INTRODUCTION

*Alpinia galanga* is a species of ginger that occur in tropical Asia. The richest area is the Southern Asian region, a floristically distinct region that includes Malaysia, Indonesia, Brunei, Singapore and Philippines [1]. *Alpinia galanga* belongs to Kingdom of Plantae, Order of Zingiberales, Family of Zingiberaceae, Genus of Alpinia and Species of *Alpinia galanga*. The common names for *A. galanga* is Greater galangal in English, Lengkuas in Malay, Hong doukou in Chinese, Arattai in Tamil and Kha in Thai.

*Alpinia galanga* bears underground stems called rhizomes which have strong aromatic smell with conspicuously nodes and internodes [2]. The branches are out into different pieces, each of which is from 1 1/2 to 3 inches in length, and seldom more than 3/4 inch thick. Each piece of the rhizome is usually cylindrical in shape, and these are often cut while in a fresh state, each piece of the rhizome is marked at short intervals by the presence of a narrow and whitish color body, which gives rise to raised rings, the legacy of scars produced by former scaly leaves growing along the rhizome.

The rhizomes are characterized externally by a dark reddish-brown color, and cuttings of the inner rhizome are characterized by the presence of a dark center surrounded by a wider and paler layer on the outer rim, that also darkens considerably when the rhizome is dried during processing. The rhizomes of galanga have a strong aromatic odor, and a spicy or pungent taste [3].

Previous review has been done on pharmacological activity of *A. galanga* from its stem up to its bark. This review combines the idea from various current studies which has been done on *A. galanga* and provides a better understanding of its pharmacology and non-pharmacological activity including insecticidal activity (Figure 1).
ACTIVE COMPOUNDS

Active compounds from the various parts *A. galanga* were widely studied by many researchers. Many active compounds were successfully isolated and identified by previous researchers. The major active compounds found in *A. galanga* are 1,8-cineol, α-fenchyl acetate, β-farnesene, β-bisabolene, α-bergamotene, β-pinene and 1′-acetoxychavicol acetate. 1, 8-cineole known as marker compound for Alpinia spp and was reported as most abundant compound in most of the studies on *A. galanga*[^4]. Chemical structures of some major compounds are given in [Figure 2].

![Chemical structures of some major compounds from *Alpinia galanga*](image)

[Figure 2. Chemical structures of some major compounds from *Alpinia galanga*](image)
Pharmacology Activity

Antimicrobial

Alpinia galanga poses antimicrobial activity against various bacteria and fungi. Essential oil from fresh rhizomes of A. galanga exhibits an antimicrobial activity against Trichophyton mentagrophytes [5]. Similarly, the ether extract of A. galanga are more potent than ethyl acetate in antibacterial activity and significantly effective on Staphylococcus aureus and Klebsiella pneumonia [6]. 1,8-Cineole from the ethanolic extract of Alpinia galanga was discovered to have antibacterial activity against Staphylococcus aureus. The antimicrobial activity is due to composition of 1,8-cineole, 4-allylphenyl acetate and a-bisabolene [7].

Alpinia galanga also been studied and found to be inhibit a wide range of human pathogenic fungi, zoonotic dermatophytes and yeast-like Candida albicans. The ethanolic extracts pose fungicidal activity against Trichophyton longii, Fusarium oxysporum, Trichophyton mentagrophytes, Trichophyton rubrum, Trichophyton concentricum, Rhizopus stolonifer and Aspergillus niger [8].

Antitumor

Alpinia galanga was found to cause antitumor activity. Active compounds from A. galanga such as 1′-acetoxychavicol acetate and 1′-acetoxyeugenol acetate were isolated as antitumour principles against Sarcoma 180 ascites in mice [9]. The high dose of methanolic extract of A. galanga treated albino mice showed no estrogenic activity rather showed decrease uterine wet weight as well as morphologically constricted uterine horns which clearly suggests anti-estrogenic activity [10]. Two isolated compounds from the rhizomes A. galanga, 1,7-bis (4-hydroxyphenyl)-1,4,6-heptatrien-3-one (BHPHTO) and bisdemethoxycurcumin (BDMC) were examined for their bioeffectiveness on the human melanoma A2058 and showed that significantly inhibited the proliferation of melanoma cells in the cell viability assay. The research was also taken on the tests to B16-F10 cell line and showed minor inhibitory consequences of cellular tyrosinase activities and melanin contents [11].

Antiiulcer

The effect of A. galanga ethanolic extract has been studied on experimentally induced gastric ulcers in rats and the findings suggest that a significant antisecretory and cytoprotective action of A. galanga may be responsible for its antiulcer activity [12].

Antiallergic

Alpinia galanga was found to be effective in treatment of allergy and the isolated compounds which extract inhibit the release of antigen IgE mediated in passive cutaneous anaphylaxis reactions in mice [1].

Antioxidant

Ethanolic extracts obtained from Holy basil (Ocimum sanctum Linn) and Galangal (Alpiniagalanga) showed strong antioxidant activity, acts as radical scavenger and also as lipoxygenase inhibitor [13]. Mahae and Chaiseri, studied antioxidant activities and antioxidative components in extracts of A. galanga. They reported 50% ethanol in water has antioxidant activity when compare with two other samples based on a water extract and the essential oil which determined using the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and oxygen radical absorbance capacity (ORAC) methods. The ethanolic extracts showed the highest DPPH free radical scavenging ability as well as the highest ORAC value when compared to the water extract and the essential oil [14].

