

学 位 論 文 要 旨	
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題 目	Studies on utilization of sweet potato waste products for feed and food ingredients (サツマイモ加工残さの飼料および食品利用に関する研究)
<p>In Kagoshima prefecture, there are approximately 300 kilotons of sweet potatoes are produced per year, and more than 2.3 kilotons of sweet potato waste (SPW, unused pieces mainly composed of the peel of tuberous roots) are estimated to be generated per year in the process of making Shochu, starch and confectioneries. The purpose of the study is to make full reuse of SPW to be valuable ingredient for feed and food industry.</p> <p>First, sweet potato polyphenol fraction (SPP) were extracted from a reduced-pressure-dry-heat processed SPW (D-SPW) and its antioxidant properties were evaluated by measuring the radical scavenging activity of Hydroxy, DPPH and ABTS+, respectively. SPP showed high antioxidant ability in any of the measuring methods.</p> <p>In <i>in vitro</i> experiments using two kinds of cell cultures of C2C12 myocyte and 3T3-L1 adipocyte, SPP increased the activities of cellular antioxidant-related enzymes (glutathione peroxidase, GPx; superoxide dismutase, SOD). On the other hand, the thiobarbituric acid reactive substances (TBARS), an index of cellular lipid peroxidation, was decreased in a dose-dependent manner in response to SPP. Although the response characteristics were different between the two cell cultures, mRNA expressions of catalase, GPx1, and SOD were mostly upregulated in response to SPP. In 3T3-L1 adipocyte, the SPP inhibited the accumulation of triglyceride in a dose-dependent manner.</p> <p>Furthermore, in <i>in vivo</i> experiment using C57BL/6 mice, the increases in body weight gain and adipose tissue weight of mice fed with high-fat diet were suppressed by dietary SPP (1% diet), indicating an activation of the mitochondrial long chain fatty acid β-oxidation pathway due to the up-regulation in carnitine palmitoyltransferase 1b mRNA expression level. SPP improved the antioxidant status of HFD-fed mice by increasing the mRNA expression of GPx1 in the liver.</p> <p>Finally, animal experiments using Ross308 broilers were conducted to evaluate D-SPW as a feed ingredient. In the experimental diet, 50% of corn, a main source of carbohydrates, was replaced with D-SPW (26.4% feed). There was no significant difference in growth performance between the D-SPW-fed broilers and the normal diet-fed broilers during 2 to 4 week-of-age period. The metabolizabilities of dietary crude protein and gross energy of the D-SPW group were increased compared with those of the air-dried-SPW (A-SPW) group. Plasma and liver TBARS showed lower values in the A-SPW and D-SPW groups than in the control group. The long-term feeding experiment from 2 to 7 week-of-age showed no difference in growth performance, confirming that D-SPW is a suitable feed ingredient for partial replacement of corn. On the other hand, there was a change in meat quality, indicating that chicken meat with high fat content and low yellowness could be produced.</p> <p>In conclusion, the SPP fraction in SPW has a high antioxidant ability and can be efficiently used as a functional food material, and it is confirmed that D-SPW can be used as an ingredient for broiler feed in large quantities.</p>	