

Optimization of the Production Conditions of Glutinous Rice Bran Protein Hydrolysate with Antioxidative Properties

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ABSTRACT

Glutinous rice bran (GRB) is a byproduct of milling rice. Because of its high protein content, GRB can be used to produce protein hydrolysate with antioxidative properties. The antioxidant activity of protein hydrolysate depends on hydrolysis conditions. In this study, protein from GRB cv. RD6 was prepared and then subjected to proteolytic hydrolysis by alcalase. The hydrolysis conditions were optimized using response surface methodology (RSM). We investigated two independent variables: the enzyme to substrate (E/S) ratio (0.59-3.41%, w/w) and the time taken for hydrolysis to occur (45-555 minutes). The E/S ratio and hydrolysis time significantly affected the yield, DPPH radical scavenging activity, metal chelating activity, degree of hydrolysis (DH), and average molecular weight (MW) of the protein hydrolysates. The optimum conditions for hydrolysis were an E/S ratio of 2.84% and 480 minutes for hydrolysis, which obtained a yield of $40.73 \pm 0.44\%$, an IC_{50} value of 0.87 ± 0.02 mg/ml in the DPPH assay, a metal chelating activity of $72.80 \pm 1.79\%$, a DH of $22.18 \pm 0.42\%$ and a MW of 3.07 ± 0.14 kDa. GRB protein hydrolysate, produced using alcalase, could have potential applications as an ingredient in functional food products due to its high antioxidative properties.

Keywords: Glutinous rice bran, Protein hydrolysate, Alcalase, Optimization, Antioxidant activity

INTRODUCTION

Glutinous rice is widely cultivated in northern and northeastern Thailand. The major byproduct obtained from milling is bran (Onyeneho and Hettiarachchy, 1992), which is a rich source of nutrients, including protein, fiber, lipids, vitamins, minerals, and flavonoids (Juliano, 1994; Aguilar-Garcia et al., 2007). Rice bran contains 12–20% protein (Saunders, 1990) and has more lysine than other cereal bran proteins (Juliano and Ben, 1985). It is a good source of hypoallergenic protein, and thus suitable for infant food formulations (Burks and Helm, 1994). Several researchers have studied the nutraceutical and functional properties of rice bran proteins (Wang et al., 1999; Fabian and Ju, 2011), however, their antioxidative properties are less known. Furthermore, rice bran protein, with its potential uses in health foods, offers an alternative use for rice.