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PLANTS USED FOR TREATMENT OF BREATHING DISORDERS BY THE COQUEIROS COMMUNITY, CATALÃO (GO), BRAZIL

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Abstract – **The searching for cure through medicinal plants dates back to the earliest times of human civilization, and it currently stands out due to the availability of several promising species for pharmacological studies. In this study, we evaluated the ethnomedical knowledge of the Coqueiros Community, in the municipality of Catalão (GO), specifically investigating the use of plants for treating respiratory system diseases. In order, to do this we interviewed 32 inhabitants of this community, who informed 20 different species. When comparing the data obtained from common knowledge with the scientific knowledge found in specialized literature, we noted that 90% of the mentioned species had been reported in literature as alternative therapies for respiratory system diseases.**

Keywords: **Ethnobotanics , ethno-pharmacology, respiratory diseases**

I. INTRODUCTION

Medicinal plants play an important social and cultural role as they are often presented as the available alternative for treating population's health issues [1]. The Cerrado biome contains several pharmacologically active plant species used in popular medicine. Such great taxonomic diversity consequently provides it with a high chemicals variety, contributing to the region's vast potential of bioactive compounds [2]. However, studies identifying Cerrado useful plants are scarce, and the fast destruction of the ecosystem's vegetation added to its lack of protection policies deepens its knowledge gaps [3].

Part of Cerrado's natural resources may not be available for future generations, thus including the therapeutic options offered by medicinal plants. Consequently, ethnobotanical studies in rural and traditional communities become essential to identify such resources and record the community knowledge about their usage. Therefore, the Coqueiros Community, located in the municipality of Catalão (GO), is a study area with a high exploratory potential, as it is represented by important social actors of the region's history of medical knowledge, such as: midwives; healers using faith, religion and the belief in plants for healing rituals; and countrymen that go to the field looking for plants to be used as medicine.

Many of such plant species are endangered despite of their promising use for bioprospection, and for that reason scientific studies are necessary [4]. In this respect, the importance of ethno-focused studies (ethnobotanics and ethno-pharmacology) must be highlighted because of their capacity of optimizing scientific investigation in terms of time, money and human resources. These studies also predict the factors that turn species into possible candidates for bioprospection studies by using selection criteria adopted from a cultural perspective [5].

Due to the possibilities of sustainable exploitation of the Cerrado plants, the present study aimed to perform an ethnobotanical sampling in the Coqueiros Community, targeting the population medical knowledge regarding the species used to treat respiratory disorders**.**

II. METODOLOGY

A. *Study Area*

The study was performed in the rural area of the municipality of Catalão. This region is located in southeastern Goiás state, between the meridians of 47º17 and 48º12' W Long. Grt. and the parallels of 17º28' and 18º30' S Lat., with an area of 3.777.6 km² [6], corresponding to 1.11% of the Goiás state territory. The microregiao of Catalão integrates the South Goiás mesoregion, according to the administrative division made by the Brazilian Institute of Geography and Statistics [6]. The vegetation is characterized by the Cerrado domain. The climate is classified as Aw Tropical savanna climate after the Köppen classification, with rainy summers and falls. The dry season lasts from four to five months, and monthly average temperatures are higher than 18ºC. The dry period spans from May to September and the rain season goes from October to March [7].

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In the region there are 19 rural communities, according data provided informally by Catalão municipal government: Custódia, Cisterna, Morro Agudo, Mata Preta, São Domingos, Martírios, Babilônia, Ribeirão, Tabatinga, Macaúba, Limoeiro, Mumbuca, Olhos D´Água, Pedra Branca, Olaria, Tambiocó, Lourenços, Batalha and the Coqueiros, the focus of this study, which is located in Central-North part of the municipality, 15 km away from the municipal head office. This community presents 38 households.

B. *Ethnobotanical Procedures*

For the ethnobotanical research we used the methodology which is partially based on methods of the social and anthropological sciences aiming to maximize the capture of the traditional know-how. The sample cannot be made at random, but rather directed to the elements of population that are probable to know more about the approached theme [8]. To find people with such profile, we applied the Snowball Sampling Technique [9], in which an interviewee indicates the next one. We interviewed 32 inhabitants of the Coqueiros Community in total.

In terms of the data collection, two of the most cited methods used in Ethnobotanics are the ethnobotanical interview and the "observation-participation". We applied both in this study. According to Camejo Rodrigues (2007), such methods consist in: "structured interview" – the interview is totally structured as a questionnaire, but is mentally applied by the interviewer, without the need for the respondent to fulfill the items. Several techniques can be used (such as consensus analysis, with its proper rules explained prior to interview) [8].

