

**A REVIEW ON MEDICINAL PLANTS POSSESSING ANTI-INFLAMMATORY ACTIVITY**

Muhammad kifayatullah, Mohd.Shahimi Mustafa, Satheeshbabo Natrajan, Arindam Das, Mashood Ahamad Shah

Lincoln University College, Selangor, Malaysia

***Corresponding author e-mail:** kifayatpharma86@yahoo.com

ABSTRACT

Medical plants have a wide range of pharmacological activities such as anti-inflammatory, immunological, antiviral, hypoglycemic, antifungal, antihepatic, antiphlogistic cardiovascular and central nervous effect especially in developing countries where resources are meager. About 80% of the remote area populations rely on the traditional medicines for their health. In literature approximately 500 plants with medicinal use are mentioned and around 800 plants have been used in indigenous systems of medicine. Because of side effect of synthetic drugs, there is an increasing interest towards natural product remedies with a basic approach towards the nature. The inflammatory drug from plants in present clinical use and their similar mechanism of action of medicinal components are preferred mainly due to low cost and lesser side effects. A number of side effects like gastrointestinal bleeding, mucosal erosion, hepatotoxicity, renal toxicity and nephropathy are associated with the use of Anti-inflammatory drugs. Cyclooxygenase-1 enzyme is present throughout the body and their functions is to maintains the normal gastric mucosa and influencing renal blood flow and platelet aggregation and Cyclooxygenase-2 mediates inflammatory responses. Non-steroidal anti-inflammatory drugs inhibit both enzymes; inhibition of Cox2 is directly implicated in ameliorating inflammation, whereas the inhibition of cyclooxygenase - 1 causes adverse effects in the gastrointestinal tract. Meanwhile, in order to avoid from side effect, there are development and introduction of new antipyretic, analgesic and anti-inflammatory agents that compete with Non-steroidal anti-inflammatory drug. The use of natural remedies for the treatment of inflammatory and painful condition has long history starting with Ayurvedic treatment, extends to the European and other systems of traditional medicines. The present review focus on the some of the medicinal plants and their medicinal uses which have been shown experimentally. The profiles presented include information about the scientific name, family, methodology used and the degree of anti-inflammatory activity. WHO has pointed out this prevention of inflammatory diseases and its complications is not only a major challenge for the future, but essential if health for all is to attain. Therefore, in recent years, considerable attention has been directed towards identification of plants with anti-inflammatory activity that may be used for human consumption.

Keywords: Inflammation, Anti-inflammatory drugs, Medicinal plants, Carrageenan, Pharmacognosy, medicinal use

INTRODUCTION

Inflammation is a complex biological response of vascular tissues for the removal of harmful stimuli, necrotic cells and tissue. It either acts by lowering the concentration or neutralizing toxic agents, e.g. (infection, burns, toxin), that leads to accumulation of blood and plasma fluid[1]. All living organisms remove foreign importers like infectious agents and

dead tissues to survive. These functions performed by a complex host reaction, known as inflammation[2]. Leukocytes and chemicals released in normal process of inflammation protect the body against injuries and foreign substances[3]. Although inflammation is a defense mechanism of curing wounds, removing dead tissues, but also induces, maintain and aggravate many disorders([1]. Inflammation may be acute or chronic depends upon

the inflammatory mediators, acute type occurs immediately after injury and delivers plasma proteins and leukocytes to the site of injured tissues characterized by redness, swelling, local pain and loss of functions while chronic type of inflammation develops if initiating factor is not removed completely and characterized by presence of mononuclear cell (lymphocytes, plasma cell, macrophages), leading to replacement of Neutrophils by T cells and macrophages resulting in necrosis and tissues fibrosis [4].

Inflammation processes can be categorized into four distinct groups:

- (1) Changes in the blood flow supply to the affected area cause changes in smooth muscles cell function causing vasodilatation.
- (2) Contraction of cytoskeleton in endothelial cells causing alterations in vascular permeability engendered.
- (3) Passage of phagocytic leukocytes from capillary vessels into the surrounding interstitial spaces to the site of injury or inflammation.
- (4) Phagocytosis [5].

The word Inflammation is derived from Latin word "inflammare" means burn. In earlier study, inflammation was consider as a single disease that causes disturbance of the body fluids but according to modern concept inflammation occurs from several disturbances and diseases[6]. A group of polypeptides called cytokines mediates inflammatory activities[7]. Inflammatory cytokines (IL-1, IL-6, TNF α , IL-8, chemokines etc) has two types, one involved in development of acute and other responsible for chronic inflammation [8]. Inflammatory symptoms are characterized by pain, redness, heat, swelling and loss of functions, result from, the dilation of the blood vessels, increase blood supply and increased intercellular spaces, resulting in the movement of protein, leukocytes and fluids into the inflamed area[9]. Various evidences provide the role of pro-inflammatory cytokines (interleukin-6, interleukin 1- β and tumor necrosis factors α) in the facilitation of inflammation as well as neuropathic pain and hyperalgesia[10]. Increase uptake of oxygen by neutrophils causes engulfment of bacteria and foreign particles, produces reactive oxygen species (ROS), activating transcription factors and nuclear factors kappa which regulates of cytokines that initiate the process of inflammation [9]. Mast cells contain endogenous mediators like serotonin, heparin, histamine, prostaglandin and bradykinin produces inflammation in response to infection and injury. Allergen in lungs activates IgE which can mediate mast cells releases histamine, bradykinin, that attacks inflammatory cells, permeating the airway wall and result in asthma.[11].

