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The Efficacy of Lerek Fruits (*Phrynium maximum*) Extract Related Body Weight, Lipid Profile and Leptin in Wistar Rats-Induced High Fat Diet

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Abstract

Background

Phrynium maximum (local name : lerek) is a plant native to Sumatera, Malaya and Borneo. This plants have a potential as a local wisdom for therapeutics. In Sumatera, Lerek was used as traditional treatment for fever, diarrhea, diabetics and for wound healing.

Aim of Study

Aim of this study to explore the efficacy of lerek fruits extract in body weight, lipid profile and leptin level in Wistar Rats-Induced High Fat Diet

Methods

This study was an experimental study , pre-post test with control group design. The sample in this study was 30 male rats, 8 weeks old, weight 150-200 gram. Rats were given high fat diet and lerek fruits extract at dose of 50, 100 and 200 mg/kgBW/day for 2 weeks. Lerek fruits was extracted by infusion methods. The results of this study were assayed by SPSS 18.

Results

Lerek fruit extract 100 mg/kgBW was more potent to reduce body weight gain, triglyceride level and leptin level than lerek fruit extract 50 mg/kgBW, 200 mg/kgBW, negative control and positive control.

Conclusion

Lerek fruit extracts had a potentiation to reduce body weight, triglyceride and leptin level.

Keywords: Lerek fruit extract – body weight- triglycerida - leptin

Background

Phrynium maximum (local name : lerek) is a plant native to Sumatera, Malaya and Borneo. This plants have a potential as a local wisdom for therapeutics. In Sumatera, Lerek was used as traditional treatment for fever, diarrhea, diabetics and for wound healing.¹ Phytochemical analysis of lerek showed that lerek contained flavonoid, steroid and alkaloid. Flavonoids represent a broad family of more than 4000 secondary plant metabolites. The four predominant classes are 4-oxoflavonoids (flavones and flavonols), isoflavones, anthocyanins, and flavan-3-ol derivatives (tannins and catechin).²⁻⁴ For centuries, preparations that contain flavonoids are applied as the primary physiologically active components that have been used for treating human diseases.⁵ Epidemiological studies have shown that the risk of heart diseases and hypercholesterolemia can be reduced through the consumption of flavonoid-rich diets.⁶ Flavonoids may inhibit the vascular diseases' development through alteration in endothelial cell eicosanoid production.⁷ Flavonoids also showed blood pressure lowering effect in hypertensive and normotensive subjects while flavonoids may have beneficial actions in obesity due to their capacity to regulate fatty oxidation and improve adipocyte functionality.⁸ Besides, food derived flavonols (quercetin, kaempferol, and myricetin) have been reported to exhibit various biological functions and medicinal properties such as antioxidant, antithrombotic, anti-inflammatory, anti atherogenic, antiatherosclerotic, anti dyslipidemia and cardioprotective effects.⁹⁻¹² Aim of this study to explore the efficacy of lerek fruits extract in body weight, lipid profile and leptin level in Wistar Rats-Induced High Fat Diet

Methods

The research design was experimental study, pre-post test with control group design. The study had been approved by bioethic humaniora Faculty of Medicine Sriwijaya University .

Preparation Extract of Lerek Fruits

Lerek fruits were provided by Indonesia Traditional Herbal Research Center, Tawangmangu, Central Java, Indonesia. Lerek fruits were washed, dried and drilled. After that Lerek fruits were extracted by infusa methode in 95°C, 15 minutes and it would get lerek fruit extract.

Procedure of Experimental

Thirty rats were used in this study. Inclusion criteria were male Wistar Rats , eight weeks old, weight 150-200 gram and health. Rats were divided into 5 group, every group 6 rats. Rats were given high fat diet for 8 weeks. High fat diet contained 60% fat, 25% carbohydrate, 10% protein and 5% vitamin and minerals. Every Rat was given high fat diet 10% from body weight. At the 9th weeks, Rats were given high fat diet and treatment, group 1 : high fat diet + aquadest 1 mL (negative control) , group 2 : high fat diet + simvastatin 10 mg/kgBW (positive control), group 3 : high fat diet + lerek fruits extract 50 mg/kgBW, group 4 : high fat diet +

lerek fruits extract 100 mg/kgBW, and group 5: high fat diet+lerek fruits extract 200 mg/kgBW. Treatment was given for 2 weeks.

The Body Weight, Lipid Profile and Leptin Assays

The body weight of rats were measured before treatments and after treatments. It was used digital analytic scale (One Med). The measurements were done three times and get the mean of body weight. Lipid profile (triglyceride level) was measured using Spectrophotometer and Diasys Kits for triglyceride. Leptin level was measured using ELISA methods and Sunlong biotech Rat ELISA Leptin Kit. The procedure of ELISA was based on the procedure assay in manual book.

