



Review of the plants with anti-inflammatory activity studied in Brazil

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ABSTRACT: The inflammatory reaction is a response of the organism against an injury and it involves the action of complex events and mediators through of the blood vessels. The present work is a literature survey of the extracts of plants with anti-inflammatory activity studied in Brazil. The review refers to 75 plants with their families, parts used, type of extract used, bioassay models and their activity.

Keywords: Anti-inflammatory activity, medicinal plants, natural products, review.

INTRODUCTION

Inflammation or flogose is a reaction of the tissue blood vessels against aggressor agent characterized by access of liquids and of cells to interstice (Lope et al., 1987). The inflammatory reaction is characterized by blush, heat, tumor, pain and lost function (Dassoler et al., 2004).

There are many causes for the inflammations, but the mechanisms are common to all. The inflammatory agent acts in the cell membranes inducing the activation of phospholipase A₂ and consequently, liberates arachidonic acid and metabolites. According to Dassoler et al. (2004) the inflammatory mediators such as cytokine, histamine, serotonin, leukotrienes and prostaglandin increase the vascular permeability to all on the migration leukocytes cells to act on the site of inflamed tissue. Any interruption of this sequence of events results in the reduction of the liberation of the mediators causing the microcirculation to come back to normal hemodynamic state (Lope et al., 1987).

Although, there is a defense mechanism, the complex events and mediators involved in the inflammatory reaction can induce, maintain or aggravate many diseases (Sosa et al., 2002). The non steroidal anti-inflammatory drugs (NSAIDs) are one of the categories of drugs most frequently used by population. However, these drugs cause adverse gastric reactions, inhibit renal function, reduce the efficacy of the diuretics and retard the angiotensin converting enzyme inhibitors (Gaddi et al., 2004).

The use of anti-inflammatory agents is helpful in the therapeutic treatment of the pathologies. The medicinal plants are widely used in folk medicine of many countries to treat different inflammatory conditions and, in particular, skin inflammations. However, for many of the plants in use, the real efficacy and the relevant active

principles are unknown. Consequently, experimental studies aimed at demonstrating the pharmacological properties of these plants and identifying the relevant active principles are needed (Sosa et al., 2002).

In the course of our continuing search for bioactive natural products from plants, we recently published some reviews on crude plant extracts and plant-derived compounds with potential antitumor activity against mammary (Moura et al., 2001), uterine cervical (Moura et al., 2002) and ovarian neoplasia (Silva et al., 2003), antileishmanial activity (Rocha et al., 2005), HMG CoA reductase inhibitors (Gonçalves et al., 2000), central analgesic activity (Almeida et al., 2001), prevention of the osteoporosis (Pereira et al., 2002) and for the treatment of Parkinson's disease (Morais, 2003). In the present work we have reviewed the literature related with plants of the Brazil with anti-inflammatory activity.

MATERIAL AND METHODS

The anti-inflammatory activity of the plants was searched through the data bank of the University of Illinois in Chicago, the NAPRALERT (Acronym for Natural Products ALERT). The data were updated in December 2004, using anti-inflammatory plants as legend. The plant extracts studied in Brazil were selected for this work and the references found in the search were later consulted for details on the models or mechanisms.

RESULTS AND DISCUSSION

It was possible in this review to list seventy five species of medicinal plants with anti-inflammatory activity. Those species are distributed in thirty six families of which the following stood out: Asteraceae, Fabaceae, Euphorbiaceae and Apocynaceae with 10, 10, 5 and 4 species, respectively, studied so far.

The effectiveness of the plant extracts was dependent on the type of extract used, the model of ulcer induction and the organism tested. Thus, it was possible to classify the extracts as strongly active, active, weakly active, inactive and equivocal.

Anti-inflammatory activity of crude plant extracts

Plants of the genus *Bouchea* are popularly known as “gervão”. The leaves of *Bouchea fluminensis* contain iridoid and steroid glycosides that are present in the form of crude triterpene mixture having anti-inflammatory property. The purified fraction was found to contain ursolic, oleanolic and micromeric acids (Costa et al., 2003).

