



ANTI-INFLAMMATORY ACTIVITY OF SOME MEDICINAL PLANTS FROM KARAWANG, WEST JAVA, INDONESIA – A REVIEW

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ABSTRACT

Numerous nonsteroidal anti-inflammatory drugs reduce pain and inflammation by inhibiting the cyclooxygenase enzyme isoforms' metabolism of arachidonic acid, thereby reducing prostaglandin production. Regrettably, administering nonsteroidal anti-inflammatory drugs often results in a multitude of adverse effects. At present, scholars are commencing the search for novel anti-inflammatory compound candidates derived from naturally occurring substances that have demonstrated anti-inflammatory properties through empirical evidence. Researchers are replacing anti-inflammatory medications, which currently show numerous hazardous adverse effects, with this approach. Scientists have validated a number of medicinal plants indigenous to Karawang, Indonesia, including *Apium graveolens*, *Kaempferia galanga*, *Andrographis paniculata*, *Psidium guajava*, *Moringa oleifera*, *Aloe vera*, and *Mangifera indica* as possessing anti-inflammatory properties via distinct mechanisms. Therefore, this review article is aimed to discuss the potential of several medicinal plants native to Karawang, Indonesia which have anti-inflammatory effects.

KEYWORDS: Anti-inflammatory, Medicinal plants, *Apium graveolens*, *Kaempferia galanga*, *Andrographis paniculata*, *Psidium guajava*, *Moringa oleifera*, *Aloe vera*, *Mangifera indica*.

INTRODUCTION

Inflammation is a physiological reaction that is typically initiated by bacterial, viral, or fungal infections, physical agents, compromised immune systems, or damage to living tissue. Localizing and eliminating harmful agents is the primary objective of the inflammatory response, as is removing damaged tissue components to promote tissue, organ, or systemic healing.^[1,3] The acute inflammatory state is initiated, progresses, persists, is regulated, and ultimately resolves due to the secretion of various mediators by macrophages and neutrophils that comprise the inflammatory response. A number of anti-inflammatory mediators and the recruitment of monocytes to eliminate cell or tissue debris impact the resolution of inflammation. Resolution during the acute phase may not transpire, resulting in the development of a chronic phase.^[3,4] By inhibiting prostaglandin production and inhibiting the metabolism of arachidonic acid by cyclooxygenase enzyme isoforms (COX-1 and/or COX-2), numerous nonsteroidal anti-inflammatory drugs can alleviate pain and inflammation. Unfortunately, the administration of nonsteroidal anti-inflammatory drugs is accompanied by a multitude of adverse effects.^[5]

Nevertheless, certain botanical species possess anti-inflammatory properties and exhibit minimal to nonexistent adverse effects.^[6,8]

Indonesia boasts the second-most extensive forest biodiversity of any country globally, encompassing a staggering 28,000 plant species, of which 2,500 are classified as medicinal plants.^[9,11] Presently, ongoing investigations aim to discover novel anti-inflammatory medications sourced from natural components. One such approach is the examination of active compounds present in medicinal plants, which have historically been employed by local populations in different regions of Indonesia, particularly in Karawang.^[12,14] The objective is to identify novel anti-inflammatory compounds characterized by minimal toxicity and mild side effects so as to prevent patient harm.^[15,17] Therefore, this review article is aimed to discuss the potential of several medicinal plants native to Karawang, Indonesia which have anti-inflammatory effects.

Apium graveolens

Apium graveolens is a plant belonging to the *Umbelliferae* family. *A. graveolens* seeds contain various substances, such as essential oils, flavonoids, coumarin, and linoleic acid. *A. graveolens* seeds have long been used to treat arthritis, gout, and help reduce muscle spasms, calm nerves, and reduce inflammation.^[18,20] Oral administration of *A. graveolens* at doses of 100 and 200 mg/kg/day for 8 days was reported to significantly reduce levels of TNF- α and IL-1 β in mice induced by acetaminophen.^[21]

