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Ethnobotanical survey of medicine species used in Taboco Village, Maracaju mountains, Brazil, and healing activity of the specie with higher value of use (*Maytenus ilicifolia*)

[Estudio etnobotánico de especies medicinales utilizadas en Villa do Taboco, Serra de Maracaju, Brasil y la actividad curativa de la especie de mayor valor de uso (*Maytenus ilicifolia*)]

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Abstract: The objective of this work was to identify and classify the plants species designated as medicinal by the population of Taboco in different categories of use and investigate the specie with higher value of use with medicinal potential in experimental models. The field research took place between June and November 2018, with periodic visits to the Taboco Village, Brazil. The community makes use of a diversity of native, cultivated and domesticated species, corresponding to 89 plant species, belonging to 44 families, for cure or prevention over 60 types of health problems. The species *Maytenus ilicifolia*, with the highest use value was evaluated in experimental models. In this treatment a higher keratin production, reconstitution of the epithelium and the structured dermis was observed, with thick collagen fibers rich in fibroblasts, which favored the healing of exposed wounds.

Keywords: Medicinal plants; Traditional knowledge; Cerrado; Wound healing

Resumen: El objetivo de este trabajo fue identificar y clasificar las especies de plantas designadas como medicinales por la población de Taboco en diferentes categorías de uso e investigar la especie con mayor valor de uso con potencial medicinal en modelos experimentales. La investigación de campo se llevó a cabo entre junio y noviembre de 2018, con visitas periódicas a Villa de Taboco, Brasil. La comunidad hace uso de una diversidad de especies nativas, cultivadas y domesticadas, correspondientes a 89 especies vegetales, pertenecientes a 44 familias, para la curación o prevención de más de 60 tipos de problemas de salud. La especie *Maytenus ilicifolia*, con mayor valor de uso, fue evaluada en modelos experimentales. En este tratamiento se observó una mayor producción de queratina, reconstitución del epitelio y de la dermis estructurada, con espesas fibras de colágeno ricas en fibroblastos, lo que favoreció la cicatrización de las heridas expuestas.

Palabras clave: Plantas medicinales; Conocimiento tradicional; Cerrado; Cicatrización de heridas.

INTRODUCTION

Brazil, a country of continental dimensions, has a diverse flora among the different biomes. Among these, Cerrado stands out, being the second largest in South America, occupying around 204.7 million hectares (24% of the territory), in which, in the last three decades, there was a reduction of about 40% in its area of original vegetation, converted to pasture, agriculture and urbanization (Rocha *et al*., 2011).

According to Myers *et al*. (2000), it is considered a hot spot, being among the 25 areas worldwide with great biodiversity and concentration of endemic species; but it is one of the biomes that suffers the most from the impacts of agricultural expansion. One of its characteristics is the great variety of species used by traditional populations, for food and medicinal purposes, as a result of their close contact with the environment in which they live, and the use of herbs for therapeutic purposes is a widespread practice.

The state of Mato Grosso do Sul, West Central of Brazil, is partly covered by the vegetation of this biome. In this region there is a strong influence of the traditional communities [*pantaneiros* (swamp-dwellers), *quilombolas* (communities formed by descendants of runaway slaves), fishermen, indigenous and family farmers], which have a vast knowledge about the plants and their use for the health problems treatment. The use of such species, in parallel with conventional medicine, is important, since phytotherapy is the most accessible way to prevent, treat and cure diseases in certain places and communities (Pasa, 2007). This situation occurs mainly in regions where there are no hospitals and care for the communities is precarious, which favors the use of flora, a reality that occurs in the region of Taboco (Patrimony of Taboco), located more than 100 km from Campo Grande, capital of the state.

The different species used by the population, especially in smaller cities or areas away from large centers, are easily found in homegardens, free trade and popular markets, as well as remaining areas of vegetation around urban centers, allowing them to be easily collected and used. Researchers such as Maciel *et al*. (2002) report that the use of medicinal plants for the diseases treatment is as old as the community life of the human species, and today, in the most disadvantaged regions of the country, they are sold at free trade and found in homegardens of residences. The World Health Organization quantifies that approximately 80% of the population uses traditional medicine (WHO, 2011) and the dissemination of information on medicinal flora obtained through research with traditional populations can be an important tool for the cultural wealth maintenance of the country (Oliveira *et al*., 2011).

According to Pasa (2007), popular knowledge about the use of herbal methods, parallel to conventional medicine, is important, emphasizing that this is the most accessible way to treat, cure and even prevent diseases in certain places and communities. Hamilton *et al*. (2003), state that the study of different aspects of ethnobotanical works is important because according to the region where they are performed, a strong influence of the types of the present ecosystems may occur. Therefore, this type of study allows the rescue and transmission of popular knowledge of the communities involved, in order to avoid that the use of plants be forgotten.

Guarim Neto (2006) mentions that normally the procedures for the collection and correct use of these species belong to small groups of the population, usually people with little formal education with knowledge transmitted by their parents or other older people. These groups are threatened by environmental changes that lead to a change in their lifestyle. Therefore, the knowledge of their culture is fundamental for the preservation of their ancestral traditions.

Thus, traditional plant use for various therapies also collaborates with health services, which are scarce in areas far from large centers, especially of patients with chronic non-communicable diseases, such as diabetes *melitus*. Diabetic patients may present injured tissue and the closure of the lesion is slow and complex, often leading to aesthetically unpleasant scars (Moreira *et al*., 2009). For these reasons, many seek the solution through the use of medicinal plants. However, the use of plants for therapeutic purposes, without validation studies, constitutes a risk to public health, which justifies trials on these species.

Considering these aspects, the objective of this work was to identify and classify the plants species designated as medicinal by the population of Taboco region in different categories of use, as well as to investigate the species with higher value of use with medicinal potential in experimental models.

MATERIAL AND METHODS

Study area

The municipality of Corguinho is located on the eastern border of the Pantanal (flood plain) in the central region of state of Mato Grosso do Sul, southwestern Brazil (Figure No. 1). The small village of Taboco (Patrimony of Taboco), located in the municipality, has an approximate population of 650 people, whose economy is based on cattle raising. The region altitude is 320 m on average (between 200 and 600 m) and, according to Köppen and Geiger (1928), the climate is tropical (Aw) with dry winters and rainy summers, with a temperature of 24.8°C on average (minimum can reach 15°C, May to August and maximum, 32°C, September to April). The annual rainfall of 1444 mm on average with three months of drought (July, August, and September) and rainfall less than 50 mm/month (Mato Grosso do Sul, 2015).

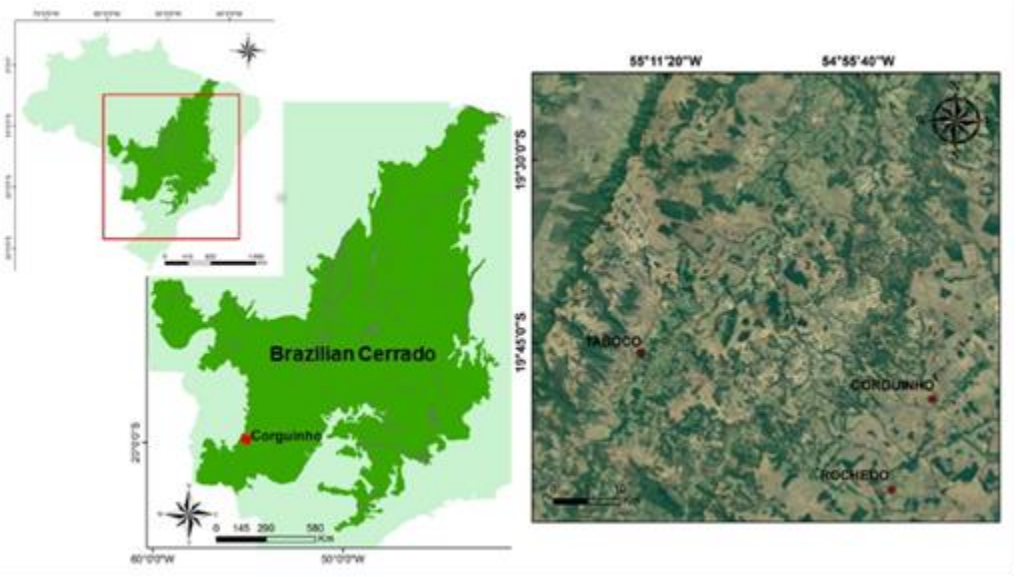

Figure No. 1
Location of the study area, Taboco, Corguinho, Mato Grosso do Sul, Brazil. The left of the study area is the flood plain (Pantanal) and the right, Maracaju Mountains

The major vegetation formations found are the *cerrado sensu stricto* (woodland savanna), forest formations dominated by arboreal species, rocky outcrop cerrado locally called *cerrado rupestre* and forest vegetation (closed canopy tall forest) which occur along the streams. However, most part of the region has pastures planted with *Urochloa humidicola* (Rendle) Morrone & Zuloaga, that predominate in flatter locations (Bononi *et al*., 2017).

