

ORIGINAL PAPER

Effect of Microwave Radiation Pretreatment of Rice Flour on Gluten-Free Breadmaking and Molecular Size of β -Glucans in the Fortified Breads

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Abstract Cereal β -glucan concentrates can be used in gluten-free breads to improve dough handling properties and quality of final products as well as to enhance their nutritional value; however, the presence of endogenous β -glucanases in rice flour, in combination with prolonged mixing, fermentation, and proofing time, can cause a substantial reduction in β -glucan molecular weight, affecting detrimentally their efficacy for bioactivity. In this study, microwave (MIWA) heating was applied to the rice flours before breadmaking at different flour water contents (13–25%) and treatment times (0–4 min) to reduce β -glucanase activity. Gluten-free breads made from the MIWA-treated rice flours were fortified with oat β -glucan concentrate to enhance their nutritional profile. The molecular weight of added β -glucan in the final products increased with increasing both flour water content and time of MIWA treatment, reflecting the magnitude of residual β -glucanase activity in the flour. Pretreatment with MIWA radiation for 4 min of the rice flour tempered at 25% moisture resulted in negligible residual β -glucanase activity and preserved to a great extent the molecular weight of β -glucans in the enriched breads. End-product quality was not affected by flour MIWA pretreatment, and even a slightly higher loaf specific volume was noted for breads made from the MIWA-treated flours (4 min MIWA at 25% moisture content)

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compared to that of untreated flour. These findings can contribute to the improvement of nutritional value of rice-based gluten-free breads for celiac consumers as well as of any β -glucan-containing yeast-leavened bakery product without altering its sensorial attributes. Additional studies are still required for further evaluation of the effect of more intense microwave treatment on rice flour and its application on breadmaking.

Keywords β -Glucan molecular weight · β -Glucanase inactivation · Gluten-free bread · Microwave treatment · Rice flour