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DETERMINATION OF METABOLITES FROM STAR APPLE LEAF (*CHRYSOPHYLLUM CAINITO* L.) GROWN IN CAMPECHE

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Abstract: The star apple is a tree found in the State of Campeche. Its leaves are used in the northern region because medicinal properties have been attributed to it. It has been used as a treatment for diabetes mellitus and joint rheumatism. The results obtained from oven drying, in aqueous extract at room temperature, are: flavonoids +, reducing sugars +; in hot aqueous extract they are: flavonoids +, alkaloids +, essential oils +, amino acids +, reducing sugars +; in ethanolic extract at room temperature they are: phenols +, tannins +, flavonoids +, essential oils +, triterpenes +, anthocyanidins +, reducing sugars +; In hot aqueous extracts they are: phenols +, tannins +, flavonoids +, essential oils +, triterpenes +, anthocyanidins +. The presence of flavonoids as antioxidants in the four leaf extracts provides benefits in human health care. The presence of essential oils with cholagogue and choleretic effect activities, others manifest an antirheumatic, anti-inflammatory action, due to its benefits it is used by the Campechana population.
Keywords: Star apple, Screening, Secondary Metabolites

INTRODUCTION

The star apple (*Chrysophyllum cainito L.)* is a very leafy tropical fruit tree with a height between 8 to 30 m. Its stem is characterized by being straight and subtly irregular. The bark is grayish brown to dark gray, longitudinally fissured, detaching in large, elongated pieces. The trunk frequently branches, consequently, the thin and inclined branches give it an asymmetrical orientation. It has alternate elliptical or oblong-elliptic leaves of 5-15 cm, smooth margins, convex base and acuminate apex, leathery blades, glossy on the upper surface and markedly pubescent on the underside. Pubescence gives a golden color to its leaves, a characteristic that makes it a favorite ornamental species (Mar Jiménez & Vargas Simón, 2022).

The star apple (Chrysophyllum cainito L.) is one of the most popular fruits of the Sapotaceae family in the Yucatan Peninsula, Mexico, and is native to Central America, however, some authors consider it to be native to the West Indies of the Caribbean and which is acclimatized in areas from southern Mexico to Panama. Therefore, this species generally develops at low altitudes, in both dry and humid places. It is common to observe populations of this fruit tree on farms on the banks of rivers and even in dry areas of the Pacific, where it commonly blooms and bears fruit from the month of July (Carranza, 2020).

Its fruits can be purple or green, they are consumed fresh and sold on a small scale; These are subglobose berries 5 to 10 cm in diameter, smooth, with fleshy, sweet pulp, they can be purple-red, dark purple or pale green and with an average weight of 128.9 g, in addition, their seed is in the center presenting the appearance of an asterisk when cut transversely, giving the fruit its common name in English "star apple", this is seen in Figure 1.

Figure 1 Star apple fruit

Source: (Valencia, 2022)

DEVELOPMENT

One of the ways to publicize the benefits and properties of natural resources is through study in a laboratory known as Phytochemical Screening, to determine the metabolites present and allow them to understand why the star apple is not only used as a fruit tree, but The leaf is also used for its properties, the usefulness of the leaf is a knowledge of the older people of the state of Campeche.

METHODOLOGY

To carry out the determination of the metabolites, the techniques from the work carried out by the Ministry of Public Health (MINSAP, 1997) were used.

To carry out this work, star apple leaves collected in Pomuch, Hecelchakán, Campeche were used. The base raw material was the leaves of the star star plant.

Figure 2 shows the diagram of the process used during the development of this work, where it is observed that the initial sample before drying corresponds to 600 g per sample, from which fractions of 10 g were subsequently taken for each type of extract. either aqueous or ethanolic, at room temperature (T.A. *) or hot, respectively.

The techniques for carrying out Phytochemical Screening are mentioned below; they were developed based on the work carried out by the Ministry of Public Health (MINSAP, 1997).

Ferric chloride technique (Phenols and Tannins).

Bornträger test (Quinonas).

Shinoda Method (Flavonoids).

Baljet test (Lactones).

Dragendorff Method (Alkaloids).

Sudan Test (Essential Oils).

Ninhydrin Technique (Free amino acids or amines).

Determination of triterpenes. Libermann-Burchard test (Steroidals and triterpenes).

Kedde test (Cardiotonic glycosides).

Determination of Anthocyanhydrins.

Fehling test (reducing sugars).

RESULTS

The results obtained from the determination of the Phytochemical Screening of star apple (*Chrysophyllum cainito L.)* are shown, in the extraction solvents: water and ethanol, used at room temperature and hot as appropriate.

