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Herbs in Inflammation - A Review

P.L.Rajagopal[a*], K.K.Dhilna[a] , P.N.Sajith Kumar[b], Jeril John[c]

*[a]*Department of Pharmacognosy, Academy of Pharmaceutical Sciences, Pariyaram Medical College, Kannur, Kerala, S.India.*

[a]*Department of Pharmacognosy, Academy of Pharmaceutical Sciences, Pariyaram Medical College, Kannur, Kerala, S.India.*

[b]*Department of Pharmacognosy, Academy of Pharmaceutical Sciences, Pariyaram Medical College, Kannur, Kerala, S.India.*

[c]*Department of Pharmacognosy, Academy of Pharmaceutical Sciences, Pariyaram Medical College, Kannur, Kerala, S.India.*

*** Corresponding Author:** P.L.Rajagopal, Asst.Professor, Academy of Pharmaceutical Sciences, Pariyaram Medical College P.O, Kannur- 670503, Kerala, South India
Tel: +91 4972751003, 9495905585, 9497862287
E-mail address: **just4rajagopal@gmail.com**

Abstract :. *Inflammation is a "surface" phenomenon triggered by immunological and non-immunological stimuli, capable of activating both humoral and cellular systems, normally present in the body in an inactive state and regulated by systemic inhibitors.*

Keywords: Antiinflammatory, Herbs, Phytoconstituents

Introduction

Inflammation is the reaction of vascularized living tissues to local injury.Inflammation comprises a series of changes in the terminal vascular bed,in blood and in connective tissues with the purpose of eliminating the offending irritant and to repair the damaged tissue.

India is one of the 12 mega biodiversity centers having over 45,000 plant species. About 1500 plants with medicinal uses are mentioned in ancient texts and around 800 plants have been used in traditional medicine (Kamboj.2000). However, India has failed to make an impact in the global market with drugs derived from plants and the gap between India and other countries is widening rapidly in the herbal field (Valiathan., 1998). The export of herbal medicine from India is negligible despite the fact that the country has a rich traditional knowledge and heritage of herbal medicine (Kamboj.,2000).

In this review an attempt has been made out to compile the anti-inflammatory medicinal plants with their prominent chemical ingradients and pharmacological actions.

Acanthus ilicifolius (Acanthaceae)

Parts used:Leaves

Pharmacological activities:Leaves are used as fomentation in neuralgia and rheumatism

Chemical constituents:Water,carbohydrates,lipids,protein nitrogen,nonprotein

nitrogen,acanthicifolin from air dried plant

Alangium salviifolium (Alangiaceae)

Parts used:Stem bark

Pharmacological activities:Anti inflammatory activity of the bark extract was found in formaldehyde induced arthritis and granuloma pouch oedema in animals Chemical constituents:New alkaloid demethylcephaeline along withcephaeline,psychotrine,tubulosine and demethylpsychotrine,substance AL60,a

monoterpenoid lactam-alangiside.

Allium sativum *(*Liliceae)

Parts used:Bulbs

Pharmacological activities:Treatment for all rheumatic and cattarrhal conditions.A concentrate containing allicin and allinase effective in the treatment of rheumatoid arthritis

Chemical constituents:ScordininA1 on hydrolysis yielded a peptide ,scormine and allylthiofructosiduronic acid,allicin and allinase,bulbs yielded a mixture of polysaccharides containing pectic acid ,a D-galactone and a fructan component containing fructose and glucose.

Alpinia calcarata (Zingiberaceae)

Parts used:Leaves, flowers

Pharmacological activities:Anti-tubercular properties

Chemical constituents:Essential oil containing methyl cinnamate.

Anacardium occidentale (Anacardiaceae)

Parts used:whole plant

Pharmacological activities:Anti inflammatory activity of the plant extract was found in carrageenin induced oedema,cotton pellet induced granuloma,formaldehyde induced arthritis.

Chemical constituents:A gum containing bassorin,leaves contain p-hydroxy benzoic,protocatechuic,gentisic,gallic acid and quercitol

Ananas comosus (Bromeliaceae)

Parts used:Fruit and stem

Pharmacological activities:It reduces pain and inflammation associated with surgery,arthritis,trauma.

