Journal of Research Administration
Society of Research Administrators International

Essential oils have Anti-inflammatory Activities: A Systematic Review

Purnima Laishram,

Department Of Chemical Engineering And Biotechnology, National Taipei University Of Technology, Taipei 106, Taiwan purnimalaishram3@gmail.com,

Gui-Bing Hong

Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei 106, Taiwan lukehong@mail.ntut.edu.tw

Abstract

Medicinal herbs are being used for the medication of several human ailments. Ancient people looked for antidotes in nature and practiced herbal remedies from different parts of the plant. The relationship between nature and human mankind deteriorated due to the increased production of modern synthetic drugs. The remedial preparatory measures from plants are considered profitable and safe for the medication of anti-inflammatory. Natural extracts and herbal essential oils can subdue inflammation practically. Parts of those essential oils are used as antidotes to treat many human ailments. The motivation of this article is to document the herbal containing essential oils which are having anti-inflammatory properties. A total of 209 species and their components along with extracts have been reviewed. Parts of the plants which are to be used, use different types of solvents and performed experiments both in vivo and in vitro screening. The anti-inflammatory activity is ascribed to the inconsistent phytochemicals present in medicinal plants.

Index Terms— Anti-inflammatory, essential oils, in-vitro, in-vivo, medicinal plants, review

INTRODUCTION

Medicinal herbs play a foremost role in the improvement and advancement of human mankind. Human and natural resources are reliable each other. In ancient times, herbs of different parts like bark, seed oils, woodies, leaves, root, flower and fruit were used as an antidote medication in several human ailments. In the world survey for production of herbs, Indian becomes the second highest producer of medicinal herbs. Medicinal plants are the fascinating source of herbal products for several health conditions. They are passed down because of profitable safety measures and safer medications for various diseases. Throughout the past, oils extracted from the plant have been used for a variety of purposes with their unification into cosmetics, foods, and medicament products. Inflammation is a normal protective response induced by tissue injury or infection and functions to combat invaders in the body (microorganisms and non-self cells) and to remove dead or damaged host cells.[1] Inflammation is a physiological response to a variety of agents including infectious microorganisms, toxic chemical compounds, and physical injury. There are many diseases that are associated with the inflammation process, such as skin

inflammation[2-3], autoimmune diseases such as arthritis and diabetes, Alzheimer's disease, and cancer. Inflammation can cause diabetes and cancer[4], arthritis, Alzheimer's disease, atherosclerosis, cardiovascular disease, eye diseases, and autoimmune diseases, including inflammatory bowel disease[5]. Some clinical and pathophysiological data also showed that inflammation could also affect children with inflammatory bowel disease, uveitis, and juvenile idiopathic arthritis by slowing their growth in height and weight[6]. It can be classified as either acute or chronic and involves a cascade of biochemical events comprising the local vascular system, the immune system, and different cell types found in the injured tissue. Acute inflammation is the initial response and is characterized by the increased movement of plasma and innate immune system cells, such as neutrophils and macrophages, from the blood into the injured tissues. Chronic inflammation concerns a progressive change in the type of cells present at the site of the inflammatory reaction and is characterized by simultaneous destruction and healing of the injured tissue[7]. The activation of inflammation is closely related to immune cells and biological molecules. In particular, innate lymphoid cells (LCs), with multiple immune functions, play important roles in inflammatory diseases[8]. Infiltration of macrophages and neutrophils is a feature of acute inflammation, and infiltration of T lymphocytes and plasma cells is a feature of chronic inflammation[9]. An essential oil is defined internationally as the product obtained by hydro distillation, steam distillation, or dry distillation or by a suitable mechanical process without heating of a plant or some parts of it[10]. The pharmaceutical properties of aromatic plants are partially attributed to essential oils. Essential oils are natural, complex, multi-component systems composed mainly of terpenes[11]. Essential oils have a complex composition, containing from a dozen to several hundred components. The great majority of components identified in essential oils include terpenes (oxygenated or not), with mono-terpenes and sesquiterpenes prevailing. Nevertheless, allyl- and propenylphenols (phenylpropanoids) are also important components of some essential oils[12]. Essential oils are complex mixtures isolated from aromatic plants which may possess antioxidant and anti-inflammatory activities of interest in the food, and cosmetic industries as well as in the human health field[13]. In addition to the ability of some essential oils to scavenge free radicals, there is also evidence that some essential oils possess anti-inflammatory activity. For example, chamomile essential oil has been used for centuries as an anti-inflammatory and for alleviating the symptoms associated with eczema, dermatitis, and other pronounced irritation[14]. The proportions of the components present in essential oils vary greatly. Major components can constitute up to 85% of the essential oils, while the remaining components can be present in only trace amounts[15]. The aroma of each oil results from the combination of the aromas of all components, and even minor oil constituents may have major organoleptic roles to play[16]. In addition to the extraction techniques reported above, there are other ones that may be used for extracting the volatile fraction, nevertheless this cannot be called an "essential oil" in those cases. Such techniques include: vacuum distillation, solvent extraction combined off-line with distillation, simultaneous distillation extraction (SDE), supercritical fluid extraction (SFE), and microwave assisted extraction and hydro distillation (MAE and MA-HD), static (S-HS), dynamic (D-HS) and high concentration capacity headspace (HCC-HS) sampling. Capillary gas chromatography is the technique of choice for the analysis of essential oils due to the volatility and polarity of essential oil components, combining two different polarity stationary phases. Identification of oil components is generally performed by chromatographic data (Kováts index,

linear retention index, relative retention time, retention time locking) and/or by spectral data, mainly by mass spectrometry (GC-MS), as well as other techniques reported in a recent review articles[17]. In Nature, essential oils play an important role in the attraction of insects to promote the dispersion of pollen and seeds or to repel other ones. In addition, essential oils may also act as antibacterials, antivirals, antifungals, insecticides, herbicides, or have feeding deterrent effects against herbivores by reducing their appetite for such plants. Essential oils have also an important role in allelopathic communication between plants[18,19]. If essential oils are able to scavenge some free radicals, they can also act as anti-inflammatory agents, because one of the inflammatory responses is the oxidative burst that occurs in diverse cells (monocytes, neutrophils, eosinophils, and macrophages). Phagocytosis of bacteria, which occurs during inflammation, is accompanied by a dramatic increase in oxygen consumption resulting in the formation of superoxide anion radical ($O_2^{\bullet -}$) which is quickly converted to hydrogen peroxide (H_2O_2), spontaneously, or by the enzyme superoxide dismutase. Hydrogen peroxide can then also be reduced by transition metal ions generating the hydroxyl radical (HO•), one of the strongest oxidizing agents that can rapidly react with polyunsaturated fatty acids, resulting in the production of peroxyl radicals (ROO•). Peroxide hydrogen can also oxidize halide ions (Cl^-) to hypochlorous acid (HOCl), which is a strong oxidant that can react with amines producing chloramines, some of them being very toxic[20-24]. These radicals are commonly known as ROS (reactive oxygen species). Nevertheless and during the inflammatory process, there is also the generation of other free radicals named RNS (reactive nitrogen species). Nitric oxide (•NO) and peroxynitrite anion ($ONOO^-$) are two examples of this sort of radicals. Nitric oxide is produced in large quantities by inducible nitric oxide synthase (iNOS) in activated macrophages and neutrophils during defense and immunological reactions. However, this reactive species can also exert its toxicity by generating the peroxynitrite anion after reacting with the superoxide anion radical[24-28].

Upon the presence of the inflammatory agent, cell membranes induce the activation of phospholipase A2 followed by release of arachidonic acid and inflammatory mediators such as cytokines, serotonin, histamine, prostaglandins and leukotrienes that increase vascular permeability, thus facilitating the migration of leukocytes to the site of inflammation. A closer look at this process shows that during the initial stages of inflammation, leukotrienes, prostaglandins, and histamine bind to their receptors on endothelial cells leading to vasodilatation, contraction of endothelial cells, and increased blood vessel permeability. The binding of histamine sets off up the regulation of P-selectin (a cell adhesion molecule) and platelet-activating factor (PAF) on the endothelial cells that line the venules. The subsequent binding of P-selectin and PAF to leukocytes leads to extravasation followed by leukocyte migration towards chemo-tactic agents (e.g., complement protein C5a and leukotriene B4) produced by cells at the site of injury. In addition, activated macrophages and vascular endothelial cells release inflammatory cytokines such as tumor necrosis factor (TNF) and interleukin-1 (IL-1) that bind to receptors on endothelial cells maintaining the inflammatory response by upregulation of the production of the adhesion molecule E-selectin and keeping the expression of P-selectin. E-selectin binds to leukocytes, which then move across the basement membrane towards chemokines such as interleukin-8 (IL-8) and monocyte chemo-tactic protein-1 (MCP-1) generated by cells at the infected site[29]. In the inflammatory response, there is an increase of permeability of endothelial lining cells and influx of blood leukocytes into

the interstitium, oxidative burst, and release of cytokines [interleukins and tumor necrosis factor-α (TNF-α)]. At the same time, there is also an induction of the activity of several enzymes (oxygenases, nitric oxide synthase, and peroxidases) as well as the arachidonic acid metabolism. In the inflammatory process, there is also the expression of cellular adhesion molecules, such as intercellular adhesion molecule (ICAM) and vascular cell adhesion molecule (VCAM) [30]. Carrageenan-induced mouse paw oedema is frequently used to determine the anti-inflammatory activity of diverse bioactive compounds such as plant extracts and essential oils[31-39]. The biological activities of many plants have been long known in ethnomedicine to treat inflammatory diseases. These biological properties are often due to essential oils contained in plants which are used as herbal remedies in traditional medicine. It has been found that these essential oils possess different activities such anti-inflammatory and antiradical properties[40-42]. However, there are other examples of essential oils (eucalyptus, rosemary, lavender, mille, folia) along with other plants (pine, clove, and myrrh) that have been used as mixed formulations as anti-inflammatory agents[43].

Initially, upon inflammatory response, keratinocytes and innate immune cells such as leukocytes (PMNs, macrophages, and lymphocytes), mast cells, and dendritic cells are activated. Secreted cytokines such as IL-1α, TNF-α, and IL-6 induce the chemokines of chemo-taxis that attract the immune cells to the site of injury and infection. ROS are produced by activated keratinocytes and immune cells. Immune cells also secrete elastases and proteinases. The inflammatory microenvironment contributes to tissue repair and infection prevention/control. However, the chemokines produced by activated keratinocytes and immune cells are also able to damage the skin tissue in proximity to the target of the inflammatory response. Therefore, the intensity of inflammation and time to resolution are critical in avoiding or at least limiting damage to normal skin tissue. Thus, modulation of inflammation is important in maintaining skin homeostasis. If the initial acute response fails to resolve the causative factor, then the inflammatory response will continue and the subsequent inflammatory microenvironment will disrupt skin homeostasis. If the dysregulation of the inflammatory skin response persists, chronic inflammatory dermatoses will arise[44,45]. Furthermore, there are many bioactive substances that are synthesized from constituents of essential oils. Some pharmacological activities of these oils, such as antitumor and antinociceptive actions, are related to their anti-inflammatory effects[46-50].

Essential Oil: Essential oils are aromatic, volatile liquids obtained from plant materials through steam distillation and named after the plant from which they are derived. Essential oils can be defined as either products or mixtures of fragrant substances or as mixtures of fragrant and odorless substances. These fragrant substances are chemically pure compounds that are volatile under normal conditions[51]. An essential oil is defined internationally as the product obtained by hydrodistillation, steam distillation, or drydistillation or by a suitable mechanical process without heating of a plant or some parts of it[52]. They are aromatic oily liquids, volatile, characterized by a strong odor, rarely colored, and generally with a lower density than that of water[53]. The parts of plants may contain essential oils as follows: Inflorescence, calyx, flowers, flower bud, aerial parts, latex, leaves, roots, rhizomes, seeds, fruits, ripe fruit, fruit peels, branch, stem, tuber, venom, oleoresin, balsam, gum resin, wood, bark, and trunk, phyto-complex composed and entire plant. Production of Essential Oils by: Hydrodistillation, Solvent extraction, Decoction, Infusion, Hydro-alcoholic extract, Lyophilized extract, Oleoresin,

Chromatographic fraction, Juice, Plant Juice, Aqueous high seed natant, Tannin fraction, Shell and Saponin fraction.

Experimental Procedure

Material and Methods

i. Search Strategy

The anti-inflammatory activity of the plants was searched through Google Scholar, Crossref, PubMed, Web of Science® and other journals. The data were updated in August 1977 to April 2022 using anti-inflammatory plants as legend. The plant extracts studied in several states of different countries were selected for this work and the references found in the search were later consulted for details on the mechanisms. A PubMed literature search was performed using the following terms: “plants having essential oils”, “essential oils”, “anti-inflammation plants”, “inflammatory response innate”, anti-inflammatory response plant having essential oil”, etc.

ii. Study Selection

The inclusion criteria were the effects of volatile oils and the active components of traditional medicine on inflammatory diseases, including in vivo and in vitro models and the possible mechanisms of action. The authors excluded articles based on the following criteria: review articles, meta-analyses, and abstracts, case reports, studies in humans, and animals.

iii. Data Extraction

Authors summarized the data from the article and examined it. Table 1 summarizes the following information from the in vitro and in vivo experiments: the source of the essential oil, plant species, and botanical name of the plant, model/administration, and types of solvents used in extraction, organisms, results, the bioactive major compounds, and conclusions.

Conclusion

In this review included 209 species of medicinal herbs with anti-inflammatory properties. Those species are distributed in 61 families, namely: *Acanthaceae, Acoraceae, Agavaceae, Amaranthaceae, Anacardiaceae, Annonaceae*, *Apiaceae, Apocynaceae, Arecaceae*, *Altingiaceae, Asteraceae, Bignoniaceae, Boraginaceae, Burseraceae, Caesalpinoideae, Cannabaceae, Caprifoliaceae, Celastraceae,* Chenopodiaceae, *Crassulaceae, Cupressaceae, Cucurbitaceae, Cyperaceae, Dilleniaceae, Elaeagnaceae, Erythroxylaceae, Euphorbiaceae, Fabaceae, Flacourtiaceae, Geminiviridae, Geraniaceae, Illiciaceae, Labiatae*, *Lamiaceae, Lauraceae, Magnoliaceae, Malvaceae, Meliaceae, Menispermaceae, Moraceae, Myrtaceae, Olacaceae, Pinaceae, Piperaceae, Phytolaccaceae, Plantaginaceae, Poaceae, Polygonaceae, Ranunculaceae, Rhamanaceae*, *Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Santalaceae, Scrophulariaceae, Solanaceae, Theacea, Verbenaceae, Winteraceae and Zingiberaceae* species, respectively, studied so far. The effectiveness of the plant extracts was reliant on the type of solvent used.

S.No	Family and botanical name	Part used	Extract	Model/Administration	Organism	Result	Bioactive Major Compound	References
1	Acanthaceae							
	Justicia pectoralis var.stenophylla	Dried Leaf	Hexane-acetone	Dextran-induced pedal edema/Intragastric	Rat	Inactive	[1,2-benzopyrone-coumarin (CM) (1), dihydrocoumarin (2) and 7-Hydroxydocumarine	Lino et al.,1997(55)
			Hydro-alcoholic extract	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Lino et al.,1997(55)
2	Acoraceae							
	Acorus gramineus	Rhizome	Decoction	Mouse primary splenocytes and peritoneal macrophages	Mouse	Active	Beta-asarone, asaraldehyde, propioveratrone	Yeh TH et al., 2020(56)
3	Agavaceae							
	Cordyline dracaenoides	Dried Rhizome	EtOH-H_2O (50%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active	Steroidal saponins and anthocyanidins	Calixto et al.,1990(57)
4	Amaranthaceae							
	Alternanthera brasiliana	Dried leaf	H_2O Ext.	Carrageenan-induced pedal edema/**	Rat	Inactive	Hydrocarbons, Diterpenes, Monoterpenes, Vitamin, Carotenoid, Phytosterols and Triterpenes	Delaporte et al.,2001(58)
	Pfaffia iresinoides	Dried Root	H_2O Ext.	Cotton pellet granuloma/Intragastric	Rat	Inactive	.....	Taniguchi et al.,1997(59)
		Dried Root	H_2O Ext.	Adjuvant-induced arthritis /Intragastric	Rat	Active		Taniguchi et al.,1997(59)
		Dried Root	Saponin Fraction	Carrageenan-induced pleurisy /Intragastric	Rat	Active		Taniguchi et al.,1997(59)
		Dried	Saponin	Cotton pellet	Rat	Active		Taniguchi

		Root	Fraction	granuloma/Intragastric				et al.,1997(59)
		Dried Root	Saponin Fraction	**/Intragastric	Rat	Active		Taniguchi et al.,1997(59)
		Dried Root	H_2O Ext.	Carrageenan-induced pleurisy/Intragastric	Rat	Active		Taniguchi et al.,1997(59)
	Pfaffia paniculata	Dried Root	EtOH (60%) Ext.	Carrageenan-induced pleurisy/IP	Rat	Active	.....	Mazzanti et al.,1994(60)
	Pfaffia stenophylla	Dried Root	EtOH (20%) Ext.	Carrageenan-induc pleurisy/IP	Mouse	Active	.....	Mazzanti et al.,1993(61)
5	Anacardiaceae							
	Anacardium occiddentale	Dried Bark	Isopropanol-H_2O (1:1) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active	Phenols, Phlobotannins, Cyanogenic glycosides, Saponins, (3E)-3,7-dimethylocta-1,3,6-triene, and (1S,6S,7S,8S)-1,3-dimethyl-8-propan-2-yltricyclo [4.4.0.02, 7] dec-3-ene	Mota et al.,1985(62)
		Dried Bark	Isopropanol-H_2O (1:1) Ext.	Acetic acid-induced writhing/IP	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Adjuvant-induced arthritis/IP	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Carrageenan-induced pedal edema/Gastric intubation	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Acetic acid-induced writhing/Gastric intubation	Rat	Inactive		Mota et al.,1985(62)

		Dried Bark	Shell	Dextran-induced pedal edema/Gastric intubation	Rat	Inactive		Mota et al.,1985(62)
		Dried Bark	Shell	Adjuvant-induced arthritis/Gastric intubation	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Carrageenan-induced pedal edema/IP	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Acetic acid-induced writhing/IP	Rat	Active		Mota et al.,1985(62)
		Dried Bark	Shell	Dextran-induced pedal edema/IP	Rat	Active		Mota et al.,1985(62)
	Astronium urundeuva	Dried Bark	Tannin Fraction	Carrageenan-induced pedal edema/IP	Mouse	Active	(Z)- beta-ocimene, Bycyclogermacrene, Limonene	Viana et al.,1997(63)
		Dried Bark	Tannin Fraction	Cyclophosphamide-induced hemorrhagic cystitis/IP	Rat	Active		Viana et al.,1997(63)
		Dried Bark	Tannin Fraction	Dextran-induced pedal edema/IP	Rat	Active		Viana et al.,1997(63)
		Stem Bark	EtOAc Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Viana et al.,1997(63)
		Stem Bark	EtOAc Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Viana et al.,1997(63)
	Pistacia integerrima	Entire Part	Decoction	Escherichia coli, ovalbumin	In vitro	Active	4-Carvomenthenol	Shirole et al., 2014(64)
	Mangifera indica	Fruit	H_2O Ext.	carrageenan-induced paw model/pleurisy	Rat	Active	(Z)- Beta-ocimene, Terpinolene, 3-Limonene	Oliveira et al., 2017(65)
6	Annonaceae							
	Dennettia tripetala	Fruit, Root, Bark, Leaf	Ethanolic Ext.	carrageenan-induced paw edema	Mice	Active	.....	Oyemitan IA et al., 2008(66)

