ACTA SCIENTIFIC MEDICAL SCIENCES

Volume 2 Issue 8 November 2018

Research Article

Evaluation of the Anti-Inflammatory Activity of the Oil from the Pequi (*Caryocar brasiliensis* Camb) in Mice

Mayara Tania Pinheiro[1]*, Flavia de Oliveira Pantoja[2], Nubia Priscilla Leite Távora[2], Roberto Messias Bezerra[3], Clarissa Silva Lima[3], Elza Caroline Alves Muller[3], Glauber Vilhena da Costa[3] and Alex Bruno Lobato Rodrigues[4]

[1]*Department of Biological and Health Sciences, Faculty of Pharmaceutical Sciences, General and Analytical Chemistry Laboratory of the Federal University of Amapá, Macapá- Amapá, Brazil*

[2]*Undergraduate Course of Pharmaceutical Sciences, General and Analytical Chemistry Laboratory of the Federal University of Amapá; Rodovia Juscelino Kubitschek, Brazil*

[3]*Department of Biological and Health Sciences, Faculty of Pharmaceutical Sciences, Laboratory of Reproductive Toxicology of the Federal University of Amapá, Macapá- Amapá, Brazil.*

[4]*Laboratory of Pharmacognosy and Phytochemistry of the Federal University of Amapá; Rodovia Juscelino Kubitschek, Brazil*

***Corresponding Author:** Mayara Tania Pinheiro, Department of Biological and Health Sciences, Faculty of Pharmaceutical Sciences, General and Analytical Chemistry Laboratory of the Federal University of Amapá, Macapá- Amapá, Brazil.

Received: August 29, 2018; **Published:** October 05, 2018

Abstract

Introduction: Pequi is found in Brazilian Cerrado and belongs to the Caryocaceae family and *Caryocar* genus. In folk medicine, the oil is used as an anti-inflammatory, to heal wounds, and for the treatment of rheumatic and muscle pains.

Objective: The present study aims to investigate the effect of pequi oil on inflammatory response about Mourinho model of paw edema.

Methodology: For experimental methodology, we used mice, females weighing 20 grams of C57BL/6 line, divided in four groups, two controls and two experimental, so that the body masses were homogeneous. Before administration of the treatments for oral administration (time 0h), the diameter of the right hind paw of all the animals with a digital pachymeter and the paw marked at a defined height, guaranteeing the regularity of the measurement. The 01 group received pequi oil (OP) at a concentration of 100 mg/Kg (v.o); 02 Group received a concentration of 200 mg/Kg (v.o); the 03 Group received only the Tween® 80 - vehicle of dilution (negative control); and the 04 group was treated with indomethacin, intraperitoneal route, at a dose of 10 mg/Kg (positive control). After one hour of treatment administration, edema was induced in all groups by intraplanar injection of 50 µL of 1% carrageenan in the right pelvic (right hind paw) of the mice. The formation of edema was quantified by changes in the diameter of this limb. The diameter was measured using a digital caliper before edema and until the sixth hour and after 24 and 48 hours. After induction of the edema and the paws were treatments measured with the aid of a digital pachymeter until the sixth hour and later 48 hours and 24. The results were statistically analyzed by analysis of variance at 5% probability to verify which treatments differ, and these were tested by Kruskal-Wallis and Student-Newman-Keuls.

Results: Treatment with OP at concentrations of 100 and 200 mg/Kg, not significantly reduced the carrageenan-induced edema, when compared to the two control groups until the first 24 hours. However, there was a significant one-off for reduction, 100 mg/Kg, just in time to 48 hours when compared to all other treatments, this time featuring a chronic inflammatory response. It was observed, that the two orders of OP significantly reduced the swelling when compared to Tween® group, 200 mg/Kg in 3, 4 and 5th hour and at a dose of 100 mg/Kg 4, 5 and 6th hour. Suggesting a good anti-inflammatory response of OP on the model of acute inflammation induced here. The indomethacin presented a standard behavior on the inflammatory process, reducing edema at all times measured when compared to the negative control.

Conclusions: Oral treatment with OP was not efficient to reduce edema, compared with to negative and positive controls (indomethacin). In general, the oil didn't influence on the reduction of edema, but other routes will still be tested.

Keywords: Inflammation; Medicinal Plants; *Caryocar brasiliense*; Oil; Pequi

Introduction

The pequizeiro tree, known by the common names of pequi, *Caryocar coriaceum*, pequá, thorn almond, horse grain or almond Brazil is an arboreal species native to the Cerrado in the family Caryocaraceae. Occurs in almost all the country's systems and agroecos has paid off greatly appreciated and used in the cuisine of the Central-West region, North and northeastern part [1].

