ajfand SCHOLARLY, PEER REVIEWED
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
Volume 20 No. 5 September 2020
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Afr. J. Food Agric. Nutr. Dev. 2020; 20(5): 16509-16521 https://doi.org/10.18697/ajfand.93.19325

BREAD CONSUMPTION PATTERN AND THE POTENTIAL OF ORANGE-FLESHED SWEETPOTATO-COMPOSITE BREAD IN GHANA

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Volume 20 No. 5
September 2020
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ABSTRACT

Bread is consumed by most Ghanaians. Wheat flour and refined sugar are the main raw materials in bread making. These key raw materials are imported, thereby causing the local currency to consistently lose value. Therefore, developing bread recipes with locally available raw materials such as root and tuber crops is of the essence. The study assessed bread consumption patterns in Ghana; potential consumer preference for orange-fleshed sweetpotato (OFSP) puree-wheat flour composite bread; consumers' willingness to buy and bakers' willingness to bake this composite bread. Cross-sectional surveys were conducted in four regions of Ghana: Accra, Ashanti, Northern, and Upper East regions; data were collected using a semi-structured questionnaire. Consumers (n = 651) and bakers (n = 77) were randomly selected to participate in the study. Data were analyzed using descriptive scores procedure in IBM Statistical Package for the Social Sciences version 20. Almost all the consumer-respondents (96.50%; n = 628) indicated that they eat bread. Based on the frequency of bread consumption, 54% of respondents consumed bread daily, 18% once a week and 28% twice or more per week. The preferred bread types across the regions were: tea, butter, and "sugar" bread. Respondents across the regions consumed at least one type of bread with tea bread being the most consumed in the Upper East (n = 153; 39.30%) and Northern (n = 58; 38%) regions. However, butter bread was the most consumed in the Greater Accra (n =17; 36%) while consumer-respondents in the Ashanti region (n = 24; 38.70%) indicated they consume more than one type. The least consumed bread type across all the regions was composite and bran (brown) bread types. The consumers' willingness to buy the OFSP-based bread further increased by 8.3% when they were informed about the nutritional benefits of OFSP-based bread. Thus, the OFSP-based wheat flour composite bread could have a higher potential of being adopted into the Ghanaian community irrespective of regional demarcation to increase dietary intake of vitamin A. This would contribute to efforts to find a sustainable way of increasing dietary intake of vitamin A, particularly children in Ghana.

Key words: Baker, composite-bread, consumer, Ghana, orange-fleshed sweetpotato, puree, survey, vitamin A

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INTRODUCTION

Bread is widely consumed by Ghanaians [1] of all ages irrespective of their per capita income [2]. White bread variants: butter, sugar, brown, tea; and whole wheat type, brown are available in the Ghanaian market. According to a report by the Ghana Statistical Service [3], bread is now taking the highest cash expenditure within the food sub-group in Ghana. This has led to a steady rise in wheat importation [4] and consequently high foreign exchange expenditure for importation. Furthermore, wheat importation suppresses indigenous cereals, with a resultant detrimental effect on agricultural and technological development, thereby aggravating the food insecurity status of a nation [5, 6]. Baking of bread also requires sugar, and this ingredient is also imported.

Efforts have been carried out to promote the use of composite bakery products in which a portion of wheat flour is replaced with locally grown crops [6-10]. The use of root crops such as orange-fleshed sweetpotato (OFSP) for producing bakery products has not been widely exploited in Ghana, although it is a good source of β-carotene. Bonsi and co-workers found sweetpotato to be a good composite to wheat flour if pureed for bread production [7]. It has been previously reported that OFSP can serve as a partial substitute (20-50%) for wheat flour in bakery products [11, 12]. Another study has shown that the OFSP-based composite bread could be a significant dietary source of vitamin A [13]. Two composite bread types (vita butter bread and vita tea bread) were developed with an estimated trans β-carotene intake of 3,293 µg/day (vita butter) and 1,931 µg/day (vita tea) that met 21% and 12% respectively of the daily requirement of 1,300 µg RAE/day for lactating mothers [13]. This confirms the valuable contribution that OFSP can make as a food-based approach to reduce vitamin A deficiency (VAD) in individuals at risk.

