

The therapeutic properties of *Mikania glomerata* Spreng. (Asteraceae)

As propriedades terapêuticas da *Mikania glomerata* Spreng. (Asteraceae)

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Abstract

The *Mikania glomerata* Spreng is a specie found in Europe, Africa, North and South America and is commonly known as “guaco” and “guaco climber”. Many scientific studies confirm the bactericidal, anti-ophidic, antifungal, anti-inflammatory, antimalarial, and bronchodilator pharmacological activities. These studies aim to contribute to new research, report the phytotherapy aspects and describe the therapeutical properties of *Mikania glomerata*. This study is an integrative review with a descriptive approach. Were found during the study that the guaco therapeutical properties are diverse, such as: antiasthmatic, tonic, antipyretic, expectorant, appetite stimulant, anti-influenza, antirheumatic, soothing, healing, diuretic, emollient, fluidizing, bacterial growth inhibitor, antiallergic, antifungal, antioxidant, anthelmintic. Thereby, the analyzed texts show, besides the properties mentioned above, an expressive performance on duodenal and stomach ulcers, infectious diseases such as tonsillitis and oropharyngeal inflammation, influenzas, and upper airway infections (UAI), usually known as cold. Thus, is essential to highlight the value of the medicinal use of this compound, in a way to accentuate their benefits for the clinical improvement of various conditions that currently affect patients. However, given the data that were shown previously, as well as the limited number of studies, it is fundamental to carry out more research to define more safely the therapeutic properties of the M.

glomerata, in addition to showing the long-term effects of the use of your phytotherapeutic and safe doses, such as side effects.

Keywords: *Mikania glomerata*; Guaco; Guaco properties.

Resumo

A *Mikania glomerata* Spreng. uma espécie encontrada na Europa, África e nas Américas Central do Norte e do Sul é conhecida popularmente por 'guaco' e 'guaco-trepador'. Vários estudos científicos confirmam as atividades farmacológicas bactericidas, antiofídicas, antialérgicas, antifúngicas, anti-inflamatórias, antidiarreicas, antimalárica e broncodilatadora. Estudos esses que tem por objetivo contribuir com novas pesquisas, relatar os aspectos fitoterápicos e descrever as propriedades terapêuticas da *Mikania glomerata*. O presente estudo trata-se de uma revisão integrativa com abordagem descritiva. Foram achados durante o estudo que as propriedades do guaco são diversas como: antiasmática, tônica, antipirética, expectorante, estimulador de apetite, antigripal, antirreumático, calmante, cicatrizante, diurética, emoliente, fluidificante, inibidor do crescimento bacteriano, antialérgica, antifúngica, antioxidante, anti-helmíntica. Bem como os textos analisados apontam além das propriedades supracitadas, demonstram ter expressiva atuação no tratamento referente a úlceras duodenais e estomacais, doenças infecciosas como amigdalites e inflamação de orofaringe, gripes e infecções das vias aéreas superiores (IVAS), que é comumente conhecida como resfriado. Dessa forma, é imprescindível destacar a relevância do uso medicinal desse composto, de maneira a ressaltar seus benefícios para a melhora clínica de várias condições que acometem muitos pacientes no cenário atual. Todavia, tendo em vista os dados que foram apresentados previamente, como também o número limitado de estudos, é importante a realização de mais pesquisas para definir com mais segurança as propriedades terapêuticas da planta *M. glomerata*, além de evidenciar efeitos a longo prazo da utilização do seu fitoterápico e doses seguras, como os efeitos colaterais.

Palavras-chave: *Mikania glomerata*; Guaco; Propriedades do guaco.