Chemical constituents:Bromelain

Anemone obtusiloba (Ranunculaceae)

Parts used:Seed

Pharmacological activities:oil extracted from the seed is used in rheumatism

Chemical constituents:Air dried plant is reported to contain a substance similar to anemonin.

Anthemis cotula (Asteraceae)

Parts used:Aerial part of the plant

Pharmacological activities:Provides relief in inflammation of tissues

Chemical constituents:Whole fresh plant yields 0.01% of reddish,bitter essential oil.A crystalline acid present in both free and ester form in the volatile oil.flowers and leaves contain alkaloids.

Arnebia hispidissima (Boraginaceae)

Parts used: whole plant

Pharmacological activities:extract showed antiinflammatory effects in carragenin induced oedema,cotton pellet induced granuloma in animals

Chemical constituents:flavonoids(vitexin).Roots yielded dl-alkanin as a crystalline red solids

Azadirachta indica (Meliaceae)

Parts used:Bark

Pharmacological activities:Sodium nimbinate isolated from plant possessed potent antiinflammatory activity in carragenin induced oedema and formaldehyde induced arthritis in animals.

Chemical constituents:Nimbin,nimbidin,azadirachtin.New oxophenol-nimbiol.

Berberis asiatica (Berberidaceae)

Parts used:Stem

Pharmacological activities:The root has bitter ,sharp,hot taste ,as a fomentation,removes inflammation and swelling

Chemical constituents:Alkaloids,berberine and palmatine are present as chlorides

Berberis petiolaris (Berberidaceae)

Parts used:Roots

Pharmacological activities:Root has cooling effects,used in paralysis and rheumatism

Chemical constituents :Berberine,berbericine

Bergenia ligulata (Sexifragaceae)

Parts used:Roots(rhizomes)

Pharmacological activities:Acetone extract of rhizome has potent anti inflammatory activity but activity decreases with increasing dosage

Chemical constituents :Bergenin ,(-)Afzelechin,catechin-3-gallate

Boerhaavia diffusa (Nyctaginaceae)

Parts used:Whole plant

Pharmacological activities:Plant possess good anti inflammatory activity

Chemical constituents :Hentriacontane,ursolic acid,ash,calcium

Boswellia serrata (Burseraceae)

Parts used:Bark

Pharmacological activities:Anti arthritic activity

Chemical constituents :Oleo gum resin consists of 3 principal constituents namely turpentinic liquid,rosin like resin and gum

Bryophyllum pinnatum (Crassulaceae)

Parts used:Leaves

Pharmacological activities:Anti inflammatory activity found in formaldehyde induced arthritis ,freund's adjuvant induced oedema,turpentine induced arthritis

Chemicalconstituents :Quercetine-3-L-rhamnoside-L-arabinofuranoside,Quercetine-diarabinoside,waxes,flavonoid glycoside

Calophyllum innophyllum (Clusiaceae)

Parts used:Seeds

Pharmacological activities:Fixed oil from seed applied externally in rheumatism,antiinflammatory activity in granuloma pouch,carragenin induced oedema

Chemicalconstituents:Callophylloeide,xanthones,inophyllolide,calophymic acid,cinnamic acid,leucocyanidine

Calotropis gigantea (Asclepiadaceae)

Parts used:Whole plant

Pharmacological activities:Useful in treating skin diseases and healing of wounds and ulcers,analgesic and antipyretic activity

Cananga odorata (Annonaceae)

Parts used:Flowers

Pharmacological activities:Flowers of oil are used for application of cephalagia,opthalmia and gout.

Chemical constituents:canangine

Canscora decussata (Gentianaceae)

Parts used:Whole plant

Pharmacological activities:Fresh juice is recommended in epilepsy,insanity and nervous debility

Chemical constituents:Gluanone,conscoradione,friedelin,sitosterol,stigmasterol and campesterol

Cassia alata (Caesalpiniaceae)

Parts used:Whole plant

Chemical constituents:Cassiaxanthone,kaempferol,aloe-emodin,chrysophanol,rhein.

