Article

Potential Therapeutic use of *Anredera cordifolia* in Chronic Non-Communicable Diseases: A Scoping Review*

* Article derived from the master's thesis in nursing entitled "Propriedades terapêuticas da Anredera cordifolia nas doenças crônicas não transmissíveis: Revisão de escopo" [Therapeutic properties of Anredera cordifolia in non transmissible chronic diseases: A scope review], defended at Universidade Federal de Santa Maria, Brazil. Available at: http://repositorio.ufsm.br/handle/1/28051

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Theme: Promoting health, well-being, and quality of life

Contributions to the subject: The lack of a scientific basis regarding medicinal plants constitutes a significant barrier to safe healthcare. Therefore, it is imperative for health professionals to gain access to scientific knowledge concerning these plants and to be encouraged to conduct new research into their properties, effects, and safe usage. Medicinal plants are considered a potential therapeutic resource for inclusion in healthcare practices, and research on this topic can support their safe utilization. In this context, this study aims to contribute to further research into the properties of *Anredera cordifolia*.

Abstract

Introduction: *Anredera cordifolia* is a plant recognized as a non-conventional food plant. In folk medicine, it shows promise, being used in the treatment of skin diseases, diabetes, and hypertension. **Objectives:** to map the properties of the *Anredera cordifolia* plant in the therapeutic process of non-communicable chronic diseases. **Materials and methods:** The study was based on the Joanna Briggs Institute guidelines. The search was conducted in the Medline/PubMed, Scopus, Web of Science, and CINAHL databases in 2022 and updated in 2023. Selection criteria were primary studies, in any language, country of origin, and publication year, conducted with humans, animals, and/or cellular models, in a laboratory context, focusing on the properties of the plant. Selection was performed independently by two reviewers using the Rayyan software. Data were analyzed using content analysis. **Results:** In the 27 included articles, the results demonstrated that the plant has positive properties in the treatment of diabetes mellitus, arterial hypertension, chronic kidney disease, obesity, and cataracts, as well as being beneficial in controlling cholesterol, triglyceride, and uric acid levels. The main therapeutic properties identified were hypoglycemic effect and reduction in serum levels of triglycerides and total cholesterol. The plant also showed beneficial effects on the healing of diabetic wounds, reduction in heart rate, and obesity. **Conclusions:** Chronic diseases with evidence on the use of the plant include hypertension, diabetes, kidney disease, obesity, and cataracts. Additionally, the plant has beneficial properties regarding clinical markers such as triglycerides, cholesterol, and blood glucose.

Keywords (Source: DeCS)
Medicinal plants; phytotherapy; nursing; complementary therapies; noncommunicable diseases.

Potencial uso terapéutico de la *Anredera cordifolia* en enfermedades crónicas no transmisibles: revisión de alcance*

* Artículo derivado de la tesis de maestría profesional en enfermería "Propriedades terapêuticas da *Anredera cordifolia* nas doenças crônicas não transmissíveis" ("Propiedades terapéuticas de la *Anredera cordifolia* en las enfermedades crónicas no transmisibles"), presentada en la Universidade Federal de Santa Maria, Brasil. Disponible en: http://repositorio.ufsm.br/handle/1/28051

Resumen

Introducción: *Anredera cordifolia* es una planta reconocida como planta alimenticia no convencional. En la medicina popular, se muestra prometedora, siendo utilizada en el tratamiento de enfermedades de la piel, diabetes e hipertensión. **Objetivos**: mapear las propiedades de la planta *Anredera cordifolia* en el proceso terapéutico de las enfermedades crónicas no transmisibles. **Materiales y método**: el estudio se basó en las orientaciones del Instituto Joanna Briggs. La búsqueda se realizó en las fuentes de datos Medline/PubMed, Scopus, Web of Science y CINAHL, en 2022 y se actualizó en 2023. Los criterios de selección fueron estudios primarios, en cualquier idioma, país de origen y año de publicación, desarrollados con seres humanos, animales y/o modelos celulares, en contexto laboratorial y con enfoque en las propiedades de la planta. La selección se realizó de manera doble-independiente, utilizando el software Rayyan. Se analizaron los datos mediante análisis de contenido. **Resultados**: en los 27 artículos incluidos, los resultados demostraron que la planta tiene propiedades positivas en el tratamiento de la diabetes mellitus, la hipertensión arterial, la enfermedad renal crónica, la obesidad y la catarata, además de ser beneficiosa en el control de los niveles de colesterol, triglicéridos y ácido úrico. Las principales propiedades terapéuticas identificadas fueron efecto hipoglucémico y disminución de los niveles séricos de triglicéridos y colesterol total. La planta también mostró efectos beneficiosos en la cicatrización de heridas diabéticas, reducción de la frecuencia cardíaca y obesidad. **Conclusiones**: las enfermedades crónicas que tienen evidencia sobre el uso de la planta son hipertensión, diabetes, enfermedad renal, obesidad y cataratas. Además, la planta tiene propiedades beneficiosas en cuanto a marcadores clínicos, como triglicéridos, colesterol y glucemia.

Palabras clave (Fuente: DeCS)
Plantas medicinales; fitoterapia; enfermería; terapias alternativas; enfermedades no transmisibles.

Potencial uso terapêutico da *Anredera cordifolia* nas doenças crônicas não transmissíveis: revisão de escopo*

* Artigo derivado da dissertação de mestrado acadêmico em enfermagem intitulada "Propriedades terapêuticas da *Anredera cordifolia* nas doenças crônicas não transmissíveis", defendida na Universidade Federal de Santa Maria, Brasil. Disponível em: http://repositorio.ufsm.br/handle/1/28051

Resumo

Introdução: a *Anredera cordifolia* é uma planta reconhecida como planta alimentícia não convencional. Na medicina popular, mostra-se promissora, sendo utilizada no tratamento de doenças de pele, de diabetes e de hipertensão. **Objetivos**: mapear as propriedades da planta *Anredera cordifolia* no processo terapêutico das doenças crônicas não transmissíveis. **Materiais e método**: o estudo teve como base as orientações do Joanna Briggs Institute. A busca foi realizada nas fontes de dados Medline/PubMed, Scopus, Web of Science e CINAHL, em 2022 e atualizada em 2023. Os critérios de seleção foram estudos primários, de qualquer idioma, país de origem e ano de publicação, desenvolvido com seres humanos, animais e/ou modelos celulares, em contexto laboratorial e com enfoque nas propriedades da planta. A seleção ocorreu de modo duplo-independente, utilizando o software Rayyan. Os dados foram analisados por meio de análise de conteúdo. **Resultados**: nos 27 artigos incluídos, os resultados demonstraram que a planta tem propriedades positivas no tratamento da diabetes *mellitus*, da hipertensão arterial, da doença renal crônica, da obesidade e da catarata, além de ser benéfica no controle dos níveis de colesterol, de triglicerídeos e de ácido úrico. As principais propriedades terapêuticas identificadas foram efeito hipoglicêmico e diminuição dos níveis séricos de triglicerídeos e colesterol total. A planta também demonstrou efeitos benéficos na cicatrização de feridas diabéticas, na redução da frequência cardíaca e na obesidade. **Conclusões**: as doenças crônicas que possuem evidência sobre o uso da planta são hipertensão, diabetes, doença renal, obesidade e catarata. Além disso, a planta tem propriedades benéficas quanto a marcadores clínicos, como triglicerídeos, colesterol e glicemia.

Palavras-chave (Fonte DeCS)
Plantas medicinais; fitoterapia; enfermagem; terapias alternativas; doenças não transmissíveis.

Introduction

In Brazil's Unified Health System, integrative and complementary health practices (PICS) are crucial in achieving one of its foundational principles: Integrality. These practices represent treatments that draw on traditional knowledge and utilize therapeutic resources aimed at preventing a range of diseases, including hypertension and diabetes mellitus (DM). Thus, applying these practices can promote health beyond the physical realm, considering they encompass social, cultural, and emotional concerns within a multidisciplinary approach (1, 2).

Currently, approximately 29 PICS are available at no cost within Brazil's public healthcare system, with the utilization of medicinal plants being particularly notable. These plants, whether cultivated or wild, can be administered through various methods, such as orally or via infusion, and possess therapeutic effects. However, similar to any medication, they must be employed judiciously due to potential risks of adverse effects, contraindications, or interactions (2).

