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Research Article

Production and Sensory Analysis of Complementary Food from Purple Yam and Soya Beans

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Abstract

The purpose of this study was to produce complementary food using purple yam and soya beans. Different proportions of purple yam flour and soya beans flour were employed to obtain three (3) products. Product A (60% Purple yam flour and 40% Soya beans flour), Product B (50% Purple yam flour and 50% Soya beans flour) and Product C (40% Purple yam flour and 60% Soya beans flour). The sensory attributes assessed included; (taste, aroma, colour, texture, after taste and overall acceptability) of the baby food on a 5-point scale. Forty assessors were recruited from Casablanca Hospital at Suame and St Edwards Hospital in Ashanti Region. Product B (50% purple yam flour and 50% Soybean flour) was the most favored by the assessors based on its high mean scores for taste (4.36), aroma (4.58), color (4.65), texture (4.21) and aftertaste (4.53). The study concluded that, from the sensory analysis, Product B recorded the highest mean score for all the attributes. Based on the findings of this study, it is recommended that baby food made from purple yam flour and soya beans flour should be explored for commercial production. The affordability, sensory appeal, and long shelf life make it a promising product for both local and international markets. Efforts should be made to scale up production to meet potential demand.

Keywords: Scaling Up Nutrition (SUN); World Health Organization (WHO);

Introduction

Complementary Food or feeding is the process of introducing solid or semi-solid food to infants, alongside breast milk, typically starting around six months of age. It is a critical period in child development, as it ensures adequate nutrition to support growth and development. Globally, the World Health Organization (WHO) emphasizes the importance of timely, adequate, and appropriate complementary feeding practices. Despite global efforts, malnutrition remains a significant issue, with 144 million children under the age of five affected by stunting in 2020, highlighting the need for improved complementary feeding practices [1].

In Africa, complementary feeding practices vary widely, influenced by cultural, economic, and geographic factors. Inadequate feeding practices, low dietary diversity, and poverty contribute to malnutrition in children across the continent. According to UNICEF, only 23% of children aged 6-23 months in sub-Saharan Africa receive the minimum acceptable diet [2]. Initiatives such as the Scaling Up Nutrition (SUN) movement are promoting better feeding practices and policies to improve infant and child nutrition in Africa, though challenges persist in achieving widespread success.

In Ghana, complementary feeding practices also face challenges. According to the 2019 Ghana Demographic and Health Survey (GDHS), only 13% of children aged 6-23 months receive the minimum acceptable diet, with significant regional disparities [3]. Poor feeding practices contribute to the country's high rate of stunting (18%) and wasting (5%) in children under five. The Ghana Health Service and UNICEF have collaborated to promote improved complementary feeding through education and community programs, but progress is slow due to persistent poverty and cultural barriers. Improving complementary feeding practices globally, and particularly in Africa and Ghana, is essential for addressing malnutrition and promoting child health.

Purple yam (*Dioscorea alata*), also known as a root vegetable native to Southeast Asia, but it is cultivated and consumed globally, particularly in tropical and subtropical regions such as the Caribbean, West Africa, and Central America. It is distinguished by its vibrant purple hue, starchy texture, and mild sweetness, making it a popular ingredient in various culinary traditions. Beyond its culinary uses, purple yam is also celebrated for its nutritional value and health benefits, contributing to its status as a functional food in many diets worldwide (Kaushal., *et al.* 2020).

Purple yam is rich in complex carbohydrates, which provide a sustained source of energy. It is also a good source of dietary fiber, aiding in digestion and promoting gut health. Purple yam is low in fat but rich in essential micronutrients, including vitamin C, potassium, and vitamin A. Its distinct purple colour comes from anthocyanins, a class of powerful antioxidants that are beneficial for health [4]. One hundred grams of purple yam provides about 120 calories, 27 grams of carbohydrates, and 4 grams of dietary fiber [5].

Figure 1: Image of soya beans.

Purple yam has been shown to possess anti-inflammatory properties, which may help reduce the risk of chronic inflammatory conditions such as arthritis and cardiovascular diseases. The presence of antioxidants, vitamins, and minerals in the yam plays a crucial role in regulating inflammation in the body [6]. Purple yam's high fiber content makes it an excellent food for promoting digestive health. Dietary fiber helps prevent constipation and encourages regular bowel movements. Furthermore, fiber acts as a prebiotic, feeding the beneficial bacteria in the gut, which play a crucial role in overall digestive and immune health [7].