Cassia fistula (Caesalpiniaceae)

Parts used:Roots,bark

Chemical constituents:

Flavonoid,fistucacidin,tannins,phlobaphenes

Cedrus deodara (Pinaceae)

Parts used:Bark,leaf

Pharmacological activities:Bark in fever and rheumatism,in belching inflammation

Chemical constituents:Flavonoids,ascorbic acid,etheral oil,oleo resin

Centella asiatica (Apiaceae)

Pharmacological activities:In improving memory and treating mental fatigue,anxiety and eczema.

Chemical constituents:

Triterpene saponins mainly asiaticoside,sapogenin,asiatic acid,madecassoside and madecassic acid

Chrysanthemum indicum (Asteraceae)

Parts used:Leaves

Pharmacological activities:Useful in migrain

Chemical constituents:dl-camphor,azulene,chrysanthenone

Cimicifuga foetida (Ranunculaceae)

Parts used:Roots

Pharmacological activities:Root is poisonous,in Europe considered a mild emeto-purgative

Cocculus hirsutus (Menispermaceae)

Parts used:Roots,stems.

Pharmacological activities:Roots are useful in chronic rheumatism and venereal diseases.Extract of stems and roots are sedative spasmolytic.

Chemical constitiuents:D-Trilobine and DL-coclaurine,ginnol

Crotalaria leburnifolia (Papilionaceae)

Parts used:Whole plant

Pharmacological activities:Potent anti inflammarory activity in carragenin induced oedema,cotton pellet induced granuloma,anti hyaluronidase

Chemical constituents:An alkaloid crotalaburnine,a pyrrolizidine alkaloid anacrotine

Cryptolepis buchanani (Asclepiadaceae)

Pharmacological activities:Latex of the plant mixed with hot water is applied on knees to cure rheumatism

Chemical constituents:Pyridine alkaloid buchananine

Curcuma domestica (Zingiberaceae)

Parts used:Rhizome

Pharmacological activities:Wide medicinal use,used as stomachic toxic,blood purifier,antiseptic,also in sprains

Curcuma longa (Zingiberaceae)

Parts used:Rhizome

Pharmacological activities:Used in rhinitis,wound healing,common cold,skin infections,as blood purifier

Chemicalconstituents:

Curcuminoids which include curcumin,dimethoxycurcumin and bisdimethoxy curcuminoid

Cyperus rotundus (Cyperaceae)

Parts used:Whole plant

Pharmacological activities:Potent anti inflammarory activity in carragenin induced oedema,cotton pellet induced granuloma.

Chemical constituents:Cyperene,patchoulenone,mustakone,kobusone and isokobusone

Dalbergia lanceolaria (Papilionaceae)

Parts used:Whole plant

Pharmacological activities: Potent anti inflammatory activity in carragenin induced oedema, formaldehyde induced arthritis

Chemical constituents: Lanceolarine

Desmodium gangeticum (Papilionaceae)

Parts used:Whole plant

Pharmacological activities:Anti inflammarory and antipyretic activity in carragenin induced oedema,cotton pellet induced granuloma.

Chemical constituents:A new pterocarpan-gangetin,two pterocarpanoids gangetinin and desmodin

Dysoxylum binectariferum (Meliaceae)

Parts used: Whole plant

Pharmacological activities:Anti-inflammatory activity in carragenin induced oedema

Chemical constituents:New tetranortriterpene-dysobinin

Echinopus echinatus (Asteraceae)

Parts used:Roots and other parts

Pharmacological activities:Antiinflammatory activity in acute carragenin induced oedema,formaldehyde induced arthritis

Chemical constituents:Beta amyrin and lupeol

Elephantopus scaber(Asteraceae)

Parmacological activities:Plant paste without sugar is applied externally in rheumatism

Chemical constituents:Epifriedelinol,lupeol,stigmasterol

Euphorbia heterophylla(Euphorbiaceae)

Pharmacological activities:Treatment of constipation,bronchitis and asthma

Chemical constituents:Flavonoid quercetin

Flacourtia indica(Flacourtiaceae)

Parts used:Seeds

Pharmacological activities:Seeds are made into paste and used in rheumatism

Garcinia mangostana (Guttiferae)

