Taiwanese Style Steamed Bread Quality as Influenced by the Gluten Strength and Steam Generation Rate

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ABSTRACT

The purpose of this study is to elucidate the effects of flour properties and steam generation rate on the quality of Taiwanese style steamed bread. Three points are expected to be clarified, first of all, the relationship between the protein content (gluten strength) of flour and the quality of steamed bread. Secondly, with the same extent of fermentation, the change of gluten strength due to different fermentation times and the resulting influence on the quality of steamed bread. Thirdly, the effects of gluten strength and steam generation rate on the quality of steamed bread. This study used three flours with various protein contents (13.23,11.60 and 7.73%, respectively) and obviously different extensograph properties (ratios of resistance-to- extension (R) value to extensibility (E), so called R/E value, are 10.96 、 5.37 and 2.62, respectively). Different temperatures were used to prepare steamed bread dough which resulting in various fermentation times (15, 30, and 60 minutes) and dough with different extents of gluten strength before steaming. Steamed breads were prepared by using different steam generation rates to steam the fermented dough. Results showed that the steam generation rate had great influence on the quality of steamed bread prepared. The steamed bread prepared from the high protein content flour(strong gluten strength) steaming by middle steam generation rate, not only had good exterior appearance and internal texture, but also had better textural properties determined by textural profile analysis (TPA) and cohesiveness determined by sensory evaluation than those of the steamed breads prepared from middle or low protein content flours. Fermented dough preparing from high or middle protein content flours and steaming by high steam generation rate produced steamed bread with shrinking phenomenon as removing from steamer. Generally, flour with middle protein content is considered suitable for preparing steamed bread due to its proper gluten strength. However, as the fermented dough preparing from the middle protein content flour was steamed by the high steam generation rate,shrinking of steamed bread occurred. On the other hand, shrinking phenomenon did not occurred on the steamed bread preparing from low protein content flour and steaming by high steam generation rate. Moreover, its exterior appearance was smoother than steamed breads steaming by low and middle steam generation rates. This indicates that the high steam generation rate results in the shrinking of steamed bread. Nevertheless, in spite of the flour used, low steam generation rate produces steamed breads with small volume, poor textural and chewiness properties, and obvious extent of stickiness to teeth. The gluten strength of dough changed after fermenting, the R value decreased and the E value increased. However, when the temperature used for dough fermentation decreasing, both R and E values increased. Since the decreasing of temperature resulted in the increasing time of fermentation, the R value of fermented dough preparing at high or middle temperature was similar, while the E value increased obviously. Consequently, the R/E ratio showed significantly different among dough prepared at various temperature, and was in the order of high temperature > middle temperature > low temperature. The differences did cause more or less impacts to the texture of steamed bread. However, steamed breads preparing from the same kind of flour at different fermentation temperatures, accordingly different relaxation times, with the same steam generation rate showed comparable scores in sensory evaluation. This result indicates that controlling the steam generation rate can compensate or reduce the effect of gluten strength. Shrinking phenomenon did not occurred in the steamed bread preparing from flour with low protein content (weak gluten strength), even steaming by high steam generation rate. However, the textural property of the steam bread was worse than prepared from middle and high protein content flours. Moreover, the steamed bread preparing from low protein content flour with any preparing conditions showed high extent of stickiness-to-teeth. This should be the reason that the low protein content flour is not used to produce Taiwanese style steamed bread industrially. It is generally considered that high protein content and strong gluten strength are the limited factors to get the good quality of steamed bread, however, results of this study show that the steam generation rate is also one of the critical factors in preparing steamed bread.

Keywords : Taiwanese style steamed bread ; Shrinking ; Steam generation rate ; Gluten strength ; Gluten content

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