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Independent Study on Sensory Evaluation for Acceptability of Fortified Flour Products
Research Brief

Recently, concerns were raised on the difference of colour of baked products using fortified flour, compared to the products made from unfortified flour specifically by Maida and fine Atta. This independent study was conducted by ***Institute of Food Science and Nutrition, Bahauddin Zakariya University, Multan.*** Baking trials of fortified flour were conducted followed by sensory analysis and the level of acceptability of the baked products prepared with fortified flour. The overall objective of the study is to inform the policymakers, flour millers, consumers and other stakeholders about the influence of premix on fortified flour baked products and on ensuring quality and acceptability.

Study Design

The Sensory Evaluation Study was designed to conduct baking trials of fortified flour followed by a sensory analysis, i.e. the use of human senses to objectively analyze fortified flour products for sensory attributes including colour, taste, odour, texture, chewability, and mouthfeel. Sensory study of the fortified products was completed in two phases a) laboratory-scale baking trials conducted at Bahauddin Zakariya University b) commercial baking trials deployed in industrial setting.

Pre-Mix Flour Blends: Widely accepted wheat flour-based baked products including "*Naan*" and "leavened bread (*double roti*)" were selected on account of the higher consumer preference for these products. Nine different combinations of premix-flour blends were prepared for leavened bread and Naan. Each blend used for Naan and bread production was tested with two different brands of instant dry yeast and baking soda.

The flour samples for the purpose were procured from 4 mills across Punjab, Khyber Pakhtunkhwa, and Sindh. The premix was sourced from 4 different suppliers (Attaullah Zia International, Morgan technologies (Pvt.) Ltd., Genera Pharmaceuticals and Vitablend Asia

Pacific Pvt. Ltd., Singapore). Two brands of leaving agents including baking soda (Arm and Hammer baking™ powder, ICI baking soda) and yeast (SAF Yeast and Mauri Yeast) were used and evaluated for their role in sensory quality of naan and bread.

Product Trials: A total of 160 products trials (96 with Naan and 64 with bread) were conducted with fortified flour (Maida and fine Atta) in accordance with the experimental protocols to rule out individual and combined effect of premixes, wheat flour source and types of leavening agents on sensory attributes and overall acceptability of the baked products. This trial was replicated at commercial-scale settings followed by an expert panel evaluation of the fortified flour baked products.

Sensory Evaluation: Following steps were involved in the sensory evaluation.

- **Sensory profiling** of the baked products was conducted by adopting a preference test using a nine-point hedonic scale to measure for acceptability for different parameters including Colour, Texture, Taste, Odour, Chewability and Mouth feel.
- **Colour Indexing**: Crust of the Naan and crumb of the bread loaves was instrumentally analysed using digital colorimeter for colour indexing and L-value or degree of lightness was recorded for each sample. The results were also compared with the products developed from non-fortified flour.
- **Minerals analysis of fortified products:** All variants of the fortified naan and bread were evaluated for mineral composition i.e., Iron and Zinc in accordance with the methods laid down by Association of Official Analytical Chemists (AOAC)
- **Statistical Analysis:** Quantitative and qualitative data generated from sensorial and biochemical analysis were statistically evaluated by using analysis of variance (ANOVA) and effect of experimental variables i.e. blends, and sample sources were identified by Least significance difference test at p value of <0.05.

Findings

- None of the premixes were observed to negatively influence any of the product's sensory attributes.
- Compositional assessment of the raw material did identify certain differences in the samples of flour from different regions in terms of grain particle size distribution, gluten and total protein contents.
- In some samples, bicarbonate and pH levels of the baking soda significantly affected the color, taste and texture properties of baked products.
- The effect of different premix with zinc and without zinc was also assessed and no change in colour was found in terms of colour change on the baked products.
- The panel evaluation validated the laboratory findings that keeping the source of flour, premixes and leavening agent constant or at par with the laboratory settings, the product recipes used by the commercial bakers in a commercial setting did not show any significant change in the baked products.

Conclusions and Recommendations

Sensory quality of the bread and Naan is determined by the type and quality of principle ingredients including flour, chemical and biological leavening agents, sugar and other minor components like salts. This study concludes that fortification is not expected to result in an undesirable sensory response to the baked products. Across the country, a high degree of variability in the baking quality of flour meant for naan and bread production was observed as the major factor linked to significant sensory scoring differences (reduction). The explorative study further concludes that baking soda, as well as other important ingredients, may enhance crust and crumb colour acceptability of leavened baked goods by maintaining a composition that favours optimum bicarbonate – acid balance. At present, most conventional baking soda recipes followed by small and medium bakers are not very suitable for the flours as has been identified in this sensory acceptability research study.

Following are the key recommendations derived from the study:

- Uniform quality standards for milling the grains need to be adopted to enhance the quality and acceptability of baked products
- Flour extraction rates and grain particle size below 80µm must be considered as a benchmark to yield maximum sensorial quality of the leavened baked products
- The bakers may be encouraged to implement in-house quality assessment procedures for flour and leavening agents to develop premium quality fortified baked goods with higher consumer acceptability.