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# In Vitro Study of *Kaempferia galanga* L. Compound, $\delta$ -3-Carene, Against 5-Lipoxygenase

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## ABSTRACT

*Kaempferia galanga* has anti-inflammatory activity and worth developing as lipoxygenase inhibitors. The aim of this study was to determine  $\delta$ -3-carene, one of the potential compounds of *K. galanga*, as a lipoxygenase inhibitor. The LOX-inhibitor activity was tested in-vitro. The result showed that the IC<sub>50</sub> of  $\delta$ -3-carene was 23.10  $\mu$ M, which was less potential compare to zileuton (7.54  $\mu$ M). The study showed that *K. galanga* contains possible active components that could be developed as 5-LOX-inhibitor.

**Keywords:** *Kaempferia galanga*, Anti-inflammatory, lipoxygenase,  $\delta$ -3-carene

## 1. INTRODUCTION

*Kaempferia galanga* rhizome has been known for its various activities, such as anti-inflammatory [1]. The main components are ethyl p-methoxycinnamic (30%), ethyl cinnamate (25%), p-methoxycinnamic acid, monoterpenes ketone, and 3-carene-5-one [2]. It has shown potential in inhibiting cyclooxygenase (COX) and perhaps also binds to the lipoxygenase (LOX) enzyme. In previous study, the docking and molecular dynamics stimulation study showed that, among the compounds of *K. galanga*, the highest affinity towards 5-LOX was shown by  $\delta$ -3-carene. Therefore, in this study, we further examined the activity of one of the components of *K. galanga* as LOX inhibitor by in-vitro study.

## 2. METHOD

The Lipoxygenase (LOX) inhibitor Screening assay kit (Abnova, Taiwan) was used in this study. Zileuton (sigma, US) used as comparator. Lipoxygenase enzyme was used as a standard and linoleic acid as the substrate. The kit detects and measures the hydroperoxides produced in the lipoxygenase reaction. The zileuton and  $\delta$ -3-carene (Sigma, US) were dissolve in ethanol. The procedure was done based on the kit instruction. The result was read at 490 nm.

## 3. RESULT AND DISCUSSION

*K. galanga* has been studied as anti-inflammatory [3–8]. Despite many studies of the rhizome on inflammation, there has not been research of the compounds of *K. galanga* as lipoxygenase inhibitor. Lipoxygenase (LOX) plays a role in the metabolic process of arachidonic acid (AA) that could produce leukotriene (LT), which mediates inflammation. LOX inhibition can reduce LT, resulting in anti-inflammatory effects [9]. Inflammatory mediators produced

by cyclooxygenase (COX) and lipoxygenase (LOX) pathways are responsible for many diseases in humans, such as cancer, arthritis, autoimmune, cardiovascular, and neurological disorders. Studies showed mediators produced by 5-LOX, 12-LOX, and 15-LOX associated with allergic reactions, and the pathogenesis of atherosclerosis [10]. The research was started by in-silico study of 21 potential compounds of *K. galanga*, : ethyl cinnamate, ethyl p-methoxycinnamic acid, p-methoxycinnamic acid, 3-carene-5-one, camphene,  $\delta$ -3-carene, p-methoxy styrene,  $\gamma$ -pinene,  $\beta$ -myrcene, p-cymene, 1,8-cineole, iso-myrcene, camphor,  $\alpha$ -terpineol, p-cymene-8-ol, eucarvone,  $\delta$ -cadinene, kaempferol, quercetin, cyanidin and delphinidin. The highest affinity towards LOX was shown by  $\delta$ -3-carene, then this compound was continued to be tested in in-vitro study. The result of the study showed that the IC<sub>50</sub> of  $\delta$ -3-carene was 23.10  $\mu$ M, which was less potential compare to zileuton (7.54  $\mu$ M) (Figure 1 and 2). This result indicated that carene has the activity towards 5-LOX. Therefore, further study is crucial to confirm the 5-LOX inhibitor activity of  $\delta$ -3-carene and other compounds of *K. galanga*.

