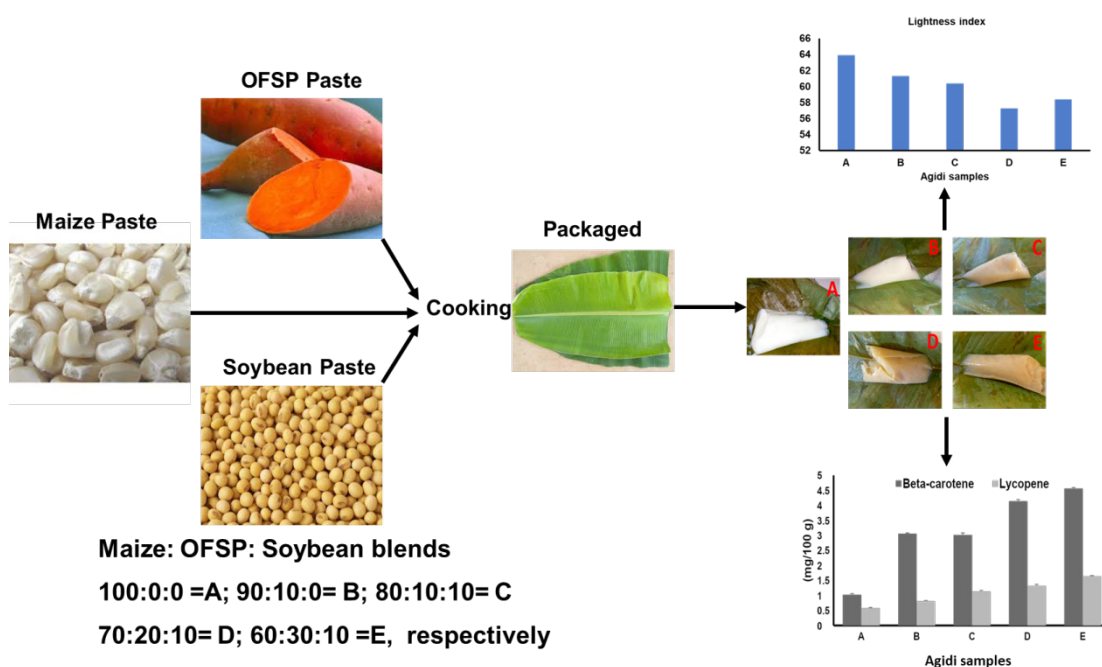


Chemical composition and consumer acceptability of *agidi* (maize gel) enriched with orange-fleshed sweet potato and soybean

F.L. Kolawole*, S.A. Oyeyinka, M.A. Balogun and F.F. Oluwabiya



Graphical Abstract for the preparation of *agidi* from maize, orange fleshed sweet potato (OFSP) and soybean pastes

Highlights

- Protein-enriched *agidi* was prepared from maize, orange fleshed sweet potato & soybean.
- Enriched *agidi* had improved mineral contents with calcium as the major mineral.
- Beta-carotene contents of enriched *agidi* increased by about 3 to 5 folds the initial level.
- Sensory properties were not significantly altered compared to the traditional *agidi*.

RESEARCH ARTICLE

Chemical composition and consumer acceptability of *agidi* (maize gel) enriched with orange-fleshed sweet potato and soybean

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Received: 13/02/2020; Accepted: 31/10/2020

Abstract: Vitamin A deficiency remains a serious public-health concern in developing nations of the world. Staple foods such as maize gruel and maize gel may be used as carriers of beta-carotene that could be used to reduce the prevalence of this diseases, especially among children. In this study, maize gel (*agidi*) was enriched with orange fleshed sweet potato (OFSP) and soybean to improve the vitamin A and protein intake of regular consumers of *agidi*. The protein, ash, crude fibre and fat contents of the *agidi* samples increased with increased amounts of OFSP and soybean providing a balanced protein-energy diet. There was also a significant increase in the mineral, phytochemical and vitamin composition of the *agidi*-fortified samples when compared to the control (maize *agidi*). The significant increase in the beta-carotene (pro-vitamin A) of the OFSP-soybean maize *agidi* is an advantage for consumers especially in the management of vitamin A deficiency (VAD). The enriched *agidi* samples compared well with maize *agidi* in some sensory characteristics and were also acceptable.

