

# **Guarana supplementation attenuated obesity, insulin resistance, and adipokines dysregulation induced by a standardized human Western diet via brown adipose tissue activation**

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## **Abstract**

Obesity is a metabolic disorder associated with adverse health consequences that has increased worldwide at an epidemic rate. This has encouraged many people to utilize nonprescription herbal supplements for weight loss without knowledge of their safety or efficacy. However, mounting evidence has shown that some herbal supplements used for weight loss are associated with adverse effects. Guarana seed powder is a popular nonprescription dietary herb supplement marketed for weight loss, but no study has demonstrated its efficacy or safety when administered alone. Wistar rats were fed four different diets (low-fat diet and Western diet with or without guarana supplementation) for 18 weeks. Metabolic parameters, gut microbiota changes, and toxicity were then characterized. Guarana seed powder supplementation prevented weight gain, insulin resistance, and adipokine dysregulation induced by Western diet compared with the control diet. Guarana induced brown adipose tissue expansion, mitochondrial biogenesis, uncoupling protein-1 overexpression, AMPK activation, and minor changes in gut microbiota. Molecular docking suggested a direct activation of AMPK by four guarana compounds tested here. We propose that brown adipose tissue activation is one of the action mechanisms involved in guarana supplementation-induced weight loss and that direct AMPK activation may underlie this mechanism.

In summary, guarana is an attractive potential therapeutic agent to treat obesity.

Keywords:

diet-induced obesity, guarana, microbiota, molecular docking, weight loss