The "observation-participation" (or "observer-participant") method requires a strong and long closeness between the scientist and the studied community in order to get the trusting of people. This methodology demands a constant presence of the investigator within the community, and their experimentation and participation in community's social life, as if they were a native person or a long-established dweller. Such technique allows the scientist to observe and record the lives of many community elements, as much as to get a precise description of the popular uses of plants. This happens because of the experience and the participation of these elements as they provide access to information that would otherwise be very cryptic and hard to acquire from regular interviews and questionnaires (e.g., if the person still makes use of a certain plant and if so, the frequency of this use) [8].

The project and the scripts of the applied interviews were approved by the Ethics Committee of the Federal University of Goiás (Number 863.234); we also obtained a Previous Consent Form of the research participants while informants.
The bibliography research about the usage potentialities of vegetal species in relation to their biological activities was based on scientific papers, using databases such as Scifinder, Web of Science, ScienceDirect, Capes Journals Database, Atheneu, PubMed, among others.

Species identification was made while in the field. The plants were collected during the application of interviews in 2016 (authorization for the access and shipping of genetic patrimony components' samples nº 010698/2013-2). The plant material indicated by the community was identified following the most current classification system, APG III (2009). We checked for the scientific names, plant families, species authors and geographic distribution using the "Plant List, 2013" and the *"*Lista da Flora do Brasil*"* databases. The indicated plants were collected, dehydrated, botanized and set as exsiccates with their respective collection numbers, and kept in the collection of Prof. Dr. Maria Inês Cruzeiro Moreno in the Integrated Botany, Zoology and Ecology Laboratory of the Federal University of Goiás – Catalão Unit.

The collected local knowledge was analyzed by quantitative measures applied to the general sampling, which contributed to the selection of promising species for biotechnological development. We calculated the Species Importance Value (SIV) [10], and the Informant Consensus Factor (ICF) [11]. The SIV was calculated using the ratio between the number of interviewees attributing therapeutic properties to the species and the total number of interviewees [10]. The ICF evidences the plants that should be more deeply studied, using a scale with the maximum value of 1, which indicates the existence of a complete consensus between informants about the use of a certain plant for a specific disease. Some papers make this quantitative approach for the analysis of ethnobotanical samplings [11], [12] and [13].

III. RESULTS AND DISCUSSION

The ethnobotanical study revealed the utilization of 20 plant species distributed in 18 botanical families. These species were cited for the treatment of respiratory disorders 180 times by 32 different informants, with IFC equal to 0.89. This value shows consensus among informants about the species use for respiratory disorders treatment. Larger consensus on information increases the likelihood of finding promising ethnopharmacological species [11].

The table 1 shows the species indicated by the Coqueiros Community for the treatment of respiratory disorders. It also presents their geographic distribution, the plant parts used, forms of preparation, and the SIV, which estimates all the possible uses of a plant species for the community, besides the literature records regarding studies on biological activities related to the treatment of these issues.

Table 1. Ethnobotanical survey of species with indication for the treatment of respiratory disorders, realized in the community Coqueiros, Catalão, Goiás. Legend: SIV – Importance Value for Species.

Family/ Scientific name / common name (Brazilian) Number of the Collection	Geographical occurrence	Therapeutic indications / pharmacological properties (literature review)	Way of preparation	SIV