According to Costa et al. (2003) the anti-inflammatory activity of oleanolic and ursolic acid inhibiting the edema induced by carrageenin or serotonin have been attributed to various mechanisms which include: inhibition of lipoxygenase and cyclo-oxygenase, inhibition of elastase and inhibition of complementary system (possibly through the inhibition on C3-convertase of the classical complementary pathway).

Gochnatia polymorpha (Less.) Cabr. is distributed in Southern Brazil and it is known in popular medicine as “cambara”. The leaves of this plant have been found to contain sesquiterpenes and lactone derivatives. From *G. polymorpha* leaves were obtained various fractions, and the EtOAc fraction showed significant antiedematogenic activity with a dose level of 150 mg/kg on carrageenin model in rats when this activity was compared to a control group, the amino acid 4-hydroxy-N-methyl-proline, that showed significant inhibition of edema with a dose level 200 mg/kg (Moreira et al., 2000).

Hyptis pectinata (L.) Poit (Lamiaceae) is popularly known in Brazil as “sambacaita” or “canudinho”. The essential oil of the leaves of this species contains 95.8% of monoterpenes and the aqueous extract of *H. pectinata* leaves was tested in rat for the observation of antiedematogenic effects using the carrageenin and arachidonic acid induced paw edema model. The extract administered orally at the dose of 600 mg/kg exhibited a significant antiedematogenic activity (34.1% inhibition). The doses of 200 and 400 mg/kg did not show any significant differences on the first model. In another set of experiment, the intraperitoneal administration of the extract at the dose level of 300 mg/kg inhibited the rat-paw edema by 33.8%. The results show that the aqueous extract of *H. pectinata* acts on both the cyclooxygenase and lipoxygenase pathways (Bispo et al., 2001).

Pterodon pubescens is popularly called “sucupira” in Brazil. Sabino et al. (1999) studied the hydroalcoholic extract of *P. pubescens* seeds in an arthritis model for preventive and therapeutic antiarthritic treatment. The preventive treatment significantly reduced the arthritic index and the arthritis incidence induced

by collagen. Therefore, that study results, provide a preliminary scientific foundation for the use of *P. pubescens* infusions in popular medicine for the treatment of rheumatoid arthritis.

Franzotti et al. (2000) studied *Sida cordifolia* L. (Malvaceae) which is popularly known in Brazil as “malva-branca” or “malva-branca-sedosa”. The aqueous extract (AE) of *S. cordifolia* leaves was studied to assess the anti-inflammatory properties using the carrageenin and arachidonic acid induced rat paw edema model. The administration of a dose level of 400 mg/kg of the extract of *S. cordifolia* showed 28.31% reduction in edema, whereas the dose level of 200 mg/kg was ineffective in reducing edema, and the dose of 800 mg/kg inhibited by 7.55% in the model of carrageenin-induced edema. This model involves three distinct phases: (1) the release of histamine and serotonin, (2) the release of kinins and (3) the release of prostaglandins. The arachidonic acid model is highly sensitive to inhibitors of the lipoxygenase pathway and is resistant to selective cyclooxygenase inhibitors. Thus, the dose 200 mg/kg was ineffective as antiedematogenic. According to the results obtained from the inflammation models used in the present study, *S. cordifolia* seems not to interfere with the lipoxygenase pathway but rather with the cyclooxygenase pathway (prostaglandin biosynthesis) (Franzotti et al., 2000).

CONCLUSION

It can be concluded that studies with new active principles are important for understanding the complex mechanism of inflammation. Academic institutions should invest in this type of study with medicinal plants and thus, contribute to the benefit of the populations needing this type of health care.

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Table 1. Extracts of plants with anti-inflammatory activity studied in Brazil.

