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A REVIEW ON MEDICINAL PLANTS WITH ANTI-INFLAMMATORY ACTIVITIES

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ABSTRACT:

This review presents updated information gathered on scientifically proved medicinal plants used for anti-inflammatory activity. This study provides the information on botanical name, family, parts used and their solvents used in plants. In spite of rapid progress and spread of modern medicine and surgery, faith in and popularity of traditional method has not decreased. There are a large number of studies which supports the anti-inflammatory effects of traditional herbal medicines. The aim of this review is to highlight the work on anti-inflammatory of plant origin. The present paper also involves various plant drugs and their bioactive extracts involved in anti-inflammatory mechanism. This article may help investigators to identify medicinal plants responsible for anti-inflammatory activity.

Keywords: Traditional herbal medicine, anti-inflammation plant, mechanism.

Introduction

Inflammation is a host defence mechanism of the body and it's an essential immune response that enables the body to survival during infection or injury and maintains tissue homeostasis in noxious conditions. According to the modern concept, inflammation is a healthy process resulting from some disturbance or disease. Inflammation is a normal response to any noxious stimulus that threatens the host and may vary from localized response to a generalized one. In other words "Inflammation is the major and complex reaction of the body against infection upon tissue injury." The role of inflammation as a healing, restorative process, as well as its aggressive role, is also more widely recognized today. But in some

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conditions appears to be no resolution and a chronic state of inflammation develops that may last the life of the individual. Such conditions include the inflammatory disorders rheumatoid arthritis, osteoarthritis, inflammatory bowel diseases, retinitis, multiple sclerosis, psoriasis and atherosclerosis. To overcome this problem different kind of safe and effective anti-inflammatory agents are available, including aspirin and other nonsteroidal anti-inflammatories, with many more drugs under development. So these agents which are helpful to reduce the inflammatory response are called anti-inflammatory agent.[1] Inflammation has a very big variety of pathological and physiological response.

Process of Inflammation

Inflammation is a localized protective reaction of cells tissues of the body to allergic or chemical irritation, injury and/or infections. The symptoms of inflammation are characterized by pain, heat, redness, swelling and loss of function that result from dilation of the blood vessels leading to an increased blood supply and from increased intracellular spaces resulting in the movement of leukocytes, protein and fluids into the inflamed regions.[2] This is very necessary to understand the role of chemical mediators of inflammation. These mediators are the substances released as plasma proteins, or that come from cells like mast cells, platelets, neutrophils and monocytes/macrophages. They are triggered by allergic or chemical irritation, injury and infections. These mediators, depending on the duration of injury determine the severity of inflammation and are termed pro-inflammatory fundamental factors. These substances bind to specific target receptors on the cells and may increase vascular permeability, promote neutrophil chemotaxis, stimulate smooth muscle contraction, increase direct enzymatic activity, induce pain and/or mediate oxidative damage. [3] Examples of chemical mediators include: nitric oxide, prostaglandins, leukotrienes, vasoactive amines (histamine, serotonin), and cytokines. Although some of the cytokines (IL-3 -4,-5,-6,-10,-13) released are beneficial by acting as anti-inflammatory mediator within the cells.[4]