Resumen

La *Mikania glomerata* es una especie que se encuentra en Europa, África y América del Norte y del Sur. Es popularmente conocida por 'guaco' y 'guaco-trepador'. Varios estudios científicos confirman las actividades farmacológicas bactericidas, antiofídicas, antialérgicas, antifúngicas, antiinflamatorias, antidiarreicas, antipalúdicas y broncodilatadoras. Estos estudios tienen como objetivo contribuir a nuevas investigaciones, informar sobre aspectos fitoterapéuticos y describir las propiedades terapéuticas de *Mikania glomerata*. El presente estudio es una revisión integradora con enfoque descriptivo. Se observó durante el estudio que las propiedades del guaco son diversas: antiasmático, tónico, antipirético, expectorante, estimulador del apetito, antigripal, antirreumático, calmante, cicatrizante, diurético, emoliente, fluidificante, inibidor del crecimiento bacteriano, antialérgico, antifúngico, antioxidante, antihelmíntico. Así como, los textos analizados apuntan más allá de las propiedades antes mencionadas, demostrando tener un rendimiento significativo en el tratamiento referido a úlceras duodenales y estomacales, enfermedades infecciosas como amigdalitis e inflamación de la orofaringe, gripe e infecciones de las vías respiratorias superiores (IVRS), lo que comúnmente se conoce como resfriado. Por lo tanto, es esencial resaltar la relevancia del uso medicinal de este compuesto, con el fin de resaltar sus beneficios para la mejora clínica de diversas afecciones, que afectan a muchos pacientes en el escenario actual. Sin embargo, en vista de los datos presentados anteriormente, así como del número limitado de estudios, es importante realizar más investigaciones para definir de manera más segura las propiedades terapéuticas de la planta *M. glomerata*, además de mostrar los efectos a largo plazo del uso de sus dosis herbales y seguras, como los efectos secundarios.

Palabras clave: *Mikania glomerata*; Guaco; Guaco propiedades.

1. Introduction

The specie *Mikania glomerata* (Spreng.) belongs to the Asteraceae family, present in the tropical and subtropical regions of Africa, America, and Asia. In Brazil, is spread in all regions, and is commonly known as 'guaco', 'guaco trepador', 'guaco-de-cheiro', 'guaco liso', 'erva-de-cobra', 'cipó-catinga' and coração-de-jesus'. In popular medicine, the leaves of 'guaco' are used for the treatment of inflammatory diseases, including bronchitis, influenza, and the common cold is also used as a bronchodilator and expectorant. Biological and pharmacological activities are reported for the specie, as anti-inflammatory, anti-ophidic, antimicrobial, antispasmodic, antiallergic, antihemorrhagic, antidiarrheal, antimalarial, and antiviral (Della Pasqua et al., 2019; Fraga & Borges, 2020; Ormond, Fernandes, & Diniz, 2022; Polonio et al., 2015; L. C.L.R. Santana, Brito, Sousa, & Freitas, 2014).

The *M. glomerata* was quite used by several indigenous people, to defeat the venom of the snakes and homemade pharmaceutical forms keep being used nowadays, such as poultice and plasters on the bite of snakes and other venomous animals, besides the infusion of the leaves is used in the treatment of respiratory tract diseases. The *M. glomerata* shows ethnopharmacological importance, because is part of the Brazilian Pharmacopoeia since 1929, in their first edition and, presently, the syrup and oral solution are provided by the Unified Health System (SUS). Was introduced in the fourth edition of the Brazilian Pharmacopoeia, in 2005, the *Mikania laevigata* (Sch. Bip. ex Baker). Both vegetable species share chemical characteristics and morphological similarities, as the uses and therapeutical indications, being the phytotherapeutic medicine most consumed for the treatment of asthmatic bronchitis, cough, and hoarseness (Costa, Borghi, Mayer, & Sawaya, 2018; Coutinho, Gonçalves, & Marcucci, 2020; Della Pasqua et al., 2019; E Silva et al., 2012; João C. Gasparetto, Campos, Budel, & Pontarolo, 2010; Moreti et al., 2017).

The Brazilian legislation considers the coumarin (1,2- benzopyrone as a chemical marker for the species *M. glomerata* and *M. laevigata*, a metabolite responsible for the anti-inflammatory activity. For quality control, the Brazilian Pharmacopoeia recommends the use of High-Performance Liquid Chromatography (HPLC) for quantification of coumarins in the extracts of leaves from both vegetable species. Beyond coumarin are reported other chemical substances as derivatives of coumaric acid, lupeol, dihydrocoumarin, caffeic, kaurenic, and chlorogenic acids, among others, that can be used for chemical differentiation of the species (Bertol, Cobre, & Pontarolo, 2021; Della Pasqua et al., 2019; Ormond et al., 2022).

