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PHARMACOLOGICAL POTENTIAL OF CASHEW GUM (*Anacardium occidentale* L.): A BIOPOLYMER FROM THE NORTHEAST BRAZIL

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Abstract: Cashew gum (*Anacardium occidentale* L.) (CG) is mainly composed of a highly branched heteropolysaccharide structure, consisting of galactose in its main chain with bonds (1 → 3) and side chains with bonds (1 → 6). A CG has been used in important biotechnological processes. Thus, this review aims to provide a brief prospection about CG, its biological properties, and possible biotechnological applications. To this end, a survey of articles published on ready to use the topic in the databases Science direct, Scopus and Web of Science was carried out. Recent studies available in the literature suggest an enormous potential and wide applicability of this polymer and pharmacological and application in a controlled drug release process.
Keywords: Polysaccharides, vegetable exudates, vegetable gums.

INTRODUCTION

The Cashew (*Anacardium occidentale L.*) is a plant native to northeastern Brazil with considerable adaptive capacity to low fertility soils, high temperatures and water stress (SERRANO and PESSOA, 2016). Cashew production in Brazil is concentrated in the Northeast region, and is of high socioeconomic importance for the Region, especially for the semi-arid region, as it generates jobs and income during the driest time of the year (BRAINER and VIDAL, 2018) and because it is a fruit supplier of raw material for the manufacture of various by-products (ALENCAR et al, 2018).

In Northeast Brazil, given the economic importance of this crop, in 2019 the cultivated area of the plant was 434,614 hectares with a productivity for cashew nuts of 319 kg/hectare (CONAB, 2020). Cashew gum (CG) is a co-product of cashew agribusiness with great potential for application in different industrial areas (PORTO et al, 2017). In this context, undoubtedly, the development of new bioproducts based on cashew polysaccharides is an alternative to add value to cashew farming, in addition to making it possible to obtain a product based on regional raw material with low cost/benefit (SILVA et al, 2013).

Polysaccharides obtained from various natural sources have been widely used in industry, especially in the food, pharmaceutical and cosmetic areas, in addition to moving numerous research works (Lima, Maia and Lima, 2013). Studies on GC arouse more and more interest from the scientific community, since this polysaccharide has rheological characteristics that favor its biotechnological application. Thus, this review aimed to carry out a brief prospection on GC, its structural aspect, obtaining and purification, its pharmacological properties and biotechnological applications.

DEVELOPMENT

CASHEW CROP (*Anacardium occidentale L.*) – ECONOMIC ASPECTS

The cashew tree (*Anacardium occidentale L.*) is a plant native to the Brazilian Northeast, which has a great adaptive capacity to low fertility soils, high temperatures and water stress (EMBRAPA, 2016). Characteristics that favored the spread of the cultivation of this plant throughout the Northeast Region, making it an important source of income for this region. For marketing, the main cashew product is the cashew nut kernel, located inside the nut.

According to data from CONAB (Companhia de Nacional de Abastecimento) among the Northeastern States that produce cashew nuts in natura, the State of Ceará stands out as the largest producer, with a production of approximately 87 thousand tons in 2019, representing 62.4% of the total national production estimated at 139.3 thousand tons. Ceará is followed by the states of Piauí and Rio Grande Norte with approximate productions of 21.6 and 16.8 thousand tons in 2019, respectively.

In a context of world nut production, Brazil is among the ten largest producers, behind countries such as: Vietnam, India and Ivory Coast (FAO, 2017). In 2016, Brazil ranked as the fifth largest exporter of shelled cashew nuts, with a share of 3.1% of the global total exported that year, the main importing country of this product is the United States, followed by the Netherlands and Germany (CONAB, 2019).

As previously mentioned, the cashew nut kernel is the main commercial product extracted from the cashew tree, however, practically all parts of the plant can be used, from the nut the skin covering the almond, rich in tannins used in the industry, can also be extracted. chemistry of paints and varnishes. The cashew peduncle (pseudofruit) is processed by industries to obtain juice or frozen pulp, to be used in the manufacture of juices, cashew nuts and other beverages, in the manufacture of sweets and in animal feed, in addition, the whole cashew (peduncle with chestnut) is sold in natura at fairs and supermarkets. Other parts of this plant are also used, the bark of the trees and the leaves, are sources of tannin and gum of biotechnological interest.

