



## A REVIEW ON ANTI-INFLAMMATORY ACTIVITY SHOWS BY PLANTS EXTRACTS

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### ABSTRACT

Inflammation is essential immune response of body during the infection or injury and it maintain the homeostasis of tissue also it is commonly known as host defense mechanism. Inflammation has an important role in various diseases with high prevalence within populations such as rheumatoid arthritis, atherosclerosis and asthma. Herbal plant are use as source of human ailments such as *Psidium guajava* (Myrtaceae), *Carum copticum*. Linn. (Umbelliferae), *Eugenia caryophyllata* its essential oil mainly shows good anti-inflammatory activity .The environmental factors such as heat, cigarette smoke and foreign bodies, acid causes the inflammatory disorders gastritis, esophagitis etc. The review summarizes some of the herbal plant extract possessing anti-inflammatory activity.

**KEYWORDS:** Anti-inflammatory activity, *Psidium guajava* ethanolic extract, *Carum copticum*, ethanolic extract of *ginger*(*Zingiber officinale*), *Azardirachta indica*, *piper ovatum*.

### INTRODUCTION

Inflammation is a defense response of our body to hazardous stimuli such as allergens and/or injury to the tissues; on the other hand, uncontrolled inflammatory response is the main cause of a vast continuum of disorders including allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases imposing a huge economic burden on individuals and consequently on the society.

Plant extract is widely used for treatment or diagnosis of diseases. Plant extracts are the massive source of medicines. Herbal and natural products are recently used for human ailments because of their beneficial biological and pharmacological activities. *Psidium guajava* L. (Myrtaceae), commonly known as guava, has long been used in traditional as a therapeutic agent for the treatment of various diseases in Asia. The ethanol leaf extract of Guava and also *carum copticum* popularly known as *ajowan* ethanolic extract shows better anti-inflammatory activity. Guava leaf extract (GLE) significantly inhibited lipopolysaccharide (LPS)-induced production of nitric oxide and prostaglandin E<sub>2</sub> in a dose-dependent manner. GLE suppressed the expression and activity of both inducible nitric oxide synthase and cyclooxygenase-2 in part through the down regulation of ERK1/2 activation in RAW264.7 macrophages. Furthermore, GLE exhibited significant anti-inflammatory activity in 2 different animal models—Freund's complete adjuvant-induced hyperalgesia in the rat and LPS-induced endotoxic shock in mice.

Clove distillate by steam distillation process gives a colourless or light yellowish essential oil possesses anti-inflammatory activity. The main constituents are eugenol (80-90%),  $\beta$ -caryophyllene (9%), eugenyl acetate (7%). Ginger also shows good anti-inflammatory activity active constituents present are gingerol, shogaol which inhibit synthesis of pro-inflammatory cytokines such as IL-1, TNF- $\alpha$ , and IL-8. Also the ginger rhizomes inhibit the allergic reactions and so it may be useful for treatment and prevention of allergic diseases.

### Types of inflammation

**Acute inflammation** - Acute inflammation usually has become 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 and plasma proteins and the migration of leukocytes, most importantly neutrophils into the injured area. This acute inflammatory response is useful as the defense mechanism aimed at killing of bacteria, virus and parasites while still facilitating wound repairs.

**The 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.<sup>[1]</sup> 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.<sup>[2]</sup> All of which are associated with immune pathological that appears to play a key role in the onset of the condition.<sup>[3]</sup>

### Medicinal plants possessing Anti-inflammatory Activity

#### *Curcuma longa*

*Curcuma longa* (common name is Turmeric in English). The most important secondary metabolite of *C. longa* is curcumin, which is responsible for anti-inflammatory effect of this plant.<sup>[4]</sup> Many clinical trials have been done for proving the antiinflammatory effect of curcumin. Their results suggest that curcumin can be effective in improvnflammation of rheumatoid arthritis (RA) and reducing clinical manifestation of RA, such as joint swelling and morning stiffness in comparison with phenylbutazone which is used as a positive control.<sup>[5]</sup> Also, curcumin was tested in patients with anterior uveitis; after 2 weeks, exhaustive remission occurred.<sup>[6]</sup> The effectiveness of curcumin in patients with dyspepsia and/or gastric ulcer was proved by another clinical trial. In this study, subjects experienced remission after 12 weeks (maximum).<sup>[7]</sup> Curcumin is beneficial in irritable bowel syndrome (IBS) treatment.<sup>[8]</sup> and also works as a reducing agent to delayed graft rejection (DGR) after kidney transplant surgery.<sup>[9]</sup> Curcumin likewise has a beneficial effect in inhibition of inflammatory bowel disease (IBD) and reduction in sedimentation rate in patients who suffered from IBD.<sup>[10]</sup> It is also proven to be beneficial in maintaining amelioration of ulcerative colitis.<sup>[11]</sup> and psoriasis (by the selective prohibition of phosphorylase kinase).



Figure 1: *Curcuma longa*.