Keywords: *Agidi*, OFSP, Soybean, Enrichment, Maize.


INTRODUCTION

Agidi is a smooth-textured, semi-solid food, cooked from wet-milled and wet-sieved maize paste (Akobundu and Hoskins, 1982). It is a traditional fermented starchy food produced from maize, millet or sorghum (Ogiehor *et al.*, 2005). *Agidi* is mostly consumed in many parts of West African countries including Nigeria (Ikya *et al.*, 2013; Osungbaro, 1990a; Osungbaro, 1990b; Otunola *et al.*, 2006). The consumption of *agidi* is becoming very popular, with acceptability cutting across the various multi-ethnic groups and socioeconomic classes (Ogiehor *et al.*, 2005). *Agidi* is usually consumed by infants and adults (Akobundu and Hoskins, 1982) with stew, vegetables, bean cake or bean pudding (Abdulrahman and Kolawole, 2006). *Agidi* has varying appearance in terms of colour, depending on the raw material used for its preparation. For example, *agidi* prepared from maize may have a cream to glassy white while those prepared from sorghum and millet produces light brown and grey colours, respectively.

Nutritionally, *agidi* is rich in carbohydrate (46.51-74.06%) and relatively low in protein (6.56-8.92%)

and fibre (0.74-1.92%) (Balogun *et al.*, 2016; Oguche *et al.*, 2017). Due to its low fiber content, it is usually recommended during convalescence and weaning (Akobundu and Hoskins, 1982). In addition, most cereals including maize are low in protein, for example, maize is generally low in lysine, methionine, and tryptophan. Hence, cereal based products are usually enriched in order to improve their nutritive value. Previous studies reported significant improvement in the protein contents of maize gruel enriched with soybean (Balogun *et al.*, 2016; Ikya *et al.*, 2013). Enriching cereal-based foods with protein-rich leguminous crops and vitamins such as vitamin A are promising avenues for improving nutritional value of foods and combating many life-threatening diseases such as vitamin A deficiency, respectively. Vitamin A deficiency (VAD) remains a serious public-health and the leading cause of blindness in children from developing countries (Campagnoli and Smiddy, 2016). *Agidi* is majorly made from the white variety and this maize type is very low in beta carotene. However, the yellow variety of maize is rich in beta carotene (0.25-2.5 µg/g), a precursor of vitamin A, while the provitamin A varieties of maize contain up to about 15 µg/g (Nuss and Tanumihardjo, 2010). Plant materials such as orange fleshed sweet potato (OFSP) may be used in the development of value-added products which can be potentially used to address VAD. This seems plausible since they are good sources of beta-carotene (132-194 µg/g) (Van Jaarsveld *et al.*, 2005). Thus, OFSP can be used to enhance the beta-carotene contents of staple foods such as *agidi* in developing nations of the world including Africa. Recently, Kolawole *et al.* (2020) suggested that OFSP paste and flour could be used by commercial food industries and even at household levels to enhance the nutritional intake of the vulnerable groups especially in addressing the problem of malnutrition and Vitamin A deficiency (VAD) affecting developing countries. Therefore, it seems plausible that OFSP can be incorporated into maize to enhance the nutrient content and antioxidant potentials of *agidi*. The utilization of OFSP in food applications is still limited. Hence its use in the enrichment of *agidi* may increase its consumption, thereby improving the dietary status of the consumers. In this study, the chemical composition and acceptability of *agidi* enriched with orange-fleshed sweet

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potato and soybean was investigated.