Calophyllaceae/ *Kielmeyera coriacea* Mart./ Pau-Santo. 000140	Amazonia and Cerrado	Antibiotic for respiratory problems/ Antimicrobial [14]. Antifungal [15]	Leaves - Tea Outer bark - Thicken with milk	1.00
Caryocaraceae/ *Caryocar brasiliense* Camb./ Pequi. 000177	Amazonia, Caatinga, Cerrado and Atlantic Forest	Antitussive; Bronchitis/ Antioxidant and Anti-inflammatory effects [16]. Antifungal [17].	Leaves -Tea Outer bark - Tea	0.94
Euphorbiaceae/ *Croton antisyphiliticus* Mart/ Pé-de-perdiz. 000153	Amazonia, Caatinga, Cerrado and Atlantic Forest	Flu/ Anti-inflammatory effect [18].	Root - Tea	0.94
Leguminosae/ *Pterodon emarginatus* Vogel/Sucupira-branca. 000156	Amazonia, Caatinga, Cerrado and Pantanal	Sore throats/ Anti-inflammatory effect [19,20]. Antinociceptive action [21]. Antioxidant potential [22]. Antimicrobial [23].	Leaves - Boiling of the bast in the water, fruit maceration and manufacturing of the beverage with wine (add 3 fruits to the tonic). Outer bark - boiling of the bast in the water, fruit maceration and manufacturing of the beverage with wine (3fruits to the tonic).	0.84
Leguminosae/ *Hymenaea stigonocarpa* Hayne./Jatobá. 000207	Amazonia, Caatinga, Cerrado, Atlantic Forest and Pantanal	Antitussive/ Anti-inflammatory effect [24]	Leaves - Syrup Outer bark – Syrup.	0.81
Compositae/ *Cabobanthus polysphaerus* (Baker) H.Rob./Assa-peixe-branco. 000189	Naturalized	Antitussive/ Antinociceptive and Anti-inflammatory effects [25].	Leaves - Syrup Outer bark – Syrup.	0.81
Lamiaceae/ *Ocimum basilicum* L./ Farvacão. 000197	Cultivated	Antitussive/ Antifungal; Phytotoxic [26]. Anti-inflammatory effect [27]. Antimicrobial; Antitumoral; Larvicidal; Immunomodulatory [28].	Leaves - Using with the eggnog; Outer bark – using a with the eggnog.	0.75
Lythraceae/ *Punica granatum* L./ Romã 000212	Naturalized	Sore throats/ Antibacterial and Antiviral [29]. Antifungal [30]. Antimicrobial, Antioxidant and Anti-inflammatory [31].	Leaves or outer bark - Decoction with water and sugar (syrup)	0.75
Iridaceae/*Crocus sativus* L./ Açafrão. 000155	Cultivated	Flu and sore throats/ Antinociceptive and Anti-inflammatory effects [32].	Leaves or outer bark - Used in powder with honey	0.72
Combretaceae/ *Terminalia argentea Mart. &Zucc.* / Capitão. 000182	Amazonia,Caatinga, Cerrado and Atlantic Forest	Antitussive; Bronchitis/ No information about this species on database	Leaves or outer bark - Syrup	0.72
Malvaceae/ *Abelmoschus esculentus* (L.) Moench. / Quiabo. 000214	Cultivated	Bronchitis/ Antioxidant potential [33]. Immunomodulatory [29].	Leaves or outer bark - Tea	0.69

Continued from Table 1

Apocynaceae/ *Hancornia speciosa* Gomez. /Mangaba. 000180	Amazonia, Caatinga, Cerrado and Atlantic Forest	Expectorant / Antibacterial [34]. Anti-inflammatory effect [35].	Leaves or outer bark – Tea leaves, bast cookedin water	0.56
Rutaceae/ *Citrus aurantiifolia* (Christm.) Swingle./ Lima-de-bico. 000165	Cultivated	Sinusitis/ Antifungal [36].	Fruit immersed in alcohol	0.56
Arecaceae/*Mauritia flexuosa* Linn. F. Buriti 000173	Amazonia, Caatinga and Cerrado	Antitussive/ Antioxidant [37]. Antioxidant and Antimicrobial [38].	Ingest oil o fnut	0.53
Solanaceae/ *Solanum lycocarpum* A. St.-Hil. Lobeira. 000226	Cerrado and Atlantic Forest	Antitussive/ Immunomodulatory effects [29].	Boil the whole ripe fruit with honey	0.50

Bixaceae/*Bixa orellana* L. Urucum. 000149	Amazonia, Cerrado and Atlantic Forest	Flu/ Antioxidant and Antimicrobial [39]. Anti-inflammatory [40].	Leaves or outer bark - Syrup with macerated seed	0.50
Aquifoliaceae/*Ilex conocarpa* Reissek. Congonha-do-campo. 000172	Caatinga, Cerrado and Atlantic Forest	Bronchitis/ No information about this species on database.	Leaves or outer bark - Tea	0.41
Rutaceae/*Citrus medica* L. Cidra. 000164	Cultivated	Antitussive/ Antioxidant and Anti-inflammatory [41].	Grated fresh fruit soaked in water (store in the fridge)	0.38
Adoxaceae/ *Sambucus nigra L.* Sabugueirão. 000129	Cultivated	Flu/ Antioxidant [42].	Leaves or outer bark - Tea	0.31
Verbenaceae / *Lantana câmara.* Camará. 000168	Amazonia, Caatinga, Cerrado and Atlantic Forest	Antitussive/ Antioxidant [43]. Antimicrobial [44]. Antimicrobial property [45].	Leaves or outer bark – Syrup	0.16

In this investigation, six species presented SIV above 0.8: *Kielmeyera coriacea* Mart., *Caryocar brasiliense* Camb., *Croton antisyphiliticus* Mart, *Pterodon emarginatus* Vogel, *Hymenaea stigonocarpa* Hayne, *Cabobanthus polysphaerus* (Baker) H. Rob.; some studies have already described the pharmacological properties of these species, thus validating the use of these species for respiratory disorders. Thereby, these species are interesting for the chemical and biological studies continuity and are promising sources for the development of drugs.

