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International Journal of Pharmacy & Pharmaceutical Sciences

IJPPS

INNOVARE ACADEMIC SCIENCES

INTERNATIONAL JOURNAL Of
PHARMACY AND PHARMACEUTICAL SCIENCES
Online ISSN: 0975-1491 | **Print ISSN:** 2656-0097

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Vol 3 Suppl 1 (Feb 2011)

International Conference and Exhibition on Pharmaceutical, Nutraceutical and Cosmeceutical Technology, Malaysia)

Full Proceeding Papers

Source details

International Journal of Pharmacy and Pharmaceutical Sciences

Scopus coverage years: from 2009 to 2017

(coverage discontinued in Scopus)

Publisher: International Journal of Pharmacy and Pharmaceutical Sciences

ISSN: 0975-1491

Subject area: Pharmacology, Toxicology and Pharmaceutics: Pharmaceutical Science | Pharmacology, Toxicology and Pharmaceutics: Pharmacology

Source type: Journal

CiteScore 2015
1.2

SJR 2019
0.165

SNIP 2019
0.823

International Journal of Pharmacy and Pharmaceutical Sciences

Discontinued in Scopus as of 2016

COUNTRY

India

Universities and research institutions in India

SUBJECT AREA AND CATEGORY

Pharmacology, Toxicology and Pharmaceutics
- Pharmaceutical Science
- Pharmacology