Phenols were found in star apple leaves; polyphenols are a heterogeneous group of molecules that share the characteristics of having in their structure several benzene groups replaced by hydroxyl groups (Zavaleta et al., 2012). Phenolic antioxidants are naturally occurring chemical compounds in many varieties of plants and foods, but they can also be synthetic. They have the property of delaying the oxidation of an oxidizable substrate through several mechanisms such as the chelation of free radicals and the interception of free oxygen. The hypothesis concerning antioxidant compounds is that they prevent oxidation due to their ability to trap free radicals and delay lipid peroxidation, thus reducing cellular damage by inhibiting low-density lipoprotein oxidation and protecting DNA. Vitamins E and C, along with phenolic compounds, are the main antioxidants found in foods of plant origin. The antioxidant capacity of phenolic compounds is based on their ability to complex free radicals (Ruiz et al., 2018).

The presence of tannins that have different molecular weights and chemical structures of groups derived from gallic acid, phloroglucinol, catechins and epicatechins was found in the leaves. These natural tannins have different pharmacological activities and

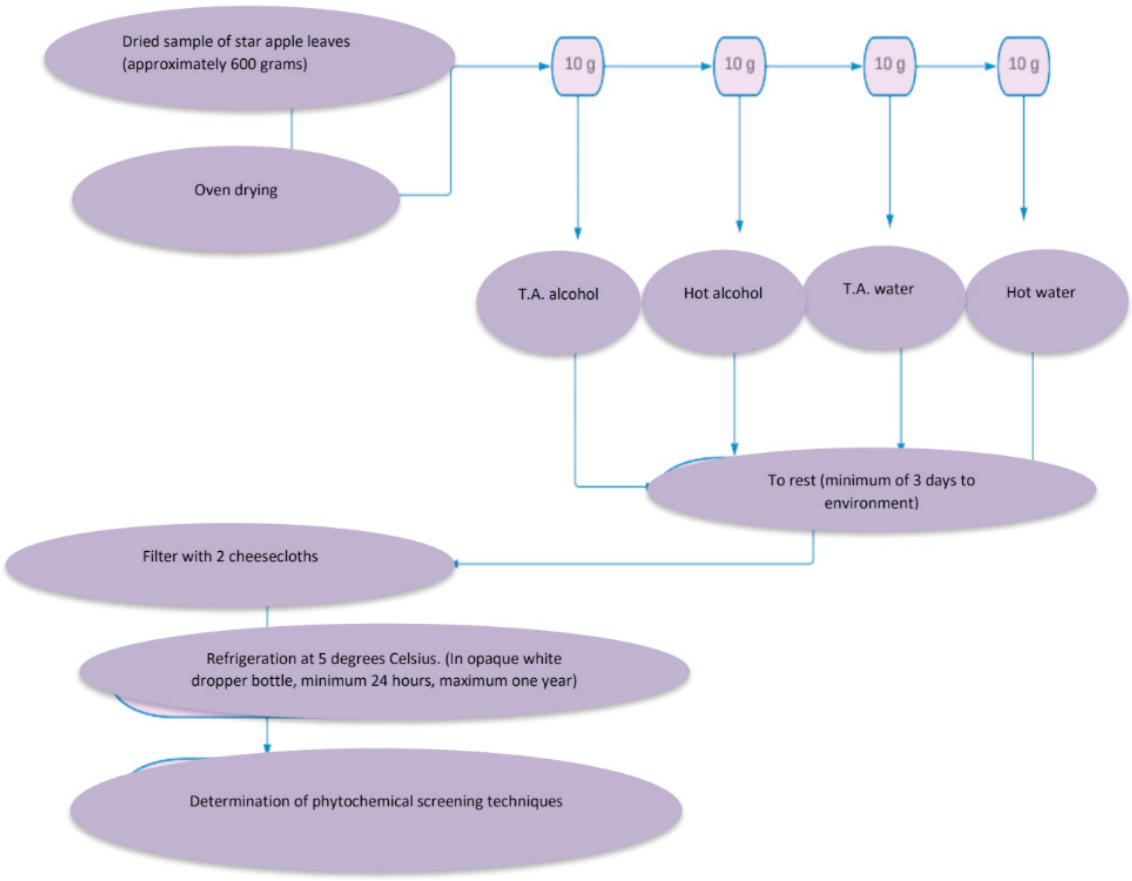

Figure 2. Process diagram

Source: own elaboration

Metabolites	Aqueous Extract Room temperature	Aqueous Extract Hot	Ethanolic Extract Room temperature	Ethanolic Extract Hot
Phenols	-	-	+	+
Tannins	-	-	+	+
Quinones	-	-	-	-
Flavonoids	+	+	+	+
Lactones	-	-	-	-
Alkaloids	-	+	-	-
Essential oils	-	+	+	+
Amino acids	-	+	-	-
Triterpenes	-	-	+	+
Cardiotonic glycosides	-	-	-	-
Anthocyanidins	-	-	+	+
Reducing sugars	+	+	+	-

Table 1 Results of Phytochemical Screening of Starflower Leaf (Chrysophyllum cainito L.)