Out of the twenty plants species mentioned by the Coqueiros community, only *Ilex conocarpa* and *Terminalia argentea* have not yet been reported by literature to present any biological activity useful against respiratory system disorders. However, *T. argentea* presented a SIV of 0.72, indicating the use of this species by many respondents, which might be promising for studies of chemical-biological bioprospection. Therefore, 90% of the species here recorded have had their biological activity against respiratory disorders confirmed by literature, thus supporting the popular use indication. These species are promising for the continuity of bioprospection studies and for the development of drugs for the treatment of diseases of the respiratory tract. Furthermore, the popular knowledge about species allows the comprehension of the dynamics of the human - plant relationship, and favors the implementation of future projects of intervention, management and conservation of biodiversity.

In the case of medicinal plants, it is important to know not only the popular use indications but also their evidences in literature, and to perform the chemical and biological prospection of the plants that have not been studied yet. Following this protocol favors the collection of data about environmental dynamics and determines alternatives for the sustainable use of preserved areas, as it contribute researches with assumptions on plant biotechnology.

The ethnobotanical survey performed by other study, reported four species also found in the present study, which are: *Hymenaea stigonocarpa* (pectoral stimulator); *Punica granatum* (tonsillitis, pharyngitis and laryngitis); *Sambucus nigra* (pectoral stimulator); and *Pterodon emarginatus* (tonsillitis) [46]. Also mentions the use of *S. nigra* for the treatment of diseases of the respiratory tract [47].

Other authors recorded the following species reported by this survey: *Sambucus nigra* (cold), *Lantana camera* (inflammation of throat, cough, flu, bronchitis and asthma); *Cabobanthus polysphaerus* (bronchitis and asthma); *Caryocar brasiliense* (flu); *Hymenaea stigonocarpa* (anti-inflammatory) and *Mauritia flexuosa* (energetic) [48].

Other species also are cited for treatment of diseases of the respiratory tract: *Sambucus nigra* (fever and flu); *Cabobanthus polysphaerus* (bronchitis and flu); *Bixa orellana* (flu); *Pterodon emarginatus* (sore throat); *Hymenaea stigonocarpa* (cough, laryngitis and asthma); *Punica granatum* (sore throat) and *Crocus sativus* (flu) [49].

K. coriacea showed the highest SIV and is extensively used by the Coqueiros community. Studies have found that this species to be rich in xanthones, a compounds class with pharmacological properties, such as antifungal, antibacterial, tuberculostatic and anti-inflammatory [50]. The species was indicated by the community for respiratory disorders.

A study of the essential oil from the seeds of *P. emarginatus* observed its inhibitory effect on *Staphylococcos aureus* growth, bacterium responsible for pyodermitis, abscesses, pneumonia, meningitis and septicaemia [51]. It thus demonstrates that this is a promising species for the treatment of respiratory diseases.

H. speciosa presents antimicrobial activity against *Helicobacter pilori* and *Staphylococcus aureus* [52], with the second being the cause to respiratory, skin and wound infections, and may be associated with diseases of the respiratory system, such as pneumonia. *Ocium basilicum* is cited for the treatment of flu and cough [53].

Studies shown anti-inflammatory activity of *Abelmochus esculentus* in tests concerning the biological activity of lectin present in the seeds flour. Hence, the species may show anti-inflammatory activity against diseases affecting the respiratory system [54].

Punica granatum, popularly known as pomegranate, is used to treat throat infections, hoarseness and fever. It has also been described to possess antiseptic and antiviral activity in inflammatory processes of the oral mucosa [55].

The triterpenes present in *Croton antisyphiliticus* were shown to present anti-inflammatory and antimicrobial activities against *S. aureus* in tests in mice [56].

Citrus aurantifolia has indications of use for bronchitis and cough, and emphasizes the sedative activity of the volatile oil from the fruit bark fruit, which had been already noted by other researches. The juice of the fruit presented, antimicrobial activity, in vitro [57].

The geographic distribution of the species, Figure 1, shows in which areas the vegetation can be found. Out of the 20 plants listed in the survey, 12 occur within Cerrado and five are cultivated by the community in in backyards (medicinal gardens). Besides, the native vegetation found inside the properties are also used. Thereby, the conservation of Cerrado, the rescue of knowledge regards biodiversity and the use of medicinal plants by rural communities are faced as big challenges when it comes to environmental preservation.

The Cerrado is a vegetation complex with a highly rich biodiversity and remarkable socioeconomic and cultural importance for the country. Despite the growing number of ethnobotanical studies, there are still many gaps of knowledge. In this manner, it is necessary to propose a more intensive handling of shrubs and trees flora in the Brazilian Cerrado.