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Mechanism of inflammation

The inflammatory process is a combination of many pathways like a synthesis of prostaglandin, interleukin or other chemo toxin, adhesive protein receptor action, platelet-activating factors. All can act as chemotactic agonists. Inflammation initiates with any stress on the membrane or by other trigger or stimuli, these activate hydrolysis of membrane phospholipid by phospholipase A into arachidonic acid, which further substrate for cyclooxygenase and lipooxygenase enzyme and byproduct of these are prostaglandins PGE2, PGH2 and leukotrines like LTC4, LTB4 etc. Several cytokines also play essential roles in orchestrating the inflammatory process, especially interleukin-1 (IL-1) and tumor necrosis factor-a (TNF-a). IL-1 and TNF are considered principal mediators of the biological responses to bacterial lipopolysaccharide (LPS, also called endotoxin). They are secreted by monocytes and macrophages, adipocytes, and other cells. Working in concert with each other and various cytokines and growth factors (includingIL-8 and granulocyte-macrophage colony-stimulating they induce gene expression and protein synthesis in a variety of cells to mediate and promote inflammation. Prostaglandin (PGE2) or prostacyclin (PGI2) release increase blood flow as well as increase blood vessel permeability by assisting in releasing of nitric oxide from endothelium derived releasing factor which cause again vasodilation and help in sticking platelets and other chemo toxin (bradykinin,histamine) While LTs generally are pro-inflammatory LTB4 is a potent chemotactic agent for polymorphonuclear leukocytes,eosinophils, and monocytes. In higher concentrations, LTB4 stimulates the aggregation of polymorphonuclear leukocytes and promotes degranulation and the generation of superoxide. LTB4 promotes adhesion of neutrophils to vascular endothelial cells and their trans-endothelial migration and stimulates synthesis of pro-inflammatory cytokines from macrophages and lymphocytes.[5]

There are three basic stages of inflammation:

1) Vasodilatation and increased permeability of blood vessels.

2) Phagocyte migration

3) Tissue repair

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Types of inflammation

Acute inflammation- Acute inflammation usually has becoming within minutes or at most hours after tissue injury, and may be characterized by the classical symptoms of redness, heat, oedema. It's a short term process. It is characterized by the exudation of fluids[6] and plasma proteins and the migration of leukocytes, most importantly neutrophils into the injured area. This acute inflammatory response is useful to the defense mechanism aimed at killing of bacteria, virus and parasites while still facilitating wound repairs.

Chronic inflammation **-** Chronic inflammation is of a more prolonged duration and histologically by the presence of lymphocytes and macrophages, resulting in fibrosis and tissue necrosis. The chronic inflammation increases the development of the degenerative diseases such as rheumatoid arthritis, atherosclerosis, heart disease, Alzheimer, asthma, acquired immunodeficiency disorder (AIDS), cancer, congestive heart failure, multiple sclerosis, diabetes, infections, gout, IBD-inflammatory bowel disease, aging and other neurodegenerative CNS depression, Chronic inflammation also has been implicated as part of the cause of the muscle loss that occurs with aging. 9 all of which are associated with immunopathological that appears to play a key role in the onset of the condition.[7]

Treatment of inflammation:

The inflammation can be treated by;

a) Nonsteroidal anti-inflammatory drugs

Side effects can include:

- stomach irritation, erosion, or ulcers (can lead to stomach bleeding and death)
- kidney problems
- If you're allergic to aspirin, you also shouldn't take NSAIDs.

Examples of NSAIDs include:

- Aspirin
- Ibuprofen (Advil, Motrin, Midol, Nuprin)
- Naproxen sodium and naproxen (Aleve)

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However, it does have some side effects. These include: heartburn, stomach pain, nausea, diarrhea, headaches, dizziness and drowsiness.

Diclofenac (Voltaren) and diclofenacmisoprostol (Arthrotec)

· stomach pain, diarrhea, nausea

b) Corticosteroids:

Side effects of all steroids can include:

· high blood sugar levels, stomach ulcers, nausea, diarrhea, headaches, dizziness, drowsiness

c) Opioids:

Opioids include:

· codeine, oxycontin, morphine

d)Topical analgesics:

Topical analgesics include:

· Capsaicin.

· Diclofenac sodium gel and solution.

This topical NSAID is only available as a prescription.

· Lidocaine patch.

· Methyl salicylate and menthol (Bengay).

· Trolamine.

