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Extraction of delonix regia oil for phytochemical analysis

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1 INTRODUCTION

In the past, it was common to use plants to manufacture homemade medicines that were called "bottles", but there were many advances with the arrival of technology, making the field of research development.

The use of herbal remedies dates back to primitive tribes where women were in charge of extracting the active principles from plants to use them to cure diseases. As the people of that time became more qualified to meet their survival needs, specific social roles were established for the members of the community in which they lived (FRANÇA, I et al. 2008).

According to Junior and Pinto (2005), nowadays studies around plants with medicinal value have only increased because, with all the technology involved, it is possible to discover new properties, and increase or decrease the concentrations of compounds, all this to improve the phytotherapy that many plants provide for man according to their active principles.

Something that differentiates modern man from other times is his high consumption of medicines. And even with all the advances made by recent chemical and pharmaceutical research, which provided relief from various pathologies through the greater supply of allopathic medicines, most of the population still has health problems due to factors such as lack of access to basic care. health and resources to obtain prescribed drugs (JUNIOR, 2008).

Brazil is contained in a minority of countries that are called “megadiverse” (FUNARI; FERRO, 2005 apud Lewinsohn; Prado, 2002) and with about 20% of the entire world flora (FUNARI; FERRO, 2005 apud SANT'A; ASSAD, 2002).

Studies focused on Brazilian plants and their properties are of great scientific value since they emphasize the importance of preserving the biodiversity present in the flora, the ethnobotanical values

employed by the population that has the cultural knowledge of the use of medicinal plants, and demonstrate the contribution to the taxonomy of plants to compose the literature.

Taxonomy is the most connected area, and makes connections with biodiversity, as the genetic variation among plants is so great that sometimes the smallest characteristic already differs one plant from another, and creates a new species or class. Since Linnaeus, in the second half of the 18th century, the taxonomic practice has been considered of great importance and indispensable support for a wide variety of purposes. In addition to the work of collecting, identifying, describing, and studying biology and interrelationships between taxa, these scientists are, in general, called upon to give opinions and issue reports on biodiversity (PEIXOTO; MORIN, 2003).

But even with all this taxonomic study, according to Maria A. et al. (2005), converting all this material from years ago to updated systems is extremely difficult, including the difference in biostatistics used at different times, making this translocation of material even more difficult.

Research still has an enormous value when thinking about ways of treating diseases, whatever they may be, because, with research, active principles are discovered that can have good effects, whether palliative or strategic, aimed at curing various pathologies.

Even with so many secondary metabolites contained in the most diverse plants, classical phytochemistry seeks to study the most abundant ones, as it is possible to isolate them more easily and obtain them in greater quantities. The analysis of active substances is much more complex and time-consuming, since generally the compounds present in smaller proportions in the plant are those with better biological effects, but they can also be indispensable in some areas. For this reason, there is a need for more collaborative work between chemists and pharmacologists for the analysis of extracts, obtaining semi-pure extracts, fractions, and finally, pure compounds (FILHO; YUNES, 1998).

It is worth remembering that this entire study generates and opens up a gigantic market for Brazil to enter. It is indeed possible to analyze the secondary metabolites present in the plant after it undergoes phytochemical analysis processes

, there are hundreds of secondary metabolites, however, depending on the research, only a few are effective for a given objective, be it, for example, anti-inflammatory, analgesic, or others.

When chemical studies on the species of interest are not available, the preliminary phytochemical analysis may indicate the group of relevant secondary metabolites of the species. If the interest is restricted to a specific class of constituents or the substances responsible for a certain biological activity, the investigation should be directed towards its isolation and structural elucidation (FOLIGO et al., 2006 apud SIMÕES O.M.C, et al. 1999).

The chemical composition of secondary metabolites varies greatly from one to the other and it is this variation that will determine their action and their individuality for man. Plant secondary metabolites stand

out in the area of pharmacology due to their biological effects on the health of the human species (Pereira; Cardoso 2012).

Secondary metabolites are divided into groups that have no affinities with each other just because they have similar chains, but not the same, they just collide in their formation.

> Shikimic acid is a precursor of hydrolyzable tannins, coumarins, alkaloids derived from aromatic amino acids, and phenylpropanoids, compounds that have in common the presence of an aromatic ring in their constitution; whereas the acetate derivatives are the aliphatic amino acids and the alkaloids derived therefrom; terpenoids, steroids, fatty acids and triglycerides (LEITE, 2008).

Examples of metabolites present in plants are flavonoids, tannins, phenolics in general, terpenes, and alkaloids.