Brazil boasts the highest level of biodiversity worldwide, accounting for 15-20 % of all known species. Plant life, a key component of this biodiversity, is the foundation for home remedies in traditional medicine. Furthermore, Brazil's rich cultural and ethnic diversity has fostered a wealth of knowledge about managing and utilizing medicinal plants, which has been endowed through successive generations (3, 4).

In 2019, chronic non-communicable diseases (NCDs) accounted for 75 % of morbidity and mortality among the Brazilian population (5); NCDs are chronic conditions generally attributable to multiple factors, characterized by a gradual onset and prolonged or indefinite duration (6). They arise from lifestyle-related factors such as unhealthy diets, physical inactivity, smoking, and alcohol consumption (7).

When used responsibly, medicinal plants can play a pivotal role as a complementary and integrative approach to treating NCDs. Various species offer therapeutic benefits and functional properties, in addition to being accessible and cost-effective (8). Among the native plants of Brazil, many are acknowledged for their therapeutic and nutritional value by both traditional and scientific medicine (9). For example, *Anredera cordifolia* (Ten.) Steenis is a species native to Brazil found in various regions but is not endemic (10). *A. cordifolia* is primarily recognized for its nutritional value; it is a plant with high nutrient content and biomass yield, classified as an unconventional food plant (11).

Studies on *A. cordifolia* have highlighted its varied popular names in Brazil, including *bertalha-coração*, *madeira vine*, and *folha gorda* (12-14). In traditional medicine, the plant is valued for its therapeutic properties in treating skin diseases, DM, and hypertension (13). There is also documentation on its anti-inflammatory, antibacterial, anti-ulcer, and healing properties (15-17). However, despite experi-

mental studies confirming those effects, the understanding of its properties remains in the early stages (15-17).

Hence, examining the existing evidence concerning its use and potentially identifying gaps in our knowledge is essential. Given the context described and the increasing interest in therapeutic practices involving medicinal plants, particularly the therapeutic potential of *A. cordifolia*, the significance of this study is evident. This study sought to survey both national and international scientific literature on the properties of *A. cordifolia* within the therapeutic management of NCDs.

Materials and Method

This study comprises a scoping review, a type of systematic literature review that adopts the PCC research approach, where P stands for population, C for concept, and the second C for context. This type of review is utilized to map the key concepts underpinning a research field and elucidate the definitions and conceptual limits of a topic (i.e., provide an overview or evidence map) (18).

The purposes of this method include serving as a precursor to a systematic review, identifying the types of evidence available in a specific field, analyzing knowledge gaps, elucidating the main concepts/definitions in the literature, examining research methodologies within a given topic or field, and identifying the principal characteristics or factors related to a concept (19).

A scoping review initiates with the development of a protocol, which acts as a blueprint and is crucial to minimize bias occurrence (18). For this study, a protocol was formulated and registered on the Open Science Framework platform. The review question posed was as follows: What are the properties of *A. cordifolia* in the therapeutic process of NCDs in laboratory studies involving humans, animals, and cell models?

The inclusion criteria were: a) studies involving human beings, animals, or cell models; b) studies investigating the therapeutic properties of the plant in NCDs; c) experiments executed in a laboratory setting; d) primary studies; e) studies regardless of the language, country of origin, or timeframe. The exclusion criteria consisted of incomplete or unavailable articles; duplicates were also excluded.

The search was conducted in July and August 2022 and updated in August 2023, using the Medline/PubMed, Scopus, and Web of Science databases, as well as the reference lists of the included studies after an exhaustive reading. The controlled descriptor searches were conducted in the Descriptors in Health Sciences (DeCS) and Medical Subject Headings (MeSH) databases, while non-controlled descriptors were identified by reviewing the titles and abstracts of previously published studies. The search strategies applied to each data source are described in Table 1.

Table 1. Data Sources and search Strategies, Santa Maria, Rio Grande do Sul, Brazil, 2023

Database	Search strings
Medline via PubMed	((“*anredera cordifolia*”[Title/Abstract]) OR (“binahong”[Title/Abstract])) OR (“madeira vine”[Title/Abstract])
Scopus	“*anredera cordifolia*” OR “madeira vine” OR binahong
Web of Science	ALL = (*anredera cordifolia* OR madeira vine OR binahong)

Source: Elaborated by the authors.

The selection of evidence was conducted in a double-independent manner, with a third reviewer available in case of any disagreements. The studies retrieved from the data sources were transferred to the Rayyan software; their titles and abstracts were reviewed, followed by a full reading of the selected articles and a critical assessment of the reference lists.

For data extraction, a script was devised containing relevant information to map the data, including author/year, country of study/language, part of the plant and type of extract used, experimental model utilized, NCD or clinical marker researched, and the therapeutic properties of the plant in NCDs.

The data underwent coding and content analysis, as proposed in the literature (20). The results will be presented below, accompanied by descriptive summaries and in-depth discussions based on the existing literature.

Results

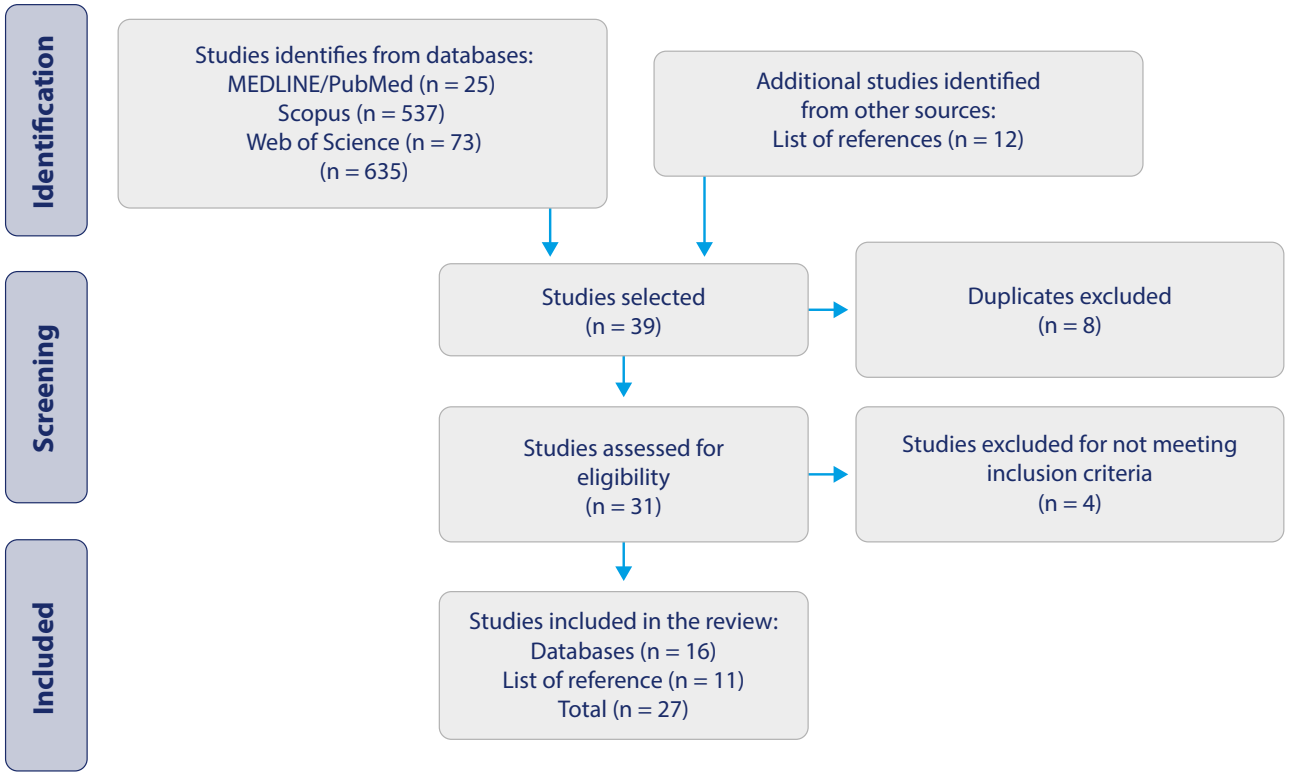
The search yielded 635 studies, of which 31 were selected for comprehensive review. Among them, eight were excluded due to duplication, and, upon detailed review, four more were excluded for failing to meet the selection criteria. This resulted in a total of 19 articles. Further evaluation of the reference lists of these studies led to the inclusion of an additional 11 studies, composing a final corpus of 27 articles (Figure 1).