Sampling of the informants

The interviewees were selected, according to information from the residents themselves, who indicated the local people with practical and empirical knowledge about the use of plant species as medicinal. As sampling technique, the methodology was used proposed by Bailey (1994), called "snow ball", where the first expert interviewed indicates the next, so that, at the end of the study, all experts in the community are interviewed.

The work was submitted and approved by the Research Ethics Committee of the Anhaguera-Uniderp University (under number 2,191.959), according to procedures of Brazil Platform. A register of access to the genetic patrimony or associated traditional knowledge was also carried out in the National System of Genetic Resource Management and Associated Traditional Knowledge (CGEN/MMA), under registration number A87540D.

Four locals with this profile were indicated by the local population, all of them over the age of 40 years. Thus, for data collection, a semi-structured

questionnaire (presents open questions, in which the respondent can answer freely and closed questions, those that present pre-defined answers) was applied, with questions related to ethnobotany (name and part of the species used, collection place, method of preparation, diseases for which it served, and characteristic of the preparation) following what is recommended by Albuquerque & Lucena (2004). The data collection occurred with periodic visits month to month (June - November of 2018).

In informal conversations, respondents were free to talk about species indicated as medicinal, using a regional language. When possible, on that day or later, visitation routes to the area of the property or forests of the region were realized. In these places, the existence of the cited plants was indicated, and clarifications were made on the various uses related to their therapeutic use.

Identification of species and use value

The interviewees used the popular names to identify the mentioned species, which were then classified using the Angiosperm Phylogeny Group (APG III, 2009; APG IV, 2016). When necessary, herbarium specimens were assembled and the collected material transported to the institution's herbarium for identification and / or confirmation, with subsequent storage. Species cited by Sano *et al*. (2008) and Pott & Pott (1994, 1999) were considered native to the region.

According to Phillips & Gentry (1993), the Usage Value of a species was calculated for each informant (UVis), using the formula UVis = ΣUis/nis, where Uis corresponds to the number of uses mentioned for the species and nis, number of interviews with the informant. The calculation of the Usage Value of each species (UVs) was performed using the formula UVs = ΣUVis/n, where UVis equals the value of use of a species for the informant and n, total number of informants.

Species with higher Value of Use and method of extraction

The species with the highest Value of Use (*Maytenus ilicifolia*) was selected to validate the therapeutic effects attributed to the plant. An herbarium specimen was assembled and incorporated into the institution's herbarium under the number RG. 8567. The collected leaves were dried at ambient temperature (28 ± 5°C) and subsequently crushed in a blender. The resulting powder (100 g) was extracted with 100 mL of a hydroethanolic solution (1:4) by static maceration at room temperature for seven days. The solvent was removed under vacuum on a rotary evaporator (Tecnal, MA120), producing 18 g of crude hydroalcoholic extract (yield 4.5%).

Assembling the experiment (in vivo animal)

The experiment was performed with 45 adult Wistar rats (*Rattus norvegicus albinus*) (290±10 g), maintained in the institution's vivarium, with free access to nuvital® ration and water *ad libitum*, throughout the study. The procedures for the animals' care and handling complied with the guidelines of the International Association for the Study of Pain with the Use of Animals and were approved by the Animal Ethics Committee (CEUA/AESA, number 2671).

Surgical procedures for wound induction

The animals were weighed, anesthetized with ketamine hydrochloride (75 mg kg^{-1}) and xylazine (10 mg kg^{-1}), with 0.2 mL per 100 g animal weight, intraperitoneally (Flecknell, 2015). In sequence, the rats were positioned in the ventral decubitus and immobilized on a wooden board, using elastic tensors on the limbs. A space of 2x2 cm, 0.5 cm of the spinal column and 1 cm above the iliac crest were measured in the right dorsolateral region, being the area trichomized. For the wound induction, a metal punch with a diameter of 8 mm was used. A cutaneous fragment was removed in the center of the delimited area until exposure of the superficial muscular fascia.

The rats received individual identifications and were randomly divided into three groups of 15 animals, with three collection times (3, 7 and 14 days [n=5]). The groups were: G1 - 0.2 mL of saline solution (0.9%) applied on the lesion; G2 - 0.1 g of Collagenase® applied on the lesion; and, G3 - 0.1 g of crude hydroethanolic extract applied on the lesion. Treatment was started immediately after surgery and all groups treated once daily at the same time. Photographic images of the lesions were performed at intervals of three days, evaluating the healing evolution. At the end of the experimental period, the animals were weighed and euthanized by intraperitoneal administration of a lethal dose of anesthetic ketamine + xylazine hydrochloride (0.4 mL per 100 g) (Massone, 2019).

Histological analysis

After euthanasia, the dorsal area was surgically removed and fixed in paraformaldehyde buffered at 4.0%. Then the samples were incorporated into paraffin blocks and sectioned in samples of 5 µm thickness, using microtome (Microm HM320, lberg, Germany). The resulting samples were stained with hematoxylin and eosin and examined under optical microscopy (Carl Zeiss) (Luna, 1968).

RESULTS

The researched population reported that most of the knowledge about the use of plants for therapeutic purposes originated from information passed on by their parents, grandparents and/or close relatives.

A total of 44 families and 89 species were identified, with 67,4% of the species being native. The botanical families with the highest number of species were Fabaceae (13.5%), Asteraceae (9.0%), Lamiaceae (6.7%), Poaceae (5.6%), Bignoniaceae (4.5%), Rutaceae (3.4%) and Cucurbitaceae (3.4%). The other 37 families represented 53.9% of the species (Table No. 1).

The health problems and/or diseases most cited to justify the use of plants are those related to the digestive system, with 29 citations, followed by those associated with the circulatory system (22), respiratory system (17), skin problems (14) and various types of pain (10). In some cases, informants recommended the use of plants from different families to treat the same type of disease, or a plant species to treat various problems (Table No. 1).

Regarding the preparation method, approximately 92.1% of the plants are used in the form of tea and 15.7%, infusion. The other forms are: (1) a plant mixed with *chimarrão* (7.9%), a hot drink based on yerba mate (*Ilex paraguariensis* A. St.-Hil.), common in southern Brazil and typical of some areas of the state, (2) *garrafada*s (5.6%), in which parts of the plant are placed in bottles and added some type of liquid, such as wine, *Biotônico Fontoura* (fortifying and antianemic medicine) or *cachaça* (beverage distilled from cane sugar), among others, depending on the objective to be reached, (3) *in natura* (4.5%) and, (4) syrup (3.4%) (Table No. 1).

The most used vegetative organs are leaves (43.8%), bark - external, internal and between bark (35.9%), root (30.3%), fruit (15.7%), flowers (10.1%), stem (6.8%), and seed (6.7%). The most cited places to find and collect the species were the backyards own homes (53.9%) followed by plants found only in native areas of Cerrado (34.8%) and forest areas (7.8%). About 9.0% of the plants are collected in both backyards and forest areas (Table No. 1).

Table No. 1

Family, scientific and common name of plant, native or exotic, used part, therapeutic indication, Use Value of a species for an informer (UVis) and Use Value of each species (UVs), cited by the interviewees of the Patrimony of Taboco, municipality of Corguinho, Mato Grosso do Sul, Brazil

Brazil.