THE CASHEW GUM (GC)

According to Licá et al. (2018) gums are natural polymers, formed by monosaccharide units in linear or branched arrangements, belonging to the carbohydrate class. They are translucent, odorless, tasteless, non-toxic, hydrophilic, amorphous substances, with colloidal properties, with thickening (binding with water molecules), gelling (network construction, involving binding zones), emulsifying, stabilizing and binding functions. They also have the ability to control crystallization, inhibit syneresis, encapsulation and film formation. Exuded gums are produced by plant epithelial cells when the cortex is damaged by physical injury or microbial attack. The production of gummy exudate is a defense mechanism of these plants that grow in semi-arid areas (ANDRADE et al, 2013). Several vegetables have the ability to produce gums, among which the cashew tree (*Anacardium occidentale L.*) deserves to be highlighted.

Cashew gum (GC) is a highly branched complex anionic heteropolysaccharide obtained from the exudate of the bark or stem of the tree, it is mainly composed of β-D-galactose (72%), followed by α-D-glucose (14 %), arabinose (4.6%), rhamnose (3.2%) and glucuronic acid (4.6%) and its main chain contains galactose units linked by β-type links (1 → 3) and in the side chain β (1 → 6) (QUELEMES et al, 2017), as can be seen in Figure 1. According to Paula et al. (2011) the concentrations of gum constituents may vary according to the time of year, in addition to seasonal factors that the plant is subject to at the time of exudate extraction.

This polysaccharide has some attractive characteristics for biotechnological use because it is non-toxic, hydrophilic, biocompatible and biodegradable, having properties similar to gum arabic in relation to molecular weight, uronic acid content and the same type of monosaccharide units (PAULA et al, 2011).

In the food area, cashew gum, specifically, has potential application as a food additive in the form of a thickener for juices and refreshments, an emulsifier for sauces and salads, and a wall material for microcapsules (FURTADO et al, 2013). GC also has the ability to be used as a binder for tablets, superabsorbent hydrogels, gelling agents, as viscosity enhancers, as surfactants, coating

