

Modelling and optimization of processing variables of snack (kokoro) produced from blends of maize and African yam bean seed flour

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Abstract

Response surface methodology was used to study the effect of process variables on product quality of fried maize-based snack (kokoro). The process variables are: African yam bean seed flour (AYBSF) (20-40%) inclusion in maize flour, frying temperature (150-170°C) and frying time (8-12 min). Product's protein content, sensory quality and color parameters (L^* , a^* and b^*) were determined. High quality kokoro characterized by high protein content (>10%), high sensory quality (>6.5), and acceptable color parameters [(minimum redness (a^*), optimum yellowness (b^*) and lightness (L^*)] were obtained by using 30% AYBSF, at frying temperature, 155°C for 11.5 min. Addition of legume (AYBSF) resulted in significant increases in protein content and sensory evaluation while increasing frying temperature increased the redness and yellowness. Based on the lack of fit test and coefficient of determination, R^2 , quadratic model was appropriate for protein content, sensory quality, yellowness (b^*) and lightness (L^*) while linear model was appropriate for redness (a^*). Statistical analysis with response regression showed significant ($p=0.05$) interactions between process variables and quality parameters measured. The optimal process variables of frying temperature 155°C, frying time 11.5 min and AYBSF level (30%) would produce AYB-maize kokoro with enhanced nutritive value, better sensory quality and consistent color parameters.

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Keywords

African yam bean seed flour
Optimization
Fried maize snack
Protein content
Color content

Introduction

Most maize snacks in Nigeria are prepared by frying, roasting and some by boiling. Frying is the commonest of these processing methods. Frying is a unit operation used to alter the eating quality of food products. It is often selected as a method of choice for creating a unique flavor and texture in processed foods (Patterson *et al.*, 2004). The popularity of these fried snacks necessitates the need to improve their quality.

In the tropics, maize is a common cereal crop, a good source of carbohydrate, vitamins and minerals. It can be processed into a wide range of food items and snacks (FAO, 2009). Some of these snacks include; guguru (pop-corn), aadun (maize snack), kokoro (corn cake), donkwa (maize-peanut ball). Although, these snacks and appetizers are popular food items with a long history of consumption especially among the low income populace, findings shows that there exists a paucity of information on the improvement of their quality attributes (Aletor and Ojelabi, 2007). Kokoro, like other cereal-based foods is rich in carbohydrate, but low in protein and deficient in

some essential amino acids particularly lysine. This makes the product nutritionally deficient. Since these snacks are widely consumed by low income populace in Southern Nigeria, optimization of its production process to improve its quality will positively affect the people.

African yam bean seed (AYBS) (*Sphenostylis stenocarpa*), a lesser known legume of tropical origin which has attracted research interest in recent times (Azeke *et al.*, 2005). Up till now, it is classified as a neglected underutilized species of legume (Anon, 2007). It is grown throughout tropical Africa, most commonly in Central and Western Africa, especially in Eastern Nigeria. It is also reported to be cultivated in Ivory Coast, Ghana, Gabon, Congo, Ethiopia and parts of East Africa (Wokoma and Aziagba, 2001). It grows well in acid and highly leached sandy soils of the humid lowland tropics where other major food legumes do not flourish. It suffers less of pest damage than the other legumes both in cultivation and storage, and it has the potential to meet year-round protein requirement if grown on a large scale (Adewale *et al.*, 2010).

AYBS has attracted research interest because of

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