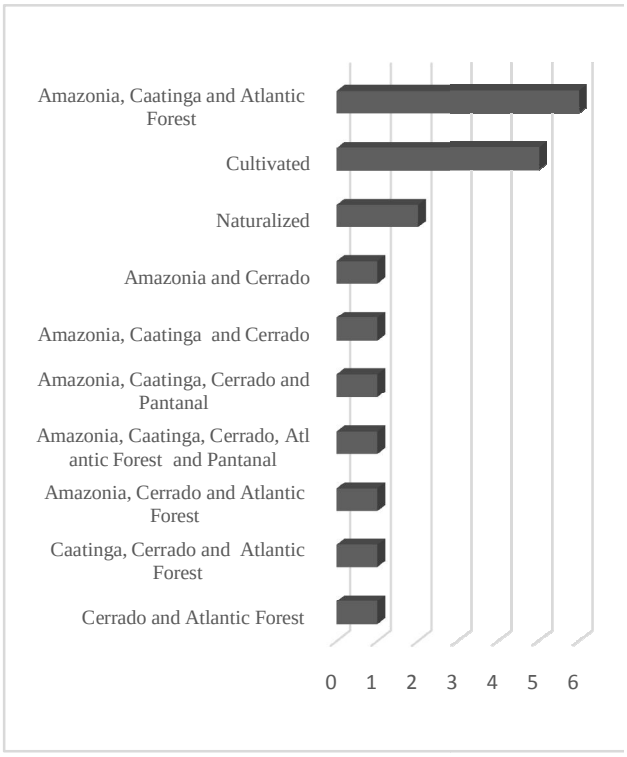

Fig.1 Geographic distribution and species Cultivated and Naturalized of ethnobotanical survey in the community Coqueiros, Catalão, GO.

IV. CONCLUSION

The finding of plants with activity against diseases of the respiratory system in both the recommendations from the Coqueiros Community and the literature demonstrates similarity between popular and scientific knowledge, as we found a percentage of 90% of agreement in relation to the therapeutic indication. The FCI was close to the maximum value, thus certifying the common and wide use of the plants used for respiratory disorders among community members.

The rural communities demonstrated to be able to correctly identify the species and their medicinal uses. So, from the biotechnological point of view, encouraging the sustainable use of this biome, can prevent the extinction and loss of information about the biological and chemical properties of several species and, consequently, preserve the knowledge of traditional communities.

V. CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

[1] L. Harvey, R. Edrada-Ebel, R. J. Quinn.. *The re-emergence of natural porducts for drug Discovery in the genomics era*. Nature reviews drug discovery, vol. 14(2), pp. 111-129. 2015.

[2] P. Novaes, J. G. Molinillo, R. Varela, F. Macías. *Ecological phytochemistry of Cerrado (Brazilian savanna) plants.* Phytochemistry Reviews, vol. 12(4), pp. 839. 2013.

[3] F. R. Scarano, R. P. C. Medeiros, R. A. Mittermeier. *The Biome Cerrado: conservation and theasts*. In Livro Vermelho da Flora do Brasil – plantas raras do Cerrado. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro: CNFlora, Rio de Janeiro, Brazil, pp. 21-24. 2014.

[4] E. J. Barreiro, V. S. Bolzani. *Biodiversity: potential source for drug Discovery*. Quimica Nova, vol. 32(3), pp. 679-688. 2009.

[5] U. P. Albuquerque, M. A. Ramos, J. G. Melo. *New strategies for drug discovery in tropical forests based on ethnobotanical and chemical ecological studies.* Journal of Ethnopharmacology, vol. 146(3), pp. 842-852. 2012.

[6] Instituto Brasileiro de Geografia e Estatística- IBGE. Database of Goiandira. Available: http://www.ibge.gov.br/cidadesat/topwindow.htm?1.

[7] Ultrafertil S.A. Environmental Impact Study of the expansion of the Mining Complex of Catalão Goiás - EIA/RIMA. Catalao: Ultrafertil S.A, 2005.

[8] J. S. Camejo Rodrigues. *Contribution to the ethnobotanical study of medicinal and aromatic plants in the Park Natural da Serra* S. Mamede. Internship report. ICN-PNSSM, FCUL. 249 p. 2007.

[9] M. Thiollent. *Methodological criticism: social research and worker survey*. 11ª ed. São Paulo (SP): Polis. 2002.

[10] U. P. Albuquerque, R. F. P. Lucena, L. V. F. Cunha. Methods and techniques in ethnobotanical research. Recife, Editora Comunigraf. 2008.

[11] C. F. C. B. R. Almeida, U. P. Albuquerque. *Use and conservation of medicinal plants and animals in the state of Pernambuco (Northeast Brazil): a case study*. Interciência, vol. 27(6), pp. 279 – 285. 2002.

[12] S. L. Cartaxo, M. M. A. Souza, U. P. Albuquerque. *Medicinal plants with bioprospecting potential used in semi-arid northeastern Brazil*. Journal of Ethnopharmacology, vol. 131(2), pp. 326–342. 2010.

[13] R. K. D. Souza, M. A. P. Silva, I. R. A. Menezes, D. A. Ribeiro, L. R. Bezerra, M. M. A. Souza. *Ethnopharmacology of medicinal plants of carrasco, northeastern Brazil.* Journal of Ethnopharmacology, 157(18): 99–104. 2014.

