Protection effect of *Acalypha indica* L. extract versus combination of *Acalypha indica* L.- gemfibrosil against fatty renal induced high-fructose and fat diets in rats

Cite as: AIP Conference Proceedings 2092, 030025 (2019); https://doi.org/10.1063/1.5096729
Published Online: 09 April 2019

Caren Andika Surbakti, Rani Wardani Hakim, Adisti Dwijayanti, Erni H. Purwaningsih, and Siti Farida
Protection Effect of Acalypha indica L. Extract Versus Combination of Acalypha indica L.- Gemfibrosil against Fatty Renal Induced High-Fructose and Fat Diets in Rats

Caren Andika Surbakti¹, Rani Wardani Hakim², Adisti Dwijayanti², Erni H Purwaningsih², Siti Farida², a)

¹Faculty of Medicine, Universitas Indonesia, JI. Salemba Raya No. 6, Central Jakarta 10430 Indonesia
²Department of Medical Pharmacy, Faculty of Medicine, Universitas Indonesia, JI. Salemba Raya No. 6, Central Jakarta 10430 Indonesia

a)Corresponding author: siti.farida@ui.ac.id

Abstract. Modern foods in the world today use high-fructose sweeteners with high-fat foods increases the risk of metabolic syndrome. Fatty organs such as the renal can occur in the metabolic syndrome that causes renal tissue damage. The extract from the Acalypha indica L. plant, a traditional plant from Asia, allegedly has a protective effect against tissue damage to fatty organs such as the liver. This study aims to examine the protective effect of Acalypha indica L. extract on fatty renal in rats. Twenty-five male Sprague Dawley rats were randomly divided into 5 groups. Four treatment groups were induced with high-fructose and fat diet for 4 weeks were then treated with aquadest (control), standard gemfibrozil drug, Acalypha indica L. extract, and a combination of both drugs in each group for 4 weeks. The variables measured were the circumference of the glomerulus, tubular circumference, and tubular diameter of the renal. Significant differences (p < 0.05; 95% CI) were only found in tubular circumferential variables between rats with Acalypha indica L. therapy (146.02±3.46) and control (169.36±18.74) groups. However, combination of gemfibrozil and Acalypha indica L. extract was shown to share similar characteristics with the control (162.34±7.77 vs 169.36±18.74) group. This study indicates that protection effect of Acalypha indica L. extract was better than combination of Acalypha indica L. extract and gemfibrozil on fatty renal in rats.

Keywords: Acalypha indica L., fatty renal, gemfibrozil, high-fructose and fat diets

INTRODUCTION

Global consumption of high fructose diet in form of corn syrup has increased the risk of obesity and vascular disease in most people [1,2]. It causes a condition called metabolic syndrome in human body and insidiously damage body organs through damage from vessels supplying the organ or direct deposition of fats inside the organs [2-5]. The damage of direct deposition of fats can be seen mostly and commonly in liver, but it can also be seen in other organ such as renal [6-8].

Fatty renal is a term that is still rarely used even in medicine. In fact, this disorder is not widely known and usually has no clinical symptoms. Fatty renal is thought to be a strong link between risk factors for metabolic syndrome and obesity and chronic kidney disease. Several existing studies have successfully linked the conditions of ectopic fat accumulation in the kidneys to the risk or worsening of chronic kidney disease [9-12]. This factor is also associated with hyperglycemia conditions which are also one of the characteristics of the metabolic syndrome. A study from The Framingham Heart Study concluded that fatty renal is closely related to an increased risk of hypertension and chronic kidney disease [13]. Although no pathogenesis can be ascertained from this study, the hypothesis suggests that kidney fat is excessive fat deposits in the area of the renal sinus, the cavity where the renal arteries and veins are located. This study provides strong evidence that excessive accumulation of fat in the renal sinus in the kidneys can affect kidney
function starting from impaired blood pressure regulation to chronic kidney disease in a longer period of time. This is probably caused by tissue damage that occurs due to fatty [13].

Gemfibrozil activates PPAR-alpha to increase LPL, Apo I and Apo II in oxidizing fatty acids in the liver and muscle cells which causes a decrease in VLDL and LDL compounds [14,15], but it has side effects [15]. Therefore, traditional medicine such as medicinal plant become an alternative. Acalypha indica Linn is among the traditional medicines from Asia that is known to have a protective effect from many diseases, one of which includes protection from organ damage [16-18]. This research aims to find out whether an extract from Acalypha indica L. can protect renal from deposition of fats after induction of high fructose and fat diet in mice.

MATERIALS AND METHODS

Plant Material and Extract Preparation

The root of Acalypha indica L. was acquired from Depok, West Java, Indonesia and identified by The Indonesian Institute of Sciences (LIPI) in Bogor, West Java, Indonesia. The root of Acalypha indica L. was dried and powdered. After that, Acalypha indica L. was then macerated for 24 hours using 70% ethanol. The residue was then remacerated three times using the same solvent. The collected extract was then concentrated using a rotary vacuum evaporator. On the day of extract administration, the extract was dissolved with sufficient aquadest to obtain the proper dosage form for intragastric administration.

