

学 位 論 文 要 旨	
氏 名	Yukiko Kinjo
題 目	Evaluation of anti-stress effects of non-centrifugal cane sugar, Kokuto and its bioactive compounds (黒糖の抗ストレス作用と作用成分の解析)
<p>Non-centrifugal cane brown sugar, Kokuto is traditionally manufactured in Okinawa by boiling sugar cane juice without molasses removal process. In addition to sugar components, Kokuto had been known to contain numerous potent anti-stress substances, including phenolic compounds and amino acids such as γ-aminobutyric acid. However, there is very little information on the elucidation of anti-stress effects of Kokuto. Thus, this study aimed to evaluate anti-stress effects of Kokuto and its bioactive compounds using human and mouse stress models.</p> <p>Firstly, the effects of Kokuto on the mental stress of healthy human beings were investigated using the Uchida-Kraepelin psychodiagnostic test for 15 min. Kokuto was orally administered to the subjects 1 min prior to introduction of the mental stress. Salivary stress biomarkers, including chromogranin A, α-amylase, secretory immunoglobulin A, dehydroepiandrosterone, and testosterone, were elevated to a lesser extent in treated subjects. Subjective ratings for mental state using the visual analog scale were significantly lower than control subjects (no Kokuto intake). Moreover, the profiles of mood state scores showed a positive influence on negative mood states, indicating improved vigor. These results suggest that the consumption of Kokuto could mitigate mental stress.</p> <p>Secondly, to identify the compounds contributing to the anti-stress activity of Kokuto, 25%, 50%, 75%, and 100% aqueous methanol (MeOH) extracts of non-sugar component of Kokuto were investigated. The 50% MeOH fraction showed a high phenolic content and high in vitro antioxidant activity. Component analysis of this fraction identified five antioxidative phenolic compounds: <i>p</i>-hydroxybenzaldehyde (HBA), <i>p</i>-hydroxyacetophenone (HAP), schaftoside, isoschaftoside, and <i>p</i>-coumaric acid. The effects of the extracts on the serum stress hormone level and antioxidant activity in restraint-stressed mice treated were also measured. The oral administration of the 50% MeOH fraction suppressed secretion of the stress hormone into the serum and reduced the antioxidant activity in the serum and liver. This work suggests that the anti-stress properties of Kokuto are correlated with one or more of the components of the non-sugar fractions.</p> <p>Lastly, the phenolic compounds identified in the 50% MeOH fraction, HBA and HAP were selected for further investigation regarding the anti-stress effects of Kokuto. Chronically stressed mice maintained on a high-fat diet were treated with HBA, HAP, or the 50% MeOH fraction. Oral administration of the fraction or HAP suppressed secretion of the stress hormone in the chronically stressed mice. Moreover, oral administration of the fraction prevented hepatic lipid accumulation and peroxidation, which could be correlated with the in vivo antioxidant activity of HAP. This study suggests that the anti-stress activity of Kokuto is linked to its phenolic compounds, with HAP strongly implicated in these beneficial effects.</p>	