PUBLISHER

IJPPS

H-INDEX

41

PUBLICATION TYPE

Journals

ISSN

09751491

COVERAGE

2009-2017

INFORMATION

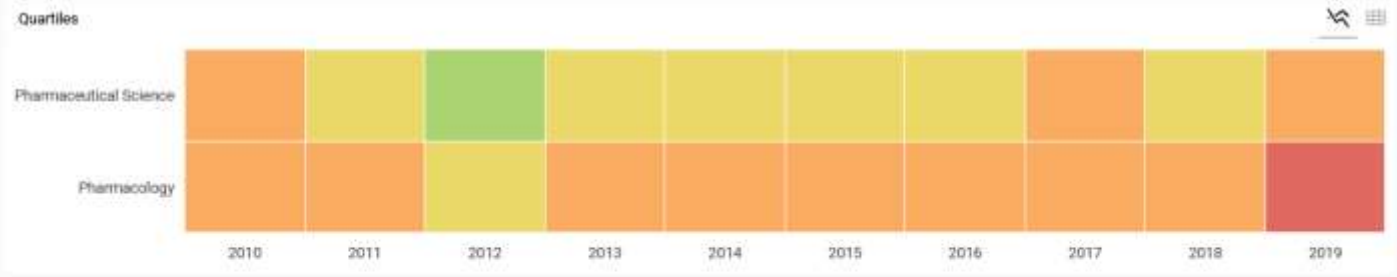
Homepage

How to publish in this journal

editor@ijppsjournal.com

SCOPE

International Journal of Pharmacy and Pharmaceutical Sciences (Int J Pharm Pharm Sci) is peer-reviewed, monthly (Onward April 2014) open access Journal. IJPPS publishes original research work that contributes significantly to advance the scientific knowledge in pharmacy and pharmaceutical sciences including Pharmaceutical Technology, Pharmaceutics, Novel Drug Delivery, Biopharmaceutics, Pharmacokinetics Pharmacognosy and Natural Product Research Pharmaceutical/Medicinal Chemistry, Computational Chemistry and Molecular Drug Design, Pharmaceutical Analysis Pharmacology, Pharmacy Practice, Clinical and Hospital Pharmacy Cell Biology, Genomics and Proteomics, Pharmacogenomics, Bioinformatics, Pharmacoeconomics Research outcomes from medical sciences/case study and biotechnology of pharmaceutical interest are also considered. IJPPS publishes original research work either as an Original Article or as a Short Communication. Review articles on the current topic under mentioned scopes are also considered for publication. In addition, a hypothesis is also invited now for the publication onwards March 2016.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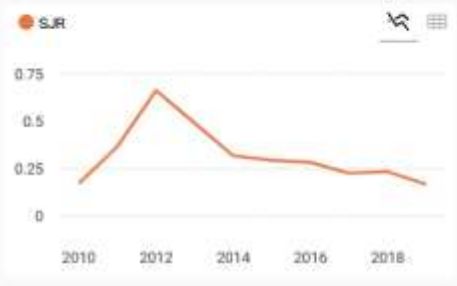
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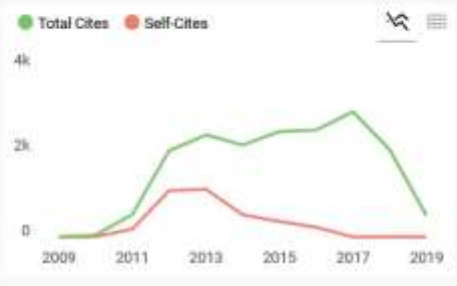
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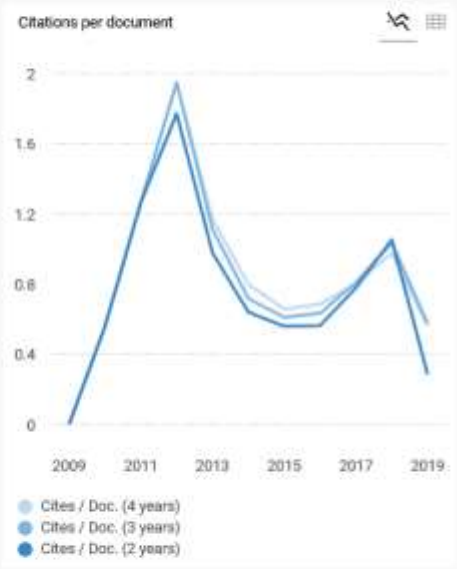
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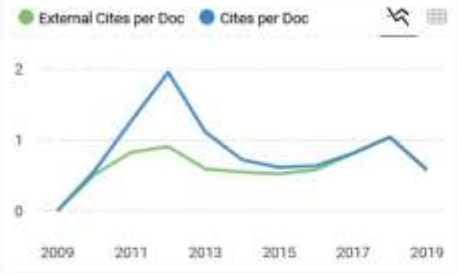
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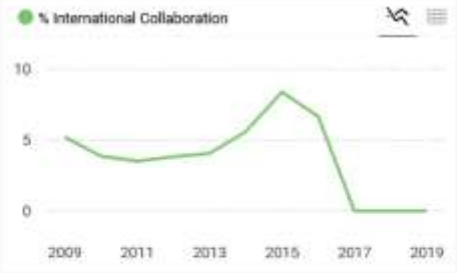
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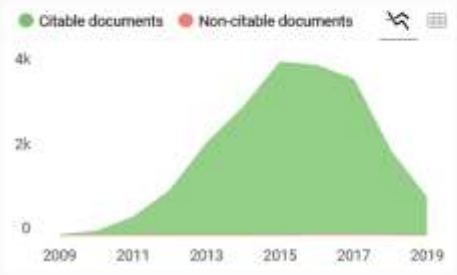
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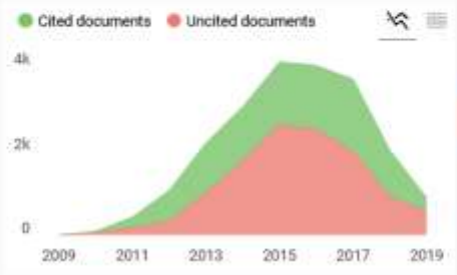
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International Journal of Pharmacy and Pharmaceutical Sciences
ISSN- 0975-1491 Vol 3, Suppl 1, 2011

Full Proceeding Paper

PHOSPHOLIPID COMPLEX AS A CARRIER OF *KAEMPFERIA GALANGA* RHIZOME EXTRACT TO IMPROVE ITS ANALGESIC ACTIVITY

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ABSTRACT

Preparation of phospholipid complex of *Kaempferia galanga* rhizome extract using phosphatidylcholine was intended to improve the bioavailability of its constituents. Characteristics and analgesic activity of the extract and its marker compound, ethyl *p*-methoxycinnamate (EPMS), were compared to their phospholipid complex (F.Extract and F.EPMS). Characteristics of the free form and their complexes were analysed by DTA and SEM. Their analgesic activity was determined using writhing test. The complex showed a better analgesic activity compared to the free form of both extract and EPMS at an equivalent dosage.