All the studies were conducted in Asia, written predominantly in English, and conducted by the same researchers (Table 2).

Table 2 also indicates that 26 studies utilized ethanolic leaf extract, and one used leaf powder (24), with only five studies specifying the concentration of the extract (22, 26, 33, 37, 38). The most common dose used in the experiments was 100 mg/kg, as noted in 11 studies (25, 27, 30-32, 35-37, 39, 43, 45).

Furthermore, DM and HT were the most frequently studied NCDs, with 9 studies on DM (21, 33, 34, 36, 38, 42, 45–47), and 6 studies on HT (23, 26, 30, 37, 40, 44). Three studies examined clinical markers of chronic kidney disease (CKD) (25, 27, 29), 6 investigated serum cholesterol and triglyceride levels (24, 28, 31, 32, 39, 43), 3 focused on obesity (35, 38, 39), 1 on cataracts (22), and another one on serum uric acid levels (41).

Figure 1. Study's design Flowchart Based on the PRISMA Extension for Scoping Reviews (PRISMA-ScR), Santa Maria, Rio Grande do Sul, Brazil, 2023



Source: Elaborated by the authors.

Table 2. Characterization of the Studies, Santa Maria, Rio Grande do Sul, Brazil, 2023

Author and publication year	Country and language	Plant part, extract type, concentration, and/or dose used	NCD or clinical marker	Population model
Dwitiyanti et al. (2021) (21)	Indonesia English	Leaves/ethanolic extract (50 mg/kg)	DM	Rats (*in vivo*)
Feriyani et al. (2021) (22)	Indonesia English	Leaves/ethanolic extract (100, 200 µg; concentration)	Cataract	Goat lenses (*in vitro*)
Sukandar et al. (2021) (23)	Japan English	Leaves/ethanolic extract (50 mg/kg)	HT	Rats (*in vivo*)
Hashimoto et al. (2022) (24)	Indonesia English	Leaves/leaf powder (1.12 g; powder	Triglycerides, glucose	Humans (*in vivo*)
Sukandar et al. 2011 (25)	Indonesia English	Leaves/ethanolic extract (50, 100, 150 mg/kg)	CKD	Rats (*in vivo*)
Sukandar et al. (2019) (26)	Indonesia English	Leaves/ethanolic extract (1 and 2 % concentrations; 50 mg/kg)	HT	Rats (*in vivo*)
Sukandar et al. (2013) (27)	Indonesia English	Leaves/ethanolic extract (100 mg/kg)	CKD	Rats (*in vivo*)
Dwitiyanti and Rorenza (2021) (28)	Indonesia English	Leaves/ethanolic extract (12.5, 25.50 mg/kg)	Cholesterol triglycerides	Rats (*in vivo*)
Bahtiar et al. (2021) (29)	Indonesia English	Leaves/ethanolic extract (75, 150, 300 mg/kg)	CKD	Rats (*in vivo*)
Garmana et al. (2016) (30)	Indonesia English	Leaves/ethanolic extract (100 mg/kg)	HT	Rats (*in vivo*)

Author and publication year	Country and language	Plant part, extract type, concentration, and/or dose used	NCD or clinical marker	Population model
Lestari et al. (2016) (31)	Indonesia English	Leaves/ethanolic extract (50, 100, 200 mg/kg)	Cholesterol	Rats (*in vivo*)
Sukandar et al. (2016) (32)	Indonesia English	Leaves/ethanolic extract (100 mg/kg)	Cholesterol triglycerides	Rats (*in vivo*)
Sutrisno et al. (2018) (33)	Indonesia English	Leave/ethanolic extract (2 %; concentration)	DM	Rabbits (*in vivo*)
Wahjuni et al. (2019) (34)	Indonesia English	Leaves/ethanolic extract (20 mg/kg)	DM	Rats (*in vivo*)
Sukandar et al. (2016) (35)	Indonesia English	Leaves/ethanolic extract (100 mg/kg)	Obesity	Rats (*in vivo*)
Djamil et al. (2017) (36)	Indonesia English	Leaves/ethanolic extract (10, 50, 100 mg/kg)	DM	Mice (*in vivo*)
Garmana et al. (2018) (37)	Indonesia English	Leaves/ethanolic extract (12.86 % concentration; 50, 100, 200 mg/kg)	HT	Rats (*in vivo*)
Kintoko et al. (2016) (38)	Indonesia English	Leaves/ethanolic extract (10 and 30 % concentration; 150 mg/kg)	DM Obesity	Rats (*in vivo*)
Lestari et al. (2015) (39)	Indonesia English	Leaves/ethanolic extract (50, 100, 200 mg/kg)	Cholesterol triglycerides, obesity	Rats (*in vivo*)
Sukandar et al. (2016) (40)	Indonesia English	Leaves/ethanolic extract (0.9 mg/mL)	HT	Isolated rabbit aorta (*in vitro*); Frogs (*in vivo*)
Widyarini et al. (2015) (41)	Indonesia English	Leaves/ethanolic extract (250 mg/kg)	Uric acid	Rats (*in vivo*)
Astuti et al. (2012) (42)	Indonesia English	Leaves and tubers (ethanolic extract)	DM	Rats (*in vivo*)
Wahjuni (2014) (43)	Indonesia English	Leaves/ethanolic extract (100 mg/kg)	Cholesterol	Rats (*in vivo*)
Sukandar et al. (2016) (44)	Indonesia English	Oleanolic acid and apigenin (extracted from the leaf extract); ethanolic extract/oleanolic acid (0.5 µg/mL); apigenin (0.05 µg/mL)	HT	Isolated rabbit aorta (*in vitro*); Frogs (*in vivo*)
Sukandar et al. (2011) (45)	Indonesia English	Leaves/ethanolic extract (50, 100, 200 mg/kg)	DM	Rats (*in vivo*)
Kusriani et al. (2023) (46)	Indonesia English	Leaves/ethanolic extract (15 g/mL)	DM	Rats (*in vivo*)
Sulfianti et al. (2023) (47)	Indonesia English	Leaves/ethanolic extract (250 mg/kg)	DM	Rats (*in vivo*)

DM: Diabetes mellitus; HT: hypertension; CKD: chronic kidney disease. Source: research data.

Source: Elaborated by the authors.

As per the selection criteria for this review, all of the studies included had an experimental design with quantitative/statistical analysis: 1 with an *in vitro* population (22), 22 *in vivo* (21, 23-39, 41-43, 45-47), and 2 studies that used both *in vitro* and *in vivo* models (40, 44). Of the *in vitro* studies, 1 was performed on goat lenses (22) and 2 on rabbit aortic rings (40, 44). The *in vivo* research comprised 21 studies conducted on rats (21, 23, 25-32, 34, 35, 37-39, 41-43, 45-47), 2 on frogs (40, 44), 1 on rabbits (33), 1 on mice (36), and 1 on humans (24). Regarding the plant's therapeutic properties, the results of the studies included in this review are detailed in Table 3.

Table 3. Therapeutic Properties of the Plant *A. cordifolia*, Santa Maria, Rio Grande do Sul, Brazil, 2023

NCD/clinical marker	Therapeutic properties
DM	Hypoglycemic effect/reduced blood glucose levels (21, 24, 34, 36, 42, 45-47)
	Increased insulin secretion (42)
	Diabetic wound healing (33, 38)
	Increased fibroblast cell proliferation (33)
	Improved glucose tolerance (21)
	Increased water intake (38)
	Reduced fatty acids (21)
	Increased essential amino acid concentrations (21)
	Repairing effect on pancreatic beta cells (45, 47)
	Reduced liver weight (21)
HT	Decreased heart rate (37, 40)
	Vasodilator effect (40, 44)
	Reduced systolic blood pressure (23, 30)
	Reduced diastolic blood pressure (23, 30)
	Reduced blood pressure (26, 44)
	Increased nitric oxide levels (30)
	Diuretic properties (37)
Lipid profile (cholesterol and triglycerides)	Reduced serum triglyceride levels (24, 28, 31, 32, 39)
	Reduced LDL (31, 32, 39)
	Increased HDL (31, 39)
	Reduced total cholesterol (28, 31, 32, 39, 43)
CKD	Reduced serum creatinine level (25, 27, 29)
	Reduced serum urea concentration (25, 27)
	Improved kidney structure (27)
	Increased antioxidant enzyme levels (catalase and superoxide dismutase) (27, 29)
	Reduced hydronephrosis (29)
Obesity	Inhibition of body weight gain/fat layer reduction (35, 38, 39)
Uric acid	Anti-hyperuricemic effect, xanthine oxidase inhibitory activity (41)
Cataract	Lowest degree of cataract (22)
	Reduced malondialdehyde (22)

DM: Diabetes mellitus; HT: hypertension; CKD: chronic kidney disease; LDL: low-intensity lipoprotein; HDL: high-density lipoprotein.