Phytochemical Analysis

The sample solution was bottled using capillary tube on Silica GF silent phase 254 which was activated by heating at 105°C - 110° C for 1 hour then eluted with methanol: chloroform phase (1:39) v/v. Chromatogram results were observed in UV254 nm. Spotting is detected by H₂SO₄ spray.

Analysis of Data

The results of this study were assayed by SPSS 18. Data was assayed for bivariate and multivariate analysis. Bivariate analysis was used T test and multivariate test was used pos hoc test.

Results

The Efficacy of Lerek Fruit Extract on Body Weight, Triglycerida and Leptin Level

Table 1 showed lerek fruit extract 100 mg/kgBW was more potent to reduce body weight gain, triglycerida level and leptin level than lerek fruit extract 50 mg/kgBW, 200 mg/kgBW, negative control and positive control.

Table 1. The Efficacy of Lerek Fruit Extract on Body Weight, Triglycerida and Leptin

Variable	Group	Before	After	p value ^a	% gained
Body Weight (gram)	Negative Control	220±5.72	220±8.83	1.000	0
	Positive Control	221±7.21	203±5.23	0.015	-7.72
	Extract 50 mg/kgBW	222±6.78	200±7.82	0.011	-9.91
	Extract 100 mg/kgBW	224±11.11	190±5.72	0.016	-15.18
	Extract 200mg/kgBW	222±14.9	211±11.43	0.018	-4.95
Triglycerida (mg/dL)	Negative Control	212±6.75	212±1.09	1.000	0
	Positive Control	213±5.87	200±3.76	0.021	-6.43
	Extract 50 mg/kgBW	221±6.15	198±0.53	0.011	-10.42
	Extract 100 mg/kgBW	215±5.25	169±0.78	0.004	-21.39

	Extract 200mg/kgBW	216±5.65	199±0.84	0.009	-7.91
Leptin (pg/mL)	Negative Control	78.87±5.12	78.78±0.87	1.000	0
	Positive Control	77.35±5.43	70,65±1.09	0.013	-8.67
	Extract 50 mg/kgBW	75.47±6.22	69.23±0.34	0.011	-7.69
	Extract 100 mg/kgBW	79.17±6.52	61.23±0.87	0.003	-22.78
	Extract 200mg/kgBW	80.45±5.23	69.13±0.35	0.008	-13.75

*Paired T test, p=0,05

Phytochemical Analysis

Based on qualitative test of phytochemical component showed on extract contained alkaloid component, steroid / ternoid (essential oil), and flavonoid.



Figure 1. TLC Analysis of Lerek Fruits extract

Discussion

Lerek fruits extract showed U-curve efficacy to reduce body weight, leptin and triglicerida level. Lerek fruits extract at doses 100 mg/kgBW had more potent to reduce body weight, leptin and triglicerida level than lerek fruits extract at doses 50 mg/kgBW and 200 mg/kgBW. The increasing doses of extract did not positive correlation with efficacy to body weight, leptin and triglicerida level. Based on phytochemical analysis, lerek fruits extract contained alkaloid, steroid and flavonoid. Quercetin (one of flavonoid) supplementation was reported to reduce blood pressure in hypertensive patients .¹³ Its antioxidant activity may also suppress the elevation of blood pressure in diet-induced obesity rat models .¹⁴ Quercetin was reported to stimulate apoptosis in 3T3-L1 preadipocytes by decreasing the mitochondria membrane potential, downregulating expression of B-cell lymphoma 2 (Bcl-2) and poly(ADP-ribose) polymerase (PARP), and activating Bcl-2 homologous antagonist/killer (Bak), Bcl-2-associated X protein (Bax), and cysteine-dependent aspartate-directed proteases 3 (caspase 3) .¹⁵ In growing preadipocytes, quercetin extensively decreased the expression of Leptin, sterol regulatory element-binding protein 1c (SREBP1c), and PPARγ, a key adipogenic transcription factor .^{16,17} Quercetin caused dose- and time-dependent increases in lipolysis in rat adipocytes, synergistically with

epinephrine (also known as adrenalin or adrenaline), which plays a pivotal role in the fight-or-flight response by augmenting blood flow to the muscles, increasing cardiac output, dilating the pupils, and increasing blood sugar.¹⁸ Triglyceride breakdown and fatty acid and glycerol release are vital for the control of energy homeostasis in adipocytes.

Conclusion

Lerek fruit extracts had a potentiation to reduce body weight, triglyceride and leptin level.

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