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Enhancement of liberated diosgenin content in yam through the preparation of yam koji and its subsequent heat treatment

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Abstract

We attempted to enhance the production of diosgenin through the production of yam koji. Diosgenin was not detected in yam and yam koji itself. However, diosgenin was detected in the heat-processed yam koji at 55°C. To screen a suitable koji strain, we prepared 10 yam koji samples. After heat processing, diosgenin was detected in all yam koji, but no clear relationship was observed between the diosgenin content and the strains. While, a correlation was observed between β-glucosidase and α-rhamnosidase activities of yam koji and the diosgenin content in the heat-processed koji. These findings suggest that these enzymes contribute to the liberation of diosgenin. Three different heat processing were tested: 55°C, 75°C, and a sequential combination of 55°C followed by 75°C. The highest amount of diosgenin was obtained at 55°C. In conclusion, this study demonstrates that the potential contribution of yam koji to release of diosgenin.

Keywords : yam, koji, diosgenin, β-glucosidase, α-rhamnosidase

Ⅰ Introduction

The dried yam contains various components such as carbohydrates, proteins, lipid, minerals, and choline[1-3]. Therefore, dried yam has been used in traditional Chinese medicine and is called “*san-yaku*” in Japanese or “*shan yao*” in Chinese. Dried yam is an important ingredient in Kampo medicine, such as *Hachimijiogan*, *Goshajinkigan*, *Rokumigan*, *Keihito*, and *Jinryobyakujutsusan*.

It has been discovered that diosgenin, a major active component of yam, possesses several pharmacological functions, including the suppression of cholesterol absorption, the increment of cholesterol secretion through biliary excretion, and the promotion of the functional recovery of damaged neural circuits, and the reduction of amyloid β and phosphorylated tau protein[4-8]. Diosgenin, a steroidal sapogenin, exists in yam as the glycoside dioscin. Gastric acid hydrolyzed the glycosidic bond, releasing diosgenin for utilization in the body[9]. However, administration of yam extract containing dioscin to mice does not increase the diosgenin concentration in the brain or enhance object recognition memory[10]. In contrast, mice administered the diosgenin-rich yam extract showed improved object recognition memory, and diosgenin was detected in the brain.

Therefore, processing is necessary to hydrolyze dioscin and enable ingestion in the form of diosgenin[11]. Diosgenin is primarily obtained through the acid hydrolysis of dioscin in yam[10]. Acid hydrolysis of yam has several limitations: the resulting acidic aqueous phase must be neutralized before disposal, and the treatment of such wastewater is critical because of the high concentration of sulfate or chloride ions. In addition, strong acids corrode metals and lead to the deterioration of the apparatus. Since this also causes the release of metal ions, we must pay attention to environmental pollution. Moreover, strong acids have a direct impact on human health for

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