Moreover, *M. glomerata* and *M. laevigata* are known for the same vulgar nomenclature, possessing the same uses, witch can be replaced of each other. Phytotherapy is grown on SUS, because of the stimulus of Politic and the National Program of Medicinal Plants and Phytotherapics, aiming to expand the available therapeutical options, value and preserve traditional knowledge, encourage industrial and technological development, and participation in the social control (Brasil, 2006; João C. Gasparetto et al., 2010).

Brazilian population possesses a long tradition in the use of medicinal plants to the treat and prevent diseases. Therefore, *M. glomerata* has an important medicinal value and is present in the National List of Medicinal Plants of Interest to SUS (RENISUS) and the National List of Essentials Medicines (RENAME), in the pharmaceutical forms of syrup, solution, and tincture, the recommended oral dosage is between 0.5 and 5 mg of coumarin as a daily dose (Brasil, 2012; Carvalho et al., 2012; Menezes et al., 2022; Saúde, 2009).

Given the search for new therapies for the disease treatment, this aimed to a report the pharmacological properties of the *M. glomerata*.

2. Methodology

This review is an integrative research, with a descriptive approach, based on several databases, PubMed/Mediline, Latin American, Caribbean Literature on Health Sciences (Lilacs), Scientific Electronic Library Online (SciELO), and Google Scholar. The descriptors used in the research were: *Mikania glomerata*, guaco, properties of guaco, properties of guaco.

The established limits or established inclusion criteria were the time frame from 2010 to 2022, in English and Portuguese, and only scientific articles were considered for the research. The selection of articles was conducted through the initial reading of the titles and abstracts that were suitable for the review.

3. Results

Table 1 presents the quantity of articles found for each descriptor used, total was 13 papers, after the exclusion 12 studies remain for development the integrative review. A flow diagram of review process. can be seen in Figure 1

Table 1: Found and used articles

Descriptors	Found articles	Relevant articles	Used articles
<i>Mikania glomerata</i>	5	4	4
Guaco	4	4	4
Guaco properties	4	4	4
TOTAL	13	12	12

Source: Own authorship (2022).

The Table 2 shows the information removed from the studies, organized according of the used part used, pharmacological properties, uses and conclusion of the studies.

Table 2: Main information from the studies included in the review.

Reference	Part of the plant evaluated	Therapeutic property evaluated	Mode of use	Main conclusions
GASPARETTO et al., 2010	Leaves and stem	Antispasmodic, exciting, sweating, anti-asthmatic, anti-inflammatory, tonic, depurative, antipyretic, anti-ophidic, scorpion sting, arthritis, rheumatism and neuralgia, expectorant, balsamic, appetite stimulant.	Syrup and tea.	The phytotherapy medicines based on guaco have been used on large scale in the public mesh.
PINTO et al., 2021	Roots, peels and leaves	Anti-influenza, anti-inflammatory, anti-neuralgic, anti-rheumatic, antiseptic, bechic, bronchodilator, soothing, healing, depurative, diuretic, emollient, expectorant, febrifuge, fluidifying, chest, sudorific, tonic, anti-ophidic and bacterial growth inhibitor.	Essential oil, tincture tintura and syrup.	The participation of health professionals is important, as alternative therapies have a lot to offer and can contribute to health sciences, in addition to allowing the individual relative autonomy in relation to health care.
SANTANA et al., 2014	Leaves	Bactericid, anti-ophidic, antiallergic, antifungal, anti-inflammatory, antidiarrheal, monoamine oxidase (MAO) enzyme inhibitor, antimalarial, antioxidant, anthelmintic, anxiolytic and bronchodilator.	Powder, indication for use up to 300 mg/kg.	The powder was obtained from the leaves of <i>M. glomerata</i> , it is suggested that the powder be used in a solid pharmaceutical form formulation.
COUTINHO et al., 2020	Leaves	Influenza, hoarseness, throat infection, cough and bronchitis.	Syrup (adult 15 ml 3x a day and child over 2 years 15 ml 2x a day).	The guaco for containing coumarin is inadvisable for use by children younger than 1 year and in pregnant women. Besides, the long-term use may cause hemorrhagic accidents by the antagonism to vitamin K. Beyond the interaction with anticoagulants and some antibiotics such as tetracyclines, chloramphenicol, gentamicin, vancomycin, and penicillin, however, the mechanism of action is still unknown.
CZELUSNIAK et al., 2012	Leaves, Flowers, stem and roots.	Tonic, depurative, antipyretic and bronchodilator action, as well as appetite stimulant.	Tincture and extract.	The biggest concentration of coumarins was found near the apical bud on the leaves, with make better the relationship with the development process of guaco.
SILVA et al., 2012	Leaves.	Bronchitis pleurisy, cough, asthma, colds and influenza.	Syrup, guaco capsule produced from dry extract.	The techniques used for determining coumarins in <i>M. glomerata</i> , were high performance liquid chromatography (HPLC) and gas chromatography (GC).
OLIVEIRA et al., 2013	Leaves.	Expectorants, effective against cancer, ulcers and infectious diseases.	Extract.	The guaco has several applications in the chemical and pharmaceutical industry, it has the metabolite coumarin, a