MATERIALS AND METHODS

White maize (*Zea mays*) and soybean (*Glycine max*) were purchased from Ipata Market, Ilorin East Local Government Area, Kwara State, Nigeria. Freshly harvested orange-fleshed sweet potatoes (*Ipomea batatas*) were obtained from a farm in Agricultural and Rural Management Training Institute, Ilorin, Kwara State. The batch used in this study was harvested after a growing season of 30 weeks and were immediately transferred in jute bags to the Department of Home Economics and Food Science Laboratory, where they were immediately processed. The β -carotene and lycopene standards were purchased from Sigma-Aldrich Chemicals (St. Louis, MO, USA).

Preparation of maize, OFSP and soybean paste

Maize paste was produced using traditional methods with slight modifications. Briefly, cleaned maize grains (1 kg) were steeped in 4 L of potable water for 72 h at room temperature (27 ± 2 °C). The steep water was decanted and the grains were washed thoroughly with potable water. The grains were then milled with 4 L of water using attrition mill after which the slurry was then sieved with excess water using a muslin cloth. The filtrate was allowed to settle for 12 h and the supernatant decanted.

The OFSP tubers were processed into paste by washing 1 kg of OFSP in clean water. The cleaned tubers were peeled, diced and blanched in 1 L of boiling water for 15 min. The blanched OFSP roots were then milled together with the blanching water in a blender to obtain a puree.

Soybean paste was produced as described by Adesokan *et al.* (2011) with slight modifications. Briefly, Soybeans (250 g) was weighed and sorted. The beans were soaked in hot water (60 °C) for 2 min, after which they were de-hulled to remove seed coats. The de-hulled beans were parboiled in 500 mL of hot water for 20 min and wet milled using a blender to obtain a paste.

Preparation of *agidi* samples

Agidi was produced following the method of Oguiche *et al.* (2017) with slight modifications. Slurry made from 500 g of maize paste mixed with 300 mL of potable water, was added to 1000 mL of boiling water with continuous stirring (for about 10 min) until custard-like semisolid gruels were formed. Each sample was wrapped in banana leaves and left to cool for 2 h at room temperature and subjected to chemical and sensory analyses. The above method was

used to prepare maize: OFSP: soybean blends in different ratios as shown in Table 1.

Proximate analysis

Moisture, fat and ash contents were determined using AOAC (2000) methods. Protein content was determined by the Kjeldahl method ($6.25 \times N$) and total carbohydrate was calculated by the difference. Fibre content was determined by standard laboratory procedure.

Mineral Analysis

Mineral content of the sample was determined as described previously (Oyeyinka *et al.*, 2018a), using Inductively Coupled Plasma (ICP) spectroscopy. Samples were acid-digested by the addition of 1.0 mL of 55% (v/v) HNO_3 .

Determination of Beta-carotene and Lycopene

Beta-carotene and lycopene contents of the samples were determined according to the method of Kumari *et al.* (2011) and described by Kolawole *et al.* (2017). Briefly, samples were extracted with methanol and the dried methanolic extract (100 mg) was mixed with 10.0 mL of acetone-hexane mixture (4:6) for 1 min and filtered. The absorbance was recorded at three different wavelengths of 453, 505 and 663 nm. Beta-carotene was calculated as: $0.216 \times A_{663} - 0.304 \times A_{505} + 0.452 \times A_{453}$, while lycopene content was estimated as: $-0.0458 \times A_{663} + 0.372 \times A_{505} - 0.0806 \times A_{453}$.

Colour

The CIE tristimulus L, a and b parameters of the *agidi* samples were measured using a chroma meter (ColourFlex-Diffuse) as reported previously (Oyeyinka *et al.*, 2018b). The colorimeter operates on the CIE L, a and b color schemes, L (lightness) axis – 0 is black, 100 is white, a (red-green) axis – positive values are red; negative values are green and 0 is neutral, b (yellow-blue) axis – positive values are yellow; negative values are blue and 0 is neutral. The instrument was standardized and the samples were placed in the sample holder. Color measurement was determined in triplicates.