Kaempferia galanga

Kaempferia galanga is an herbal plant known for its rhizomes, which are used in traditional medicine and as a cooking spice. This plant has green leaves and flowers that grow above the ground. The rhizome of *K. galanga* has a fragrant aroma and is used in various traditional medicines because it is reported to have anti-inflammatory, antimicrobial, and antioxidant properties.^[22,23] Researchers reported that oral administration of *K. galanga* at doses of 100 and 200 mg/kg/day reduced carrageenan-induced hind paw edema in rats.^[24] In addition, clinical testing using the double-blind randomized clinical trial method reported that administration of *K. galanga* extract at 160 mg/day for 10 days in patients with knee osteoarthritis showed a reduction in pain scores, joint stiffness, and improved knee function.^[25] The anti-inflammatory effect of *K. galanga* is due to its ability to inhibit the synthesis of cyclooxygenase (COX) and also inhibit several inflammatory mediators such as TNF- α , IL-1 β , and nitric oxide.^[26]

Andrographis paniculata

Andrographis paniculata, known as Sambiloto, is a medicinal plant that is empirically used as a medicine for respiratory diseases, diabetes, cancer, obesity, skin infections, herpes, dysentery, fever, sore throat, urinary tract infections, diarrhea, and to reduce inflammation.^[27,28] Oral administration of *A. paniculata* at doses of 100 and 300 mg/kg/day for 24 days was reported to significantly reduce the levels of TNF- α , IL-1 β , and IL-6 in monosodium iodoacetate-induced osteoarthritis mice.^[29]

Psidium guajava

Psidium guajava, usually known as *guava*, is a medicinal plant that has been used traditionally for a long time in tropical countries, including Indonesia. *P. guajava* is a plant belonging to the *Myrtaceae* family that can be used as an anti-inflammatory, analgesic, antidiabetic, antihypertensive, antimicrobial, antioxidant, antibacterial, and antitumor drug.^[30-32] Intraperitoneal administration of *P. guajava* at a dose of 50 to 800 mg/kg/day was reported to significantly inhibit acute inflammation in rat leg edema induced by fresh egg albumin.^[33]

Moringa oleifera

Moringa oleifera is a plant belonging to the *Moringaceae* family that is traditionally used as antiasthma, antidiabetic, hepatoprotective, anti-inflammatory, antifertility, anticancer, antimicrobial, antioxidant, cardiovascular, antiulcer, central nervous system activity, anti-allergy, wound healing, analgesic, and antipyretic.^[34, 35] Administration of *M. oleifera* at doses of 50, 100, and 200 mg/kg orally for 5 days was reported to reduce the severity, area, and index of ulcers as well as the severity and extent of inflammation of the intestinal mucosa in mice in an acute model of acetic acid-induced colitis.^[36]

Aloe vera

Aloe vera has long been used as a traditional medicine to speed up wound healing. The benefits associated with aloe vera are attributed to the polysaccharides contained in the gel of its leaves, although there are various indications for its use. Its biological activities include improving wound healing, antifungal, anti-inflammatory, anticancer, and immunomodulatory activities.^[37] Oral administration of *A. vera* at doses of 100, 200, and 400 mg/kg was reported to significantly inhibit acute inflammation in rat paw edema induced by carrageenan, as well as reducing neutrophil migration and inhibiting prostaglandin production.^[38,39]

Mangifera indica

Mangifera indica, also known as mango, is one of the most popular tropical fruits. The content of mangiferin, polyphenols, and glucosyl xanthenes in this plant has effects such as strong antioxidant, anti-lipid peroxidation, immunomodulation, cardioprotective, hypotensive, wound healing, anti-degenerative, and antidiabetic activity. Meanwhile, various parts of this plant are often used as dental medicine, antiseptic, astringent, laxative, diuretic, anti-diarrhea, anemia, asthma, bronchitis, cough, hypertension, insomnia, rheumatism, toothache, vaginal discharge, bleeding, and hemorrhoids.^[40] Oral administration of *M. indica* at a dose of 10 mg/kg was reported to reduce joint inflammation and reduce infiltration and activation of leukocytes, as well as the expression of various proinflammatory cytokines in inflamed tissue in a mouse model of gouty arthritis induced by monosodium urate crystals.^[41]

CONCLUSION

Indonesia is home to a diverse array of medicinal plants that possess promising attributes that could be harnessed to formulate alternative anti-inflammatory medications. It has been empirically and scientifically demonstrated that each of these plants inhibits the inflammatory response. The presence of active compounds in these plants, which possess anti-inflammatory properties through various mechanisms of action, renders this impossible to separate. There is optimism regarding the potential of medicinal plant research to advance the treatment of inflammation and serve as a substitute for

anti-inflammatory drugs, which presently exhibit numerous hazardous side effects.

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