[14] C. M. Martins, E. A. Nascimento, S. A. L. Morais, A. Oliveira, R. Chang, L. C. S. Cunha, M. M. Martins, C. H. G. Martins, T. S. M.

Moraes, P. V. Rodrigues, C. V. Silva, F. J. T. Aquino. *Chemical constituents and evaluation of antimicrobial and cytotoxic activities of Kielmeyera coriacea Mart. & Zucc. Essential Oils.* Evidence-Based Complementary and Alternative Medicine, 9 pages. 2015.

[15] F. Melo e Silva, J. E. Paula, L. S. Espindola, L. S. *Evaluation of the antifungal potential of Brazilian Cerrado medicinal plants.* Mycoses, vol. 56 (6), pp. 511-517. 2009.

[16] L. R. O. Torres, F. C. Santana, F. L. Torres-Leal, I. L. P. Melo, L. T. Yoshime, E. M. Matos-Neto, M. C. L. Seelaender, C. M. M. Araujo, B. Cogliati, J. Mancini-Filho. *Pequi (Caryocar brasiliense Camb.) almond oil attenuates carbon tetrachloride-induced acute hepatic injury in rats: antioxidant and anti-inflammatorory effects.* Food and Chemical Toxicology vol. 97, pp. 205-216. 2016.

[17] C. A. Breda, A. M. Gasperini, V. L. Garcia, K. M. Monteiro, G. A. Bataglion, M. N. Eberlin, M. C. T. Duarte. *Phytochemical analysis and antifungal activity of extracts from leaves and fruit residues of Brazilian Savanna plants aiming its use as safe fungicides*. Natural Products Bioprospecting, vol. 6(4), pp. 195-204. 2016.

[18] G. O. Reis, G. Vicente, F. K. Carvalho, M. Heler, G. A. Micke, M. G. Pizzolatti, T. S. Frode. 2013. *Croton antisyphuiliticus Mart. Attenuates the inflammatory response to carrageenan-induced pleurisy in mice.* Infammopharmacology, vol. 22(2), pp. 115-126. 2013.

[19] F. K. Carvalho. *Phytochemical analysis and biological activity of Croton antisyphiliticus Martius and Croton heterodoxus Bailon*. Tese. Química Orgânica. Universidade Federal de Santa Catarina. Florianópolis, SC. 225 fls. 2013.

[20] H. Pascoa, D. G. A. Diniz, I. F. Florentino, E. A. Costa, M. T. F. Bara. Microemulsion based on *Pterodon emarginatus* oil and its anti-inflammatory potential. Braz. Journal of Pharmaceutic Science, vol. 51, 117-126. 2015.

[21] P. C. Oliveira, E. C. Conceição, P. A. Oliveira, M. V. Nascimento, E. A. Costa, J. R. Paula, M. T. F. Bara. *Obtaining a dry extract of Pterodon emarginatus (Fabaceae) fruits by spray-drying*, Journal of Pharmacy Research, vol. 5(1), pp. 641–645. 2012.

[22] R. C. Dutra, M. N. Leite, N. R. Barbosa. *Quantification of phenolic constituents and antioxidant activity of Pterodon emarginatus Vogel seeds*, Int. Journal of Molecular Science, vol 9(4), pp. 606–614. 2008.

[23] R. C. Dutra, F. G. Braga, E. S. Coimbra, A. D. Silva, N. R. Barbosa. *Atividades anitmicrobiana e leishmanicida das sementes de Pterodon emarginatus* Vogel. Revista Brasileira de Farmacognosia, vol. 19(2), pp. 429 – 435. 2009.

[24] P. R. Orsi, L. N. Seito, L. C. Di Stasi. *Hymenaea stigonocarpa* Mart. Ex. Hayne: *A tropical medicinal plant with intestinal anti-inflammatory activity in TNBS modelo of intestinal inflammation in rats*. Journal of Ethnopharmacology, vol. 151(1), pp. 380-385. 2014.

[25] I. V. S. Temponi, J. B. Silva, M. S. Alves, A. Ribeiro, R. G. P. J. Jesus, C. H. Yamamoto, M. A. Pinto, G. Del-Vechio-Vieira, S. O. B. Vieira. *Antinociceptive and Anti-Inflammatory Effects of Ethanol Extract from* Vernonia polyanthes*Less in Robents.* International Journal of Molecular Sciences, vol.13(3), pp. 3887-3899. 2012.

[26] K. Ahmad, A. T. Khali, Y., R. Somayya. *Antifungal, phytotoxic and hemagglutination activity of methanolic extracts of Ocimum basilicum*, Journal of Traditional Chinese Medicine, vol. 36(6), pp.794–798. 2016.