Sensory evaluation

The descriptive test was used for the sensory evaluation of the various *agidi* samples. A 50-member panel was put up made up of University of Ilorin students that are familiar to *agidi*. A preliminary study was organized and members of the panel gave different descriptions of attributes of *agidi*

Table 1: Formulation of maize, orange fleshed sweet potato and soybean in maize gel (w/w).

Samples	Maize	OFSP	Soybean
A	100	0	0
B	90	10	0
C	80	10	10
D	70	20	10
E	60	30	10

Table 2: Descriptive sensory chart.

<i>Sensory attribute</i>	<i>Definition</i>
Colour	
Pale orange	Slightly or dull orange colour
Cream	Milky cream colour
White	Plain white paper colour
Taste	
Bitter	Chemical-like, taste sensation of which coffee is typical A taste sensation related to sugar
Sweet (sugary)	A taste sensation that is acidic and sharp
Sour	
Texture	
Smooth	A textural characteristics of a clean mouth feel Presence of small grainy or sandy particles
Gritty	Uneven mouth feel with tiny chunks
Lumpy	
Consistency	
Watery	A consistency similar to that of water A viscous consistency
Thick	General acceptability of the product
Overall acceptability	

(Source: Akissoe *et al.*, 2015)

based on colour, taste, texture, consistency and overall acceptability. The results obtained were analyzed and a descriptive test chart (Table 2) was developed for the study.

Statistical analysis

Duplicate samples were prepared and analyses was conducted in triplicate. Data was analyzed using one-way analysis of variance (ANOVA) and means were compared using the Fisher Least Significant Difference (LSD) test ($p \leq 0.05$) using the Statistical Package for the Social Sciences (SPSS) Version 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS AND DISCUSSION

Proximate composition of *agidi* samples

With the exception of carbohydrate, ash, fat, fibre, protein and moisture contents increased with increase in either OFSP or soybean (Table 3). *Agidi* samples generally had high amounts of carbohydrate (53.28-55.9%) and moisture (35.44-36.97%), but the ash (1.21-1.39%), fat (0.85-1.01%) and protein contents (5.59-6.31%) were very low (Table 3). High amount of carbohydrate is expected since the bulk of the raw material for making *agidi* is maize. This is one of the major reasons for enriching *agidi* and other cereal based staple with leguminous crops such as soybean and Bambara groundnut. For example, some authors reported significant

increase in the protein contents of maize gruel or *agidi* enriched with soybean (Balogun *et al.*, 2016; Ikya *et al.*, 2013; Oguche *et al.*, 2017) or Bambara groundnut (Zakari *et al.*, 2010). Oguche *et al.* (2017), found that the protein content of *agidi* increased more than 100 folds when 20% of soybean was added to maize paste. In the current study, OFSP and soybean were used in varying ratios to achieve different objectives of enriching the *agidi* with beta carotene and protein respectively. Protein contents (approx. 6.02%) recorded in this study for *agidi* enriched with 10% soybean were much lower than values previously reported for *agidi* enriched with 20 and 30% soybean (Oguche *et al.*, 2017). Differences in the protein contents obviously resulted from the varying proportions of soybean used. Furthermore, it appears that the OFSP contributed to the increase in protein content of the *agidi* samples. At the same soybean levels (10%), the protein content of the samples slightly increased from 6.11 to 6.31% (Table 3). OFSP has been reported to contain small amounts of protein (5.74-9.72) (Adeola *et al.*, 2019). These relatively small quantities of protein possibly contributed to the slight but significant increase in protein in the samples.

As stated previously, the moisture content of the samples was high (approx. 36%) and compares favorably with the literature (Balogun *et al.*, 2016; Oguche *et al.*, 2017). High moisture content in *agidi* could be due to the processing method since these samples were cooked pastes. Moisture

Table 3: Proximate compositions of *agidi* from maize, OFSP and soybean.

