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Medicinal plants with anti-inflammatory activity

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ABSTRACT

Inflammation is part of the body's immune response. There can be four primary indicators of inflammation: pain, redness, heat or warmth and swelling. Plants have the ability to synthesize a wide variety of phytochemical compounds as secondary metabolites which shows anti-inflammatory activity. In the present review an attempt has been made to investigate the anti-inflammatory activity of some medicinal plants.

Keywords: Medicinal Plants, Anti-inflammatory, Response.

INTRODUCTION

Inflammation is a severe response by living tissue to any kind of injury. There can be four primary indicators of inflammation: pain, redness, heat or warmth and swelling. When there is injury to any part of the human body, the arterioles in the encircling tissue dilate. This gives a raised blood circulation towards the area (redness).^[1] Inflammation is either acute or chronic inflammation. Acute inflammation may be an initial response of the body to harmful stimuli. In chronic inflammation, the inflammatory response is out of proportion resulting in damage to the body. Cyclooxygenase (COX) is the key enzymes in the synthesis of prostaglandins, prostacyclins and thromboxanes which are involved in inflammation, pain and platelet aggregation.^[2] Steroidal and non-steroidal anti-inflammatory drugs (SAIDs and NSAIDs, respectively) are currently the most widely used drugs in the treatment of acute inflammatory disorders, despite their renal and gastric negative secondary effects^[3]. These drugs block COX-1 and COX-2 enzyme activity. COX enzymes assist with prostaglandin production. NSAIDs, steroidal anti-inflammatory drugs are being used till now, As a result long term uses of these drugs cause adverse side effects and damage human biological system such as liver, gastrointestinal tract, etc. As a result of adverse side effects, like gastric lesions, cardiovascular, renal failure^[4] and gastrointestinal damage.^[5-6]

Now there is a need for the new safe, potent, nontoxic or less toxic anti-inflammatory drug. Plant medicines are great importance in the primary healthcare in many developing countries. According to World Health Organization (WHO) still about 80% of the world population rely mainly on plant-based drugs. In Ayurveda, Siddha, and Unani, utilizing a large number of medicinal plants were used for the treatment of human diseases.^[7]

Plants have the ability to synthesize a wide variety of phytochemical compounds as secondary metabolites. Many of the phytochemicals have been used to effectively treat the various ailments for mankind. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species. Most of the medicinal plant parts are used as raw drugs and they possess varied medicinal properties^[8]. Plants have a great potential for producing new drugs and used in traditional medicine to treat chronic and even infectious diseases.^[9] In the present review an attempt has been made to investigate the anti-inflammatory activity of some medicinal plants.

PLANT WITH ANTI-INFLAMMATORY ACTIVITY

Aegle marmelos (Rutaceae)

The aqueous extract of the root bark of Bilwa was prepared and tested for anti-inflammatory activity in albino rats using Carrageenan induced paw edema model and cotton pellet induced granuloma and the standard drug was taken indomethacin and Bilwa. The result revealed that anti-inflammatory activity was expressed the inhibition^[10].

Bryophyllum pinnatum (Crassulaceae)

The anti-inflammatory potential of *Bryophyllum pinnatum* was investigated by ojewole et al. The study was undertaken to investigate anti-inflammatory and of the plant leaf aqueous extract in experimental

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animal models. In this experiment using fresh egg albumin-induced pedal (paw) oedema model and drug taken Diclofenac 100 mg/kg. The results revealed of this experimental animal study suggest that *Bryophyllum pinnatum* leaf aqueous extract possessed anti-inflammatory. The different flavonoids, polyphenols chemical constituents of the herb are speculated to account for the observed antiinflammatory of the plant [11].

Albizia lebbek (Mimosaceae)

The bark extract of *Albizia lebbek* Benth obtained by cold extraction of mixture of equal proportions of petroleum ether, ethyl acetate and methanol was chosen for pharmacological screening. In rat paw edema model induced by carrageenan, the extract at the 200 and 400 mg/kg dose level showed 27.51% and 36.68% (P<0.001) inhibition of edema volume at the end of 4 h [12].