Source: own elaboration

relevant applications, due to the appropriate use of their concentration and dose. Rosero,2021 agrees that antioxidant power is the main biological activity of tannins, being the basis for the rest of the functions. At the same time, condensed tannins are considered to be more related to applications, their use is more common, they are stable and non-toxic, and both hydrolyzable and condensed tannins denote a greater amount of pharmacological activities due to the strong bonds formed. with proteins, turning them into preventive sources of degenerative diseases (Rosero, 2021).

Due to the presence in the leaves of flavonoids, which are a class of phenolic compounds responsible for plant pigments and the color of fruits and flowers (Bone and Mills 2013). Plants rich in flavonoids exhibit adequate bioavailability against the characteristics of an adverse effect and also provide protection against Covid-19 (Alzaabi et al., 2022). Plants contain differentials of polyphenols and flavonoids, which is why they reduce oxidative stress due to the capture of free radicals, and their variations in nine chemical components are due to geographical origin (Phuyal et al., 2020). The presence of flavonoids in plant extracts has antioxidant properties and other phytochemicals are present (Wuttisin et al., 2021).

The alkaloids present in the leaf provide its interesting pharmacological properties due to quinoline compounds; Many of its derivatives can act as powerful analgesic agents, hypertensive agents, amoebicides, virucidal agents, among others (Meléndez-Gómez et al., 2005).

The essential oils in star apple extracts decrease laboratory-induced inflammation and could constitute a new and attractive alternative for the treatment of persistent inflammatory and neuropathic pain in humans (Tuesta et al., 2014).

Amino acids was a test that was positive, the importance is that it contains a wide variety of vitamins that contribute a lot to the immune system in addition to a high presence of Calcium, Phosphorus and Lysine which is one of the 10 essential amino acids for humans. In addition, its consumption stimulates growth hormone and mental development (Timpe, 2015).

The triterpenes present in the leaf are secondary metabolites, they have a complex cyclic structure which has 30 carbon atoms, they are natural compounds that are formed from six isoprene units; These compounds are widely distributed in the plant kingdom, playing a broad and important role in nature. They also have very diverse biological effects and are summarized as: anti-tumor, anti-inflammatory, anti-HIV, anti-microbial, hepa and cardioprotective, analgesic, anti-fungal, anti-chemopreventive, among others (Cano, 2013).

Star apple, with a sweet flavor and pleasant aroma, is rich in soluble and insoluble fiber, anthocyanins, phenolic compounds, flavonoids, carotenoids, and high antioxidant activity (Ku, 2021). Anthocyanins are the components responsible for the pigments of yellow, orange, red, magenta, violet and blue tones in plants (Tanaka and Ohmiya, 2008). These compounds are considered safe natural dyes, have proven beneficial effects and are among the most used vegetable dyes in the food industry, mainly in food beverages (Castañeda-Ovando et al., 2009; Pazmiño-Durán et al., 2001).

In this area, it is worth noting that a study carried out by Williams & Benkeblia (2018) with the objective of determining total reducing sugars, total phenolic compounds and chlorophylls in the green and purple star apple varieties, demonstrated that total reducing sugars increase significantly during its three stages of maturation, while total

phenolic compounds decrease, in addition to the skin showing a higher level of total phenolics compared to the pulp. A botanical study by Shailajan & Gurjar (2017) revealed that C. cainito leaves are a good source of ursolic acid (anti-cancer, anti-inflammatory, antioxidant and hepatoprotective), β-sitosterol (anti-cancer, estrogenic and lipid-lowering), lupeol (anti-inflammatory, anticancer, antimicrobial, hepatoprotective and cardioprotective) and gallic acid (antioxidant, antiallergic, anti-inflammatory, antimutagenic, anticancer, apoptotic and healing), demonstrating its application for the development of pharmacologically active herbal medicines.

CONCLUSIONS

Finally, the presence of Flavonoids was found in star apple leaves in all alcoholic extracts, as well as in aqueous extracts at room temperature and at hot temperature. The presence of Flavonoids provides the pharmacological action of effect as antioxidants, beneficial in human health care, reducing oxidative stress due to the capture of free radicals. The presence of other metabolites was also found such as phenols, tannins, alkaloids, essential oils, amino acids, triterpenes, anthocyanidins and reducing sugars, so all the metabolites present in the leaf provide pharmacological actions for uses. This allows awareness among the population about the use and conservation of the resource for the benefits it offers. It can be planted in the patio of the homes of many people from Campeche who enjoy its fruit in the months of February, March and part of April.

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