Keywords: *Kaempferia galanga,* Ethyl-*p*-methoxycinnamate, Phospholipid complexes, Analgesic activity

INTRODUCTION

Kaempferia galanga is known as "kencur" and in Java is used in cooking, especially in Indonesian cuisine. A Javanese beverage called "beras kencur" is made from its rhizome. The pasta form of its juice is also used to relief fatique[1]. In Malaysia and Indonesia, this plant is used to make a gargle, the leaves and rhizomes are chewed to treat coughs, or pounded and used in poultices or lotions applied to relieve many topical ailments. The juice of the rhizome is used as an expectorant and carminative, and is often as a part of children's medicine and tonics. The rhizome is also used to treat abdominal pain, swelling and muscular rheumatism[2].

The major chemical constituents of its volatile oil extracted from dried rhizome were ethyl-*p*-methoxycinnamate (31.77%), methylcinnamate (23.23%), carvone (11.13%), eucalyptol (9.59%) and pentadecane (6.41%)[3]. Other constituents of the rhizome are cineol, borneol, 3-carene, camphene, kaempferal, cinnamaldehyde, *p*-methoxycinnamic acid, ethyl cinnamate and ethyl *p*-methoxy cinnamate[4].

Phospholipids are small lipid molecules where glycerol is bonded to two fatty acid**s**, with the third hydroxyl, normally one of the two primary methylenes, bearing a phosphate group[5]. Phospholipids from soy, mainly phosphatidylcholine, are lipophilic substances and readily complex polyphenolic compounds. In this context, phosphatidylcholine, the major molecular building block of cell membranes and a compound miscible in both water and in oil/lipid environments, is well absorbed orally, and has the potential to act as a chaperon for polyphenolics, accompanying them through biological membranes[6].

Phosphatidylcholine is a major constituent of cell membranes and it is freely compatible with other nutrients, and when coadministered may enhance their absorption. Several studies have demonstrated that complexation of phospholipid with phytoconstituents increases their bioavailability [7,8]. Based on the properties of phospholipid mentioned above and also the analgesic activity of the plant extract, effect of phospholipid complexes were evaluated and compared against their free form in acetic acids-induced writhing test in mice.

MATERIAL AND METHODS

Plant material

The *Kaempferia galanga* fresh rhizomes used in this study were authenticated and supplied by Purwodadi Botanical Garden, Indonesia. Voucher specimens from the plant samples were deposited at the Department of Pharmacognosy and Phytochemistry, Faculty of Pharmacy, Airlangga University, Indonesia. The rhizomes were dried at 40°C in hot air oven for 24 hrs to remove any moisture present.

Preparation of extracts

Dried powders of the rhizomes were extracted using 70% ethanol with reflux in a water bath at 40˚C for 6 hours. The extract were filtered and evaporated under vacuo to dryness with a rotary evaporator and then placed in an oven at 40˚C until constant weight was obtained. The final weights of all extracts were determined. The yield was defined as the percentage of the final extract per dried rhizomes weight and was found to be 14.77%.

Preparation of phosphatidylcholine complexes of extract of *Kaempferia galanga*/EPMS and its characterizations

The PC complexes were prepared at molar ratio 1:1 of EPMS contained in the extract and phospholipid (MW EPMS=206.24; MW PC=760.09). The weighed amount of extract and phospholipid were taken into a 250 ml round bottom flask and absolute ethanol was added. The mixture was refluxed at a temperature not exceeding 60°C for 2h, and an adsorbent (i.e. cab-o-sil) was added to the resulting clear solution. Afterwards, the mixture was evaporated under vacuo to remove the solvents. The resulting complex was kept in an amber colored glass bottle, purging with nitrogen gas to avoid oxidation of lipids during storage, and sealed tightly before stored at 4°C. These experiments were performed in triplicate.