The name Caryocar comes from the Greek caryon (= nucleus, walnut) and kara (= head), referring to the globose fruit [2] Already the name "pequi" has origin indigenous (py-chi, py = skin, bark; qui = thorn), meaning "bark bark", arising from the endocarp spines [3].

The pulp and the almond fruit are extracted an oil that offers great versatility as for your use, with applications ranging from regional cuisine to the cosmetic industry, in the production of soaps and creams [4], besides presenting potential use in the cosmetics, food and pharmaceutical industry [1].

In folk medicine, are assigned various property data to the plant and medicinal fruit, the bark of the tree and the fruit are used in infusions as antifebrin and diuretics [5], the leaves in the treatment of colds, flus, edema and the oil of the fruit is used for treatment of sunburn, as aphrodisiac [6], and as balm in cases of rheumatism [7]. Ethnopharmacological and ethnobotanical studies confirm its use in the treatment of colds and bronchopulmonary infections (pure or in combination with honey), throat inflammations, rheumatism, external ulcers, pain muscle and inflammation of the skin [8-11].

Studies have identified the phytochemical profile of plants of the genus Caryocar. The evaluations carried out by Perez [12] the presence of several substances in the species *Caryocar brasiliense* Camb: o internal mesocarp plus fruit endocarp present flavonic heterosides, saponin heterosides, fixed acids, condensed tannins and sugars; O exocarp of the fruit suggested the presence of steroids and triterpenes, heterosides anthraquinones, flavonic heterosides; saponin heterosides, amino groups, condensed and hydrolysable tannins and sugars [12].

Analysis by gas chromatography coupled to mass spectrometry (GC/ MS) of *C. brasiliense* seed and leaf essential oils revealed a series of compounds, with the major component of seeds of *C. brasiliense* was ethyl hexanoate, while essential oil of the leaves presented octacosan, heptadecane and hexadecanol [13].

When identifying carotenoids in the *C. brasiliense* pulp by chromatography high efficiency liquid chromatography (HPLC) and mass spectrometry (MS), the Azevedo-Meleiro and Rodriguez-Amaya [14] revealed the presence of violaxanthin, lutein, zeaxanthin and small percentages of β-cryptoxanthin, β-carotene and neoxanthin.

Therefore, medicinal plants have had their therapeutic value researched more intensely by science in recent years, as well as their use recommended by health professionals [15]. The World Health Organization [16] defines a medicinal plant as "any plant that contains, in one or more organs, substances that can be used for therapeutic purposes or that are precursors of semi-synthetic drugs. Despite being described the use of pequizeiro tree in treating a wide variety of enfermi activities, with regard to your use as anti-inflammatory little has been seen in the scientific literature, the present study aims to investigate the effect of pequi oil on inflammatory response about murinho model of paw edema.

Material and Method

The present study was certified by the Animal Use Ethics Committee of the Federal University of Amapá under number 0010/2017. The pequi fixed oil (OP) was purchased from a well-known (not cited) trademark in the region.

For experimental methodology, we used mice, females weighing 20 grams of C57BL/6 line, divided in four groups, two controls and two experimental, so that the body masses were homogeneous. Before administration of the treatments for oral administration (time 0h), the diameter of the right hind paw of all the animals with a digital pachymeter and the paw marked at a defined height, guaranteeing the regularity of the measurement. The 01 group received pequi oil (OP) at a concentration of 100 mg/Kg (v.o); 02 Group received a concentration of 200 mg/Kg (v.o); the 03 Group received only the Tween® 80 - vehicle of dilution (negative control); and the 04 group was treated with indomethacin, intraperitoneal route, at a dose of 10 mg/Kg (positive control).

After one hour of treatment administration, edema was induced in all groups by intraplanar injection of 50 µL of 1% carrageenan in the right pelvic (right hind paw) of the mice. The formation of edema was quantified by changes in the diameter of this limb.

