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ORIGINAL ARTICLE

Evaluation of chemical composition and antiedematogenic activity of the essential oil of *Hyptis martiusii* Benth

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Abstract Evaluations of the therapeutic potential of medicinal plants and their components have been the subject of many studies. Furthermore, the biological activities of various plant species have been reported in various pieces of literature. *Hyptis martiusii* Benth (Lamiaceae), popularly known as "mad balm" is commonly found in the North, Southeast, and Northeast of Brazil. Its leaves are used ethnobiologically as antiulcerogenic, antimicrobial, antitumor and as insecticide. This study aimed to analyze the chemical composition of the essential oil of *H. martiusii* Benth (OEHM) by GC/MS as well as its possible topical activity as an antiedematogenic. This is verified by the models of ear edema induced by single (acute edema) and multiple (chronic edema) applications of croton oil topically, and systemically verified through the model of paw edema induced by carrageenan 1%. Doses of 50, 75 and 100 mg/kg OEHM were used in all tests. Chemical analysis of the oil revealed the 1,8-cineole (34.58%) and δ-carene (21:58%) as major components present in the

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essential oil. On the model of ear edema, acute and chronic OEHM in all the tested doses showed no significant antiedematogenic activity ($p < 0.05$). The systemic model of paw edema induced by carrageenin showed that a dose of 100 mg/kg effectively reduced swelling by 55.37% in the second hour evaluation when compared to the saline group. The anti-inflammatory systemic effect can give greater bioavailability of the components present in the essential oil and your interference in cytokines and leukotriene, thromboxane and prostaglandin biosynthesis. It is therefore concluded that OEHM presents systemic antiedematogenic activity but not topical activity at these doses.

1. Introduction

Medicinal plants represent an important therapeutic option for maintaining the health of people, especially for the low-income population (Lima et al., 2013). There are many materials to be extracted from medicinal plants that can be used in folk medicine and targeted for study, such as, essential oils, extracts, and latex. These materials were analyzed in order to contribute to the research and manufacture of new drugs (Elisabetsky and Wannmacher, 1993).

Essential oils are the volatile elements contained in many plant organs and related to various functions necessary for plant survival playing a key role in defense against microorganism (Siani et al., 2000). Essential oils were derived from the secondary metabolism of plants and have a complex chemical composition, especially the presence of terpenes and phenylpropanoids (Silva et al., 2003).These compounds are responsible for presenting answers to biological activity.

The genus *Hyptis* is considered of great economic importance due to the presence of essential oil (Falcão and Menezes, 2003) used in folk medicine as an alternative therapy, with some pharmacological properties already described as antioxidant (Santos et al., 2010), antiulcerogenic (Caldas et al., 2011), antiseptic (Pereda-Miranda et al., 1993), insecticide (Araújo et al., 2003), antibacterial (Souza et al., 2003), antifungal (Oliveira et al., 2004) and antinociceptive (Menezes et al., 2007).

Hyptis martiusii Benth is a small shrub, commonly found in northern, southeastern and northeastern Brazil (de Almeida and de Albuquerque, 2002) popularly known as "cidreira brava" or "cidreira do mato". This is an important source of essential oil, with the predominance of mono-and sesquiterpenes, presenting its chemical compounds as: 1,8-cineole, δ-3-carene and β-caryophyllene and bicyclogermacrene (Araújo et al., 2003).

Even in studies of Araújo et al. (2003), the insecticidal potential of the *H. martiusii* essential oil and its isolated compound 1,8-cineole was proven. Moreover, Costa et al. (2005) confirmed its insecticidal activity against *Aedes aegypti*. In studies by Coutinho et al. (2008), the ethanol extract from the leaves of *H. martiusii* showed *in vitro* antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*.

Caldas et al. (2011) studied the anti-inflammatory activity of the essential oil of *H. martiusii* in models of gastric mucosal injury in rodents. They were able to demonstrate a significant gastroprotective activity of the oil by increasing factors of gastric mucosa defense, encouraging the development of new research on different models of inflammation and their mechanisms of action.

The main effect of the inflammatory cascade is the reaction of the blood vessels that leads to the accumulation of fluid and leukocytes into extravascular tissues featuring edema, a consequence of the inflammatory process. These inflammatory responses may have beneficial or harmful effects to the body and are closely linked to the repair process (Brito et al., 2006).

Considering the aspects already discussed about the Lamiaceae family, as well as previous literature on anti-inflammatory properties of other species of the genus *Hyptis* and the high prevalence of diseases involving inflammatory reactions, this claim investigates the potential antiedematogenic effects of the species *H. martiusii* Benth essential oil through the classical pharmacologic model of inflammations as topical acute and chronic ear edema, and systemic effects by paw edema.

2. Materials and methods

2.1. Ethical aspects

This research was conducted in strict compliance with the current rules and bioethical guidelines for trials involving living beings as according to the Ethics Committee on Animal Research (CEUA) of the Regional University of Cariri – URCA, for the review of experimental protocols, and approved under section number 18/2012.2.

2.2. Botanical material

The collection of plant material (leaves) of *H. martiusii* Benth, was held in the savannah area of the Chapada of Araripe (Barreiro Grande Farm, Crato-Ce, 7° 21′ 50″ S; 39° 28′ 39″ W; altitude: 930 m) in May of 2012. A voucher specimen of the plant specimen was deposited in the Herbarium Carirense Dárdano de Andrade Lima – HCDAL the Regional University of Cariri – URCA, under registration number 8394.

2.3. Animals

For implementation of *in vivo* tests, male mice (*Mus musculus* specimen) restricted to a body mass between 20 and 30 g were chosen randomly. They were kept in polypropylene cages and kept in a temperature of 22 ± 3 °C, accompanied by light/dark cycles of 12 h with free access to drinking water and specific to rodents (Labina, Purina®).

2.4. Essential oil extraction

The fresh leaves collected (3950 g) were subjected to distillation with water vapor drag in Clevenger type apparatus for