Most chronic illness likes diabetes, cancer, pulmonary and cardiovascular diseases are mediated through chronic inflammation [12]. Several endogenous substances, including interleukin 1 β , interleukin 6, interleukin 8, tumor necrosis factors α , macrophage and prostaglandin are responsible for the development of fever and inflammation[13]. The cytokines (interleukin 1 β , interleukin 6, interleukin 8, TNF α), are pro inflammatory mediators, enhances the PGE2 synthesis in pre optic hypothalamus area, which in turn elevates body temperature and inflammation[14]. Cyclooxygenase (COX) also known as prostaglandin (PG) H synthetase, catalyzes the conversion of Arachidonic acid into prostaglandin H2 [15]. The common therapy for management and control of fever and inflammation are NSAIDs. Non-steroidal anti-inflammatory drugs are the class of compounds that are widely valued for pain killing, antipyretic and inflammation properties[16]. They are used for relief of inflammation, headache, anti-arthritis pain, heart attacks and stroke[17]. Non-steroidal anti-inflammatory drugs also inhibit prostaglandin and its derivatives produced through cyclooxygenase enzyme that cause inflammation, fever, pain and related diseases[18]. Cyclooxygenase play an important role in converting Arachidonic acid into prostaglandins (PGs) and thromboxane [19]. The use of NSAIDs is associated with a number of side effects like gastrointestinal bleeding, mucosal erosion, hepatotoxicity, renal toxicity and nephropathy[20]. Two types of cyclooxygenase, COX-1, present throughout the body and performs a number of homeostatic functions such as maintaining normal gastric mucosa and influencing renal blood flow and platelet aggregation and Cox2 mediates inflammatory responses[21]. Non-steroidal anti-inflammatory drugs inhibit both enzymes; inhibition of Cox2 is directly implicated in ameliorating inflammation, whereas the inhibition of cyclooxygenase-1 causes adverse effects in the gastrointestinal tract[22]. Meanwhile, in order to avoid from side effect, there are development and introduction of new antipyretic, analgesic and anti-inflammatory agents that compete with NSAIDs. The use of natural remedies for the treatment of inflammatory and painful condition has long history starting with Ayurvedic treatment, extends to the European and other systems of traditional medicines. Plant drugs are known to play a vital role in the management of inflammatory diseases. Approximately, 250,000-500,000 species of plants are present. Only 1% are studied phytochemically, which shows that there is great potential for discovering new compounds. Various compounds such as carbohydrates, terpenoids, enzymes, fats, proteins, oils, minerals, alkaloids, quinones, vitamins,

flavonoids, carotenoids, sterols, simple phenolic glycosides, tannins, and saponins are derived from plants [23]. Research on plants continues on identification and isolation of active ingredients, rather than to study medicinal properties of whole plant. In addition to active constituents, plants also contain minerals, vitamins, volatile oils, glycosides, alkaloids, bioflavonoids. Substances that are isolated from medicinal plants are used for heart diseases such as angina pectoris, hypertension, asthma, pain, and other human health-related problems. Therefore, the current review was designed to focus on the currently available medicinal plants possessing anti-inflammatory activity.

MEDICINAL PLANTS POSSESSING ANTI-INFLAMMATORY ACTIVITY

Malvaparviflora Linn: *Malvaparviflora Linn* is a prostrate perennial herb belonging to the family of Malvaceae, with deep strong tap root system. The plant is native to Europe, but also distributed throughout South Africa, India, Malaysia and Namibia. Intra peritoneal administration of *Malvaparviflora* extract at the doses of 100 and 200 mg/body weight significantly reduced the rats paw edema induced by carrageenan injection. The reduction in edema was (67%) at the dose of 100 mg/kg at 2 h after carrageenan injection while the plant extract after 1hr injection of carrageenan at the dose 200 mg/kg showed a significant reduction in edema 97% compared with control[24].

Anogeissus acuminata: *Anogeissus acuminata* is a moderate size tree. The leaves are small which falls earlier on the dry season. The plant grows mostly in Arabian Peninsula and South Africa. Oral administration of *Anogeissus acuminata* extract in rat at the doses of 200 and 400 mg/kg body weight produced a significant ($p \leq 0.01$) reduction in paw edema induced by carrageenan. The plant extract at the dose of 200 mg/kg produced 66.67% reduction in rat paw edema; while the extract at the dose of 400 mg/kg dose produced reduction in edema was 77.78%[25].