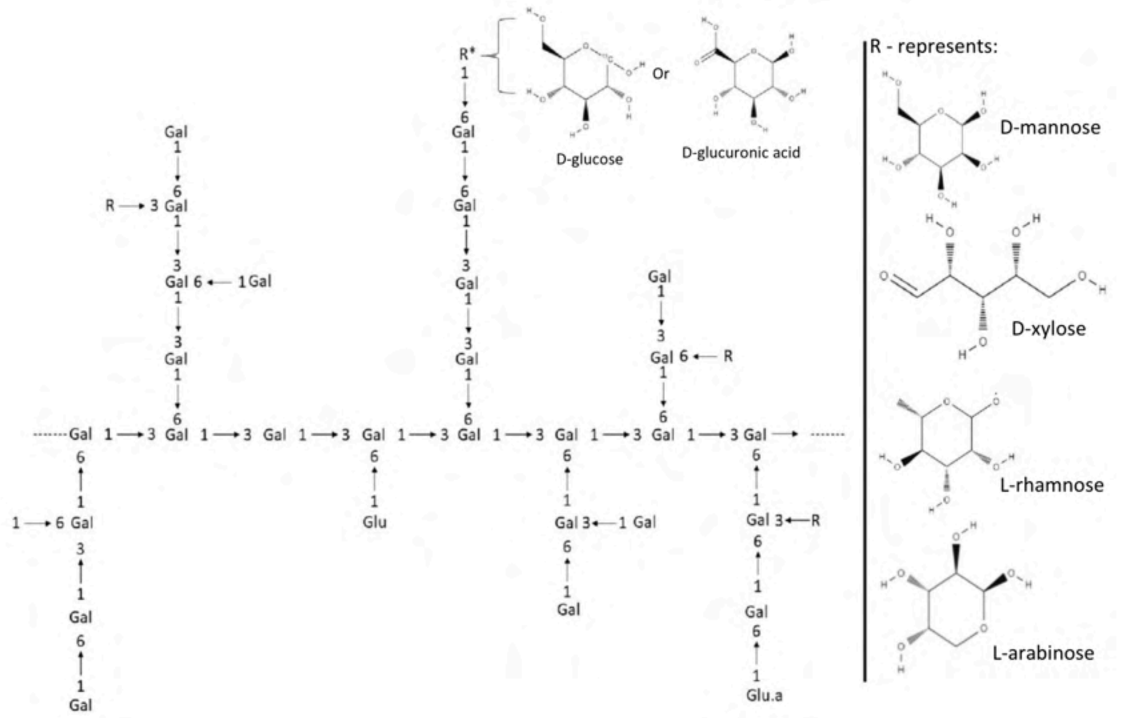

Figure 1. Structure of cashew gum (*Anacardium occidentale*, L.)

Source: Adapted of Lima, Maia e Lima, 2013.

agent for microencapsulation, and for controlled drug release. such as: antitumor, antioxidant, anti-inflammatory and healing, antibacterial and antifungal activity. As the cashew gum has a structure very similar to that of gum arabic. It is assumed, therefore, that this gum potentially has the same applications as gum arabic (ARAÚJO et al, 2018). In addition to the structural (branches) and chemical (component sugars) similarity with gum arabic, GC has an important differential: its high availability in the Northeast region of Brazil, which can generate profits in the cashew off-season period (ANDRADE et al, 2013).

Extraction and purification of cashew gum

The most used way to extract the raw gum exuded from the cashew tree is through the physical method, where an incision is made in the trunk of the plant and an exudate that varies from pale yellow to reddish brown is then collected, and dried by exposure to the sun until it loses its color. adhesion and become hard and brittle, in order to facilitate handling and subsequent purification steps. The other way of extracting the gum is chemically by the action of benzoic acid derivatives (NAYAK et al, 2019).

After the extraction, the purification of the crude gum is an important step carried out in order to remove the impurities from the sample, since these can affect the properties of the polymer. The GC purification steps were initially described by Costa, Paula and Rodrigues in 1996, however, the purification process described by these authors has undergone some changes over the years, such as the drying of the material using lyophilization and the use of chromatography to confirm the purity of the gum obtained after the purification steps, however, the most important steps of the process remain unchanged (Figure 2). For purification, initially the crude gum is crushed and dissolved in distilled water in the proportion of 4g of crude gum for each 100 mL of distilled water (GC crude extract) after complete dissolution this solution will have an acid pH, which is corrected by the addition of a concentrated sodium chloride solution to replace cations with sodium. The pH adjustment is one of the most critical factors in the process. pH values lower than 6.0 decrease the solubility of GC, because under these conditions there is a greater probability of formation of hydrogen bonds between molecules with the consequent aggregation of particles. If the pH is raised above 7.0, the solution and the gum obtained become dark, probably due to the solubilization of poorly soluble impurities in an acidic medium. The crude extract GC is then filtered, the supernatant is discarded, and the filtrate is precipitated with volatile solvents such as acetone and ethanol. Excess sodium chloride is removed by successive washings with distilled water, acetone and ethanol and again subjected to filtration and precipitation processes. To ensure the formation of sodium salt from cashew gum, the powder obtained is resuspended in distilled water and passed through a chromatographic column, later the material is lyophilized, the dry powder is called purified cashew gum and will be stored at low temperatures. Figure 2 presents a simplified schematic of GC purification.

