



## EVALUATING THE IMPACT OF NON-GLUTEN MODIFICATIONS ON BREAD QUALITY: A STRUCTURAL EQUATION MODELING APPROACH

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**ABSTRACT**

While modifications for low-gluten bread production have been extensively reported, including the utilization of Non-Gluten Components (NGC), Natural Hydrocolloids (NH), and Chemical Modification Reaction (CMR). Implementing this modification remains challenging and has yet to meet the expectations for bread quality (BQ). This research aims to propose a measurement model for assessing the effectiveness of modifications (NGC, NH, and CMR) on BQ. This research involved 45 bread companies in Indonesia, and the three modifications were attempted for application. Structural Equation Modeling (SEM), with the Partial Least Square (PLS) approach, was employed for analysis. The findings indicate that the modified (NGC, NH, and CMR) variables did not directly contribute to a positive effect on BQ (T stat. <1.65;  $p > 0.05$ ). However, when mediated by Research and Development (R&D) the three modifications showed a positive impact on BQ, with respective contributions of 19.2% (NGC), 14.6% (NH), and 12.8% (CMR). R&D had a fairly strong influence ( $f^2 > 0.35$ ), and 28.2% ( $R^2$ ) of its indicators were understood by NGC, NH, and CMR. The model's suitability was deemed satisfactory, with SRMR < 0.07; GFI > 0.36; and NFI > 0.9. The original contributions of this research lie in providing practical recommendations for the widespread application of modified variables and proposing conceptual a framework for gluten-free bread modification with R&D mediation.

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