Purple yam is a versatile ingredient used in both savory and sweet dishes. In Southeast Asia, particularly in the Philippines, purple yam is famous for its use in desserts such as ube halaya (a sweet jam) and ube ice cream. It is also used in cakes, pastries, and beverages. In Africa and the Caribbean, purple yam is often boiled, roasted, or mashed and served as a staple food, similar to other yams and root vegetables [8].

In Ghana, yam, including purple yam, is a traditional staple food. It is consumed in various forms, such as boiled yam, yam fufu, or pounded yam, often served with soups or stews. While white yam varieties are more commonly used, purple yam is gaining popularity due to its vibrant colour and nutritional benefits. In recent years, it has been incorporated into various modern and fusion dishes, appealing to health-conscious consumers and food enthusiasts [9].

Purple yam is not only a staple food in many parts of the world but also a superfood with numerous health benefits. Rich in essential nutrients, antioxidants, and fiber, it supports heart health, regulates blood sugar, and promotes digestive wellness. The growing global interest in functional foods has spotlighted purple yam, particularly for its potential role in cancer prevention and other health benefits. Whether used in traditional dishes or modern culinary creations, purple yam is a valuable food resource with promising contributions to health and nutrition.

Soya beans (*Glycine max* (L.) Merrill) is an important legume which is grown in tropical, subtropical and temperate climates. Like peas, beans, lentils and peanuts, it fit in to the botanical family, *Leguminosae*, in the subfamily *Papilionideae*. It has 40 chromosomes and is a self-fertile species with less than 1 % out-crossing [10].

Figure 2: Image of soya beans [11].

Soy beans contain significant amounts of dietary minerals and B vitamins. Soya beans is the most important protein source for feed farm animals During World War II, Soya beans became important in both North America and Europe chiefly as substitutes for other protein foods and as a source of edible oil. During the war, the Soya beans was discovered as fertilizer due to Nitrogen fixation by the United States Department of Agriculture [12].

Soybeans (*Glycine max*) are a versatile legume widely cultivated for their high protein and oil content, making them a key agricultural commodity worldwide. Originating from East Asia, soybeans have become one of the most important crops, not only for human consumption but also for animal feed and industrial uses. They are rich in essential amino acids, which make them a valuable source of protein in plant-based diets [13]. Additionally, soybean oil is commonly used for cooking and as a base for products such as margarine and biodiesel [14].

In recent years, the global demand for soybeans has increased, driven by the growth of plant-based food markets and the need for sustainable protein sources [15]. Soybeans are also recognized for their role in improving soil health, as they fix nitrogen in the soil, reducing the need for synthetic fertilizers [16]. However, the expansion of soybean farming, particularly in regions like South America, has raised concerns about deforestation and biodiversity loss [17]. Efforts to improve soybean sustainability include advancements in crop breeding and precision agriculture to enhance yields while minimizing environmental impacts [18].

Materials and Methods

Source of materials

The main source of materials for this research work such purple yam were purchased from Suame Market in Ashanti Region of Ghana.

Experimental design

Purple yam was washed and peeled; it was then sliced. The sliced purple yam was washed in salty solution. It is then exposed

to sunlight for 3 days (10:00 am-4:00pm) in a tray. The dried purple yam was milled using blender to obtain the purple yam flour and package.

The soybean was sorted, Chaff, Stones and unwanted materials were separated from the beans. It was then milled and packaged in an airtight container.

Figure 3: Image of soya beans.
Source: Authors own construct, 2024.

Figure 4: Image of soya beans.
Source: Authors own construct, 2024.

Product design

Product Code	Purple yam Flour	Soya beans Flour
A	60%	40%
B	50%	50%
C	40%	60%

Table 1: Shows the amount of purple yam flour and Soya beans flour in the product of baby food.

Preparation of Baby food

Authors own construct, 2025.

Sensory evaluation

The method used in assessing the product or sample was Sensory Evaluation. Assessors were asked to scope product and comment after evaluating it. The Sensory evaluation forms were prepared to enable the assessors to provide right answers after tasting the product. Some demographic information on respondent on the evaluation forms includes sex, age, and occupation. Attributes assessed included taste, aroma, colour, texture, after taste and overall acceptability. The products were assessed on five-point scale, 5-like extremely, 4-like moderately, 3-neither like nor dislike, 2-dislike moderately, 1-extremely dislike. The assessors were recruited from City Hospital and St. Edward hospital all at Amakom in the Ashanti Region of Ghana. The three products were assessed by the respondents to determine which product was the best. In all 20 nursing mothers from City Hospital and 10 from St Edward hospital were selected for the sensory.