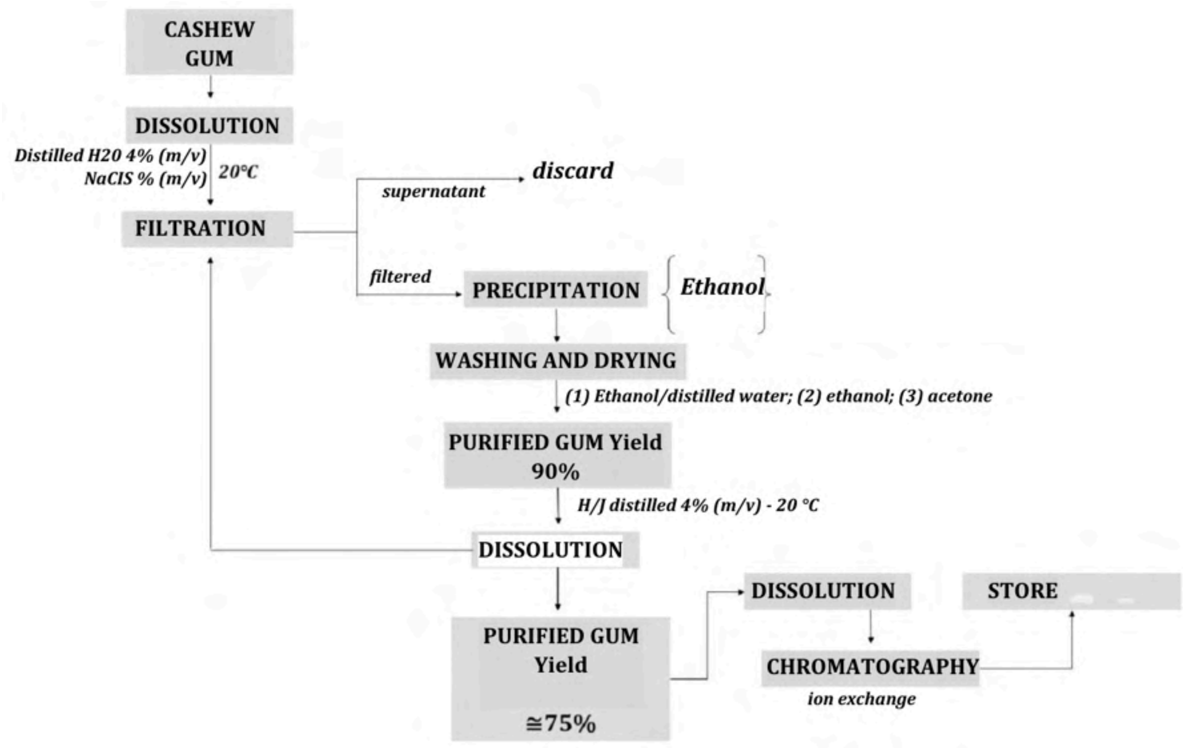

Figure 2. Simplified scheme with main steps of cashew gum purification (*Anacardium occidentale* L.)

Source: Adaptaded of Ribeiro et al, 2016

MAIN PHARMACOLOGICAL PROPERTIES OF CASHEW GUM

The use of cashew tree gum as a natural medicine has been carried out for decades based on popular knowledge in several regions of the Brazilian Northeast, where it is commonly used by the population, as an anti-inflammatory, wound healing agent, antidiarrheal, gastroprotective agent, among other uses. The popular use of the gum has stimulated scientific research in order to confirm such properties attributed to cashew exudate.

BIOTECHNOLOGICAL FORMULATIONS FOR DRUG DELIVERY SYSTEM USING CASHEW GUM

Controlled-release systems have two main objectives: to keep the blood concentration of a particular drug constant, ensuring greater bioavailability, and to reduce side effects, thus enhancing patient adherence to treatment with a lower number of required dosages, FALCARE AND LOPES, 2006). Different systems have already been described in the literature, such as: liposomes, osmotic pumps, enteric coatings, transdermal systems, prodrugs, and polymeric matrix systems, in which they provide a longer time release of the drug in the body, especially in the tissue. or target organ when compared to the conventional one, becoming a target of great interest for the pharmaceutical industries (DE OLIVEIRA ALENCAR et al, 2018).

According to Bizerra and Silva (2016) polymeric systems for controlled release represent an alternative for the incorporation of active substances and have advantages such as: (1) greater control of the release of the active ingredient; (2) reduction of toxic and subtherapeutic doses; (3) monitoring drug levels at the site of application; (4) obtaining high drug concentrations at the site to be treated, when compared to plasma levels after oral administration; and (5) targeting the active ingredient to specific targets. Decreasing the dosage interval and reducing unwanted side effects as it uses a smaller amount of the active ingredient, resulting in lower cost.