Family and scientific name	Used part (preparation)	Indications	1. Native species 2. Location	UVis	UVs
(1) Alismataceae					
Echinodorus grandiflorus (Cham. & Schltr.) Micheli	Leaf (tea)	1. Circulatory system (purification of blood and diuretic)	1. Yes; 2. Wetlands (marsh)	2.0	0.5
(2) Amaranthaceae					
Dysphania ambrosioides (L.) Mosyakin & Clemants	Leaf and stem [tea, *garrafada* (with *cachaça*), mixed with milk and infusion]	1. Skin problems (burns and bruises); 2. Verminoses	1. Yes; 2. Planted in the backyard	6.0	1.5
Gomphrena arborescens L. f.	Leaf, stem, bark, flower, fruit and root (tea and infusion)	1. Antipyretic (high fever); 2. Sore throat	1. Yes; 2. Cerrado and planted in the backyard	2.0	0.5
(3) Amaryllidaceae					

Hippeastrum puniceum (Lam.) Voss	Bulb (*garrafada*)	1. Respiratory diseases (asthma)	1. Yes; 2. Rocky outcrop cerrado	1.0	0.25
(4) Anacardiaceae					
Anacardium humile A.St. Hil.	Root (tea)	1. Circulatory system (diabetes)	1. Yes; 2. Cerrado	1.0	0.25
Astronium urundeuva (M.Allemão) Engl.	Bark (inner bark) (infusion)	1. Skin problems (healing); 2. Digestive diseases (against ulcers)	1. Yes; 2. Cerrado (dry forests and *cerradão*, a type of forest formation in the Cerrado biome)	2.0	0.5
(5) Apiaceae					
Foeniculum vulgare Mill.	Fruit (seed) (tea)	1. Digestive problems (cramps and gases)	1. No (naturalized); 2. Planted in the backyard	1.0	0.25
Pimpinella anisum L.	Fruit (tea)	1. Respiratory diseases (bronchitis, the flu, cold and cough)	1. No; 2. Planted in the backyard	4.0	1.0
(6) Apocynaceae					
Nerium oleander L.	Leaf (infusion)	1. Skin problems (accelerates the abcesses maturation)	1. No; 2. Planted in the garden	1.0	0.25
(7) Arecaceae					
Attalea phalerata Mart. ex Spreng.	Leaf (tea)	1. Verminoses (*amarelão* - popular name of diseases caused by intestinal parasites)	1. Yes; 2. Cerrado and planted in the backyard	1.0	0.25
(8) Asteraceae					
Acanthospermum australe (Loefl.) Kuntze	Leaf (tea)	1. Urinary system (inflammation)	1. Yes; 2. Found in the backyard	1.0	0.25
Achyrocline satureioides (Lam.) DC.	Leaf (tea)	1. Respiratory diseases (asthma, bronchitis and flu)	1. Yes; 2. Cerrado and planted in the backyard	3.0	0.75
Artemisia absinthium L.	Leaf and root (tea)	1. Digestive problems (stomachache and congestion)	1. No; 2. Planted in the backyard	3.0	0.75
Baccharis trimera (Less.) DC.	Leaf (tea)	1. Circulatory system (purification of blood, diuretic and the urinary tract inflammation)	1. Yes (other biomes); 2. Planted in the backyard	3.0	0.75
Bidens pilosa L.	Entire plant [tea and shower (boil in water and use in the bath)]	1. Circulatory system (purification of blood and child with jaundice); 2. Digestive system (hepatitis)	1. Yes; 2. Cerrado and found in the backyard	5.0	1.25
Mikania glomerata Spreng.	Leaf (tea and syrup)	1. Respiratory diseases (bronchitis, asthma, the flu, cold and cough)	1. Yes (other biomes); 2. Planted in the backyard	9.0	2.25
Solidago chilensis Meyen	Leaf and rhizome [infusion and	1. Muscle system (twisting, muscle pain and trauma); 2.	1. Yes; 2. Cerrado and planted in the	6.0	1.5

	tanned in alcohol (external use)]	Skin problems (against insect bites)	backyard		
Vernonanthura brasiliana (L.) H.Rob.	Root (tea)	1. Antipyretic (high fever)	1. Yes; 2. Field and degraded pasture	1.0	0.25
(9) Bignoniaceae					
Handroanthus impetiginosus (Mart. ex DC.) Mattos	Bark (inner bark) (tea and *chimarrão*)	1. Circulatory system (prostate problems); 2. Cancer	1. Yes; 2. Cerrado and *cerradão*	2.0	0.5
Jacaranda cuspidifolia Mart.	Root (tea)	1. Circulatory system (blood purification and reduces high cholesterol)	1. Yes; 2. Weak cerrado	4.0	1.0
Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	Stem (tea)	1. Digestive problems (pain)	1. Yes; 2. *Cerradão*	1.0	0.25
Zeyheria montana Mart.	Root (tea and infusion)	1. Skin diseases	1. Yes; 2. Cerrado	1.0	0.25
(10) Bromeliaceae					
Bromelia antiacantha Bertol.	Fruit (syrup)	1. Respiratory diseases (asthma and bronchitis)	1. Yes; 2. Cerrado	2.0	0.5
(11) Burseraceae					
Protium heptaphyllum (Aubl.) Marchand	Resin (tea)	1. Toothache	1. Yes; 2. *Cerradão* and forest closed	1.0	0.25
(12) Caricaceae					
Carica papaya L.	Seed and milk of green fruit [tea and infusion (*escaldado*, popular name)]	1. Respiratory diseases (asthma and bronchitis); 2. Against verminoses	1. No (naturalized); 2. Planted in the backyard	3.0	0.75
(13) Caryocaraceae					
Caryocar brasiliense Cambess.	Leaf (tea)	1. Against verminoses (*amarelão*)	1. Yes; 2. Cerrado	1.0	0.25
(14) Celastraceae					
Maytenus ilicifolia Mart. ex Reissek	Leaf and root (more efficient), stem and flower [tea and *garrafada* (with *cachaça*]	1. Circulatory system (blood purification and diabetes control); 2. Digestive diseases (gastritis, ulcer and inflammations); 3. Healing	1. Yes; 2. Wetlands (marsh) and planted in the backyard	16.0	4.0
(15) Cochlospermaceae					
Cochlospermum regium (Mart. ex Schrank) Pilg.	Root (tea)	1. Reproductive system (inflammation)	1. Yes; 2. Found in the backyard	1.0	0.25
(16) Commelinaceae					
Murdannia nudiflora (L.) Brenan	Flower [eye drops (dripping water from the flower in the eye)]	1. Vision (eye problems)	1. No (naturalized); 2. Found in the backyard	1.0	0.25
(17) Costaceae					
Costus spicatus (Jacq.) Sw.	Root and aerial part (tea)	1. Circulatory system (blood purification and	1. Yes; 2. Wetlands (marsh) and	4.0	1.0