Source: Elaborated by the authors.

Notably, the properties with the most scientific evidence pertain to a hypoglycemic effect or reduction in blood glucose levels (21, 24, 34, 36, 42, 45-47). These are closely followed by those demonstrating reduced triglyceride levels (24, 28, 31, 32, 39) and decreased total cholesterol levels (28, 31, 32, 39, 43). Furthermore, the plant has shown beneficial effects on the healing of diabetic wounds (33, 38), in lowering systolic, diastolic blood pressure, and overall blood pressure (23, 26, 30, 44), in addressing obesity (35, 38, 39), and in treating CKD. This treatment for CKD is evidenced by the reduction of creatinine levels (25, 27, 29) and serum urea concentrations (25, 27), along with an increase in antioxidant enzyme levels (27, 29).

Discussion

Commonly, the first treatment option for chronic conditions includes drug therapy along with encouraging patients to change their lifestyles. An alternative, however, which remains underutilized, is the use of herbal medicine as a complement to conventional medication (48). In Brazil, policies have been implemented to encourage the therapeutic use and production of herbal medicine under the supervision of the National Health Surveillance Agency (49).

Diabetes mellitus is one of the most prevalent NCDs in the world. In 2021, 537 million individuals were diagnosed with DM, with Brazil accounting for 14.3 million of these cases (50). It is characterized by persistent hyperglycemia (51), and various studies have demonstrated the hypoglycemic effect of various treatments (21, 24, 34, 36, 42, 45-47). Hyperglycemia arises due to a deficiency in insulin production, action, or both (51). Specifically, the oral ingestion of the ethanolic extract of *A. cordifolia* has been documented to enhance insulin secretion (42). In the context of DM, pancreatic beta cells may be deficient, which are critical for insulin secretion and glucose tolerance (51, 52). It has been shown that oral treatment with this plant extract can repair these cells and improve glucose tolerance (21, 45, 47).

Moreover, an increase in the concentration of essential amino acids has been observed regarding DM (21). These amino acid chains play a pivotal role in protein synthesis within living organisms and are essential for muscle tissue strength, improved intestinal function, and blood sugar level regulation, among other functions (53). They are crucial supplements for individuals with DM, as they can lower blood glucose levels, enhance insulin resistance, and alleviate oxidative stress (54). Furthermore, they can reduce the likelihood of complications associated with DM, effectively diminishing the condition's damage (55).

As for DM complications, the most prevalent and significant are microvascular alterations, particularly diabetic neuropathy. Diabetic peripheral neuropathy, the most common form, results from chronic hyperglycemia and cardiovascular risk factors, manifesting as a symmetrical, diffuse, distal, and progressive lesion of both autonomic and sensory-motor fibers. Affected individuals experience

pain in the impacted area, negatively affecting their quality of life, functionality, and mood. It can lead to additional comorbidities such as anxiety, depression, insomnia, loss of functionality, and, notably, the diabetic foot (52).

With the global rise in DM prevalence, incidents of foot complications (e.g., diabetic foot) and infection and amputation rates have increased, constituting the most debilitating complications and leading to significant loss of functionality (52, 56). Two studies featured in this scoping review demonstrated the positive effects of *A. cordifolia* on healing diabetic wounds, with one utilizing an ointment combining the ethanolic extracts of the *A. cordifolia* and *Centella asiatica* plants at a 2 % concentration and the other employing a gel of the *A. cordifolia* leaf extract at concentrations of 10 and 30 % (33, 38). Its application has also been associated with an increase in fibroblast cell proliferation (33), which is critical for the healing process as these cells form a layer differing in function and structure from the original tissue, thereby generating the scar and contributing to regeneration.

One study reported that ingesting the ethanolic extract of the plant led to a reduction in liver weight (21). The liver is crucial for carbohydrate metabolism, and the regulation of glucose homeostasis, and excessive fat deposition constitutes non-alcoholic fatty liver, a chronic liver disease linked with obesity, insulin resistance, and type 2 DM, affecting up to 30 % of the general population and significantly predisposing individuals to type 2 DM (58).

Additionally, the oral administration of *A. cordifolia* extract has been shown to increase water intake and reduce fatty acid levels (21, 38). Fatty acids, while essential for the normal functionality of beta cells, can lead to fat accumulation in muscles, liver, and pancreas when in excess (45). Regarding water intake, hydration is critical in preventing and controlling DM, and low water consumption is associated with an increased risk of type 2 DM and cardiovascular, liver, and kidney problems (59).

In terms of HT, the studies present promising outcomes. HT is characterized by a persistent rise in blood pressure, confirmed using the correct technique at least two separate times in the absence of antihypertensive medication. Controlling blood pressure to normal levels is vital for diminishing the risk of both micro and macrovascular complications (60). In this context, the ethanolic extract from the leaves of *A. cordifolia* has proven effective in treating hypertension by reducing both systolic, diastolic blood (23, 30) and total blood pressure (26, 44).

Some factors directly influence blood pressure such as heart rate, which, when high, becomes a risk factor for the occurrence of adverse events and mortality in users with hypertension (61). Studies have shown that the plant's leaf extract reduces heart rate (37, 40), suggesting that research should be carried out on human beings, as the plant could be used to benefit people with hypertension.

Moreover, in experiments where the vasodilator effect was examined, the results were affirmatively in favor of using the extract (40, 44). The mechanisms of vasodilation and the application of drugs or phytomedicine that facilitate it are critically important in individuals with HT, as this process increases blood flow to the tissues and decreases blood pressure and central venous pressure, ultimately reducing cardiac workload (62).

Furthermore, the plant has demonstrated an ability to elevate nitric oxide levels and exhibited diuretic properties (30, 37). Nitric oxide plays a significant role in vasodilation, which leads to lower blood pressure and provides positive cardiac, renal, and vascular effects (62). Conversely, diuretics work to reduce intravascular volume through increased renal excretion of water and sodium. In cases of hypertension, the decline in intravascular volume results in decreased cardiac output and, consequently, a lowering of blood pressure (63).

Continuing with NCDs, CKD is characterized by a long-term and gradual deterioration of kidney function, with the most common causes being diabetic nephropathy (a complication of DM) and hypertensive nephrosclerosis (a complication of HT) (64). The diagnosis is based on various tests, including serum creatinine and urea levels. Creatinine is one of the biomarkers for CKD, whereas urea is extensively utilized in clinical settings to assess kidney function (65). Research demonstrating the effects of *A. cordifolia* on rats with CKD has shown its efficacy in reducing serum creatinine levels and serum urea concentrations (25, 27, 29). In addition, in the context of CKD, the use of the extract has led to improvements in kidney structure (27), increased antioxidant enzymes catalase and superoxide dismutase levels (27, 29), and reduced hydronephrosis (29). Antioxidant enzymes play a crucial role in the kidney's defensive mechanisms and in mitigating oxidative stress (66), while hydronephrosis is a condition characterized by kidney enlargement due to the obstruction of urine flow into the bladder, caused by a blockage in the ureter (29).

Another NCD for which evidence has been found is obesity. The application of the plant's ethanolic extract resulted in the inhibition of body weight increase and a diminution of the fat layer (35, 38, 39). Obesity is a NCD of multifactorial origin, implying that excess weight is associated with the population's lifestyle, shaped by historical, biological, ecological, social, economic, cultural, and political factors (67). It is also a risk factor for other NCDs, such as HT and DM (68).

Turning to clinical markers influenced positively by *A. cordifolia*, the lipid profile (total cholesterol, low-intensity lipoprotein [LDL], high-density lipoprotein [HDL], and triglycerides) has shown positive outcomes. Cholesterol is a lipid categorized into LDL and HDL. Elevated serum total cholesterol and LDL levels amplify the risk of cardiovascular disease (69-71). HDL, conversely, is vital for stabilizing total cholesterol, as it facilitates the transport of cholesterol to the liver, where it is sequestered and eliminated. It also contributes

to vascular protection by stimulating nitric oxide release and removing oxidized lipids from LDL (69).

