ABSTRAK

Efek Pemberian Tempe yang Difermentasi dengan *Lactobacillus rhamnosus* GG Dan *Rhizopus oligosporus* Terhadap Berat Badan, Lee Index, *High Sensitivity* C *Reactive Protein*, dan Profil Lipid Pada Tikus Obes

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Latar belakang: Tempe merupakan produk fermentasi kedelai yang kaya akan protein peptida, zat bioaktif isoflavon dan memiliki manfaat terhadap obesitas. Ko-fermentasi tempe menggunakan *Lactobacillus rhamnosus* GG dapat meningkatkan kadar isoflavon.
Tujuan: Penelitian ini bertujuan untuk mengetahui efek tempe ko-fermentasi menggunakan *Lactobacillus rhamnosus* GG (tLGG) terhadap berat badan (BB), Lee Index, high sensitivity C Reactive Protein (hs-CRP), dan profil lipid pada tikus obesitas.
Metode: Total 30 tikus Sprague Dawley jantan obesitas dibagi menjadi lima kelompok dan diberi diet berbeda selama empat minggu: Diet *high fat high sucrose* (HFHS) (grup kontrol negatif), diet HFHS + orlistat (grup kontrol positif), diet HFHS + tempe standar dengan *Rhizopus oligosporus* (tS), diet HFHS + 60 mg/kg BB/hari tLGG (low tLGG), diet HFHS + 120 mg/kg BB/hari tLGG (high tLGG). Satu grup tambahan didesain sebagai kontrol normal. Berat badan dan Lee Index diukur sebelum dan setelah intervensi; hs-CRP, kolesterol total (TC), trigliserida (TG), HDL, dan LDL diukur pada akhir penelitian. Total flavonoid dan isoflavon aglikon tempe juga dianalisis.
Hasil: Dibandingkan dengan kelompok kontrol negatif dan tS, intervensi tempe ko-fermentasi dosis tinggi menunjukkan kenaikan berat badan, kadar hs-CRP, kadar TG, TC, dan LDL yang lebih rendah ($p<0,001$). Selain itu, intervensi *high* tLGG menunjukkan penurunan Lee index dan kadar HDL yang lebih tinggi ($p<0,001$). Penurunan Lee indeks pada intervensi tLGG lebih baik dibandingkan dengan intervensi orlistat. Kadar total flavonoid dan isoflavon aglikon tempe ko-fermentasi tLGG lebih tinggi daripada tempe fermentasi standar tS.
Kesimpulan: Ko-fermentasi tempe tLGG menunjukkan manfaat pada tikus obesitas dengan mencegah penambahan berat badan, penurunan indeks Lee, perbaikan profil lipid dan peradangan sistemik.

***Kata kunci**:* Tempe, Bakteri asam laktat, Diet tinggi lemak tinggi sukrosa, Obesitas

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ABSTRAK

Effects of Tempeh Fermentation with *Rhizopus oligosporus* and *Lactobacillus rhamnosus* GG on Body Weight, Lee Index, High Sensitivity C Reactive Protein and Lipid Profile in Obese Rats

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Background: Tempeh is a fermented soybean containing isoflavones that shows good benefits against obesity. Co-fermentation of tempeh using *Lactobacillus rhamnosus* GG could increase the digestibility of isoflavones.

Objective: This study aimed to determine the effect of co-fermented tempeh using *Lactobacillus rhamnosus* GG (tLGG) on body weight (B.W.), Lee Index, high sensitivity C Reactive Protein (hs-CRP), and lipid profile of obese rats.

Methods: A total of 30 Male Sprague Dawley obese rats were divided into five groups and were given different diets for four weeks: the high-fat high sucrose (HFHS) diet (negative control group), HFHS diet + orlistat (positive control group), HFHS diet + standard tempeh fermented with *Rhizopus oligosporus* (tS group), HFHS diet + 60 mg/kg B.W./day tLGG (low tLGG group), and HFHS diet + 120 mg/kg B.W./day tLGG (high tLGG group). One additional group with a standard diet was designated as the normal control group. Body weight and Lee Index, were measured before and after intervention; meanwhile hs-CRP, total cholesterol (TC), triglyceride (TG), HDL, and LDL were measure at the end of the experiment. In addition, total flavonoid and isoflavone aglycone of tempeh were also analyzed.

Results: Compared to the negative control and tS group, the high tLGG intervention exhibited lower body weight gains, hs-CRP level, TG, TC, and LDL levels ($p<0.001$). In addition, high tLGG intervention also showed higher Lee Index reduction and HDL level ($p<0.001$). Moreover, the Lee index reduction of tLGG interventions was better compared to orlistat intervention.the total flavonoid and isoflavone aglycone levels of co-fermented tempeh tLGG were confirmed higher than standard fermented tempeh tS.

Conclusion: Co-fermented tempeh tLGG showed beneficial effect on obese rats by preventing weight gain, Lee index reduction, lipid profile improvement and systemic inflammation.

Keywords: Tempeh, Lactic acid bacteria, High fat high sucrose diet, Obesity

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