		diuretic); 2. Digestive problems (stomachache)	cultivated in the garden		
(18) Cucurbitaceae					
Citrullus lanatus (Thunb.) Matsum. & Nakai	Fruit and seed (*in natura*)	1. Reproductive system (sexual impotence)	1. No (naturalized); 2. Vegetable garden and free trade	1.0	0.25
Cucurbita pepo L.	Seed (macerated with milk)	1. Verminoses	1. No (cultivated); 2. Vegetable Garden	2.0	0.5
Momordica charantia L.	Leaf (tea)	1. Digestive problems (indigestion and heavy stomach)	1. No (naturalized); 2. Planted in the backyard	2.0	0.5
(19) Cyperaceae					
Cyperus rotundus L.	Leaf, flower, seed, and root (tea)	1. Reproductive system (sexual impotence)	1. Yes; 2. Found in the backyard	1.0	0.25
Kyllinga odorata Vahl	Leaf (tea)	1. Digestive problems (gases, indigestion, and dysentery)	1. Yes; 2. Planted in the backyard	3.0	0.75
(20) Euphorbiaceae					
Croton salutaris Casar.	Latex (*garrafada* and *chimarrão*)	1. Skin problems (healing)	1. Yes; 2. Riparian formations	1.0	0.25
(21) Fabaceae					
Amburana cearensis (Allemao) A.C.Sm.	Bark (internal) and seed (tea and bark and seed tanned in wine for 7 days)	1. Circulatory system (anemia); 2. Digestive problems (indigestion); 3. Spine pain	1. Yes (other biomes); 2. Street and planted in the backyard	5.0	1.25
Anadenanthera colubrina (Vell.) Brenan	1. Bark (inner bark) (infusion)	1. Skin problems (healing)	1. Yes; 2. Cerrado	1.0	0.25
Anadenanthera colubrina var. *cebil* (Griseb.) Altschul	Bark (inner bark) (infusion)	1. Skin problems (healing)	1. Yes; 2. Cerrado	1.0	0.25
Anadenanthera peregrina var. falcata (Benth.) Altschul	Bark (inner bark) (infusion)	1. Skin problems (healing)	1. Yes; 2. Cerrado	1.0	0.25
Arachis hypogaea L.	Seed (*in natura*)	1. Reproductive system (sexual impotence)	1. Yes; 2. Planted in the backyard	1.0	0.25
Caesalpinia sp.	Bark (tea and in *cachaça*)	1. Circulatory system (diabetes); 2. Pain (in general)	1. Yes; 2. Cerrado	2.0	0.5
Dipteryx alata Vogel	Seed and bark (between bark) [roasted for consumption (seed) and tea (bark)]	1. Circulatory system (blood fortifier); 2. Digestive problems (bellyache)	1. Yes; 2. *Cerradão*	2.0	0.5
Hymenaea courbaril L.	Fruit (pulp) and bark [pulp mixed with honey and tea (bark)]	1. Respiratory diseases (asthma, bronchitis and cough)	1. Yes; 2. *Cerradão*	5.0	1.25

Pterodon emarginatus Vogel	Seed and bark (internal) (infusion and tea)	1. Muscular and skeletal system (rheumatism); 2. Pain (muscular and throat)	1. Yes; 2. Cerrado	6.0	1.5
Senna occidentalis (L.) Link	Root and bark (tea)	1. Respiratory diseases (the flu and cold)	1. Yes; 2. Degraded pasture and found in the backyard	2.0	0.5
Stryphnodendron adstringens (Mart.) Coville	Bark (insufion and tea)	1. Skin problems (healing and antifungal); 2. Reproductive system (wound in uterus)	1. Yes; 2. Cerrado and found in backyard	3.0	0.75
Vatairea macrocarpa (Benth.) Ducke	Bark (tea)	1. Digestive problems (stomachache)	1. Yes; 2. Cerrado	1.0	0.25
(22) Lamiaceae					
Leonotis nepetifolia (L.) R.Br.	Root (tea)	1. Digestive problems (bellyache and dysentery)	1. No (naturalized); 2. Found in the backyard	2.0	0.5
Mentha spicata L.	Leaf (macerated in the milk)	1. Verminoses	1. No (naturalized); 2. Planted in the backyard	1.0	0.25
Mentha pulegium L.	Leaf (tea)	1. Pain (headache prevention)	1. No (naturalized); 2. Free trade and planted in the backyard	1.0	0.25
Ocimum basilicum L.	Leaf (tea)	1. Digestive problems (indigestion)	1. No (cultivated); 2. Planted in the backyard	1.0	0.25
Plectranthus barbatus Andrews	Leaf (tea and macerated in the water)	1. Digestive problems (bellyache, digestion problems and malaise)	1. No (cultivated); 2. Planted in the backyard	6.0	1.5
Plectranthus neochilus Schltr.	Leaf (tea and macerated in water)	1. Digestive problems (bellyache, digestion problems and malaise)	1. No (cultivated); 2. Planted in the backyard	6.0	1.5
(23) Laureceae					
Cinnamomum verum J.Presl	Bark (tea and *in natura*]	1. Digestive problems (bellyache, intestinal dysfunction, heartburn and regurgitation)	1. No (cultivated); 2. Free trade	4.0	1.0
Persea americana Mill.	Seed and leaf [tea (leaf) and seed (crushed)]	1. Circulatory system (reduces high cholesterol and controls diabetes)	1. No (naturalized); 2. Planted in the backyard	1.0	0.25
(24) Lythraceae					
Lafoensia pacari A. St.-Hil.	Bark (inner bark) and leaf (infusion, tea and *tereré*, a cold blend using a mixture of *Ilex paraguariensis* and water)	1. Circulatory system (prostate problems and kidney stone); 2. Digestive problems (gastritis, ulcer and burning); 3. Skin problems (healing)	1. Yes; 2. Dry cerrado and planted in the backyard	10.0	2.5
(25) Loganiaceae					

Strychnos pseudoquina A. St.-Hil.	Bark (inner bark) (tea and roasted and ground in the food)	1. Digestive problems (heartburn, indigestion and other stomach problems); 2. Verminoses	1. Yes; 2. *Cerradão*	6.0	1.5
(26) Malpighiaceae					
Heteropterys tomentosa A.Juss.	Root (tea and *tereré*)	1. Circulatory system (blood purification)	1. Yes; 2. Dry cerrado	1.0	0.25
(27) Moraceae					
Brosimum gaudichaudii Trécul	Leaf (tea and infusion)	1. Circulatory system (blood purification); 2. Skin problems (treatment of dermatitis)	1. Yes; 2. Cerrado	2.0	0.5
Maclura tinctoria (L.) D.Don ex Steud.	Leaf (tea)	1. Verminoses	1. Yes; 2. Cerrado	1.0	0.25
Dorstenia brasiliensis Lam.	Root (tea)	1. Respiratory diseases (anti-inflammatory and combat high fever)	1. Yes; 2. Wetlands (marsh)	2.0	0.5
(28) Myrtaceae					
Psidium guajava L.	Leaf (shoots), bark, flower, fruit and root (tea)	1. Digestive problems (diarrhea and intestinal disorders)	1. Yes; 2. Planted in the backyard	6.0	1.5
Psidium araca Raddi	Leaf (shoots), bark, flower, and fruit (tea)	1. Digestive problems (diarrhea and intestinal disorders)	1. Yes; 2. Open cerrado	2.0	0.5
(29) Nyctaginaceae					
Mirabilis jalapa L.	Tuberous root (potato) (tea and *chimarrão*)	1. Circulatory system (reduces high cholesterol and controls diabetes)	1. No (naturalized); 2. Dry cerrado	6.0	1.5
(30) Oxalidaceae					
Oxalis sp.	Tuberous root (potato), stem and flower (tea and *chimarrão*)	1. Digestive problems (lazy bowel)	1. Yes; 2. Planted in the backyard	1.0	0.25
(31) Passifloraceae					
Passiflora edulis Sims	Bark (tea)	1. Circulatory system (reduces high cholesterol)	1. Yes; 2. Free trade and planted in the backyard	1.0	0.25
(32) Phyllanthaceae					
Phyllanthus niruri L.	Root (tea)	1. Pain (combat backache, related to the kidneys)	1. Yes; 2. Found in the backyard	2.0	0.5
(33) Plantaginaceae					
Scoparia dulcis L.	Leaf (tea)	1. Headache	1. Yes; 2. Open field	1.0	0.25
(34) Poaceae					
Cymbopogon citratus (DC.) Stapf	Leaf, root and flower (tea)	1. Respiratory diseases (cough and catarrh); 2. Skin problems (healing); 3. Headache; 4. Muscle system (relaxing and analgesic)	1. No (naturalized); 2. Planted in the backyard	6.0	1.5