Natural substances such as polysaccharide gums, among which cashew gum (CG), offer a unique advantage in the development and formulation of drug delivery systems and are preferred over synthetic ones (OLOGUNAGBA et al, 2017; NAYAK et al, 2019). Recent research using GC in drug delivery systems is available in the literature, testing this biopolymer as an excipient in the formulation of tablets, hydrogels, biofilms and also in the production of polymeric particles for drug encapsulation.

DISCUSSION

In order to carry out a brief prospection regarding the pharmacological properties of cashew tree gum (CG) and its application in the development of controlled drug delivery processes, a search was carried out in different databases of journals (Table 1). The survey of the available literature on the subject was carried out in July 2020, only research articles that used purified GC alone or purified GC in combination with other natural or synthetic polysaccharides, scientific articles that evaluated the activity of other plant parts: *Anacardium occidentale* L. (leaf, bark, fruit) were discarded, no restrictions were used regarding the year of publication, only research articles were selected, literature reviews or other documents were not considered for the research.

MAIN PHARMACOLOGICAL PROPERTIES OF CASHEW GU

Antitumor activity

The combination of cashew gum with other oligosaccharides and proteins, exhibited

Database	E-mail
Science Direct	https://www.sciencedirect.com/
Scopus	https://www.scopus.com/
Web of Science	https://www.webofknowledge.com/
Google Scholar	https://scholar.google.com/
Search terms	
("Cashew gum" OR "Anacardium occidentale") AND *antitumor*	
("Cashew gum" OR "Anacardium occidentale") AND *antiproliferative*	
("Cashew gum" OR "Anacardium occidentale") AND (*Antimicrobial* OR *Antibacterial* OR *Antifungal)*	
("Cashew gum" OR "Anacardium occidentale") AND *Gastroprotective*	
("Cashew gum" OR "Anacardium occidentale") AND *antidiarrheal*	
("Cashew gum" OR "Anacardium occidentale") AND "*Drug delivery*"	

Table 1. Database consulted and search terms used in the review.

Source: Author

a mean inhibitory activity of 88% $p<0.005$ against a solid sarcoma 180 tumor implanted in mice (Mothé et al, 2008). The antitumor potential of cashew tree gum (GC) in vitro and in vivo was determined by Barros et al. (2020), in their studies, the aforementioned authors evaluated the level of cytotoxicity of GC and the antitumor effect through the B16-F10 melanoma model. Tumor inhibition was calculated based on tumor weight. As a result, GC did not demonstrate cytotoxicity in vitro, but showed significant tumor inhibition in vivo, with about 36.9 to 43% reduction in tumor mass, without organ toxicity.

The impact of GC on cell morphology and viability with tumor and non-tumor cell lines was recently evaluated Ribeiro et al. (2020) using atomic force microscopy (MFA) and 3-(4,5-dimethyl-2-thiazole)-2,5-diphenyl-2-H-tetrazolium bromide (MTT), respectively. Antiproliferative activity was confirmed for the cancer cell lines HCT116 (colorectal carcinoma), B16F10 (melanoma) and HL60 (promyelocytic leukemia). A change in cell morphology was observed as an increased surface roughness for HL60. In the results obtained by the authors, it was not possible to observe any degree of cytotoxicity for non-tumor lines by GC, GC showed selectivity for tumor cells, thus, it can be considered that GC has great antitumor potential and is a promising biomaterial for studies future, this way, it becomes evident the need to stimulate new researches in this field of application.

Antimicrobian activity

Some authors have reported the antibacterial and antifungal potential of cashew gum against different species of microorganisms. Torquato et al. (2004) tested the activity of crude and purified cashew gum against bacteria, yeasts and fungi. These authors observed an increase in antimicrobial activity in the purified gum compared to the crude gum.