7	Apiaceae							
	Anethum graveolens L.	Inflorescence	Decoction	Escherichia coli	In vitro	Active	Thymol	Kazemi 2015(67)
	Carum copticum L	Seed	H_2O Ext.	Escherichia coli	In vitro	Active	Thymol	Kazemi 2015(67)
	Eryngium duriaei	Entire plant Essential oil	H_2O Ext.	primary human chondrocytes and in an intestinal cell	Human	Active	Necrodane, α-pinene, Camphene, β-pinene	Rufino AT et al., 2015(68)
	Ligusticum chuanxiong	Entire Plant Essential Oil	Decoction	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Phthalide, Terpene alcohols and Fatty acids	Du JC et al., 2016(69)
	Oenanthe crocata L	Aerial Part	Decoction	Escherichia coli and INF-γ	In vitro	Active	β-Ocimene or Sabinene	Valente et al. 2013(70)
	Pimpinella corymbosa	Root	Essential Oil	NF-kB mediated transcription	.....	....	7(4-(2-propenyl)phenylangelate), 12(4-(3-methyloxiranyl)phenyltiglate), 17(4-mthoxy-2-(3-methyloxiranyl)phenyl isobutyrate)	Ramos LM et al., 2011(71)
	Pimpinella tragium	Root	Essential Oil	NF-kB mediated transcription	.....	....	7(4-(2-propenyl)phenylangelate), 12(4-(3-methyloxiranyl)phenyltiglate), 17(4-mthoxy-2-(3-methyloxiranyl)phenyl isobutyrate)	Ramos LM et al., 2011(71)
	Pimpinella rhodanta	Root	Essential Oil	NF-kB mediated transcription	.....	....	7(4-(2-propenyl)phenylangelate), 12(4-(3-methyloxiranyl)phenyltiglate), 17(4-mthoxy-2-(3-methyloxiranyl)phenyl isobutyrate)	Ramos LM et al., 2011(71)
8	Apocynaceae							
	Ervatamia coronaria	Dried Stem	EtOH (95%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Weak Activity	Coronaridine, Heyneanine, Voacristine, Voacamine,	Henriques et al.,1996(72)

							Descarbomethoxyvoacamine	
		Dried Stem	EtOH (95%) Ext.	Carrageenan-induced pedal edema/IP	Rat	strong activity		Henriques et al.,1996(72)
		Dried Stem	H_2O Ext.	Carrageenan-induced pedal edema/IP	Rat	Weak Activity		Henriques et al.,1996(72)
	Himatanthus sucuuba	Latex	Hexane Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Phenolic acids, Lupeol, β-dihydro-plumbericinic acid, Plumericin, and Plumeride	De Miranda et al.,2000(73)
	Peschiera austratis var. Australis	Dried Leaf	EtOH(100%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active	Coronaridine, Tabersonine, Olivacine, Coronaridine-hydroxyindolenine, Catharinensine, Decarbomethoxyvoacamine and Tabernamine	Rates et al.,1993(74)
		Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Rates et al.,1993(74)
	Mandevilla velutina	Dried Rhizome	Aqueous-alcoholic Ext.	Dextran-induced pedal edema/Intragastric	Mouse	Active		Calixto et al.,1986(75)
		Dried Rhizome	Aqueous-alcoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Calixto et al.,1986(75)
		Dried Rhizome	Aqueous-alcoholic Ext.	Dextran-induced pedal edema/Intragastric	Rat	Active		Calixto et al.,1986(75)
		Dried Rhizome	Aqueous-alcoholic Ext.	Snake venom-induced pedal edema/Intragastric	Rat	Inactive		Calixto et al.,1986(75)
		Dried Rhizome	Aqueous-alcoholic Ext.	5-HT-induced pedal edema/ Intragastric	Rat	Inactive		Calixto et al.,1986(75)
		Dried	Aqueous-	Platelet	Rat	Inactive		Calixto et

		Rhizome	alcoholic Ext.	aggregating factor-acether-induced pedal edema/Intragastric				al.,1986(75)
		Dried Rhizome	Aqueous-alcoholic Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Calixto et al.,1986(75)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	5-HT-induced pedal edema/ Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Zymosan induced rat paw edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Dextran-induced pedal edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Dextran-induced pedal edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Bothrops jararaca induced rat paw edema/Intragastric	Rat	Inactive		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Platelet aggregating factor-acether-induced pedal edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H2O(50%) Ext.	Bradykinin-induced pedal edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Cellulose sulfate induced rat paw edema/Intragastric	Rat	Active		Henriques et al.,1991(76)
		Frozen Rhizome	EtOH-H_2O (50%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Henriques et al.,1991(76)

		Dried Entire Plant	EtOH (95%) Ext.	Arachidonic-acid induced ear edema/Intragastric	Mouse	Active		Calixto et al.,1991(77)
9	Arecaceae							
	Cocos nucifera	Fresh Fruit	Lyophilized aqueous crude extracts	formalin test and subcutaneous air pouch model	Mouse	Active	2-Thiapentane, 4-(9-borabicyclo [3. 3.1]non-9-yloxy), Dodecanoic acid, Asarone	Silva et al., 2013(78)
		Husk fiber	Infusion	Carrageenan-induced formalin test and subcutaneous air pouch model	Mouse	Active	.....	Silva et al., 2013(78)
10	Altingiaceae							
	Liquidambar styraciflua	Leaf, Stem	Decoction	Escherichia coli	In vitro	Active	α-Pinene	El-Readi et al., 2013(79)
11	Asteraceae							
	Achillea millefolium L.	Dried Leaf	Decoction	Escherichia coli	In vitro	Active	Thymol	Kazemi 2015(67)
	Achyrocline satureioides	Dried Inflorescence	EtOH (95%)Ext.	Croton oil ear edema test/External	Mouse	Active	alpha-pinene, Camphene, Sabinene	Simões, 1988(80)
		Dried Inflorescence	EtOH (95%)Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Simões et al., 1988(81)
		Dried Inflorescence	H_2O Ext.	Croton oil ear edema test/External	Mouse	Active		Simões, 1988(80)
		Dried Inflorescence	H_2O Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Simões et al., 1988(81)
		Dried Inflorescence	Hot H_2O Ext.	Croton oil ear edema test/External	Mouse	Active		Simões, 1988(80)

		Dried Inflorescence	Hot H_2O Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Simões et al., 1988(81)
	Ageratum conyzoides	Dried Leaf	EtOH(70%) Ext.	Carrageenan-induced pedal edema/SC	Rat	Active	Ageratochromene, β-caryophyllene, Precocene	Magalhaes et al., 1997(82)
		Dried Leaf	EtOH(70%) Ext.	Yeast-induced inflammation of the paw/IP	Rat	Active		Viana et al., 1998(83)
	Ageratum fastigiatum	Dried Leaf	H_2O Ext.	Leukocytes, cytokine secretion in peripheral blood	Human	Active	Germacrene D, alpha-humulene and bata-cedrene	Del-Vechio-Vieira G et al., 2009(84)
	Artemisia argyi	Dried Leaf	MeOH Ext.	Zymosan-induced pedal edema	Mouse	Active	Cylcofenchene, α-pinene, α-myrcene, D-limonene, Caryophyllene, and Germacrene D	Pereira et al., 1999(85)
	Artemisia judaica	Aerial Parts Essential Oil	Hydrodistillation	lipopolysaccharide (LPS)-stimulated mouse macrophages	Mouse	Active	Piperitone, Camphor, Ethyl cinnamate	Abu-Darwish MS et al., 2016(86)
	Atractylodes macrocephala	Dried Leaf	Ethanol Ext.	TPA-induced ear edema/ LPS-induced, cytokines	Mouse	Active	Cineole, Camphor, alpha-(-)- thujone, Borneol	Chen LL et al., 2017(87)
	Baccharis dracunculifolia	Dried Leaf	Hydrodistillation	Arachidonic Acid or TPA-induced	Mice	Active	Germacrene B, Naringenin, Kaempferol, Artepillin C, α-Pinene, Hydroxycinnamic acid, Apigenin, Kaempferide, Limonene,	Brandenburg MM et al., 2020(88)
	Baccharis punctulata	Dried Leaf	Hydrodistillation	TPA (12-O-tetradecanoylphorbol-13-acetate) induced ear edema	Rat	Active	δ-elemene, Germacrene D, Bicyclogermacrene	Ascari J et al., 2019(89)
	Bidens pilosa	Rhizome	H_2O Ext.	LPS-activated ANA-1 cells	In vitro	Active	alpha-Guaiene, alpha-Amylcinnamyl alcohol, Berkheyaradulene,	Gu S et al., 2019(90)

							Eremophylene	
	Blumea balsamifera (L.) DC	Leaf	Hydrodistillation	LPS-induced RAW264.7 cells	Rat	Active	Borneol, Caryophyllene, Ledol, Caryophyllene oxide	Lu wang et al., 2021(91)
	Calendula officinalis	Phytocomplex composed by dry extract	Dry Ext.	Carrageenan, Dextan and Hystamine/**	Rat	Active	2-Oxa-6-azatricyclo[3.3.1.1(3,7)]decane, 4,8-diiodo-6-(phenylsulfonyl)-, Octadec-9-enoic acid, 6-Octadecenoic acid	Sartori et al., 2003(92)
	Conyza bonariensis	Aerial Parts Essential Oil	Essential Oil	LPS-induced leukocyte recruitement/Intragastric	Mouse	Active	Levoglucosenone, Butanedioic acid, Diethyl ester, Benzoic acid	Souza et al.,2003(93)
	Cynara scolymus	Fresh Leaf	Infusion	Dye diffusion assay/Intragastric	Mouse	Active	1-octen-3-one, (*E*)-2-hexenal, Benzene acetaldehyde, 2,2-dimethyl-4-pentenal, β-ionone, Furfural, (*E*)-β-damescenone, α-methyl-γ-butirolactone, benzaldehyde	Ruppelt et al., 1991(94)
	Elephantopus scaber	Dried Entire Plants	Decoction	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive	2-Amino-4-hydroxypteridine-6-carbo acid, 25-Hydroxy-25-methylcholesterol	Poli et al., 1992(95)
		Fresh Leaf	Infusion	Dye diffusion assay/Intragast.	Mouse	Weak Activity		Ruppelt et al., 1991(94)
	Gochnatia polymorpha	Dried Leaf	Butanol Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive	(E)-nerolidol, Eugenol, Phenylacetaldehyde	Moreira et al., 2000(96)
		Dried Leaf	Dichloromethane Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive		Moreira et al., 2000(96)
		Dried Leaf	EtOAc Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Moreira et al., 2000(96)

		Dried Leaf	EtOH(100%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Moreira et al., 2000(96)
	Helianthus annus	Dried Seed	Essential Oil	skin barrier homeostasis	Human	Active	Oleic, Linoleic acids	Santiago et al., 2017(97)
	Gynura procumbens	Phyto complex composed by dry extract	Dry Ext.	Carrageenan, Dextan and Hystamine/**	Rat	Active	.....	Sartori et al., 2003(92)
	Matricaria recutita	Leaf	Decoction	LPS-induced migration RAW264.7/ xylene-induced ear oedema	Mice	Active	alpha-Pinene, 3-Carene, Limonene	Huang XL et al., 2019(98)
	Mikania Glomerata	Dried Leaf	Dichloromethanol Ext.	**/IP	Mouse	Active	Methyl cinnamate, 2H-1-Benzopyran-2-one, (2-hydroxyphenyl)methyl propionate, (Z)-methyl-hexadec-7-enoate, Methyl hexadecanoate,	De moura et al.,2002(99)
		Dried Leaf	EtOH-H_2O(1:1) Ext.	Histamine-induced edema/SC	Rat	Inactive		Fierro et al.,1999(100)
		Dried Leaf	EtOH-H_2O(1:1) Ext.	Serotonin-induced pleural edema/SC	Rat	Inactive		Fierro et al.,1999(100)
		Dried Leaf	EtOH-H_2O(1:1) Ext.	PAF-induced edema/SC	Rat	Inactive		Fierro et al.,1999(100)
		Fresh Leaf	Infusion	Dye diffusion assay/Intragast.	Mouse	Weak Activity		Ruppelt et al., 1991(94)
	Porophyllum ruderale	Aerial Parts Essential Oil	Essential Oil	LPS-induced leukocyte recruitement/Intragastric	Mouse	Active	limonene, (E,E)-dodecadienal	Souza et al.,2003(93)
	Rhaponticum carthamoides	Root	Decoction	Escherichia coli	In vitro	Active	Cyperene, Aplotaxene, Cinnamaldehyde,	Skala et al., 2016(101)

							Thymol	
	Vanillosmopsis arborea	Dried Trunk Wood	Essential Oil	**/Gastric intubation	Mouse	Active	α-Bisabolol	Menezes et al.,1990(102)
	verbesina macrophylla	Leaf	Hydrodistillation	carrageenan-induced ear edema	Rat	Active	Sesquiterpenes of hydrocarbons	Veras et al., 2020(103)
12	Bignoniaceae							
	Tabebuia impetiginosa	Dried Bark	**	Formalin-induced pedal edema/**	Rat	Active	.....	Oga et al., 1969(104)
13	Boraginaceae							
	Cordia verbenacea	Dried Leaf	EtOH (70%) Ext.	Croton oil-induced edema/External	Mouse	Active	α-Humulene, α-Pinene, Trans-caryophyllene, Artemetin, Spathulenol and Allo-aromadrendene	Sertie et al., 1991(105)
		Dried Leaf	EtOH (70%) Ext.	Nystatin-induced pedal edema/ Gastric intubation	Rat	Active		Sertie et al., 1991(105)
		Dried Leaf	EtOH (70%) Ext.	Cold stress and carrageenin-induced edema combined/Gastric intubation	Rat	Active		Sertie et al., 1991(105)
		Fresh Leaf	EtOH (70%) Ext.	Cotton pellet granuloma/External	Rat	Active		Basile et al., 1989(106)
		Fresh Leaf	EtOH (70%) Ext.	Cotton pellet granuloma/Ingra gastric	Rat	Active		Basile et al., 1989(106)
		Fresh Leaf	EtOH (70%) Ext.	Carrageenan-induced pedal edema/Oral	Rat	Active		Sertie et al., 1988(107)
		Fresh Leaf	EtOH (70%) Ext.	Cotton pellet granuloma/Oral	Rat	Active		Sertie et al., 1988(107)
	Symphytum officinale	Dried Leaf	Aqueous high seed	Carrageenan-induced pedal	Rat	Inactive	.....	Goldman et al.,

			natant	edema/Gastric Intragastric				1985(108)
14	Burseraceae							
	Aucoumea klaineana	Leaf	H_2O Ext.	lipoxygenase method	Invitro	Inactive	Alpha-Pinene, Alpha-phelandrene, p-cymene and 1,8-Cineole	Jazet DPM et al., 2008(109)
	Boswellia carterii	Dried Leaf	Decoction	Oral	Rat	Active	Monoterpenes α-pinene, (S)-(−)-Limonene, Linalool, Geraniol,	Siddiqui MK, 2011(110)
	Canarium scheinfurthii	Resin	Hydrodistillation	lipoxygenase method	Invitro	Active	p-cymene, Limonene and Alpha-terpineol.	Jazet DPM et al., 2008(109)
15	Caesalpinoideae							
	Mezoneuron benthamianum	Entire Plant Essential Oil	Hydrodistillation	TPA induced ear edema	Mice	Active	3-Carene, Pinene, Trans-nerolidol, Farnesene and Thujene	Moronkola AD et al., 2009(111)
16	Cannabaceae							
	Cannabis sativa L.	Seed Oil	Decoction	Fresh human monocytes/ human macrophages	Human	Active	Acyclic Diterpene Phytol	Claro-cala et al., 2022(112)
17	Caprifoliaceae							
	Patrinia scabiosaefolia	Entire Part	Decoction	Escherichia coli	In vitro	Active	Caryophyllene oxide	Lin et al., 2018(113)
18	Celastraceae							
	Maytenus aquifolium	Dried Leaf	Hydro-acoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Triterpenoids, α-amyrin, β-amyrin, Campesterol, Cholesterol	Kimura et al., 2000(114)
		Dried Leaf	Hydro-acoholic Ext.	Adjuvant-induced arthritis/Intragastric	Rat	Active		Kimura et al., 2000(114)
19	Chenopodiaceae							
	Chenopodium album	Leaf	Hydrodistillation	TPA-induced ear edema	Mice	Strong Active	p-cymene, Ascaridole, Pinane-2-ol, Alpha-pinene, Beta-pinene, Alpha-	Usman LA et al., 2010(115)

							terpineol	
20	***Crassulaceae***							
	Kalanchoe brasiliensis	Fresh Leaf	Juice	**/IP	Mouse	Active	.....	Ibrahim et al., 2000(115)
		Fresh Leaf	Juice	Zymosan-induced inflammat/IP	Mouse	Active		Ibrahim et al., 2002(116)
		Fresh Leaf	Plant Juice	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Mourão et al., 1999(117)
		Fresh Leaf	Plant Juice	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive		Mourão et al., 1999(117)
21	Cupressaceae							
	Callitris intratropica	Wood, Branch, Leaf	H_2O Ext.	Escherichia coli	In vitro	Active	β-Caryophyllene	Destryana et al., 2014(118)
	Chamaecyparis obtusa	Leaf	Decoction	carrageenaninduced paw edema, thioglycollate-induced peritonitis	Rat	Active	.....	Park et al., 2016(119)
		Leaf	Decoction	Escherichia coli	In vitro	Active	.....	Park et al., 2016(119)
	Sabina virginiana	Leaf	H_2O Ext.	TPA induced ear edema	Mice	Active	Limonene, Safrole, Asarone and Alpha-pinene	Sherifat AA et., 2010(120)
	Thuja plicata	Leaf	H_2O Ext.	human dermal fibroblast culture model	Human	Active	.....	Han X et al., 2017(121)
	Juniperus oxycedrus	Leaf	H_2O Ext.	human chondrocytic cell line C-28/I2	Human	Active	alpha-pinene [2,6,6-trimethyl-bicyclo(3.1.1)hept-3-ene]	Neves et al., 2011(122)
22	Cucurbitaceae							
	Cayaponia tayuya	Dried Root	$CHCl_3$ Ext.	Carrageenan-induced pedal	Mouse	Weak Activity	Vicenin-2, Spinosin, Isovitexi	Rios et al., 1990(123)