The sensory data from the survey indicated that the panelists (n = 310) preferred the OFSP-based composite bread types to the existing recipe [13]. Although the panelist for this study were university students from diverse backgrounds, they largely depend on their parents or guardians and may not be able to influence the decision to buy bread or not. Therefore, there is a need for a larger survey using average Ghanaian consumers to measure the preference of the OFSP-based composite bread.

Importantly, OFSP-based composite bread recipes will reduce the production cost of bread as the incorporation of imported wheat flour is reduced, and in the case of refined sugar, possibly eliminated [14, 15]. However, there is a dearth of knowledge on the potential of OFSP-based composite bread on the Ghanaian market in a larger survey.

Therefore, the objectives of this study were to assess bread consumption pattern from four regions in Ghana; and the preference of a proposed composite OFSP puree-based bread. Also, the willingness of bakers to bake the OFSP puree bread recipes was investigated.

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MATERIALS AND METHODS

Description of Study Area

Cross-sectional surveys were carried out in peri-urban areas of Greater Accra, Ashanti, Northern, and Upper East Regions of Ghana to assess consumers' responses on the frequency of bread consumption and types of bread they consume. The Greater Accra and Ashanti Regions are cosmopolitan with higher resource levels compared to the Northern and Upper East Regions [16]. In Ghana, bread is categorized into two groups: wheat-based bread such as white bread and bran (brown) bread; and composite bread, which includes bread made from a mixture of flours from either cereals, legumes, root crops, and wheat flour [1].

Two semi-structured questionnaires were separately used to interview bread consumers and bakers. The consumers' questionnaire comprised of two sections: Demographic information and a series of questions regarding consumers' preference of bread and willingness to buy bread. The bakers' questionnaire also captured demographic information as well as baker's willingness to bake the OFSP-based composite bread. Respondent characteristics of the study are presented in Table 1.

Data Analysis

The quantitative data were analyzed using descriptive scores procedure in IBM Statistical Package for the Social Sciences version 20. We calculated. Data have been summarized in tables and graphs.

RESULTS AND DISCUSSION

Respondents' demographics characteristics and bread consumption

A little over half (57.6%) of the respondents in this study were male. A majority (64.8%) of the respondents were at a youthful age (15 – 45 years) as presented in Table 1. Because almost (97%) all the respondents were 15 years and above, indicating that they decide on the type of food to buy. This adds strength to the information on the willingness to buy the OFSP-based composite bread investigated in this study.

Regional distribution of types of bread consumed and frequency of consumption

The data presented in Figure 1 showed that both female and male respondents consumed bread, except a minority (6.1%) who indicated they do not consume bread in Northern and Upper East Regions. Among the bread consumers, 55.6% of them were male while 40.9% being female (Table 2).

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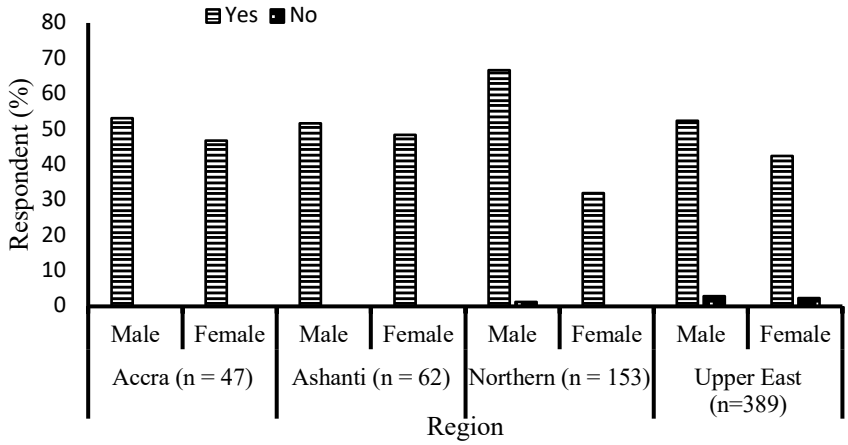

Figure 1: Percentage of respondents who consume bread across the regions based on gender