compound with many pharmaceutical properties.

BASTOS et al., 2011	Leaves and stem.	Bronchodilator, influenza and cold.	Extract.	The leaves and stem are used by the Brazilian population because of their medicinal effects used in natura for the treatment of influenza and common cold.
FULANETTI et al., 2016	Whole plant.	Antimicrobial, anti-inflammatory, analgesic, spasmodic, vasodilator, anti-ulcer, central nervous system depressant, anti-venom serum, anti-stress, insecticide, fungicide, anticoagulant and allergen.	Extract.	M. glomerata promotes relaxation of the smooth muscles of the airways, mainly bronchi, by improving the fluidity of exudates through the tracheobronchial cough reflex.
FRAGA; BORGES, 2020	Stem and leaves.	Cough, expectorante, bronchodilator, hoarseness and dyspnea.	Extract and oil.	Drug of increasing use in Brazil with the aim of treaty clinical conditions of the airway, mainly dyspnea, with an important interest of the Unified Health System.
MOREIRA et al., 2016	Leaves	Antiallergic, anti-inflammatory, bronchodilator and antimicrobial.	Extract.	The study is about guaco extract in oral treatment as mouthwash, also used on caries treatment.
GASPARETTO et al., 2015	Leaves.	Bronchodilator, anti-inflammatory e anti-allergen.	Syrup.	It shows the main metabolites of the plant responsible for the therapeutic effects.

Source: Own authorship (2022).

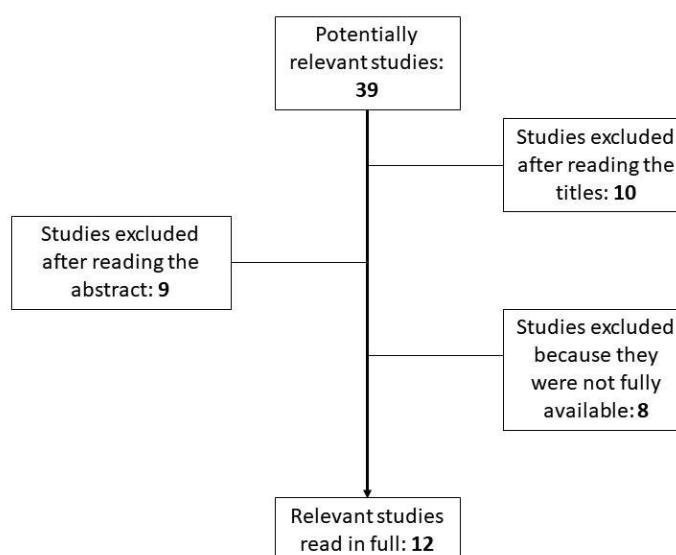
Table 3 were described the majority compounds reported in the studies for *in vitro* and *in vivo* treatment.

Table 3: Majority compounds for *in vitro* and *in vivo* treatment.