				edema/Gastric Intragastric			n	
		Dried Root	$CHCl_3$ Ext.	Carrageenan-induced pedal edema/IP	Mouse	Active		Rios et al., 1990(123)
		Dried Root	MeOH Ext.	Carrageenan-induced pedal edema/Gastric Intragastric	Mouse	Inactive		Rios et al., 1990(123)
		Dried Root	MeOH Ext.	Carrageenan-induced pedal edema/IP	Mouse	Weak Activity		Rios et al., 1990(123)
		Dried Root	Infusion	Dye diffusion assay/Intragast.	Mouse	Equivocal		Ruppelt et al., 1991(94)
	Wilbrandia ebracteata	Dried Root	CH_2Cl_2 Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Weak Activity	22-deoxy-22-hydroxy-25-deacetoxycucurbitacin B	Peters et al., 1999(124)
		Dried Root	CH_2Cl_2 Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Peters et al., 1999(124)
		Dried Root	$CHCl_3$ Soluble Fraction	Carrageenan-induced pleurisy/Intragastric	Mouse	Active		Peters et al., 1999(124)
		Dried Root	$CHCl_3$ Soluble Fraction	Carrageenan-induced pleuri./IP	Mouse	Active		Peters et al., 1999(124)
		Dried Root	Chromatographic Fraction	Carrageenan-induced pleurisy/IP	Mouse	Active		Peters et al., 1999(124)
	Wilbrandia species	Dried Rhizome	EtOH (70%) Ext.	Acetic acid-induced pedal edema/Intragastric	Mouse	Active	.....	Almeida et al., 1992(125)
		Dried Rhizome	EtOH (70%) Ext.	Carrageenan-induced granuloma/Intragastric	Rat	Active		Almeida et al., 1992(125)
		Dried Rhizome	EtOH (70%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Almeida et al., 1992(125)
23	Cyperaceae							
	Cyperus	Leaf	Essential Oil	carrageenan-	Mouse	Active		Biradar S

	esculentus			induced edema, formaldehyde induced arthritis, formalin induced writhing and MES induced convulsion				et al., 2010(126)
	C. rotundus	Leaf	Essential Oil	carrageenan-induced edema, formaldehyde induced arthritis, formalin induced writhing and MES induced convulsion	Mouse	Active		Biradar S et al., 2010(126)
	Mariscus pedunculatus	Venom	Essential Oil	LPS-induced pleurisy model/Intragastric	Mouse	Active	Irol (4-hydroxy-6-methoxytremetone) 1 and Isoevodionol (6-acetyl-5-hydroxy-7-methoxy-2,2-dimethyl-3-chromene)	Siani et al.,2001(127)
	Remirea maritima Aubl.	Root, Rhizome	Essential Oil	Formalin-induced nociception/ carrageenan-induced edema test	In vitro	Active	Remirol, Cyperene, Iso-evodionol, Cyperotundone, Caryophyllene oxide, Rodundene	Rabelo AS et al., 2014(128)
24	***Dilleniaceae***							
	Curatella americana	Dried Stem Bark	Hydro-alcoholic Ext.	12-O-tetradecanoylphorbol-13-1cetate (TPA)/IP	Mouse	Active	Catechin, Epicatechin, Kaempferol-4-beta-glucopyranoside	Alexandre-Moreira et al., 1999(129)
		Dried Stem Bark	Hydro-alcoholic Ext.	Capsaicin induced mouse ear edema/IP	Mouse	Active		Alexandre-Moreira et al., 1999(129)
		Dried Stem Bark	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Alexandre-Moreira et al., 1999(129)
		Dried	Hydro-	Adjuvant-	Rat	Active		Alexandre

		Stem Bark	alcoholic Ext.	induced arthritis/IP				-Moreira et al., 1999(129)
25	Elaeagnaceae							
	Elaeagnus oldhamii Maxim.	Dried Leaf	MeOH Ext.	Carrageenan-induced pedal edema/Intragastric	Mice	Active	Oleanolic acid, Ursolic acid	Liao et al., 2012(130)
	Elaeagnus angustifolia	Flower, Leaf	Hydrodistillation	Carrageenan-induced pedal edema/Intragastric	Mice	Active	E-ethyl cinnsmate, Hexahydrofarnesyl acetone, Palmitic acid	Farahbakhsh et al., 2011(131)
26	Erythroxylaceae							
	Erythroxylum	Dried Leaf	EtOH (70%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Chaves et al.,1988(132)
	Argentinum	Dried Leaf	EtOH (70%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Chaves et al.,1988(132)
27	Euphorbiaceae							
	Croton cajucara	Bark Essential Oil	Essential Oil	Carrageenan-induced pedal edema/Intragastric	Mouse	Active	Terpenes, Trans-dehydrocrotonin (t-DCTN) and Acetyl aleuritolic acid	Bighetti et al.,1999(133)
		Bark Essential Oil	Essential Oil	Cotton pellet granuloma/Ingra gastric	Rat	Active		Bighetti et al.,1999(133)
	Croton celtidifolius	Dried Bark	Butanol Ext.	Carrageenan-induced pedal edema/Intragastric	Mouse	Active	1l-1-O-methyl-myo-inositol, Neo-inositol and Sitosterol	Nardi et al., 2003(134)
		Dried Bark	Butanol Ext.	Carrageenan-induced pedal edema/IP	Mouse	Active		Nardi et al., 2003(134)
		Dried Bark	EtOAc Ext.	Carrageenan-induced pedal edema/Intragastric	Mouse	Active		Nardi et al., 2003(134)
		Dried Bark	EtOAc Ext.	Carrageenan-induced pedal edema/IP	Mouse	Active		Nardi et al., 2003(134)
		Dried Bark	EtOH (80%) Ext.	Carrageenan-induced pedal	Mouse	Active		Nardi et al.,

				edema/Intragastric				2003(134)
		Dried Bark	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Mouse	Active		Nardi et al., 2003(134)
		Dried Bark	H_2O Ext.	Carrageenan-induced pedal edema/IP	Mouse	Active		Nardi et al., 2003(134)
	Croton urucurana Baillon	Dried Bark	MeOH Ext.	Carrageenan-induced pedal edema/IP	Mice	Active	(+)-Gallocatechin, Procyanidin B3, (+)-Catechin, Tembetarine	Cordeiro KW et al., 2016(135)
	Jatropha elliptica	Fresh Tuber	EtOH-H_2O (50%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	erpenes jatrophone, jatropholone A and jatropholone B	Trebien et al., 1988(136)
		Fresh Tuber	EtOH-H_2O (50%) Ext.	Dextran-induced pedal edema/Intragastric	Rat	Inactive		Trebien et al., 1988(136)
		Fresh Tuber	EtOH-H_2O (50%) Ext.	Serotonin-induced pedal edema/Intragastric	Rat	Weak Activity		Trebien et al., 1988(136)
	Phyllanthus corcovadensis	Dried Leaf+Stem+Root	EtOH-H_2O (1:1) Ext.	Carrageenan-induced pedal edema/IP	Mouse	Inactive	.....	Gorski et al., 1993(137)
		Dried Leaf+Stem+Root	EtOH-H_2O (1:1) Ext.	Dextran-induced pedal edema/IP	Mouse	Inactive		Gorski et al., 1993(137)
	Phyllanthus carolinensis	Dried Entire Plant	Hydro-alcoholic Ext.	Formalin-induced pedal edema/IP	Mouse	Active	benzene, 1, 2 – dimethoxy – 4 - [[(4-methylphenyl) sulfonyl] methyl] - (53.78%),Phenethyl amine, 2-methoxy-alpha-methyl-4,5-(methylenedioxy)	Filho et al., 1996(138)
	Phyllanthus muellerianus	Dried Leaf	Hydrodistillation	Carrageenan-induced pedal edema	Rat	Active	hexahydrofarnesyl acetone, isocaryophyllene, limonene	Isiaka et al., 2019(139)
	Ricinus communis	Root	MeOH Ext.	Carrageenan-induced hind	Wistar albino	Active	n-haxadecanoic acid, Octadecanoic	Ilavarasan et al.,

				paw edema model	rat		acid, 1-hexadecanol. 2-methyl, Gibb-3-ene-1. 10decarboxylic acid ,2,4a. 7trihydroxy-1-methyl—8-methylene	2006(140)
28	Fabaceae							
	Apuleia leiocarpa	Fresh Bark+ Twigs	Infusion	Dye diffusion assay/Intragastric	Mouse	Active	(+)-pinitol, β-sitosterol and ten flavones	Ruppelt et al., 1991(94)
	Bauhinia guianensis	Dried Stem Bark	CH_2Cl_2 Ext.	Dextran-induced pedal edema/IP	Rat	Active	ergosterol, ergosterol peroxide, mevalolactone, monomethylsulochrin, trypacidin A	Carvalho et al., 1999(141)
		Dried Stem Bark	CH_2Cl_2 Ext.	Histamine-induced edema/IP	Rat	Inactive		Carvalho et al., 1999(141)
		Dried Stem Bark	EtOAc Ext.	Dextran-induced pedal edema/IP	Rat	Active		Carvalho et al., 1999(141)
		Dried Stem Bark	EtOAc Ext.	Dextran-induced pedal edema/IP	Rat	Active		Carvalho et al., 1999(141)
		Dried Stem Bark	MeOH Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Carvalho et al., 1999(141)
		Dried Stem Bark	MeOH Ext.	Dextran-induced pedal edema/IP	Rat	Active		Carvalho et al., 1999(141)
		Dried Stem Bark	MeOH Ext.	Histamine-induced edema/IP	Rat	Active		Carvalho et al., 1999(141)
	Copaifera cearensis	Dried Balsam	Oleoresin	Carrageenan-induced pedal edema/Intragastric	Mouse	Active	clorechinic, hardwickiic acid, kaurenoic, kolavenic acids	Fernandes et al., 1992(142)
	Caesalpinia ferrea	Dried Fruit	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	.....	Carvalho et al., 1996(143)
	Copaifera langsdorfii	**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active	caryophylene oxide, (-) copalic acid, (-)-acetoxycopalic acid	Sarti et al., 1986(144)

	Copaifera species	Oleoresin	Oleoresin	Carrageenan-induced pedal edema/Intragastric	Rat	Active	caryophylene oxide, (-) copalic acid, (-)-acetoxycopalic acid	Basile et al., 1988(145)
		Oleoresin	Oleoresin	Cotton pellet granuloma/Ingra gastric	Rat	Active		Basile et al., 1988(145)
		Oleoresin	Oleoresin	Histamine-induced vascular peremability/Intragastric	Rat	Active		Basile et al., 1988(145)
	Copaifera reticulata	Gum Resin	Decoction	Escherichia coli	In vitro	Active	(+)-Calaren	Destryana et al., 2014(118)
	Pterodon emarginatus	Dried Fruit	Hexane Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	β-elemene, trans-caryophyllene, α-humulene, germacrene-D, bicyclo germacrene, spathulenol	Carvalho et al., 1999(141)
	Pterodon pubescens	Dried Seed	Hydro-alcoholic Ext.	Collagen-induced arthritis/ Intragastric	Mouse	Active	Furanoditerpenes methyl 6α-acetoxy-7β-hydroxyvouacapan-17β-oate and methyl 6α-hydroxy-7β-acetoxyvouacapan-17β-oate from P. pubescens	Carvalho et al., 1999(141)
		Dried Seed	Hydro-alcoholic Ext.	Experimental arthritis / Intragastric	Mouse	Active		Coelho et al., 2001(142)
		**	**	Carrageenan, Dextran, Prostagandin E2 / **	Rat	Active		Sarti et al., 1986(143)
	Marsypianthes chamaedrys	Fresh Leaf	Infusion	Dye diffusion assay/Intragastric	Mouse	Active	sesquiterpenes β-caryophyllene, bicyclogermacrene, germacrene D	Ruppelt et al., 1991(94)
	Senna occidentalis	Entire Plant	Ethanolic Ext.	carrageenan induced paw edema model	Rat	Active	sennoside, anthraquinone glycosides, fatty oils, flavonoids, glycosides	Sreejith et al., 2010(144)

	Stryphnodendron adstringens	Dried Stem Bark	**	Acetic acid induced vascular permeability/ Intragastric	Mouse	Active	.....	Lima et al., 1998(146)
		Dried Stem Bark	Acetone Ext.	Rat pleurisy test results for leukocyte number and exudate volume/ Intragastric	Rat	Weak Activity		Lima et al., 1998(146)
		Dried Stem Bark	Acetone Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Lima et al., 1998(146)
		Dried Stem Bark	Acetone Ext.	Dextran-induced pedal edema/Intragastric	Rat	Active		Lima et al., 1998(146)
		Dried Stem Bark	Acetone Ext.	Adjuvant-induced arthritis/Intragastric	Rat	Weak Activity		Lima et al., 1998(146)
	Torresea cearensis	Dried Stem Bark	**	Carrageenan-induced pedal edema/Intragastric	Rat	Active	.....	Leal et al., 1997(147)
29	Flacourtiaceae							
	Casearia sylvestris	Fresh Bark+ Leaf	Infusion	Dye diffusion assay/Intragastric	Mouse	Weak Activity	sesquiterpene a-zingiberene	Ruppelt et al., 1991(94)
30	Geminiviridae							
	Lindernia anagallis	Entire Plant	H_2O Ext.	THP-1 (human mylomonocytic cell)	Human	Active	.....	Tsai et al. 2011(148)
31	Geraniaceae							
	Pelargonium fragrans	Dried Aerial Parts	H_2O Ext.	5-Lipoxy-genase inhibition/ cytokine secretion assay	In vitro	Active	spathulenol, fenchone, methyl eugenol ether, monoterpenes	Tsai et al., 2011(148)
	Pelargonium graveolens	Dried Aerial Parts	H_2O Ext.	LPS-elicited expression of the induced proinflammatory enzymes COX-	In vitro	Active	citronellol, citronellyl formate, linalool, geraniol, isomenthone and menthone	Elmann A et al., 2010(149)

				2 and iNOS				
32	Illiciaceae							
	Illicium anisatum	Essential Oil	Hydrodistillation	LPS-induced NO and PGE2 production in RAW 264.7 cells	Mouse	Active	Eucalyptol, sabinene, a-terpinenyl acetate, kaurene, isopimaradiene, safrol, beta-linalool, alpha-cadinol and terpinen-4-ol	Kim YJ et al., 2009(150)
33	Labiatae							
	Origanum vulgare L.	Flower	Essential Oil	THP-1 macrophages were used as cellular model of atherogenesis and the release/ secretion of cytokines (TNT-a, IL-1b, IL-6 and IL-10)	Mice	Active	Trans-sabinene hydrate, thymol and carvacrol	Ocana-Fuentes A et al., 2010(151)
34	Lamiaceae							
	Hyptis pectinata	Dried Leaf	H_2O Ext.	Arachidonic acid-induced edema/ Intragastric	Rat	Active	beta-caryophyllene, caryophyllene oxide and calamusenone	Bispo et al., 2001(152)
		Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Bispo et al., 2001(152)
	Origanum ehrenbergii	Leaf	H_2O Ext.	murine monocytic macrophage cell line RAW 264.7	Human	Active	thymol and p-cymene	Loizzo MR et al., 2009(153)
	O. syriacum L	Leaf	H_2O Ext.	murine monocytic macrophage cell line RAW 264.7	Human	Active	thymol and p-cymene	Loizzo MR et al., 2009(153)
	Origanum vulgare	Dried Leaf	H_2O Ext.	Primary human neonatal fibroblasts	Human	Active	alpha-thujene, alpha-pinene, camphene	Han X et al., 2017(121)
	Origanum virens L.	Dried Leaf	H_2O Ext.	human chondrocytes	Human	Active	carvacrol, thymol (5.14%), γ-terpinene, ρ-cimne	Neves et al., 2011(122)

	Raphiodon echinus	Dried Aerial Parts	H_2O Ext.	Acetic acid-induced dye diffusion / Intragastric	Mouse	Active	ellagic acid, caffeic acid and chlorogenic acid	Menezes et al., 1998(154)
	salvia officinalis	Dried Leaf	n-hexane	Croton oil-induced ear oedema	Mice	Weak Active	1,8-Cineole, camphor, β-pinene, E-β-caryophyllene	Baricevic D et al., 2001(155)
		Dried Leaf	Chloroform	Croton oil-induced ear oedema	Mice	Strong Active	1,8-Cineole, camphor, β-pinene, E-β-caryophyllene	Baricevic D et al., 2001(155)
	Stachys lavandulifolia Vahl	Dried Leaf	H_2O Ext.	algogen-induced orofacial nociceptive	Mice	Active	(-)-α-bisabolol, bicyclogermacrene, δ-cadinene, spathulenol	Barreto et al., 2016(156)
	Thymus albicans	Entire plant Essential oil	Hydrodistillation	LPS-stimulated mouse macrophages (RAW 264.7)	Mice	Active	1,8-cineole, linalool, borneol, α-terpineol	Roxo M et al., 2020(157)
	Thymus camphoratus	Dried Leaf	Hydrodistillation	lipopolysaccharide (LPS)-stimulated macrophages	Mice	Active	1,8-cineole, borneol	Zuzarte M et al., 2018(158)
	Thymus carnosus	Dried Leaf	Hydrodistillation	lipopolysaccharide (LPS)-stimulated macrophages	Mice	Active	borneol, camphene	Zuzarte M et al., 2018(158)
	Thymus vulgaris	Dried Leaf	H_2O Ext.	5-Lipoxy-genase inhibition/ cytokine secretion assay	In vitro	Active	p-cymene, thymol	Tsai et al., 2011(148)
	Lavandula augustifolia	Entire plant Essential oil	H_2O Ext.	Pleurisy, ear edema, formalin	Male swiss mice, female wistar rat	Active	(-)-linalool and linalyl acetate	Silva GL et al., 2015(159)
	Lavandula luisieri	Entire plant Essential oil	H_2O Ext.	primary human chondrocytes and in an intestinal cell	Human	Active	necrodane, α-pinene, camphene, β-pinene	Rufino AT et al., 2015(68)
	Lavandula pedunculata	Dried Aerial Parts	H_2O Ext.	primary human chondrocytes and in an intestinal cell	Human	Active	necrodane, α-pinene, camphene, β-pinene	Rufino AT et al., 2015(68)
	Lavandula viridis	Dried Aerial Parts	Hydrodistillation	lipopolysaccharide (LPS)-stimulated	Human	Active	1,8-cineole, camphor and α-pinene	Zuzarte M et al., 2022(160)

				macrophages				
	Nepeta cataria L	Entire plant Essential oil	Hydrodistillation	Carrageenan-induced pedal edema	Mice	Active	trans-nepetalactone, cis,trans-nepetalactone, trans,cis-nepetalactone and nepetalactol	Lopes RE et al., 2010(161)
	Rosmarinus officinalis L	Entire plant Essential oil	H_2O Ext.	In vivo, in vitro	Zebrafish	Active	1,8-cineole, α-pinene, and camphor	Borges RS et al., 2018(162)
	Thyme	Leaf	Decoction	Shigella flexneri	Bacteria	Active	.....	Allam et al. 2015(163)
	Ziziphora tenuior L.	Dried Leaf	Hydrodistillation	lipopolysaccharide (LPS)-stimulated macrophages	Mouse	Active	pulegone, p-menth-3-en-8-, isomenthone, 8-hydroxymenthone	Abu-Darwish MS et al., 2016(86)
35	Lauraceae							
	Cinnamomum cassia Presl	Dried Bark	H_2O Ext.	paw edema induced by carrageenan	Mice	Active	cinnamaldehyde, aromatic turmerone,11-Oxatetracyclo-dodecan-9-one, 2-methoxycinnamaldehyde, α-curcumene, (Z)-cinnamaldehyde, coumarin, benzenepropana	Sun L et al., 2016(164)
	Cinnamomum insularimontanum	Fruit	Essential Oil	Croton oil-induced mice ear edema	Mice	Active	alpha-pinene, camphene, beta-pinene, limonene, citronellal, citronellol and citral	Lin CT et al., 2008(165)
	Cinnamomum zeylanicum	Dried Bark	H_2O Ext.	human dermal fibroblast system	Human	Active	Cinnamaldehyde, cinnamic acid, eugenol	Han X et al., 2017(121)
	Cinnamomum osmophloeum	Leaf	Decoction	induced by LPS-treated J774A.1 murine macrophage.	Human	Active	1,8-cineole, santolina triene, spathulenol, caryophyllene oxide	Chao et al., 2005(166)
	Ocotea quixos	Leaf, Branch	Decoction	Escherichia coli	In vitro	Active	trans-Caryophyllene	Destryana et al., 2014(118)

