Quality Evaluation of Maize Based Complimentary Food Supplemented with Garden Peas

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Authors' contributions

This work was carried out in collaboration Among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The quality of complimentary food made from blends of maize ogi flour and garden pea flour was studied. Five blend ratios and codes of 100:0 (Sample A), 90:10 (Sample B), 80:20 (Sample C). 70:30 (Sample D) and 60:40 (Sample E) were developed for Maize ogi flour and garden pea flour respectively. Proximate compositions, functional and sensory properties of the samples were analyzed using standard methods. The result for the functional properties of the formulated complimentary food samples showed that the bulk density, water absorption capacity, oil absorption capacity, foaming capacity, swelling index and least gelation concentration ranged between 0.65 g/mL-0.75 g/mL, 1.73 g/g-1.87 g/g, 1.61 g/g-1.78 g/g, 5.97%-8.91%, 1.51 v/v-1.96 v/v and 6.00%-14.00% respectively. The proximate composition result revealed that the moisture, protein, fat, fibre, ash and carbohydrate contents were 7.34%-7.96%, 6.24%-12.04%, 1.11%-10.16%, 2.13%-4.27%, 0.66%-1.44% and 64.75%-81.90% accordingly. The sensory evaluation carried out on the formulated samples by the panelists showed that the sample incorporated with 10% garden pea flour was the most preferred in terms of appearance, aroma, texture, taste and

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overall acceptability. The study has indeed shown that it is possible to produce a maize based complimentary food supplemented with garden pea flour with up to 40% supplementation level. This will not only improve the macro- and micro-nutrient content, but it will also enhance the functional quality attributes as well. The formulated food product also has low moisture content, which will reduce drastically the proliferation of microorganisms which will ultimately guarantee the shelf life stability of the food. However, further studies should be carried out in exploring processing methods that produces Pea protein hydrolysate from Garden pea grains which can improve the protein content of the maize based complimentary food and help in meeting the protein demands of infants.

Keywords: Maize ogi flour; garden pea flour; complimentary food; proximate composition; functional properties; sensory characteristics.

1. INTRODUCTION

During the first 6 months of life, breast milk is the most nutritionally balanced milk that can be given to an infant. It has a good repository of all the right nutrients and immunological factors that an infant needs to maintain a healthy living, promote growth and development. In addition, breast milk also protects infants against the two leading causes of infant mortality, upper respiratory infection and diarrhea [1]. However, after 6 months, breast milk alone will no longer be able to meet the nutritional demands of the growing infant whose weight is expected to have doubled. This is why complimentary food also known as weaning food needs to be introduced between the periods of 6 months to 24 months, to form part of the diet, when transition from exclusive breastfeeding to semi solid food is expected to commence. It is at this stage that the nutritional requirements of many infants are not met, thus leading to the onset of malnutrition that is prevalent in children under 5 years of age worldwide [2]. This indeed has strengthened the resolve of relevant stakeholders in the academia, food industry, government and foreign bodies to focus on producing locally developed and nutritious complimentary foods that can be affordable by low income families especially those in Sub-Saharan Africa. Nigeria is a country with an abundance of food that can be used for proper nutrition, as well as for the formulation of complementary foods [3]. A complementary food is any suitable food given to older infants and young children in addition to breast milk that provide additional nutrition to meet all growing child's needs [4-6]. Most traditional weaning foods in developing countries are made from cereals, starchy fruits, root and tuber [7]. They are known to be of low nutritive value and are characterized by low protein, low energy and high bulk [7]. Cereal based diets have been implicated in protein-energy malnutrition [6]. The problems inherent in the traditional West Africa weaning foods and feeding practices predispose the infants to malnutrition, growth retardation, infection and high mortality [6]. Today, since many low income mothers are unable to afford most commercially available complementary foods, the use of locally developed, nutritious and affordable weaning foods from plant sources become imperative in order to address malnutrition among infants and very young growing children.