Parts used:Fruits

Pharmacological activities:Anti-inflammatory properties in Freund's complete adjuvant induced arthritis in animals

Chemical constituents:Three new xanthones gartanin,8-deoxy gartanin and normangostin

Gastrodia elata (Orchidaceae)

Pharmacological activities:

To treat headache,migraine,dizziness,epilepsy,rheumatism,neuralgia,paralysis

Chemical constituents:alkaloids and flavonoids

Glycyrrhiza glabra (Papilionaceae)

Parts used:roots

Pharmacological activities:anti-inflammatory properties in Freund's complete adjuvant induced arthritis I,antipyretic activities

Chemical constituents:glycyrrhizin,glucose,sucrose,resins,asparagine,

Harpagophytum procumbens (Pedaliaceae)

Pharmacological activities:Anti inflammatory and analgesic activity

Chemical constituents:Harpagoside,harpagide and procumbide

Hedychium coronarium (Zingiberaceae)

Parts used:Rhizome

Pharmacological activities:Essential oil is active against gram positive bacteria and fungi.Powdered rhizomes as febrifuge,decoction as antirheumatic and tonic

Chemical constituents:Essential oil contained eucalyptol

Hibiscus *vitifolius* (Malvaceae)

Parts used:seeds

Pharmacological activities:Antiinflammatory activity in carragenin induced oedema,Granuloma pouch.

Chemical constituents:A new gossypetin glucuronide-hibifolin from flowers along with gossypin.

Juniperus communis (Pinaceae)

Parts used:Leaves

Pharmacological activities:Antiinflammatory activity in carragenin induced oedema,Granuloma pouch in rats.

Chemical constituents:Communic acid,Juniperol,stigmasterol.

Madhuca longifolia (Sapotaceae)

Parts used:Barks

Pharmacological activities:Antiinflammatory activity in acute carragenin induced oedema,formaldehyde induced arthritis in rat

stigmasterol,n-hexacosanol,sitosterol,quercetin,quercitrin are the major ingradients.

Mammea longifolia (Clusiaceae)

Pharmacological activities:Potent antiinflammatory activity

Chemical constituents:Squalene,stigmasterol,vitexin,mesoinositol

Mangifera indica (Anacardiaceae)

Pharmacological activities:Anti inflammatory and analgesic activity

Chemical constituents

Mesua ferrea (Clusiaceae)

Parts used:Seed

Pharmacological activities:Seeds yield a fatty oil used as an embrocation in rheumatism.Antiinflammatory activity in carragenin induced oedema and granuloma pouch in animals.

Chemical constituents:

Mammeisin,new 4-phenylcoumarin mesuagin,mammeigin,mesuol,new biflavanone mesuaferrone A.

Michelia champaca (Magnoliaceae)

Parts used:Roots,root barks

Pharmacological activities:The dried root and root bark,mixed with curdled milk is useful as an application to abscesses,clearing away or maturing the inflammation

Moringa oleifera (Moringaceae)

Parts used:Seeds

Pharmacological activities:Oil is used medicinally in gout and acute rheumatism

Chemical constituents:One antibiotic named ptergospermin.

Myrtus communis (Myrtaceae)

Parts used:Berries

Pharmacological activities:Myrtle oil applied in rheumatism and considered as rubifacient

Chemical constituents:Acylphloroglucinols,limonene,linanool,cineol,P-cymol,camphene

Nyctanthes arbor-tristis (Oleaceae)

Parts used:Leaves

Pharmacological activities:Used in rheumatism and fevers.

Chemical constituents:Flavonol glycosides-astragalin and nicotiflorin ,D-mannitol.

Ocimum basilicum (Lamiaceae)

Parts used:Whole plant

Pharmacological activities:Antipyretic agent

Chemical constituents:

Volatile oil contains Ocimene,methylchavicol,sambulene,methyl cinnamate,linalool,borneol,safrole and cineole.

Paederia scandens (Rubiaceae)

Parts used:Leaves and stems

Pharmacological activities:Plant extract showed anti-inflammatory activity stronger than that of acetyl salicylic acid and weaker than that of hydrocortisone

Chemical constituents:Hentriacontan,hentriacontanol,methyl mereaptan,ceryl alcohol,Palmitic acid,sitosterol,stigmasterol.