36	Magnoliaceae							
	Talauma ovata	Dried Leaf	EtOH(95%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Inactive	phytosteroids, saponins, alkaloids	Morato et al., 1989(167)
37	Malvaceae							
	Sida cordifolia	Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Rosmarinic	Franzotti et al., 2000(168)
	Hibiscus sabdariffa L	Calyx	Decoction	Escherichia coli	In vitro	Active	n-Hexadecanoic acid	Shen et al. 2016(169)
38	Meliaceae							
	Guarea guidonia	Seed	EtOH(90%) Ext.	Cotton pellet granuloma / Gastric intubation	Rat	Active	(2 S *)-eudesma-5,7-dien-2-ol, (23 S *)-cycloarta-24-ene-3β,23-diol and (23 R *)-cycloarta-24-ene-3β,23-diol	Oga et al., 1981(170)
		Fruit Cover	carbon tetrachloride extract	carrageenan-induced paw oedema model.	Rat	Active		Ilango et al., 2012(171)
39	Menispermaceae							
	Cissampelos sympodialis	Dried Leaf	EtOH(80%) Ext.	12-O-tetradecanoylphorbol-13-1cetate (TPA)/IP	Mouse	Active	Milonine	Batista Lima et al., 2001(172)
		Dried Leaf	EtOH(80%) Ext.	Capsaicin-induced pedal edema/IP	Mouse	Active		Batista Lima et al., 2001(172)
		Dried Leaf	EtOH(80%) Ext.	Carrageenan-induced pedal edema/IP	Rat	Active		Batista Lima et al., 2001(172)
40	Moraceae							
	Dorstenia brasiliensis	Fresh Root	Infusion	Dye diffusion assay/Intragastri	Mouse	Weak Activity	5-[3-(4,5-dihydro-5,5-dimethyl-4-oxo-	Ruppelt et al.,

				c			2-furanyl)butoxy]-7H-furo[3-2-g][1]benzopyran-7-one, psoralen, bergapten, sitosterol, stigmasterol	1991(94)
41	Myrtaceae							
	Calycorectes sellowianus	Leaf	Alocholic Ext.	carrageenan-induced paw edema	Rat	Active	guaiol, beta-caryophyllene	Apel M et al., 2010(173)
	Eucalyptus citriodora	Entire Plant	H_2O Ext.	formol-induced edema/ acetic acid induced abdominal cramps	Wistar rat	Active	citronellal	Gbenou JD et al., 2013(174)
	Eugenia uniflora	Dried Leaf	EtOH (100%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive	sterol, β-sitosterol, two triterpenes, betulinic acidm and centelloside C	Schapoval et al., 1994(175)
		Dried Leaf	Infusion	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive		Schapoval et al., 1994(175)
		Fresh Leaf	Decoction	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Schapoval et al., 1994(175)
		Fresh Leaf	EtOH (100%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Schapoval et al., 1994(175)
		Fresh Leaf	Infusion	Carrageenan-induced pedal edema/Intragastric	Rat	Strong Activity		Schapoval et al., 1994(175)
	Eucalyptus bridgesiana	Dried Leaf	H_2O Ext.	5-Lipoxy-genase inhibition/ cytokine secretion assay	In Vitro	Active	1,8-Cineole, Alpha-terpimeol	Tsai et al., 2011(148)
	Eucalyptus camaldulensis	Dried Leaf	H_2O Ext.	trinitrobenzenes ulfonic acid (TNBS)-induced colitis model	Rat	Active	1,8-cineole	Santos et al., 2004(176)
	Eugenia caryophyllata	Dried Fruit	DMSO	human dermal fibroblast	Human	Active	collagen, eugenol, interferon,α	Han X et al.,

	Thunb.			system			chemoattractant	2017(121)
	Melaleuca alternifolia	Dried Leaf	H_2O Ext.	Leukocytes, cytokine secretion in peripheral blood	Human	Weak activity	Terpinene-4-ol	Caldefie et al., 2006(177)
	Melaleuca viridiflora	Dried Leaf	H_2O Ext.	Leukocytes, cytokine secretion in peripheral blood	Human	Active	Terpinene-4-ol	Caldefie et al., 2006(177)
	Myrciaria tenella	Leaf	Decoction	carrageenan-induced paw edema	Rat	Active	beta-caryophyllene and spathulenol	Apel M et al., 2010(173)
	Psidium guineense	Fresh Leaf Essential Oil	Decoction	Carrageenan-induced pedal edema/Intragastric	Rat	Active	eugenol, β-caryophyllene, eugenol, eugenin, and oleanolic acid	Santos et al., 1997(178)
	Syzygium aromaticum L.	Bud	Decoction	External	Human	Active	Eugenol, eugenyl acetate, β-caryophyllene, and α-humulene	Haro-González JN et al., 2021(179)
	Taxandria fragrans	Entire Plant	H_2O Ext.	Peripheral blood mononuclear cells	In Vitro	Active	.....	Hammer KA et al., 2008(180)
	Psidium guineense Sw.	Dried Leaf	Decoction	pleurisy and oedema	Mice	Active	spathulenol (PG-1),	do Nascimento KF et al., 2018(181)
	Ugni myricoides	Leaf	Decoction	Carrageenan-induced pedal edema	Mice	Active	α-pinene, 1,8-cineole, α-humulene, caryophyllene oxide + globulol, humulene epoxide II, β-caryophyllene	Quintão NL et al., 2010(182)
	Psidium glaziovianum Kia ersk	Leaf	H_2O Ext.	Carrageenan-induced paw edema	Mice	Active	1.8-cineole, α-pinene, and β-pinene	Costa et al., 2022(183)
42	Olacaceae							
	Heisteria pallida	Dried Bark	**	** / oral	Human	Active	Ourteacatechin (4'-Omethyl-(-)-epigaallocatechin), ouratea-proanthocyanidin A (epiafzelechin-(4beta)-4-O-methyl-	Dirsch et al., 1992(184)

							(-)-epigaalllocatechin)	
	Olea europea L	Dried Bark	H_2O Ext.	acetic acid-induced abdominal constrictions and paw edema	Mice	Active	alpha-pinene, 2,6-dimethyloctane and 2-methoxy-3-isopropylpyrazine	Haloui E et al., 2010(185)
43	Pinaceae							
	Cedrus atlantica	Bark	H_2O Ext.	Plantar incision surgery in hindpaw	Mice	Active	beta-sisensal, Isoledene, Himachala-2,4-diene	Martins DF et al., 2015(186)
44	Piperaceae							
	Piper marginatum	Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Safrole, 3,4-(methylenedioxy) propiophenone, P-mentha-1(7), 8-diene	D'Angelo et al., 1997(187)
	Piper nigrum Linn	Dried Leaf	Essential Oil	Formalin	Mice	Active	Caryophyllene	Jeena et al., 2014(188)
	Piper glabratum	Dried Leaf	Ethanolic Ext.	Carrageenan-induced pedal oedema/Pluerisy	Swiss mice	Active	beta-pinene, longiborneol, alpha-pinene	Leitão et al., 2020(189)
	Piper vicosanum	Dried Leaf	H_2O Ext.	Carrageenan-induced pedal oedema/Pluerisy	Mice	Active	gamma-elemene, alpha-alaskene, limonene	Hoff Brait DR et al., 2005(190)
	Piper aleyreanum	Aerial Part	Ethanolic Ext.	Formalin, pleurisy	Mice	Active	Caryophyllene oxide, beta-pinene, beta-elemene, spathulenol, camphene	Daniella KS Lima et al., 2012(191)
45	Phytolaccaceae							
	Petiveria alliacea	Dried Root	EtOH (70%) Ext.	Croton oil-induced irritation / External	Rat	Active	Asarone, 2-propenonic acid, Ester, Phytol, Benzaldehyde, benzyl thiol, dibenzyl disulphide	Germano et al., 1993(192)
		Dried Root	EtOH (70%) Ext.	Cotton pellet granuloma / External	Rat	Active		Germano et al., 1993(192)
		Dried	Hydro-	Carrageenan-	Rat	Active		Germano

		Root	alcoholic Ext.	induced pedal edema/Intragastric				et al., 1995(193)
		Dried Root	Hydro-alcoholic Ext.	Cotton pellet granuloma / Intragastric	Rat	Weak activity		Germano et al., 1995(193)
		Dried Root	Hydro-alcoholic Ext.	Nystatin induced edema / Intragastric	Rat	Active		Germano et al., 1995(193)
		Dried Root	Lyophilized Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Lopes Martins et al., 2002(186)
46	Plantaginaceae							
	Plantago australis	Dried Fruit	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Iridoid glucoside aucubine, Phenolic salidroside, Isoverbascoside, Verbascoside	Palmeiro et al., 2002(194)
		Dried Leaf	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Palmeiro et al., 2002(194)
		Dried Root	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Palmeiro et al., 2002(194)
	Plantago major	Dried Leaf	H_2O Ext.	** /External	Mouse	Inactive	Flavonoids, Lipids, Iridoid glycosides, Polysaccharides, terpinoids, Caffeic acid	Guillen et al., 1997(195)
		Dried Leaf	H_2O Ext.	Croton oil-induced edema / Intragastric	Mouse	Weak activity		Guillen et al., 1997(195)
		Dried Leaf	H_2O Ext.	Carrageenan-induced pleurisy /Intragastric	Rat	Active		Guillen et al., 1997(195)
		Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Inactive		Guillen et al., 1997(195)
		Dried Leaf	H_2O Ext.	Dextran-induced pedal edema/Intragastric	Rat	Active		Guillen et al., 1997(195)

		Dried Leaf	H_2O Ext.	Croton oil granuloma pouch / Intragastric	Rat	Active		Guillen et al., 1997(195)
47	Poaceae							
	Cymbopogon martinii	Dried Leaf	H_2O Ext.	5-Lipoxy-genase inhibition/ cytokine secretion assay	In vitro	Active	Geraniol, Geranyl acetate	Tsai et al., 2011(148)
	Cymbopogon winterianus	Leaf Essential Oil	H_2O Ext.	Carrageenan-induced neutrophil migration	Mice	Active	geraniol, citronellal, citronellol	Leite BL et al., 2010(196)
	Cymbopogon citratus	Dried Leaf	Hydrodistillation	carrageenan-induced paw edema	Mice	Active	geranial, neral	Boukhatem et al., 2014(197)
	Cymbopogon flexuosus	Leaf	Hydrodistillation	human dermal fibroblast system	Human	Active	lemicin, d-gurjunene, a-cadinol, b-caryophyllene, b-bourbonene, limonene	Han X et al., 2017(121)
48	Polygonaceae							
	Polygonum punctatum	Dried Entire Plant	Decoction	Carrageenan-induced pedal edema/Gastric intubation	Rat	Active	Squalene, 2-Benzenedicarboxylic acid, Mono[2-ethylhexyl]ester	Oliveira Simões et al., 1989(198)
		Dried Entire Plant	Decoction	Carrageenan-induced pedal edema/IP	Rat	Inactive		Oliveira Simões et al., 1989(198)
		Dried Entire Plant	EtOH-H_2O (1:1) Ext.	Carrageenan-induced pedal edema/Gastric intubation	Rat	Active		Oliveira Simões et al., 1989(198)
49	Ranunculaceae							
	Nigella sativa L.	Leaf	Essential Oil	Escherichia coli	Mice	Active	.....	Entok et al., 2014(199)
	Rhamanaceae							
	Zizyphus jujube Miller	Seed	Essential Oil	ear edema induced with TPA	Mice	Active		Al-reza SM et al., 2010(200)

50	Rubiaceae							
	Chiococca brachiata	Fresh Root	Infusion	Dye diffusion assay/Intragastric	Mouse	Active	Lignans, Coumarin, Ketoalcohol, Triterpenes, Iridoid	Ruppelt et al., 1991(94)
	Coutarea hexandra	Dried Stem Bark	EtOH(95%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active	Coumarin, Cucurbitacin	De Almeida et al., 1991(201)
51	Rutaceae							
	Choisya ternata Kunth	Dried Leaf	Hexane	carrageenan, bradykinin, serotonin, prostaglandin E2 (PGE2), 12-*O*-tetradecanoylphorbol-acetate (TPA), histamine, formalin	Mice	Active	tecleamaniensine A, lup-20(29)-en-3β-ol (lupeol), lup-20(29)-en-3β,24-diol, β-sitosterol glucoside and skimmianine	Pinheiro MM et al., 2015(202)
	Citrus aurantium L	Inflorescence	Decoction	Cotton pellet — subcutaneous	Rat	Active	Linalool	Khodabakhsh et al., 2014(203)
	Citrus limetta	Dried Fruit	Ethanol Ext.	THP-1 cell line/ Lipopolysaccharide-induced	Mice	Active	Limonene, alpha-Pinene, beta-myrcene	Dnyaneshawar UB et al., 2018(204)
	Citrus reticulata	Fruit Peels	H_2O Ext.	indomethacin-induced enterocolitis	Rat	Active	D-limonene	Rohit et al., 2014(205)
	Citrus sinensis	Fruit Peels	H_2O Ext.	lipoxygenase enzymatic method	Mice	Active	D-limonene	Jazet DPM et al., 2008(109)
	Citrus sunki	Fruit Peels	H_2O Ext.	LPS-induced secretion of NO in RAW 264.7 cells	Mice	Active	dl-limonene, b-myrcene	Yang EJ et a., 2010(206)
	Cleistocalyx operculatus	Buds	H_2O Ext.	lipopolysaccharide induced secretion of pro-inflammatory cytokines	Mouse	Active		Dung Thi N et al., 2009(207)
	Fortunella japonica	Fruit	H_2O Ext.	LPS-induced NO release in RAW 264.7 cells	Mice	Active	dl-limonene and carvone	Yang EJ et a., 2010(206)
	Tetradium	Dried	H_2O Ext.	TPA-induced ear	Mice	Active	alpha-pinene,	Maurya

	ruticarpum	Peels		, cytokines, ear tissue			limonene, beta-Myrcene	AK et al., 2017(208)
	Zanthoxylum myriacanthum	Seed	Decoction	Mouse primary splenocytes and peritoneal macrophages	Mouse	Active	Chlorogenic acid, Hyperoside, Ribalinine	Yeh TH et al., 2020(56)
	Zanthoxylum coreanum nakai	Dried Fruit	H_2O Ext.	Induction of Atopic Dermatitis in ear	Mouse	Active	alpha-Thujene, (-)-alpha-pinene, Camphene	Guo RH et al., 2018(209)
	Zanthoxylum schinifolium	Dried Fruit	Ethanol Ext.	LPS in RAW 264.7 cell	Mice	Active	Linalool, limonene, beta-Thujene	Dnyaneshawar UB et al., 2018(204)
	Zanthoxylum piperitum	Dried Fruit	H_2O Ext.	LPS-induced nitrite production	Mice	Active	limonene and geranyl acetate	Pérez et al., 2008(210)
52	Sapindaceae							
	Allophylus edulis	Fresh Leaf	Decoction	carrageenan-induced mice paw oedema, pleurisy	Mice	Active	viridiflorol	Trevizan LNF et al., 2016(211)
53	Sapotaceae							
	Bumelia sartorum	Dried Root Bark	EtOH(95%) Ext.	Carrageenan-induced pedal edema/Gastric intubation	Rat	Active	Polyphenolic	GR de Morais lima et al., 2011(212)
54	Santalaceae							
	Santalum spicatum	Trunk, Wood	H_2O Ext.	Leukocytes, cytokine secretion in peripheral blood	Human	Active	alpha- santalol	Jain et al., 2019(213)
55	Scrophulariaceae							
	Scoparia dulcis	Dried Entire Plant	EtOH(95%) Ext.	Cotton pellet granuloma / Intragastric	Rat	Inactive	3-buten-2-one-4(2,5,6,6, tetramethyl 2-cyclohexane 1-yl, tetra cy-cl-o pentadeca-5,12 dien-3 one, Coumarine	Freire et al., 1993(214)
		Dried Entire Plant	EtOH(95%) Ext.	Dextran-induced pedal edema/Intragast	Rat	Active		Freire et al., 1993(214)

				ric				
		Dried Entire Plant	EtOH(95%) Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Freire et al., 1993(214)
	Lindernia anagallis	Dried Leaf	H_2O Ext.	5-Lipoxy-genase inhibition/ cytokine secretion assay	In Vitro	Active	p-menthanone, menthol, pulegone	Tsai et al., 2011(148)
56	Solanaceae							
	Brunfelsia uniflora	Fresh Leaf	Infusion	Dye diffusion assay/Intragastric	Mouse	Inactive	Phytol, tocopherol	Ruppelt et al., 1991(94)
		Root	$CHCl_3$ Ext.	** / Oral	Rat	Active		Iyer et al., 1978(215)
		Root	MeOH Ext.	Carrageenan-induced pedal edema/Oral	Rat	Active		Iyer et al., 1977(216)
57	Theacea							
	Camellia reticulata L.	Entire Plant	Decoction	Indomethacin (INDO) Induced Enterocolitis	Rat	Active	.....	Patil et al. 2014(217)
58	Verbenaceae							
	Bouchea fuluminensis	Dried Aerial Parts	EtOH(95%) Ext.	Carrageenan-induced pedal edema/Intragastric	Mouse	Active	Iridoid lamiide,	Costa et al., 2003(218)
		Dried Aerial Parts	EtOH(95%) Ext.	Histamine-induced edema	Mouse	Active		Costa et al., 2003(218)
		Dried Aerial Parts	EtOH(95%) Ext.	5-HT-induced pedal edemaa/ Intragastric	Mouse	Active		Costa et al., 2003(218)
		Dried Leaf	H_2O Ext.	Carrageenan-induced pedal edema/**	Rat	Active		Delaporte et al., 2001(219)
	Stachytarpheta cayennensis	Dried Leaf	Butanol Ext.	Carrageenan-induced pedal edema/IP	Rat	Active	Decanoic acid, ethylester, dodecanoic acid, tetradecanoic acid	Schapoval et al., 1998(220)
		Dried Leaf	Butanol Ext.	Carrageenan-induced pedal edema/IP	Salvelinus alpinus	Weak activity		Schapoval et al., 1998(220)
		Dried	EtOH (70%)	Carrageenan-	Rat	Weak		Schapoval