Samples	Moisture	Ash	Fat	Protein	Fibre	*CHO	Energy (Kcal/100g)
A	35.44 ^c	1.21 ^c	0.85 ^d	5.59 ^c	0.94 ^b	55.98 ^a	253.91 ^a
B	35.48 ^c	1.24 ^c	0.88 ^c	5.83 ^d	0.96 ^b	55.62 ^b	253.74 ^a
C	35.85 ^b	1.29 ^b	0.91 ^c	6.11 ^c	0.98 ^b	54.86 ^c	252.07 ^b
D	36.93 ^a	1.37 ^a	0.98 ^b	6.27 ^b	1.03 ^a	53.44 ^d	247.60 ^c
E	36.97 ^a	1.39 ^a	1.01 ^a	6.31 ^a	1.05 ^a	53.28 ^c	247.45 ^c

Mean along the same column with different superscripts are significantly ($p < 0.05$) different.

*CHO: Carbohydrate

Table 4: Mineral composition of *agidi* from maize, OFSP and soybean (mg/100 g).

Mineral	A	B	C	D	E
Calcium	236.10 ^d ±0.42	237.60 ^d ±0.14	240.90 ^d ±0.42	250.45 ^b ±0.35	294.00 ^a ±0.57
Magnesium	47.30 ^a ±3.82	46.40 ^a ±1.27	46.95 ^a ±0.49	46.55 ^a ±0.35	46.95 ^a ±0.92
Potassium	16.00 ^c ±1.41	23.50 ^b ±3.54	25.50 ^b ±0.71	27.50 ^b ±2.12	30.50 ^a ±0.71
Phosphorus	23.00 ^c ±1.41	25.50 ^b ±0.71	25.50 ^b ±0.71	26.50 ^b ±0.71	33.50 ^a ±0.71
Iron	3.15 ^a ±1.26	3.70 ^a ±1.41	3.80 ^a ±7.07	5.10 ^a ±0.00	5.20 ^a ±7.07
Zinc	2.40 ^d ±1.41	3.80 ^c ±1.41	4.55 ^b ±2.12	4.85 ^{ab} ±0.71	5.00 ^a ±1.41
Sodium	1.90 ^a ±1.41	1.35 ^b ±2.12	1.40 ^b ±1.41	2.20 ^a ±0.00	2.15 ^a ±0.71
Copper	2.70 ^c ±1.41	3.25 ^b ±0.71	3.30 ^b ±0.00	3.45 ^b ±0.71	4.55 ^a ±0.71

Mean along the same column with different superscripts are significantly ($p < 0.05$) different.

content is an important indicator of the shelf-life of foods (Oguche *et al.*, 2017). Thus, the high moisture contents of the samples predispose them to rapid spoilage, and hence, there may be needed to consume as soon as possible or to refrigerate where this option is available.

Mineral composition of *agidi* samples

Calcium (236.10-294.00 mg/100 g) is the major mineral present in the *agidi* samples (Table 4). Following calcium in quantities are magnesium (46.40-47.30 mg/100 g), phosphorus (23.00-33.50 mg/100 g) and potassium (16.00-30.50 mg/100 g). Other mineral elements i.e. iron (3.15-5.20 mg/100 g), zinc (2.40-5.00 mg/100 g), sodium (1.35-2.20 mg/100 g) and copper (2.70-4.55 mg/100 g) were present in small quantities (Table 4). The addition of 10% OFSP alone to *agidi* significantly increased the levels of calcium (Ca), potassium (K), phosphorus (P), iron (Fe), Zinc (Zn) and Copper (Cu), but the contents of sodium (Na) and Magnesium (Mg) reduced (Table 4). However, with the addition of 10% soybean to the *agidi* containing 10% OFSP, there seems to be an increase in both Na and Mg, suggesting that soybean is a good source of both minerals (Na and Mg). Increasing the proportion of OFSP in the formulation further increased the mineral contents of the *agidi* samples. Mg is an essential nutrient in the appropriate utilization of vitamin B and E and functions with other minerals such as Ca, Na, and K in maintaining osmotic balance (Nafiu *et al.*, 2011), while K has been reported to help in reducing blood pressure (Ranhotra *et*

al., 1998).

