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Research Article

Anti-obesity effect of ethanolic extract of jasmine flowers (jasminumsambac(l)Ait) in high-fat diet-induced mice: potent inhibitor of pancreatic lipase enzyme

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ABSTRACT

Objective : The objective of this research was to evaluate potential effect of ethanolic extract of jasmine flowers as the anti-obesity.

Method : Anti-obesity effect was evaluated based on the *in vitro* assay using pancreatic lipase enzyme and *in vivo* parameter of high-fat diet-induced mice.

Results : Jasmine flowers extract at a dose 100 mg/kg and 300 mg/kg b.w. exhibit a significant decrease of mice body weight, fat index, and food intake compared with obese mice group. In addition, *in vitro* assay showed that ethanolic extract of jasmine flowers also inhibit pancreatic lipase enzyme activity.

Conclusion : Jasmine flowers extract may be a potentially therapeutic alternative in the treatment of obesity.

Keywords : jasmine, potential, anti-obesity, high-fat diet.

INTRODUCTION

The prevalence of obesity in worldwide always increase during time to time, give result increase of morbidity and mortality incidence [1-5]. Obesity is a condition which an abnormally or over fat accumulation in adipose tissue. Obesity condition is results from lack of equilibrium between energy intake and expenditure. Furthermore, obesity has impact on several diseases like type-II diabetes mellitus associated insulin resistance, cardiovascular diseases, arthritis disorder, hypertension, and cancers [6-10].

Change a lifestyle and exercise for obesity treatment is less effective to long-term weight loss. Several studies suggest that combination of pharmacology treatment and change a lifestyle improves health quality. Drug regimens to treat obesity were given for the long-term often exhibit several adverse effects [11-13]. So, phytotherapy as alternative medicine was considered to synthetic drugs for obesity treatment.

Jasmine (*Jasminum sambac* (L.) Ait) is the family of Oleaceae. This plant can found in Asia, warm region in Europe, and Africa continent [14-15]. Both jasmine flowers and leaves have medicinal benefit. The jasmine flowers in Asia were used to treat diarrhea, ocular disorder, asthma, dermatitis, abdominal pain, cancer, wound healing, and toothache [16-18]. Several studies discovered that jasmine contain various compounds, including iridoidal glycosides, oleanoic acid, daucosterol, hesperidin, ß-primeveroside, and ß-rutenosid. The volatile components containing benzyl acetate, indole, benzyl alcohol, linalool, and methyl antranilate [18].

Utilization of jasmine flowers for obesity had reported. The objective of this research was to evaluate anti-obesity effect of ethanolic extract of jasmine flowers in high-fat diet-induced mice and against pancreatic lipase enzyme activity.

MATERIAL AND METHODS

Plant collection and identification

The fresh flowers of jasmine (*Jasminum sambac* (L.) Ait.) were collected from Sukabumi, West Java, Indonesia. The flowers specimen was identified in *Herbarium Bandungense* School of Life Sciences and Technology, Bandung Institute of Technology (ITB), Indonesia.

Chemicals

All the chemicals in this study were of analytical grade. Orlistat (Xenical) ® were obtained from Kimia Farma pharmacy. Porcine pancreatic lipase enzyme, oleic acid, and bovine serum albumin (BSA) purchased from Sigma-Aldrich ®.

Preparation of jasmine extract

Jasmine flowers were collected and cutting the flower to small. Moreover, jasmine flowers were extracted to ethanol (96%) through maceration at room temperature overnight. Furthermore, filtrate and recidue were separated by filter paper. Filtrate evaporated using *Rotary Evaporator* and were stored at the room temperature protected from sunlight. The percentage of yield of ethanol extract were found to be 5.30 % w/w. The extract were used for the *in vivo* study by dissolving in 1.0% w/v carboxymethylcellulose sodium (CMC-Na).

Preliminary phytochemical screening

The ethanol extract of jasmine flowers is subjected to preliminary phytochemical screening for their presence or absence of phytoconstituents.

Animal care

Thirty Swiss-Webster mice weighing from 20 to 30g (2 to 3 month weeks old) provided by Animal Laboratory of Bandung School of Pharmacy. The mice were housed in a controlled room temperature. The animal were fed and drink *ad libitum* during acclimatization period.

Experimental design

To evaluate jasmine effect reduces body weight, food intake, and fat index, the mice were divided into five groups of six animals in each group. The obese mice group was fed high-fat diet and the normal mice group was fed Animal Laboratory standard diet for 21 days (3 weeks). The ingredients of the experimental diet based on Adnyana et al. method (2014) [9]. Food intake was measured daily, and body weight was measured twice per week. Finally, after 2 weeks of treatment with various dose, mice were sacrified. Adipose pad component was removed.

