Effect of Roasting and Wet-Milling on Physicochemical Properties of Brown Rice

（焙煎処理及び湿式粉砕が玄米の物理化学的特性に及ぼす影響）

福井　美帆（201921155）

指導教員：北村 豊・粉川 美踏

1. Background and Objectives

Rice has long been the main staple of the traditional diet especially in Asian countries including Japan and Taiwan, however, its consumption continues to decline in both countries because of changing lifestyle, e.g., diversification of eating habit, busier lifestyle and others. As a result, people refrain from eating rice in cooked grain form because it is kind of time-consuming. To alleviate this trend, Therefore, Japanese government has been promoting to develop new rice-based foods. Rice slurry is newly developed rice based food material which can overcome defects of rice flour, e.g., high production cost, easily forming lamps, wasting water and loss of nutrients.

Brown rice is healthier and more nutritious because it contains outer layers which is rich in fibers and bioactive compounds. Despite such nutritious properties, its flavor, long cooking time, and short shelf life do not meet consumers' requirements. Roasting has been used to improve flavor and to extend shelf life of cereal products.

In this study, towards development of new brown rice (BR) food material, i.e., roasted BR slurry, effects of roasting and micro wet milling (MWM) on physicochemical properties of BR were analyzed. This research was carried out in three parts: 1) effects of roasting and screening of roasting levels; 2) effects of roasting & MWM on processing suitability; 3) effects of roasting & MWM on functionality.

2. Material and Method

2.1. Effects of roasting on BR powders

Materials: Taitung No.30, nonwaxy; *Taikeng Glutinous No.3*, waxy. Roasted at 180℃ for 0, 20, 30, and 40 minutes (i.e., Raw, Light, Medium, and Dark, respectively), ground into powder and storage at -18℃.

Degradability: moisture content (MC), water activity (a_w), acid value (AV), and DPPH antioxidant activity were analyzed during 4 weeks of storage.

Processing suitability: Pasting properties (Rapid Visco Analyzer), and thermal properties (Differential Scanning Calorimeter) were analyzed.

2.2. Effects of roasting & MWM on processing suitability of BR slurry

Materials: same as 3.1. Raw and Dark roast BR was tempered to MC 17%, followed by MWM into slurry.

Processing suitability: same as 2.1. and morphology

Frozen storage stability: frozen storage (-18℃) for 4 weeks and measured the syneresis rate at each week.

2.3. Effects of roasting & MWM on functionality of BR slurry

Materials: Koshihikari, nonwaxy; *Koganemochi,* waxy. Raw and Dark roast BR was tempered to MC 17%, followed by MWM into slurry.

Physicochemical functionality: particle size, texture profile, freeze-thaw stability.

Phytochemical functionality: total polyphenol contents (TPC), antioxidant activity (DPPH and FRAP) assay

3. Result and Discussion

3.1. Effects of roasting and screening of roasting level

Degradability improved upon roasting with decreased MC, a_w, and AV, increased antioxidant activity. Processing stability improved with lower breakdown and setback viscosity. Dark roasted sample showed the best properties and selected as an optimal roasting level for following MWM processing.

3.2. Processing suitability of roasted BR slurry

Processing suitability: roasted BR slurries showed better processing stability with lower setback and breakdown.

Frozen storage stability: syneresis rate decreased in roasted BR slurry.

3.3. Functionality of roasted BR slurry

Physicochemical functionality: harder texture and improved freeze-thaw stability were obtained in roasted BR slurry.

Phytochemical functionality: TPC and antioxidant activity were higher in roasted BR slurries.

4. Conclusion

Roasted and wet-milled BR slurry may have potential as a good food material to improve the functionality, pleasant aroma, and to adjust food texture with higher processing & storage stability. This study provides valuable guidance for further quality improvements and development of new BR based food materials.