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Phytotherapeutic properties of the *Caesalpinia* genus present in the Caatinga biome

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Abstract. The society enjoys a lot of medicinal plants due to their easy access and due to the effectiveness of their use. Currently, the popular use of these plants has been awakening the pharmaco-chemical study of their properties. Brazil with its great biodiversity worldwide, has an endemic biome, the Caatinga has a great diversity of plants with medicinal properties. The present work aimed to unite plants of the *Caesalpinia* genus with medicinal properties, through a literature review. The research was carried out on the electronic databases Google Scholar, Pubmed and Scielo using the following descriptors: "Plantas Mediciniais", "medicinal plants", "gênero *Caesalpinia*", "*Caesalpinia* genus", "fitoterápicos", "herbal medicines", "Caatinga". In total, 142 articles were found, of which 44 were included, with the characteristics of being plants with medicinal properties of the *Caesalpinia* genus in the Caatinga biome. After surveying the works found, it was possible to identify the following species, *Caesalpinia pyramidalis* Tul, *Caesalpinia Ferrea* Mart. *Caesalpinia bracteosa* Tul, found in the Caatinga biome. Each studied species had characteristics, having in common some anti-inflammatory properties, are studied by some researchers and are effective in their popular use.

Keywords: Medicinal plants, Phytotherapics, *Caesalpinia* Genus

Introduction

The use of medicinal plants (MP) by society as a therapeutic form is an old practice that has been following human evolution and being part of

the culture of humanity (Badke, 2016). The popular knowledge generated using PM is transmitted daily and without formality, that is why in many traditional communities, the practice of cultivating these plants

is the first alternative of health care (Ferreira, 2015).

Brazil is a country with one of the greatest biodiversity in the world, due to its climatic and edaphic variety among its biomes. It is possible to find several biomes, including the Caatinga, which corresponds to almost 54% of the Northeast Region and covers 900.000 km²(Andrade et al., 2015). (Andrade-Lima, 1981) defines the biome as an arboreal vegetation, which for the most part has good resistance to water stress, the leaves are deciduous, so they fall in the summer, endowed with thorns and with a great presence of cacti, succulents, and bromeliads. (Souza, 2013) states that the Caatinga is one of the main Brazilian biomes with great plant diversity and many of these are used by the population for medicinal purposes. Data from (Brazilian Institute of Geography and Statistics, 2012) show that it is a biome where average annual temperatures can reach 45°C during the summer and the predominant climate is semi-arid, has stony soil and is composed of several types of rock. According to (Queiroz et al., 2018), this biome has species diversity, with families of Euphorbiaceae and Leguminosae. It is divided into three subfamilies: Caesalpinioideae, Mimosoideae and Papilionoidae(Lpwg, 2013). Within the subfamily Caesalpinioideae we find the genus *Caesalpinia*, composed of 2,200 species, are plants of tropical climate, having medicinal potential and a great economic and ecological potential (Santos, 2013). The species belonging to this genus are used to cure diseases and illnesses, using fruits, flowers, barks, fruits and roots (Ribeiro, 2013).

The *Caesalpinia* genus stands out within the biome because its species have great medicinal potential, according to (Silva et al., 2015), but, even with all the richness present in the biome with its endemic biodiversity, (Andrade, 2011) states that many authors they encounter difficulties in this biome and among those mentioned the lack of detailed survey and the absence or deficiency of data stand out. Thus, the present work aims to build a bibliographic reference on the medicinal properties of the *Caesalpinia* genus. It is important to highlight that these species are endemic to the Caatinga biome, which demonstrates the great contribution of

the dissemination of popular knowledge about the properties of these plants in this rich and little explored biome.

Methods

The research is of a qualitative nature and was carried out during the first semester of 2020. Consisting of search and analysis of articles to compile plants with phytotherapeutic properties of the *Caesalpinia* genus present in the Caatinga, these articles were located on the Google Scholar, PubMed and Scielo platforms, in Portuguese and English. Based on the research carried out on these academic platforms, the articles of greatest interest were filtered, with the inclusion criteria: articles published in the last 10 years (between 2010 and 2020), where the descriptors such as: medicinal plants in the Caatinga; medicinal plants in Caatinga, genus *Caesalpinia* in Caatinga; *Caesalpinia* genus in Caatinga; phytotherapics; herbals medicine. Articles published outside the chosen 10-year range, in addition to those that did not include at least one of the search keywords or that were written in a language other than Portuguese and / or English, were not considered for the research. After selecting the articles, the plants of the genus *Caesalpinia* that were most cited were selected and their phytotherapeutic profile was discussed through a bibliographic review.

