucleus tests (Egan *et al*., 1990). Although coumarin was banned in 1954 due to its hepatotoxicity in rats and dogs, its effect in humans is not entirely clear; for example, the coumarin dose that causes toxicity is more than 100 times the maximum human intake (Lake, 1999).

According to the CESAM group, *P. alliacea* is toxic if ingested. *P. alliacea* can cause miscarriages, hallucinations, insomnia, and problems to the nervous system at high or repeated doses; thus, it should be administered orally with caution (Pinto, 2000; Lorenzi & Matos, 2002). According to Hoyos *et al*. (1992), *P. alliacea* contains mutagenic and potentially carcinogenic agents, and the consumption of large amounts may pose a risk for the development of health problems. Volatile compounds, such as benzaldehyde, benzyl thiol, dibenzyl disulphide, and various thiosulfinate compounds, in addition to coumarins, triterpenes, and flavonoids have been isolated from *P. alliacea* (Benevides *et al*., 2001; Zoghbi *et al*., 2002; Okada *et al*., 2008). However, these constituents from *P. alliacea* leaves have not yet been evaluated for toxicity. Due to its high value of relative importance at CESAM, more studies are needed for validation of its safety.

Symphytum officinale, locally known as confrei (= confrey), is a very popular plant used for therapeutic purposes in different parts of world. The information from CESAM that this species is toxic to the liver is reported in the literature. *S. officinale* contains several pyrrolizidine alkaloids, for example, lasiocarpine, lycopsamine, intermedine, symlandine, riddelliine, and symphytine, and it was demonstrated that lasiocarpine induces a series of chronic and progressive lesions in rat liver, including fibrosis, cirrhosis, and malignant neoplasm (Laconi *et al*., 1995). The amount of pyrrolizidine alkaloids in cup of tea brewed from *S. officinale* leaves varies from 8.5 to 26 mg (Pinto, 2000; Lorenzi & Matos, 2002). *S. officinale* was the major toxic species found in our ethnopharmacology survey. However, it is worth noting that *A. conyzoides*, a species indicated by CESAM for internal use, also contains such pyrrolizidine alkaloids as lycopsamine and its N-oxide, which are hepatotoxic and tumorigenic (Bosi *et al*., 2013). In our interview, the CESAM group did not cite *A. conyzoides* as toxic.

According to CESAM members, *Momordica charantia* is also toxic if ingested. Traditionally all parts of *M. charantia*, mainly the fruits, are reported in traditional medicine for the treatment of such ailments as hyperlipidaemia, digestive disorders, microbial infections, and menstrual problems. Although this species has received much attention in recent years for its anti-diabetic properties (Joseph & Jini, 2013), adverse effects, such as hypoglycaemic coma and convulsions in children (Basch *et al*., 2003) and abortions (Grover & Yadav, 2004), have been reported. For medicinal purposes, extracts and powdered formulations from the fruits are more frequently used than teas from the stems and leaves (Basch *et al*., 2003). The *M. charantia* stem is the part used for phytomedicine at CESAM (Table 1). Several cucurbitacin triterpenoids and other bioactive compounds have been isolated from *M. charantia*, and a toxic lectin in the seeds and outer rind of the fruits has been reported (Lampe &

McCann, 1985; Wang *et al*., 2012, and references cited therein). Regardless, the studies to date are insufficient to confirm or refute the recommendation with regard to toxicity.

Table 2
Medicinal plants indicated as toxic and the precautions for use reported at CESAM, Jaboatão dos Guararapes, Pernambuco state, Brazil.

Species (Toxic class)*	Toxicity and Precautions
Justicia pectoralis var. *stenophylla* (Coumarins)	Can be hemorrhagic if used during pregnancy or by children under two years of age.
Petiveria alliacea (Not known)	Toxic if ingested; external use only.
Symphytum officinale (Pyrrolizidine alkaloids)	Can be toxic to the liver if ingested.
Momordica charantia (Not known)	Toxic if ingested; external use only.
Schinus terebenthifolia[2] (Amentoflavones)	Toxic if ingested; external use only.
Chenopodium ambrosioides (Volatile oil)	Can be toxic if ingested in a large amount or over a long period of time.
Laportea aestuans (Protein allergens)	The fresh leaves have toxic trichomes and must be dried in an oven before ingestion.
Xanthosoma sagittifolium (Calcium oxalate)	The fresh leaves are toxic and must be cooked before ingestion.
Kalanchoe blossfeldiana[1] (Cardiac glycosides)	Is toxic if the plant is flowering.
Vernonia condensata (Not known)	Can affect eyesight if ingested in great quantities.