Beta-carotene and lycopene contents of *agidi* samples

The β -carotene contents of the *agidi* samples varied between 1.02 and 4.56 mg/100 g (Figure 1). In general, the β -carotene content of the OFSP enriched sample was significantly higher than the sample without OFSP, reaching up to 3-5 times of the initial level. Yellow maize variety may contain up to 2.5 μ g/g β -carotene depending on cultivar, while the provitamin A type contains up to about 15 μ g/g (Nuss and Tanumihardjo, 2010). Thus, the higher β -carotene content of the OFSP enriched *agidi* samples may be attributed to the high levels (132-194 μ g/g) of β -carotene (a provitamin A) in OFSP (Van Jaarsveld *et al.*, 2005). In the body, β -carotene is converted to the active form of vitamin A in the body. As a standard, 12 μ g of β -carotene is equal to 1 μ g Retinol Activity Equivalent-RAE (Tadesse *et al.*, 2015).

Lycopene was found in considerable amounts (0.58-1.65 mg/100 g) in the *agidi* samples (Figure 1). The lycopene contents increased with increasing levels of OFSP. There was approximately 184% increase in the lycopene content of the sample, when 30% OFSP was included in the formulation. Orange fleshed sweet potato has been shown to be a good source of lycopene which is an important carotenoid associated with several health benefits (Kolawole *et al.*, 2017). *Agidi* appears white since

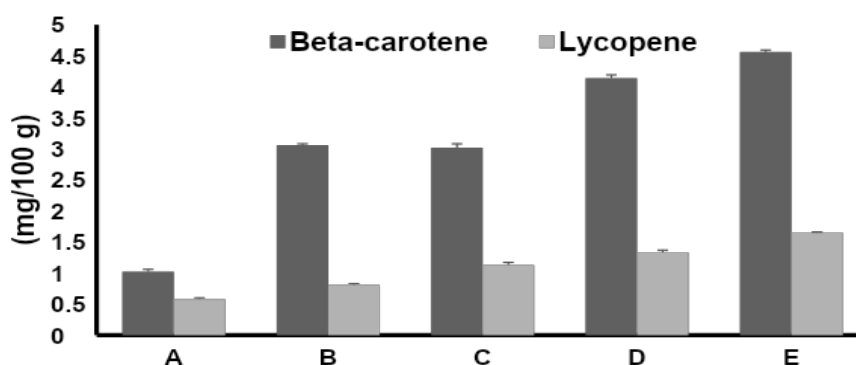


Figure 1: Beta-carotene and lycopene contents of agidi from maize, OFSP and soybean. Error bars indicate standard deviation (N= 6).

Table 5: Colours parameters of *agidi* from maize, OFSP and soybean.

Samples	L	a	b
A	63.92 ^a ±0.46	-1.91 ^d ±0.08	-1.69 ^d ±0.02
B	61.30 ^b ±1.15	-1.44 ^d ±0.03	2.90 ^c ±0.17
C	60.38 ^{bc} ±0.40	-0.14 ^e ±0.12	7.75 ^b ±0.47
D	57.28 ^d ±0.98	1.32 ^b ±0.45	9.26 ^b ±0.59
E	58.38 ^{cd} ±2.11	2.59 ^a ±1.20	15.99 ^a ±3.17

Values are means of triplicates (mean ± standard deviation). Within each column, values with different superscripts differ significantly (P<0.05). L (lightness) axis – 0 is black, 100 is white, a (red-green) axis-positive values are red; negative values are green and 0 is neutral, b (yellow-blue) axis- positive values are yellow; negative values are blue and 0 is neutral.