In vitro pancreatic lipase assay

Activity of pancreatic lipase enzyme was determined by measure of the release rate of oleic acid from emulsified sesame oil. This method was performed by the method of Han *et al***.** (1999), with slight modification[19]. The substrate suspension (5 ml, containing 15 mmol/l sesame oil, 1 mmol/l NaCl, 1 mmol/l $CaCl_2$, 10 mg of bovine serum albumin (BSA)/ml, and phosphate buffer solution (pH 8.0) was prepared through sonification for 5 min. Furthermore, substrate suspension was incubated with 50µl of *porcine* pancreatic lipase and various concentrations of the jasmine flowers ethanol extract for 30 min at 37°C. After incubated, were added to 3 ml of 1:1 (v/v) mixture of chloroform and n-heptane, extracted by shaking the centrifuge tube for 10 min in a shaker. The mixture was centrifuged at 2000 rpm for 10 min. The upper aqueous phase was removed and the lower phase was added with copper reagent (0.5 ml). The tube was shaken again for 10 min, was centrifuged at 2000 rpm, and 0.5 ml of the upper phase (organic phase) was added with 0.5 ml diethyldithiocarbamate-sodium solution. The absorbance was then measured at 480 nm in a spectrophotometer UV-Vis.

STATISTICAL ANALYSIS

The observational data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 18. Analysis of variance (ANOVA) with the post-hoc tukey LSD was used to analyze the data, and a value of $p < 0.05$ was used to statistical significance. The results are expressed as standard error of the mean (SEM).

RESULTS AND DISCUSSIONS

Preliminary phytochemical screening

Preliminary phytochemical screening of jasmine flowers ethanol extract showed the presence of alkaloid, flavonoid, quinone, and volatile oil. The phytochemicals activities of extract are complex. Based on Park and Kim (2011) explain that flavonoid, alkaloid, and other compounds in plant

have several biological properties, such as influence of adipose tissue.

Effects of ethanolic extract of jasmine flowers in high-fat diet-induced mice

In this research, obese mice group was induced by high-fat diet for 21 days (3 weeks) and obese mice group have a significant different were compared with normal mice fed a standard diet. Obese mice group occurs increase of body weight until 20% from early body weight after 21 days induce with high-fat diet.

Increase of the body weight in obese mice group associate with increase of adipose pad component involving perirenal fat, perianal fat, retroperitoneal fat, and epididymal fat. As shown in Figure 1, jasmine flowers ethanol extract at the dose 100 mg/kg b.w. showed a significant decrease compared to dose 300 mg/kg b.w. The administration of jasmine flowers ethanol extract at dose 100 mg/kg and 300 mg/kg b.w. showed a capability to decrease body weight compared to the obese mice group.

As shown in figure 2, jasmine flowers ethanol extract at 100 mg/kg and 300 mg/kg b.w. showed a significantly lower on retroperitoneal fat, perianal fat, perirenal fat, and epididymal fat weight compared to the obese mice group ($P < 0.05$). Furthermore, figure 3 exhibit that ethanol extract of jasmine flowers did not have a significant decrease in food intake compared to the normal group and obese mice group. So, it can be concluded that jasmine flowers ethanol extract did not affect food intake.

***In vitro* pancreatic lipase enzyme assay**

As shown in table 1, jasmine flowers ethanol extract significantly inhibited the pancreatic lipase activity with IC_{50} at the concentration 89.11 µg/ml. Jasmine flowers ethanol extract exhibit remarkable effect to inhibit pancreatic lipase activity.

Jasmine flowers ethanol extract showed maximum inhibitory by the increase of concentration. Inhibitory effect of jasmine dependent on concentration and substrate was presented to the pancreatic lipase. Jasmine compounds can be considered effectively inhibit pancreatic lipase activity by interaction with the sesame oil – bovine serum albumin (BSA), adsorbing to the substrate surface, and retarding the lipolytic mechanism. This mechanism is different with orlistat. Orlistat (tetrahydrolipstatin), is a semisynthetic hydrogenated derivative of the naturally occurring lipase inhibitor produced by *Streptomyces toxitricinii*, which strongly inhibits pancreatic lipase enzyme. The mechanism of orlistat is through a covalent bond to the serine as active site of the pancreatic lipase and did not worked to the substrate.

CONCLUSION

Jasmine flowers ethanol extract can inhibit development of obesity in high-fat diet-induced mice. The effect appear mediated by inhibiting pancreatic lipase enzyme activity. The present study showed that jasmine flowers ethanol extract become a potentially therapeutic alternative in the treatment of obesity condition.