		Leaf	Ext.	induced pedal edema/Intragastric		activity		et al., 1998(220)
		Dried Leaf	Infusion	Carrageenan-induced pedal edema/Intragastric	Rat	Active		Schapoval et al., 1998(220)
	Lippia gracilis Schauer	Dried Leaf	Hydrodistallation	Carrageenan-induced oedema	Rat	Active	thymol-p-cymene chemotype	Mendes SS et al., 2010(37)
	Lippia sidoides	Leaf	H_2O Ext.	acute ear edema induced by 12-O-tetradecanoylforbol 13-acetate (TPA)	Rat	Active	.....	Barros MMV et al., 2007(221)
59	Winteraceae							
	Dryimis winteri	Dried Bark	Hydro-alcoholic Ext.	Dextran-induced pedal edema/Intragastric	Rat	Equivocaal	Elemol, gamma-eudesmol, beta-eudesmol, alpha-eudesmol, alpha-pinine	Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	PGE2 induced paw or edema / Intragastric	Rat	Inactive		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	Histamine-induced edema / Intragastric	Rat	Active		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	Carrageenan-induced pedal edema/Intragastric	Rat	Weak activity		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	Bradykinin-induced pedal edema / Intragastric	Rat	Weak activity		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	PAF-acether induced paw oedema / Intragastric	Rat	Weak activity		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic Ext.	Substance produced paw oedema / Intragastric	Rat	Weak activity		Trarsk et al., 1997(222)
		Dried Bark	Hydro-alcoholic	Ovalbumine induced paw	Rat	Active		Trarsk et al.,

			Ext.	oedema / Intragastric				1997(222)
	Drimys brasiliensis	Leaf, Stem Bark		Paw edema induced by carrageenan and formalin test	Mice	Active	monoterpenes, sesquiterpenes	Lago LHJ et al., 2010(223)
60	Zingiberaceae							
	Aframomum daniellii	Rhizome Essential Oil	H_2O Ext.	.....	....	Active	e limonene, 1,8-cineole, a- and b-pinenes, linalool and (E)-b-ocimene	Pérez SG et al., 2011(210)
	A. Melegueta	Seed	MeOH Ext.	Xyene-induce topical edema	Mouse	Active	e limonene, 1,8-cineole, a- and b-pinenes, linalool and (E)-b-ocimene	Okoli CO et al., 2007(224)
	Curcuma longa.L	Rhizome Essential Oil	H_2O Ext.	Carrageenan, dextran induced paw edema / Oral	Mice	Active	ar-turmerone, curlone, ar-curcumene	Liju VB et al., 2011(225)
		Rhizome Essential Oil	H_2O Ext.	Intraperitonial	In vitro	Active	ar-turmerone, curlone, ar-curcumene	Liju VB et al., 2011(225)
	Fructus Alpinia zerumbet	Dried Ripe Fruit	Decoction	Lipopolysaccharide-induced endothelial cell	Human	Active	Terpene, sterol, flavonoids	Ji YP et al., 2019(226)
	Ginger	Rhizome Essential Oil	H_2O Ext.	Carrageenan, dextran, formalin	Mice	Active	Zingiberene, ar-curcumene, a-sesquiphellandrene	Jeena et al., 2013(226)
	Globba sessiliflora Sims.	Rhizome Essential Oil	H_2O Ext.	carrageenan-induced mice paw edema	Mice	Active	β-Eudesmol, (E)-β-caryophyllene, caryophyllene oxide, T-muurolol	Ravendra et al., 2017(228)
	Hedychium coronarium	Rhizome Essential Oil	Hydrodistillation	carrageenan-induced hind paw edema	Rat	Active	Beta-trans-ocimenone, linalool, 1,8-cineole, alpha-terpineol, 10-epi-g-eudesmol, sabinene and terpinen-4-ol	Lu Y et al., 2009(229)
	Zingiber cassumunar Roxb.	Rhizome Essential Oil	Decoction	Porphyromonas gingivalis/1,2-Dimethylhydrazine, DSS	Mice	Active	Terpinen-4-ol, Carvacrol	Leelarungrayub et al., 2017,(230) Arigesava

								n et al.,2017(230)
		Dried Ripe Fruit	Decoction	Intraperitoneal/ Intragastrical	Mouse	Weak Activity	Terpene, sterol, flavonoids	Ji YP et al., 2019(226)
	Zingiber officinale Roscoe	Rhizome Essential Oil	Hydrodistillation	acetic acid-induced writhing	In vitro	Active	monoterpenes and sesquiterpene	Vendruscolo A et al., 2006(231)
	Zingiber zerumbet	Rhizome Essential Oil	Decoction	carrageenan-induced paw edema and cotton pellet-induced granuloma	Rat	Active		Zakaria ZA et al., 2010(232)

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Acknowledgements

The author acknowledges the phytochemistry department of RGU, Arunachal Pradesh and National Taipei University of Technology, Taipei, Taiwan for providing all infrastructures for completing this review.

REFERENCES

[1] Stevenson D.E., Hurst R.D. "Polyphenolic phytochemicals-just antioxidants or much more? A review." *Cell. Mol. Life Sci.* 2007;64:2900–2916. doi: 10.1007/s00018-007-7237-1. [PubMed] [CrossRef] [Google Scholar]
[2] C.A. Donanello, "Proinflammatory and anti-inflammatory cytokines as mediators in the pathogenesis of septic shock." Chest, 112, 321–329 (1997).
[3] M.A.Palladino, F.R. Bahjat, E.A. Theodorakis, L.L. Moldawe, "AntiTNF-alpha therapies: the next generation." Natl. Rev. Drug Discov., 2, 736–746 (2003).
[4] A. N. Abdalla, U. Shaheen, Q. M. A. Abdallah et al., "Proapoptotic activity of Achillea membranacea essential oil and its major constituent 1, 8-cineole against A2780 ovarian cancer cells," Molecules, vol. 25, p. 7, 2020.
[5] P. Arulselvan, M. T. Fard, W. S. Tan et al., "Role of antioxidants and natural products in inflammation," Oxidative Figure 6: e anti-inflammatory effect of the essential oils of traditional Chinese medicine involves multiple signal pathways. Evidence-Based Complementary and Alternative Medicine 11 Medicine and Cellular Longevity, vol. 2016, Article ID 5276130, 2016.
[6] D. Simon, "Inflammation and growth," Journal of Pediatric Gastroenterology and Nutrition, vol. 51, no. Suppl 3, pp. S133–S134, 2017
[7] Ferrero-Miliani, L.; Nielsen, O.H.; Andersen, P.S.; Girardin, S.E. "Chronic inflammation: Importance of NOD2 and NALP3 in interleukin-1beta generation." Clin. Exp. Immunol. 2007, 147, 227–235
[8] M. Ebbo, A. Crinier, F. V´ely, and E. Vivier, "Innate lymphoid cells: major players in inflammatory diseases," Nature Reviews Immunology, vol. 17, no. 11, pp. 665–678, 2017.
[9] L. Ferrero-Miliani, O. H. Nielsen, P. S. Andersen, and S. E. Girardin, "Chronic inflammation: importance of NOD2 and NALP3 in interleukin-1beta generation," Clin Exp Immunol, vol. 147, no. 2, pp. 227–235, 2007.
[10] Rubiolo, P.; Sgorbini, B.; Liberto, E.; Cordero, C.; Bicchi, C. "Essential oils and volatiles: sample preparation and analysis. Flavour Fragr. J. 2010, 25, 282-290.
[11] Edris AE. Pharmaceutical and therapeutic potentials of essential oils and their individual volatile constituents: A review, Phytother Res. 2007; 21: 308-323.
[12] Cavaleiro, C.M.F. Óleos essenciais de Juniperus de Portugal. PhD Thesis, Universidade de Coimbra, Faculdade de Farmácia, Coimbra, Portugal, 2001.
[13] Maria Graça Miguel Faculdade de Ciências e Tecnologia, Universidade do Algarve, IBB, Centro de Biotecnologia Vegetal, Antioxidant and Anti-Inflammatory Activities of Essential Oils: A Short Review, Ed. 8, Campus de Gambelas, 8005-139 Faro, Portugal; Published: 15 December 2010 Kamatou G.P.P., Viljoen A.M. A review of the application and pharmacological properties of α-bisabolol and α-bisabolol-rich oils. *J. Am. Oil Chem. Soc.* 2010;87:1–7. doi: 10.1007/s11746-009-1483-3. [CrossRef] [Google Scholar]
[14] Miguel, M.G. Antioxidant activity of medicinal and aromatic plants. Flavour Fragr. J. 2010, 25, 291-312.
[15] Sangwan, N.S.; Farooqui, A.H.A.; Shabih, F.; Sangwan, R.S. Regulation of essential oil production in plants. Plant Growth Regul. 2001, 34, 3-21.

[16] Rubiolo, P.; Sgorbini, B.; Liberto, E.; Cordero, C.; Bicchi, C. Essential oils and volatiles: sample preparation and analysis. Flavour Fragr. J. 2010, 25, 282-290
[17] Bakkali, F.; Averbeck, S.; Averbeck, D.; Idaomar, M.M. Biological effects of essential oils- a review. Food Chem. Toxicol. 2008, 46, 446-475.
[18] Ibrahim, M.A.; Kainulainen, P.; Aflatuni, A.; Tiilikkala, K.; Holopainen, J.K. Insecticidal, repellent, antimicrobial activity and Phytotoxicity of essential oils: with special reference to limonene and its suitability for control of insect pests. Agr. Food Sci. Finland 2001, 10, 243-259.
[19] Babior, B.M. NADPH oxidase. Curr. Opin. Immunol. 2004, 16, 42-47.
[20] Quinn, M.T.; Gauss, K.A. Structure and regulation of the neutrophil respiratory burst oxidase: comparison with nonphagocyte oxidases. J. Leukocyte Biol. 2004, 76, 760-781.
[21] Fridovich, I. Superoxide anion radical (O2 •-), superoxide dismutases, and related matters. J. Biol. Chem. 1997, 272, 18515-18517.
[22] Chen, S.-X.; Schopfer, P. Hydroxyl-radical production in physiological reaction. A novel function of peroxidase. Eur. J. Biochem. 1999, 260, 726-735.
[23] Gomes, A.; Fernandes, E.; Lima, J.L.F.C.; Mira, L.; Corvo, M.L. Molecular mechanisms of antiinflammatory activity mediated by flavonoids. Curr. Med. Chem. 2008, 15, 1586-1605
[24] Kostka, P. Free radicals (nitric oxide). Anal. Chem. 1995, 67, 411R-416R.
[25] Nagano, T. Practical methods for detection of nitric oxide. Luminescence 1999, 14, 283-290.
[26] Miyasaka, N.; Hirata, Y. Nitric oxide and inflammatory arthritides (minireview). Life Sci. 1997, 61, 2073-2081
[27] Dassoler, M.; Schwanz, M.; Busseto, F.; Moreira, E.A.; Gutierrez, L. Perfil fitoquímico e ensaio farmacológico de Averrhoa carambola L. (Oxalidaceae). J. Bras. Fitom. 2004, 2, 4–8.
[28] Falcão, H.; Lima, I.O.; Santos, V.L.; Dantas, H.F.; Diniz, M.F.F.M.; Barbosa-Filho, J.M.; Batista, L.M. Review of the plants with anti-inflammatory activity studied in Brazil. Braz. J. Pharmacogn. 2005, 15, 381–391.
[29] Gomes A., Fernandes E., Lima J.L.F.C., Mira L., Corvo M.L. Molecular mechanisms of anti-inflammatory activity mediated by flavonoids. *Curr. Med. Chem.* 2008;15:1586–1605. doi: 10.2174/092986708784911579. [PubMed] [CrossRef] [Google Scholar]
[30] Santos F.A., Rao V.S.N. Antiinflammatory and antinociceptive effects of 1,8-cineole a terpenoid oxide present in many plant essential oils. *Phytother. Res.* 2000;14:240–244. doi: 10.1002/1099-1573(200006)14:4<240::AID-PTR573>3.0.CO;2-X. [PubMed] [CrossRef] [Google Scholar]
[31] Hajhashemi V., Ghannadi A., Jafarabadi H. Black cumin seed essential oil, as a potent analgesic and anti-inflammatory drug. *Phytother. Res.* 2004;18:195–199. doi: 10.1002/ptr.1390. [PubMed] [CrossRef] [Google Scholar]
[32] Oyemitamn I.A., Iwalewa E.O., Akanmu M.A., Olugbade T.A. Antinociceptive and anti-inflammatory effects of essential oil of *Dennettia tripetala* G. Baker (Annonaceae) in

rodents. *Afr. J. Trad. CAM.* 2008;5:355–362. [PMC free article] [PubMed] [Google Scholar]

[33] Lino C.S., Gomes P.B., Lucetti D.L., Diógenes J.P.L., Sousa F.C.F., Silva M.G.V., Viana G.S.B. Evaluation of antinociceptive and antiinflammatory activities of the essential oil (EO) of *Ocimum micranthum* Willd. from Northeastern Brazil. *Phytother. Res.* 2005;19:708–712. doi: 10.1002/ptr.1737. [PubMed] [CrossRef] [Google Scholar]

[34] Juhás Š., Bujňáková D., Rehák P., Cikoš Š., Czikková S., Veselá J., Il'ková G., Koppel J. Anti-inflammatory effects of thyme essential oil in mice. *Acta Vet. Brno.* 2008;77:327–334. doi: 10.2754/avb200877030327. [CrossRef] [Google Scholar]

[35] Apel M.A., Lima M.E.L., Sobral M., Young M.C.M., Cordeiro I., Schapoval E.E.S., Henriques A.T., Moreno P.R.H. Anti-inflammatory activity of essential oils from leaves of *Myrciaria tenella* and *Calycorectes sellowianus*. *Pharm. Biol.* 2010;48:433–438. doi: 10.3109/13880200903164386. [PubMed] [CrossRef] [Google Scholar]

[36] Mendes S.S., Bomfim R.R., Jesus H.C.R., Alves P.B., Blank A.F., Estevam C.S., Antoniolli A.R., Thomazzi S.M. Evaluation of the analgesic and anti-inflammatory effects of the essential oil of *Lippia gracilis* leaves. *J. Ethnopharmacol.* 2010;129:391–397. doi: 10.1016/j.jep.2010.04.005. [PubMed] [CrossRef] [Google Scholar]

[37] Işcan G., Kirimer N., Kürkçüoglu M., Arabaci T., Küpeli E., Başer K.H.C. Biological activity and composition of the essential oils of *Achillea schischkinii* Sosn. and *Achillea aleppica* D.C. subsp. *aleppica*. *J. Agr. Food Chem.* 2006;54:170–173. [PubMed] [Google Scholar]

[38] Hajhashemi V., Ghannadi A., Sharif B. Anti-inflammatory and analgesic properties of the leaf extracts and essential oil of *Lavandula angustifolia* Mill. *J. Ethnopharmacol.* 2003;89:67–71. doi: 10.1016/S0378-8741(03)00234-4. [PubMed] [CrossRef] [Google Scholar]

[39] V. Ballabeni, M.Tognolini, M. Chiavarini, M. Impicciatore, R. Bruni, A. Bianchi, E. Barocelli, Novel antiplatelet and antithrombotic activities of essential oil from Lavandula hybrida Reverchon "Grosso". Phytomed., 11, 596–601 (2004).

[40] D.P.M. Jazet, F. Boyom, M.L. Sameza, D.B. Ndongson, N.L. Kwazou, A.P.H. Zollo, C. Menut , Investigations on the essential oils of some Aframomum species (Zingiberaceae) from Cameroon as potential antioxidant and anti-inflammatory agents. Int. J. Esset. Oil Ther., 2, 149-155 (2008).

[41] D.P. M.Jazet, F. Tchoumbougnang, S. E. Tchinda, S. Manedong, K., A. P.H. Zollo, C. Menut, Antioxidant and anti-inflammatory potential of essential oils of some Zanthoxylum (Rutaceae) of Cameroon. Int. J. Esset. Oil Ther., 2(2), 82-88 (2008).

[42] Darsham, S.; Doreswamug, R. Patented anti-inflammatory plant drug development from traditional medicine. Phytother. Res. 2004, 18, 343-357

[43] Reinke, J.M.; Sorg, H. Wound repair and regeneration. Eur. Surg. Res. 2012, 49, 35–43. [CrossRef] [PubMed]

[44] Schmuth, M.; Blunder, S.; Dubrac, S.; Gruber, R.; Moosbrugger-Martinz, V. Epidermal barrier in hereditary ichthyoses, atopic dermatitis, and psoriasis. J. Dtsch. Dermatol. Ges. 2015, 13, 1119–1123. [CrossRef] [PubMed]

[45] De Sousa, D.P. Medicinal Essential Oils: Chemical, Pharmacological and Therapeutic Aspects, 1st ed.; Nova Science Publishers: New York, NY, USA, 2012; p. 236.

