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REVIEW ARTICLE

HERBAL PLANT USED IN ANTI-INFLAMMATORY AND ANALGESIC ACTIVITY

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ABSTRACT

The use of traditional medicine is expanding to new horizons and plants still remain as the novel source of structurally important compounds that lead to the development of innovative drugs. India has about 45,000 plant species among which medicinal property has been attributed to several thousands. The traditional Indian system of medicine, the Ayurveda, mentions the use of plants in the treatment of various diseased conditions.

Ethnobotanical research done in last few decades have revealed the anti-inflammatory and analgesic properties of plants cited in the traditional literature. Many herbal preparations are being prescribed as anti-inflammatory and analgesic in the traditional literature.

Some of the important taxa which are found effective as anti-inflammatory and analgesic agents are *Ananas comosus* (L.) Merr. *Bosewellia serrata* Roxb., *Callophyllum inophyllum* L., *Calotropis gigantea* (L.) R.Br., *Calotropis procera* (Ak.) R.Br., *Camellia sinensis* (L.) Kuntz., *Cannabis sativa* L., *Centella asiatica* (L.) Urban, *Curcuma longa* L., *Euphorbia heterophylla* L., *Gastrodia elata* Blume, *Harpagophytum procumbens* (Burch.) DC, *Kalanchoe crenata* Andr., *Mangifera indica* L., *Mesua ferrea* L., *Plumeria accuminata* W.T. Aiton., *Ricinus communis* Linn., *Salix alba* L., *Sida cordifolia* L., *Sylibium marianum* L., *Spillanthes acmella* Murr, *Tripterygium wilfordii* Hook f., *Uncaria tomentosa* (Willd.) DC, *U. guianensis,* J.F.Gmel and *Zingiber officinale* Roscoe. These plants have shown varying degrees of anti-inflammatory and analgesic activities.

KEYWORDS: *Ricinus communis* Linn., *Salix alba* L., *Sida cordifolia* L., *Sylibium marianum* L., *Spillanthes acmella* Murr. *Triptervaium wilfordii* Hook f

INTRODUCTION:

India harbours about 15% out of the 20,000 medicinal plants of the world, of which 90% of them are found growing wild in different climatic conditions [1]. The tribal and rural populations of India depend on medicinal plants for their health care as well as for their livestock. This is attract the attention of several botanists that lead to an array of reports on ethnomedicine [2].

Medicinal plants are the main sources of chemical substances with potential therapeutic effects. The use of medicinal plants for the treatment of many diseases is associated with folk medicine from different parts of the world.

The term inflammation is derived from the Latin word – *Inflammare*, means burn. Any form of injury to the human body can elicit a series of chemical changes in the injured area. Earlier it was believed that inflammation was contemplated as a single disease caused by disturbances of body fluids.

According to the modern concept, inflammation is a healthy process resulting from some disturbance or disease. The cardinal signs of inflammation are-

1) Heat
2) Redness
3) Swelling
4) Pain
5) Loss of function.

Inflammation usually involves a sequence of events which can be categorized under three phases viz. acute transient phase, delayed sub acute phase and chronic proliferate phase.

Inflammatory diseases include different types of rheumatic disorders such as rheumatic fever, rheumatoid arthritis, ankylosing spondylitis, polyarthritis nodosa, systemic lupus erythematosus and osteoarthritis.

Most of the anti-inflammatory drugs now available are potential inhibitors of cyclooxygenase (COX) pathway of arachidonic acid metabolism which produces prostaglandins. Prostaglandins are hyperalgesic, potent vasodialators and also contribute to erythema, edema and pain. Hence for treating inflammatory diseases analgesic and anti-inflammatory agents are required.

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PLANTS WITH ANTI-INFLAMMATORY AND ANALGESIC ACTIVITY:

1. *ANANAS COMOSUS* (BROMELIACEAE)- PINEAPPLE:

It has been used as a medicinal plant in several native cultures and its major active principle, Bromelain, has been known chemically since 1876. Bromelain is a general name for a family
of sulphydryl proteolytic compounds obtained from *Ananas comosus.*

The primary component of bromelain is a sulphydryl proteolytic fraction. It also contains peroxidase, acid phosphatase, several protease inhibitors and originally bound calcium.