Differential thermal analysis (DTA)

Thermograms of extract, EPMS, and PC in their single components and PC complexes were characterized using a Differential Thermal Analysis (DTA) (Mettler Toledo, Switzerland). The investigations were carried out over the temperature range between 30–280°C at a heating rate of 10˚C min^{-1}.

Scanning electron microscope (SEM)

The PC complex of extract and EPMS were characterized by a Scanning Electron Microscope (SEM) (Zeiss EVO®MA10, England) to observe their particle shape and surface morphology.

Experimental animals

Male ICR mice weighing 20-25 g were obtained from the Animal Laboratory Airlangga University, Surabaya, Indonesia. At the beginning of experiments, animals were housed in plastic cages, maintained under 12 h dark light cycles in a temperature-controlled room. They were allowed to adapt to this environment for a period of 1 week before the experiments. Food and water were available *ad libitum*. The study was conducted in accordance with Ethical

Commision on Animal Research of Airlangga University. Every effort was made to minimize the numbers and any suffering of animals used in the experiments.

Acetic acid induced writhing in mice

The method of Koster, et al.9 was used to evaluate the antinociceptive activity. Thirty mice were randomly divided into six groups each containing five animals. Equivalent dose of the extract, F.Extract, EPMS and F.EPMS used in this test (30 mg EPMS/kg) was administered orally to each mouse 30 min. before intraperitoneal injection of 0.6% acetic acid in normal saline (10 ml/kg body weight) to induce the characteristic writhing. Cosolvent (10 ml/kg PO) and aspirin (100 mg/kg PO) were given to mice in the control and reference groups, respectively. The mice were observed and counted for the number of abdominal constrictions and stretching in a period of 0-30 min. The responses in the treated groups were compared with those of animals in the control group. The percentage of inhibition of the number of writhing was calculated.

RESULTS AND DISCUSSION

Characterization of phospholipid complex

Differential thermal analysis (DTA)

Thermal analysis was used in order to monitor physical changes (e.g. crystalline transitions, fusion, vaporization, and adsorption) or chemical changes (e.g. dehydration, decomposition) of a sample which occurred as the temperature of a sample increased. Phospholipids (Fig. 1) showed two major peaks at 184.6°C and 195°C. The first (184.6°C) peak is not very sharp, which might indicate melting phase of the non-polar hydrocarbon chain of phospholipids. This melting phase might have occurred in two phases that gave another peak at 195°C respectively, which was relatively sharper. As single compound, EPMS (Fig. 1) showed a sharp endothermic peak at 58.31°C; while in contrast, F.EPMS showed a shifting peak at 178.34°C, which was different from the peaks of the individual components of the complex. Although a small peak still appear referring to the remaining small amount of individual EPMS, it was evident that the original peak of EPMS almost disappeared from the thermogram of PC complex, showed only a small amount of remaining EPMS that was not complexed. For the pure extract, two endothermic peaks were seen in the thermogram. The first peak at 46.5°C might be related with major constituent which contained in the extract i.e. EPMS, and the second broad peak at 127.8°C could be explained as common extract and the lost of water molecules due to dehydration. Interestingly, the similar thermal profile was seen in F.Extract with those that shown in F.EPMS.

Scanning electron micrograph (SEM)

Scanning electron micrographs of the complexes are shown in Fig. 2. The PC complexes, either extract or EPMS were found to be irregular shaped in powdered form. The morphology of their surfaces was seen to be rough. However, its irregular shaped did not affect their flowability as the complex was found to be free flowing particles. The shape and surface morphology, however, might be affected by the type of phospholipids since they are natural components in which their purity grades were determinant factors.