Plants as natural anti-inflammatory agents

Unlike modern allopathic drugs which are single active components that target one specific pathway, herbal medicines work in a way that depends on an orchestral approach. A plant contains a multitude of different molecules that act synergistically on targeted elements of the complex cellular pathway.[10] Medicinal plants have been source of wide variety of biologically active compounds for many centuries and used extensively as crude material or as pure compounds for treating various disease conditions.[11]The use of herbal medicines

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becoming popular due to toxicity and side-effects of allopathic medicines. Medicinal plants play an important role in the development of potent therapeutic agents. There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications.[12] India with its biggest repository of medicinal plants in the world may maintain an important position in the production of raw materials eitherdirectly for crude drugs or as the bioactive compounds in the formulation of pharmaceuticals and cosmetics etc.[13]

Table 1: Plants having anti-inflammatory potential

S.No	Plant Name	Family	Plant Part	Type of Extract	Ref.
1.	*Achillea millefolium*	Asteraceae	Whole Plant	Aqueous, alcohol	14
2.	*Aconitum heterophyllum*	Valeraneaceae	Root	Ethanol	15
3.	*Adhatoda vasica*	Acanthaceae	Leaves	Methanol	16
4.	*Adansonia digitata*	Malvaceae	Fruit	Aqueous	17
5.	*Aegle marmelos*	Rutacae	Leaves	Ethylacetate and methanol	18
6.	*Aloe vera*	Asphodelaceae	Leaves	Pet.ether, Ethanol	19
7.	*Azardirachta indica*	Meliaceae	Leaves	Hydro-alchol	20
8.	*Annona squamosa*	Annonaceae	Seeds	Ethanol	21
9.	*Baccharis incarum*	Astereae	Whole plant	Ethanol	22
10.	*Bacopa Monnieri*	Scrophulariaceae	Whole Plant	Ethanol	23
11.	*Barleria prionitis*	Acanthaceae	Whole plant	Methanol	24
12.	*Bonafousia sananho*	Apocyanaceae	Whole plant	Ethanol	25
13.	*Boussingaultia gracilis*	Bassellaceae	Leaves, Stem and Bark	Aqueous	26
14.	*Boswellia serrata*	Burseraceae	Resin	Methanol	27
15.	*Bryophyllum pinnatum*	Crassulaceae	Leaves	Methanol	28
16.	*Bursera simaruba*	Burseraceae	Leaves, Bark	Hexane, Ethanol	29

17.	*Caralluma tuberculata*	Asclepiadaceae	Whole plant	Ethanol	30
18.	*Cassia obtusifolia*	Leguminosae	Leaves	Methanol	31
19.	*Citrus auranticum*	Rutaceae	Fruit	Not indicated	32
20.	*Commiphora mukul*	Burseraceae	Resin	Methanol	33
21.	*Cordia ulmifolia*	Boraginaceae	Leaves	Pet.ether	34
22.	*Curcuma longa*	Zingiberaceae	Rhizomes	Ethanol	35
23.	*Daphne pontica*	Thymelaeaceae	Aerial Parts, Roots	Methanol	36
24.	*Elephantophs scaber*	Compositae	Leaves	Pet.ether	37
25.	*Emblica officinalis*	Euphorbiaceae	Fruit	Ethanol and Aqueous	38
26.	*Garcinia mangostana*	Guttiferae	Fruit	Methanol	39
27.	*Hammada elegans*	Chenopodiaceae	Aerial part	Ethanol	40
28.	*Hedera rhombea*	Araliaceae	Leaves	Methanol	41
29.	*Iberis amara*	Brassicaceae	Whole plant	Ethanol	42
30.	*Kirkia acuminata*	Simaroubaceae	Leaves	Methanol	43
31.	*Lantana camera*	Verbenaceae	Leaves	Pet.ether	44
32.	*Lippia nodiflora*	Verbenaceae	Leaves	Pet.ether, Ethanol	45
33.	*Lippia geminata*	Verbenaceae	Leaves	Pet.ether, Ethanol	46
34.	*Lycopodium clavatum*	Lycopodiaceae	Aerial Parts	Chloroform extract, the alkaloid Fraction	47
35.	*Mangifera indica*	Anacardiaceae	Bark	Aqueous	48
36.	*Marsdenia condurango*	Asclepiadaceae	Whole plant	Ethanol	49
37.	*Mikania cordata*	Compositae	Root	Methanol	50
38.	*Moringa olifera*	Moringaceae	Root, Flowers,	Methanol, Aqueous	51

