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Revisão

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 A_2 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.

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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 lipooxygenase 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						
Justicia pectoralis var. *stenophylla*	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						
Cordyline dracaenoides	DRZ	EtOH - H_2O (50%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Calixto et al., 1990
Amaranthaceae						
Alternanthera brasiliana	DLF	H_2O Ext.	Carrageenan-induced pedal edema / **	Rat	Inactive	Delaporte et al., 2001
Pfaffia iresinoides	DRT	H_2O Ext.	Cotton pellet granuloma / Intragastric	Rat	Inactive	Taniguchi et al., 1997
	DRT	H_2O 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_2O Ext.	Carrageenan-induced pleurisy / Intragastric	Rat	Active	Taniguchi et al., 1997
Pfaffia paniculata	DRT	EtOH (60%) Ext.	Carrageenan-induced pleurisy / IP	Rat	Active	Mazzanti et al., 1994
Pfaffia stenophylla	DRT	EtOH (20%) Ext.	Carrageenan-induc pleurisy / IP	Mouse	Active	Mazzanti et al., 1993
Anacardiaceae						
Anacardium occidentale	DBK	Isopropanol - H_2O (1:1) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Mota et al., 1985
	DBK	Isopropanol - H_2O (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
Astronium urundeuva	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						
Ervatamia coronaria	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_2O Ext.	Carrageenan-induced pedal edema / IP	Rat	Weak activity	Henriques et al., 1996
Himatanthus sucuuba	LX	Hexane Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	De Miranda et al., 2000
Peschiera australis var. *australis*	DLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Rates et al., 1993
	DLF	H_2O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Rates et al., 1993
Mandevilla velutina	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
	FNRZ	EtOH - H_2O (50%) Ext.	5-HT-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Zymosan indued rat paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Bothrops jararaca induced rat paw edema / Intragastric	Rat	Inactive	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Platelet aggregating factor-acether induced paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Bradykinin-induced pedal edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (50%) Ext.	Cellulose sulfate induced rat paw edema / Intragastric	Rat	Active	Henriques et al., 1991
	FNRZ	EtOH - H_2O (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						
Achyrocline satureioides	DIF	EtOH (95%) Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
	DIF	EtOH (95%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
	DIF	H_2O Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
	DIF	H_2O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
	DIF	Hot H_2O Ext.	Croton oil ear edema test / External	Mouse	Active	Simões, 1988
	DIF	Hot H_2O Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Simões et al., 1988
Ageratum conyzoides	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / SC	Rat	Active	Magalhaes et al., 1997
	DLF	EtOH (70%) Ext.	Yeast-induced inflammation of the paw / IP	Rat	Active	Viana et al., 1998
Bidens pilosa	DLF	MeOH Ext.	Zymosan-induced pedal edema	Mouse	Active	Pereira et al., 1999
Calendula officinalis	PHY	Dry extract	Carrageenan, Dextan and Hystamine / **	Rat	Active	Sartori et al., 2003
Conyza bonariensis	APEO	Essential Oil	LPS-induced leukocyte recruitement / Intragastric	Mouse	Active	Souza et al., 2003
Cynara scolymus	FhLF	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
Elephantopus scaber	DEP	Decoction	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Poli et al., 1992
	FhLF	Infusion	Dye diffusion assay / Intragast.	Mouse	Weak activity	Ruppelt et al., 1991
Gochnatia polymorpha	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
Matricaria recutita	PHY	Dry extract	Carrageenan, Dextan and Hystamine / **	Rat	Active	Sartori et al., 2003
Mikania glomerata	DLF	Dichloromethanol Ext.	** / IP	Mouse	Active	De moura et al., 2002
	DLF	EtOH-H_2O(1:1) Ext.	Histamine-induced edema / SC	Rat	Inactive	Fierro et al., 1999
	DLF	EtOH-H_2O(1:1) Ext.	Serotonin-induced pleural edema / SC	Rat	Inactive	Fierro et al., 1999
	DLF	EtOH-H_2O(1:1) Ext.	PAF-induced edema / SC	Rat	Inactive	Fierro et al., 1999
	FhLF	Infusion	Dye diffusion assay / Intragast.	Mouse	Weak activity	Ruppelt et al., 1991
Porophyllum ruderale	APEO	Essential Oil	LPS-induced leukocyte recruitement / Intragastric	Mouse	Active	Souza et al., 2003
Vanillosmopsis arborea	DTW	Essential Oil	** / Gastric intubation	Mouse	Active	Menezes et al., 1990
Bignoniaceae						
Tabebuia impetiginosa	DBK	**	Formalin-induced pedal edema / **	Rat	Active	Oga et al., 1969
Boraginaceae						
Cordia verbenacea	DLF	EtOH (70%) Ext.	Croton oil-induced edema / External	Mouse	Active	Sertie et al., 1991