Family and botanical name	Part used	Extract	Model / Administration	Organism	Result	References
Acanthaceae						
<i>Justicia pectoralis</i> var. <i>stenophylla</i>	DLF	Hexane-acetone	Dextran-induced pedal edema / Intragastric	Rat	Inactive	Lino et al., 1997
		Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Lino et al., 1997
Agavaceae	DRZ	EtOH - H ₂ O (50%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Calixto et al., 1990
Amaranthaceae	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / **	Rat	Inactive	Delaporte et al., 2001
<i>Alternanthera brasiliana</i>	DRT	H ₂ O Ext.	Cotton pellet granuloma / Intragastric	Rat	Inactive	Taniguchi et al., 1997
<i>Puffia lvesinoides</i>	DRT	H ₂ O Ext.	Adjuvant-induced arthritis / Intragastric	Rat	Active	Taniguchi et al., 1997
	DRT	Saponin Fraction	Carrageenan-induced pleurisy / Intragastric	Rat	Active	Taniguchi et al., 1997
	DRT	Saponin Fraction	Cotton pellet granuloma / Intrag	Rat	Active	Taniguchi et al., 1997
	DRT	Saponin Fraction	** / Intragastric	Rat	Active	Taniguchi et al., 1997
	DRT	H ₂ O Ext.	Carrageenan-induced pleurisy / Intragastric	Rat	Active	Taniguchi et al., 1997
<i>Puffia paniculata</i>	DRT	EtOH (60%) Ext.	Carrageenan-induced pleurisy / IP	Rat	Active	Mazzanti et al., 1994
<i>Puffia stenophylla</i>	DRT	EtOH (20%) Ext.	Carrageenan-induced pleurisy / IP	Rat	Active	Mazzanti et al., 1993
Anacardiaceae				Mouse		
<i>Anacardium occidentale</i>	DBK	Isopropanol - H ₂ O (1:1) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Mota et al., 1985
	DBK	Isopropanol - H ₂ O (1:1) Ext.	Acetic acid-induced writhing / IP	Rat	Active	Mota et al., 1985
	DBK	Shell	Adjuvant-induced arthritis / IP	Rat	Active	Mota et al., 1985
	DBK	Shell	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Mota et al., 1985
	DBK	Shell	Acetic acid-induced writhing / Gastric intubation	Rat	Inactive	Mota et al., 1985
	DBK	Shell	Dextran-induced pedal edema / Gastric intubation	Rat	Inactive	Mota et al., 1985
	DBK	Shell	Adjuvant-induced arthritis / Gastric intubation	Rat	Active	Mota et al., 1985
	DBK	Shell	Carrageenan-induced pedal edema / IP	Rat	Active	Mota et al., 1985
	DBK	Shell	Acetic acid-induced writhing/IP	Rat	Active	Mota et al., 1985
	DBK	Shell	Dextran-induced pedal edema / IP	Rat	Active	Mota et al., 1985
<i>Astronium urundeuva</i>	DBK	Tannin Fraction	Carrageenan-induced pedal edema / IP	Mouse	Active	Viana et al., 1997
	DBK	Tannin Fraction	Cyclophosphamide-induced hemorrhagic cystitis / IP	Rat	Active	Viana et al., 1997
	DBK	Tannin Fraction	Dextran-induced pedal edema / IP	Rat	Active	Viana et al., 1997
	SB	EtOAc Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Viana et al., 1997
	SB	EtOAc Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Viana et al., 1997
Apocynaceae						
<i>Ervatamia coronaria</i>	DSM	EtOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Henriques et al., 1996
	DSM	EtOH (95%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Strong activity	Henriques et al., 1996
	DSM	H ₂ O Ext.	Carrageenan-induced pedal edema / IP	Rat	Weak activity	Henriques et al., 1996
<i>Himatanthus sucubus</i>	LX	Hexane Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	De Miranda et al., 2000
<i>Peschiera australis</i> var. <i>australis</i>	DLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Rates et al., 1993
	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Rates et al., 1993
<i>Mandevilla velutina</i>	DRZ	Aqueous-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Calixto et al., 1986
	DRZ	Aqueous-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Calixto et al., 1986
	DRZ	Aqueous-alcoholic Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Calixto et al., 1986
	DRZ	Aqueous-alcoholic Ext.	Snake venom-induced pedal edema / Intragastric	Rat	Inactive	Calixto et al., 1986