Anti inflammatory

Alpinia galanga have anti-inflammatory and analgesic effects towards rheumatic condition. It acts as therapeutical agent for treating inflammatory immune disorders and induced paw inflammation and granuloma weight. Furthermore, it shows drastic significant effect on reducing symptoms of osteoarthritis [8]. Phitak et al., reported the effects of p-hydroxycinnamaldehyde from A. galanga aceton extracts on human chondrocytes, Osteoarthritis (OA) is the most common form of arthritis and affects millions of people worldwide and patients have traditionally been treated with non-steroidal anti-inflammatory drugs (NSAIDs), but these are associated with significant side effects [15].

Anticancer

The active compound, 1′S′-1′-acetoxychavicol acetate were found to provide inhibition of the growth of oral squamous cell carcinoma in in-vitro or in-vivo besides potentiating the effect of synthetic drug, cisplatin [16]. Batra et al., reported that 1′-acetoxychavicol acetate inhibits the NF-kB activation and demonstrates the suppression on the generation of tumor in the mice [17].

OTHER PHARMACOLOGICAL ACTIVITY

Alpinia galanga also been studied by several authors for other pharmacological purposes including stomachache [18]. A. galanga has been used as a medicine for curing stomach aches in China and Thailand [19]. Methanolic extract of A. galanga showed potent inhibitory activity against human immunodeficiency virus type-1 (HIV-1) and human cytomegalovirus (HCMV) [20].
The ethanolic extract of *A. galanga* is reported to possess hypolipidemic activity. A dose of 20 mg/day of the extract was given for the period of 4 weeks to the rats and results in the reduction in the serum and tissue levels of total cholesterol, triglycerides, and phospholipids significantly increased the serum levels of high density lipoproteins (HDL) in rats. Effects of extract on lipid profile exhibited the efficacy of *A. galanga* in lowering the risk of arteriosclerosis [21].

The ethanolic extract of *A. galanga* poses an hypolipidemic characteristic by which a dose of 20 mg/kg of the extract for each day was given to the rats for 4 weeks and resulted in the reduction of total cholesterol and triglyceride level and the phospholipids significantly increases the high density lipoprotein level in the rats. Thus, *A. galanga* extract has shown a potential to lower the risk of arteriosclerosis [21].

**OTHER USES**

**Insecticidal Activity**

*A. galanga* was found to exhibit insecticidal activity in previous studies. Hexane crude extract of *A. galanga* gave the highest control efficiency to adult *Bactrocera dorsalis* compared to dichloromethane, ethyl acetate and 95% ethanol. Thus, this extract may be an alternative way for control this insect pest in the future [22].

The essential oil of *A. galanga* rhizomes was found to possess strong contact toxicity against Lasioderma serricorne adults and also showed strong fumigant toxicity against *L. serricorne* adults. Moreover, the essential oil and eucalyptol also exhibited the strong repellency against *L. serricorne* adults. The study also revealed that the bioactivity properties of the essential oil can be attributed to the synergistic effects of its diverse major and minor components [23].

Abdullah et al., reported that essential oil from *A. galanga* and 1,8-cineol poses antifeedant, repellent and toxicity activity against asian subterranean termites *Coptotermes gestroi* and *Coptotermes curvignathus* [24]. Other studies have shown that *A. galanga* can also used to control *Plutella xylostella* and *Callosobruchus chinensis* [25] and *Sitophilus zeamais*, *Tribolium castaneum* and two parasitoids [26]. Acaricides are present in *A. galanga* seed extracts showed mortality against *Tyrophagus putrescentiae* and *Dermatophagoides pteronyssinus* [26].

**Traditional Uses**

For different countries, galanga is used distinctly. In most South East Asian countries dried galanga is employed only in the absence of fresh galanga whereas in Indonesia slices or powder of the fresh or dried rhizome are used frequently. The rhizome is used against rheumatism, bronchial catarrh, bad breath, and ulcers whooping colds in children, throat infections, to control incontinence, fever and dyspepsia [27]. The root has been used in Europe as a spice for over a thousand years, having probably been introduced by Arabian or Greek physicians, but it has now largely gone out of use except in Russia and India. The rhizomes have been used as flavors in native dishes and ingredients in many traditional medicines to treat various ailments, such as stomach disorders and skin diseases. In India the rhizomes have many applications in traditional medicines such as for skin diseases, indigestion, colic, dysentery, enlarged spleen, respiratory diseases, mouth cancer and stomach cancer. It is used as a body deodorizer and halitosis remedy [28].

**CONCLUSION**

Aromatic and rhizomatous plant, *Alpinia galanga* used in various biological activities. *Alpinia galanga* are rich in photochemical it is an important source of various types of active compounds that poses many biological activities and insecticidal activities. Since *A. galanga* has been known for its broad range of biological activity. Further research should be carried out on formulating the bioactive compounds of *A. galanga* with other biologically important plants in order to produce more effective and environmentally safe methods. Therefore this plant has great potential to be highlighted and achieve breakthrough that can help various fields, especially medical and health.

**REFERENCES**


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