Bromelain has both direct as well as indirect actions involving other enzyme systems exerting its anti-inflammatory effect.

It inhibits the inflammatory pain in rats in a dose dependent manner . It reduces pain and inflammation associated with surgery, arthritis, trauma or sports injury(2).

Bromelain was the most potent of nine anti-inflammatory substances tested on experimental rats(3).

Non-steroidal anti-inflammatory drugs inhibits COX, which is required for the synthesis of two prostaglandins, resulting in a decrease in both pro and anti-inflammatory prostaglandins. Rather than blocking the arachidonic acid cascade at the enzyme COX, bromelain may selectively decrease thromboxane generation and change the ratio of thromboxane/prostacyclin in favour of prostacyclin(1)

2. *BOSWELLIA SERRATA* (BURSERACEAE)- FRANKINCENSE (LOBAN):

Boswellia serrata is use traditionally in Indian Ayurvedic medicine and is well known for its anti-inflammatory activity. The resinous gum of the bark is known as guggulu in Ayurveda and is also used in modern phytomedicine.

It has been reported to be a powerful anti-inflammatory agent without the ulceration or irritation as observed in non-steroidal anti-inflammatory drugs [4].

Bosewellia has been shown to possess sedative(5), analgesic, anti-inflammatory(6,7) and anticancer(8) effects. The resin obtained from the plant is recommended for rheumatoid arthritis, osteoarthritis, fibromyositis and spondylitis(9).

Patients treated with *Bosewellia* reported decreases in knee pain, joint swelling and increases in knee flexion and walking distance.(10)

Four pentacyclic triterpene acids including the bioactive compound β-boswellic acid which interferes with leukotriene biosynthesis have been isolated from *B. serrata*. It is a specific and dose dependent inhibitor of 5-lipoxygenase, 5- eicosatetraenoic acid and leukotriene B4(11).

These chemical mediators of inflammation are implicated in the pathogenesis of many diseases including asthma(12), arthritis(13), colitis and cancer(14). *Bosewellia* inhibits human leukocyte elastase (HLE) under *in vitro* conditions(15).

3. ***CALLOPHYLLUM INOPHYLLUM* AND *MESUA FERREA*(INDIAN ROSE CHESTNUT**, OR **COBRA'S SAFFRON) (CLUSIACEAE):** commonly called Alexandrian laurel

Callophyllum inophyllum and *Mesua ferrea* has been commonly used for the treatment of rheumatism, skin diseases, dysentery and bleeding piles [15].
The whole plant is medicinal and contains compounds such as xanthones, triterpenes, coumarins and glucosides.

The anti-inflammatoryeffect of *C. inophyllum* was reported earlier [16]. Gopalakrishnan et al. reported the anti-inflammatory and Central Nervous System (CNS) depressant activities of xanthones from *C. inophyllum* and *M. ferrea* [17]

Usually the anti-inflammatory agents in clinical use exhibit analgesic and antipyretic properties along with ulcerogenicity and impairment of blood clotting as side effects.

4. *CALOTROPIS GIGANTEA* (ASCLEPIADACEAE)-MADAR:

Calotropis gigantea is an important medicinal plant where all parts of the plant including the milky secretion have been claimed to possess varied medicinal uses(15,18). It has been claimed to be useful in treating skin diseases and healing of wounds and ulcers(19). Very recently, the plant is reported to possess analgesic and antipyretic activities.

The methanolic extract of *Calotropis gigantea* leaves revealed the anti-inflammatory activity in experimental rats using paw edema test(20). Anti-inflammatory effects of aqueous extract of leaves and latex of *C. procera* were reported earlier(21).

5. *CALOTROPIS PROCERA* (ASCLEPIADACEAE)-MADAR:

Calotropis procera is a well known medicinal plant in the traditional medicine system of India. It is used in the treatment of skin diseases, rheumatism and aches(22). It has been reported to possess antiinflammatory, analgesic and weak antipyretic activities.

The latex was reported to be as potent as standard anti-inflammatory drug phenylbutazone in inhibiting inflammatory response induced by different inflammatory agents in acute and chronic models [23].