	DRZ	Aqueous-alcoholic Ext.	5-HT-induced pedal edema / Intragastric	Rat	Inactive	Calixto et al., 1986
	DRZ	Aqueous-alcoholic Ext.	Platelet aggregating factor-acether-induced pedal edema / Intragastric	Rat	Inactive	Calixto et al., 1986
	DRZ	Aqueous-alcoholic Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Calixto et al., 1986
	FNZR	EtOH - H ₂ O (50%) Ext.	5-HT-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Zymosan induced rat paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Bothrops jararaca induced rat paw edema / Intragastric	Rat	Inactive	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Platelet aggregating factor-acether induced paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Bradykinin-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Cellulose sulfate induced rat paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNZR	EtOH - H ₂ O (50%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Henriques et al., 1991
	DEP	EtOH (95%) Ext.	Arachidonic-acid induced ear edema / Intragastric	Mouse	Active	Calixto et al., 1991
Asteraceae	DIF	EtOH (95%) Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
<i>Achyrocline satureioides</i>	DIF	EtOH (95%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
	DIF	H ₂ O Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
	DIF	H ₂ O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
	DIF	Hot H ₂ O Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
	DIF	Hot H ₂ O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
<i>Ageratum conyzoides</i>	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / SC	Rat	Active	Magalhaes et al., 1997
	DLF	EtOH (70%) Ext.	Y east-induced inflammation of the paw / IP	Rat	Active	Viana et al., 1998
<i>Bidens pilosa</i>	DLF	MeOH Ext.	Zymosan-induced pedal edema	Mouse	Active	Pereira et al., 1999
<i>Calendula officinalis</i>	PHY	Dry extract	Carrageenan, Dextan and Hystamine / **	Rat	Active	Sartori et al., 2003
<i>Conyza bonariensis</i>	APEO	Essential Oil	LPS-induced leukocyte recruitment / Intragastric	Mouse	Active	Souza et al., 2003
<i>Cynara scolymus</i>	FhLF	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
<i>Elephantopus scaber</i>	DEP	Decoction	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Poli et al., 1992
	FhLF	Infusion	Dye diffusion assay / Intragastric	Mouse	Weak activity	Ruppelt et al., 1991
<i>Gochornatia polymorpha</i>	DLF	Butanol Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Moreira et al., 2000
	DLF	Dichloromethane Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Moreira et al., 2000
	DLF	EtOAc Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Moreira et al., 2000
	DLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Moreira et al., 2000
<i>Matricaria recutita</i>	PHY	Dry extract	Carrageenan, Dextan and Hystamine / **	Rat	Active	Sartori et al., 2003
<i>Mikania glomerata</i>	DLF	Dichloromethanol Ext.	Histamine-induced edema / SC	Mouse	Active	De moura et al., 2002
	DLF	EtOH-H ₂ O(1:1) Ext.	Serotonin-induced pleural edema / SC	Rat	Inactive	Fierro et al., 1999
	DLF	EtOH-H ₂ O(1:1) Ext.	PAF-induced edema / SC	Rat	Inactive	Fierro et al., 1999
	DLF	EtOH-H ₂ O(1:1) Ext.	Dye diffusion assay / Intragastric	Rat	Inactive	Fierro et al., 1999
	FhLF	Infusion	LPS-induced leukocyte recruitment / Intragastric	Mouse	Weak activity	Ruppelt et al., 1991
<i>Porophyllum ruderale</i>	APEO	Essential Oil	** / Gastric intubation	Mouse	Active	Souza et al., 2003
<i>Vanillosmopsis arborea</i>	DTW	Essential Oil	Formalin-induced pedal edema / **	Mouse	Active	Menezes et al., 1990
Bignoniaceae	DBK	**	Croton oil-induced edema / External	Rat	Active	Oga et al., 1969
<i>Tabebuia impatiiginosa</i>	DLF	EtOH (70%) Ext.	Croton oil-induced edema / External	Mouse	Active	Sertie et al., 1991
Boraginaceae						
<i>Cordia verbenacea</i>						