[46] Santos, F.A.; Rao, V.S.N. Antiinflammatory and antinociceptive effects of 1,8-cineole a terpenoid oxide present in many plant essential oils. Phytother. Res. 2000, 14, 240–244.
[47] Valério, D.A.R.; Cunha, T.M.; Arakawa, N.S.; Lemos, H.P.; da Costa, F.B.; Parada, C.A.; Ferreira, S.H.; Cunha, F.Q.; Verri, J.W.A. Anti-inflammatory and analgesic effects of the sesquiterpene lactone budlein A in mice: Inhibition of cytokine production-dependent mechanism. Eur. J. Pharmacol. 2007, 562, 155–163. Molecules 2013, 18 1248
[48] Juergens, U.R.; Stober, M.V. The anti-inflammatory activity of l-menthol compared to mint oil in human monocytes in vitro: A novel perspective for its therapeutic use in inflammatory diseases. Eur. J. Med. Res. 1998, 3, 539–545.
[49] Wu, X.; Li, X.; Xiao, F.; Zhang, Z.; Xu, Z.; Wang, H. Studies on the analgesic and anti-inflammatory effect of bornyl acetate in volatile oil from Amomum villosum. Zhong Yao Cai 2004, 27, 438–439.
[50] José-Luis Rios, "Essentials Oils: What They Are and How the Terms Are Used and Defined", Essential Oils in Food Preservation, Flavor and Safety, 2016, Pages 3-10.
[51] Rubiolo, P.; Sgorbini, B.; Liberto, E.; Cordero, C.; Bicchi, C. Essential oils and volatiles: sample preparation and analysis. Flavour Fragr. J. 2010; 25:282-290.
[52] Burt, S. Essential oils: their antibacterial properties and potential applications in foods – a review. Int. J. Food Microbiol. 2004; 94:223- 253.
[53] Heloina de S. Falcão, Igara O. Lima, Vanda L. dos Santos, Harlan de F. Dantas, Margareth de F.F.M. Diniz, José M. Barbosa-Filho, Leônia M. Batista. Review of the plants with anti-inflammatory activity studied in Brazil. Revista Brasileira de Farmacognosia Brazilian Journal of Pharmacognosy, 2005, 15(4): 381-391.
[54] Lino CS, Taveira ML, Viana GSB, Matos FJA 1997. "*Analgesic and antiinflammatory activities of Justicia pectoralis Jacq and its main constituents: coumarin and umbelliferone."* Phytother Res 11: 211-215.
[55] T. H. Yeh and J. Y. Lin, *"Acorus gramineus and euodia ruticarpa steam distilled essential oils exert anti-inflammatory effects through decreasing ,1/,2 and pro-/anti-inflammatory cytokine secretion ratios in vitro,"* Biomolecules, vol. 102 pages, 2020.
[56] Calixto JB, De Lima TCM, Morato GS, Nicolau M, Takahashi RN, Valle RMR, Schmidt CC, Yunes RA 1990 *"Chemical and pharmacological analysis of the crude aqueous/alcoholic extract from Cordyline dracaenoides."* Phytother Res 4: 167-171.
[57] Delaporte RH, Sanchez GM, Cuellar AC, Demello JCP 2001. *"Quality control and anti-inflammatory activity of the plant drugs Alternanthera brasiliana (L.) Kuntze and Bouchea fluminensis (Vell.) Mold."* Acta Farm Bonaerense 20: 39-46.
[58] Taniguchi SF, Bersani-Amado C, Sudo LS, Assef SMC, Oga S 1997. *"Effect of Pfaffiairesinoides on the experimental inflammatory process in rats."* Phytother Res 11: 568-571.
[59] Mazzanti G, Braghiroli L 1994. "*Analgesic and anti-inflammatory action of Pfaffia paniculata (Marticus) Kuntze."* Phytother Res 8: 413-416.

[60] Mazzanti G, Braghiroli L, Tita B, Bolle P, Piccinelli D 1993. *"Anti-inflammatory activity of Pfaffia paniculata (Marticus) Kuntze and Pfaffia stenophylla (Sprengel) Stuchl."* Pharmacol Res 27: 91-92.

[61] Mota MLR, Thomas G, Barbosa Filho JM 1985. *"Antiinflammatory actions of tannins isolated from the bark of Anacardium occidentale L."* J Ethnopharmacol 13: 289-300.

[62] Viana GSB, Bandeira MAM, Moura LC, Souza-Filho MVP, Matos FJA, Ribeiro RA 1997. *"Analgesic and antiinflammatory effects of the tannin fraction from Myracrodruon urundeuva Fr All*." Phytother Res 11: 118-122.

[63] R. L. Shirole, N. L. Shirole, A. A. Kshatriya, R. Kulkarni, and M. N. Saraf, *"Investigation into the mechanism of action of essential oil of Pistacia integerrima for its antiasthmatic activity,"* Journal of Ethnopharmacology, vol. 153, no. 3, pp. 541–551, 2014.

[64] Oliveira RM, Dutra TS, Simionatto E, Ré N, Kassuya CA, Cardoso CA. *"Anti-inflammatory effects of essential oils from Mangifera indica."* Genet Mol Res. 2017 Mar 16;16(1). doi: 10.4238/gmr16019227. PMID: 28362977.

[65] I.A. Oyemitan, E.O. Iwalewa, M.A. Akanmo, T.A. Olugbade, *"Antinociceptive and anti-inflammatory effects of essential oil of Dennettia tripetala G. Baker (Annonaceae) in rodents."* Afr. J. Trad. CAM. 5(4), 355-362 (2008).

[66] M. Kazemi, *"Chemical composition and antimicrobial, antioxidant activities and anti-inflammatory potential of Achillea millefolium L., Anethum graveolens L., and Carum copticum L. essential oils,"* Journal of Herbal Medicine, vol. 5, no. 4, pp. 217–222, 2015.

[67] Rufino A.T., Ferreira I., Judas F., Salgueiro L., Lopes M.C., Cavaleiro C., Mendes A.F. *"Differential effects of the essential oils of Lavandula luisieri and Eryngium duriaei subsp. juresianum in cell models of two chronic inflammatory diseases." Pharm. Biol.* 2015;53:1220–1230. doi: 10.3109/13880209.2014.970701.

[68] Du JC, Xie XF, Xiong L, Sun C, Peng C. *"Research progress of chemical constituents and pharmacological activities of essential oil of Ligusticum chuanxiong."* Zhongguo Zhong Yao Za Zhi. (2016) Dec;41(23):4328-4333. Chinese. doi: 10.4268/cjcmm20162306. PMID: 28933107

[69] J. Valente, M. Zuzarte, M. J. Gonçalves et al., *"Antifungal, antioxidant and anti-inflammatory activities of Oenanthe crocata L. essential oil,"* Food and Chemical Toxicology, vol. 62, pp. 349–354, 2013.

[70] Salud Pérez G., Miguel Zavala S., Lucina Arias G. and Miguel Ramos L. *"Anti-inflammatory Activity of Some Essential Oils."* 38/Journal of Essential Oil Research Vol. 23, September/October 2011.

[71] Henriques AT, Melo AA, Moreno PRH, Ene LL, Henriques JAP, Schapoval EES 1996. *"Ervatamia coronaria: chemical constituents and some pharmacological activities."* J Ethnopharmacol 50: 19-25.

[72] De Miranda AL, Silva JR, Rezende CM, Neves JS, Parrini SC, Pinheiro MLB, Cordeiro MC, Tamgborini E, Pinto AC 2000. *"Anti-inflammatory and analgesic activities of the latex containing triterpenes from Himatanthus sucuuba."* Planta Med 66: 284-286.

[73] Rates SMK, Schapoval EES, Souza IA, Henriques AT 1993. *"Chemical constituents and pharmacological activities of Peschiera australis."* Int J Pharmacogn 31: 288-294.

[74] Calixto JB, Nicolau M, Trebien H, Henrique MGO, Weg VB, Cordeiro RSB, Yunes RA 1986. *"Antiedematogenic actions of a hydroalcoholic crude water-alcohol extract of Mandevilla velutina."* Braz J Med Biol Res 19: 4-5.

[75] Henriques MGMO, Fernandes PD, Weg VB, Yunes RA, Cordeiro RSB, Calixto JB 1991. *"Inhibition of rat paw or edema and pleurisy by the extract from Mandevilla velutina."* Agents Actions 33: 272-278.

[76] Calixto JB, Zanini JC, Cruz AB, Yunes RA, Medeiros YS 1991. *"Extract and compounds obtained from Mandevilla velutina inhibit arachidonic acid-induced ear or edema in mice, but not rat stomach contraction."* Prostaglandins 41: 515-526.

[77] Silva RR, Oliveira e Silva D, Fontes HR, Alviano CS, Fernandes PD, Alviano DS. *"Anti-inflammatory, antioxidant, and antimicrobial activities of Cocos nucifera var. typical."* BMC Complement Altern Med. 2013 May 16;13:107. doi: 10.1186/1472-6882-13-107. PMID: 23680079; PMCID: PMC3680169.

[78] M. Z. El-Readi, H. H. Eid, M. L. Ashour et al., *"Variations of the chemical composition and bioactivity of essential oils from leaves and stems of Liquidambar styraciflua (Altingiaceae),"* Journal of Pharmacy and Pharmacology, vol. 65, no. 11, pp. 1653–1663, 2013.

[79] Simões CMO 1988. *"Anti-inflammatory action of Achyrocline satureioides extracts applied topically."* Fitoterapia 59: 419-421.

[80] Simões CMO, Schenkel EP, Bauer L, Langeloh A 1988. *"Pharmacological investigations on Achyrocline satureioides (Lam). DC, Compositae."* J Ethnopharmacol 22: 281-293.

[81] Magalhães JFG, Viana CFG, Aragão Junior AGM, Moraes VG, Ribeiro RA, Vale MR 1997. *"Analgesic and antiinflammatory activities of Ageratum conyzoides in rats."* Phytother Res 11: 183-188.

[82] Viana CFG, Aragão Jr AGM, Ribeiro RA, Magalhães JFG, Vale MR 1998. *"Effects of Ageratum conyzoides innociception and inflammatory response induced by zymosan."* Fitoterapia 69: 349-354.

[83] G. Del-Vechio-Vieira, S.O. Vieira, M.M. Abreu, L. Senna-Valle, K.M.A. Coelho, *"Analgesic and anti-inflammatory properties of essential oil from Ageratum fastigiatum."* Braz. Arch. Biol. Technol., 52(5), 1115-1121 (2009)

[84] Pereira RLC, Ibrahim T, Lucchetti L, Da Silva AJR, De Moraes VLG 1999. *"Immunosuppressive and antiinflammatory effects of methanolic extract and the polyacetylene isolated from Bidens pilosa L."* Immunopharmacology 43: 31-37.

[85] Abu-Darwish MS, Cabral C, Gonçalves MJ, Cavaleiro C, Cruz MT, Zulfiqar A, Khan IA, Efferth T, Salgueiro L. *"Chemical composition and biological activities of Artemisia judaica essential oil from southern desert of Jordan."* J Ethnopharmacol. 2016 Sep 15;191:161-168. doi: 10.1016/j.jep.2016.06.023. Epub 2016 Jun 16. PMID: 27318275.

[86] L.-L. Chen, H.-J. Zhang, J. Chao, and J.-F. Liu, *"Essential oil of Artemisia argyi suppresses inflammatory responses by inhibiting JAK/STATs activation,"* Journal of Ethnopharmacology, vol. 204, pp. 107–117, 2017.

[87] Brandenburg MM, Rocha FG, Pawloski PL, Soley BDS, Rockenbach A, Scharf DR, Heiden G, Ascari J, Cabrini DA, Otuki MF. *"Baccharis dracunculifolia (Asteraceae) essential oil displays anti-inflammatory activity in models of skin inflammation."* J Ethnopharmacol. 2020 Sep 15;259:112840. doi: 10.1016/j.jep.2020.112840. Epub 2020 Apr 5. PMID: 32268204.

[88] Ascari J, de Oliveira MS, Nunes DS, Granato D, Scharf DR, Simionatto E, Otuki M, Soley B, Heiden G. *"Chemical composition, antioxidant and anti-inflammatory activities of the essential oils from male and female specimens of Baccharis punctulata (Asteraceae)."* J Ethnopharmacol. 2019 Apr 24;234:1-7. doi: 10.1016/j.jep.2019.01.005. Epub 2019 Jan 17. PMID: 30660710.

[89] S. Gu, L. Li, H. Huang, B. Wang, and T. Zhang, *"Antitumor, antiviral, and anti-inflammatory efficacy of essential oils from atractylodes macrocephala koidz. Produced with different processing methods,"* Molecules, vol. 2416 pages, 2019.

[90] Lu Wang, Jiamei Liao, Xueyan Xie, Wanlin Wang, Yue Gao, Yaling Cai, Junchao Peng, Tianzhen Li, Qiong Yi, Changliang He. *"Anti-inflammatory Activity of Essential Oil from Leaves of Blumea balsamifera (L.) DC through Inhibiting TLR4/NF-kB Signaling Pathways and NLRP3 Inflammasome Activation in LPS-induced RAW264.7 Macrophage Cells."* Pages 160-176 | Received 15 Jun 2020, Accepted 01 Apr 2021.

[91] Sartori LR, Ferreira MS, Perazzo FF, Mandalho Lima L, Carvalho JCT 2003. *"Atividade antiinflamatória do granulado de Calendula officinalise Matricaria recutita L."* Rev Bras Farmacogn 13(Supl 1): 17-19.

[92] Souza MC, Siani AC, Ramos MFS, Menezes de Lima O, Henriques MGMO 2003. *"Evaluation of antiinfl ammatory activity of essential oils from two Asteraceae species."* Pharmazie 58: 582-586

[93] Ruppelt BM, Pereira EFR, Gonçalves LC, Pereira NA 1991. *"Pharmacological screening of plants recommended by folk medicine as anti-snake venom-1. Analgesic and anti-inflammatory activities."* Mem I Oswaldo Cruz 86: 203-205.

[94] Poli A, Nicolau M, Simões CMO, Nicolau RMRDV, Zanin M 1992. *"Preliminary pharmacologic evaluation of crude whole plant extracts of Elephantopus scaber. Part 1: in vivo studies."* J Ethnopharmacol 37: 71- 76

[95] Moreira AS, Spitzer V, Schapoval EES, Schnekel EP 2000. *"Antiinflammatory activity of extracts and fractions from the leaves of Gochnatia polymorpha."* Phytother Res 14: 638-640

[96] Juan Luis Santiago, Tzu-Kai Lin, Lily Zhong, *"Anti-Inflammatory and Skin Barrier Repair Effects of Topical Application of Some Plant Oils."* Int. J. Mol. Sci. 2018, 19, 70; doi:10.3390/ijms19010070.

[97] X.-L. Huang, X.-J. Li, Q.-F. Qin, Y.-S. Li, W. K. Zhang, and H.-B. Tang, *"Anti-inflammatory and antinociceptive effects of active ingredients in the essential oils from Gynura procumbens, a traditional medicine and a new and popular food material,"* Journal of Ethnopharmacology, vol. 239, p. 111916, 2019.

[98] De Moura RS, Costa SS, Jansen J, Silva CA, Lopes CS, Bernardo-Filho M, Da Silva VN, Criddle DN, Portela N, Rubenich LMS, Araujo RG, Carvalho LCRM 2002. *"Bronchodilator activity of Mikania glomerata Sprengel on human bronchi and guinea pig trachea."* J Pharm Pharmacol 54: 249-256

[99] Fierro IM, Da Silva ACB, Da Silva Lopes C, De Moura RS, Barja-Fidalgo C 1999. *"Studies on the anti-allergic activity of Mikania glomerata."* J Ethnopharmacol 66: 19-24.

[100] E. Skała, P. Rijo, C. Garcia et al., *"The essential oils of Rhaponticum carthamoides hairy roots and roots of soil-grown plants: chemical composition and antimicrobial, anti-inflammatory, and antioxidant activities,"* Oxidative Medicine and Cellular Longevity, vol. 2016, Article ID 8505384, 10 pages, 2016.

[101] Menezes AMS, Almeida FRC, Rao VSN, Matos MEO 1990. *"Anti-inflammatory activity of the essential oil of Vanillosmopsis arborea."* Fitoterapia 61: 252-254

[102] de Veras BO, de Oliveira JRS, de Menezes Lima VL, do Amaral Ferraz Navarro DM, de Oliveira Farias de Aguiar JCR, de Medeiros Moura GM, da Silva JW, de Assis CRD, Gorlach-Lira K, de Assis PAC, de Souza Barbosa JI, de Melo MRCS, de Oliveira MBM, da Silva MV, de Souza Lopes AC. *"The essential oil of the leaves of Verbesina macrophylla (Cass.) S.F. Blake has antimicrobial, anti-inflammatory and antipyretic activities and is toxicologically safe."* J Ethnopharmacol. 2021 Jan 30;265:113248. doi: 10.1016/j.jep.2020.113248. Epub 2020 Aug 14. PMID: 32805356.

[103] Oga S, Sekino T 1969. *"Toxicity and anti-inflammatory activity of Tabebuia avellanedae extracts."* Rev Fac Farm Bioquim Univ Sao Paulo 7: 47-53.

[104] Sertie JAA, Basile AC, Panizza S, Oshiro TT, Azzolini CP, Penna SC 1991. *"Pharmacological assay of Cordia verbenaceae III. Oral and topical anti-inflammatory activity and gastro toxicity of crude leaf extract."* J Ethnopharmacol 31: 239-247.

[105] Basile AC, Sertie JAA, Oshiro T, Caly KDV, Panizza S 1989. *"Topical anti-inflammatory activity and toxicity of Cordia verbenacea."* Fitoterapia 60: 260-263

[106] Sertie JAA, Basile AC, Panizza S, Matida AK, Zelnik R 1988. *"Pharmacological assay of Cordia verbenacea: part I. anti-inflammatory activity and toxicity of the crude extract of the leaves."* Planta Med 54: 7-10.

[107] Goldman RS, Freitas PCD, Oga S 1985. *"Wound healing and analgesic effect of crude extracts of Symphytum offi cinale rats."* Fitoterapia 56: 323-329.

[108] D.P.M. Jazet, P.M.B. Fekam, M.L. Sameza, D.B. Ndongson, N.L. Kwazou, *"Investigations of the essential oils of some Afromomum species (Zingiberaceae) from Cameroon as potential antioxidant and anti-inflammatory agents."* Int. J. Esset. Oil Ther., 2(4),149-155 (2008).

[109] MZ Siddiqui. "Boswellia Serrata, *"A Potential Antiinflammatory agent: An Overview."* India J Pharm Sci., 2011, 73(3): 255-161.

[110] O.D. Moronkola, I.A. Oladosu, A. Adeleke, M.S. Ali, *"Chemical composition and anti-inflammatory activity of the essential oil of the aerial part of Mezoneuron benthamianum Baill. (Caesalpinoideae)."* European J. Appl. Sci. 1(3): 30-33 (2009).

[111] Claro-Cala CM, Grao-Cruces E, Toscano R, Millan-Linares MC, Montserrat-de la Paz S, Martin ME. *"Acyclic Diterpene Phytol from Hemp Seed Oil (Cannabis sativa L.) Exerts Anti-Inflammatory Activity on Primary Human Monocytes-Macrophages."* Foods. 2022 Aug 7;11(15):2366. doi: 10.3390/foods11152366. PMID: 35954130; PMCID: PMC9367727.

[112] J. Lin, Q. Y. Cai, W. Xu, J. M. Lin, and J. Peng, *"Chemical composition, anticancer, anti-neuroinflammatory, and antioxidant activities of the essential oil of Patrinia scabiosaefolia,"* Chinese Journal of Integrative Medicine, vol. 24, no. 3, pp. 207–212, 2018.

[113] Kimura E, Albiero ALM, Cuman RKN, Caparroz-Assef SM, Oga S, Bersani-Amado CA 2000. *"Effect of Maytenus aquifolium extract on the pharmacokinetic and antiinflammatory effectiveness of piroxicam in rats."* Phytomedicine 7: 117-121.

[114] Ibrahim T, Pereira RLC, Almeida AP, Madi K, Fonseca LBM, Costa SS, Gonçalves Moraes VL 2000. *"Antiinflammatory effect of Kalanchoe brasiliensis on zymosan-induced arthritis in mice."* Phytomedicine Suppl 7: 110.