Elevated triglyceride levels are identified as a risk factor for cardiovascular disease, HT, and DM. Individuals with hypertriglyceridemia (high triglyceride levels) are more prone to develop obesity, hepatic steatosis, and ectopic fat deposition (48, 60, 72, 73). For these clinical markers, the use of *A. cordifolia* has been shown to decrease serum triglyceride levels (24, 28, 31, 32, 39), total cholesterol levels (28, 31, 32, 39, 43), and LDL (31, 32, 39), in addition to increasing HDL (31, 39). Another clinical marker, uric acid, which is a product of purine metabolism, when elevated, results in hyperuricemia, known as gout (74). Gout is a form of inflammatory arthritis, with the most typical clinical presentation being intense acute inflammatory arthritis (75). Moreover, there is evidence that uric acid is significantly associated with hypertension, indicating that effective management is crucial in preventing HT (74). According to the findings of this scoping review, the plant extract exhibits an anti-hyperuricemic effect and inhibits the enzyme xanthine oxidase (41), which is responsible for converting xanthine into uric acid and thus directly relates to the quantity and rate of uric acid production (76).

Another pathology highlighted in the studies was cataracts, characterized by the opacification of the eye's lens, leading to impaired visual acuity, which can be partial or total. The prevalence of cataracts in diabetic patients is significantly higher—two to five times—compared to the general population (77). Additionally, it remains a leading cause of visual impairment among individuals with DM due to increased incidence and progression, as well as earlier occurrence. It is estimated that 20 % of cataract surgeries are conducted on patients with DM (78, 79). Regarding the therapeutic use of *A. cordifolia*, the plant demonstrated positive effects in an experiment on induced cataracts in goat lenses (22), where the treated lenses exhibited a lesser degree of cataract, along with a reduced concentration of malondialdehyde. Malondialdehyde, a biomarker indicative of oxidative stress, is closely linked to the development of cataracts; the higher its level, the greater the ocular lens turbidity and the cataract severity. The level reduction is presumably due to the extract's high antioxidant content (22).

After reviewing all the articles and learning about the benefits of *A. cordifolia* and its therapeutic potential, it is evident the plant holds promise for the production of herbal medicine. It is critical to acknowledge that scientific research has been a pivotal factor driving the increased interest in herbal medicine. There remains a need to enhance awareness about the vast biodiversity of medicinal plants in Brazil and how to access them for both the public and professionals who can offer guidance on their use (80).

Health professionals, especially nurses, are at the forefront of recognizing PICS and play a significant role in fostering the ex-

change and development of new knowledge regarding medicinal plants. Nevertheless, the lack of awareness about PICS and the absence of a scientific basis for these practices are barriers to providing safe care (81). Hence, professionals must possess scientific knowledge about medicinal plants, such as *A. cordifolia*, and encourage ongoing scientific research into their properties, effects, and safe usage to integrate them into future care practices (80).

Conclusions

This scoping review has facilitated the identification and mapping of evidence regarding the therapeutic properties of *Anredera cordifolia* in treating chronic non-communicable diseases. The compiled studies suggest that the plant may effectively treat DM, HT, CKD, obesity, and cataracts. Additionally, it has demonstrated the potential for controlling triglycerides, cholesterol, and uric acid levels.

The primary attributes identified include its hypoglycemic effects, antihypertensive activities, and ability to lower total cholesterol and triglyceride levels. It is also worth noting that *Anredera cordifolia* has been found to have healing properties for diabetic wounds, reduce serum creatinine levels, prevent body weight gain, and exhibit positive effects on factors directly influencing CNDs. Therefore, our findings contribute to advancing research on the therapeutic benefits of *Anredera cordifolia*, particularly highlighted by the urgency for further research in different geographical locations and by various researchers to validate the published research data.

Emphasizing and incorporating traditional knowledge into new research is crucial. Given the significance of medicinal plants and the positive impacts of *Anredera cordifolia* and its potential as a therapeutic resource in healthcare practice, further investigation in the field of nursing is suggested. This approach aims to provide a scientific foundation and support for the safe use of medicinal plants in healthcare settings.

Conflicts of interest: None declared.

Referências

1. Aguiar J, Kanan LA, Masiero AV. Práticas Integrativas e Complementares na atenção básica em saúde: um estudo bibliométrico da produção brasileira. Saúde Debate [Internet]. 2019 [acesso 7 abril 2023];43(123):1205-28. DOI: https://doi.org/10.1590/0103-1104201912318
2. Brasil. Ministério da Saúde. Práticas Integrativas e Complementares (PICS) [Internet]. Ministério da Saúde; 2020. [acesso 10 abril 2023]. Disponível em: https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/p/pics
3. Organização das Nações Unidas (ONU). Pnuma: Brasil possui entre 15% e 20% da diversidade biológica mundial [Internet]. 2019. [acesso 8 maio 2023]. Disponível em: https://news.un.org/pt/story/2019/03/1662482
4. Santana da Silva LW, Soares Pamponet LSP. Saberes populares no uso de plantas medicinais: tradição de valor familiar na convergência aos saberes científicos. Revista REVISE [Internet]. 2022 [acesso 13 fev. 2023];9:325-51. Disponível em: https://www3.ufrb.edu.br/index.php/revise/article/view/2646/1650
5. World Health Organization. Noncommunicable diseases progress monitor 2022 [Internet]. Geneva: World Health Organization; 2022 [acesso 11 mar. 2023]. Disponível em: https://iris.who.int/bitstream/handle/10665/353048/9789240047761-eng.pdf?sequence=1

6. Figueiredo AEB, Ceccon RF, Figueiredo JHC. Doenças crônicas não transmissíveis e suas implicações na vida de idosos dependentes. Cien Saude Colet [Internet]. 2021 [acesso 8 maio 2023];26(1). DOI: https://doi.org/10.1590/1413-81232020261.33882020

7. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. Plano de ações estratégicas para o enfrentamento das doenças crônicas e agravos não transmissíveis no Brasil 2021-2030. Brasília: Ministério da Saúde; 2021 [acesso 8 maio 2023]. Disponível em: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/doencas-cronicas-nao-transmissiveis-dcnt/09-plano-de-dant-2022_2030.pdf/view

8. Barros DM. A utilização de plantas medicinais no processo terapêutico complementar das doenças crônicas não transmissíveis. In: Pereira TT, Castro LHA, Oesterreich SA, editores. Ciências da saúde campo promissor em pesquisa. Ponta Grossa: Atena Editora; 2020. p. 22-40.

9. Badke MR, Barbieri RS, Cogo SB, Essi L, Alvim NAT, da Silva RAR et al. Natural resources for therapeutic use: Evidence from Brazil. Res Rev J Nurs Health Sci [Internet]. 2021 [cited 2023 Apr 9];7(1):24-34. Disponível em: https://portal.uern.br/wp-content/uploads/2021/01/natural-resources-for-therapeutic-use-evidence-from-brazil-1.pdf

10. Pellegrini MOO, Imig DC. Basellaceae in Flora do Brasil [Internet]. Jardim Botânico do Rio de Janeiro 2020 [acesso 5 fev. 2023]. Disponível em: https://floradobrasil2020.jbrj.gov.br/FB5558

11. Martinevski CS, Oliveira VR de, Rios A de O, Flores SH, Venzke JG. Utilização de bertalha (anredera cordifolia (ten.) Steenis) e ora-pro-nobis (pereskia aculeata mill.) na elaboração de pães. Alimentos e Nutrição [Internet]. 2013 [acesso 5 abril 2023];24(3). Disponível em: https://doaj.org/article/6b8f3706f4ea4b1ab763fb0976393c91

12. Cordeiro SZ. Anredera cordifolia (Ten.) Steenis [Internet]. Universidade Federal do Estado do Rio de Janeiro. 2021 [acesso 4 jan. 2023]. Disponível em: https://www.unirio.br/ccbs/ibio/herbariohuni/anredera-cordifolia-ten-steenis

13. Heisler EV, Badke MR, Andrade A, Rodrigues MGS. Saber popular sobre a utilização da planta Anredera cordifolia (folha gorda) [Internet]. Texto & contexto enferm. 2012 [acesso 5 fev. 2023];21(4):937-44. DOI: https://doi.org/10.1590/S0104-07072012000400026