39.	*Paederia foetida*	Rubiaceae	Leaves	Methanol	52
40.	*Palisota hirsuta*	Commelineceae	Leaves	Aqueous	53
41.	*Petiveria alliaceae*	Phytolaccaceae	Root	Ethanol	54
42.	*Phyllanthus polyphyllus*	Euphorbiaceae	Whole plant	Ethanol	55
43.	*Piper longum*	Piperaceae	Roots	Aqueous	56
44.	*Piper ovatum*	Piperaceae	Leaves	Hydro alcoholic	57
45.	*Pluchea indica*	Asteraceae	Root	Methanol	58
46.	*Ricinus communis*	Euphorbiaceae	Roots, leaves	Methanol, pet ether	56
47.	*Rheum australe*	Polygonaceae	Root	Pet.ether, Chloroform, Methanol	60
48.	*Rubrus ellipticus*	Rubiaceae	Leaves	Ethanol	61
49.	*Saussurea costus*	Asteraceae	Whole Plant	Methanol	62
50.	*Sesbania sesban*	Leguminosae	Leaves and Bark	Methanol	63
51.	*Sida cordifolia*	Malvaceae	Whole Plant	Water	64
52.	*Sidium guajava*	Myrtaceae	Fruit	Methanol	65
53.	*Swertia chirata*	Gnetaceae	Aerial part	Benzene	66
54.	*T. buxifolium*	Rosaceae	Leaves, Stem	Methanol	67
55.	*T. flavum*	Ranunculaceae	Leaves, Stem	Methanol	68
56.	*T. micrantha*	Myrtaceae	Leaves	Ether, Ethanol	69
57.	*Tinospora cardifolia*	Menispermeaceae	Aerial part	Aqueous	70
58.	*Tuberaria lignosa*	Cistaceae	Leaves	Hexane	71
59.	*Thespesia populnea*	Malvaceae	Leaves and Barks	Oil	72
60.	*Vinca rosea*	Apocynaceae	Leaves	Not indicated	73

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61.	*Visnea mocanera*	Theaceae	Leaves	Ethanol	74
62.	*Vitex negundo*	Lamiaceae	Leaves	Alcohlic	75
63.	*Xeromphis spina*	Compositae	Pulp	Ethanol	76
64.	*Zanha africana*	Sapindaceae	Root, bark	Methanol	77
65.	*Zingiber officinalae*	Zingiberaceae	Rhizome	Ethanol	78

DISCUSSION:

It is evident from the documentations that a number of medicinal plants are employed in the treatment of inflammatory disease conditions. These anti-inflammatory plants have demonstrated effect in acute and chronic inflammation in experimental animal models. The effect of these various family of herbs may be due to the different structurally complex active principles or constituents present in these plants and the possible multiple targets for drug action in the complex inflammatory response. It is thus obvious that the efficacy of anti-inflammatory plants in the treatment of inflammatory diseases possibly derive from a multifaceted assault on the inflammatory response cascade. The mechanism of action varies from plant to plant and certainly determines the observed potency of the plant. In addition to anti-inflammatory activity, some of these plants also possess antinociceptive, antiulcer and antimicrobial activities. Also this effect is of greater importance for plants, which have shown activity in chronic inflammation. Perhaps the safety of such plants in chronic use may be better appreciated by considering the severe limitations experienced in short term use of NSAIDs. In a continued effort to develop more effective anti-inflammatory agents from plant sources, a number of active principles have been isolated and identified.[79].

CONCLUSION:

Plants are one of the most important sources of medicines. Since ancient time's medicinal plants have been used to treat different ailments due to their accessibility, availability, inherited practice, economic feasibility, and perceived efficacy. This review will help the recent and future researchers in more research work on these valuable medicinal plants. Large

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group of medicinal plants are used as traditional medicine, which have potential to cure various ailments. These medicinal plants which containing potential sources of phytocompounds which are used for many therapeutics. Almost all parts of the medicinal plant are used as medicines. Commonly available many medicinal plants are used in Indian traditional medicine. The above referred studies reported that the above mentioned medicinal plants have potent anti-inflammatory activity.

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