

Original article

Effect of *Sargassum hystrix* on blood biochemistry profile of stress-induced Wistar rats

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Introduction

Oxidative stress is an unbalanced condition between prooxidant and antioxidant that affecting oxidative damage [1]. Oxidative damage implicated to several pathologist conditions, such as cell damage, tissue, and organ consists of liver, kidney, and heart [2].

Sargassum sp. is a kind of brown algae that found easily in South Coastal District, Gunungkidul, Yogyakarta [3]. Lailatussifa et al. [3], mentioned that ethanolic extract from *Sargassum plicystum* doses 450 mg/kg effective to improve blood biochemistry and gastric ulcer of stress Wistar rats. Therefore, the present study was conducted to investigate the effect of supplementation with *S. hystrix* powder as an alternative to functional food to against oxidative stress.

Materials and methods

Algae Extraction

Extracts of *S. hystrix* samples were performed using modified methods of Zhang et al. [4]. 200 g algal dry powder extracted with ethanol p.a. (1875 ml) at a pH of 4 which is adjusted using 1 N HCl (7 ml) in a container which is protected from light at room temperature and stirring for 4 hours and then stays for 2 × 24 hours and filtered with Whatman paper. Then the filtrate was taken and evaporated with a rotatory evaporator at 135-150 rpm and extracted freeze dry.

Test in vivo

The treatment used consisted of 7 groups, i.e., normal control, fasting control, negative control (fast and pool stress treatment group) and positive control (standard diazepam drugs 0.18 mg/kg, ethanolic extract *S. hystrix* 150 mg/kg; 300 mg/kg and 450 mg/kg). Each group consists of 5 mice. The negative and positive control group were treated with fasting stress (not fed only ad libitum) and given 5 minutes/day swimming treatment. Swimming stress was done using Wistar rats placed on a box-shaped tube of size 70 × 40 × 50 cm³ containing

water with a height of 25 cm. A stressor is done once a day for 10 days in a row. The weight of each rat was measured daily both before and after the stress treatment. Mice blood was taken three times on day 0 (beginning of the study) for baseline, day 5 and day 10 (end of research). Blood is collected in a microtube and centrifuged 10,000 rpm for 10 minutes. Blood serum was taken for measurement of glucose, triglycerides, cholesterol and cortisol hormones.

Results and Discussion

Blood glucose

Blood glucose levels were shown in Table 1. The negative control group (stress without drugs) shows high blood glucose levels and was classified as diabetic and indicates that giving a fasting and swimming stress of 5 minutes/day for ten days gave rise to oxidative stress that can cause hyperglycemia. According to Evans et al. [5], oxidative stress can be experienced by people with diabetes due to glucose autoxidation, induction and activation of lipoxygenase enzymes, glycation activation and decreased enzyme antioxidant activity. Positive control treatment in the form of diazepam and ethanolic extract of *S. hystrix* either dose 150 mg/kg; 300 mg/kg and 450 mg/kg had the ability to lower blood glucose levels.

Triglyceride

The levels of triglycerides were shown in Table 1. The negative control group (stress without drugs) showed high triglyceride levels. Positive control treatment in the form of diazepam and *S. hystrix* ethanolic extract have the ability to decrease triglyceride levels. The decrease in triglyceride levels was in accordance with Neelima et al. [6] study which stated that the giving of *Embllica officinalis* fruit extract at a dose of 400 mg/kg showed triglyceride level approaching normal control.

Total cholesterol

Total cholesterol levels were shown in Table 1. The

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negative control group showed high cholesterol levels due to stressors causing the secretion of the hormone catecholamines (epinephrine and norepinephrine) to stimulate lipolysis in adipose tissue that triggers the breakdown of triacylglycerol into fatty acids and glycerol [7]. Positive control treatment in the form of

diazepam and *S. hystrix* ethanolic extract have the ability to lower total cholesterol levels. Decreased cholesterol levels by research Lailatussifa et al. [3] who mentioned that *S. polycystum* extract and standard drug diazepam could reduce cholesterol levels of cold-stressed Wistar mice.

Table 1. Effect of *Sargassum hystrix* and diazepam on biochemical changes of swimming restraint stress-induced in fasting rats

Treatment groups	Glucose (mg/dL)	Triacylglycerols (mg/dL)	Cholesterol (mg/dL)
Normal control	105.70 ± 5.20 ^c	89.93 ± 3.82 ^c	51.77 ± 7.75 ^{d,e}
Fasting normal control	78.90 ± 7.99 ^b	37.70 ± 4.11 ^a	33.77 ± 7.03 ^b
Negative control	222.20 ± 6.71 ^d	147.67 ± 7.70 ^d	60.60 ± 2.92 ^c
Diazepam 0,18 mg/kg p.o	58.30 ± 7.64 ^a	72.30 ± 6.77 ^b	22.00 ± 4.39 ^a
<i>S. hystrix</i> 150 mg/kg	56.30 ± 7.57 ^a	75.90 ± 6.74 ^b	38.50 ± 5.33 ^{b,c}
<i>S. hystrix</i> 300 mg/kg	51.90 ± 9.33 ^a	91.13 ± 7.13 ^c	38.10 ± 8.74 ^{b,c}
<i>S. hystrix</i> 450 mg/kg	52.73 ± 5.46 ^a	47.60 ± 7.51 ^a	46.93 ± 3.02 ^{c,d}

Values with different letters in the same column indicate significant difference (p<0,05)

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