From the study, majority (96.2%) of the respondents consumed various types of bread in Ghana (Table 2). The current findings indicate that bread is a major staple food as reported earlier [1], and has become part of the daily Ghanaian diet. The possible reasons for these observations could be that bread is a convenient food and most Ghanaians consider it an essential part of breakfast meals. The findings on high consumption of bread in Greater Accra and Ashanti regions support earlier findings of [1] who reported that daily consumption of bread is relatively high in Greater Accra (62%) and Ashanti (53%) regions. The consumption of different bread types as shown by the study respondents suggest that recipes on OFSP-composite bread are needed for all the different bread types available in Ghana.

Tea and butter bread types were the most consumed bread types in all regions (Figure 2). Tea bread was the most consumed bread type in Northern (38%) and Upper East (39.3%). However, in Greater Accra, the most consumed was the butter bread type (36.2%), while in the Ashanti region, 38.7% of respondents said they consume more than one bread type (Figure 2). It is worth noting that the least consumed bread types in all the four regions were composited and bran (brown) bread. The least preference for composite bread is that respondents may not be aware of the term "composite bread". For the bran, it could be its relatively high price compared with the other bread types. Also, its processing is on a low scale in Ghana. As expected, the OFSP-composited bread was among the least consumed in Ghana. Therefore, there will be a greater need for education on the nutritional value of the OFSP-based composite bread.

However, the minority (6.1%) of respondents who did not consume bread in the Northern and Upper East regions indicates that bread consumption is patronized by both poor- and wealthy-households as extreme poverty prevails in the rural-savannah at 27.3% but virtually non-existent in urban localities such as Greater Accra and Ashanti Regions [3].

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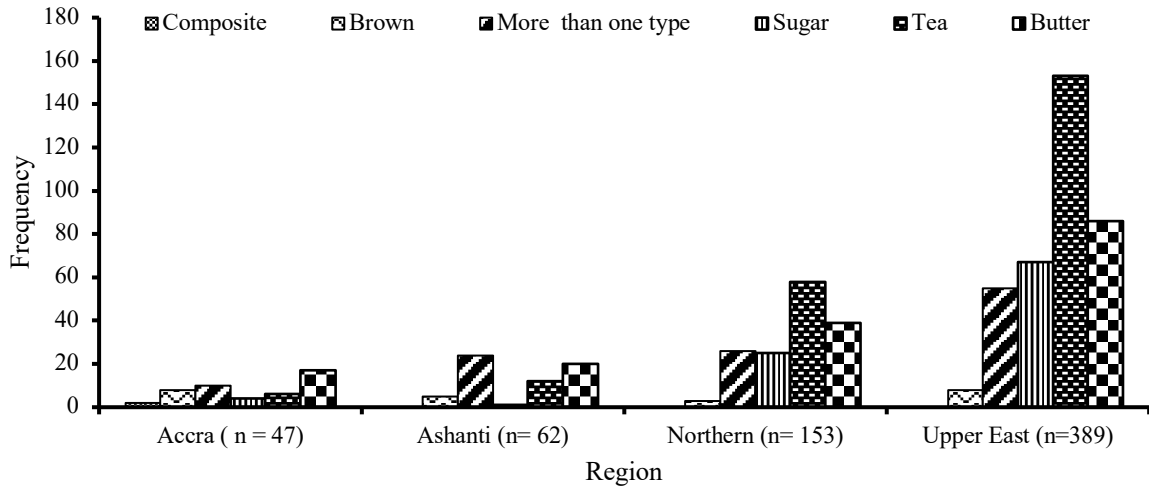

Figure 2: Types of bread consumed across regions

The data as presented in Figure 3 showed that slightly more than half (54.4%) of respondents across the four regions consume bread daily. Almost 27.9% of respondents across the regions said they consume bread twice or more times in a week.

