

Impact of Fermentation Duration of Okara on Dough and Bread Properties

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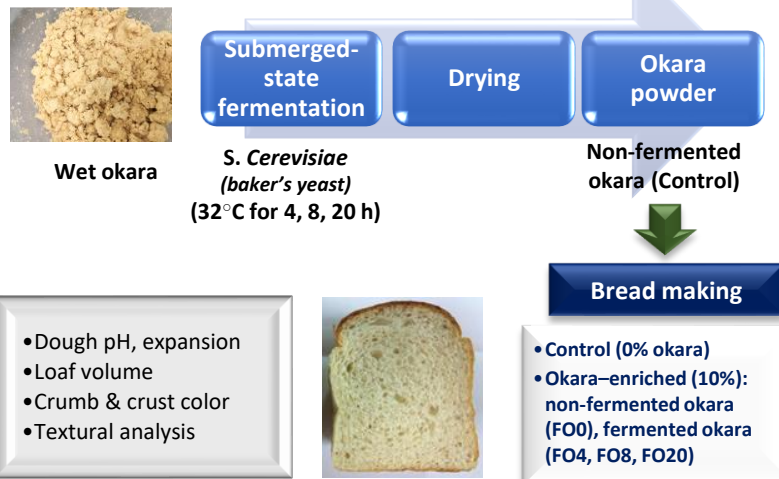
Background

- Okara, a by-product of soybean processing consist of high dietary fiber (50-58%, on dry basis), with a high fraction of insoluble fiber
- Incorporation of fiber into bakery products enhanced nutritional properties and increases shelf-life. Nevertheless, it impart a detrimental consequences to product quality such as lower loaf volume, harder texture, and unacceptable flavour (Erdil et al., 2012; Katina et al., 2006)
- Modification of fiber via microbial modification involves partial hydrolysis of fiber components, enhancing the level of soluble fiber, alteration of water binding properties, and minimizing the disruption on gluten network (Katina et al., 2012; Ilowefah et al., 2014)

Research Approach

Pre-treatment of wet okara via microbial fermentation to impart hydrolysis of fiber components through the activity of extracellular enzymes secreted by the microorganisms. Functional properties of the fiber is regulated by manipulating duration of fermentation that results in various degree of components alteration. These changes eventually affect functional properties of fiber and how it affect the interactions with starch and protein (gluten) network.

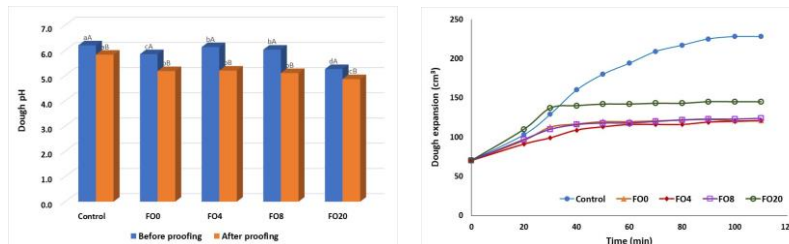
Research Design



- Dough pH, expansion
- Loaf volume
- Crumb & crust color
- Textural analysis

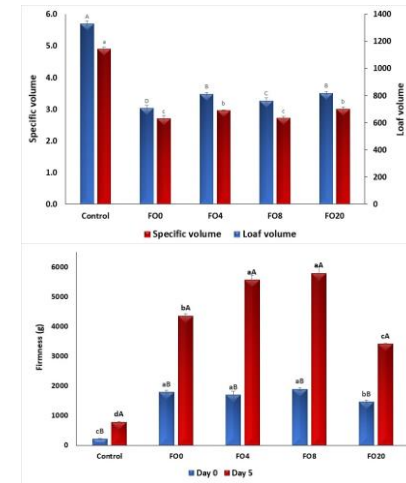
- Control (0% okara)
- Okara-enriched (10%): non-fermented okara (FO0), fermented okara (FO4, FO8, FO20)

Results



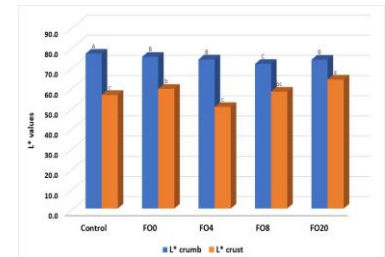
- pH of dough measured before and after proofing. Lower pH observed in dough made with substitution of fermented okara attributed to activity of *S. cerevisiae* and higher organic acid in the fermented okara.
- Longer fermentation duration enhanced volume expansion of fiber-enriched dough. Higher levels of soluble fiber minimizes weakening effect on gluten network, hence producing dough with better gas retaining ability

Results



- Fermentation improves loaf volume of okara-enriched bread; able to withstand the expanding gas during baking process
- Softer bread texture was obtained in bread made with okara fermented at longer duration, due to higher increment of soluble fiber.
- Fermentation for 4 and 8 hours perhaps caused only minimal changes to fiber components

- Fermented okara produces bread with lighter crumb and darker crust.
- Crumb and crust color is regulated by the Maillard reaction and caramelization during baking process, in which degree of reactions depends on concentration of reactants and pH of product



Conclusions

Fermentation duration play an important role in regulating the characteristics of dough and bread. Microbial fermentation of okara for 20 hours improved the dough and bread quality, attributed to higher soluble fiber content.