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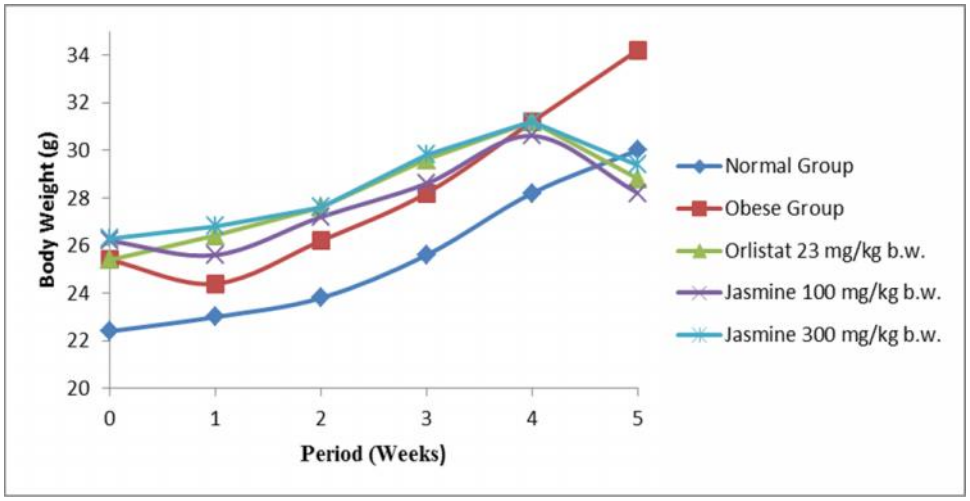

Fig. 1
Effect of the ethanolic extract of jasmine flowers administration on body weight

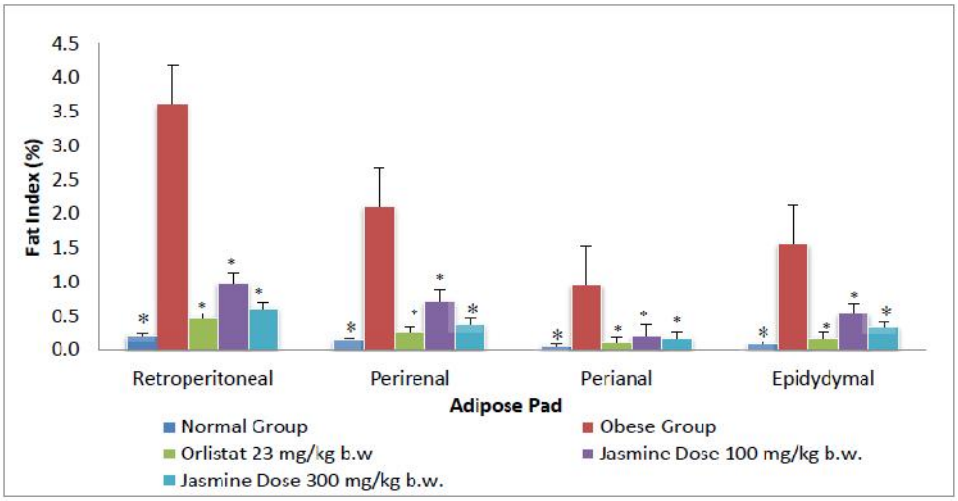

Fig 2
Effect of the ethanolic extract of jasmine flowers on adipose pad after treatment

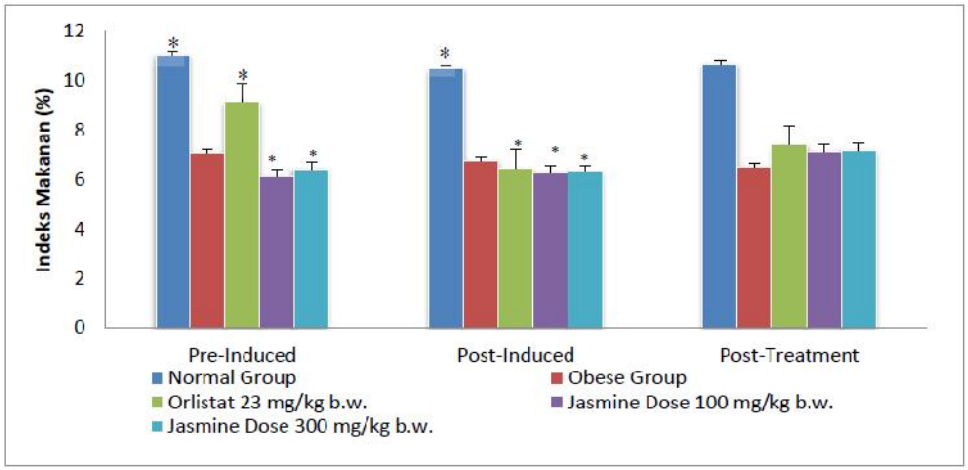

Fig 3
Effect of the ethanolic extract of jasmine flowers on food intake

Table 1
Inhibition of pancreatic lipase activity by ethanolic extract of jasmine flowers *in vitro*

	Concentration (ppm)	Inhibitory effect (%)
Jasmine flowers ethanol extract	0.1	1.79
	1	8.93
	10	10.71
	100	55.36

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