[115] Ibrahim T, Cunha JMT, Madi K, Da Fonseca LMB, Costa SS, Koatz VLG 2002. *"Immunomodulatory and antiinflammatory effects of Kalachoe brasiliensis."* Int Immunopharmacol 2: 875-883.

[116] Mourão RHV, Santos FO, Franzotti EM, Moreno MPN, Antoniolli AR 1999. *"Anti-inflammatory activity and acute toxicity (LD50) of the juice of Kalanchoe brasiliensis (Comb.) leaves picked before and during blooming."* Phytother Res 13: 352-354.

[117] R. A. Destryana, D. G. Young, C. L. Woolley, T.-C. Huang, H.-Y. Wu, and W.-L. Shih, *"Antioxidant and anti-inflammation activities of Ocotea, Copaiba and Blue Cypress essential oils in vitro and in vivo,"* Journal of the American Oil Chemists' Society, vol. 91, no. 9, pp. 1531–1542, 2014.

[118] Y. Park, S. A. Yoo, W. U. Kim, C. S. Cho, J. M. Woo, and C. H. Yoon, *"Anti-inflammatory effects of essential oils extracted from Chamaecyparis obtusa on murine models of inflammation and RAW 264.7 cells,"* Molecular Medicine Reports, vol. 13, no. 4, pp. 3335–3341, 2016.

[119] A.A. Sherifat, A.I. Oladosu and A.O. Isiaka, *"Topical anti-inflammatory activity and chemical composition of essential oil of Sabina virginiana L. Antoine (Cupressaceae)."* Arch. Appl. Sci. Res., 2(2), 1-6 (2010)

[120] Han X, Parker TL. *"Arborvitae (Thuja plicata) essential oil significantly inhibited critical inflammation and tissue remodeling related proteins and genes in human dermal*

fibroblasts." Biochim Open. 2017 Feb 20;4:56-60. doi: 10.1016/j.biopen.2017.02.003. PMID: 29450142; PMCID: PMC5801906.

[121] Neves A, Rosa S, Gonçalves J, Rufino A, Judas F, Salgueiro L, Lopes MC, Cavaleiro C, Mendes AF. *"Screening of five essential oils for identification of potential inhibitors of IL-1-induced Nf-kappaB activation and NO production in human chondrocytes: characterization of the inhibitory activity of alpha-pinene."* Planta Med. 2010 Feb;76(3):303-8. doi: 10.1055/s-0029-1186085. Epub 2009 Sep 11. PMID: 19774507.

[122] Rios JL, Giner RM, Jimenez MJ, Wickman G, Hancke JL 1990. *"A study on the anti-inflammatory activity of Cayaponia tayuya root."* Fitoterapia 61: 275-278.

[123] Peters RR, Saleh TF, Lora M, Patry C, De Brum-Fernandes CAJ, Farisa MR, Ribeiro-do-Valle RM 1999. *"Anti-inflammatory effects of the products from Wilbrandia ebracteata on carrageenan-induced pleurisy in mice."* Life Sci 64: 2429-2437.

[124] Almeida FRC, Rao VSN, Matos MEO 1992. *"Anti-inflammatory, antitumour and antifertility effects in rodents of two nor-cucurbitacin glucosides from Wilbrandia species."* Phytother Res 6: 189-193.

[125] S. Biradar, V.A. Kangralkar, Y. Mandavkar, M. Thakur, N. Chougule. *"Anti-inflammatory, anti-arthritic, analgesic, and anticolvulsant activity of Cyperius essential oils."* Inter. J. Pharm. Pharm. Sci. 2(4), 112-115 (2010).

[126] Siani AC, Silva AMP, Nakamura MJ, De Carvalho MV, Henriques MGMO, Ramos MFS, Kaiser CR 2001. *"Chemical composition and anti-inflammatory activity of the hydrodistillation from Mariscus pedunculatus."* J Braz Chem Soc 12: 354-359.

[127] Rabelo AS, Serafini MR, Rabelo TK, de Melo MG, da Silva Prado D, Gelain DP, Moreira JC, dos Lima Nogueira PC, de Souza Moraes VR, do Nascimento Prata AP, Quintans LJ Jr, Araújo AA. *"Chemical composition, antinociceptive, anti-inflammatory and redox properties in vitro of the essential oil from Remirea maritime Aubl.(Cyperaceae)."* BMC Complement Altern Med. 2014 Dec 23;14:514.

[128] Alexandre-Moreira MS, Piuvezam MR, Araujo CC, Thomas G 1999. *"Studies on the anti-inflammatory and analgesic activity of Curatella americana L."* J Ethnopharmacol 67: 171-177.

[129] Liao CR, Chang YS, Peng WH, Lai SC, Ho YL. *"Analgesic and anti-inflammatory activities of the methanol extract of Elaeagnus oldhamii Maxim. in mice."* Am J Chin Med. 2012;40(3):581-97. doi: 10.1142/S0192415X12500449. PMID: 22745072.

[130] Farahbakhsh SH, Arbabian S, Emami F, Moghadam BR, Ghoshooni H, Noroozzadeh A. et al. *"Inhibition of cyclooxygenase type 1 and 2 enzyme by aqueous extract of Elaeagnus angustifolia in mice."* Basic Clin Neurosci. 2011; 2(2): 31-7

[131] Chaves CG, Schapoval EES, Zuanazzi JA, Diehl E, Se Siqueira NCS, Henriques AT 1988. *"Erythroxylum argentinum: assays for anti-inflammatory activity."* J Ethnopharmacol 22: 117-120.

[132] Bighetti EJB, Hiruma-Lima CA, Gracioso JS, Brito ARMS 1999. *"Anti-inflamamtory and antinociceptive effects in rodents of the essential oil of Croton cajucara Benth."* J Pharm Pharmacol 51: 1447-1453.

[133] Nardi GM, Felippi R, Dalbo S, Siqueira-Junior JM, Arruda DC, Monache FD, Timbola AK, Pizzolatti MG, Ckless K, Ribeiro-do-Valle RM 2003. *"Anti-inflammatory and antioxidant effects of Croton celtidifolius bark."* Phytomedicine 10: 176-184.

[134] Cordeiro KW, Felipe JL, Malange KF, do Prado PR, de Oliveira Figueiredo P, Garcez FR, de Cassia Freitas K, Garcez WS, Toffoli- Kadri MC. "Anti-inflammatory and antinociceptive activities of Croton urucurana Baillon bark." J Ethnopharmacol. 2016; 128-135.

[135] Trebien HA, Neves PCA, Yunes RA, Calixto JB 1988. *"Evaluation of pharmacological activity of a crude hydroalcoholic extract from Jatropha elliptica."* Phytother Res 2: 115-118.

[136] Gorski F, Correa CR, Filho VC, Yunes RA, Calixto JB 1993. *"Potent antinociceptive activity of a hydroalcoholic extract of Phyllanthus corcovadensis."* J Pharm Pharmacol 45: 1046-1049.

[137] Filho VC, Santos ARS, De Campos ROP, Migueo OG, Yunes RA, Ferrari F, Messna I, Calixto JB 1996. *"Chemical and pharmacological studies of Phyllanthus caroliniensis in mice."* J Pharm Pharmacol 48: 1231-1236.

[138] Isiaka A. Ogunwande , Opeyemi N. Avoseh , Daniel O. Igile , Oladipupo A. Lawal , Roberta Ascrizzi, and Flamini Guido. *"Chemical Constituents, Anti-nociceptive and Anti-inflammatory Activities of Essential Oil of Phyllanthus muellerianus."* Natural Product Communications May 2019: 1–7.

[139] Ilavarasan R, Mallika M, Venkataraman S. *"Antiinflammatory and free radical scavenging activity of Ricinus communis root extract."* Journal of Ethnopharmacology 2006; 3: 478-80.

[140] Carvalho JCT, Santos LS, Viana EP, De Almeide SSMS, Marconato E, Rodrigues M, Ferreira LR, Van De Kamp A 1999. *"Anti-inflammatory and analgesic activities of the crude extracts from stem bark on Bauhinia guianensis."* Pharm Biol 37: 281-284.

[141] Coelho MGP, Marques PR, Gayer CR, Vaz LCA, Neto JFNN, Carvalho Sabino KC 2001. *"Subacute toxicity evaluation of a hydroalcoholic extract of Pterodon pubescens seeds in mice with collagen-induced arthritis."* J Ethnopharmacol 77: 159-164.

[142] Sarti SJ, Santos Filho D, Souza GEP, Ferreira SH, Leitão Filho HF, Abreu JE, Silva CAA 1986. *"Atividade antiinfl amatória de produtos naturais de origem vegetal."* Rev Bras Farmacogn 1(Supl 1): 39-40.

[143] Sreejith G, Latha PG, Shine VJ, et al. *"Anti-allergic, antiinflammatory and anti-lipidperoxidant effects of Cassia occidentalis Linn."* Indian J Exp Biol 2010 May; 48(5):494-498.

[144] Basile AC, Sertié JA, Freitas PC, Zanini AC. Anti-inflammatory activity of oleoresin from Brazilian Copaifera. J Ethnopharmacol. 1988 Jan;22(1):101-9. doi: 10.1016/0378-

8741(88)90235-8. PMID: 3352280.Lima JCS, Martins DTO, De Souza Jr PT 1998. *"Experimental evaluations of stem bark of Stryphnodendron adstringens (Mart.) Coville for anti-inflammatory activity."* Phytother Res 12: 218-220.

[145] Leal LKAM, Matos ME, Matos FJA, Ribeiro RA, Ferreira FV, Viana GSB 1997. *"Antinociceptive and antiedematogenic effects of the hydroalcoholic extract and coumarin from Torresea cearensis"* Fr. All. Phytomedicine 4: 221-227.

[146] M. L. Tsai, C. C. Lin, W. C. Lin, and C. H. Yang, *"Antimicrobial, antioxidant and anti-inflammatory activities of essential oils from five selected herbs,"* Bioscience, Biotechnology, and Biochemistry, vol. 75, no. 10, pp. 1977–1983, 2011.

[147] A. Elmann, S. Mordechay, M. Rindner, U. Ravid, *"Anti-neuroinflammatory effects of geranium oil in microglial cells."* J. Functional Foods, 2(1), 17-22 (2010).

[148] J.Y. Kim, S.S. Kim, T.H. Oh, J.S. Baik, G. Song, N.H. Lee, C.G. Hyun, *"Chemical composition, antioxidant, anti-elastase, and antiinflammatory activities of Illicium anisatum (Illiciaceae) essential oil."* Acta Pharm. 59, 289-300 (2009).

[149] A Ocana-Fuentes, E. Arranz-Gutierrez, E. Senorans, *"Supercritical fluid extraction of oregano (Origanum vulgare) essential oils: Antiinflammatory properties based on cytokine response on THP-1 macrophages."* Food Chem. Toxicol. 48, 1568-1575 (2010).

[150] Bispo MD, Mourão RHV, Franzotti EM, Bomfi m KBR, Arrigoni Blank MDF, Moreno MPN, Marchioro M, Antoniolli AR 2001. *"Antinociceptive and antiedematogenic effects of the aqueous extract of Hyptis pectinata leaves in experimental animals."* J Ethnopharmacol 76: 81-86.

[151] M.R. Loizzo, F. Menichini, F. Confort, R. Tundis, M. Bonesi, A.M. Saab, G.A. Statti, B. Cindio, P.J. Houghton, F. Menichini, N.G. Frega, *"Chemical analysis, antioxidant, anti-inflammatory and anticholinesterase activities of Origanum ehrenbergii Boiss and O. syriacum L. essential oils*." Food Chem., 117, 174-180 (2009).

[152] Menezes FS, Cardoso GLC, Pereira NA, Borsatto AS, Kaplan MAC 1998. *"Phytochemical and pharmacological studies on Raphiodon echinus."* Fitoterapia 69: 459-460.

[153] Baricevic D, Sosa S, Della Loggia R, Tubaro A, Simonovska B, Krasna A, Zupancic A. *"Topical anti-inflammatory activity of Salvia officinalis L. leaves: the relevance of ursolic acid."* J Ethnopharmacol. 2001 May;75(2-3):125-32. doi: 10.1016/s0378-8741(00)00396-2. PMID: 11297842.

[154] Barreto RSS, Quintans JSS, Amarante RKL, Nascimento TS, Amarante RS, Barreto AS, Pereira EWM, Duarte MC, Coutinho HDM, Menezes IRA, Zengin G, Aktumsek A, Quintans-Júnior LJ. *"Evidence for the involvement of TNF-α and IL-1β in the antinociceptive and anti-inflammatory activity of Stachys lavandulifolia Vahl. (Lamiaceae) essential oil and (-)-α-bisabolol, its main compound, in mice."* J Ethnopharmacol. 2016 Sep 15;191:9-18. doi: 10.1016/j.jep.2016.06.022. Epub 2016 Jun 9. PMID: 27292196.

[155] Roxo M, Zuzarte M, Gonçalves MJ, Alves-Silva JM, Cavaleiro C, Cruz MT, Salgueiro L. "*Antifungal and anti-inflammatory potential of the endangered aromatic plant Thymus*

albicans." Sci Rep. 2020 Nov 2;10(1):18859. doi: 10.1038/s41598-020-75244-w. PMID: 33139758; PMCID: PMC7608662.

[156] Zuzarte M, Francisco V, Neves B, Liberal J, Cavaleiro C, Canhoto J, Salgueiro L, Cruz MT. *"Lavandula viridis L´Hér. Essential Oil Inhibits the Inflammatory Response in Macrophages Through Blockade of NF-KB Signaling Cascade."* Front Pharmacol. 2022 Jan 25;12:695911. doi: 10.3389/fphar.2021.695911. PMID: 35145398; PMCID: PMC8821966.

[157] Silva GL, Luft C, Lunardelli A, Amaral RH, Melo DA, Donadio MV, Nunes FB, de Azambuja MS, Santana JC, Moraes CM, Mello RO, Cassel E, Pereira MA, de Oliveira JR. *"Antioxidant, analgesic and anti-inflammatory effects of lavender essential oil."* An Acad Bras Cienc. 2015 Aug;87(2 Suppl):1397-408. doi: 10.1590/0001-3765201520150056. Epub 2015 Aug 4. PMID: 26247152.

[158] Zuzarte M, Francisco V, Neves B, Liberal J, Cavaleiro C, Canhoto J, Salgueiro L, Cruz MT. *"Lavandula viridis L´Hér. Essential Oil Inhibits the Inflammatory Response in Macrophages Through Blockade of NF-KB Signaling Cascade."* Front Pharmacol. 2022 Jan 25;12:695911. doi: 10.3389/fphar.2021.695911. PMID: 35145398; PMCID: PMC8821966.

[159] R.E Lopes, T.D. Oliveira, L.J.H. Guilardi, P. Romoff, K.T. Berti, M.T. Reis-Silva, M.M. Bernardi, *"Anti-nociceptive and anti-inflammatory actions of Nepeta cataria L. var. citriodora (Becker) Balb. essential oil in mice."* J. Health Sci. Inst. 28(3), 289-293 (2010).

[160] Borges RS, Keita H, Ortiz BLS, Dos Santos Sampaio TI, Ferreira IM, Lima ES, de Jesus Amazonas da Silva M, Fernandes CP, de Faria Mota Oliveira AEM, da Conceição EC, Rodrigues ABL, Filho ACMP, Castro AN, Carvalho JCT. *"Anti-inflammatory activity of nanoemulsions of essential oil from Rosmarinus officinalis L.: in vitro and in zebrafish studies."* Inflammopharmacology. 2018 Aug;26(4):1057-1080. doi: 10.1007/s10787-017-0438-9. Epub 2018 Feb 5. PMID: 29404883.

[161] N. G. Allam, E. A. E. A. Eldrieny, and A. Z. Mohamed, *"Effect of combination therapy between thyme oil and ciprofloxacin on ulcer-forming Shigella flexneri,"* The Journal of Infection in Developing Countries, vol. 9, no. 05, pp. 486–495, 2015.

[162] Sun L, Zong SB, Li JC, Lv YZ, Liu LN, Wang ZZ, Zhou J, Cao L, Kou JP, Xiao W. *"The essential oil from the twigs of Cinnamomum cassia Presl alleviates pain and inflammation in mice".* J Ethnopharmacol. 2016 Dec 24;194:904-912. doi: 10.1016/j.jep.2016.10.064. Epub 2016 Oct 22. PMID: 27780753.

[163] C.T. Lin, C.J. Chen, T.Y. Lin, J.C. Tung, S.Y. Wang, *"Anti-inflammation activity of fruit essential oil from Cinnamomum insularimontanum Hayata."* Bioresource. Technol., 99(18), 8783-8787 (2008).

[164] Chao LK, Hua KF, Hsu HY, Cheng SS, Liu JY, Chang ST. *"Study on the antiinflammatory activity of essential oil from leaves of Cinnamomum osmophloeum."* J Agric Food Chem. 2005 Sep 7;53(18):7274-8. doi: 10.1021/jf051151u. PMID: 16131142.

[165] Morato GS, Calixto JB, Cordeiro L, De Lima TCM, Morato EF, Nicolau M, Rae GA, Takahashi RN, Valle RMR, Yunes RA 1989. *"Chemical and pharmacological studies on Talauma ovata ST. Hil. (Magnoliaceae)."* J Ethnopharmacol 26: 277-286.

[166] Franzotti EM, Santos CVF, Rodrigues HMSL, Mourão RHV, Andrade MR, Antoniolli AR 2000. *"Antiinflammatory, analgesic activity and acute toxicity of Sida cordifolia L. (malva-branca)."* J Ethnopharmacol 72: 273-278.

[167] C. Y. Shen, T. T. Zhang, W. L. Zhang, and J. G. Jiang, "Antiinflammatory activities of essential oil isolated from the calyx of Hibiscus sabdariffa L," Food & Function, vol. 7, no. 10, pp. 4451–4459, 2016.

[168] Oga S, Sertie JA, Brasile AC, Hanada S 1981. *"Anti-infl ammatory effect of crude extract from Guarea guidonia."* Planta Med 42: 310-312.

[169] Ilango K, Maharajan G, Narasimhan S. *"Anti-nociceptive and anti-inflammatory activities of Azadirachta indica fruit skin extract and its isolated constituent azadiradione."* Natural Product Research 2012; 27: 1463-7.

[170] Batista Lima KV, Ribeiro R, Balestieri FMP, Thomas G, Piuvezam MR 2001. *"Anti-inflammatory activity of Cissampleos sympodialis Eichl. (Menispermaceae) leaf extract."* Acta Farm Bonaerense 20: 275-279.

[171] M. Apel, M.E.L Lima, M. Sobral, M.C.C. Young, I. Cordeiro, E.E.S. Schapoval, A.T. Henriques, P.R.H. Moreno, *"Anti-inflammatory activity of essential oil from leaves of Myciaria tenella and Calycorectes sellowianus."* Pharm.Biol., 48(4), 433-438 (2010).