Digitaria insularis (L.) Mez ex Ekman	Leaf (macerated)	1. Skin problems (bleeding)	1. No (naturalized); 2. Planted in the backyard	1.0	0.25
Melinis minutiflora P.Beauv.	Leaf (infusion with burnt sugar)	1. Respiratory diseases (cough and bronchitis)	1. No (naturalized); 2. Planted in the backyard	2.0	0.5
Imperata brasiliensis Trin.	Root (tea)	1. Respiratory diseases (cough); 2. Digestive problems (vomit); 3. Skeletal system (fortification); 4. Teeth (when a tooth is born in children); 5. Regulate body temperature (*friagem*, popular name)	1. Yes; 2. Cerrado (fertile land) and planted in the backyard	6.0	1.5
Saccharum officinarum L.	Root [tea and *garapa* (sugarcane juice) where it can be mixed with pineapple or lemon juice]	1. Circulatory system (high blood pressure)	1. No (cultivated); 2. Planted in the backyard	1.0	0.25
(35) Polypodiaceae					
Phlebodium decumanum (Willd.) J. Sm.	Root (tea and *chimarrão*)	1. Pain (spine and lumbar)	1. Yes; 2. Planted in the backyard	2.0	0.5
(36) Rubiaceae					
Rudgea viburnoides (Cham.) Benth.	Leaf (tea and *chimarrão*)	1. Circulatory system (diabetes control and high cholesterol)	1. Yes; 2. Forest closed	5.0	1.25
(37) Rutaceae					
Citrus x aurantium L.	Leaf and fruit rind (tea)	1. Digestive problems (indigestion, gases, and newborn babies' cramps)	1. No (naturalized); 2. Planted in the backyard	3.0	0.75
Citrus reticulata Blanco	Leaf (tea)	1. Respiratory diseases (the flu)	1. No (naturalized); 2. Planted in the backyard	1.0	0.25
Citrus limon (L.) Osbeck	Fruit (tea and juice)	1. Respiratory diseases (the flu and cold); 2. Digestive problems (heartburn and high uric acid); 3. Circulatory system (thicken or thin the blood)	1. No (naturalized); 2. Planted in the backyard	9.0	2.25
(38) Solanaceae					
Brunfelsia uniflora (Pohl) D.Don	Root (tea and *chimarrão*)	1. Muscular and skeletal system (against rheumatism)	1. Yes (other biomes); 2. Planted in the garden	2.0	0.5
Capsicum frutescens L.	Fruit (baked for seat bath)	1. Reproductive system (against hemorrhoids)	1. No (naturalized); 2. Free trade and planted in the backyard	1.0	0.25

Solanum paniculatum L.	Fruit and leaf [tea (leaf) and *garrafada* (fruit)]	1. Digestive problems (stimulates digestion and helps the liver)	1. Yes; 2. Degraded cerrado and wasteland	2.0	0.5
(39) Urticaceae					
Cecropia pachystachya Trécul	Leaf (syrup)	1. Respiratory diseases (the flu, cold and chest pain due to cough)	1. Yes; 2. Cerrado	3.0	0.75
(40) Verbenaceae					
Stachytarpheta cayennensis (Rich.) Vahl	Root and stem (tea)	1. Circulatory system (kidney problems); 2. Respiratory diseases (bronchitis); 3. Verminoses; 4. Reproductive system (urinary inflammation with pain); 5. Headache; 6. Muscle system (contusion)	1. Yes; 2. Open cerrado, pasture and wasteland	7.0	1.75
(41) Violaceae					
Anchietea pyrifolia (Mart.) G.Don	Root (tea)	1. Circulatory system (cleans the blood); 2. Nervous diseases (soothing)	1. Yes; 2. *Cerradão*	2.0	0.5
(42) Vochysiaceae					
Vochysia cinnamomea Pohl	Bark (tea)	1. Respiratory diseases (cough); 2. Digestive problems (bellyache)	1. Yes; 2. Cerrado	3.0	0.75
(43) Xanthorrhoeaceae					
Aloe vera (L.) Burm.f.	Leaf (internal part) (sap *in natura* and mixed with honey)	1. Skin problems (burns); 2. Hair loss; 3. Verminoses	1. No (cultivated); 2. Planted in the backyard	4.0	1.0
(44) Zingiberaceae					
Alpinia zerumbet (Pers.) B.L.Burtt & R.M.Sm.	Root (tea)	1. Digestive problem (congestion)	1. No (cultivated); 2. Planted in the backyard	1.0	0.25
Curcuma longa L.	Root (tea)	1. Digestive problems (improves digestion and whets the appetite)	1. No (cultivated); 2. Planted in the backyard	2.0	0.5

Regarding the UVis and UVs, *Maytenus ilicifolia*, *Lafoensia pacari*, *Mikania glomerata*, *Citrus limon*, *Stachytarpheta cayennensis*, *Imperata brasiliensis*, *Mirabilis jalapa*, *Psidium guajava*, *Strychnos pseudoquina*, *Plectranthus barbatus*, *Plectranthus neochilus*, *Pterodon emarginatus*, *Dysphania ambrosioides. Solidago chilensis*, *Cymbopogon citratus*, *Bidens pilosa*, *Amburana cearensis*, *Rudgea viburnoides* and *Hymenaea courbaril* stand out in order of importance. Of these, 61% are native to the biome of the region, 28% are naturalized or from other regions of Brazil and only 11% are cultivated.

Of the 16 species cited for the skin problems treatment, two of them presented higher use value, *Maytenus ilicifolia* and *Lafoensia pacari*. Only for *M. ilicifolia* there is no record validating the use in the second intention wounds healing and for this reason it was chosen for the tests. The results of the macroscopic evaluation in animals submitted to the wound healing treatment, with the extract of *M. iliciofolia*, demonstrate the formation of crust, but with no purulence and redness of the group treated with the plant (G3) and with Collagenase® ointment

(G2), relative to the negative control group (G1).

In the histological analysis, in the negative control group (saline solution – Figures No. 2A, No. 2B, No. 2C and No. 2D), the wound was still open with presence of extensive crust, disorganized epithelium and elevated inflammatory infiltrate. In the microscopic evaluation in three days, it was observed that besides the fibrinoleucocyte crust (c), there was an intense inflammatory process by neutrophil and moderate hemorrhage (h), under the crust. The dermis (d) was disorganized in relation to collagen fibers and vascularization (Figure No. 2A). In 7 days there was still evident fibrinoleukocytic crust (c), initiation of epithelialization (e) below the crust (c), slight inflammation (inf) and dermis in moderate regeneration, initiating the granulation tissue production (tg) (Figure No. 2B). At 14 days (Figure No. 2C), the epidermis was already formed with the three layers, but thin and with keratin (q) in small amount on the epidermis surface. The dermis (d) also had thin and disorganized collagen fibers (arrows). These data confirm that the saline solution did not inhibit the inflammatory (inf) and hemorrhagic process (h), besides not propitiating the adequate collagen fibers production.

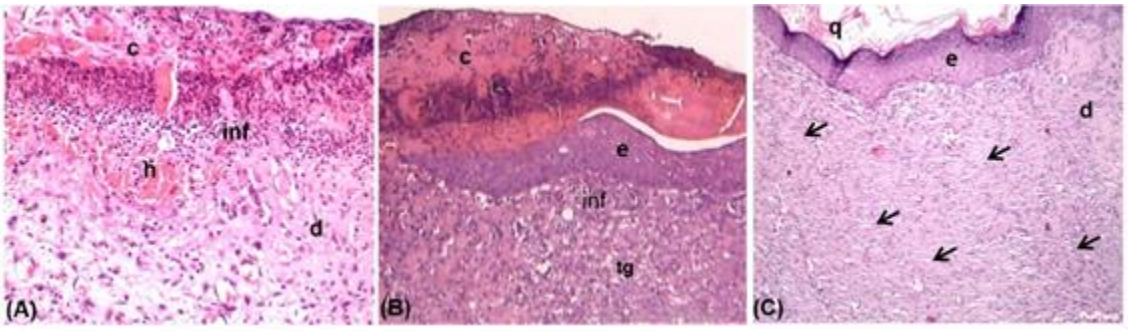

Figure No 2

Photomicrographs of rats' cutaneous wounds of the negative control group after topical treatment with saline solution (increase of 100 and 200x). HE. (A) 3 days, fibrinoleucocyte crust (c), inflammatory process (inf), haemorrhage (h) and collagen fibers in disorganized dermis (d). (B) 7 days, inflammatory process (inf), beginning of epithelization and production of granulation tissue (tg). (C) 14 days, epidermis (e) formed with thin layers and thin keratin (q) and dermis (d) also with fine collagen fibers, disorganized (arrows) and without the epidermal attachments

Microscopic evaluation of cutaneous wounds in rats after topical treatment with Collagenase® (Figures No. 3A, No. 3B and No. 3C) showed that at three days (Figure No. 3A) there was presence of fibrinoleukocytic crust (c), with inflammatory process (inf) and evident collagen fibers (arrows). In 7 days (Figure No. 3B), the crust partially covered the lesion, with formation of the thick epithelial layer (e) in part of the lesion. In the dermis (d), between the crust and epidermis, a moderate inflammatory and hemorrhagic process and fiber-rich activated granulation tissue and angiogenesis (circle). In 14 days (Figure No. 3C), the epidermis was already formed, being thick and with three layers [basal (cb), prickly (cc) and granular (cg)] formed, besides abundant keratin. In this case, Collagenase® inhibited the inflammatory and hemorrhagic process and promoted fibroblast proliferation, collagen synthesis and the appearance of cutaneous appendages and the collagen remodeling, with little vascularization and presence of sebaceous gland.