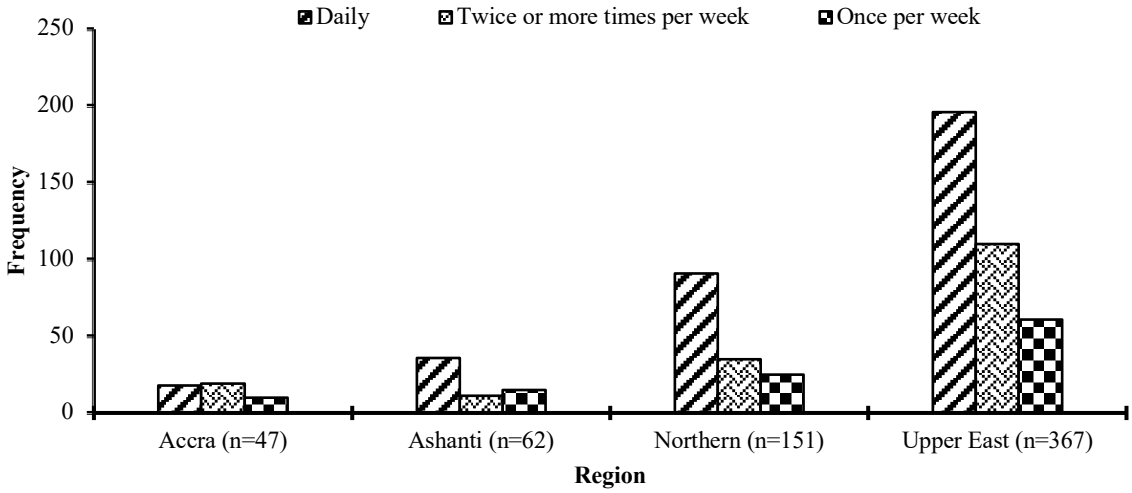

Figure 3: Frequency of bread consumption among regions surveyed in Ghana

The main drivers of bread consumption were because the respondents considered it as part of a breakfast meal (69.12%) and as a ready-to-eat food (Table 3).

Consumers' willingness to buy OFSP-based composite bread

Consumers were asked whether they were willing to purchase OFSP-based composite bread without prior knowledge about its vitamin A content (Figure 4a) and 83.2% of them responded in the affirmative. The data confirm previous works by Laurie and Van-Heerden [17] who observed that 87% of respondents were willing to purchase food products (chips, doughnut, juice) made from OFSP. This could be that the substitution of wheat flour with OFSP puree does not significantly affect the physical and sensory

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properties of the products. The higher willingness to purchase the new composite bread in the Upper East and Northern regions, compared to Greater Accra and Ashanti regions could be due to earlier works on Jumpstarting Project by International Potato Center and University for Development Studies in the Northern and Upper East regions that have created the awareness of the people on the benefits of OFSP in these areas. This corroborates the observation of Bhatta, Doppler, and Bahadur [18] that knowledge about a product is an important factor influencing willingness to pay for it. The respondents' willingness to buy further increased by 8.3% when the respondents were informed about the nutritional benefits of OFSP-based composite bread (Figure 4b). The increase in willingness to buy the OFSP-based composite bread after highlighting the nutritional benefits is supported by earlier works [19]. The authors listed factors such as taste, packaging, price, size, color, market distance, and health benefits to affect consumers' buying decisions. Willingness to pay a premium for functional food is significantly affected by the link between nutrition and health concern about chronic diseases among other factors [20, 21]. The current findings generally suggest that when marketing the new composite bread, its nutritional and health benefits to consumers should be highlighted to promote patronage.