Similar studies were carried out by Campos et al. (2012), aiming to analyze the antimicrobial action mechanism of cashew gum (crude and purified) by atomic force microscopy (AFM) imaging, evaluated the growth of eight different species of bacteria in the presence of the gum. The results indicated strong antimicrobial properties of pure cashew gum against all microorganisms tested, except: *Candida albicans* and *Lactobacillus acidophilus*. On the other hand, the raw cashew gum showed only antimicrobial activity against Gram-positive bacteria. (MRSA, MSSA, *Listeria innocua and Enterococcus faecium*). Atomic force microscopy images showed that purified cashew gum leads to bacterial cell breakdown indicating that cashew gum purification affects its antimicrobial spectrum.

Structural changes through the introduction of new functional groups to add cationic character to GC were performed by Quelemes et al. (2017), who observed strong antimicrobial activity against strains of *Staphylococcus aureus* methicillin resistant. The results described indicate that the purified and structurally modified cashew tree gum has strong antimicrobial activity, however, the reports found in the literature of the isolated action of the gum (without interaction with other substances) are old, and suggest the need for further studies.

Gastroprotective and antidiarrheal properties of cashew gum

Cashew gum (CG) is traditionally used in the Brazilian Northeast in the treatment of various diseases, such as gastrointestinal tract disorders, leading to the interest of the scientific community in investigating such properties. Araújo et al. (2015) when they evaluated the activity of GC against acute diarrhea through the model of diarrhea induced by castor oil and PGE2 in rodents, and its effect against secretory diarrhea using a model of fluid secretion in closed loops of the intestine treated with toxin. cholera in live mice. They observed an excellent antidiarrheal activity of GC, since, at the evaluated concentrations of the gum, the severity of acute diarrhea in rats was significantly reduced, in addition, GC decreased the volume of castor oil and PGE2 and induced intestinal fluid secretion. Furthermore, in secretory diarrhea, GC significantly inhibited the secretion of intestinal fluids. The authors were able to conclude in their study that GC has antidiarrheal activity in models of acute, inflammatory and secretory diarrhea, which could justify its traditional use in the treatment of diarrhea in Northeast Brazil.

A study by Carvalho et al. (2015) aimed to evaluate the gastroprotective properties of GC from stomach injuries induced by naproxen (NAP) in male Wistar rats treated with different concentrations of GC (1, 3, 10 and 30 mg/kg). The medial small intestine was used to evaluate the macroscopic lesions and samples from the stomach and intestine were used for histological evaluation in glutathione (GSH), malonyldialde-hyde (MDA) and myeloperoxidase (MPO) assays. Additional mice were used to measure gastric secretion and mucus. Pretreatment with GC reduced the macroscopic and microscopic damage induced by NAP. GC significantly attenuated NAP-induced changes in MPO, GSH and MDA levels. In addition, the authors observed that adherent mucus levels returned to normal values after GC treatment.

Results that corroborate those presented by Nicolau et al, (2019) when they evaluated the activity of GC in the human esophageal mucosa (cells from human esophageal biopsies with non-erosive reflux) and in mice with non-erosive gastroesophageal reflux disease (GERD) experimentally induced. The GC adhered to the human esophageal mucosa for up to 1 h. In animal studies, GC improved barrier function parameters (TER and mucosal permeability) in the distal esophageal mucosa, and reduced inflammatory characteristics of esophageal damage, providing topical protection to the esophageal mucosa. These results confirm the protective effect of GC against gastrointestinal damage through mechanisms that involve the inhibition of inflammation and the increase in the amount of adherent mucus in the mucosa.

MAIN BIOTECHNOLOGICAL FORMULATIONS FOR DRUG DELIVERY SYSTEM USING CASHEW GUM

The controlled drug delivery system is a modern pharmacological approach that aims to improve drug efficacy, increasing its bioavailability and decreasing toxicity and possible side effects for patients undergoing treatment (CRUZ et al, 2019; RICHTER et al, 2020). The micro and nanoencapsulation