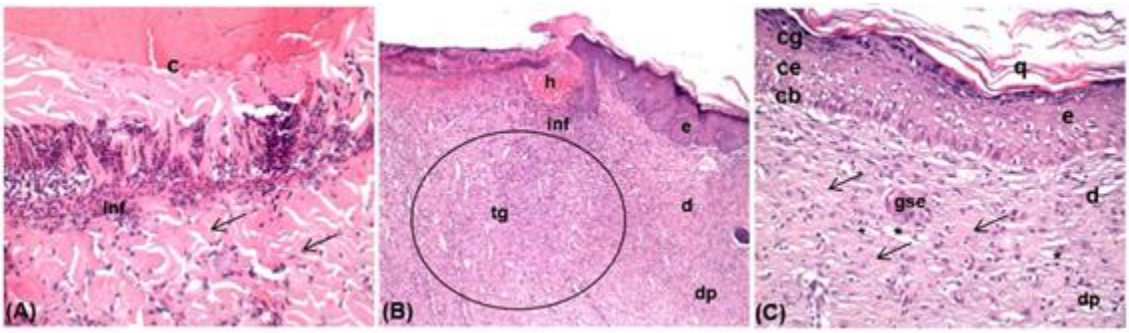

Figure No 3

Photomicrographs of cutaneous wounds of rats after topical treatment with Collagenase® (increase of 100 and 200x). HE. (A) 3 days, fibrinoleucocytic crust (c), mild inflammatory process (inf) and dermis with thicker collagen fibers (arrows). (B) 7 days, mild inflammation (inf) and formation of granulation tissue (tg) consisting of angiogenesis and collagen with thicker fibers (circle). (C) 14 days, epidermis (e) constituted with the three layers [basal (cb), prickly (cc) and granular (cg)] and thick keratin (q). The arrows in the dermis show thick collagen fibers, low vascularity (*) and sebaceous gland (gse)

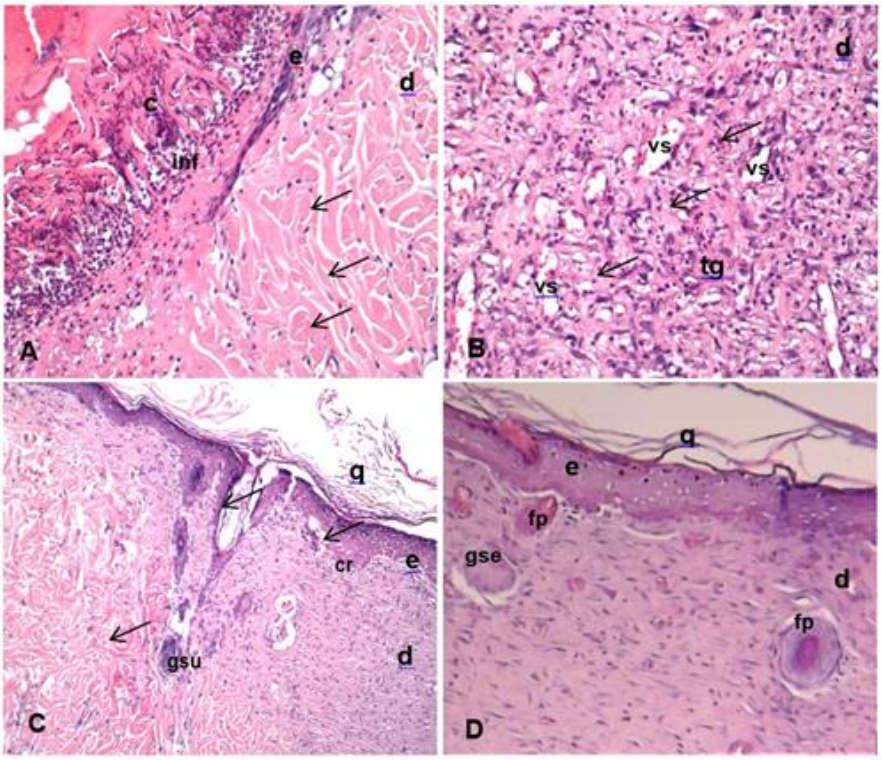

Figure No. 4

Photomicrographs of rats' cutaneous wounds after topical treatment with extract of *Maytenus ilicifolia* (increase of 100 and 200x). HE. (A) 3 days, beginning of epithelization under the crust (e), fibrinoleucocyte crust (c), inflammation by mononuclear (inf) and dermis (d) already with thick collagen fibers (arrows). (B) 7 days, apparent granulation tissue (tg) in relation to angiogenesis and thick collagen fibers. (C/D) 14 days, epidermis formed with three layers and crests (cr) above keratin layer (q). One can observe the annexes as hair follicle (fp), sweat glands (gsu), sebaceous glands (gse) and keratin (q). In the D image, the epithelium is reconstituted with all skin attachments and the dermis is already structured and mature, with thick collagen fibers and rich in fibroblasts and vascularization

In the animals treated with *M. ilicifolia* in 3, 7 and 14 days (Figures No. 4A, No. 4B and No. 4C), the histological sections demonstrate that the hydroethanolic extract decreased the inflammatory cells infiltration, with the hemorrhagic process not being observed as early as 3 days (Figure No. 4A). In 7 days (Figure No. 4B), the granulation tissue was evident, being dense. In 14 days (Figure No. 4C), the epidermis was constituted with the generation of cutaneous appendages and in the dermis, existence of collagen fibers in the remodeling process.

DISCUSSION

The results indicated that the information about which plants should be used, depending on the problems to be addressed, had as primary information source their parents, grandparents, close relatives and/or older people in the community. Informants use or have already used at some point, the mentioned plants for some type of disease, claiming that they provided some benefit to their health. Brito & Senna-Valle (2011) evidenced in their work in the community of Caiçara, located in Sono Beach, Rio de Janeiro, that the family group was the most significant means of propagation of information on medicinal plants, which was also verified by this research.

Other works, such as those published by Lozada *et al*. (2006) and Cunha & Bortolotto (2011), also indicate that knowledge is obtained through known persons or close relatives, demonstrating the importance of family ties. The information exchange during adult life is an example of a source of information and knowledge (Eyssartier *et al*., 2008). According to Cunha and Bortolotto (2011), social interaction allows the knowledge transmission passed on to the children, brothers, neighbors and known persons, verbally or accompanying practical experiences.

Brazil, because of its great biodiversity, associated to the native people knowledge added to the information and plants brought by the European settlers and African slaves, produced a rich diversity of strategies in the use of plants in the prevention and cure of diseases. The use of medicinal plants has always been a treatment option, which, together with the lack of access to medical services and conventional treatments in some regions, high cost of industrialized medicines and the ingrained culture of certain places, has maintained its tendency to use. In addition, many users consider this method a less aggressive and less adverse effect than the use of conventional drugs (Brandão *et al*., 2008).

