MAKERERE UNIVERSITY

DEVELOPMENT OF A PRODUCTION PROCESS FOR SORGHUM BASED ICE-CREAM CONES

By

Julia Kigozi
BSc. Agricultural Engineering (Makerere University)
M.Eng (Agricultural Engineering) University of Pretoria

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ABSTRACT

In the development of the production process for sorghum ice-cream cones, wheat was completely substituted with whole white sorghum flour. Eight white sorghum varieties available in Uganda were evaluated for their suitability for the process. Physico-chemical properties of the sorghum varieties were determined and correlated to the properties of the ice-cream cones produced. Amylose content, lipid content and to lesser extent mineral, dietary fibre and tannin content had the most significant effect on the performance of the sorghum flour in ice-cream cone production. An amylose content of about 28% and lipid content of about 3% with endosperm texture rated as 3 (scale; 1-corneous and 5-floury), 0.1% tannins, 1.7% minerals and dietary fibre of 5%, in the *Epuripur* variety, produced the best sorghum ice-cream cone. The sorghum cone competed well against the wheat cone and it was rated higher than the wheat cone for texture, taste, overall acceptability using a sensory panel.

The texture was optimized against the cone formulation using sensory analysis and the optimal formulation comprised; 400 g sorghum flour, 120 g maize starch, 80 g sugar, 16 ml oil, 7.28 g soya lecithin, 6 g sodium bicarbonate, 1 g sodium metabisulphite, 2 g salt, 800 ml water, yielding cones with an overall consumer acceptance of 8.06 on a 9 point hedonic scale.

Instrumental techniques for texture assessment that present some advantages especially in the industrial environments (quick to use and economically profitable), were also developed in this research. They comprised the measurement of crispness and mechanical hardness using an Instron Universal Testing Machine. For validity it was necessary to show correlation of the instrumental techniques to sensory assessments. The correlation coefficient between cone crispness and mechanical hardness measured by sensory analysis and instrumental measurement were r=0.961 and 0.958 ($p<0.05$). Mathematical models depicting the overall consumer acceptability with good accuracy were also developed comprising both crispness and mechanical hardness depicting $R^2 = 0.907$ and R^2 adjusted $= 0.89$. Models with high accuracy for predicting sorghum cone texture from the formulation for hardness, crispness and overall acceptability ($R^2 = 0.968, 0.851$ and 0.919 respectively) were also successfully developed; and these can be used to explore production alternatives of the formulation for purposes of guaranteeing consumer acceptability.