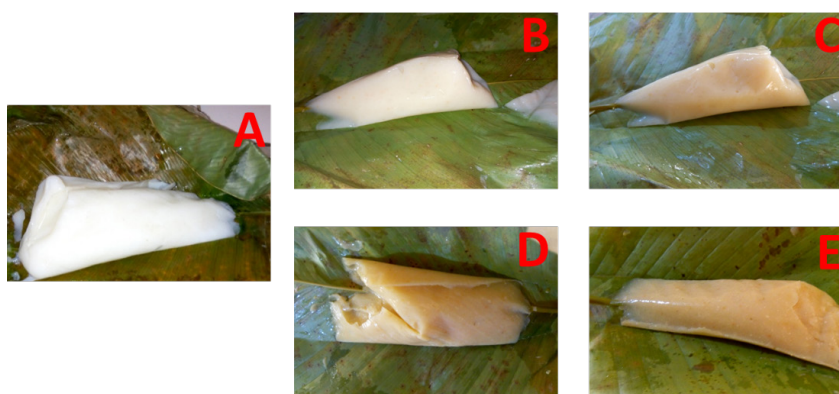


Figure 2: Appearance of *agidi* from maize, OFSP and soybean.

A: 100% Maize, 0% OFSP and 0% Soybean

B: 90% Maize, 10% OFSP and 0% Soybean

C: 80% Maize, 10% OFSP and 10% Soybean

D: 70% Maize, 20% OFSP and 10% Soybean

E: 60% Maize, 30% OFSP and 10% Soybean

it is usually prepared from white maize, but the colour imparted by the addition of OFSP may further increase the acceptability of the products especially among children.

Colour of *agidi* samples

Colour and appearance of food are important quality parameters that determine the acceptability of a food. To assess the impact of OFSP on the *agidi* samples the objective colour attributes were assessed using a colorimeter. *Agidi* is known to be white to off-white depending on the grain colour. For example, *agidi* prepared from yellow maize will

have a yellow colour. Color of the samples expressed as Hunter L, 'a' and 'b' are presented in Table 5. The lightness (L) value of the samples decreased, while a and b values increased with increasing levels of OFSP. The decrease in L value suggest a change in colour from the off-white colour, which was accompanied with a corresponding increase in redness and yellowness of the sample. This was confirmed by the appearance of the samples (Figure 2). The samples containing OFSP showed substantial variation in their appearance (Figure 2 B-E) suggesting increase in yellowness as measured by the colorimeter. This colour

variation may be associated to the presence of colour pigments such as carotenoids in the OFSP sample.

Sensory properties

The results of the sensory evaluation of the *agidi* samples are shown in Table 6. There were significant differences ($p < 0.05$) in the sensory attributes measured. The sensory properties were determined using descriptive terms as indicated in Table 2. The control (100% maize) differed significantly in colour from all the other samples with a highest mean score of 3.25 corresponding to 'plain white colour'. Inclusion of soybean and OFSP resulted in the development of a cream to dull orange colour which gradually increased in intensity in samples containing 10, 20 and 30% OFSP. OFSP is rich in beta carotene, which has been reported for its characteristic orange colour (Van Jaarsveld *et al.*, 2005). Values in the range of 1.75 – 2.15 were recorded for the various *agidi* samples in sour taste. The control (100% maize) had the highest mean score for 'sour taste' which corresponds to the taste of a fermented food while the *agidi* sample containing 30% OFSP was described with a sweet potato taste. The sour taste of the control however decreased in intensity with the inclusion of 10% soybean in 80:10:10 maize-OFSP-soybean sample. A sweet taste corresponding to the taste of sweet potato was reported in the *agidi* samples with OFSP inclusion. OFSP is known to be characteristically sweet in taste. The sweet taste of OFSP has been reported to be due to its high content of sucrose (Fetuga *et al.*, 2014). There was a significant difference in texture among the *agidi* samples. The attribute "smooth" was the most rated for the control, 90:10:0, 80:10:10 and 70:20:10 OFSP-soybean *agidi* samples with mean scores ranging from 3.05 to 4.20. The attribute "lumpy" was not detected for any of the samples. Mean scores for the attribute "gritty" was significantly different ($P < 0.05$) among the samples with values of 1.30, 1.25, 2.20, 2.05, and 3.05 for sample A, B, C, D and E, respectively. The increase in the grittiness could be as a result of the levels of the OFSP in the samples. There was a significant difference in consistency among the *agidi* samples. The control, 90:10:0, 80:10:10 and 70:20:10 OFSP-soybean samples, all recorded mean scores corresponding to a moderately thick consistency (3.10 – 3.45). The *agidi* samples containing 30% OFSP, however