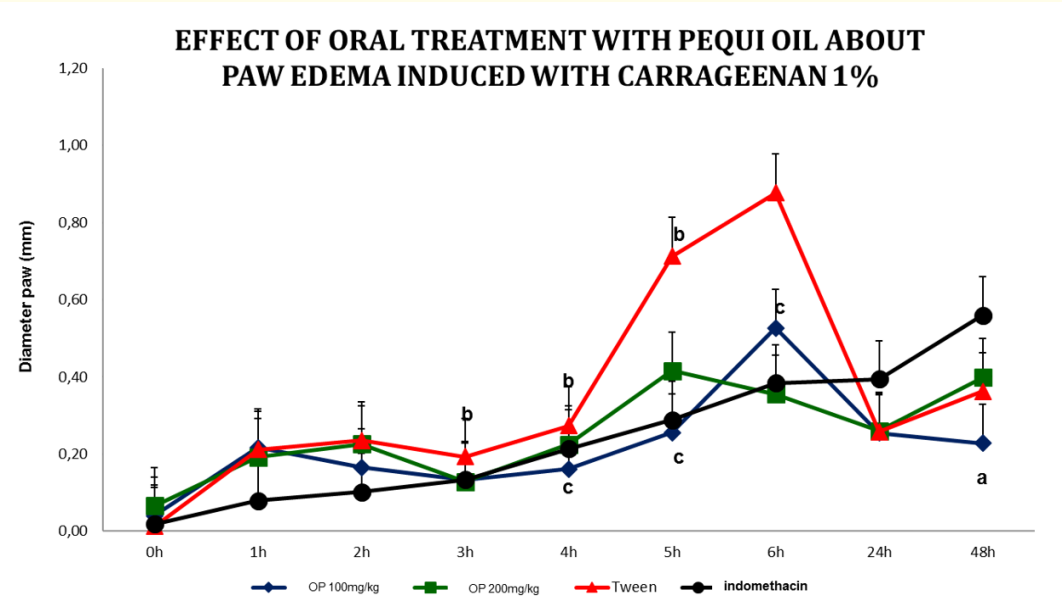
The diameter was measured using a digital caliper before edema and until the sixth hour and after 24 and 48 hours. After induction of the edema and the paws were treatments measured

with the aid of a digital pachymeter until the sixth hour and later 48 hours and 24.

The results were statistically analyzed by analysis of variance at 5% probability to verify which treatments differ, and these were tested by Kruskal-Wallis and Student-Newman-Keuls.

Results and Discussion

The results show what treatment with OP at concentrations of 100 and 200 mg/Kg, not significantly reduced the carrageenan-induced edema, when compared to the two control groups until the first 24 hours. However, there was a significant one-off for reduction, 100 mg/Kg, just in time to 48 hours when compared to all other treatments, this time featuring a chronic inflammatory response. It was observed, that the two orders of OP significantly reduced the swelling when compared to Tween® group, 200 mg/Kg in 3, 4 and 5th hour and at a dose of 100 mg/Kg 4, 5 and 6th hour. Suggesting a good anti-inflammatory response of OP on the model of acute inflammation induced here. The indomethacin presented a standard behavior on the inflammatory process, reducing edema at all times measured when compared to the negative control graph 1.



Graph 1: Effect of pequi oil treatment on paw edema induced with carrageenan 1%. Mice of the C57131/ 06 strain were treated with PO at doses of 100mg/kg and 200mg/kg, orally, 1 hour before induction of foot edema, plantar cushion, with 1% carrageenan. After the first hour the evaluation of the edema was started. The results represent the mean t SD (n = 5 animals/group). The a=ps0.01 (OP 100mg/kg compared to indomethacin). b= ps0.01 (OP 200mg/kg compared to Tween); c= ps0.01 (OP 100mg/kg compared to Tween).

In the composition of the pequi oil, the presence of vitamin A and several fatty acids is observed, with the most notable being the oleic (50.2%) and the palmitic (44.3%), and in smaller quantities myristic fatty acids, palmitolytic, stearic, linoleic and linolenic [17,18].

Fatty acids are compounds that contain a long hydrocarbon chain and terminal carboxy group, presenting three main functions: they are structural components of the biological membranes; they play the role of precursors of intracellular messages and, when oxidized, generate energy - ATP (adenosine triphosphate). There are several studies demonstrating the beneficial effect of topical application of fatty acids on wound treatment. Are low-cost substances and widely used as anti-inflammatory agents in healing by popular culture in several countries, also presenting the property of serving as a protective barrier against microorganisms, avoiding tissue dehydration as well as important immunomodulatory character [19].

The product of fatty acids acts in several stages of the inflammatory process as vascular contraction, chemotaxis, adhesion, trans endothelial migration, activation and cell death [20]. Based

on the results obtained and according to the mentioned literature suggests that these fatty acids present in OP can inhibit the inflammatory process via prostaglandins [18].

The inhibition of edema caused by carrageenan-related mechanism involves the synthesis of prostaglandins, in particular, PGE2α and PGF2α, being the activity compared to non-steroidal anti-inflammatory. Previously, it was shown that topical anti-inflammatory activity of *Calendula officinalis* is involved mainly the monoester triterpenoids of far diol. These studies have demonstrated that standardized extracts, on the presence of triterpenes produced anti-inflammatory activity similar to prostaglandin inhibitors, however, the Association of extracts of *C. Officinalis* and *M. Recutita* the GECOMR® inhibited both the edema by carrageenan, dextran as, and antagonized the effect of histamine [19].