Cassia fistula (Caesalpiniaceae)

The bark extracts of *Cassia fistula* possess significant anti-inflammatory effect in the acute and chronic anti-inflammatory model of inflammation in rats. Reactive oxygen species (ROS) generated endogenously or exogenously are associated with the pathogenesis of various diseases such as atherosclerosis, diabetes, cancer, arthritis and aging process. ROS play an important role in pathogenesis of inflammatory diseases. The main constituents responsible for antiinflammatory activity of *Cassia fistula* are flavnoids and bioflavonoids [13].

Cassia occidentalis (Caesalpiniaceae)

Sreejith *et al.* was evaluated anti-inflammatory potential of whole plant of *Cassia occidentalis* using ethanolic extract. For investigation of anti-inflammatory potential dose taken 250 mg/kg and using carrageenan induced paw edema model. The result revealed that significant reduction in malondialdehyde levels of murine hepatic microsomes and significantly reduced carrageenan induced inflammation in mice at a dose of 250 mg/kg [14].

Cynodon dactylon (Poaceae)

The anti inflammatory activity of aqueous extract of *Cynodon dactylon* at different doses using carrageenan, serotonin, histamine and dextran induced rat paw edema and cotton pellet method. The study was carried out in three different doses levels of 200,400 and 600 mg/kg orally. The Aqueous extract of *C. dactylon* was found to be safe at all doses used and there is no mortality up to the dose of 4000mg/kg of extract when administered orally. *C. dactylon* showed significant anti-inflammatory activities in all model. The extract was found to reduce significantly (P<0.001) the formation of edema induced by carrageenan, serotonin, histamine and dextran after 3 and 5 h [15].

Emblica officinalis (Euphorbiaceae)

Emblica officinalis is a tree growing in subtropical and tropical parts of China, India, Indonesia and Malay peninsula. It has been used for antiinflammatory and antipyretic activities in these areas. In the recent studies, the anti-inflammatory activity was found in the water fraction of methanol extract of plant leaves. The effects of fraction were tested on the synthesis of mediators of inflammation such as leukotriene B4, platelet activating factor (PAF) and thromboxane. The water fraction of methanol extract inhibited migration of human PMNs in relatively low concentrations [16].

Hibiscus rosa-sinensis (Malvaceae)

The methanolic extract of *Hibiscus rosa-sinensis* leaves (250 and 500 mg/kg body weight orally) was used carrageenin and dextran induced

rat paw edema anti inflammatory model. Indomethacine was used as standard drug which showed significant anti-inflammatory activity. The inhibition of edema by 17.12 and 16.46% with 250 mg/kg, 45.35%, and 44.51% with 500 mg/kg body weight after 3 h with carrageenin, dextran respectively. The plant extract at the dose level of 250 and 500-mg/kg body weight by oral route exhibited significant (P<0.001) anti-inflammatory activities against all the agents used [17].

Moringa oliefera (Moringaceae)

The aqueous and ethanolic extract of the stem bark of *Moringa oliefera* showed % inhibition after 5 h was maximum 27.27 and 30.30% significant reduction P<0.01and P<0.05 in the edema volume at a dose of 300 mg/kg body weight, which is comparable to standard drug Diclofenac sodium. The standard drug showed % inhibition 44.44% (25 mg/kg) body weight and significant value P<0.01.The percentage of paw edema was found to be better with the alcoholic extract than the aqueous extract [18].

Sida cordifolia Linn. (Malvaceae)

Sida cordifolia is a perennial subshrub of the mallow family Malvaceae. *Sida cordifolia* is used in folk medicine for the treatment of inflammation of the oral mucosa, blenorrhea, asthmatic bronchitis and nasal congestion [19]. It has been investigated as an anti-inflammatory45, for preventing cell proliferation46 and for encouraging liver growth [20].



Figure 1: Some Plants have anti-inflammatory potential

Zingiber officinale (Zingiberaceae)

Shimoda *et al.* 2010 was investigated the anti-inflammatory effect of *Zingiber officinale* and prepared 40% ethanolic extract from dried red ginger and evaluated its anti-inflammatory activity using acute and chronic inflammation models. The result possessed found a potent suppressive effect on acute and chronic inflammation, and inhibition of macrophage activation seems to be involved in this anti-inflammatory effect ^[21].

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 ^[22]. This review will help the recent and future researchers in more research work on these valuable medicinal plants.

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