	DLF	EtOH (70%) Ext.	Nystatin-induced pedal edema / Gastric intubation	Rat	Active	Serrie et al., 1991
	DLF	EtOH (70%) Ext.	Cold stress and carrageenin-induced edema combined / Gastric intubation	Rat	Active	Serrie et al., 1991
	FhLF	EtOH (70%) Ext.	Cotton pellet granuloma / External	Rat	Active	Basile et al., 1989
	FhLF	EtOH (70%) Ext.	Cotton pellet granuloma / Intragastric	Rat	Active	Basile et al., 1989
	FhLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / Oral	Rat	Active	Serrie et al., 1988
	FhLF	EtOH (70%) Ext.	Cotton pellet granuloma / Oral	Rat	Active	Serrie et al., 1988
<i>Symphytium officinale</i>	DLF	Aqueous high seed natant	Carrageenan-induced pedal edema / Gastric intubation	Rat	Inactive	Goldman et al., 1985
Celastraceae						
<i>Maytenus aquifolium</i>	DLF	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Kimura et al., 2000
	DLF	Hydro-alcoholic Ext.	Adjuvant-induced arthritis / Intragastric	Rat	Active	Kimura et al., 2000
Crassulaceae						
<i>Kalanchoe brasiliensis</i>	FhLJ	Juice	** / IP	Mouse	Active	Ibrahim et al., 2000
	FhLF	Juice	Zymosan-induced inflammat/IP	Mouse	Active	Ibrahim et al., 2002
	FhLF	Plant juice	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Mourão et al., 1999
	FhLF	Plant juice	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Mourão et al., 1999
Cucurbitaceae						
<i>Coccytonia tayiyna</i>	DRT	CHCl ₃ Ext.	Carrageenan-induced pedal edema / Gastric intubation	Mouse	Weak activity	Rios et al., 1990
	DRT	CHCl ₃ Ext.	Carrageenan-induced pedal edema / IP	Mouse	Active	Rios et al., 1990
	DRT	MeOH Ext.	Carrageenan-induced pedal edema / Gastric intubation	Mouse	Inactive	Rios et al., 1990
	DRT	MeOH Ext.	Carrageenan-induced pedal edema / IP	Mouse	Weak activity	Rios et al., 1990
	DRT	Infusion	Dye diffusion assay / Intragastric	Mouse	Equivoal	Ruppelt et al., 1991
<i>Wilbrandia ebracteata</i>	DRT	CH ₂ Cl ₂ Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Peters et al., 1997
	DRT	CH ₂ Cl ₂ Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Peters et al., 1997
	DRT	CHCl ₃ Soluble Fraction	Carrageenan-induced pleurisy / Intragastric	Mouse	Active	Peters et al., 1999
	DRT	CHCl ₃ Soluble Fraction	Carrageenan-induced pleuri./IP	Mouse	Active	Peters et al., 1999
	DRT	Chromatographic Fraction	Carrageenan-induced pleurisy / IP	Mouse	Active	Peters et al., 1999
<i>Wilbrandia</i> species	DRZ	EtOH (70%) Ext.	Acetic acid-induced pedal edema / Intragastric	Mouse	Active	Almeida et al., 1992
	DRZ	EtOH (70%) Ext.	Carrageenan-induced granuloma / Intragastric	Rat	Active	Almeida et al., 1992
	DRZ	EtOH (70%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Almeida et al., 1992
Cyperaceae						
<i>Mariscus pedunculatus</i>	VN	Essential Oil	LPS-induced pleurisy model / Intragastric	Mouse	Active	Siani et al., 2001
Dilleniaceae						
<i>Curatella americana</i>	DSB	Hydro-alcoholic Ext.	12-O-tetradecanoylphorbol-13-acetate (TPA) / IP	Mouse	Active	Alexandre-Moreira et al., 1999
	DSB	Hydro-alcoholic Ext.	Capsaicin induced mouse ear edema / IP	Mouse	Active	Alexandre-Moreira et al., 1999
	DSB	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Alexandre-Moreira et al., 1999
	DSB	Hydro-alcoholic Ext.	Adjuvant-induced arthritis / IP	Rat	Active	Alexandre-Moreira et al., 1999
Erythroxylaceae						
<i>Erythroxylum argentinum</i>	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Chaves et al., 1988
Euphorbiaceae						
<i>Croton cajucara</i>	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Chaves et al., 1988
	BKEO	Essential Oil	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Bighetti et al., 1999

