Effects of Micronutrient Fortification, Baking Temperature, and Baking Time on Sensory Acceptance of Butter Cookies

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ABSTRACT

This research aims to evaluate the effect of multiple-micronutrient fortification, baking temperature, and baking time on the sensory acceptance of butter cookies. Unfortified and fortified cookies with 3.2% (w/w) multiple-micronutrient mix were baked with different treatments: 170°C for 15 minutes and 190°C for 9 minutes. Untrained adult female panelists (n=50) did a sensory test using a 9-point hedonic scale. Interaction between treatments significantly affected texture and aroma (p<0.05). Cookies fortified with micronutrients baked at 190°C had a lower mean hedonic score for texture (5.90±1.91) and aroma (6.54±1.61) among other treatments (p<0.05). These findings indicate that micronutrient fortification and baking profile affect the aroma and texture acceptance of butter cookies.

Keywords: baking treatments, butter cookies, fortified cookies, micronutrient premix, sensory acceptance

INTRODUCTION

Single and multiple-micronutrient fortification on baked products, such as biscuits or cookies, has successfully improved the nutritional status of toddlers and pregnant women in Indonesia (Dewi & Mahmudiono 2021). Nevertheless, several micronutrients are sensitive to heat. Hence, applying the appropriate baking temperature and duration is critical to minimize micronutrient loss caused by heat exposure. The complex interactions between ingredients, baking temperature, and baking time can influence the sensory quality of the cookies. During the baking process, the moisture content evaporates and affects the texture of the cookies. In addition, the Maillard reactions occur due to the interaction between reducing sugar and amino acids during heating; this process may change other sensorial properties, such as color (Budžaki et al. 2014). This research aims to evaluate the effect of multiple-micronutrient fortification, baking temperature, and baking time on the sensory acceptance of butter cookies.

METHODS

The experiment was conducted at the pilot plant of i3L in March–June 2022. A 2 x 2 factorial design was used to evaluate the interaction between variables (Table 1).

RESULTS AND DISCUSSION

The IBM SPSS Statistics 29.0.1.0 statistical software was utilized to analyze the data. A two-way ANOVA with a confidence level of 95% was used to test the significant interaction effect between treatments, and the test was continued with Tukey’s HSD post-hoc test to evaluate the single main effect between group pairs.
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Table 1. Experimental design for butter cookies produced with different multiple-micronutrient concentrations and baking temperatures and time

<table>
<thead>
<tr>
<th>2x2 Factorial design</th>
<th>Baking temperature and time</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>170°C 15 minutes</td>
</tr>
<tr>
<td>Multiple-micronutrient mix concentration</td>
<td>0% (w/w)</td>
</tr>
<tr>
<td></td>
<td>3.2% (w/w)</td>
</tr>
</tbody>
</table>

Table 1. Experimental design for butter cookies produced with different multiple-micronutrient concentrations and baking temperatures and time

Figure 1. Interactions between multiple-micronutrient concentrations, baking temperatures, and baking time on the mean hedonic score for texture (left) and aroma (right)

Data with the same superscript letter are not significantly different (p>0.05) from Tukey’s HSD test

Figure 1. Interactions between multiple-micronutrient concentrations, baking temperatutres, and baking time on the mean hedonic score for texture (left) and aroma (right)
CONCLUSION

Multiple-micronutrient fortification and baking temperature and time influence the sensory acceptance of butter cookies. Cookies baked at 190°C for 9 minutes had lower acceptance scores for aroma and texture. Sensory acceptance of the samples were also affected by the multiple micronutrient mix.

ACKNOWLEDGEMENT

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest to disclose during the experiment and the preparation of the manuscript.

REFERENCES