> Flavonoids are aromatic substances containing 15 carbon atoms (C15) in their basic skeleton anthocyanins, flavonols, flavones, isoflavones, flavanones, and flavones, with multiple biological effects, such as antioxidant, anti-inflammatory and antitumor activity, power to reduce capillary fragility and permeability; inhibition of collagen destruction and platelet aggregation(PEREIRA; CARDOSO, 2012).

Flavonoids are a group inserted within a larger group of metabolites that are phenolic compounds, a comparison between family and kingdom in which one is inserted in the other.

> Phenolic compounds are substances widely distributed in nature, more than 8000 phenolic compounds have been detected in plants. These compounds act as antioxidants, not only because of their ability to donate hydrogen or electrons but also because of their stable intermediate radicals, which prevent the oxidation of various food ingredients, particularly lipids (SILVA et al., 2010 apud BRAND-WILLIAMS 1995).

Like Tannins, they are also metabolites that are part of the phenolic group.

> Tannins are polymeric phenolic compounds that bind to proteins, denaturing them. The tannin amount sues the ancient practice of using plant extracts to convert the skin animal leather (in tanning, collagen is added to increase its resistance to heat, water, and microorganisms). There are two categories: condensed tannins and hydrolyzable tannins (ÁVALOS; ELENA, 2009).

Because they are a larger group, they have many characteristics, which revolve around their aromatic chemical composition.

However, it is not just finding a secondary metabolite in a plant that already determines that several drugs will be manufactured from it, there are requirements to be met.

The correct use of herbal medicines can only be confirmed after several tests are carried out and laboratory analyses in vivo and in vitro, as a preliminary step to reach the necessary quality standard for medicine. Although several studies have demonstrated the need to guarantee the safety of plant-derived products, as they are frowned upon by society, which believes they do not have the same role as an industrially manufactured and manipulated medicine (BAUER; TITTEL, 1996; BRANDÃO et al., 2002;

CHOI et al., 2002; BAST et al., 2002; MELO et al., 2004).

Aiming at the search for metabolites, an ethnobotanical search was necessary that led me to a person who used the plant in a bottle to cure infections, so I arrived at Delonix regia (Bojer ex Hook.) Raf., popularly known as flamboiã, is a plant that is commonly used for ornamental purposes.

When developing the research, aiming at the identification of metabolites, an ethnobotanical search was necessary, which allowed the meeting with people who used the plant in bottles, intending to cure infections, so we arrived at Delonix regia (Bojer ex Hook.) Raf., popularly known as flamboiã, is a plant that is commonly used for ornamental purposes.

> Flamboyant is the common name of the species Delonix regia, belonging to the subfamily Caesalpinioideae. It is a medium-sized tree that grows in hot and humid regions of India, Africa, and America (tropical zones). Used in afforestation of parks and gardens, and much appreciated for the ornamental qualities of its flowers. Its flowers are red and orange and its pods are long and large, containing an average of 20 seeds, with valves that curl up and open during maturation, releasing the seeds a short distance away (BAILEY 1954; BRAGA 1976).

According to Lorenzi (1998) quoted by Agostini K., and Sazima M. (2003) many formerly exotic plants were used for ornamentation, and this was a value passed on to other generations, causing the man to stop thinking that those plants could have some medicinal value.

A plant that is often used as an ornament, as it has flowers with a very strong red tone, hence its usual name Flamboiã, which means flaming if you translate it. Because of this, the color raised the possibility of the existence of metabolites, such as carotenoids, compounds with high antioxidant action, neutralizing oxygen free radicals, and also known to be precursors of vitamin

A. In addition, the possibility of microbicidal and bactericidal properties arises, due to the popular use of D. regia flowers in infusions to treat infections (LÓPEZ, 2010).

2 METHODOLOGY

The plant chosen was D. regia, found on the premises of the Marco Zero campus of the Federal University of Amapá the leaves were collected, and for this, gardeners' scissors and garbage bags of a volume of 50 liters were used to store the leaves, the leaves were stretched out on the floor of a room at a temperature between 16 to 20°C so that they could dry, after 7 days drying they were taken to the laboratory of Pharmacognosy at UNIFAP where they were placed in a jar with a capacity of 2 liters, the leaves were immersed in 96% alcohol and 6 liters were used until the end of the experiment, in which the leaves were immersed for 24 hours, filtered and placed again in 96% alcohol, while its filtrate was concentrated in a rotary evaporator to obtain the crude extract, after repeating this process 3 times without giving breaks, the crude extract weighing 172.43g was obtained, which was stored in glassware. After the crude extract had been dried for 5 days in the laboratory, the tests were carried out, the first 3 being for the detection of

Saponins, Organic Acids, and Purines, thus seeking an idea of the possible secondary metabolites present.