Results e discussion

The present work was developed in the first semester of 2020, as a first stage of the research, a collection of necessary data was carried out. This was done on the platforms according to the methodology adopted for this work and were found and exposed in Table 1.

The articles found were selected and analyzed and those containing the genus *Caesalpinia* used as a herbal medicine in the Caatinga biome were chosen. With this filtering, it was possible to verify that the medicinal plants of this genus used in this biome are exposed in Table 2, containing the scientific name, usage, used part of each one and the source that it was found and cited.

Table 1. Articles found on Research Platforms

Plataforms	Articlesfound	Articles excluded	Articles selected
Scholar Google	62	40	22
PubMed	56	41	15
Scielo	24	17	7
Total	142	98	44

Table 2. Plants of the genus *Caesalpinia* present in the caatinga biome found in the research

Popular name	Scientific name	Use	Vegetal Part	Reference
“Catingueira”	<i>Caesalpinia pyramidalis</i> Tul	Flu; Antiasthmatic	Flower; Barks	Lemos, et al. (2015), Silva et al. (2013), Marinho, et al. (2011), Bandeira et al. (2014),
“Jucá”, “Pau ferro”	<i>Caesalpinia ferrea</i> Mart.	Pneumonia; Anti-inflammatory; febrifuge	Barks; Seeds; Fruits	Cajaiba et al. (2016); Marinho et al. (2011); Oliveira et al. (2010)
“Pau-rato”	<i>Caesalpinia bracteosa</i> Tul	Parasites, prostate inflammation	Casca; Fruto	Oliveira et al. (2010); Bapstel et al. (2014)

The species *Caesalpinia pyramidalis* and *Caesalpinia ferrea* and *Caesalpinia bracteosa* Tul are the most cited and used according to the research, according to Agra et al. (2008) these plants were the most cited and used by several residents of the states in the Northeast region. The species *Caesalpinia microphylla* Mart. Ex G. Don, (Dario et al., 2010) and *Caesalpinia echinata* Lam. (Azevedo et al., 2011) are found and used in the Caatinga, but it was not possible to find records on the popular use of both.

Caesalpinia pyramidalis

Caesalpinia pyramidalis, popularly known as “catingueira”, is an arboreal vegetable and very well distributed in the Caatinga biome and besides being used for medicinal purposes it is also widely exploited by the local population as a source of firewood (Santos et al., 2008).

This species is a small tree that reaches 4 meters in height, has bipinnate leaves and yellowish flowers. The fruit is a flattened pod, dark in color and when ripe opens to release the seeds (EMBRAPA, 2012). It is a rustic tree, very suitable for devastated areas as a source of plant reforestation (BRASIL, 2013).

According to (Bahia, 2006), this species has on its leaves and stems, triterpenes, steroids and mainly flavonoids and biflavonoids, the bark infusion of this species has anti-inflammatory, antipyretic properties and is widely used in the treatment of bronchitis and intestinal infections (Medeiros, 2012). (Santos 2011) also confirms the anti-inflammatory action of the species, in addition to the presence of relevant antinociceptive properties in animal models similar to acute pain.

The anti-inflammatory, antinociceptive and antioxidant activities present in *Caesalpinia pyramidalis* are related, at least in part, to the presence of tannins, flavonoids and saponins. (Santos, 2010), which are secondary metabolites present in most plants of the *Caesalpinia* genus (Cheng et al., 2009).

This species is within popular medicine and is used for several types of diseases (Cartaxo et al., 2010). According to (Moura et al., 2018) it is one of

the species that most stands out in the genus for its medicinal potential.

Amorim, (2011) states that *Caesalpinia pyramidalis* is very good in the treatment of diseases, based on its phenolic content and antioxidant activity, in its leaf extract it is a viable alternative for such compounds, due to its high antioxidant and renewal potential, which can supply chemical agents, food and pharmaceutical industries.

Therefore, it is necessary to take some precautions, as this species can become toxic to some animals, as the pollen from its flowers is toxic to bees, reducing their survival in the habitat. (Melo, 2013). (Reis, 2016) also states in his study the effect of this species on goats, leading them to congenital malformations and significant losses in their productivity, animals that are present in the Caatinga, as well as the presence of this species. However, the species is also effective in the treatment of gastric ulcers (Ribeiro et al., 2013). In high concentrations, it reduces the growth of a gastric tumor in rodents (Syam et al., 2009). It is also used as an aphrodisiac expectorant for the treatment of respiratory infections, colic, fever, heartburn, stomach pain, among others. (Albuquerque et al., 2007).