	DLF	EtOH (70%) Ext.	Nystatin-induced pedal edema / Gastric intubation	Rat	Active	Sertie et al., 1991
	DLF	EtOH (70%) Ext.	Cold stress and carrageenin-induced edema combined / Gastric intubation	Rat	Active	Sertie 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	Sertie et al., 1988
	FhLF	EtOH (70%) Ext.	Cotton pellet granuloma / Oral	Rat	Active	Sertie et al., 1988
Symphytum officinale	DLF	Aqueous high seed natant	Carrageenan-induced pedal edema / Gastric intubation	Rat	Inactive	Goldman et al., 1985
Celastraceae						
Maytenus aquifolium	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						
Kalanchoe brasiliensis	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						
Cayaponia tayuya	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 / Intragast.	Mouse	Equivocal	Ruppelt et al., 1991
Wilbrandia ebracteata	DRT	CH_2Cl_2 Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Peters et al., 1997
	DRT	CH_2Cl_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
Wilbrandia 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						
Mariscus pedunculatus	VN	Essential Oil	LPS-induced pleurisy model / Intragastric	Mouse	Active	Siani et al., 2001
Dilleniaceae						
Curatella americana	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						
Erythroxylum argentinum	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Chaves et al., 1988
	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Chaves et al., 1988
Euphorbiaceae						
Croton cajucara	BKEO	Essential Oil	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Bighetti et al., 1999

	BKEO	Essential Oil	Cotton pellet granuloma / Intragastric	Rat	Active	Bighetti et al., 1999
Croton celtidifolius	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_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Nardi et al., 2003
	DBK	H_2O Ext.	Carrageenan-induced pedal edema / IP	Mouse	Active	Nardi et al., 2003
Jatropha elliptica	FhTB	EtOH-H_2O (50%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Trebien et al., 1988
	FhTB	EtOH-H_2O (50%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Inactive	Trebien et al., 1988
	FhTB	EtOH-H_2O (50%) Ext.	Serotonin-induced pedal edema / Intragastric	Rat	Weak activity	Trebien et al., 1988
Phyllanthus corcovadensis	DLF + SM + RT	EtOH-H_2O(1:1) Ext.	Carrageenan-induced pedal edema / IP	Mouse	Inactive	Gorski et al., 1993
	DLF + SM + RT	EtOH-H_2O(1:1) Ext.	Dextran-induced pedal edema / IP	Mouse	Inactive	Gorski et al., 1993
Phyllanthus carolinensis	DEP	Hydro-alcoholic Ext.	Formalin-induced pedal edema / IP	Mouse	Active	Filho et al., 1996
Fabaceae						
Apuleia leiocarpa	FhBK + TG	Infusion	Dye diffusion assay / Intragastr.	Mouse	Active	Ruppelt et al., 1991
Bauhinia guianensis	DSB	CH_2Cl_2 Ext.	Dextran-induced pedal edem/IP	Rat	Active	Carvalho et al., 1999
	DSB	CH_2Cl_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
Copaifera cearensis	DB	Oleoresin	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Fernandes et al.., 1992
Caesalpinia ferrea	DFR	H_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Carvalho et al., 1996
Copaifera langsdorfii	**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active	Sarti et al. 1986
Copaifera species	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 peremability / Intragastric	Rat	Active	Basile et al., 1988
Pterodon emarginatus	DFR	Hexane Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Carvalho et al., 1999
Pterodon pubescens	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
	**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active	Sarti et al. 1986
Marsypianthes chamaedrys	FhLF	Infusion	Dye diffusion assay / Intragastric	Mouse	Active	Ruppelt et al., 1991
Stryphnodendron adstringens	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

	DSB	Acetone Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Lima et al., 1998
	DSB	Acetone Ext.	Adjuvant-induced arthritis / Intragastric	Rat	Weak activity	Lima et al., 1998
Torresea cearensis	DSB	**	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Leal et al., 1997
Flacourtiaceae						
Casearia sylvestris	FhBK + LF	Infusion	Dye diffusion assay / Intragastric	Mouse	Weak activity	Ruppelt et al., 1991
Lamiaceae						
Hyptis pectinata	DLF	H_2O Ext.	Arachidonic acid-induced edema / Intragastric	Rat	Active	Bispo et al., 2001
	DLF	H_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Bispo et al., 2001
Raphiodon echinus	DAP	H_2O Ext.	Acetic acid-induced dye diffusion / Intragastric	Mouse	Active	Menezes et al., 1998
Magnoliaceae						
Talauma ovata	DLF	EtOH (95%) Ext.	Carrageenan-induced pedal edema / IP	Rat	Inactive	Morato et al., 1989
Malvaceae						
Sida cordifolia	DLF	H_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Franzotti et al., 2000
Meliaceae						
Guarea guidonia	SD	EtOH (90%) Ext.	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Oga et al., 1981
	SD	EtOH (90%) Ext.	Cotton pellet granuloma / Gastric intubation	Rat	Active	Oga et al., 1981
Menispermaceae						
Cissampelos sympodialis	DLF	EtOH (80%) Ext.	12-O-tetradecanoylphorbol-13-acetate (TPA) / IP	Mouse	Active	Batista Lima et al., 2001
	DLF	EtOH (80%) Ext.	Capsaicin induced edema / IP	Mouse	Active	Batista Lima et al., 2001
	DLF	EtOH (80%) Ext.	Carrageenan-induced edema / IP	Rat	Active	Batista Lima et al., 2001
Moraceae						
Dorstenia brasiliensis	FhRT	Infusion	Dye diffusion assay / Intragastric	Mouse	Weak Activity	Ruppelt et al., 1991
Myrtaceae						
Eugenia uniflora	DLF	EtOH (100%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Schapoval et al., 1994
	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
Psidium guineense	FhLEO	Essential Oil	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Santos et al., 1997
Olacaceae						
Heisteria pallida	DBK	**	** / Oral	Human	Active	Dirsch et al., 1992
Phytolaccaceae						
Petiveria alliacea	DRT	EtOH (70%) Ext.	Croton oil-induced irritation / External	Rat	Active	Germano et al., 1993
	DRT	EtOH (70%) Ext.	Cotton pellet granuloma / External	Rat	Active	Germano et al., 1993
	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						
Piper marginatum	DLF	H_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	D'Angelo et al., 1997