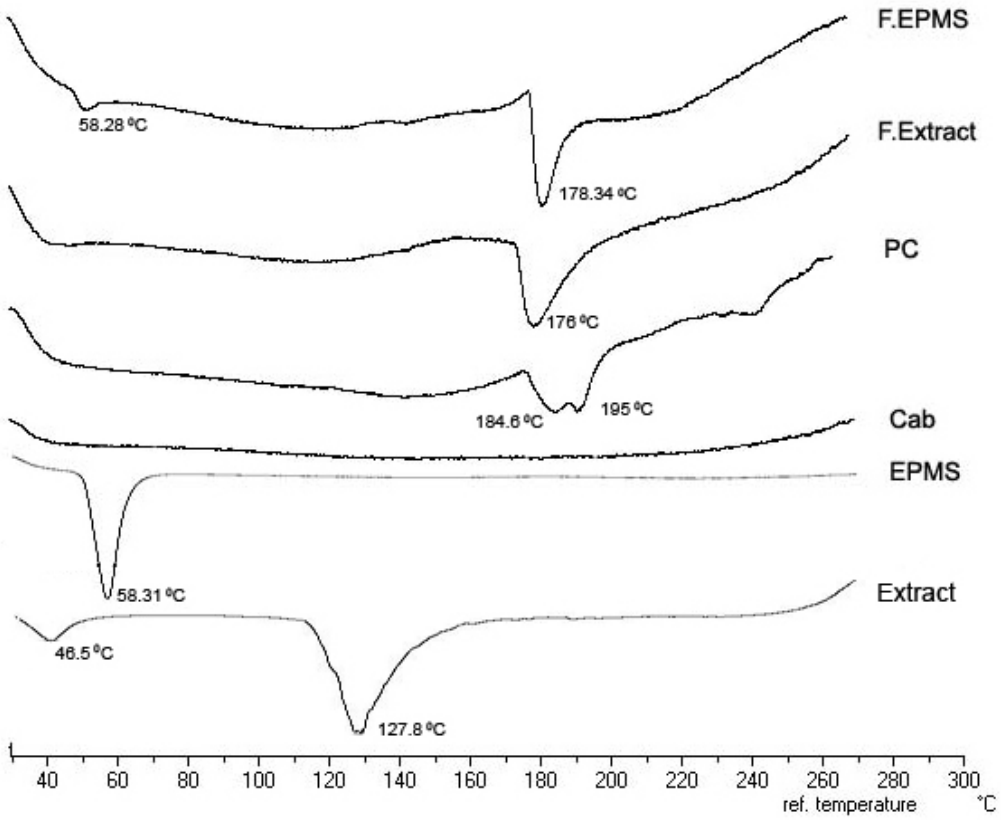
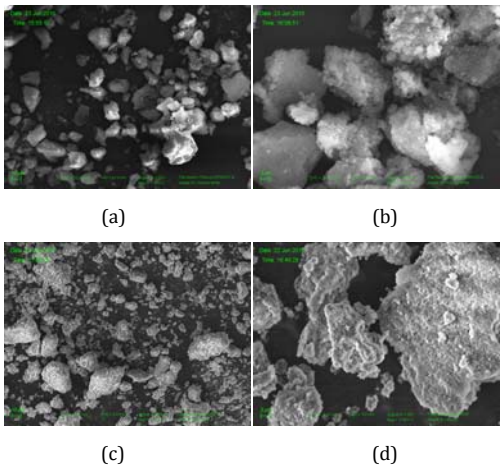


Fig. 1: Thermograms of EPMS, extract Cab-o-sil (Cab), PC, F.EPMS and F.Extract



(a) (b)

(c) (d)

Fig. 2: SEM of PC complex of EPMS: a) 1000X magnification, b) 5000X magnification. PC complex of extract: c) 1000X magnification, d) 5000X magnification.

Acetic acid-induced writhing test

Table 1 shows the effects of the *Kaempferia galanga* extract, EPMS and their phospholipids complex on acetic acid-induced writhing in mice. The oral administration of all samples significantly ($p<0.001$) inhibited writhing response induced by acetic acid. On comparing the analgesic activity of all drugs in decreasing order it was found to be as: F.EPMS > F.Extract > extract > EPMS ≈ aspirin.