*** Most likely toxic class according to the literature. [1]Some species contain cardiac glycosides (= bryotoxins), but *K. blossfeldiana* has not been chemically investigated for its cardiac glycosides. [2]Additional studies are necessary**

Schinus terebinthifolius has long been used in traditional Brazilian medicine to treat inflammatory diseases and to heal wounds. The CESAM group recommends only the external use of the inner bark in the form of a tincture, ointment, bath, or soap as a general anti-inflammatory. The pharmacological potential of *S. terebinthifolius* has been studied over the years, with varying results (Carvalho *et al*., 2003; Pires *et al*., 2004; Lima *et al*., 2009). Chemically, the stem bark of *S. terebinthifolius* contains catechin, tannins, terpenes, flavonoids, and saponins. Because tannins, saponins, and terpenes have been described as non-mutagenic or antimutagenic, the flavonoid amentoflavones 2,3-dihydroamentoflavone and tetrahydroamentoflavone present in the pepper tree decoction may be responsible for its genotoxicity (Carvalho *et al*., 2003). Due to the unclear toxicity results, Carlini *et al*. (2013) recommend a risk assessment prior to oral administration of *S. terebinthifolius*, mainly for women of childbearing age.

Chenopodium ambrosioides is a popular remedy for parasitic diseases and is also used as an expectorant. According to CESAM, this species can be toxic if ingested in a large amount or over a long period of time. As it has been confirmed that

decoctions and infusions of this plant induce genotoxic effects, such as an increase in the percentage of aberrant cells and a decrease in the mitotic index, regulation of the consumption of this phytomedicine is an important measure for avoiding injury (Gadano *et al*., 2002). Monzote *et al*. (2009) also observed that the oil constituents of this plant, including carvacrol, caryophyllene oxide, ascaridole and especially caryophyllene oxide, which inhibit the mitochondrial electron transport chain. Nonetheless, subchronic treatment with a hydroalcoholic extract of *C. ambrosioides* did not induce toxic alterations at the therapeutic dose (Pereira *et al*., 2010). These findings suggest that a low intake associated with a short duration of use should be considered as a safety measure until this phytotherapic can be fully validated.

The CESAM members state that *Laportea aestuans* and *Xanthosoma sagittifolium* leaves can be indicated for such bone diseases as osteoporosis. However, due to the stinging trichomes rich in protein allergens of *L. aestuans* and the calcium oxalates in *X. sagittifolium*, it is suggested that these species should be dried and cooked, respectively, prior to use. Oliveira *et al*. (2012) found a rather significant calcium content in *L. aestuans* leaves and concluded that the heating of *L. aestuans* and cooking of *X. sagittifolium* leaves, as recommended by specialists, causes the disintegration of the hairs and diminishes the oxalate content, respectively. According to these authors, *L. aestuans* and *X. sagittifolium* leaves may be used as a nutritional supplement in poor communities, presuming that their safe use is validated by further studies.

According to CESAM, *Kalanchoe blossfeldiana* is toxic when flowering. *Kalanchoe* species (= *Bryophyllum*) contain cardiac glycosides that are toxic to animals, such as young and adult cattle (McKenzie & Dunster, 1986; Masvingwe & Mavenyengwa, 1997). The toxicity occurs primarily from flowers, which contain a much higher concentration of cardiac glycosides (= bryotoxins) than the stems, leaves, or roots. In calves, for example, the lethal dose is approximately 7 g of flowers/kg body weight or 40 g of leaves/kg body weight (McKenzie & Dunster, 1986; McKenzie *et al*., 1987; McKenzie *et al*., 1989). In summary, the recommendation by CESAM is in agreement with the literature, though cardiac glycosides from *K. blossfeldiana* has not yet been analysed for its toxicity.

Finally, *Vernonia condensata* is widely used in Brazilian traditional medicine for gastrointestinal purposes. To our knowledge, no toxic effects, as indicated by the CESAM group, have been reported in the literature. Some studies have demonstrated that aqueous extracts from fresh leaves of *V. condensata* present low acute toxicity, without evidence of the teratogenic or mutagenic risk (Monteiro *et al*., 2001). Other studies, however, have shown that aqueous extracts from fresh *V. condensata* leaves present a higher acute toxicity and lower margin of safety when compared to organic extracts (Risso *et al*., 2010).

CONCLUSIONS

In summary, the results of the present study demonstrate that CESAM is important for supporting the primary healthcare of the local population, as the centre helps the community treat disease and conveys information and advice to local youth through meetings. Thus, CESAM contributes to knowledge on health, nutrition, and the use of medicinal plants in an urban community of northeastern Brazilian. The traditional practices from CESAM also contribute to conservation of medicinal plants providing support to that a large number people can use plant-based traditional medicines for healthcare. Additionally, the preparation of medicines by the CESAM group reveals some interesting aspects related the toxicity of the plants utilised. However, some species listed as toxic have not been studied for their chemical constituents and/or biological activities, including toxicological evaluations. Our study demonstrates the importance of ethnopharmacology surveys in urban communities as a possible source for new phytomedicines and the urgent need for the scientific validation of these phytomedicines.

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