Cayratiapedata Lam: *Cayratiapedata Lam* is a climber tree belong to the Family of Vitaceae and usually grows in shrubberies of India, Ceylon, Andaman Islands and Malaya. Intraperitoneal administration of *Cayratiapedata Lam* in different solvents extract at different doses produced significant anti-inflammatory effect. In chloroform extract at the dose of 200mg/kg produced significant ($P < 0.01$) anti-inflammatory activity after 2 hour. The inhibition in paw edema was 90% and at the dose of 400mg/kg the

anti-inflammatory effect was 80% ($P < 0.01$) respectively. Similarly, in Alcoholic extract at the dose of 200mg/kg produced significant anti-inflammatory activity i.e. 90% ($P < 0.001$) and in Aqueous extract at the dose of 200mg and 400mg/kg, the anti-inflammatory activity was 60% ($P < 0.01$) and 70% ($P < 0.01$) respectively after 2 hour[26].

Sarcostemma camorone (L) Bennet: *Sarcostemma camorone (L) Bennet* is a medicinal plant belongs to the family of Asclepiadaceae. The plant is traditionally used as a gargle for the treatment of throat and mouth infection. The roots possess anti diabetic activity. Oral administration plant extract at the doses of 100mg/kg and 200mg/kg significantly reduced the rat paw swelling induced by carrageenan, when compared to control. The %age of inhibition of paw volume with *Sarcostemma camorone* extract at the dose of 100mg/kg was 71.98% and for dose 200mg/kg was 77.95% after 3 hours of carrageenan injection. The result showed that plant extract of *Sarcostemma camorone (L) Bennet* possess a significant ($P < 0.01$; $P < 0.001$) anti-inflammatory activity [27].

Viola betonicifolia: *Viola betonicifolia* belongs to family of Violaceae. The plant is naturally found in various countries of the world like India, Nepal, Pakistan and Srilanka. Intraperitoneal administration of *VBME* at the dose of 100, 200 and 300mg/kg produced a significant $*P < 0.05$, $**P < 0.01$ anti-inflammatory effect induced by carrageenan and histamine. The reduction in paw edema at the dose of 300mg/kg was 60.880%. after 2 hour when compared to control [28].

Teucrium chamaedrys: *Teucrium chamaedrys* is a Mediterranean flowering plant belongs to the family of Lamiaceae. The plant extract at different doses produced a significant reduction in rat paw swelling induced by 0.1% carrageenan. It was found that the plant extract at the dose of 100mg/kg produced significant reduction in paw swelling ($P = 0.044$), 200 mg/kg ($P = 0.009$) and 250 mg/kg ($P = 0.0007$) compare to the control[29].

Landolphia owariensis: *Landolphia owariensis* belong to the family of Apocynaceae commonly called vine rubber. The plant is widely used for the treatment of many diseases. The result showed that plant extract at the dose of 100mg/kg in aqueous, methanol and chloroform extracts produced significant ($P < 0.05$) anti-inflammatory effect induced by carrageenan hind paw edema. The reduction in edema was highest when compared to standard [30].

***Desmostachyabipinnata* Stapf:** *Desmostachyabipinnata* Stapf is an erect, tall tree belongs to the family of Poaceae. The plant mostly found in sandy areas of India. Oral administration of *Desmostachyabipinnata* Stapf extract at the dose of 300 mg/kg produced a significant inhibition ($p < 0.05$) in rat paw edema induced by carrageenan. The maximum inhibition was shown by the ethanol extract at the dose of 300 mg/kg was 53.84% which was more than the standard drug 32.30%. [31].

***Eclipta prostrata*:** *Eclipta prostrata* is a common plant belongs to the family of Asteraceae. The plant is found in all hilly area of India and Asia. Intra peritoneal administration of methanolic extract of *Eclipta prostrata* at the dose of 100 mg/kg and 200 mg/kg produced a significant $p < 0.01$, $p < 0.001$ anti-inflammatory effect induced by Carrageenan and egg white hind paw edema methods. The result showed that methanolic extract of *Eclipta prostrata* at the dose of 100 mg/kg produced 34.02% reduction in edema and at the dose of 200 mg/kg showed 38.80% inhibition of edema respectively in carrageenan induced hind paw edema method when compared to control. Similarly the methanolic extract at the dose of 100 and 200 mg/kg produced reduction in edema 35.05% and 38.23% induced by Egg white hind paw edema method [32].

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CONCLUSION

In conclusion, this paper has reviewed the list of medicinal plant that possesses anti-inflammatory activity. The preliminary analysis showed the presence of phenols, flavonoids, alkaloids, saponins, tannins and terpenoids in plants and the pharmacological activity of the plant extract may be due to presence of these phytochemicals. Many new bioactive drugs isolated from plants having anti-inflammatory effects and sometime possess potent anti-inflammatory activity than known Anti-inflammatory drugs such as Aspirin, mefenamic acid etc. However, many other active agents obtained from plants have not been well characterized. More investigations must be carried out to evaluate the mechanism of action of medicinal plants with anti-inflammatory effect. The toxic effect of these plants should also be elucidated. These efforts may provide treatment for all and justify the role of novel traditional medicinal plants having anti-inflammatory potentials.

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