	BK/EO	Essential Oil	Cotton pellet granuloma / Intragastric	Rat	Active	Bighetti et al., 1999
<i>Croton celtidifolius</i>	DBK	Butanol Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Nardi et al., 2003
	DBK	Butanol Ext.	Carrageenan-induced pedal edema / IP	Mouse	Active	Nardi et al., 2003
	DBK	EtOAc Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Nardi et al., 2003
	DBK	EtOAc Ext.	Carrageenan-induced pedal edema / IP	Mouse	Active	Nardi et al., 2003
	DBK	EtOH (80%) Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Nardi et al., 2003
	DBK	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Nardi et al., 2003
	DBK	H ₂ O Ext.	Carrageenan-induced pedal edema / IP	Mouse	Active	Nardi et al., 2003
<i>Jatropha elliptica</i>	FhTB	EtOH-H ₂ O (50%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Trebien et al., 1988
	FhTB	EtOH-H ₂ O (50%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Inactive	Trebien et al., 1988
	FhTB	EtOH-H ₂ O (50%) Ext.	Serotonin-induced pedal edema / Intragastric	Rat	Weak activity	Trebien et al., 1988
<i>Phyllanthus corcovadensis</i>	DLF + SM + RT	EtOH-H ₂ O(1:1) Ext.	Carrageenan-induced pedal edema / IP	Mouse	Inactive	Gorski et al., 1993
	DLF + SM + RT	EtOH-H ₂ O(1:1) Ext.	Dextran-induced pedal edema / IP	Mouse	Inactive	Gorski et al., 1993
<i>Phyllanthus carolinensis</i>	DEP	Hydro-alcoholic Ext.	Formalin-induced pedal edema / IP	Mouse	Active	Filho et al., 1996
Fabaceae						
<i>Apuleia leiocarpa</i>	FhBK + TG	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
<i>Bauhinia gutianensis</i>	DSB	CH ₂ Cl ₂ Ext.	Dextran-induced pedal edema/IP	Rat	Active	Carvalho et al., 1999
	DSB	CH ₂ Cl ₂ Ext.	Histamine-induced edema / IP	Rat	Inactive	Carvalho et al., 1999
	DSB	EtOAc Ext.	Dextran-induced pedal ede / IP	Rat	Active	Carvalho et al., 1999
	DSB	EtOAc Ext.	Histamine-induced edema / IP	Rat	Active	Carvalho et al., 1999
	DSB	MeOH Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Carvalho et al., 1999
	DSB	MeOH Ext.	Dextran-induced pedal edema / IP	Rat	Active	Carvalho et al., 1999
	DSB	MeOH Ext.	Histamine-induced edema / IP	Rat	Active	Carvalho et al., 1999
<i>Copaifera cearensis</i>	DB	Oleoresin	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Fernandes et al., 1992
<i>Caesalpinia ferrea</i>	DFR	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Carvalho et al., 1996
<i>Copaifera langsdorffii</i>	**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active	Sarti et al. 1986
<i>Copaifera species</i>	OR	Oleoresin	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Basile et al., 1988
	OR	Oleoresin	Cotton pellet granuloma / Intragastric	Rat	Active	Basile et al., 1988
	OR	Oleoresin	Histamine-induced vascular permeability / Intragastric	Rat	Active	Basile et al., 1988
<i>Pterodon emarginatus</i>	DFR	Hexane Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Carvalho et al., 1999
<i>Pterodon pubescens</i>	DSD	Hydro-alcoholic Ext.	Collagen-induced arthritis / Intragastric	Mouse	Active	Carvalho et al., 1999
	DSD	Hydro-alcoholic Ext.	Experimental arthritis / Intragastric	Mouse	Active	Coelho et al., 2001
<i>Marsippanthes chamaedrys</i>	**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active	Sarti et al. 1986
	FhLF	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
<i>Stryphnodendron adstringens</i>	DSB	**	Acetic acid induced vascular permeability / Intragastric	Mouse	Active	Lima et al., 1998
	DSB	Acetone Ext.	Rat pleurisy test results for leukocyte number and exudate volume / Intragastric	Rat	Weak activity	Lima et al., 1998
	DSB	Acetone Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Lima et al., 1998