3 CONCLUSION

Phytochemical tests were carried out on the leaves of D. regia, which went through the preparation processes until reaching the testing phase, which was carried out following the Manual of Phytochemical and Chromatographic Analysis of Plant Extracts, which presents, from the collection of the plant to the preparation of reagents and how to use them to perform the tests.

Phytochemical analysis of D. regia leaves revealed a positive result for saponins, purines, organic acids, catechins, phenols, and tannins (Table 1).

Table 1: Results of phytochemical tests

Secondary metabolite	Results
saponins	+
Organic acids	+
Purines	+
phenols and tannins	+
Catechins	+
Reducing sugars	-
flavonoids	-
alkaloids	-
Proteins and amino acids	-
cardiac glycosides	-
polysaccharides	-
sesquiterpenolatones	-
steroids	-
Carotenoids	-
Depsides and Depsidones	-
coumarin derivatives	-
anthraquinones	-
Azulenos	-

Source: Maciel, 2022.

Saponin was positive, because after the test was carried out, the foam persisted for another half hour, giving a result for foaming saponin. The mechanism of action within man according to studies, showed anti-inflammatory effects inhibiting the levels of TNFα and PGE2 in the model of the air sac induced by carrageenan, in rats (KIM et al., 2006).

For Castro (2005), saponins provide plants with defense activities against insects and microorganisms, either through complexation with fungal steroids or through the synthesis of saponins analogous to predator hormones, affecting their development and making them sterile. By evaluating these benefits provided to plants, saponins have currently been used by man for the preparation of insecticide products.

However, they can also pose a danger to pregnant women if ingested indiscriminately, as saponins have the power to increase the permeability of cell membranes, having a very large impact on the fetus because it does not have its cells well structured yet.

Phytochemical tests were positive for purines. These were detected by showing a violet color in the test tube. They have an important pharmacological role in the manufacture of bronchodilators, famous painkillers such as paracetamol, and AAS which are widely used. According to Souza and Almeida (2020), these compounds are nucleotide bases of biogenetic origin and are present in several classes of plants. Purines have action on the central nervous system, promoting the inhibition of sleep and stimulating smooth muscles, being recognized by popular use for their tonic and energetic activity.

The Organic Acids were positive, as the solution in the test tube was discolored at the end of the process. These compounds are present in the industry from the composition of beverages and foods because they have a neutralizing action, controlling the alkalinity of products, as they also act as preservatives, being the most used for their antimicrobial and antioxidant activity (Hyacienth and Almeida, 2015).

The hydrolysable and catechetical tannins were positive because the dark blue precipitate in the test tube solution indicated the presence of pyrogallic tannins (hydrolyzable tannins) and green indicated the presence of catechetical tannins. Tannins are often found in beer production so that it has greater stability, they are also present in antioxidants in the food industry or even in the production of gallic acid and are often used to treat contamination by phenolic compounds.

According to Filho (2019), tannins are compounds that have antidiarrheal and antiseptic action, by forming impermeable layers to the dermis and mucous membranes, protecting the inner parts. In addition attributing the perception of astringency in several fruits, because they are very reactive, and allow the precipitation of salivary glycoprotein agents.

The catechins showed positivity in the test tube containing crude extract after the reaction with the appearance of intense red color in the solution. Catechins are involved in the food sector as food antioxidants, as sunscreens, anti-inflammatory and in some supplements as lipolytic, as they have the effect of promoting the lysis of lipid molecules in the human body, catechins have a huge action in working on the disorder of cells and their aging, which is why many moisturizers are made based on catechins so that they have direct contact with the skin.

Compounds derived from catechins have potent antioxidant action, also acting on free radicals such as superoxide. It is known that the antioxidant activity of catechin acts mainly in the digestive tract, protecting the mucosa against possible injuries caused by free radicals in the digestive process (GOMES; MARTINS; ALMEIDA, 2017).

The study showed through phytochemical tests the presence of secondary metabolites: saponins, purines, organic acids, phenols, and tannins. Thus, it was possible to verify the probable potential for

antioxidant, astringent, analgesic, antioxidant, and healing action. With that, it is highlighted that this species needs more studies to know more about its pharmacological aspects and interactions with the human body, since its common use is ornamental, although D. regia has great potential for therapeutic use.

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