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Plantaginaceae						
Plantago australis	DFR	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Palmeiro et al., 2002
	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
Plantago major	DLF	H_2O Ext.	** / External	Mouse	Inactive	Guillen et al., 1997
	DLF	H_2O Ext.	Croton oil-induced edema / Intragastric	Mouse	Weak activity	Guillen et al., 1997
	DLF	H_2O Ext.	Carrageenan-induced pleurisy / Intragastric	Rat	Active	Guillen et al., 1997
	DLF	H_2O Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Inactive	Guillen et al., 1997
	DLF	H_2O Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Guillen et al., 1997
	DLF	H_2O Ext.	Croton oil granuloma pouch / Intragastric	Rat	Active	Guillen et al., 1997
Polygonaceae						
Polygonum punctatum	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	EtOH-H_2O(1:1) Ext	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Oliveira Simões et al., 1989
Rubiaceae						
Chiococca brachiata	FhRT	Infusion	Dye diffusion assay / Intragast.	Mouse	Active	Ruppelt et al., 1991
Coutarea hexandra	DSB	EtOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	De Almeida et al., 1991
Sapotaceae						
Bumelia sartorum	DRB	EtOH (95%) Ext.	Carrageenan-induced pedal edema / Gastric intubation	Rat	Active	Almeida et al., 1985
Scrophulariaceae						
Scoparia dulcis	DEP	EtOH (95%) Ext.	Cotton pellet granuloma / Intragastric	Rat	Inactive	Freire et al., 1993
	DEP	EtOH (95%) Ext.	Dextran-induced pedal edema / Intragastric	Rat	Active	Freire et al., 1993
	DEP	EtOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Freire et al., 1993
Solanaceae						
Brunfelsia uniflora	FhLF	Infusion	Dye diffusion assay / Intragast.	Mouse	Inactive	Ruppelt et al., 1991
	RT	$CHCl_3$ Ext.	** / Oral	Rat	Active	Iyer et al., 1978
	RT	MeOH Ext.	Carrageenan-induced pedal edema / Oral	Rat	Active	Iyer et al., 1977
Verbenaceae						
Bouchea fluminensis	DAP	EtOH (95%) Ext.	Carrageenan-induced pedal edema / Intragastric	Mouse	Active	Costa et al., 2003
	DAP	EtOH (95%) Ext.	Histamine-induced edema /	Mouse	Active	Costa et al., 2003
	DAP	EtOH (95%) Ext.	5-HT-induced pedal edema / Intragastric	Mouse	Active	Costa et al., 2003
	DLF	H_2O Ext.	Carrageenan-induced pedal edema / **	Rat	Active	Delaporte et al., 2001
Stachytarpheta cayennensis	DLF	Butanol Ext.	Carrageenan-induced pedal edema / IP	Rat	Active	Schapoval et al., 1998
	DLF	Butanol Ext.	Carrageenan-induced pedal edema / IP	*Salvelinus alpinus*	Weak activity	Schapoval et al., 1998
	DLF	EtOH (70%) Ext.	Carrageenan-induced pedal edema / Intragastric	Rat	Weak activity	Schapoval et al., 1998
	DLF	Infusion	Carrageenan-induced pedal edema / Intragastric	Rat	Active	Schapoval et al., 1998
Winteraceae						
Dryimis winteri	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; DB, Dried balsam; DBK, dried bark; DEP, dried entire plant; DFR, dried fruit; DIF, dried inflorescence; DLF, dried leaf; DRB, dried rootbark; DRT, dried root; DRZ, dried rhizome; DSB, dried stembark; 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; RT, root; SB, stembark; SD, seed; SM, stem; TG, twigs; VN, venom.

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