[172] Gbenou JD, Ahounou JF, Akakpo HB, Laleye A, Yayi E, Gbaguidi F, Baba-Moussa L, Darboux R, Dansou P, Moudachirou M, Kotchoni SO. *"Phytochemical composition of Cymbopogon citratus and Eucalyptus citriodora essential oils and their anti-inflammatory and analgesic properties on Wistar rats."* Mol Biol Rep. 2013 Feb;40(2):1127-34. doi: 10.1007/s11033-012-2155-1. Epub 2012 Oct 14. PMID: 23065287.

[173] Schapoval EES, Silveira SM, Miranda ML, Alice CB, Henriques AT 1994. *"Evaluation of some pharmacological activities of Eugenia uniflora L."* J Ethnopharmacol 44: 137-142.

[174] Santos, F.A.; Silva, R.M.; Campos, A.R.; Araújo, R.P.; Júnior, R.C.P.L.; Rao, V.S.N. *"1,8-cineole (eucalyptol), a monoterpene oxide attenuates the colonic damage in rats on acute TNBS-colitis."* Food Chem. Toxicol. 2004, 42, 579–584.

[175] Caldefie- Chézet F, Fusillier C, Jarde T, Laroye H, Damez M, Vasson MP, Guillot J. *"Potential Anti-inflammatory effects of Mellaleuca alternifolia essential oil on human peripheral blood leukocytes."* Phytother Res. 2006, 20(5):364-70.

[176] Santos FA, Rao VSN, Silveira ER 1997. *"Anti-inflammatory and analgesic activities of the essential oil of Psidium guianense."* Fitoterapia 68: 65-68.

[177] Haro-González JN, Castillo-Herrera GA, Martínez-Velázquez M, Espinosa-Andrews H. *"Clove Essential Oil (Syzygium aromaticum L. Myrtaceae): Extraction, Chemical Composition, Food Applications, and Essential Bioactivity for Human Health."* Molecules. 2021 Oct 22;26(21):6387. doi: 10.3390/molecules26216387. PMID: 34770801; PMCID: PMC8588428.

[178] Hammer KA, Carson CF, Dunstan JA, Hale J, Lehmann H, Robinson CJ, Prescott SL, Riley TV. *"Antimicrobial and anti-inflammatory activity of five Taxandria fragrans oils in vitro."* Microbiol Immunol. 2008, 52(11): 522-30.

[179] Felipe do Nascimento K, Leite Kassuya CA, Pereira Cabral MR, Carvalho Souza RI, Marangoni JA, Mussury Franco Silva RM, Alves da Costa Canella D, Nazari Formagio AS. *"Chemical analysis and antioxidant, anti-inflammatory and toxicological evaluations of the hydromethanolic extract of Psidium guineense Swartz leaves."* J Ethnopharmacol. 2021 Dec 5;281:114492. doi: 10.1016/j.jep.2021.114492. Epub 2021 Aug 8. PMID: 34380066.

[180] Quintão NL, da Silva GF, Antonialli CS, Rocha LW, Cechinel Filho V, Cicció JF. *"Chemical composition and evaluation of the anti-hypernociceptive effect of the essential oil extracted from the leaves of Ugni myricoides on inflammatory and neuropathic models of pain in mice."* Planta Med. 2010 Sep;76(13):1411-8. doi: 10.1055/s-0029-1240891. Epub 2010 Feb 15. PMID: 20157878.

[181] Costa, W.K., do Nascimento, M.F., dos Santos, C.R.B. *et al. "Oral administration of essential oil from Psidium glaziovianum Kiaersk leaves alleviates pain and inflammation in mice." Inflammopharmacol* **30**, 599–607 (2022). https://doi.org/10.1007/s10787-022-00940-0

[182] Dirsch V, Wiemann W, Wagner H 1992. *"Anti-inflammatory activity of triterpene quinone-methides and proanthocyanidins from the stem bark of Heisteria pallida Engl."* Pharm Pharmacol Lett 2: 184-186.

[183] E. Haloui, Z. Marzouk, B. Marzouk, I. Bouftira, A. Bouraoui, N. Fenina, *"Pharmacological activities and chemical composition of Olea europea L. leaf essential oil from Tunisia."* J. Food Agri. Env., 8(2), 204-208 (2010).

[184] Lopes Martins RAB, Pegoraro DH, Woisky R, Penna SC, Sertie JAA 2002. *"The anti-inflammatory and analgesic effects of a crude extract of Petiveria alliacea L. (Phytolaccaceae)."* Phytomedicine 9: 245-248.

[185] D'Angelo LCA, Zavier HS, Torres LMB, Lapa AJ, Souccar C 1997. *"Pharmacology of Piper marginatum Jacq. a folk medicinal plant used as an analgesic, antiinflammatory and hemostatic."* Phytomedicine 4: 33-40.

[186] K. Jeena, V. B. Liju, N. P. Umadevi, and R. Kuttan, *"Antioxidant, anti-inflammatory and antinociceptive properties of black pepper essential oil (Piper nigrum Linn),"* Journal of Essential Oil Bearing Plants, vol. 17, no. 1, pp. 1–12, 2014.

[187] Leitão MM, Radai JAS, Ferrari IC, Negrão FJ, Silva-Filho SE, Oliveira RJ, Mota JDS, Kassuya CAL. *"Effects of an ethanolic extract and fractions from Piper glabratum (Piperaceae) leaves on pain and inflammation."* Regul Toxicol Pharmacol. 2020 Nov;117:104762. doi: 10.1016/j.yrtph.2020.104762. Epub 2020 Aug 14. PMID: 32805323.

[188] Hoff Brait DR, Mattos Vaz MS, da Silva Arrigo J, Borges de Carvalho LN, Souza de Araújo FH, Vani JM, da Silva Mota J, Cardoso CA, Oliveira RJ, Negrão FJ, Kassuya CA, Arena AC. *"Toxicological analysis and anti-inflammatory effects of essential oil from*

Piper vicosanum leaves." Regul Toxicol Pharmacol. 2015 Dec;73(3):699-705. doi: 10.1016/j.yrtph.2015.10.028. Epub 2015 Nov 7. PMID: 26545326.

[189] Lima DK, Ballico LJ, Rocha Lapa F, Gonçalves HP, de Souza LM, Iacomini M, Werner MF, Baggio CH, Pereira IT, da Silva LM, Facundo VA, Santos AR. *"Evaluation of the antinociceptive, anti-inflammatory and gastric antiulcer activities of the essential oil from Piper aleyreanum C.DC in rodents."* J Ethnopharmacol. 2012 Jun 26;142(1):274-82. doi: 10.1016/j.jep.2012.05.016. Epub 2012 May 12. PMID: 22588049.

[190] Germano DHP, Caldeira TTO, Mazella AAG, Sertie JAA, Bacchi EM 1993. *"Topical anti-inflammatory activity and toxicity of Petiveria alliaceae."* Fitoterapia 64: 459-467.

[191] Germano DHP, Sertie JAA, Bacchi EM 1995. *"Pharmacological assay of Petiveria alliacea L.: oral anti-infl ammatory activity and gastrotoxicity of a hydroalcoholic root extract."* Fitoterapia 66: 195-202.

[192] Palmeiro NMS, Almeida CE, Ghedini PC, Goulart LS, Baldisserotto B 2002. *"Analgesic and antiinflammatory properties of Plantago australis hydroalcoholic extract."* Acta Farm Bonaerense 21: 89-92.

[193] Guillen MEN, Emim JAS, Souccar C, Lapa AJ. (1997). "Analgesic and anti-inflammatory activities of the aqueous extract of *Plantago major L*." Int J Pharmacogn 35: 99-104.

[194] Leite BL, Bonfim RR, Antoniolli AR, Thomazzi SM, Araújo AA, Blank AF, Estevam CS, Cambui EV, Bonjardim LR, Albuquerque Júnior RL, Quintans-Júnior LJ. (2010) "Assessment of antinociceptive, anti-inflammatory and antioxidant properties of *Cymbopogon winterianus* leaf essential oil." Pharm Biol. Oct;48(10):1164-9. doi: 10.3109/13880200903280000. PMID: 20738158.

[195] Boukhatem MN, Ferhat MA, Kameli A, Saidi F, Kebir HT. (2014). "Lemon grass *(Cymbopogon citratus)* essential oil as a potent anti-inflammatory and antifungal drugs." Libyan J Med. Sep 19;9:25431. doi: 10.3402/ljm.v9.25431. PMID: 25242268; PMCID: PMC4170112.

[196] Oliveira Simões CM, Ribeiro-do-Vale RM, Poli A, Nicolau M, Zanin M. (1989). "Pharmacological investigation on *Polygonum punctatum Elliot* (Pacre HBK) extracts. Part I: Tests in vivo." J Pharm Belg 44: 275-284.

[197] E. Entok, M. C. Ustuner, C. Ozbayer et al. (2014). "Anti-inflammatuar and anti-oxidative effects of *Nigella sativa L.:* 18FDG-PET imaging of inflammation," Molecular Biology Reports, vol. 41, no. 5, pp. 2827–2834.

[198] S.M. Al-Reza, J.I. Yoon, H.J. Kim, J.S. Kim, S.C. Kang. (2010). "Antiinflammatory activity of seed essential oil from *Zizyphus jujube."* Food Chem. Toxicol., 48, 639-643.

[199] De Almeida ER, De Santana CF, De Mello JF (1991). "Antiinflammatory activity of *Coutarea hexandra.*" Fitoterapia 62: 447-448.

[200] Pinheiro MM, Miltojević AB, Radulović NS, Abdul-Wahab IR, Boylan F, Fernandes PD. (2015). "Anti-inflammatory activity of *Choisya ternata Kunth* essential oil, ternanthranin, and its two synthetic analogs (methyl and propyl N-methylanthranilates)." PLoS One. Mar

25;10(3):e0121063. doi: 10.1371/journal.pone.0121063. PMID: 25807367; PMCID: PMC4373924.

[201] P. Khodabakhsh, H. Shafaroodi, and J. Asgarpanah. (2015). "Analgesic and anti-inflammatory activities of *Citrus aurantium L*. blossoms essential oil (neroli): involvement of the nitric oxide/ cyclic-guanosine monophosphate pathway," Journal of Natural Medicines, vol. 69, no. 3, pp. 324–331.

[202] Anil Kumar Maurya, Shilpa Mohanty, Anirban Pal, Chandan Singh Chanotiya, Dnyaneshawar Umrao Bawankule. (2018). "The essential oil from *Citrus limetta Risso* peels alleviates skin inflammation: In-vitro and in-vivo study." Journal of Ethnopharmacology, vol. 212, pp. 86-94.

[203] Nitin R Patil, Vijaykumar P Rasal, Rohit Hanumantrao Malabade. (2014). "Screening of Mandarin Oil on Indomethcin Induced Inflammatory Bowel Disease in Wistar Rats," Indian Journal of Pharmaceutical Education and Research, Vol.48.

[204] E.J. Yang, S.S. Kim, J.Y. Moon, T.H. Oh, J.S. Baik, N.H. Lee, C.G. Hyun. (2010). "Inhibitory effects of *Fortunella japonica var. margarita and Citrus sunki* essential oils on nitric oxide production and skin pathogens." Acta Microbiol. Inmunol. Hung., 57(1), 15-27.

[205] N. Thi Dung, V.K. Bajpai, J. In Yoon, S. Chul Kang (2009) "Anti-inflammatory effects of essential oil isolated from the buds of *Cleistocalyx operculatus (Roxb.)* Merr and Perry." Food Chem. Toxicol, 47, 449- 453.

[206] A. K. Maurya, S. Mohanty, A. Pal, C. S. Chanotiya, and D. U. Bawankule. (2018). "Essential oil from *Citrus limetta Risso* peels alleviates skin inflammation: in-vitro and in-vivo study," Journal of Ethnopharmacology, vol. 212, pp. 86–94.

[207] Guo RH, J. U. Park, Jo SJ, Ahn JH, Prk JH, Yang JY, Lee SS, Park MJ, Kim YR. (2018.) "Anti-allergic inflammatory effects of the essential oil from fruits of *Zanthoxylum coreanum Nakai,"* Front Pharmacol, vol. 9, p. 1441.

[208] Salud Pérez G., Miguel Zavala S., Lucina Arias G. and Miguel Ramos L. (2011). "Anti-inflammatory Activity of Some Essential Oils." Journal of Essential Oil Research, Vol. 23, September/October.

[209] Trevizan LNF, Nascimento KFD, Santos JA, Kassuya CAL, Cardoso CAL, Vieira MDC, Moreira FMF, Croda J, Formagio ASN. (2016). "Anti-inflammatory, antioxidant and anti-Mycobacterium tuberculosis activity of viridiflorol: The major constituent of Allophylus edulis (A. St.-Hil., A. Juss. & Cambess.) Radlk." J Ethnopharmacol. 2016 Nov 4;192:510-515. doi: 10.1016/j.jep.2016.08.053. Epub Sep 6. PMID: 27612433.

[210] Gedson Rodrigues de Morais Lima, Camila de Albuquerque Montenegro, Cynthia Layse Ferreira de Almeida, Petronio Filgueiras de Athayde-Filhi, Jose Maria Barbosa-Filho, Leonia Maria Batista. (2011). "Database Survey of Anti-inflammatory Plants in South America: A Review." Int J Mol Sci. 2011; 12(4): 2692-2749.

[211] Jain, R., Nair, S. 2019. "Sandalwood Oil for the Chemoprevention of Skin Cancer: Mechanistic Insights, Anti-inflammatory, and In Vivo Anticancer Potential." Curr Pharmacol Rep 5, 345-358.

[212] Freire SMDF, Emim JADS, Torres LMB (1993). "Analgesic and anti-inflammatory properties of *Scoparia dulcis L.* extracts and glutinol in rodents." Phytother Res 7: 408-414.

[213] Iyer RP, Chaubal MG (1978). "Brunfelsia hopeana pharmacologic screening: isolation and characterization of hoppeanine." Diss Abstr Int B 39: 761.

[214] Iyer RP, Brown JK, Chaubal MG, Malone MH (1977). "*Brunfelsia hopeana* I.: hippocratic screening and antiinflammatory evaluation." Lloydia 40: 356-360.

[215] N. R. Patil, V. P. Rasal, and R. H. Malabade. (2014). "Screening of mandarin oil on indomethacin induced inflammatory bowel disease in wistar rats," Indian Journal of Pharmaceutical Education and Research, vol. 48, Supplementary, pp. 1–6.

[216] Costa VB, Coube CS, Marinho BG, Matheus ME, Leitão SG, Fernandes PD. (2003). "Anti-inflammatory and analgesic activity of *Bouchea fluminensis."* Fitoterapia 74: 364-371.

[217] Delaporte RH, Sanchez GM, Cuellar AC, Demello JCP. (2001). "Quality control and anti-inflammatory activity of the plant drugs *Alternanthera brasiliana (L.) Kuntze and Bouchea fluminensis (Vell.) Mold."* Acta Farm Bonaerense 20: 39-46.

[218] Schapoval EES, De Vargas MRW, Chaves CG, Bridi R, Zuanazzi JA. (1998). "Anti-inflammatory and antinociceptive activities of extracts and isolated compounds from *Stachytarpheta cayennensis."* J Ethnopharmacol 60: 53-59.

[219] M.M.V. Barros, L.A.K. Rocha de Melo, B.L. Medeiros, S. Maia de Morais, N.D.C. Sousa. (2007) "Topical anti-inflammatory, gastropotective and antioxidant effects of the essential oil of *Lippia sidoides Cham.* Leaves." J. Ethnopharmacol, 111, 378-382 (2007).

[220] Trarsk KS, Campos MM, Vaz ZR, Filho VC, Schlemper V, Yunes RA, Calixto JB (1997). *"Anti-allergic effects and edema inhibition caused by the extract of Drymis winteri."* Inflamm Res 46: 509-514

[221] L.H.J. Lago, L.A.C. Carvalho, F.S. Silva, D.O. Toyama, O.A. Fávero, P. Romoff. (2010). "Chemical composition and anti-inflammatory evaluation of essential oils from leaves and steam barks from *Drimys brasiliensis (Winteraceae)."* J. Braz. Chem. Soc., 21(9), 1760-1765 (2010).

[222] C.O. Okoli, P.Akah, S.V. Nwafor, U.U. Ihemelandu, C.Amadife. (2007). "Anti-inflammatory Activity of Seed Extract of Aframomum melegueta." JJournal of Herbs, Spice & Medicinal Plants, vol. 13, pp. 11-21

[223] Liju VB, Jeena K, Kuttan R. (2011) "An evaluation of antioxidant, anti-inflammatory and antinociceptive activities of essential oil from *Curcuma longa.L."* Indian J Pharmacol. Sep;43(5):526-31.PMID:22021994.

[224] Ji YP, Shi TY, Zhang YY, Lin D, Linghu KG, Xu YN, Tao Li, Lu Q, Shen XC. (2019). "Essential oil from *Fructus Alpinia zerumbet* (fruit of *Alpinia zerumbet (Pers.) Burtt.et*

Smith) protected against aortic endothelial cell injury and inflammation in vitro and in vivo," Journal of Ethnopharmacology, vol. 237, pp. 149–158.

[225] Jeena K, Liju VB, Kuttan R. (2013). "Antioxidant, anti-inflammatory and antinociceptive activities of essential oil from ginger." Indian J Physiol Pharmacol. Jan-Mar;57(1):51-62. PMID: 24020099.

[226] Kumar Ravendra, Prakesh Om, Pant Anil K, Kumar Mahesh, Isidorov Valary A, Szczepaniak Lech. (2017). "Chemical composition and anti-inflammatory, anti-nociceptive and antipyretic activity of rhizome essential oil of *Globba sessiliflora Sims.* Collected Garhwal region of Uttarakhand." Journal of Herbal Drug, vol.8, (1):59-69.

[227] Y. Lu, C.X. Zhong, L. Wang, C. Lu, X.L. Li., P.J. Wang. (2009). "Anti-inflammation activity and chemical composition of flower essential oil from Hedychium coronarium." Afri. J. of Biotechnol. 8(20), 5373- 5377.

[228] J. Leelarungrayub, J. Manorsoi, and A. Manorsoi. 2017. "Antiinflammatory activity of niosomes entrapped with Plai oil *(Zingiber cassumunar Roxb*.) by therapeutic ultrasound in a rat model," International Journal of Nanomedicine, vol. 12, pp. 2469–2476.

[229] K. Arigesavan and G. Sudhandiran. 2015. "Carvacrol exhibits antioxidant and anti-inflammatory effects against 1, 2-dimethyl hydrazine plus dextran sodium sulfate induced inflammation associated carcinogenicity in the colon of Fischer 344 rats," Biochemical and Biophysical Research Communications, vol. 461, no. 2, pp. 314–320.

[230] Vendruscolo, I. Takaki, L.E. Bersani-Amado, J.A. Dantas, C.A. Bersani-Amado, R.K.N. Cuman. (2006). "Anti-inflammatory and antinociceptive activities of *Zingiber officinale Roscoe* essential oil in experimental animal models." Indian J. Pharmacol. 38(1), 58-59.