***Psidium guajava***

The dried guava leaves extracted with ethanol i.e. 400ml of 55% ethanol (v/v) at 47°C for the 4.9 hours. Then extracted solution was filtered and evaporated. Extract was freeze dried to obtain powder. That extracted powder shows the anti-inflammatory activity. The extracts were administered at a dose of 300 mg/kg, p.o. Aspirin (300 mg/kg, p.o.) was employed as the reference drug. *Psidium guajava* leaves, showed significant anti-inflammatory activity with percentage inhibitions of 58.27%.<sup>[12]</sup>



**Figure 2: *Psidium guajava*.**

***Carum copticum***

The 500gm *carum copticum* was soaked in 750 ml of 95% ethanol for 15 days. The clear extract obtained after filtration and then concentrated in water bath maintained at 55°C to obtain a semisolid mass. Dried it at room temperature then powder form shows anti-inflammatory activity.<sup>[13]</sup>



**Figure 3: *Carum copticum*.**

**Ginger extract**

Preparation of ginger powder –The ginger extracted with the ethyl ether by percolation method below the 45°C. Then removed solvent concentrated with polyvinylpyrrolidone (PVP) and stirred well. After these concentrates extract vacuum dried below 45°C to get paste which shows the anti-inflammatory activity.<sup>[14]</sup>



**Figure 4: Ginger.**

***Piper ovatum***

The leaves of *piper ovatum* hydroalcoholic extract shows the great inhibitory activity of topical inflammation induced by croton oil.<sup>[15]</sup>



**Figure 5: *Piper ovatum*.**

***Azardirachta indica***

The *Azardirachta indica* was extracted with carbon tetrachloride. These extracted the azadiradione which treated with the 100mg kg<sup>-1</sup> (dose of carbon tetra chloride extract) which exhibit the anti-nociceptive and anti-inflammatory activities. The *Azardirachta indica* the methanol, butanol and ether fractions extract shows the good anti-inflammatory activity.<sup>[16]</sup>





**Figure 6: *Azadirachta indica*.**

***Teucrium buxifolium* Schreber**

*Teucrium buxifolium* Schreber (Lamiaceae) The aerial parts of *T. buxifolium*, have traditionally been used for the treatment of rheumatic and other inflammatory effects in the Mediterranean region. Also reported is the anti-inflammatory activity of the hexane and methanolic extracts against adjuvantcarrageenan-induced inflammation.



**Figure 7: *Teucrium buxifolium* Schreber.**

***Turner ulmifolia* L. (Turneraceae)**

*T. ulmifolia* also known as “Chanana” is a weed widely distributed in Brazil. Some *Turnera* species are employed for the treatment of inflammatory diseases in traditional medicine.<sup>[19]</sup> Among these species, *T. ulmifolia* is widely used as an anti-inflammatory agent. The hydroalcoholic extract of *T. ulmifolia* and the ethylacetate, aqueous and ethanol fractions

have been reported to exhibit anti-inflammatory effect in acute edema induced by carrageenan.<sup>[20]</sup>



**Figure 8: *Turner ulmifolia* L.**

### ***Moringa oleifera* Lam**

*Moringa oleifera* Lam (*Moringaceae*) *M. oleifera* grows on sandy soil to a small or medium-sized tree and is commonly planted as fence tree. In India, it is cultivated mainly for its fruit, which is used in curries and its leaves, which substitute as fodder for cattle. The leaves and young buds are used as vegetable in soup and rubbed on the temples to relieve headache. The root bark are regarded as antiscorbutic and are used externally as counter irritants. A poultice of the root mixed with salt is effective against inflammatory swellings. The methanol root extract inhibited carrageenan induced paw edema in rats.<sup>[21]</sup>



**Figure 9: *Moringa oleifera* Lam.**

**Table1: Plants extracts and their effect on inflammation.**

Sr. No.	Plant species	Main Effect on inflammation
1.	<i>Solanum lycocarpum</i> A. St. Hil.	A significant reduction in paw edema which was similar to that seen under treatment with indomethacin. <sup>[22]</sup>
2.	<i>Azadirachta indica</i> , <i>Acacia catechu</i> , <i>Salmalia malabarica</i> (terpenoids were extracted)	A significant dose-dependent reduction in NO levels; a decrease in leukocytes count. <sup>[23]</sup>
3.	<i>Rosmarinus officinalis</i> L	A significant dose-dependent decrease in nitrites, IL-6 and TNF- $\alpha$ levels; a significant reduction in COX-2 and iNOS expression; a significant decline in NF $\kappa$ B activity, among other inflammatory markers that were attenuated. <sup>[24]</sup>
4.	<i>Picrorhiza kurroa</i>	A significant reduction in synovial expression of IL-1 $\beta$ , IL-6 and TNF- $\alpha$ ; a significant decrease in paw edema; a significant decline in NO levels and leukocytes infiltration to the inflamed joints; all the effects were comparable to those of indomethacin. <sup>[25]</sup>
5.	<i>Ceratonia siliqua</i> L.	A significant dose-dependent reduction in paw edema which was similar to that seen under treatment with indomethacin. <sup>[26]</sup>

## DISCUSSION

The herbal plants show the anti-inflammatory activity which mainly with lesser the side effect compare to that of allopathic ingredients. The herbal drugs are much safer. These anti-inflammatory plants have demonstrated effect in acute and chronic inflammation in experimental animal models. The effect of these various families 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. inflammation as well as allergic conditions.

Anti-inflammatory effect of eugena caryophyta was thought to be due to COX-2 inhibition.<sup>[27]</sup> Analgesic effect of the eugenol may imply anti-inflammatory effect. Anti-inflammatory effect of ginger, it can reduce muscle pain after intense physical activity. Likewise, the anticancer potential of ginger is well documented and its functional ingredients like gingerols, shogaol, and paradols are the valuable ingredients which can prevent various cancers, angiogenesis and metastasis, induction of apoptosis, and inhibition of cell-cycle progression. The azardirachta indica in many of formulations use as anti-allergic agent and anti-inflammatory agent.<sup>[28,29,30]</sup>



## CONCLUSION

Efficacy of the herbal drugs in treatment of inflammatory disease conditions in animal studies as well in human has been well-documented, these plants have continued to serve as alternative and complementary therapies. Mounting experimental evidence has continued to lend acceptance to this fact and to establish rationale for the ethno medicinal use. In addition, these medicinal plants will continue to serve as reservoir for development of potent drugs with less serious and life-threatening adverse effects. Thus this present review shows that the plants possess anti-inflammatory activity and have no adverse effect.

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