Studies on the use of medicinal plants in the states of Mato Grosso and Mato Grosso do Sul have already been carried out by different researchers in different areas. For example, Berg (1980) in research in the cities of Cuiabá and Chapada dos Guimarães, reported the use of 103 species. Guarim Neto (2006), in a compilation of previous research, indicated 56 medicinal plants used in the traditional medicine of Pantanal. Oliveira *et al*. (2011), in the region of Rio Negro, mentioned 48 species, while Berg & Silva (1988), in a survey with a greater number of localities (Campo Grande, Aquidauana and Miranda), listed 104 species considered as medicinal flora.

The data obtained by this work on the number of species used in curative or preventive practices can be considered high. Taking into account the size of the community and the number of respondents, this research presented a relevant number of plants, demonstrating the wealth of knowledge of the local population, in relation to the use of vegetation in the region.

Among the identified species, some were recommended for use in different problems, such as *Bidens pilosa* or plants of different families to treat the same type of disease. Similar data were obtained by Tomazi *et al*. (2014), in which the interviewees mention 14 medicinal plants to be used in 42 therapeutic indications, demonstrating that the use of several species to treat a particular problem or a plant for several situations is normal.

In relation to health problems treated by medicinal plants, the studies usually indicate that the highest percentage of use is for respiratory diseases, a situation related to common problems in the population, such as colds and the flus (Francisco *et al*., 2004). Di Stasi & Hiruma-Lima (2002), Pilla *et al*. (2006), Silva & Proença (2008) and Cunha & Bortolotto (2011) also presented similar results, indicating that the treatments of respiratory system diseases being the most common for the use of plants.

In the Taboco region, the results were distinct, with the highest citation being related to problems of the digestive system. This situation may be related to the type of food predominant in the place, where people, perhaps due to their culture or difficulty of access, consume few vegetables, having

a tendency to eat foods of longer digestion, such as beef or pork.

Concerning the botanical family with the highest number of representatives mentioned in the study, Fabaceae, surveys carried out where the predominant phytophysiognomy is the Cerrado biome (Campos *et al*., 2006; Silva & Proença, 2008; Souza *et al*., 2008), have indicated that this family stands out. This predominance can be attributed to the biological nitrogen fixation capacity of its species, facilitating the propagation in poor soils, characteristic of this biome. Therefore, it would be expected that also the medicinal species of this family would also stand out. According to Forzza *et al*. (2010), Fabaceae Lindl. (or Leguminosae Adans.) is considered the most representative botanical family in Brazil, found in all biomes and according to Guarim Neto & Moraes (2003), one of the most used by the native populations.

Regarding the Value of Use (from one species to an informant, and from each species), the data show that native flora is still the most used by residents as a source of resolution for their health problems. This situation would be expected because most of the cited plants are not exotic. Among the species with high use value are *Maytenus ilicifolia* and *Lafoensia pacari*, mentioned as being ideal for problems of gastritis and infections, also considered anti-inflammatory, blood purifying, diuretic and antiulcer. Work by Menezes *et al*. (2006) confirmed the gastric activity of *L. pacari*, demonstrating its potential for use. *Mikania glomerata* and *Hymenaea courbaril* also stood out, both being efficient in the treatment of respiratory problems, such as bronchitis, asthma, cough, the flu and colds. Pasa (2011) highlighted *M. glomerata* as the main species used in the community of Bom Jardim, Mato Grosso, for the respiratory problems treatment.

Regarding the mode of preparation of medicinal plants, most of it is used in the form of tea. According to Namita *et al*. (2012) tea is one of the oldest and most consumed beverages in the world. Its preparation with different types of plants can lead to the release of substances originating from the secondary vegetable metabolism, such as tannins and flavonoids, among others (Naczk & Shahidi, 2004), with specific functions for certain types of diseases. The use of this preparation method is also reported as predominant in other regions, as cited by Pinto *et al*. (2006), in Itacaré - Bahia, Santos *et al*. (2008), Vargem Grande - São Paulo, Cunha & Bortolotto (2011), Anastácio - Mato Grosso do Sul and Pinto *et al*. (2017), Pantanal - Mato Grosso do Sul, because it is a simple way to use the vegetal resource at disposal.

The interviewees also cited as the most used vegetative organ, the leaves, which could be expected, since this is usually the most common plant structure for making tea, the main form of the compounds ingestion present in plants. The greater use of leaves is also cited by Medeiros *et al*. (2004), with residents of Rio das Pedras Reserve, Mangaratiba, Rio de Janeiro. The authors report that the adepts of herbal medicine usually conserve plant species, minimizing the risk of their loss or even extinction, removing parts that can be replaced usually by the plants themselves, because they may need the plant again.

Other works carried out, such as Pilla *et al*. (2006), Cunha & Bortolotto (2011) and Pinto *et al*. (2017) confirm that the leaves are the most used part. This preference is also related to the greater ease of collection, since the same, depending on the species, can be present all year round and after collection, the leaves return to sprout, making their use sustainable.

The most frequently cited sites by locals to find and collect plant species of interest were their own backyards (their residences). The same situation is described in several ethnobotanical studies, evidencing that the majority of the researched population plants of medicinal species in the lands of their houses (Coe & Anderson, 1999; Medeiros *et al*., 2004; Souza, 2007). The predominance of this type of cultivation in the Taboco patrimony is a result of the characteristics of houses in the region, which have large areas not built, a common situation in small localities in the interior of the state of Mato Grosso do Sul.

Regarding the origin of the flora used, the predominance of the native species indicates a great inhabitants' knowledge about the plants of the region. Oliveira *et al*. (2010), in work in the rural communities of Oeiras - Piauí, also reported that most of the species used as medicine belong to the native vegetation. Oliveira *et al*. (2011), along the rural communities of Rio Negro and *raizeiros* of the cities of Aquidauana and Miranda, Mato Grosso do Sul, also indicated that a predominance occurs in the use of native species in the health problems treatment. These results are mainly related to the

characteristics of the regions, where communities are more closely connected to the land.

On the other hand, Pinto *et al*. (2017) indicated that residents of a region near the city of Corumbá - Mato Grosso do Sul, used only 40% of the species identified as being native, demonstrating that there may be a loss of knowledge of the ways of using the native species. According to the authors, this situation is related to the influence of the city, of medium size, in the users' behavior of medicinal plants.

Among the species from the Cerrado biome, it is possible to mention *Stryphnodendron adstringens*, mentioned to treat wounds in the uterus (healing and antifungal). A study of its antifungal action was confirmed by Melo e Silva *et al*. (2009), where it induced the inhibition of the fungus *Trichophyton rubrum*, using diluted plant extract. The species *Bidens pilosa*, *Senna occidentalis* and *Kyllinga odorata* are also native and commonly found in backyards of residences, making them easily accessible to treat problems such as *amarelão*, the flu and muscle relaxant (soothing), respectively.

Among the species that are not native to the Cerrado, some species spread throughout the country can be found, such as *Baccharis trimera* and *Mentha spicata*, commonly found in residences. They can be classified as naturalized because they were introduced accidentally or purposely in a region where they did not exist, adapting and reproducing without anthropic help. Others, such as *Amburana cearensis*, native to Caatinga, are not easily found outside their biome.

The use of species from other regions is often related to the origin of the local population, who bring from other places, plants that they consider important for their life and begin to cultivate them in the region that now reside. Brazil, like other countries, has received waves of immigrants who brought with them the customs of their regions of origin, such as the use of certain plants, and with this occurred the introduction of several plant species from other continents (Dean, 1996).

This diversity of new knowledge allowed that even exotic species could be used and included in research that seeks to identify plants used in folk medicine. In research with 108 books dealing with the use of plants in Brazil, Oliveira (2003) observed that 80% of the species currently used are native to other continents. This finding is consistent with the results of ethnobotanical studies of traditional populations of the Atlantic Forest, in which only one of the 14 species used as antipyretic (*Strychnos triplinervia* Mart.) is native to Brazil. Similar results were cited by Di Stasi & Hiruma-Lima (2002) in research in some areas of the Amazon, where only 13 of the 36 species are native.

On the other hand, the results of this research demonstrated a greater percentage of local species utilization, which indicates that the Taboco region, perhaps due to its smaller size and isolation, has less external influence on the species used in popular medicine, with a higher native utilization rate. In relation to the small number of non-native species, Vendruscolo & Mentz (2006) suggest that the representation of the exotic plants is associated to the respondents' origin and habitat. Thus, a greater number of people originating in the region itself allows a greater citation of native species.