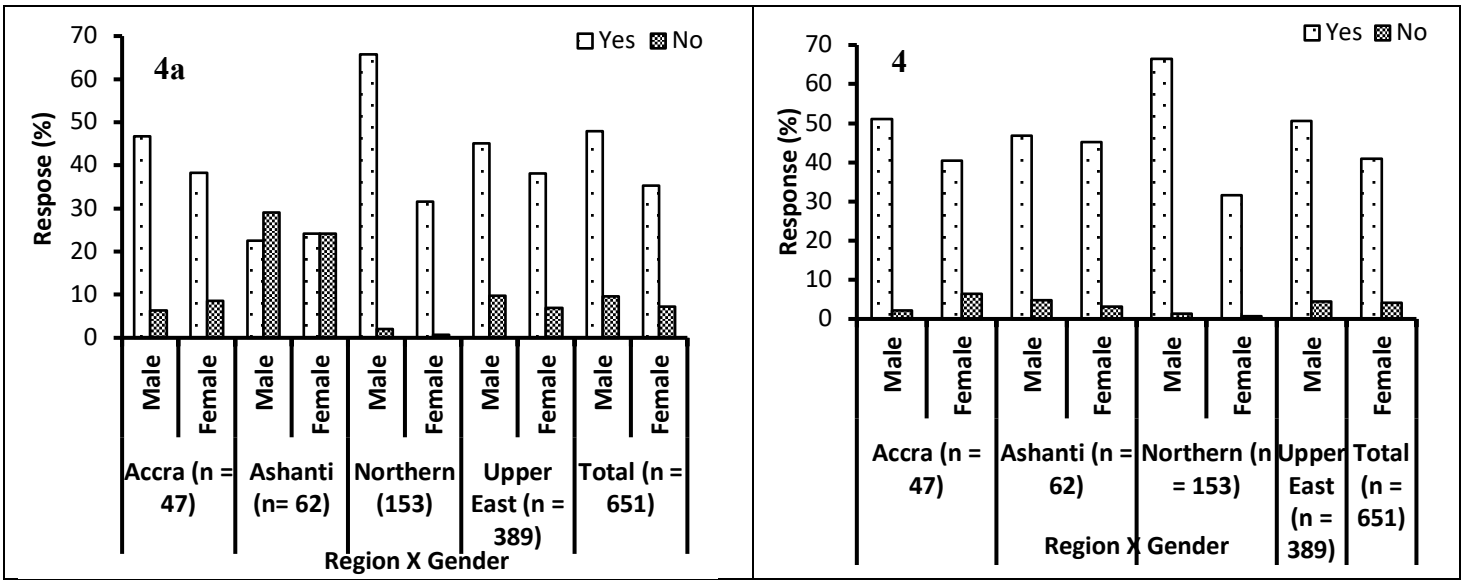

Figure 4: Consumer's willingness to buy composite bread without (4a) and with (4b) prior knowledge about its nutritional benefit

More male respondents were willing to buy the OFSP-based composite bread with or without prior knowledge about its vitamin A content than the Female respondents (Figure 4a & 4b). The relatively higher number of males willing to purchase the OFSP-based composite bread with or without prior knowledge about its nutritional content could have a huge potential as males are household heads and can influence what should be procured for the family. Also, within the age group of 15-30, the willingness to buy bread either based on composition or potential nutritional benefit was very high. This age group is generally youthful and suggests that it could be the target market when the OFSP-based composite bread is launched full-scale.

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Bakers' willingness to bake the orange-fleshed sweetpotato composite bread

Almost 87% (male = 19.5% and female = 67.5%) of bakers across the four regions indicated their willingness to bake the OFSP-based composite bread without prior knowledge of its vitamin A content (Figure 5a). This is an indication that baking composite bread generally is gaining ground in the bread market because several new bread formulations have been reported [22]. Knowledge about the use of OFSP puree in baking, signals the onset, adoption and gradual acceptance of OFSP as a potential partial substitute for wheat-based bread.

About 6.5% more bakers said they were willing to bake the OFSP composited bread after they were made aware of its vitamin A content (Figure 5b). All bakers in Accra and Northern regions were willing to bake the OFSP composited bread after they were made aware of its nutritional superiority (Figure 5b). The willingness to bake the OFSP-based composited bread could indicate that bakers have consumers' health as the foundation. This was confirmed when the health benefit of consumers topped the reasons why bakers will go into OFSP-based composited bread. Knowledge about the use of OFSP puree/flour in baking could fuel continuity of incorporation into other bakery products, which will commensurate future consumer demands.