[27] L. B. Rodrigues, A. O. B. P. B. Martins, J. Ribeiro-Filho, F. R. A. S. Cesário, F. F. Castro, T. R. Albuquerque, M. N. M. Fernandes, B. A. F. Silva, L. J. Quintans Júnior, A. A. S. Araújo, P. P. Menezes, P. S. Nunes, I. G. Matos, H. D. M. Coutinho, A. G. Wanderley, I. R. A. Menezes. *Anti-inflammatory activity of the essential oil obtained from Ocimum basilicum complexed with β -cyclodextrin (β -CD) in mice*, Food Chem. Toxicol., pp. 1–11, 2016.

[28] A. K. Pandey, P. Singh, Tripathi N. N. Chemistry and bioactivities of essential oils of some Ocimum species: an overview. Asian Pac. Journal of Tropical Biomedicine, vol. 4, pp. 682–694. 2014.

[29] H. Lorenzi, F. J. A. Matos *Medicinal plants in Brazil: native and exotic*. 2.ed. Nova Odessa: Plantarum, 544p. 2008.

[30] S. M. Hassan, B. Sultana, M. Iqbal, S. Naz, M. Abbas M.. *Anti-aflatoxigenic activity of Punica granatum and Ziziphus jujuba leaves against Aspergillus parasiticus inoculated poultry feed: Effect of storage conditions*, Biocatalysis and Agriculture and. Biotechnology, vol. 10, pp. 104–112. 2017.

[31] M. Labsi, L. Khelifi, D. Mezioug, I. Soufli, C. Touil-Boukoffa. *Antihydatic and immunomodulatory effects of Punica granatum peel aqueous extract in a murine model of echinococcosis*. Asian Pacific Journal of Tropical Medicine, vol. 9(3): 211–220. 2016.

[32] H. Hosseinzadeh, H. M. Younesi. *Antinociceptive and anti-inflammatory effects of Crocus sativus L. stigma and petal extracts in mice*. BMC Pharmacology, vol 2(7), pp. 1-8. 2002.

[33] N. Mishra, D. Kumar, S. I. Rizvi. P*rotective effect of Abelmoschus esculentus against alloxan-induced Diabetes in wistar strain rats*. Journal of Dietary Supplements, vol. 13(6), pp. 634-646. 2016.

[34] D. G. Marinho, D. S. Alviano, M. E. Matheus, C. S. Alviano, P. D. Fernandes. *The latex obtained from Hancornia speciosa Gomes possesses anti-inflammatory activity*. Journal of Ethnopharmacology. vol. 135, pp. 530-537. 2011.

[35] Y. W. Cavalcanti, G. D. R. Xavier,L. F. D. Almeida,W. N. Padilha. Antifungal Activity of Brazilian Plant Extracts Against Candida Strains. Revista Brasileira de Ciências da Saúde, vol. 16(1): 43-48.

[36] R. A. B. Rocha,M. D. C. Carvalho,N. P. H. Moreira, T. F. N. Ravenna, B. A. K. Silva,C. P. F. Marinho, A. Lima, R. C. Assis, A. E. Moreira. *In vitro and in vivo antioxidant activity of buriti fruit (Mauritia flexuosa L.F.)*. Nutricion Hospitalaria, vol. 32(5), pp. 2153-2161. 2015.

[37] H. H. F. Koolen, F. M. A. Silva, F. C. Gozzo, A. Q. L. Souza, A. D. L. Souza. *Antioxidant, antimicrobial activities and characterization of phenolic compounds from buriti (Mauritia flexuosa L. f.) by UPLC-ESI-MS/MS*.Food Research Internacional, vol. 51(2), pp. 467-473. 2013.

[38] T. V. Cuong, K. B. Chin. *Effects of Annatto (Bixa orellana L.) seeds powder on physicochemical properties, antioxidant and antimicrobial activities of pork patties during refrigerated storage*. Korean Journal Food Science Animal Resource, vol. 36(4), pp. 476- 486. 2016.

[39] T. V. Cuong, K. B. Chin. *Effects of Annatto (Bixa orellana L.) seeds powder on physicochemical properties, antioxidant and antimicrobial activities of pork patties during refrigerated storage*. Korean Journal Food Science Animal Resource, vol. 36(4), pp. 476- 486. 2016.

[40] Z. Xu, X. Q. Kong. *Bixin ameliorates high diet-induced cardiac injury mice through inflammation and oxadative stress suppression. Biomedicine & Pharmacotherapy*, vol. 89. pp. 991-1004. 2017.

[41] F. Menichini, R. Tundis, M. Bonesi, B. Cindio, M. R. Lizzo,F. Conforti, G. A. Statti, R. Menabeni, R. Bettini, F. Menichini. *Chemical composition and bioactivity of Citrus medica L. cv. Diamante essential oil obtained by hydrodistillation, cold-pressing and supercritical carbono dioxide extraction*. Natural Products Research, vol. 25(8), pp. 789-799. 2011.