Cashew gum applications	Methods	Results	Author and Year
antitumor potential	Injected 200mg/kg for 7 days	Mean inhibitory activity of 88% against a solid sarcoma 180 tumor implanted in mice	Mothé et al, 2008
	B16-F10 melanoma model	Significant tumor inhibition in vivo, with about 36.9 to 43% reduction in tumor mass, without organ toxicity	Barros et al, 2020
	MFA e MTT	Confirmed antiproliferative activity for cancer cell lines HCT116 (colorectal carcinoma), B16F10 (melanoma) and HL60 (promyelocytic leukemia).	Ribeiro et al. 2020
Antibacterial and Antifungal Potential	Antimicrobial activity (NCCLS)	Increase in activity in purified gum compared to gum gross	Torquato et al. 2004
	Antibacterial activity Atomic force microscopy (AFM)	Pure cashew gum showed strong antimicrobial activity against the microorganisms tested.	Campos et al, 2012
	Structural modification (quaternization) of the gum and test in front of methicillin-resistant Staphylococcus aureus	Strong antimicrobial activity	Quelemes et al, 2017
Gastroprotective and antidiarrheal activity	Castor oil and PGE2-induced diarrhea in rodents	The severity of diarrhea in rats significantly reduced and decreased intestinal fluid secretion	Araújo et al, 2015
	Treatment of naproxen-induced (NAP) stomach injuries in male Wistar rats	Pretreatment with GC reduced macroscopic and microscopic damage induced by NAP	Carvalho et al, 2015
	They evaluated the activity of GC in the esophageal mucosa	GC reduced inflammatory features of esophageal damage, providing topical protection of the esophageal mucosa	Nicolau et al, 2019

Table 2. Main pharmacological applications of cashew tree gum (*Anacardium occidentale L.*) (GC).

Source: Author.

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of bioactive molecules in natural polymeric matrices has also aroused increasing interest in recent decades.

The study of new natural polymers as encapsulating agents for microencapsulation is a necessity to meet the demands of the world market and guarantees the availability of alternative materials to those already used, preferably of low cost, low toxicity, wide availability and biodegradability. Studies with cashew tree gum in association with other polymers to obtain new copolymers have been widely carried out aiming at possible applications of these in the pharmaceutical industry. Copolymers of GC and L-lactide were synthesized to encapsulate amphotericin B (AMB), an antibiotic used in the treatment of fungal diseases and leishmania with side effects for patients undergoing treatment. It can be inferred that the synthesized copolymers showed potential as nanocarrier systems for AMB (RICHTER et al, 2020). In another study, GC grafted with N-isopropylacrylamide (NIPA) was used for the encapsulation of epirubicin, demonstrating good potential for use as a delivery system for this drug (ABREU et al, 2016). Another copolymer created from the association of GC with chicha gum (Sterculia striata) was developed and tested as a biomaterial for application in the pharmaceutical industry, presenting desirable characteristics and compatible with the materials commonly used, both natural polymers proved to be promising excipients for use as tablets and hydrogels (DOS SANTOS FERREIRA et al, 2019). Likewise, the potential of the association of GC with xanthan gum as an excipient for ibuprofen tablets was verified through ibuprofen matrix tablet formulations (~200 mg ibuprofen) containing varied mixtures of GC and xanthan gum prepared by direct compression. All tablets tested demonstrated the transport mechanism and release of ibuprofen involved diffusion and erosion of the hydrated gum matrices. Studies have demonstrated the potential use of blending these polymers as vehicles for controlled drug delivery (Fosu et al, 2016).

Hasnain et al, (2019) investigated the utility of GC as a pharmaceutical excipient in toothpastes containing aceclofenac for the treatment of pain in the treatment of periodontitis. Using GC with calcium carbonate (abrasive agent), glycerin (wetting agent and co-solvent), methyl paraben (preservative), sodium lauryl sulfate (surfactant) and camphor (flavoring agent) and 1% w/w CA. The formulated toothpastes demonstrated sustained release of aceclofenac for 6 hours, in vitro also revealing good adhesion to the oral mucous membrane. These 1% w/w AC toothpastes can be used in the effective treatment of dental inflammation and pain through the local administration of AC over a prolonged period in the treatment of periodontitis.