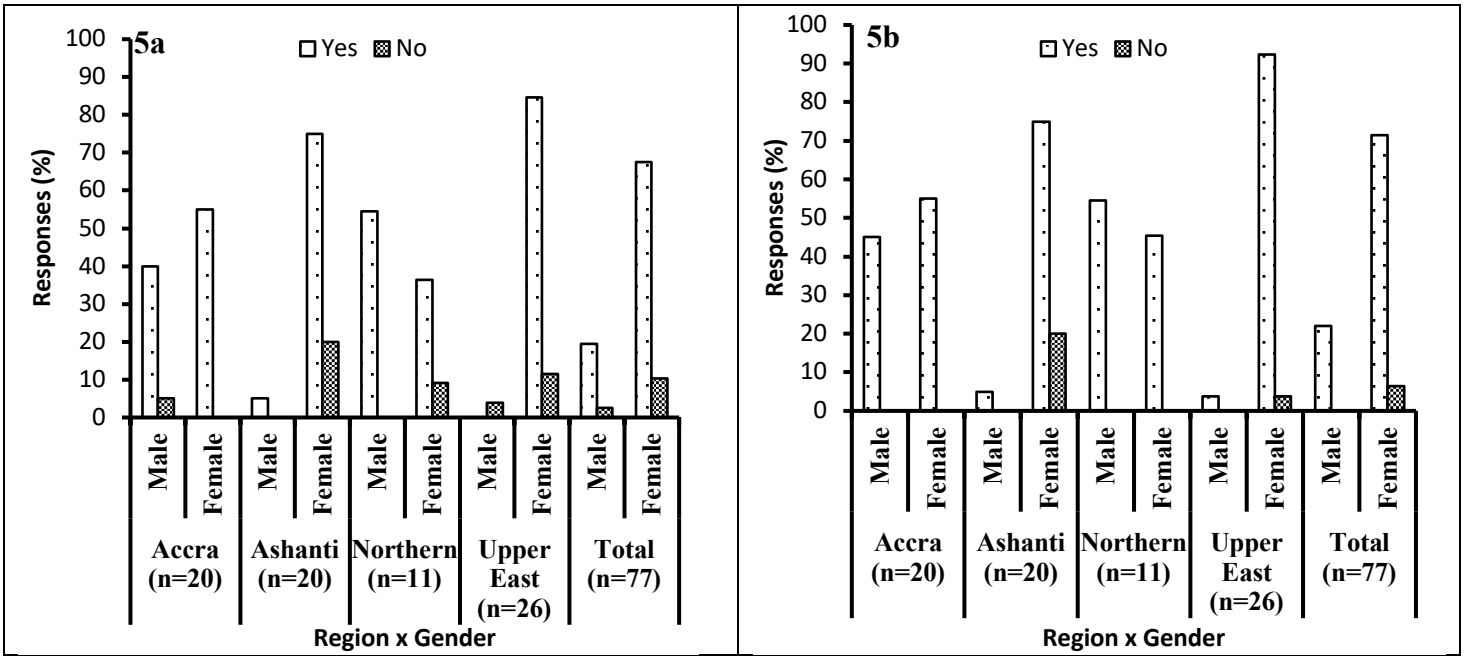

Figure 5: Bakers' willingness to bake composite bread without (5a) and with (5b) prior knowledge about its nutritional benefit

The study also elicited bakers' knowledge about the use of OFSP puree/flour for baking (Figure 6).

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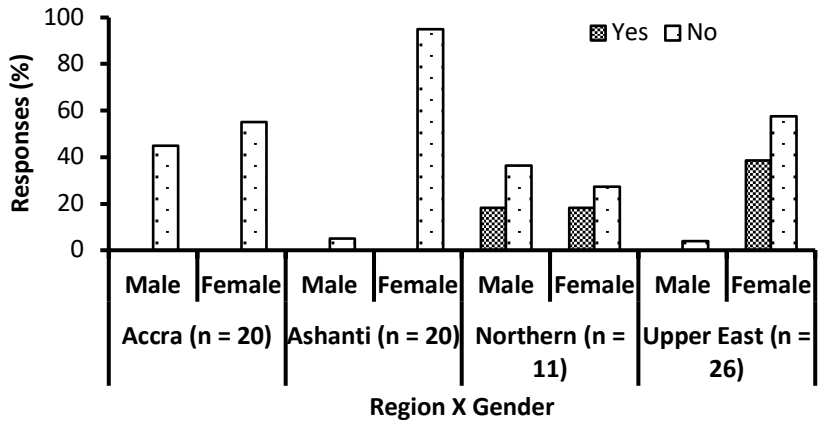