<i>Torresea cearensis</i>	DSB	Acetone Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Lima et al., 1998
Flacourtiaceae	DSB	Acetone Ext.	Adjuvant-induced arthritis / Intragastric	Rat	Weak activity	Lima et al., 1998
<i>Casuarina sylvestris</i>	DSB	**	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Leal et al., 1997
Lamiaceae	FhBK + LF	Infusion	Dye diffusion assay / Intragastric	Mouse	Weak activity	Ruppelt et al., 1991
<i>Hyptis pectinata</i>	DLF	H ₂ O Ext.	Ara chidonic acid-induced edema / Intragastric	Rat	Active	Bispo et al., 2001
<i>Raphiodon echinus</i>	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Bispo et al., 2001
Magnoliaceae	DAP	H ₂ O Ext.	Acetic acid-induced dye diffusion / Intragastric	Mouse	Active	Menezes et al., 1998
<i>Talauma ovata</i>	DLF	EtOH (95%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Inactive	Morato et al., 1989
Malvaceae	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Franzotti et al., 2000
<i>Sida cordifolia</i>	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Franzotti et al., 2000
Meliaceae	SD	EtOH (90%) Ext.	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Oga et al., 1981
<i>Guarea guidonia</i>	SD	EtOH (90%) Ext.	Cotton pellet granuloma / Gastric intubation	Rat	Active	Oga et al., 1981
Menispermaceae	DLF	EtOH (80%) Ext.	12-O-tetradecanoylphorbol-13-acetate (TPA) / IP	Mouse	Active	Batista Lima et al., 2001
<i>Cissampelos sympodioides</i>	DLF	EtOH (80%) Ext.	Capsaicin induced edema / IP	Mouse	Active	Batista Lima et al., 2001
Moraceae	DLF	EtOH (80%) Ext.	Carrageenan-induced edema / IP	Rat	Active	Batista Lima et al., 2001
<i>Dorstenia brasiliensis</i>	FhRT	Infusion	Dye diffusion assay / Intragastric	Mouse	Weak Activity	Ruppelt et al., 1991
Myrtaceae	DLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Schapoval et al., 1994
<i>Eugenia uniflora</i>	DLF	Infusion	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Schapoval et al., 1994
	FhLF	Decoction	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Schapoval et al., 1994
	FhLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Schapoval et al., 1994
	FhLF	Infusion	Carrageenan-induced pedal edema / Intragastric	Rat	Strong activity	Schapoval et al., 1994
<i>Psidium guineense</i>	FhLEO	Essential Oil	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Santos et al., 1997
Oleaceae	DBK	**	** / Oral	Human	Active	Dirsch et al., 1992
<i>Heisteria pallida</i>	DRT	EtOH (70%) Ext.	Croton oil-induced irritation / External	Rat	Active	Germano et al., 1993
Phytolaccaceae	DRT	EtOH (70%) Ext.	Cotton pellet granuloma / External	Rat	Active	Germano et al., 1993
<i>Peperomia</i>	DRT	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Germano et al., 1995
	DRT	Hydro-alcoholic Ext.	Cotton pellet granuloma / Intragastric	Rat	Weak activity	Germano et al., 1995
	DRT	Hydro-alcoholic Ext.	Nystatin induced edema / Intrag	Rat	Active	Germano et al., 1995
	DRT	Lyophilized Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Lopes Martins et al., 2002
Piperaceae	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	D'Angelo et al., 1997
<i>Piper marginatum</i>	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	D'Angelo et al., 1997