[42] A. L. Dawidowicz, D. Wianowska, B. Baraniak. *The antioxidant properties of alcoholic extracts from* Sambucus nigra *L. (antioxidant properties of extracts)*. LWT-Food Science Technology, vol. 39, pp. 308–315. 2006.

[43] B. Mahdi-Pour, S. L. Jothy, L. Y. Latha, Y. Chen, S. *Sasidharan. Antioxidant activity of methanol extracts of different parts of Lantana camara.* Asian Pacific Tropical Biomedicine, vol. 2(12), pp. 960-965. 2012.

[44] R. Naz, A. Bano. *Phytochemical screening, antioxidants and antimicrobial potential of Lantana camara in different solvents*, Asian Pacific Tropical Biomedicine, vol. 3(6), pp. 480–486. 2013.

[45] M. A. Bisi-Johnson, C. L. Obi, T. Hattori, Y. Oshima, S. Li, L. Kambizi, J. N. Eoff, S. D. Vasaikar. *Evaluation of the antibacterial and anticancer activities of some South African medicinal plants*, BMC Complementary Alternative Medicine, vol. 11(14), pp. 1-5. 2011.

[46] A. F. Souza, V. V. Ribeiro. *Profile of the roots and studies of its indication on the medicinal plants used in the treatment of diseases of the respiratory tract.* Revista de Biologia e Farmácia, vol. 3(1), pp. 102-109. 2008.

[47] R. S. Costa, T. C. Brasil, C. J. Santos, D. Santos, M. L. Barreto, N. M. A. Neves, C. A. V. Figueiredo. *Natural products used to treat asthma in children living in the city of Salvador – BA, Brazil.* Revista Brasileira de Farmacognosia, vol. 20(4), pp. 594-599. 2010.

[48] C. D. Souza, J. M. Felfili. *Use of medicinal plants in the region of Alto Paraíso de Goiás, GO, Brasil.* Acta bot. Bras vol. 20, n.1, pp.135-143. 2006.

[49] E. D. Santos, T. Faria, D. A. A. Vilhalva. *Ethnobotanical survey of medicinal plants used by residents of Goiânia Viva, Noroeste, Goiânia, Goiás,* Brazil. Revista Eletrônica de Educação da Faculdade Araguaia, vol 7, pp. 13-40. 2015.

[50] D. A. G. Cortez, A. Marston, K. *Hostettmann Separation of xanthones and biphenyl from Kielmeyera coriacea by centrifugal partition chromatography*. Chromatographia, vol.50 (1/2), pp. 7-10. 1999.

[51] R. C. Dutra, F. G. Braga, E. S. Coimbra, A. D. Silva, N. R. Barbosa. *Atividades anitmicrobiana e leishmanicida das sementes de Pterodon emarginatus* Vogel. Revista Brasileira de Farmacognosia, vol. 19(2), pp. 429 – 435. 2009.

[52] T. M. Moraes, C. M. Rodrigues, H. Kushima, T. M. Bauab, W. Villegas, C. H. Pellizon, A. Brito, C. A. Hiruma-Lima. *Hancornia speciosa: Indications of gastroprotective, healing and anti-Heliobacter pilori actions*. Journal of Ethnopharmacology, vol.120(2), pp.161-168. 2008.

[53] M. A. C. Pinto, C. M. Amorozo, A. Furlan. *Collection and use of medicinal plants in the district of Martim Francisco, Municipality of Mogi-Mirim, SP, Brasil*. Acta botanica brasílica, vol. 20(4), pp. 789-802. 2006.

[54] G. S. F. Soares. S*tudy of the nutritional quality of seeds and the antiinflammatory activity of lectin of Abelmochus esculentus (L.) Moench (Quiabo).* Dissertation. Universidade Federal da Paraíba. João Pessoa, PB, 43 fls. 2010.

[55] S. M. S. Menezes, D. M. Pinto, L. N. Cordeiro. *In vitro and in vivo biological activities of Punica granatum L. (romã)*. Rev. Moreira Jr. pp. 388 – 391. 2008.

[56] F. K. Carvalho. *Phytochemical analysis and biological activity of Croton antisyphiliticus Martius and Croton heterodoxus Bailon*. Tese. Química Orgânica. Universidade Federal de Santa Catarina. Florianópolis, SC. 225 fls. 2013.

[57] G. S. Vendruscolo, S. M. K. Rates, L. A. Mentz. *Pharmacological chemical data on plants used as medicines by the community of Ponta Grossa, Porto Alegre, Rio Grande do Sul*. Brazilian Journal of Pharmacognosy, vol. 15(4), pp. 361-372, 2005.