Caesalpinia ferrea

Popularly known as Jucá, *Caesalpinia ferrea* is a tree native to the country and its parts have been used in popular medicine (Carvalho et al., 1996). The size of the tree can vary between 5 and 10 meters and with few lenticel branches (Maia, 2004).

It is an easy to recognize plant, it has clear spots on the trunk, small leaflets, yellow flowers, soft and aromatic pods (Rizzini, 1995). Average temperature of 30° C and sand is recommended as a substrate for rapid germination (Lima et al., 2006).

Caesalpinia ferrea is a plant with a considerable number of compounds such as phenols, flavonoids and antioxidant potential present in its extract (Hussein et al., 2016). (Wyrepkowski et al., 2014) states that in its phytochemical composition, flavonoids, saponins, tannins and steroids are found.

The peel and leaves of the fruits have high levels of iron, manganese, and zinc, being an option as an alternative in human nutrition (Silva, 2010). However, (Wyrepkowski et al., 2014) shows that this plant has also been used as a tea for the treatment of ulcers, it is effective in this treatment and also used as a healing agent.

According to studies by (Vasconcelos et al., 2011), the blood glucose levels of mice decreased after consuming the aqueous extract from the stem of *Caesalpinia ferrea*. (Cunha, 2017) suggests the use of polysaccharides from the Jucá seed is effective in the treatment of type 2 diabetes. In addition, (Carvalho et al., 2009) shows that the seed extract has an anticoagulant activity against *Aedes aegypti*.

The methanolic extract of the fruits of the species proved to be effective against oral pathogens, *Streptococcus* sp. and *Candida albicans* (Sampaio et al., 2009). This plant was also efficient for the alternative control of the fungus *Colletotrichum* sp. providing greater protection in *S. obtusifolium* seeds (Melo et al., 2016). In addition, (Di Stati et al., 2002), shows that this species is characterized by antihistamine, anti-allergic, anticoagulant and hepatotoxic activities.

Conclusion

The *Caesalpinia* genus is widely used in folk medicine, for its various phytochemical properties and its beneficial effects for various diseases, such as influenza, pneumonia, and inflammation in the prostate. This work was developed based on the published literature and it was noticed that several researchers developed pharmacological investigations of the species present in this genus, evidencing the success in the healing processes of the diseases mentioned above, in addition to allergic and respiratory infections. The information available in the literature on the *Caesalpinia* genus and its presence in the Caatinga, demonstrate the importance of these plants due to their ethnopharmacological use. Data on the *Caesalpinia* genus are still scarce. In this sense, the Caatinga biome in the interior of the country, due to its territorial extension and the valorization of popular knowledge, proves to be especially important, since this knowledge is passed on for generations and is fundamental for the support of human knowledge, built in its daily besides guaranteeing the safety of the traditional community regarding the toxicological potential of the compounds found in these Medicinal Plants.

References

AGRA, M.F.; SILVA, K.N.; BASÍLIO, I.J.L.D.; FRANÇA, P.F.; BARBOSA-FILHO, J.M. Survey of medicinal plants used in the region Northeast of Brazil. *Revista Brasileira de Farmacognosia*. Vol 8, p.472- 508, 2008.

ALBUQUERQUE, U.P. Implications of ethnobotanical studies on bioprospecting strategies of new drugs in semi-arid regions. *The Open Complementary Medicine Journal*. Vol 2, pag.21-23, 2010.

ANDRADE-LIMA, D.A. The caatingas dominium. *Revista Brasileira de Botânica*. Vol 4, p.149-163, 1981.

AZEVEDO, R.A.B.; MAIA, S.S.S.; COELHO, M.F.B.; FREITAS, A.V.L. A Percepção dos quintais rurais por crianças de São Miguel, Rio Grande do Norte, Brasil. *Revista Verde de Agroecologia e Desenvolvimento Sustentável*. Vol 6, p.212-220, 2011.

BADKE, M.R.; BUDO, M.L.D.; SILVA, F.M.; RESSEL, L.B. Plantas Medicinais: o saber sustentado na prática do cotidiano popular. *Escola Anna Nery*. Vol 15, p.132-139, 2011.

BADKE, M.R.; SOMAVILLA, C.A.; HEISLER, E.V.; ANDRADE, A.; BUDÓ, M.L.D.; GARLET, T.M.B. Saber Popular: uso de plantas medicinais como forma terapêutica no cuidado a saúde. *Revista de Enfermagem da UFSM*. Vol 6, p. 225-234, 2016.