14. Kinupp VF, Amaro FS, Barros IBI. Anredera cordifolia (Basellaceae), uma hortaliça potencial em desuso no Brasil [Internet]. 2013. [acesso 5 fev. 2023]. Disponível em: https://ssmfoto.files.wordpress.com/2012/08/kinupp-amaro-barros_2004_anredera.pdf

15. Nxumalo CI, Ngidi LS, Shandu JSE, Maliehe TS. Isolation of endophytic bacteria from the leaves of Anredera cordifolia CIX1 for metabolites and their biological activities [Internet]. BMC Complementary Med Ther. 2020 [cited 2023 Mar 4];20(300). DOI: https://doi.org/10.1186/s12906-020-03095-z

16. Souza LF, de Barros IBI, Mancini E, Martino LD, Scandolera E, Feo VD. Chemical composition and biological activities of the essential oil from Anredera cordifolia grown in Brazil [Internet]. Nat Prod Commun. 2014 [cited 2023 Apr 5];9(7):1003-1006. Disponível em: https://journals.sagepub.com/doi/epdf/10.1177/1934578X1400900730

17. Yuniarti WM, Lukiswanto BS. Effects of herbal ointment containing the leaf extracts of Madeira vine (Anredera cordifolia (Ten.) Steenis) for burn wound healing process on albino rats [Internet]. Vet World. 2017 [cited 2023 Apr 24];10(7):808-13. DOI: https://doi.org/10.14202/vetworld.2017.808-813

18. JBI Manual for Evidence Synthesis [Internet]. The Joanna Briggs Institute. 2020 [cited 2022 Feb 19]. Disponível em: https://jbi-global-wiki.refined.site/space/MANUAL

19. Munn Z, Pollock D, Khalil H, Alexander L, Mclnerney P, Godfrey CM et al. What are scoping reviews? Providing a formal definition of scoping reviews as a type of evidence synthesis [Internet]. JBI Evid Synth. 2022 [acesso 29 fev. 2022];20(4):950-2. DOI: https://doi.org/10.11124/JBIES-21-00483

20. Bardin L. Análise de conteúdo. Reto LA, Pinheiro A, tradutores. São Paulo: Edições 70; 2016.

21. Dwitiyanti D, Harahap Y, Elya B, Bahtiar A. Binahong (Anredera cordifolia (Tenore) Steen.) leaf extract modulates fatty acids and amino acids to lower blood glucose in high-fat diet-induced diabetes mellitus rats [Internet]. Adv Pharmacol Pharm Sci. 2021 [acesso 14 jun. 2022];2021:e8869571. DOI: https://doi.org/10.1155/2021/8869571

22. Feriyani F, Maulanza H, Lubis RR, Balqis U, Darmawi D. Effects of Binahong (Anredera cordifolia (Tenore) Steenis) extracts on the levels of malondialdehyde (MDA) in cataract goat lenses [Internet]. Scientific World Journal. 2021 [cited 2022 Jun 14];2021:e661792. DOI: https://doi.org/10.1155/2021/6617292

23. Sukandar E, Suliska N, Suryani, Insanu M. Antihypertensive activity of combination of anredera cordifolia (Ten.) V. Steenis and Sonchus arvensis L. leaves on Epinephrine induced male Wistar rat [Internet]. J Adv Pharm Technol Res. 2021 [cited 2022 Jun 14];12(4):384. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8588926/

24. Hashimoto M, Matsuzaki K, Maruyama K, Sumiyoshi E, Hossain S, Wakatsuki H et al. Perilla frutescens seed oil combined with Anredera cordifolia leaf powder attenuates age-related cognitive decline by reducing serum triglyceride and glucose levels in healthy elderly Japanese individuals: A possible supplement for brain health [Internet]. Food Funct. 2022 [cited 2022 Jun 15];13(13):7226-39. DOI: https://doi.org/10.1039/D2FO00723A

25. Sukandar EY, Fidrianny I, Adiwibowo LF. Efficacy of ethanol extract of Anredera cordifolia (Ten) Steenis leaves on improving kidney failure in rats [Internet]. Int J Pharmacol. 2011 [cited 2023 Feb 13];1;7(8):850-5. DOI: https://doi.org/10.3923/ijp.2011.850.855

26. Sukandar EY, Garmana AN, Aidasari AU, Crystalia AA. Antihypertensive activity of ethanol extract combination of Anredera cordifolia (Ten.) v. Steenis and Sonchus arvensis L. leaves on angiotensin II- induced male wistar rat [Internet]. J Res Pharm. 2019 [cited 2023 Feb 13];15;23(6):1090-7. Disponível em: https://jrespharm.com/uploads/pdf/pdf_MPJ_747.pdf

27. Sukandar EY, Sigit JI, Adiwibowo LF. Study of kidney repair mechanisms of corn silk (Zea mays L. Hair)-Binahong (Anredera cordifolia (Ten.) Steenis) leaves combination in rat model of kidney failure [Internet]. Int J Pharmacol. 2013 [cited 2023 Feb 13];9(1):12-23. DOI: https://doi.org/10.3923/ijp.2013.12.23

28. Dwitiyanti, Rorenza T. The Effect of 96 % Ethanol extract of Binahong leaf on hyperglycemia white male rats using total cholesterol and triglyceride parameters [Internet]. IOP Conf Ser Earth Environ Sci. 2021 [cited 2023 Feb 13];1;755(1):012005. DOI: https://doi.org/10.1088/1755-1315/755/1/012005

29. Bahtiar A, Utami PS, Noor MR. The antioxidant effects of the ethanolic extract of Binahong leaves unilateral ureteral obstruction rat model [Internet]. Pharmacogn J. 2021 [cited 2023 Feb 13];13(1):185-8. DOI: https://doi.org/10.5530/pj.2021.13.26

30. Garmana AN, Sukandar EY, Fidrianny I. Preliminary study of blood pressure lowering effect of Anredera cordifolia (Ten.) Steenis) on Wistar rats [Internet]. Int J Pharmacogn Phytochem Res. 2016 [cited 2023 Feb 13];8(2);300-4. Disponível em: https://www.researchgate.net/publication/298090613

31. Lestari D, Sukandar EY, Fidrianny I. Anredera cordifolia leaves fraction as an antihyperlipidemia [Internet]. Asian J Pharm Clin Res. 2016 [cited 2023 Feb 13];9(6):82-4. DOI: https://doi.org/10.22159/ajpcr.2016.v9i6.13628

32. Sukandar EY, Safitri D, Aini NN. The study of ethanolic extract of binahong leaves (anredera cordifolia [ten.] Steenis) and mulberry leaves (morus nigra l.) In combination on hyperlipidemic-induced rats [Internet]. Asian J Pharm Clin Res. 2016 [cited 2023 Feb 13];9(6):288-92. DOI: https://doi.org/10.22159/ajpcr.2016.v9i6.14412

33. Sutrisno E, Sukandar EY, Fidrianny I, Adnyana IK. Wound healing in vivo and in vitro study of binahong leaves (anredera cordifolia (ten.) Steenis) and pegagan (centella asiatica (l.) Urban) ethanolic extract [Internet]. Pharmacologyonline. 2018 [cited 2023 Feb 13];112:111-6. Disponível em: https://pharmacologyonline.silae.it/files/archives/2018/vol1/PhOL_2018_1_A012_Sutrisno.pdf

34. Wahjuni S, Rustini NL, Putri L. Effects of Binahong (Anredera Cordifolia) Leaf ethanol extracts on blood glucose levels and pancreas histopathology in hyperglycemic rats [Internet]. JGPT. 2019 [cited 2023 Feb 14];11(4):437-42. Disponível em: https://erepo.unud.ac.id/id/eprint/29258/1/ccf668d0e69b1d873397b8694bbd62a3.pdf

35. Sukandar EY, Kurniati NF, Nurdianti AN. Antiobesity effect of ethanol extract of anredera cordifolia (ten) steenis leaves on obese male wistar rats induced by high-carbohydrate diet [Internet]. Int J Pharm Pharm Sci. 2016 [cited 2023 Feb 14];8(4):171-3. Disponível em: https://journals.innovareacademics.in/index.php/ijpps/article/view/10083