Pinus roxburghii (Pinaceae)

Parts used:Stem

Pharmacological activities:Oleoresin obtained from oil of turpentine is used in rheumatic pain.

Chemical constituents:Oleoresin,Friedelin,ceryl alcohol,hexacosyl formulate

Piper longum (Piperaceae)

Parts used:Roots and fruits

Pharmacological activities:Used as counterirritant and analgesic for muscular pain and inflammation

Chemical constistuents:

Two new alkaloids piperlongumine,piperlonguminine,sesamine.

Pluchea indica (Asteraceae)

Parts used:Roots and leaves

Pharmacological activities:Potent anti-inflammatory properties

Chemical constituents:

Endesmane derivatives of the enactahemone,linaloylapiosyl glucoside,linaloyl glucoside,plucheoside

Plumeria accuminata (Apocynaceae)

Parts used:Leaves

Pharmacological activities:Anti inflammatory and rubefacient in rheumatism and strong purgative effect

Chemical constituents:Steroids,flavonoids,tannins,alkaloids and glycosides

Pluchea lanceolata (Asteraceae)

Parts used:Whole plant

Pharmacological activities:Used in rheumatoid arthritis

Psoralea corylifolia (Fabaceae)

Parts used:Seeds

Pharmacological activities:Used for inflammatory diseases of skin

Chemical constituents:Psoralone,isopsoralone,psoralen,isopsoralen,isoflavone neobavaisoflavone

Ranunculus aquatilis (Ranunculaceae)

Parts used:Leaves

Pharmacological activities:Leaves are applied as blister to the wrists in rheumatism

Ranunculus arvensis(Ranunculaceae)

Pharmacological activities:In Europe plant is used in intermittent fevers and gout

Ranunculus muricatus (Ranunculaceae)

Pharmacological activities:In Europe plant is used in intermittent fevers,gout.

Ricinus communis (Euphorbiaceae)

Parts used:Roots

Pharmacological activities:Decoction of root is useful in lumbago

Chemical constituents:Stearic,palmitic,ricinoleic,arachidic,linolenic,linoleic and oleic acid.

Sagittaria sagittifolia *(*Alismataceae)

Parts used:Leaves

Pharmacological activities:Leaves are used in sore throat and inflammation of breast

Chemical constituents:Hentriacontanone and sitosterol

Salix alba (Salicaceae)

Parts used:Barks

Pharmacological activities:Anti inflammatory and analgesic activity.

Chemical constituents:Glycoside salicins

Semecarpus anacardium (Anacardiaceae)

Parts used:Fruits

Pharmacological activities:Used for rheumatism

Chemical constituents:Bhilawanol,leaves yielded only amentoflavone

Sida acuta (Malvaceae)

Parts used:Leaves and roots

Pharmacological activities: Leaves used in rheumatic affections and roots are used as antipyretic

Chemical constituents:Ecdysterone

Sida cordifolia (Malvaceae)

Parts used:Whole plant

Pharmacological activities:Treatment of rheumatism

Chemical constituents:Ephedrine,vasicinol,vascicinone and N-methyl tryptophan

Silybum marianum (Asteraceae)

Parts used:Leaves

Pharmacological activities:Anticancer,anti inflammatory,antioxidant and immunomodulatory effect

Chemical constituents:Sylimarin

Spilanthes acmella (Asteraceae)

Parts used:Whole plant

Pharmacological activities:Anti inflammatory and analgesic activity

Chemical constituents:Flavonoids

Tinospora crispa (Menispermaceae)

Parts used:Leaves

Pharmacological activities:It is given in chronic rheumatism

Chemical constituents:Sodium,potassium,calcium,iron,aluminium,copper ,zinc,one hydroxy compound.

Tinospora malabarica (Menispermaceae)

Parts used:Leaves and stems

Pharmacological activities:In China and Tong king fresh leaves and stems are used in treatment of chronic rheumatism,fumigations are recommended in piles and ulcerated wounds

Tripterygium wilfordii (Celastraceae)

Parts used:Root

Pharmacological activities:Treatment of inflammatory diseases like rheumatoid arthritis,asthma,nephritis

Chemical constituents:Triptolide

Tylophora asthmatica (Asclepiadaceae)

Parts used:Whole plant

Pharmacological activities:Potent anti inflammarory activity in carragenin induced oedema,cotton pellet induced granuloma.