Experimental Animals

Twenty-five male Sprague Dawley rats, 150-200 gram, obtained from Central of Health Research Development, Ministry of Health of the Republic of Indonesia and acclimatized to the laboratory conditions were then randomly divided into 5 groups (n=5) i.e. normal (positive control), control (C) as negative control, Gemfibrozil (G), Acalypha indica (AI), and Gemfibrozil-Acalypha indica (G-AI). All rats were housed 5 per cage in a room maintained at 25°C, 50 ± 10% relative humidity and a 12-hour-light/12-hour-dark cycle throughout the study. Rats had free access to water and food before starting the experiment. All of the procedures in this study were approved by the Health Research Ethic Committee Faculty of Medicine, University of Indonesia with number 376/UN2.F1/ETIK/2016.

Dose Administration

Normal (positive control) group was not given any treatment. The four experimental groups (Control, G, AI, G-AI) were induced with high fructose and cholesterol diet for 4 weeks. After inducing period, Control group was given aquadest with same volume, G was given gemfibrozil at the dose of 31mg/kg.BW; AI was given AI extract at the dose of 250 mg/kg.BW; and G-AI was given a combination therapy of 31mg/kg.BW gemfibrozil and 250 mg/kg.BW AI. The therapy was administered for 4 weeks. Then the rats were sacrificed and the renal were removed for histological analysis.

Histopathological Analysis

After the four weeks treatments, rats were sacrificed for histopathological analysis to determine the renal histopathological changes. The rats renal were soaked in 10% formaldehyde for 24 hours and cut longitudinally. The samples of renal were then dehydrated gradually using 70, 80, 90 and 100 % alcohol. This process was followed by histotechniques of renal tissue using paraffin blocks and hematoxylin-eosin staining. Each histology slide was labeled and left for 24 hours before being observed under microscope. The variables of circumference of glomerulus, tubular circumference, and tubular diameter of the renal were measured [18] by ImageJ Program version 1.6.0.

Statistical Analysis

All data were analyzed using SPSS program version 20 software. Statistical significance of the difference of the circumference of the glomerulus, tubular circumference, and tubular diameter of the renal the five groups were tested.
using one-way analysis of variance (ANOVA). The different among group was analyzed using post-hoc Bonferroni post hoc. Significance of difference was considered at p <0.05.

RESULTS AND DISCUSSION

The results in Figure 1 showed there was a statistically significant difference with one way Anova and Bonferroni post-hoc test were only found in tubular circumference between control (169,36±18,74) and AI (146,02±3,46) groups (p < 0.05; 95% CI). However, combination of gemfibrozil and Acalypha indica L. extract was shown to share similar characteristics with the control group (162,34±7,77 vs 169,36±18,74). While no significance different between control and gemfibrozile group (p > 0.05). This study indicates that protection effect of Acalypha indica L. extract was better than combination of Acalypha indica L. extract and gemfibrozil on fatty renal in rats.

![Graph](image)

**FIGURE 1.** The differences in glomerular and tubular sizes among groups after treatment

![Images](image)

**FIGURE 2.** The comparison of the circumference of glomerulus among groups. (A) normal, (B) Control, Gemfibrozil, (D) Acalypha indica, (E) combination Gemfibrozil-Acalypha indica group.

Post-therapy for 4 consecutive weeks, the data showed that there was a significant difference in group treated with extract from Acalypha indica L. and control without medicine. However, the difference was not seen in the gemfibrosil therapy group or combination therapy where the size of the renal structure was still quite large. This data could provide the assumption that there is the different mechanism of action between the Acalypha indica L. and gemfibrosil.
Acalypha indica L. extract might have protective effect microscopically from free radicals through its antioxidative effect [20] against the initial stages of tissue damage that occurs in the renal organs. These results were supported by previous studies that showed an improving of renal function in hypoxia-induced ischemia which given an antioxidant as a free radical scavenger [20]. While gemfibrozil works by preventing fat production, which in this study cannot be seen. To find out more precisely the mechanism of action of Acalypha indica L., further molecular research is needed. Moreover, insignificant difference found between normal and negative control groups indicates failure of fat induction in the renal organ probably because the time of induction is too short [18,20].

CONCLUSION

This research might conclude that in overall, protection effect of Acalypha indica L. extract alone showed better characteristics than combination of the traditional medicine and gemfibrozil. Further researches are needed to evaluate the molecular mechanism of action of Acalypha indica L. in reducing fatty cells with 12 weeks induction to support the premises.

ACKNOWLEDGMENTS

The funding of this research was supported by the PITTA Grand from Universitas Indonesia with number of contract 2131/UN2.R3.1/HKP.05.00/2018.

REFERENCES