Effects of Brown Rice and Germinated Brown Rice Extracts from Thai Rice Cultivars (PL2 and KDML105) on Adipogenic, Adipocytokine, and Antioxidant Genes in 3T3-L1 Adipocytes

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ABSTRACT

Obesity is a serious risk factor for metabolic diseases, such as atherosclerosis and type 2 diabetes mellitus. Obesity is caused by increasing adipose tissue mass via increasing cell numbers (hyperplasia) and adipocytes size (hypertrophy). Previous studies have found that natural bioactive compounds can be used to treat obesity. This study examined the anti-adipogenic mechanisms of brown rice (BR) and germinated brown rice (GBR) extracts (Khao Dawk Mali 105; KDML105 and Phitsanulok 2; PL2 cultivars) in 3T3-L1 adipocytes. The cytotoxicity effect of rice extracts was first measured by MTT assay and the non-toxic concentrations on triglyceride levels and expression of adipogenic, adipocytokine, and antioxidant genes were then investigated. The results showed that BR and GBR extracts at concentrations of 0.1, 0.5, and 1.0 mg/ml were not toxic. The triglyceride content in treated cells decreased significantly (P<0.05) in a dose-dependent manner. The mRNA expression of adipogenic (PPARγ, C/EBPα, C/EBPδ, C/EBPβ), lipogenic (SREBP-1c, FAS, aP2, LPL, ACC1, ACC2), and proinflammatory cytokine (TNFα, IL-6) genes decreased significantly (P<0.05) in treated adipocytes as compared to the control, whereas lipolytic (ATGL, HSL), adiponectin, and antioxidant (SOD2, GPx4, CAT) genes increased significantly (P<0.05). Furthermore, mRNA expression of preadipocyte gene (Pref-1) was stable in adipocytes treated with GBR from KDML105 for 19 days throughout the differentiation, in contrast to the untreated cells. This study showed that by modulating adipogenic, adipocytokine, antioxidant, and preadipocyte gene expression, brown rice and germinated brown rice treatments of both PL2 and KDML105 cultivars may help reduce obesity.

Keywords: Obesity, Adipogenesis, Adipocytokine, Antioxidant, Rice, 3T3-L1 adipocytes