BAHIA, M.V.; BATISTA, J.S.; DAVID, J.M.; DAVID, J.P. Outros biflavonóides de *Caesalpinia pyramidalis*. 29^a Reunião Anual da Sociedade Brasileira de Química, p.19-22, 2006.

BANDEIRA, A.S. Etnoconhecimento da utilização de plantas medicinais nos municípios polarizados por Pombal-PB. 86f. (Tese de Mestrado)-Universidade Federal de Campina Grande, Campina Grande, Brasil, 2014.

BAPTISTEL, A.C.; COUTINHO, J.M.C.P.; LINS, N.E.M.F.; MONTEIRO, J.M. Plantas medicinais utilizadas na Comunidade Santo Antônio, Currais, Sul do Piauí: um enfoque etnobotânico. *Revista Brasileira de Plantas Medicinai*s. Vol 16, p.406-425, 2014.

BASTOS, I.V.G.A. Avaliação da atividade farmacológica de *Caesalpinia echinata* Lam. (FLORES). 100f (Tese de Mestrado)- Universidade Federal de Pernambuco, Pernambuco, Brasil, 2010.

BRASIL. Ministério do Meio Ambiente. Agroecologia na Borborema. Cartilha: Plantar árvores para colher frutos. 2011. aspta.org.br/files/2011/11/Cartilha-Plantar-árvores-para-colher-o-futuro.pdf, 2011.

CAJAIBA, R.L.; SILVA, W.B.; SOUSA, R.D.N.; SOUSA, A.S. Levantamento etnobotânico de plantas medicinais comercializadas no município de Uruará, Pará, Brasil. *Biotemas*. Vol.29, p.115-131, 2016.

CARTAXO, S.L.; SOUZA, M.M.D.A; DE ALBUQUERQUE U.P. Medicinal plants with bioprospecting potential used in semi-arid northeastern Brazil. *Journal Ethnopharmacol*. Vol 131, p.326–342, 2010.

CARVALHO, J.C. et al. Preliminary studies of analgesic and anti-inflammatory properties of *Caesalpinia ferrea* crude extract. *Journal of Ethnopharmacology*. Vol 53, p. 175-178, 1996.

CHENG, Y.; MA, L.Y.; MIAO, J.H.; XU, X.D.; YUAN, J.Q.; YANG, J.S. A new cassene diterpenoid lactone from seed of *Caesalpinia minax*. *Chinese Chemical Letters*. Vol 20, p.444-446, 2009.

CORDEIRO, J.M.P.; FÉLIX, L.P. Conhecimento botânico medicinal sobre espécies vegetais nativas da caatinga e