Chemical constituents:(+)septicine,dehydro-tylophorine,

Uncaria tomentosa (Rubiaceae)

Chemical constituents:Pentacycilc oxindole alkaloid

Zingiber officinale (Zingiberaceae)

Parts used:Rhizomes

Pharmacological activities:Antioxidant,antiinflammatory,antiseptic and carminative properties

Chemical constituents:Volatile oils,oleoresin(gingerol),linoleic acid,trace elements magnesium,phosphorus and pottassium.

Inflammation is a pathophysiological response to injury, infection or destructioncharacterised by heat, redness, pain, swelling and disturbed functions. Inflammation is a normal protective response to tissue injury caused by physical trauma,

noxious chemical or microbial agents. It is the body response to inactivate or destroy the invading organisms, to remove the irritants and set the stage for tissue repair. It is triggered by the release of chemical mediators from injured tissue and migrating cells. (K.D.Tripathi., 2008) The most commonly used drug for management of inflammatory conditions are nonsteroidal anti-inflammatory drugs (NSAIDs), which have several adverse effects especially gastric irritation leading to formation of gastric ulcers.(P.N.Bennet.,2005)

In modern times the trend towards the use of alternative and complementarymedicine is increasing and it offers unprecedented opportunities for the development of herbal medicine. Many of the Asian countries are taking full advantage of the links to the ancient cumulative wisdom of the traditional practitioners. Previous studies have contributed much in the understanding of the compounds responsible for the known anti-inflammatory and analgesic action, their mechanism of action and therapeutic values. Compounds such as Bromelain act as anti-inflammatory agent due to its fibrinolytic and fibrinogenolytic effects. Xanthones are also implicated in the anti-inflammatory and analgesic effects. Unlike other anti-inflammatory, analgesic agents, xanthones were reported to have very less or no side effects such as ulcerogenicity and blood clotting.Terpene acids such as madecassic acid and asiatic acid from *Centella asiatica* has been reported to be an effective analgesic and anti-inflammatory compound. Curcumin is the most important ethnobotanical drug isolated from Curcumalonga and is reported to have a variety of medical applications including antiinflammatory activity. The pharmacological action of curcumin can be attributedto the inhibition of a number of inflammatory molecules including lipoxygenase, cycloxygenase, leukotrienes and prostaglandins. Pathways of anti-inflammatory activity of curcumin have been studied by many workers and they come out with different views. However, curcumin is involved in one or theother pathway of inflammatory cascade and execute its effect. *Gastrodia elata*, an orchidacean member is used in ethnomedicine to treat a variety of disorders and eight structurally different phenolic compounds were identified. These compounds were involved in the inhibition of COX activity, which was attributed to the presence of C-3 and C-4 methoxy and hydroxyl radicals respectively in them. Yet another compound, Salicin, from *Salix alba* was also found to be very effective anti-inflammatory and analgesic agent and

was proved better than aspirin. Gingerol and its analogues in *Zingiber officinale* are potent antioxidant, antinoceceptive and anti-inflammatory agents.

Much of the current research trend is towards the isolation, purification, identification and characterization of active principles from crude extracts. However, there is a hidden fact that the different components present in the crude plant drugs may be more efficient and potentthan any of the single purified compound which may help to nullify the toxic effects of individual constituents. Most of the commonly used modern medicines have originated from the plant sources. The incidence of arthritisand related diseases is increasing now due to the drastic changes that happened in the present life style. The quest for new botanicals as relief forthese life style disorders would be a welcome step for the local and urban health care. Majority of the anti-inflammatory and analgesic compounds isolated from the above discussed medicinal plants are prone to some side effects for which addition of modern medicines or antidotes from plant sources are recommended. At the same time plants like Bosewellia, Callophyllum and Mesua yield such compounds free from side effects. The development of neutraceuticals from them could substitute the present generic market to a great extent.

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