Figure 6: Baker's awareness of OFSP puree/flour for baking

Generally, bakers' knowledge about the use of OFSP puree/flour as a partial substitute for wheat flour for bakeries was low across the regions. Except for Northern and Upper East regions, bakers across the regions did not know the use of OFSP puree/flour for baking.
Majority (68%) of bakers across the four regions said they would consider commercial production of the OFSP composited bread because of consumer health (Table 4). Strangely, bakers across the regions did not consider the partial substitution of wheat flour with OFSP puree/flour to reduce the cost of production, provide better profits and market availability of the OFSP roots as some of the reasons that could lead them into commercial production the orange-fleshed sweetpotato composite bread.

The OFSP-based bread is relatively new in the Ghanaian market and because of this, not all consumers are familiar with it and this has been acknowledged as a limitation of the study.

CONCLUSION

Bread has become a major staple in Ghana, possibly patronized by both wealthy and poor households. The awareness of the health benefit of the OFSP-based composite bread influenced consumers and the baker's willingness to consume and bake, respectively. The consumption of traditional bread varieties or recipes, although existent and highly patronized, does not threaten the emergence, acceptance, adoption, and sustainability of the OFSP-based composite bread because it has a competitive advantage based on possible consumer nutritional benefits.

ACKNOWLEDGEMENTS
Funding received from International Potato Center under the project SASHA II: Sweetpotato Action for Security and Health in Africa is heartily valued and acknowledged.

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Table 1: Sample characteristics

Variable	Descriptors of variable	*n*
	Consumers	
Sex	Male	375
	Female	276
	Total	**651**
Age	<15	3
	15-30	421
	31-45	165
	46-60	42
	61+	19
	Total	***650**
Region	Accra	47
	Ashanti	62
	Northern	153
	Upper East	389
	Total	**651**
	Bakers	
	Accra	20
	Ashanti	20
	Northern	11
	Upper East	26
	Total	**77**

Note: *Not all respondents completed their questionnaire

Table 2: Bread consumption pattern in Ghana

		Do you eat bread?	
Variable	**Descriptors of variable**	**Yes**	**No**
	Male	362	13
Sex	Female	266	10
	Total	**628**	**23**
	<15	3	0
	15-30	406	15
Age	31-45	158	7
	46-60	41	1
	61+	19	0
	Total	***627**	**23**

Note: *Not all respondents completed their questionnaire

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Table 3: Main reasons why respondents purchase bread

Main reasons for purchasing bread	Percentage (%)
Ready-to-eat food	13.28
Low-cost food	0.80
Health reasons	4.80
Ready-to-eat food & health reasons	0.32
Low-cost food & health reasons	0.32
Part of breakfast meal	69.12
Ready-to-eat food & part of breakfast meal	6.56
Low-cost food & part of breakfast meal	0.80
Health reasons & part of breakfast meal	1.92
Pacifier food for kids	1.12
Pacifier food for kids & health reasons	0.32
Pacifier food for kids & part of breakfast meal	0.48
Pacifier food for kids, part of breakfast meal & ready-to-eat food	0.16

Table 4: Reasons for going into commercial production of orange-fleshed sweetpotato and wheat flour composite bread

Region	Low production cost	Consumer health	Consumer health & Low production cost	Market availability	Better profit than usual bread	Better profit than usual bread & Consumer health	Better profit than usual bread & Market availability	N
Accra	0 (0%)	19 (95%)	0 (0%)	1 (5%)	0 (0%)	0 (0%)	0 (0%)	20
Ashanti	1 (5%)	17 (90%)	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	19
Northern	1 (9%)	9 (82%)	0 (0%)	0 (0%)	1 (9%)	0 (0%)	0 (0%)	11
Upper East	0 (0%)	7 (27%)	0 (0%)	4 (15%)	6 (23%)	7 (27%)	2 (8%)	26
Total	**2 (3%)**	**52 (68%)**	**1 (1%)**	**5 (7%)**	**7 (9%)**	**7 (9%)**	**2 (3%)**	***76**

*Not all bakers responded to question

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