- plantas espontâneas no agreste da Paraíba, Brasil. *Revista Brasileira de Plantas Medicinai*s. Vol.16, p.685-692, 2014.
- CUNHA, A.P. et al. Polissacarídeos de sementes de *Caesalpinia ferrea*- Caracterização química e efeitos antidiabéticos em ratos Wistar. *Hidrocolóides alimentares*. Vol 65, p.68-76, 2017.
- DARIO, F.R. Uso de plantas da Caatinga pelo povo indígena Pankararu no estado de Pernambuco, Brasil. *Geotemas*. Vol.8, p.60-76, 2018.
- DI STASI, L.C.; HIRUMA, C.A.L.; SOUZA, A.R.M.B.; MARIOT, A.; SANTOS, C.M. *Plantas medicinais na Amazônia e na Mata Atlântica*. Editora UNESP. 2002.
- FERNANDES, M. F.; QUEIROZ, L. Paganucci de. *Vegetação e flora da Caatinga*. *Cienc. Cult.* Vol 70, p. 51-56, 2018.
- FERREIRA, A.L.S.; BATISTA, C.A.S.; PASA, M.C. Uso de plantas medicinais na comunidade quilombola Mata Cavalo em Nossa Senhora do Livramento-MT. *Revista Biodiversidade*. Vol 14, p.151-160,2015.
- FREITAS, A.V.L.; COELHO, M.F.B.; MAIA, S.S.S.; AZEVEDO, R.A.B. *Plantas medicinais: um estudo etnobotânico nos quintais do Sítio Cruz, São Miguel, Rio Grande do Norte, Brasil*. *Revista Brasileira de Biociências*. Vol 10, p.48-59, 2012.
- Helber, I.; Tucci, P.J.F. *Digitálicos: resultados do DIG no século XXI*. *Arquivos Brasileiros de Cardiologia*. Vol 95, p.108-111, 2010.
- Hussein, S.A.M.; EL-MESALLAMY, A.M.D.; SOULEMAN, A.M.A.; MOUSA, M.A. Cytotoxic Activity of Bioactive Compound from *Caesalpinia ferrea* Martius, Fabaceae. *International Journal of Pharmacognosy and Phytochemical Research*. Vol 8, p.2080-2084,2016.
- LEMO, J.R.; ARAUJO, J.L. *Estudo etnobotânico sobre plantas medicinais na comunidade de Curral Velho, Luís Correia, Piauí, Brasil*. *Biotemas*. Vol 28, p.125-136, 2015.
- LPWG. Legume phylogeny and classification in the 21st century: Progress, prospects and lessons for other species-rich clades. Vol 62, p. 217-248, 2013.
- MAIA, G.N. *Caatinga: árvores e arbustos e suas utilidades*. São Paulo. 413 p. 2004.
- MARINHO, M.G.V.; SILVA, C.C.; ANDRADE, L.H.C. *Ethnobotanical survey of medicinal plants in a caatinga área in São José de Espinharas Municipality, Paraíba State, Brazil*. *Revista Brasileira de Plantas Medicinai*s, Vol 13, p. 170-182, 2011.
- MEDEIROS, J.G.F.; SILVA, B.B.; NETO, A.C.A.; NASCIMENTO, L.C. *Fungos associados com sementes de flamboyant-mirim (Caesalpinia pulcherrima): incidência, efeito na germinação, transmissão e controle*. *Brazilian Journal of Forestry Research*. Vol.32, p.303-308, 2012.
- MELO, P.A.F.R. et al. *Extratos de Caesalpinia ferrea e Trichoderma sp. no controle de Colletotrichum sp. transmissão em sementes de Sideroxylon obtusifolium*. *Revista Brasileira de Plantas Medicinai*s. Vol 18, p. 494-501,2016.
- MOURA, E.J. et. al, *APLICAÇÕES BIOLÓGICAS DO GÊNERO Caesalpinia I. (Leguminosae-caesalpinioideae)*. III Congresso Internacional das Ciências Agrárias, 2018. DOI:https://doi.org/10.31692/2526-7701.IIICOINTERPDVAGRO.2018.00031
- OLIVEIRA, F.C.S.; BARROS, R.F.M.; MOITA, N.J.M. *Plantas Medicinai*s utilizadas em comunidades rurais de Oeiras, semiárido piauiense. *Revista Brasileira de Plantas Medicinai*s. Vol 13, n.3, p.282-301, 2012.
- PERINI, V.B.M.; CASTRO, H.G.; SANTOS, G.R.; CHAGAS JÚNIOR, A.F.; CARDOSO, D.P.; AGUIAR, R.W.S.; et al. Effect of vegetal extract in the inhibition of mycelial growth of *Pyricularia grisea*. *Journal of Biotechnology and Biodiversity*. Vol 4, p. 70-77, 2013.
- REIS, S.D.S.; OLIVEIRA, R.S.; MARCELINO, S.A.C.; MACÊDO, J.T.S.A.; CORREA, F.R.; PIMENTEL, L.A.; PEDROSO, P.M.O. *Malformações congênitas e outras perdas reprodutivas em caprinos por intoxicação por Poincianella pyramidalis (Tul.) LP Queiroz (Caesalpinia pyramidalis Tul.)*. Vol 118, p.91-94, 2016.
- RIBEIRO, A.R.S.; DINIZ, P.B.; ESTEVAM, C.S.; PINHEIRO, M.S.; ALBUQUERQUE, J.R.L.; THOMAZZI, S.M. *Gastroprotective activity of the ethanol extract from the inner bark of Caesalpinia pyramidalis in rats*. *Journal of Ethnopharmacology*. Vol 147, p. 383-388, 2013.
- RIBEIRO, A.R.S.; DINIZ, P.B.; ESTEVAM, C.S.; PINHEIRO, M.S.; ALBUQUERQUE-JÚNIOR, R.L.; THOMAZZI, S.M. *Gastroprotective activity of the ethanol extract from the inner bark of Caesalpinia pyramidalis in rats*. *Journal of Ethnopharmacology*. Vol 147, p.83-388, 2013.
- RIZZINI, C. T. *Botânica econômica brasileira*. 2.ed. Rio de Janeiro: Âmbito Cultural, 1995. 248 p.
- SANTANA, D.G.; SANTOS, C.A.; SANTOS, A.D.; NOGUEIRA, P.C.; THOMAZZI, S.M.; ESTEVAM, C. S.; CAMARGO, E.A. *Beneficial effects of the ethanol extract of Caesalpinia pyramidalis on the inflammatory response and abdominal hyperalgesia in rats with acute pancreatitis*. *Journal of Ethnopharmacology*. Vol 142, p.445-455, 2012.
- SANTANA, J.A.S.; VIEIRA, F.A.; PACHECO, M.V.; OLIVEIRA, P.R.S. *Padrão de distribuição e estrutura diamétrica de Caesalpinia pyramidalis Tul. (Catingueira) na Caatinga do Seridó*. *Revista de Biologia e Ciências da Terra*. Vol 11, 2011.
- SANTOS, C.A. *Estudo Farmacológico do Extrato Etanólico da entrecasca da Caesalpinia pyramidalis Tul. (Leguminosae)*. Dissertação de Mestrado, 2010.
- SANTOS, C.A.; PASSOS, A.M.; ANDRADE, F.C.; CAMARGO, E. A.; ESTEVAM, C.S.; SANTOS, M.R.; THOMAZZI, S.M. *Antinociceptive and anti-inflammatory effects of Caesalpinia pyramidalis in rodents*. *Revista Brasileira de Farmacognosia*. Vol 21, p.1077-1083, 2011.
- SANTOS, J.P.; ARAÚJO, E.L.; ALBUQUERQUE, U.P. *Richness and distribution of useful woody plants in the*