In this study, treatment with phospholipid complex, both extract and EPMS, showed better activity than free extract or free EPMS, but the F.EPMS gave higher increase in the analgesic activity than F.Extract if compared with the free form. The enhanced activity of PC complex of both, could be caused by their better absorption due to complexation with phosphotidylcholine.

Table 1: Effect of the extract of *Kaempferia galanga*, EPMS and its phospholipid complexes on acetic acid-induced writhing in mice

Groups	Doses	Number of writhing movements (Mean ± SEM) 30 min	Percentage of protection
Control	10 ml/kg	75.875 ± 2.997	-
EPMS	30 mg/kg	45.375 ± 2.875**	40.20
F.EPMS	equivalent with EPMS 30 mg/kg	22.125 ± 1.642**	70.84
Extract	equivalent with EPMS 30 mg/kg	37.500 ± 2.268**	50.58
F.Extract	equivalent with EPMS 30 mg/kg	30.875 ± 1.642**	59.31
Aspirin	100 mg/kg	46.875 ± 2.232**	38.22

Values are mean ± SEM, (n = 5), **: $p<0.001$, Bunferroni test as compared to control.

ACKNOWLEDGEMENTS

We express our sincere thanks and gratitude to the late Dr. Wahjo Dyatmiko, for giving us the opportunity to do this research using his grant. This study was supported by RISTEK-INSENTIF Grants from the Ministry of Research and Technology, Indonesia, and also support from IMHERE b2.c grant from Directorate General of Higher Education, Indonesia. Thanks to Hamzah Fansuri, PhD, from Laboratorium Studi Energi dan Rekayasa, ITS, Surabaya for the SEM analysis. Specially thanks to Abdul Rahman, MS for nice assistant in English.

REFERENCES

1. Ochse, J.J.& Bakhuizen, V.D.B. Vegetables of the Dutch Indies (Edible Tuber, Bulbs, Rhizomes and Spices Included). Survey of the Indigenous and Foreign Plants Serving as Plot-herbs ans Side Dishes. A. Asher & Co. Amsterdam. 1977.
2. Othman R, Ibrahim H, Mohd MA, et al. Bioassay-guided isolation of a vasorelaxant active compound from *Kaempferia galanga* L. *Phytomedicine* 2006; 13:61-66.
3. Trewtrakul S, Yuenyongsawad S, Kummee S, et al. Chemical components and biological activities of of volatile oil of *Kaempferia galanga* Linn. Songklanakarin J Sci Technol 2005; 27 (suppl 2):503-507.
4. Nakao M, Shibu C. Yakugaku Zasshi 1924; 44: 913.
5. Citernesi U, Sciacchitano M. Phospholipid/active ingredient complexes. Cosmet Toilet 1995;110:57–68.
6. Kidd PM. Phosphatidylcholine: a superior protectant against liver damage. Altern Med Rev 1996;1:258–74.
7. Conti M, Malandrino S, Magistretti MJ, Protective activity of silipide on liver damage in rodents. Japanese Journal of Pharmacology 1992; 60:315–321.
8. Morazzoni P, Montalbetti A, Malandrino S, Pifferi G. Comparative pharmacokinetics of silipide silymarin in rats. European Journal of Drug Metabolism and Pharmacokinetics 1993; 18: 289–297.
9. Koster R, Anderson M, Bee EJ. Acetic acid for analgesic screening. Fed Proc 1959;18: 412.
10. Semalty M, Semalty A., Singh D., Chamoli T. and Rawat M. S. M., Effect of purity of phospholipids in improving bioavailability performance of aspirin-phospholipid complex, National Convention of Chemistry Teachers (NCCT) Annual Conference and Convention, Nov 8–9 2008, Srinagar (Garhwal), India, Book of Abstracts, Indian Association of Chemistry Teachers, Srinagar 2008, p. 72.