Work done by Oliveira *et al*. (2011) indicated that 39.6% of the species mentioned by the inhabitants of Pantanal do Negro and *raizeiros* of the cities of Miranda and Aquidauana are exotic, a result similar to that obtained by Cunha & Bortolotto (2011), in the municipality of Anastácio (43%). On the other hand, in the region of Corumbá, Pinto *et al*. (2017) cited 60% as being exotic, confirming that proximity to larger cities may interfere with the knowledge and use of native species, which would be replaced by other ways to combat health problems.

Of the exotic species, the most cited family was Lamiaceae, with plants widely used in folk medicine, such as *Plectranthus barbatus* and *Plectranthus neochilus*, mainly used for stomach problems. The vegetables in this family are rich in antioxidants such as tocopherols, vitamin C, carotenoids and phenolic compounds (Mariutti & Bragagnolo, 2007), justifying their use.

During the interviews, the use of some animals as medicine was also mentioned, for example, the fat of *sucuri* (*Eunectes* spp.) added to the tea for treatment against bronchitis, asthma and pneumonia and the armadillo (Dasypodidae Family), for hemorroida (crushed carapace), besides being used in the gastronomy, preparing soup. One of the interviewees cited the species *faveira de anta* (unidentified species) for veterinary purposes, reporting that the tapir eats the bark to combat the ingestion of toxic plants. Another plant mentioned was the *tiborna* (unidentified species), used in the

detoxification of horses, in the form of tea leaves, demonstrating that ancient customs still predominate in the region.

Sixteen species were cited by the community of Taboco for the skin problems treatment, such as wounds, with two presenting higher use value, *Maytenus ilicifolia* and *Lafoensia pacari*. In relation to these species, only the hydrotheranolic solution of *L. pacari* leaves was pointed out by Carneiro *et al*. (2016) and Pereira *et al*. (2018), as effective in wound healing induced in mouse, with anti-inflammatory action, for example. This effect was attributed to the plant's antioxidant potential, which contributed to the wound remodeling phase.

The species *M. ilicifolia* has popular use as anti-inflammatory, analgesic and antiulcerogenic (Nunes *et al*., 2003). The plant is described in the Brazilian Pharmacopoeia, 5 edition (ANVISA Brasil, 2017) and is part of the National Program of Medicinal and Phytotherapeutic Plants, instituted in December 2008 by Ministerial Order nº 2.960 (Brasil, 2008). This program has as one of its objectives to insert, with safety, efficacy and quality, medicinal plants, phytotherapics and services related to Phytotherapy in SUS (Health Unic System). The program also seeks to promote and recognize popular and traditional practices of using medicinal plants and home remedies.

Its antiulcerogenic action favored its use as healing, by traditional communities of different Brazilian regions. In Campo Grande, the plant is commercialized by healers for the same purposes, supporting the data obtained in the present research, where the population assimilated its use to gastric problems and wound healing (Nunes *et al*., 2003). Also, the use of the plant in traditional medicine occurs in other regions due to its analgesic, anti-inflammatory, antiulcerogenic, antacid and antispasmodic effects, as well as use to combat acnes, eczema, wounds and ulcerations (Martins *et al*., 2003; Jorge *et al*., 2004; Santos-Oliveira *et al*., 2009).

The use of the leaves of *M. ilicifolia* for the gastric disorders treatment has been developed for more than 3 decades. As a product of these studies, there are studies that report the plant efficacy as a gastroprotector. For these evidences, the researchers used, experimentally, several models of induced gastric ulcers and hypersecretion (for example Tabach & Oliveira, 2003; Ferreira *et al*., 2004; Jorge *et al*., 2004; Baggio *et al*., 2007; Baggio *et al*., 2009; Cipriani *et al*., 2009; Tabach *et al*., 2017a; Tabach *et al*., 2017b).

Among the chemical constituents associated with the gastroprotective effect, capable of protecting the stomach mucosa, regulating the hydrochloric acid secretion and bacteriostatic action against *Helicobacter pylori* (usually associated with gastritis and ulcer), are the tannins (epigallocatechin, for example) and terpenes (fridenelol, for example) (Santos-Oliveira *et al*., 2009). Other active ingredients were found in different plant organs, such as flavonoids (Leite *et al*., 2001; Tiberti *et al*., 2007), pentacyclic triterpenes (Niero *et al*., 2006) and sesquiterpenes, as well as alkaloids (Brüning & Wagner, 1978). In relation to total tannins, the Brazilian Pharmacopoeia (ANVISA Brasil, 2017) indicates that the quality control of *M. ilicifolia* is done through the dosing of tannins.

Regarding the use of plant species in healing processes, there are positive reports for several species (for exemplo Prichoa *et al*. (2011), using Wistar rats and *Sonchus oleraceus* L.; Parente *et al*. (2011), with Wistar rats and *Calendula officinalis* L.; Wang *et al*. (2013), in vitro bioassay on human skin cells and plants from Traditional Chinese Medicine; Santos *et al*. (2014), with Wistar rats and *Bixa orellana* L.; Batista *et al*. (2017), with rabbits (*Oryctalagus*) and *Cesalpinia ferrea* Mart.; Mêrces *et al*. (2017), with rats (*Rattus*) and *Aloe vera* (L.) Burm.f.; Anjos *et al*. (2020), with *Swiss* mice and *Anacardium occidentale* L.). These results demonstrate the potential of using plant species to treat different types of wounds.

Regarding *M. ilicifolia*, there are no records validating its use in wound healing. For this reason, the tests in Wistar rats were performed, aiming to comply with the Brazilian legislation (Brasil, 2006) regarding the use of botanical material by traditional communities. The use of the extract showed that the healing process already evidenced in 14 days of treatment, regarding the negative and positive controls, with a better organization of dermis collagen fibers and thicker keratin on the surface. Among the constituents present on the leaves of the plant are the tannins, which may have contributed to the collagen production.

This chemical group, besides the healing properties, has the capacity to stimulate the keratinocytes proliferation around the injured area, which facilitates the wound re-epithelialization. This

action involves the keratinocytes migration at the edges of the wound lesion. The tannins also favor the increase of the number of cross-links among the collagen fibers present in the extracellular matrix and help in the orientation of these fibers in connective tissues such as the skin (Hernandes *et al*., 2010).

The potential of wound healing through the use of tannins is known; but its mode of action is not still well elucidated. However, its antioxidant activity has the capacity to induce the keratinocytes production (Khanna *et al*., 2002), which facilitates the wound re-epithelialization and the keratinocytes migration at the edges of the wound lesion. Its other important feature is related to its astringent action, leading to the ability to retract tissues and consequently, structural proteins, favoring the healing, production, and collagen fibers orientation in connective tissues (Hernandes *et al*., 2010). In the experimental group, it was possible to observe a higher keratin production, the epithelium reconstitution, and the structured and mature dermis, with thick collagen fibers rich in fibroblasts and vascularization, which may be related to the presence of tannins.

The results obtained in this study confirm the medicinal indications of the leaves of *Maytenus ilicifolia*, referring to its use as healing. Thus, it may represent a new alternative for treatment, especially in individuals with diabetes, who have as one of the consequences of the disease, chronic skin lesions, which increase drug costs and worsen the quality of life of these patients. The data obtained may allow the new drugs formulation for an important public health problem, which could be minimized with the use of a species native to Brazil.

CONCLUSION

The community of Taboco has information on a great diversity of species, used for cure or diseases prevention, with many being found in the residences, making the backyard a rich place to obtain medicines, a very effective solution due to the distance that the place is from the state capital. However, knowledge is gradually disappearing, since only a small part of the inhabitants still have knowledge about the species and its potential of use. The new generations are no longer interested in the subject, which is leading to the gradual loss of therapeutic use of the plants in the region. The tests performed with the leaves of one of the plants with higher use value, *Maytenus ilicifolia*, showed a potential for the second intention wounds healing, validating the plant popular use, being this effect associated with tannins, one of the plant chemical markers, in Brazil.

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