Plantaginaceae <i>Plantago australis</i>	DFR	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Palmeiro et al., 2002
<i>Plantago major</i>	DLF	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Palmeiro et al., 2002
	DRT	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Palmeiro et al., 2002
	DLF	H ₂ O Ext.	** / External	Mouse	Inactive	Guillen et al., 1997
	DLF	H ₂ O Ext.	Croton oil-induced edema / Intragastric	Mouse	Weak activity	Guillen et al., 1997
	DLF	H ₂ O Ext.	Carrageenan-induced pleurisy / Intragastric	Rat	Active	Guillen et al., 1997
	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Guillen et al., 1997
	DLF	H ₂ O Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Guillen et al., 1997
Polygonaceae <i>Polygonum punctatum</i>	DLP	Decoction	Croton oil granuloma pouch / Intragastric	Rat	Active	Guillen et al., 1997
Rubiaceae <i>Chiococca brachiata</i>	DEP	Decoction	Carrageenan-induced pedal edema / Gastric Intubation	Rat	Active	Oliveira Simões et al., 1989
	DEP	Decoction	Carrageenan-induced pedal edema / IP	Rat	Inactive	Oliveira Simões et al., 1989
	DEP	EiOH-H ₂ O(1:1) Ext.	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Oliveira Simões et al., 1989
<i>Conitarea hexandra</i>	FhRT	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
	DSB	EiOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	De Almeida et al., 1991
Sapotaceae <i>Bumelia sartorum</i>	DRB	EiOH (95%) Ext.	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Almeida et al., 1985
Scrophulariaceae <i>Scoparia dulcis</i>	DEP	EiOH (95%) Ext.	Cotton pellet granuloma / Intragastric	Rat	Inactive	Freire et al., 1993
Solanaceae <i>Brunfelsia uniflora</i>	DEP	EiOH (95%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Freire et al., 1993
	DEP	EiOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Freire et al., 1993
	FhLF	Infusion	Carrageenan-induced pedal edema / Intragastric	Mouse	Inactive	Ruppelt et al., 1991
	RT	CHCl ₃ Ext.	Dye diffusion assay / Intragastric	Rat	Active	Iyer et al., 1978
	RT	MeOH Ext.	** / Oral	Rat	Active	Iyer et al., 1977
	DAP	EiOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Costa et al., 2003
	DAP	EiOH (95%) Ext.	Histamine-induced edema /	Mouse	Active	Costa et al., 2003
<i>Stachytarpheta cayennensis</i>	DAP	EiOH (95%) Ext.	5-HT-induced pedal edema / Intragastric	Mouse	Active	Costa et al., 2003
	DLF	H ₂ O Ext.	Carrageenan-induced pedal edema / **	Rat	Active	Delaporte et al., 2001
	DLF	Butanol Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Schapoval et al., 1998
	DLF	Butanol Ext.	Carrageenan-induced pedal edema / IP	<i>Sabvelinus alpinus</i>	Weak activity	Schapoval et al., 1998
	DLF	EiOH (70%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Schapoval et al., 1998
Winteraceae <i>Dryinix winterti</i>	DLF	Infusion	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Schapoval et al., 1998
	DBK	Hydro-alcoholic Ext.	Dextran-induced pedal edema / Intragastric	Rat	Equivocal	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	PGE ₂ induced paw or edema / Intragastric	Rat	Inactive	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	Histamine-induced edema / Intragastric	Rat	Active	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	Bradykinin-induced pedal edema / Intragastric	Rat	Weak activity	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	PAF-acether induced paw oedema / Intragastric	Rat	Weak activity	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	Substance produced paw oedema / Intragastric	Rat	Weak activity	Tratsk et al., 1997
	DBK	Hydro-alcoholic Ext.	Ovalbumine induced paw oedema / Intragastric	Rat	Active	Tratsk et al., 1997

** Date incomplete derived from an abstract; APEO, aerial parts essential oil; BKEO, bark essential oil; DAP, Dried aerial parts; DBK, dried balsam; DBK, dried bark; DEP, dried bark; DFR, dried fruit; DIF, dried inflorescence; DLF, dried leaf; DRB, dried root bark; DRT, dried root; DRZ, dried rhizome; DSB, dried stem bark; DSD, dried seed; DSM, dried stem; DTW, dried trunkwood; FhBK, fresh bark; FhLEO, fresh leaf essential oil; FhLF, fresh leaf; FhLJ, fresh leaf juice; FhRT, fresh root; FhTB, fresh tuber; FNRZ, frozen rhizome; LF, leaf; LX, latex; OR, oleoresin; PHY, Phytocomplex composed by dry extracts; RI, root; SB, stem bark; SD, seed; SM, stem; TG, twigs; VN, venom.

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