semiarid region of northeastern Brazil. Journal of Arid Environments. Vol 72, p.652-663, 2008.

SANTOS, M.L.O.; SIQUEIRA, W.N.; SÁ, J.L.F.; SILVA, L.R.S.; CABRAL, D.L.V.; AMÂNCIO, F.F.; MELO, A.M. M.A. Estudo do efeito radioprotetor do extrato metanólico de *Caesalpinia pyramidalis* sobre células embrionárias de *Biomphalaria glabata*. Scientia Plena. Vol.9, p.15-20, 2013.

SILVA, C.H.T.P.; SOBRINHO, T.J.S.P.; CASTRO, V.T.N.A.; LIMA, D.C.A.; AMORIM, E.L.C. Antioxidant capacity and phenolic content of *Caesalpinia pyramidalis* Tul. and *Sapium glandulosum* (L.) morong from Northeastern Brazil. Molecules. Vol16, p. 4728-4739, 2011.

SILVA, C.S.; NUNES, P.O.; MESCOUTO, C.S.T.; Müller, R.C.S.; PALHETA, D.C.; FERNANDES, K.G. Avaliação do uso da casca do fruto e das folhas de *Caesalpinia ferrea* Martius como suplemento nutricional de Fe, Mn e Zn. Food Science and Technology. Vol 30, p.751-754, 2010.

SILVA, M.O.M.; FARIAS, E.T.N.; SANTOS, E.M.; SILVA, J.E.A.N.G.O.M.S.; SILVA, L.A. Plantas Medicinais- Conhecendo e valorizando os recursos naturais da Caatinga, no Alto do Capibaribe. XIII Jornada de Ensino, Pesquisa e Extensão, 2013.

SOUZA, A.V. Plantas da Caatinga com potencial medicinal e cosmético. EMBRAPA. P.89-100, 2013.

SYAM, A. F.; SADIKIN, M.; WANANDI, S. I.; RANI, A. A. Molecular mechanism on healing process of peptic ulcer. Acta medica Indonesiana. Vol 41 p. 95-98, 2009.

WYREPKOWSKI, C. C.; COSTA, D.L.; SINHORIN, A.P.; VILEGAS, W.; DE GRANDIS, R.A.; RESENDE, F.A.; VARANDA, E.A.; SANTOS, L.C. Characterization and quantification of the compounds of the ethanolic extract from *Caesalpinia ferrea* stem bark and evaluation of their mutagenic Activity. Molecules. Vol 19, p.16039-16057, 2014.

WYREPKOWSKI, C.C.; COSTA, D.L.M.G.; SINHORIN, A.P.; VILEGAS, W.; GRANDIS, R.A.; RESENDE, F.A.; VARANDA, E.A.; SANTOS, L.C. Caracterização e quantificação dos compostos do extrato etanólico da casca de *Caesalpinia ferrea* e avaliação de sua atividade mutagênica. Molecules. Vol 19, p.16039-16057, 2014.