The anti-inflammatory activity of the latex of *C. procera* and its methanolic extract against various inflammatory mediators as well as on leucocyte flux induced by carrageenan in rat paw edema model have been reported recently [24].

6. *CAMELLIA SINENSIS* (THEACEAE):

Camellia sinensis is one of the most commonly consumed beverages in the world.

The established pharmacological activity of the green tea extracts are attributed to its high content of polyphenols/catechins, mainly epigallocatechin-3-gallate (EGCG) [25].

The potential effect of green tea in Anti-inflammatory and analgesic plants 273 arthritis on collagen type-II-induced arthritis in mice has been reported [26].

The anti-inflammatory effect of green tea polyphenols was reflected in a marked inhibition of the inflammatory mediators such as COX 2, interferon–γ and TNF-α in arthritic joints(27).

7. ZINGIBER OFFICINALE (GINGER):

Ginger is commonly used in the diet, especially in India. The main ingredients in ginger that have an anti-inflammatory effect as well as antitumor and antiproliferative pro perties against tumor cells are 6-gingerol and 6-paradol, which are found in the oleoresin fraction in ginger.

25,26 Other constituents of ginger, 8-paradol and 8-shogaol, demonstrate a significant inhibitory effect on the COX-2 enzyme system.27 Three important features of the molecules are necessary for this inhibition:

(1) the degree of lipophilicity of the alkyl side chain

(2) hydroxy and carbonyl groups substitution pattern on the side chain

(3) the methoxy and hydroxy groups substitution arrangement on the aromatic moiety.

Ginger oil obtained from the plant's roots was found to have a profound anti-inflammatory effect. The German Commission E recommends a dose of 2 to 4 g of cut rhizome or dried extract daily or its equivalent. Because ginger can enhance bile secretion, it is contraindicated in patients with gallstones.(28)

Ginger root, another common spice, also contains a number of scientifically proven pain relieving agents. Ginger contains a protein-digesting enzyme called zingibain, which appears to relieve arthritis pain by reducing inflammation(29).

8. CURCUMA LONGA (TURMERIC):

One of the very most effective and potent natural anti-inflammatory agents is curcumin, derived from turmeric root. It is widely cultivated in Asiatic countries,mainly in India and China. As turmeric powder it has been in continuous use for its flavouring, as a spice in both vegetarian and non-vegetarian food preparations and has digestive properties [30]. Traditional Indian medicine claims the use of turmeric powder against biliary disorders, anorexia, coryza, cough, diabetic wounds, hepatic disorder, rheumatism and sinusitis [31].

In Hindu medicine turmeric powder has been extensively used for the treatment of sprains and swellings caused by injury [32].curcumin is the main constituent of *curcuma longa*. Curcumin is insoluble in ethanol, alkalies, ketone, acetic acid and chloroform and is insoluble in water. [33,34].

9. *MANGIFERA INDICA* L. (ANACARDIACEAE):

Mangifera indica L. aqueous extract, known as Vimang in Cuba, is used to improve the quality of life in patients suffering from elevated stress. [37] evaluated the analgesic and anti-inflammatory effects of *Mangifera indica* bark aqueous extract. Analgesia was determined using acetic acid induced abdominal constriction and formalin induced licking. Antiinflammatory effects were studied using carrageenin and formalin induced edema.

MORE NATURAL ANTI INFLAMMATORY HERBS & SPICES:

Angelica, Black Pepper, Cinnamon, Basil, Cardamon, Chives, Cilantro, Cloves, Garlic, Meadowsweet, Parsley.

CONCLUSION:

This study is undertaken medicinal plants (vetiveria zizanioides) used in the treatment of analgesic and anti-inflammatory activity in different parts of the world. The present study revealed anti-inflammatory and analgesic activity of some medicinal plants.

In conclusion, the medicinally important plant species, listed in the present paper appear to be promissory sources of anti-inflammatory and analgesic agents. The future outlook for the development of new antiinflammatory drugs derived from these medicinal plants is therefore positive and this review can help others to explore herbs to further extent and its use in various other disease and toxicity studies along with clinical trials.

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