

[TOP](#) > [Available Issues](#) > [Table of Contents](#) > Abstract

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Effect of Whole Quinoa Flours and Lipase on the Chemical, Rheological and Breadmaking Characteristics of Wheat Flour

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Two kinds of whole quinoa seeds, the stone-mortar milled quinoa flour (SMQ) and the roller milled and roasted-quinoa flour (RMRQ), were tested for their chemical, rheological and breadmaking characteristics. The loaf volume of breads baked with SMQ and RMRQ substituted wheat flour distinctly decreased in proportion to the increase of substitution (~30%, w/w). The additions of lipase (7.5×10^3 U/g) significantly increased the loaf volume of SMQ or RMRQ substituted wheat bread, except for the 30% substitution of RMRQ. Addition of lipase to SMQ or RMRQ substituted wheat bread distinctly decreased the firmness of breadcrumbs compared to those without lipase. Lipase addition to SMQ and RMRQ substituted doughs lowered viscosity, while the enthalpy change of melting for starch-lipid complexes (ΔH_2) was slightly higher than the substituted doughs without lipase. Microscopic observation of the SMQ substituted dough (~30%, w/w) showed that the increase in the substitution of SMQ could not form a well-developed gluten matrix. However, addition of lipase to the SMQ substituted dough sufficiently made the extensible gluten structure that covered starch granules. The increase in the amount of substitution of SMQ and RMRQ for wheat flour showed unfavorable bread quality, but the addition of lipase to SMQ or RMRQ substitution distinctly improved the bread qualities. These improvements might be caused by the effects of mono- and di-acylglycerol as natural emulsifiers, which were increased from lipid hydrolyzed by lipase during breadmaking.

Key words: stone-mortar milled quinoa flour, roller milled and roasted-quinoa flour, lipase, breadmaking, dough properties

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