Development and Optimization of Peanut-Chocolate Spread for Ghanaian Consumers

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ABSTRACT

Epidemiological data have linked lower risk of certain diseases including cardiovascular disease to regular consumption of peanuts. To promote enhanced benefit from the nutritional and health benefits of peanuts, there is the need to broaden the scope of consumer choice through diversification of the uses of peanuts. This study optimized the formulation for consumer acceptance of the sensory attributes of a prototype Peanut-chocolate Spread for commercial adoption. Peanuts were heat blanched at 140 °C for 30 minutes, sorted for moldy and shriveled nuts, deskinned followed by removing discolored kernels. Sorted peanuts were roasted for 100 minutes at 140 °C to medium roast (L=50) in 2 kg batches. A constrained simplex mixture design using the following proportions of peanuts, natural cocoa powder and sugar: 0.30-0.80; 0.05-0.55 and 0.15-0.65 respectively. Nine formulations were obtained. These were milled and stabilized with 1% PS 105 K-A (Danisco, USA) stabilizer in a plate mill and then conditioned for 24 hours at 10 °C. A total of 60 consumers rated the sweetness, peanut flavor, chocolate flavor, smoothness, spreadability and overall liking of the coded prototypes in two sessions using a 9-point hedonic scale. The sensory evaluation was conducted using central location testing in the Accra metropolis. The average rating of the attributes ranged from dislike slightly (4.0) to like very much (8.0) as follows: Sweetness (4.45-7.30); Peanut Flavor (5.18-7.37); Chocolate Flavor (5.28-6.97); Smoothness (4.90-7.60); Spreadability (3.60-7.63) and Overall Liking (4.97-7.57). The contour overlay of the attributes indicated that a Peanut-chocolate Spread acceptable to consumers can be produced from any of the combinations of 0.65-0.79 peanuts, 0.15-0.29 sugar and 0.05-0.13 cocoa powder. FRI has engaged an industrial partner to whom this technology will be transferred. The results of this research should significantly help to promote utilization of peanuts in Ghana.

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INTRODUCTION

•Peanuts (*Arachis hypogea*) are grown and consumed worldwide

•They have received considerable attention in recent years as one of the foods with beneficial cardiovascular health effects

•In Ghana, production volume of peanuts in 2010 was a little above half a million tonnes; an increase of 76% from 2007.

•To improve the socio-economic wellbeing of the stakeholders in the peanut value chain, there is the need to diversify the uses of peanuts through new product development in Ghana

•This will expand the scope of consumer choice and enhance nutritional intake of essential nutrients from peanuts

OBJECTIVE

•The objective of the study is to optimize the formulation for consumer acceptance of the sweetness, peanut flavor, chocolate flavor, smoothness, spreadability and overall liking of a prototype peanut-chocolate spread for commercial adoption in Ghana

MATERIALS

•**PEANUTS** (Medium roast; L=50)
- Low: 0.30, High: 0.80

•**REFINED SUGAR**
- Low: 0.15, High: 0.65

•**NATURAL COCOA POWDER**
- Low: 0.05, High: 0.55

•**STABILIZER** (PS 105 K-A, Danisco, USA)
- 1% of total mixture of the above three components.

METHODS

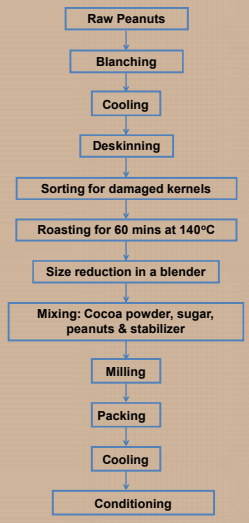

Fig. 1: Process flow chart for Peanut-chocolate spread

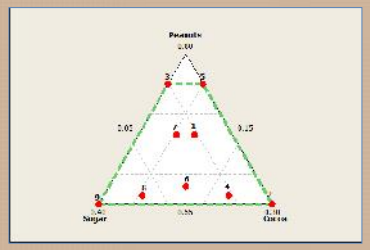

Fig. 2: Simplex Design Plot for Peanut-chocolate Spread formulations

Table 1: Proportions of components used for the 9 Peanut -chocolate spread formulations

Formulation	Mixture Components		
	Peanuts	Sugar	Cocoa Powder
1	0.665	0.205	0.130
2	0.550	0.150	0.300
3	0.750	0.200	0.050
4	0.565	0.205	0.230
5	0.750	0.150	0.100
6	0.580	0.260	0.160
7	0.665	0.230	0.105
8	0.565	0.330	0.105
9	0.550	0.400	0.050

•The process flow chart for the formulation of the Peanut-chocolate Spread is as shown in Figure 1 above.