Individual costing of items of products

Cost of product A

Table 2: Cost of Product A (60% Purple Yam flour and 40% Soya Beans Flour).

Ingredients	Unit	Unit Price (GH₵)	Quantity Required	Total Cost (GH₵)
Product A				
Purple yam	500g	5.00	60g	0.60
Soya Bean Flour	500g	10.00	40g	0.80
Labour	1.00	-	1.00	1.00
Container	1 piece	1.00	1 piece	1.00
Total				GH₵ 3.40

Cost of product B

Table 3: Cost of Product B (50% Purple Yam flour and 50% Soya Beans Flour).

Ingredients	Unit	Unit Price (GH₵)	Quantity Required	Total Cost (GH₵)
Product B				
Purple yam	500g	5.00	50g	0.50
Soya Bean Flour	500g	10.00	50g	1.00
Labour	1.00	-	1.00	1.00
Container	1 piece	1.00	1 piece	1.00
Total				GH₵ 3.50

Cost of product C

Table 4: Cost of Product C (40% Purple Yam flour and 60% Soya Beans Flour).

Ingredients	Unit	Unit Price (GH₵)	Quantity Required	Total Cost (GH₵)
Product C				
Purple yam	500g	5.00	40g	0.40
Soya Bean Flour	500g	10.00	60g	1.20
Labour	1.00	-	1.00	1.00
Container	1 piece	1.00	1 piece	1.00
Total				GH₵ 3.60

Authors own construct, 2025.

The scores allocated by the respondents to the products, based on their degree of preferences of the sensory attributes were used to calculate the mean for each sensory attribute. The mean value obtained for each Product, for a particular sensory attribute was used to calculate analysis of variance (ANOVA) to determine whether significant differences existed among the Products in terms of taste, aroma, colour, after taste and overall acceptance using mini tab software version 20.3.

Results

The assessors expressed a strong preference for the sensory attributes (taste, aroma, colour, texture, and aftertaste) of the baby food products made from purple yam flour and soya beans flour. Among the four formulations tested, Product B (50% Purple Yam flour and 50% Soya Beans flour) stood out as the most preferred in all sensory aspects. This balanced combination delivered an appealing flavour and texture, making it a favourite among assessors. In terms of cost, the price of the baby food ranged from GH₵ 3.40 for Product A to GH₵ 3.60 for Sample D, indicating affordable production costs across all formulations. Moreover, the product's shelf life was found to be six months at room temperature, with no significant changes in sensory attributes during storage. This extended shelf life adds practical value to the product, making it a viable option for both consumers and potential manufacturers.

Conclusion

The results of this study demonstrate that Product B (50% Purple Yam flour and 50% Soya Beans flour) was the most favoured by the assessors based on its high mean scores for taste, aroma, colour, texture, and aftertaste. The preference for Product B highlights the importance of achieving a balanced ratio between purple yam

and soya beans flour to create a baby food that is both nutritious and appealing. Product C (40% Purple Yam flour and 60% Soya Beans flour) followed as the second most preferred, while Product A (60% Purple Yam flour and 40% Soya Beans flour) was rated the lowest. This suggests that the higher proportion of purple yam in Product A may have resulted in a less favourable texture or flavour. Ultimately, the successful formulation of Product B indicates that baby food made from purple yam and soya beans flour is well-suited for consumer acceptance.

Recommendations

Based on the findings of this study, it is recommended that baby food made from purple yam flour and soya beans flour should be explored for commercial production. The affordability, sensory appeal, and long shelf life make it a promising product for both local and international markets. Efforts should be made to scale up production to meet potential demand.

It is also recommended that further research be conducted to assess the nutritional profile of the baby food. A comprehensive nutritional study would provide valuable insights into the health benefits of this formulation, enhancing its marketability and informing consumers of its potential to meet the dietary needs of infants.

Lastly, the introduction of this product into local markets and households is advised. Given its positive reception, this baby food can serve as a culturally relevant and affordable alternative to conventional baby food products, offering parents a homegrown option that supports both local agriculture and child nutrition.

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