Controlled-release tablets formulated with GC, cross-linked GC and microcrystalline cellulose (MCC) were prepared by direct compression. In vivo studies for the commercialized and optimized formulation showed that there was no significant difference between the two, confirming the sustained release profile. The stability study for optimized formulation showed even better results. It can be concluded that natural gums and their derivatives can be effectively used for the preparation of sustained-release tablets (BHOSALE et al, 2015). GC/PVA biofilms were able to trap trypsin inhibitors with antimicrobial activity obtained from Platypodium elegans (PeIT) and Inga laurin (ILIT). However, the inhibitory activity of immobilized PeIT was twice as high as that observed for ILIT. In addition, the released inhibitors showed high stability after 24 h of storage, confirming that GC/PVA films are versatile and efficient materials to be used as support for the immobilization of biomolecules (CRUZ et al, 2019).

Studies are being carried out with the objective of identifying how the interaction between the polymer and the drug occurs, such as the study carried out by Cordeiro et al. (2017) to evaluate the interaction between the biopolymer, composed of the association GC with chitosan, and the drug pilocarpine was carried out by aiming to identify how the controlled release of the drug occurs, according to these authors GC interacted with pilocarpine, having a protective thermal effect on the drug.

In addition to the use of cashew polysaccharides in association with other vegetable or synthetic polymers, in the literature available in the databases used in this research, it was possible to identify that structural changes in the gum are also the subject of research, as they confer differences in the chemical and physical properties of the gum. GC, as an example by modifying its solubility in water, among others. Studies carried out from the acetylation of the gum, tested its ability to produce nanoparticles and showed great potential as a vehicle in controlled drug delivery systems, especially when tested in the nanoencapsulation of the natural alkaloid epiisopiloturine. The synthesized nanoparticles show great potential for use in the release of epiisopiloturine. (DO AMARAL RODRIGUES et al, 2019). Likewise, studies were carried out by Silva et al. (2019) also using acetylated GC as a platform in drug delivery systems with insulin as a model drug. In the aforementioned study, the nanoparticles were developed through the technique of polyelectrolytic complexation and the result showed an insulin encapsulation efficiency of 52.5% and electrostatic stabilization was suggested by the zeta potential of + 30.6 mV. Sustained insulin release was observed for up to 24 h. Suggesting that acetylated GC showed potential as a vehicle for sustained oral insulin release. Indomethacin, a known anti-inflammatory agent, was also nanoencapsulated using acetylated GC as a wall material and controlled drug release was observed for up to 72 h (Pitombeira et al, 2015).

GC/PVA biofilms were able to trap trypsin inhibitors with antimicrobial activity obtained from *Platypodium elegans* (PeIT) and *Inga laurina* (ILIT). However, the inhibitory activity of immobilized PeIT was twice as high as that observed for ILIT. In addition, the released inhibitors showed high stability after 24 h of storage, confirming that GC/PVA films are versatile and efficient materials to be used as support for the immobilization of biomolecules (CRUZ et al, 2019).

FINAL CONSIDERATIONS

Much has been researched in relation to natural medicinal products and their therapeutic use. According to the results obtained in the literature review regarding the pharmacological properties of cashew tree gum (GC) and its application in the development of new bioprocesses for controlled drug release, it was possible to infer that the cashew exudates polysaccharides have a wide pharmacological activity, In this study, studies were described that showed in their results the potentiality of GC for antitumor and antiproliferative, antimicrobial, against fungi, bacteria and yeast, gastroprotective and antidiarrheal use.

Regarding the application of GC in biotechnological processes of controlled drug release, recent studies report the use of GC in combination with other polysaccharides and structurally modified GC, as a material for drug excipients, through formulations of tablets, biofilms, hydrogels and micro and nanoencapsulation of drugs, such research presents results that demonstrate the great potential of this biopolymer for biotechnological applications, indicating the use of natural gums as an effective alternative to synthetic polymers.

However, in the present research, it was possible to verify a small number of publications, mainly with regard to the pharmacological potential of GC and, in general, it shows the importance of encouraging the development of new research on the properties and technologies of GC, a polysaccharide of low cost of obtaining and widely found in the Brazilian Northeast.

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