had a softer, slightly thick slightly watery consistency (2.85 for thick, 2.00 for watery) which needed no pressure to break. They were described to be moistly by the panelist. This is evident in the significant higher moisture contents recorded for *agidi* samples with OFSP inclusion.

In terms of overall acceptability, the various *agidi* samples had mean scores ranging from 3.15 to 4.20 with *agidi* samples containing 10% OFSP inclusion recording outstanding overall acceptability except for 60:30:10 *agidi* sample which had the lowest score of 2.65. The addition of OFSP from 0 to 10% produced no significant difference in overall acceptability. This indicates that the panelists had a high preference for OFSP fortified-*agidi* samples. This could be attributed to the orange colour and sweet taste imparted on the *agidi* samples with the addition of OFSP

CONCLUSION

Agidi was enriched with soybean and OFSP. Significant changes were observed in the appearance of the sample, which was confirmed objectively using a colorimeter. This study has shown that it is possible to develop a nutritionally and organoleptically acceptable *agidi* from maize, enriched with OFSP and soybean. Furthermore, because of increased contents of beta-carotene in the samples, the *agidi* may have antioxidant potentials. The developed product could serve as a food-based approach or strategy to combating vitamin A deficiency and protein-energy malnutrition in developing countries where the syndrome is endemic. Future studies are needed to determine the bioavailability of the nutrients using *in-vitro* and *in-vivo* studies.

DECLARATION OF CONFLICT OF INTEREST

Authors declare no conflict of interest.

ACKNOWLEDGEMENT

We wish to appreciate the technical support given by the Technologists in the Department of Home Economics and Food Science, University of Ilorin, Nigeria.

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Table 6: Sensory evaluation results of *agidi* from maize, OFSP and soybean.

Samples	Colour			Taste			Texture			Consistency			Overall acceptability
	White	Cream	Pale orange	Bitter	Sweet	Sour	Gritty	Lumpy	Smooth	Watery	Thick		
A	3.25 ^a	1.00 ^b	1.00 ^c	1.05 ^a	2.20 ^a	2.15 ^a	1.30 ^c	1.25 ^b	3.85 ^{ab}	1.15 ^c	3.45 ^a	4.20 ^a	
B	2.85 ^a	2.90 ^a	1.25 ^c	1.00 ^a	2.35 ^a	2.05 ^a	1.25 ^c	1.50 ^b	4.20 ^a	1.40 ^{bc}	3.20 ^{ab}	3.95 ^a	
C	2.00 ^b	3.10 ^a	2.15 ^b	1.20 ^a	2.40 ^a	1.80 ^a	2.20 ^b	1.80 ^b	3.05 ^c	1.60 ^{abc}	3.10 ^{ab}	3.75 ^a	
D	1.60 ^b	2.85 ^a	2.65 ^a	1.15 ^a	2.50 ^a	1.75 ^a	2.05 ^b	1.85 ^b	3.20 ^{bc}	1.85 ^{ab}	3.40 ^{ab}	3.15 ^b	
E	1.75 ^b	2.45 ^a	2.70 ^a	1.10 ^a	2.75 ^a	1.85 ^a	3.05 ^a	2.50 ^a	2.20 ^d	2.00 ^a	2.85 ^b	2.65 ^b	

Mean within the same column having different superscripts are significantly ($p < 0.05$) different.

Note: 1 = not at all; 2 = slightly; 3 = moderate; 4 = strong; 5 = very strong.

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