36. Djamil R, Winarti W, Zaidan S, Abdillah S. Antidiabetic activity of flavonoid from Binahong leaves (Anredera cordifolia) extract in Alloxan induced mice [Internet]. J Pharmacogn Nat Prod. 2017 [cited 2023 Feb 14];3(2):e1000139. DOI: https://doi.org/10.4172/2472-0992.1000139

37. Garmana AN, Sukandar EY, Fidrianny I. Antihypertension study of Anredera cordifolia (ten). V. Steenis extract and its fractions in rats through dexamethasone induction and nitric oxide release [Internet]. Asian J Pharm Clin Res. 2018 [cited 2023 Feb 15];11(1):278-82. DOI: https://doi.org/10.22159/ajpcr.2018.v11i1.22312

38. Kintoko, Desmayanti A. The effectivity of ethanolic extract of Binahong leaves (Anredera cordifolia (tenore) steen) gel in the management of diabetic wound healing in aloxan-induced rat models [Internet]. JKKI. 2016 [cited 2023 Feb 15];7(5):227-36. DOI: https://doi.org/10.20885/JKKI.Vol7.Iss5.art9

39. Lestari D, Sukandar EY, Fidrianny I. *Anredera cordifolia* leaves extract as Antihyperlipidemia and Endothelial fat content reducer in male Wistar rat [Internet]. Int J Pharm Clin Res. 2015 [cited 2023 Feb 13];7(6):435-39. Disponível em: https://impactfactor.org/PDF/IJPCR/7/IJPCR,Vol7,Issue6,Article11.pdf

40. Sukandar EY, Ridwan A, Sukmawan YP. Vasodilatation effect of ethanolic extract of anredera cordifolia, sonchus arvensis l, and ursolic acid on isolated rabbit aortic and frog heart [Internet]. Int J Pharm Pharm Sci. 2016 [cited 2023 Feb 18];8(2):145-9. Disponível em: https://journals.innovareacademics.in/index.php/ijpps/article/view/9653

41. Widyarini KD, Sukandar EY, Fidrianny I. Xanthine oxidase inhibitory and antihyperuricemic activities of Anredera cordifolia (ten) steenis, sonchus arvensis l, and its combination [Internet]. Int J Pharm Pharm Sci. 2015 [cited 2023 Feb 13];7(3):86-90. Disponível em: https://impactfactor.org/PDF/IJPPR/8/IJPPR,Vol8,Issue2,Article15.pdf

42. Astuti SM, Sakinah AMM, Risch A. The triterpenoid saponin from Binahong [Anredera cordifolia (Ten) Steenis] to potential using as antidiabetic activity in animal laboratory. [Internet]. Proceeding of International Conference on Drug Development of Natural Resources. 2012 [cited 2023 Feb 13]. Disponível em: http://devel.uad.ac.id/farmasi/wp-content/uploads/52-The-Triterpenoid-Saponin-From-Binahong-...pdf

43. Wahjuni S. Anti-hyperchloesterolmia of Anredera cordifolia in hypercholesterolemic Wistar rats through malondialdehyde and 8-hydroxy-diguanosine [Internet]. InaBJ. 2014 [cited 2023 Feb 14];16;8(1):4. DOI: https://doi.org/10.15562/ijbs.v8i1.7

44. Sukandar EY, Ridwan A, Sukmawan YP. Vasodilatation effect of ethanolic extract of anredera cordifolia, sonchus arvensis l, and ursolic acid on isolated rabbit aortic and frog heart [Internet]. Int J Pharm Pharm Sci. 2016 [cited 2023 Feb 10];8(2):145-9. Disponível em: https://journals.innovareacademics.in/index.php/ijpps/article/view/9653

45. Sukandar EY, Qowiyyah A, Larasari L. Effect of methanol extract hearhleaf madeiravine (anredera cordifolia (ten.) steenis) leaves on blood sugar in diabetes mellitus model mice [Internet]. Jurnal Medika Planta. 2011 [cited 2023 Feb 14];1(4). Disponível em: https://www.neliti.com/publications/245773/effect-of-methanol-extract-hearhleaf-madeiravine-anredera-cordifolia-ten-steenis - id-section-content

46. Kusriani H, Susilawati E, Nurafipah L, Nurkholifah. Antidiabetic activity of combination of Binahong (Anredera cordifolia Ten. Steenis), Cherry (Muntingia calabura L.) and Brotowali (Tinospora crispa L.) Extracts [Internet]. J Pharm Bioallied Sci. 2023 [cited 2023 Feb 14];15(2):75-80. DOI: https://doi.org/10.4103/jpbs.jpbs_917_21

47. Sulfianti A, Firdausi N, Nurhadi N, Ngatinem N, Agustini K, Ningsih S. Antidiabetic activity of *Anredera cordifolia* (Ten.) Stennis extracts with different ethanol percentages: An evaluation based on *in vitro*, *in vivo*, and molecular studies [Internet]. Pharmacia. 2023 [cited 2023 Feb 14];70(1):39-47. DOI: https://doi.org/10.3897/pharmacia.70.e94899

48. Tomaz PA, Silva Junior WF da. Medicamentos fitoterápicos utilizados no tratamento de doenças crônicas não transmissíveis [Internet]. Res Soc Dev. 2022 [acesso 15 fev. 2023];11(10):e439111033036. DOI: https://doi.org/10.33448/rsd-v11i10.33036

49. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Instrução Normativa N° 2 de 13 de maio de 2014 [Internet]. Brasília: Ministério da Saúde; 2014. Disponível em: https://fitoterapiabrasil.com.br/sites/default/files/legislacao/in_02_2014.pdf

50. International Diabetes Federation Diabetes atlas 10TH edition - Home [Internet]. Diabetesatlas.org. 2021 [cited 2022 Nov 17]. Disponível em: https://diabetesatlas.org/atlas/tenth-edition/

51. Sociedade Brasileira de Diabetes. Diretrizes sociedade brasileira de diabetes 2019-2020 [Internet]. 2019 [acesso 17 nov. 2022]. Disponível em: http://www.saude.ba.gov.br/wp-content/uploads/2020/02/Diretrizes-Sociedade-Brasileira-de-Diabetes-2019-2020.pdf

52. Bertoluci MC, Forti AC e, Pititto B de A, Vancea DMM, Malerbi FEK, Valente F et al. Diretriz Oficial da Sociedade Brasileira de Diabetes [Internet]. 2023 [acesso 10 jan. 2023]. DOI: https://doi.org/10.29327/557753

53. Nascimento TM. Importância das proteínas na nutrição humana — teoria e prática para ensino médio [Trabalho de conclusão de curso]. Assis: Fundação Educacional do Município de Assis; 2010 [acesso 15 abr. 2023]. Disponível em: https://cepein.femanet.com.br/BDigital/arqTccs/0711290031.pdf

54. Caletti G, Bock PM. Ação do aminoácido taurina no diabetes mellitus [Internet]. Rev. bras. nutr. clín. 2009 [acesso 23 abril 2023];25(3):243-50. Disponível em: http://www.braspen.com.br/home/wp-content/uploads/2016/12/12-Ação-do-aminoácido-taurina-no-diabetes-mellitus.pdf

55. Simonard H, Maia SG, Gon GW, Grimm KS, Rosa GCB. Papel da suplementação de taurina em pacientes diabéticos [Trabalho de conclusão de curso]. Joinville: Centro Universitário SOCIESC; 2021 [acesso 16 abr. 2023]. Disponível: https://repositorio.animaeducacao.com.br/handle/ANIMA/20477

56. Muzy J, Campos MR, Emmerick I, Silva RS da, Schramm JM de A. Prevalência de diabetes mellitus e suas complicações e caracterização das lacunas na atenção à saúde a partir da triangulação de pesquisas [Internet]. Cad. Saúde Pública. 2021 [acesso 23 fev. 2023];37(5):e00076120. DOI: https://doi.org/10.1590/0102-311x00076120

57. Clark RA, Ghosh K, Tonnesen MG. Tissue engineering for cutaneous wounds [Internet]. J Invest Dermatol. 2007 [cited 2023 Mar 14];127(5):1018-29. DOI: https://doi.org/10.1038/sj.jid.5700715

58. Giestas S, Giestas A, Agostinho C. Doença hepática e diabetes mellitus: uma relação bi-direcional [Internet]. RPD. 2015 [acesso 15 mar. 2023];10(4):158-66. Disponível em: http://www.revport-diabetes.com/wp-content/uploads/2017/11/RPD-Vol-10-nº-4-Dezembro-2015-Artigo-de-Revisão-págs-158-166.pdf