•Nine products were formulated (Table 1 and Figure 2) and assessed for sweetness, peanut flavor, chocolate flavor, smoothness, spreadability, and overall liking on a 9-point hedonic scale

•Sixty (60) consumers from the Accra Metropolis were randomly selected for the sensory evaluation in a Central Location Test

•Overlaid contour plot of sweetness, peanut flavor, chocolate flavor, smoothness, spreadability and overall liking was used to locate the optimum region using a cut-off of 6

STATISTICAL ANALYSIS

•Data analysis was carried out using Minitab (version 14)

RESULTS AND DISCUSSION

•The range of average rating of the selected attributes were as follows:
Sweetness (4.45-7.30); **Peanut flavor** (5.18-7.37); **Chocolate flavor** (5.28-6.97); **Smoothness** (4.90-7.60) and **Spreadability** (3.60-7.63).

•**Overall liking** of the products was between **5** (neither like nor dislike) and **8** (like very much)

RESULTS AND DISCUSSION Cont'd

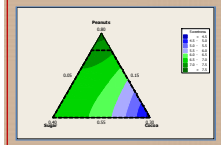

Fig. 3: Contour plot for Sweetness

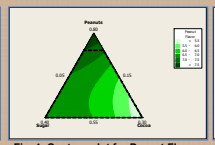

Fig. 4: Contour plot for Peanut Flavor

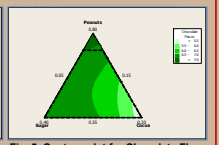

Fig. 5: Contour plot for Chocolate Flavor

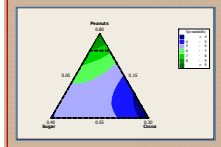

Fig. 6: Contour plot for Spreadability

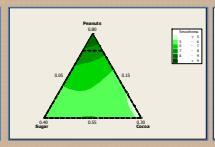

Fig. 7: Contour plot for Smoothness

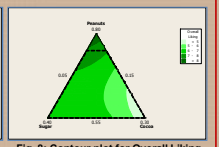

Fig. 8: Contour plot for Overall Liking

•The Contour Plots for the selected attributes and overall liking of the products are as shown in Figures 3 – 8.

•The contour plots show that Ghanaian consumers like a Peanut-chocolate Spread that has **HIGH AMOUNT OF PEANUTS**, **MODERATE SUGAR** and **VERY LOW COCOA POWDER**

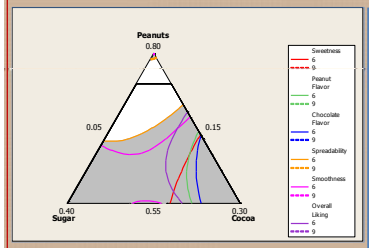

Fig. 9: Overlaid contour plot for sweetness, peanut flavor, chocolate flavor, spreadability, smoothness and overall liking of Peanut Chocolate Spread

•The **Unshaded Region** in Fig. 9 was the **area of constraint** defined by the following proportions of ingredients: **Peanuts: 65-79%; Sugar: 15-29% and Cocoa Powder: 5-13%.**

•The values for the optimum region are predicted values and yet to be verified using the following formulations:

i. 75% Peanuts, 20% Sugar & 5% Cocoa powder
ii. 70% Peanuts, 20% Sugar & 10% Cocoa powder
iii. 80% Peanuts, 15% Sugar & 5% Cocoa powder
iv. 60% Peanuts, 35% Sugar & 5% Cocoa powder

SIGNIFICANT FINDINGS

•A Peanut-chocolate Spread with high consumer acceptability can be produced from high amounts of peanuts, moderate amount of sugar and very low amount of natural cocoa powder. This information was used to formulate a prototype Peanut-chocolate Spread for commercial adoption in Ghana; the product is scheduled for a launch at a food industrial fair in July 2012

SELECTED REFERENCES
1. Peanut Butter and Spreads, USAID/Peanut CRSP Monograph Series(2006). No.6.

Enhancing the Peanut Value Chain, from Processing to Marketing of Peanuts and Peanut Products in East Africa (Uganda) and West Africa (Ghana)

UGA-GP3MT – University of Georgia Global Peanut Product, Processing and Marketing Team Project 127-M.S. Chinnan; Project 165-W.J. Florkowski; Project 166-A.V.A. Resurreccion