Maize (*Zea mays*) or corn grains consist of the outer hull (bran), embryo (germ) and the endosperm which are rich in fiber, oil and starch respectively. The whole maize contains about 11% protein, 4% fat, 3% fiber, 65% of starch and other carbohydrates, and 1.5% of minerals [8]. The amino acid compositions of the proteins in the cereal grains are generally low in the contents of lysine [9]. Garden Pea (*Pisum sativum* L.) is the second important food legume of the world and contain high percentage of digestible protein (7.2 g) having essential amino acids particularly lysine, carbohydrates (15.8 g), vitamin A (139 I.U.), vitamin C (9 mg), magnesium (34 mg) and phosphorus (139 mg) per 100 g of edible portion [10-12]. The nutritional values of legumes are low fat, high protein, dietary fiber, and various micronutrients and phytochemical substances which exhibit the medicinal properties [13]. Unfortunately, the proteins in legumes have a well-recognized deficiency of the essential sulphur-bearing amino acids namely methionine and cysteine [14]. Therefore, developing blend formulations from maize, a cereal and garden pea, a legume will enhance the nutrient reserve in the maize based complimentary food and their consumption. The major thrust of this study were to develop and evaluate the proximate composition, functional

properties and sensory characteristics of maize based complimentary food supplemented with Garden pea flour.

2. MATERIALS AND METHODS

2.1 Sources of Materials

Yellow maize and Garden peas were purchased from Wadata market in Makurdi, Benue State. These raw materials were packaged in polyethylene bags and put in a plastic container with lid and transported to University of Agriculture, Makurdi where they were processed, formulated and analyzed. Equipment and materials used for the study were supplied by laboratories in the Department of Food Science and Technology, University of Agriculture, Makurdi.

2.2 Sample Preparations

2.2.1 Production of garden pea flour

Garden pea flour was prepared using the method described by Fikiru et al. [15]. Briefly, Pea grains were cleaned, sorted, washed in tap water, rinsed with deionized water and soaked in water for 2 h. The soaking water was removed and the Pea grains were rinsed with fresh water again, and then sun dried. Finally, 100 g of the dried samples was roasted (350ºC) on stainless steel iron pan, using an electric heating appliance according to the Ethiopian shiro processing method with some modification, that is, by reducing the roasting time to only 5 min. Then the roasted pea was milled (KARLKOLB D-6072, Dreich, West Germany) to pass through the 0.5 mm sieve, packed in an airtight polythene bags and stored in a cool place (about 5ºC) until used.

2.2.2 Production of maize *ogi* flour

Maize *ogi* flour was produced using an earlier method of Adeoti and Osundahunsi [16]. 5 kg of Yellow maize grains were weighed and sorted. It was soaked in hot water, and left for 72 h. The grains were washed with distilled water; wet milled with an attrition mill (locally fabricated grinding machine), sieved with muslin cloth, and allowed to ferment for 72 h. The fermented slurry was decanted, drained, oven dried in a cabinet drier at 50ºC for 10 h, re-milled using a Philips laboratory blender (HR2811 model). It was then sieved through 250 mm. The sieved sample was packed in plastic container sealed with aluminum

foil and stored in low density polyethylene bags under freezing (-4ºC) for subsequent analyses.

2.2.3 Preparation of blend formulations of the maize based complimentary food supplemented with garden pea flour

The samples were coded A, B, C, D and E. Sample A served as the control without addition of garden pea flour. The other samples were produced by blending the Maize *Ogi* flour and garden pea flour as shown in Table 1. Each blend was mixed thoroughly in a Kenwood mixer (Model a 220) for 10 min to produce the blend formulations. The formulations developed were individually packaged in sealed polyethylene bags until used for analysis.