59. Martinez H, Morin C, Gandy J. Fluid intake of Latin American adults: Results from four 2016 Liq In surveys in 7 national cross-sectional surveys [Internet]. Eur J Nutr. 2018 [cited 2023 Mar 15];57:65-75. DOI: https://doi.org/10.1007/s00394-018-1724-z

60. Barroso WKS, Rodrigues CIS, Bortolotto LA, Mota-Gomes MA, Brandão AA, Feitosa AD de M et al. Diretrizes Brasileiras de Hipertensão Arterial – 2020 [Internet]. Arq Bras Cardiol. 2021 [acesso 15 mar. 2023];116(3):516-658. Disponível em: http://departamentos.cardiol.br/sbc-dha/profissional/pdf/Diretriz-HAS-2020.pdf

61. Rubio TA. Frequência cardíaca na hipertensão: revisão e opinião do especialista [Internet]. Rev Bras Hipertens. 2019 [acesso 8 abril 2023];26(4):144-6. Disponível em: http://departamentos.cardiol.br/sbc-dha/profissional/revista/26-4/07_revista brasileira de hipertensão_26_n4.pdf

62. Guerra ALN, Araújo SRN. Óxido nítrico no controle da hipertensão arterial sistêmica: uma revisão de literatura [Trabalho de conclusão de curso]. Brasília: Universidade Católica de Brasília; 2013 [acesso 23 mar. 2023]. Disponível em: https://repositorio.ucb.br:9443/jspui/bitstream/123456789/8601/1/AdrianeLôpodoNascimentoGuerraTCCGraduacao2013.pdf

63. Gonçalves AC, Lirio PHC, Ferraz MJRB, Moreira EAM. Benefits of drug association of diuretics and angiotensin-converting enzyme inhibitors in the treatment of systemic arterial hypertension [Internet]. BJHR. 2021 [cited 2023 Mar 24];4(2):5268-80. DOI: https://doi.org/10.34119/bjhrv4n2-100

64. Malkina A. Doença renal crônica [Internet]. Manuais MSD edição para profissionais. 2022 [acesso 15 mar. 2023]. Disponível em: https://www.msdmanuals.com/pt-br/profissional/distúrbios-geniturinários/doença-renal-crônica/doença-renal-crônica

65. Abensur H. Biomarcadores na Nefrologia [E-book]. Sociedade Brasileira de Nefrologia. São Paulo: Roche; 2011. Disponível em: https://www.periciamedicadf.com.br/manuais/biomarcadores_na_nefrologia.pdf

66. Duarte F, Pessoa EA, Reis LA, Schor N, Borges FT. Priming prevent nephrotoxic acute renal failure through stimulation of antioxidant defense mechanism [Internet]. J. bras. nefrol. 2016 [acesso 23 mar. 2023];38(2):161-72. DOI: https://doi.org/10.5935/0101-2800.20160025

67. Brasil. Ministério da Saúde. Secretaria de Ciência, Tecnologia e Insumos Estratégicos. Departamento de Assistência Farmacêutica. Política nacional de plantas medicinais e fitoterápicos [Internet]. Brasília: Ministério da Saúde; 2006. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/politica_nacional_fitoterapicos.pdf

68. Nilson EAF, Andrade R da CS, Brito DA de, Michele Lessa de O. Custos atribuíveis a obesidade, hipertensão e diabetes no Sistema Único de Saúde, Brasil, 2018 [Internet]. Rev. panam. salud pública. 2020 [acesso 20 abr. 2023];44(32). DOI: https://doi.org/10.26633/RPSP.2020.32

69. Kurmus O, Erkan AF, Ekici B, Aslan T, Eren M. Discordância entre Colesterol LDL e Não-HDL e Gravidade da Doença Arterial Coronária [Internet]. Arq. bras. cardiol. 2020 [acesso 20 abril 2023];114(3):469-75. DOI: https://doi.org/10.36660%-2Fabc.20190091

70. Malta DC, Szwarcwald CL, Machado ÍE, Pereira CA, Figueiredo AW, Sá ACMGN de et al. Prevalência de colesterol total e frações alterados na população adulta brasileira: Pesquisa Nacional de Saúde [Internet]. Rev. bras. epidemiol. 2019 [acesso 21 abr. 2023]; 22(2):e190005.supl.2. DOI: https://doi.org/10.1590/1980-549720190005.supl.2

71. Sá ACMGN de, Machado ÍE, Bernal RTI, Malta DC. Fatores associados ao LDL-Colesterol aumentado na população adulta brasileira: Pesquisa Nacional de Saúde [Internet]. Ciênc. Saúde Colet. 2021 [acesso 21 abr. 2023];26(2):541-53. DOI: https://doi.org/10.1590/1413-81232021262.37102020

72. Moura EG, Mateus KC da S, Batista PB, Bonfante ILP, Godoi ÉC, Santos MR dos et al. Particularidades dos diferentes tecidos adiposos [Internet]. Conexões. 2019 [acesso 15 abril 2023];17:e019019. DOI: https://doi.org/10.20396/conex.v17i0.8653471

73. Schroeder IH. Avaliação dos níveis de triglicerídeos em diferentes tempos de jejum após alta ingesta de gordura e carboidratos [Trabalho de conclusão de curso]. Lajeado: Universidade do Vale do Taquari; 2018 [acesso 15 mar. 2023]. Disponível em: https://www.univates.br/bduserver/api/core/bitstreams/c26f-7b3e-12bf-46b2-ac7c-fa84b3b5ac55/content

74. Zhu L, Zhang X, Fang Z, Jin Y, Chang W, Chen Y et al. Associação entre ácido úrico sérico e pré-hipertensão e hipertensão entre adultos chineses [Internet]. Arq. bras. cardiol. 2021 [acesso 17 abr. 2023];116(6):1072-8. DOI: https://doi.org/10.36660/abc.20200098

75. Azevedo VF, Lopes MP, Catholino NM, Paiva E dos S, Araújo VA, Pinheiro G da RC. Revisão crítica do tratamento medicamentoso da gota no Brasil [Internet]. Rev. bras. reumatol. 2017 [acesso 15 abr. 2023];57(4):346-55. DOI: https://doi.org/10.1016/j.rbre.2017.03.002

76. Medeiros IG, Silva C, Alcoforado I. Xantina e xantina oxidase do ácido úrico à gota. Rev. trab. acadêm. Univer. Recife. [Internet]. 2017 [acesso 20 abr. 2023];4(2). Disponível em: http://revista.universo.edu.br/index.php?journal=1UNICARECIFE2&page=article&op=viewArticle&path %5B %5D=5827

77. Serra TCS, De Paula ACN, Amorim ACC, Cardoso DD, Rocha FP, Dos Santos LR, et al. Associação entre catarata e diabetes: epidemiologia, fisiopatologia e principais complicações pós-operatórias [Internet]. Braz J Dev. 2022 [acesso 20 abr. 2023]; 8(5):34269-80. DOI: https://doi.org/10.34117/bjdv8n5-106

78. Labetoulle M, Behndig A, Tassignon M-J, Nuijts R, Mencucci R, Güell JL et al. Safety and efficacy of a standardized intracameral combination of mydriatics and anesthetic for cataract surgery in type-2 diabetic patients [Internet]. BMC Ophthalmol. 2020 [acesso 20 abr. 2023];20(81). DOI: https://doi.org/10.1186/s12886-020-01343-x

79. Naderi K, Gormley J, O'Brart D. Cataract surgery and dry eye disease: A review [Internet]. Eur J Ophthalmol. 2020 [acesso 21 abr. 2023];30(5):840-55. DOI: https://doi.org/10.1177/1120672120929958

80. Ferreira ET, Santos ES, Monteiro JS, Gomes MSM, Menezes RAO, Souza MJC. A utilização de plantas medicinais e fitoterápicos: uma revisão integrativa sobre a atuação do enfermeiro [Internet]. BJHR. 2019 [acesso 20 abr. 2023];2(3):1511-23. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/1383

81. Soares DP, Coelho AM, Silva LEA da, Silva R de JR da, Figueiredo CR de, Fernandes MC. Política nacional de práticas integrativas e complementares em saúde: discurso dos enfermeiros da atenção básica [Internet]. RECOM. 2019 [acesso 20 abr. 2023];9:e3265. DOI: https://doi.org/10.19175/recom.v9i0.3265