Compounds	Treatment	Amount	Reference
Coumarine	<i>In vitro</i>	50%	Gasparetto et al., 2015
Kaurenoic Acid	<i>In vivo</i>	34,4%	Gasparetto et al., 2015

Source: Own authorship (2022).

Figure 1: Flow diagram of review process.



Source: Own authorship (2022).

4. Discussion

The use of therapeutical plants for the prevention and/or combat of organism diseases comes from a historical practice provided by the easy access of the population, due to the vast biodiversity. In addition to being affordable because of its cost, it proves to be a therapeutic alternative to the choice of synthetic drugs (Pinto et al., 2021).

Medicinal plants symbolize an element of great relevance for monitoring people's health conditions. Moreover, the validation of the therapeutic action of some popularly used plants in phytotherapy symbolizes an important part of the class of a people, as it starts from a knowledge applied and propagated by populations over several generations (Pinto et al., 2021).

M. Glomerata is easily found and used in popular medicine in homemade preparations, such as teas airway diseases treatment because of their many pharmacological actions. Despite that, exist industrialized syrups mostly totally qualified with quality control, guarantee, efficacy, and saved. Among the secondary metabolites found in the specie stand out coumarin and kaurenoic acid for their pharmacological actions, such as anti-inflammatory and bronchodilator. Due to this important effect,

guaco syrup and other presentations are dispensed in the Basic Component of Pharmaceutical Assistance (Gasparetto et al., 2015).

Ethnopharmacological studies report that the species *M. laevigata* and *M. glomerata* are popularly named guaco despite being morphologically and chemically similar both possess differences in the concentration and composition of some chemical compounds. Pasqua et al (2019) reported that the *M. glomerata* presents a bigger amount of coumarin than the specie *M. laevigata*, on the other hand, Santos et al (2006) and Bolina et al (2009) decribed that despite the coumarin being present in both species, the metabolite content is lower in *M. Glomerata*. Moreover, made by De Bertoluccie et al (2009) and De Melo and Sawaya (2020) reported the presence of coumarin only in *M. laevigata*. Thereby, Pasqua et al (2019) suggested that *M. laevigata* is a more interesting specie by the pharmacological and chemical point of view than *M. glomeratan* because of their anti-inflammatory effect (Almeida et al., 2017).

Based on the results, it can be seen that there are several parts of guaco used for treatment, such as: leaves and stems with their expectorant, anti-inflammatory, anxiolytic, bronchodilator, appetite stimulant properties; flowers and roots with their property of tonic, depurative, antipyretic action; bark with its anti-influenza, anti-inflammatory, anti-neuralgic, anti-rheumatic, antiseptic, bekic, depurative, diuretic and emollient property; plant with its antimicrobial, anti-inflammatory, analgesic, spasmodic, vasodilator, anti-ulcer, central nervous system depressant and anti-venom property (Santana et al., 2014). In the studied extracts of *M. glomerata*, one of the main classes of secondary metabolites is coumarin, which is richly used to treat symptoms such as cough, expectoration, and dyspnea. Gasparetto et al. (2010) attribute the presence of diterpenes from the plant species to anti-cancer, antibacterial, antiparasitic, and hemolytic effects.

Moreira et al. (2017) reported that *M. Glomerata* extract can be used to prevent dental caries, as it can inhibit the growth of oral pathogens and reduce dental plaque. In this way, they demonstrate that the addition of extracts to oral products is an important strategy in caries control.

Therefore, the use of medicinal plants is part of the knowledge and customs of many populations. The guaco, is the reason of this present study for being a medicinal plant of easy access and cost for the plants fulfilling its role as studies on its research more than 90% therapeutic success of users for treating diseases such as influenza syndrome and oropharyngeal inflammation (Fraga & Borges, 2020).

5. Conclusion

All the selected studies that composed this article demonstrated effective clinical improvement in the reduction of signs and symptoms. Thus, it is essential to highlight the importance of the medicinal use of this compound and emphasize its benefits for the clinical improvement of several health conditions, which affect many patients in the current scenario. However, given the data that were previously presented, as well as the limited number of studies, it is essential to carry out more research to define more safely the therapeutic properties of *M. glomerata*, and the long-term effects of its phytotherapy medicine, safe dose approach and main side effects.

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