The anti-inflammatory activity of OP was confirmed by the model of carrageenan-induced paw edema, by reducing the volume displaced and reduction in edema. As an inflammatory agent, carrageenan induces inflammation by releasing prostaglandins, causing the formation of edema. Non-steroidal anti-inflammatories, such as indomethacin, inhibit cyclooxygenase, lowering prostaglandin biosynthesis [20].

Other studies should be performed in order to better elucidate the possible mechanisms of action of OP on other different models of induction of inflammatory process.

Conclusion

Oral treatment with OP was not efficient to reduce edema, compared with to negative and positive controls (indomethacin). In general, the oil didn't influence on the reduction of edema, but other routes will still be tested.

Bibliography

1. Oliveira ME., *et al*. "Agronomic and quality Aspects of pequi". *Fortress: Embrapa Tropical* 32 (2008).
2. Barroso GM. "Systematics of angiosperms in Brazil. Viçosa: 2 (1984).
3. BRAGA R. "Plants of the Northeast, especially Ceará". Fortaleza: Imprensa oficial (1960).
4. Pianovski AR., *et al*. "Pequi oil use (*Caryocar brasiliensis*) in cosmetic emulsions: development and evaluation of physical stability". *Brazilian Journal of Pharmaceutical Sciences* 44 (2008): 249-259.
5. Paula-Júnior., *et al*. "Leishmanicidal, antibacterial, and antioxidant activities of *Caryocar brasiliensis* Cambess leaves hydroethanolic extract". *Brazilian Journal of Pharmacognosy*14 (2006): 625-630.
6. Khouri J., *et al*. "Anticlastogenic potencial and antioxidant effects of an aqueous extract of pulp from the pequi tree (*Caryocar brasiliense* Camb)". *Genetics and Molecular Biology* 30 (2007): 442-448.
7. Saraiva RA., *et al*. "Topical anti-inflammatory activity of *Caryocar coriaceum* Wittm". (Caryocaraceae) pulp fruit and seed oils. In: 4th Brazilian Symposium on Medicinal Chemistry, 2008. Anais. Porto de Galinhas: *Brazilian Chemical Society* (2008).
8. Franco EAP and Barros RFM. "Use and diversity of medicinal plants at the "Quilombo Olho D'água dos Pires", Esperantina, Piaui State, Brazil". *Brazilian Journal of Medicinal Plants* 8 (2006): 78-88.
9. Silva MAP and Medeiros-Filho S. "Morphology of fruit, seed and seedling of piqui (*Caryocar coriaceum* Wittm)". *Journal of Agronomic Sciences* 37 (2006): 320-325.
10. Oliveira., *et al*. "Medicinal plants used in the Pharmacopoeia Popular in Crato, Juazeiro and Barbalha (Ceará, Brazil)". *Brazilian Journal of Biosciences* 5 (2007): 189-191.
11. Agra MF., *et al*. "Synopsis of the plants known as medicinal and poisonous in Northeast of Brazil". *Brazilian Journal of Pharmacognosy* 17 (2007): 114-140.
12. Perez E. "Phytochemical diagnosis of fruits of *Caryocar brasiliense* Camb., Caryocaraceae. Dissertation (Master in Pharmaceutical Sciences)". Federal University of Paraná, Curitiba (2004).
13. Passos., *et al*. "Antifungal activity of *Caryocar brasiliensis* (Caryocaraceae) on *Cryptococcus neoformans". Journal of the Brazilian Society of Tropical Medicine* 35 (2003): 623-627.
14. Azevedo-Meleiro CH and Rodriguez-Amaya DB. "Confirmation of the identity of the carotenoids of tropical fruits by HPLC-DAD and HPLC-MS". *Journal of Food Composition and Analysis* 17 (2004): 385-396.
15. Arnous., *et al*. "Medicinal plants for home use - popular knowledge and interest for community cultivation". *Revista Espaço Saúde* 6 (2005): 1-6.
16. World Health Organization (WHO). WHO Strategy on Traditional Medicine. 2002-2005. Geneva: WHO (2002).

17. CRODA DO BRASIL. Crodamazon Pequi. Campinas: Croda (2002).

18. Bezerra., *et al*. "The action of pequi oil (*Caryocar brasiliense*) on the cicatricial process of lesions in rats". *Revista Brasileira de Plantas Medicinais* 17 (2015): 875-880.

19. Hatanaka E and Curi R. "Fatty acids and wound healing: a review". *Revista Brasileira de Farmácia,* 88 (2007): 53-58.

20. Cardoso CR. *et al*. "Influence of topical administration of n-3 and n-6 essential and n-9 nonessential fatty acids on the healing of cutaneous wounds". *Wound Repair and Regeneration 12* (2004): 235-243.

Volume 2 Issue 8 November 2018