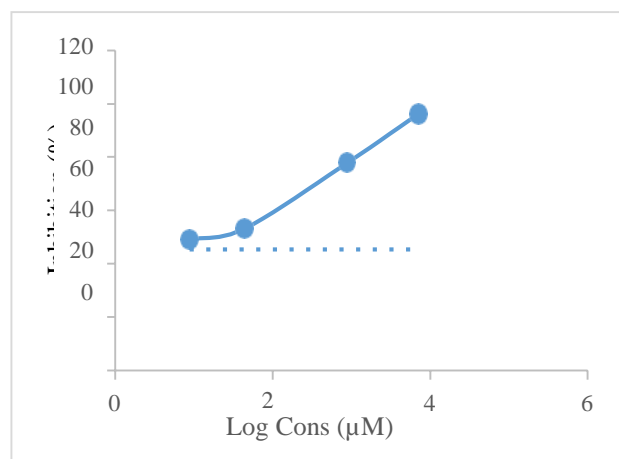


Figure 1. Zileuton Lipoxygenase Inhibition

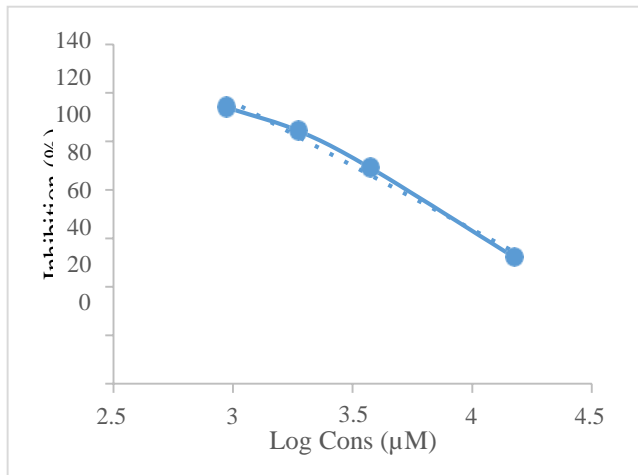


Figure 2.  $\delta$ -3-carene Lipoxygenase Inhibition

#### 4. CONCLUSION

*Kaempferia galanga* has anti-inflammatory activity and worth developing as lipoxygenase inhibitors. The aim of this study was to determine  $\delta$ -3-carene, one of the potential compounds of *K. galanga*, as a lipoxygenase inhibitor. The LOX-inhibitor activity was tested in-vitro. The result showed that the IC<sub>50</sub> of  $\delta$ -3-carene was 23.10  $\mu$ M, which was less potential compared to zileuton (7.54  $\mu$ M). The study showed that *K. galanga* contains possible active components that could be developed as 5-LOX-inhibitor.

#### AUTHORS' CONTRIBUTIONS

Lusi Putri Dwita (Concepts, experimental studies, data analysis, manuscript preparation), Supandi (Concepts, design), Yeni (Literature search).

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#### REFERENCES

- [1] Umar MI, Asmawi MZ Bin, Sadikun A, Altaf R, Iqbal MA. Phytochemistry and medicinal properties of *kaempferia galanga* L. (Zingiberaceae) extracts. *African J Pharm Pharmacol* 2011;5:1638–47. doi:10.5897/AJPP11.388.
- [2] Kumar A. Phytochemistry, pharmacological activities and uses of traditional medicinal plant *Kaempferia galanga* L. – An overview. *J Ethnopharmacol* 2020;253:112667. doi:10.1016/j.jep.2020.112667.
- [3] Samodra G, Febrina D. Anti-Inflammatory Effects of *Kaempferia galanga* L. Rhizome Extract in Carrageenan-Induced Female Rats. 1st Int. Conf. Community Heal. (ICCH 2019), vol. 20, 2020, p. 13–7. doi:10.2991/ahsr.k.200204.004.
- [4] Ridditid W, Sae-wong C, Reanmongkol W, Wongnawa M. Antinociceptive activity of the methanolic extract of *Kaempferia galanga* Linn. in experimental animals. *J Ethnopharmacol* 2008;118:225–30. doi:10.1016/j.jep.2008.04.002.
- [5] Jagadish PC, Latha KP, Mudgal J, Nampurath GK. Extraction, characterization and evaluation of *Kaempferia galanga* L. (Zingiberaceae) rhizome extracts against acute and chronic inflammation in rats. *J Ethnopharmacol* 2016;194:434–9. doi:10.1016/j.jep.2016.10.010.
- [6] Sulaiman MR, Zakaria ZA, Daud IA, Ng FN, Ng YC, Hidayat MT. Antinociceptive and anti-inflammatory activities of the aqueous extract of *Kaempferia galanga* leaves in animal models. *J Nat Med* 2008. doi:10.1007/s11418-007-0210-3.
- [7] Tungcharoen P, Wattanapiromsakul C, Tansakul P, Nakamura S, Matsuda H, Tewtrakul S. Anti-inflammatory effect of isopimarane diterpenoids from *Kaempferia galanga*. *Phyther Res* 2020;34:612–23. doi:10.1002/ptr.6549.
- [8] Yuen C, Chan V, Lee J. Anti-inflammatory and Antioxidant Effects of Hot Water Extracts from *Kaempferia Galanga* L. *J Converg Inf Technol* 2019;9:218–26. doi:10.22156/CS4SMB.2019.9.6.218.
- [9] Hu C, Ma S. Recent development of lipoxygenase inhibitors as anti-inflammatory agents. *Medchemcomm* 2018;9:212–25. doi:10.1039/c7md00390k.
- [10] P. Jaismy Jacob, S.L. Manju, K.R. Ethiraj GE. Safer anti-inflammatory therapy through dual COX-2/5-LOX inhibitors: A structure-based approach. *Eur J Pharm Sci* 2018:#pagerange#. doi:10.1016/j.ejps.2018.06.003.



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