Table 1. Blend formulations of maize based complimentary food supplemented with garden pea flour

Sample	Maize *ogi* flour (%)	Garden pea flour (%)
A	100	-
B	90	10
C	80	20
D	70	30
E	60	40

A= 100% Maize ogi flour: 0% Garden pea flour; B= 90% Maize ogi flour: 10% Garden pea flour; C= 80% Maize ogi flour: 20% Garden pea flour; D= 70% Maize ogi flour: 30% Garden pea flour and E= 60% Maize ogi flour: 40% Garden pea flour

2.3 Determination of Proximate Composition

The moisture, protein, crude fat, crude fibre and ash contents of the formulated maize based complimentary food supplemented with garden pea flour samples were determined according to the standard methods of AOAC [17]. The Total Carbohydrate was determined by difference [18]: % Carbohydrate = 100%–(% moisture + % crude protein + % crude fat + % crude fiber+ % total ash).

2.4 Determination of Functional Properties

The Bulk density, water absorption capacity and oil absorption capacity were determined by using an earlier method of Ahemen et al. [19]. Foaming capacity was determined as previously described by Ohizua et al. [20]. Swelling index and least gelation concentration of the formulated maize

based complimentary food supplemented with garden pea flour samples were determined by the methods of Ojo and Enujiugha [21].

2.5 Sensory Evaluation

The organoleptic characteristics of the formulated maize based complimentary food supplemented with garden pea flour samples were evaluated by a 20 member trained panelists drawn from Department of Food Science and Technology, University of Agriculture, Makurdi, comprising both staff and students who were already familiar with the consumption of formulated maize based complimentary food. The formulated maize based complimentary food supplemented with garden pea flour was made into slurry by adding water till it formed a paste and boiled water was added to it and stirred continuously till it became viscous and formed a gruel as described by Ojo and Enujiugha [21]. The panelists were provided with a questionnaire. The samples were evaluated for appearance, aroma, texture, taste and overall acceptability using a 9-point hedonic scale in which 9 = like extremely and 1 = dislike extremely as previously used by Meilgaard et al. [22]. The order of presentation of samples to the panel was randomized. Tap water was provided for each panelist to rinse their mouth in-between evaluations.

2.6 Statistical Analysis

All analyses were conducted in duplicate determinations. Means and standard deviations were calculated. The data obtained were subjected to Analysis of Variance (ANOVA). Least Significance Difference (LSD) test was used to separate means where significant difference existed at (P<0.05).

3. RESULTS AND DISCUSSION

3.1 Proximate Composition of Maize Based Complimentary Food Supplemented with Garden Pea Flour

Proximate composition is important in determining quality raw materials and it is often used as a basis for establishing the nutritional value and overall acceptance of developed food products [23]. The result of proximate composition (moisture, crude protein, crude fat, crude fiber, total ash and carbohydrate) of the formulated maize based complementary food

supplemented with Garden pea flour is shown in Table 2. The moisture content ranged between 7.34% to 7.96%, with 100% Maize *ogi* flour having the highest moisture content, while the sample with the inclusion of 40% Garden pea flour had the lowest moisture content. There was significant difference (p<0.05) between all the samples analyzed. It was observed that the increasing incorporation of Garden pea flour to the complementary food formulations led to a gradual decrease in the moisture content. Low moisture content in complementary foods is very important to prevent nutrient losses and ensure adequate shelf life of the product [24]. The Protein Advisory Group of the United Nations recommends that moisture content should not exceed 10% in order to keep a floury product for a reasonably long time [16]. Thus, the moisture contents of the samples were within the recommended value (5-10%) [4]. However, the moisture content of the developed diet was higher than the values of 1.52% and 2.55% reported by Kumkum et al. [25] who developed weaning mixes containing roasted ingredients. The higher moisture content reported in the study could be attributed to the methods of processing used in the production of Maize *ogi* flour and Garden pea flour respectively. With increasing levels of supplementation of Maize *ogi* flour with Garden pea flour, the protein content of the formulated complimentary food increased from 6.24% to 12.04%. There was significant (p<0.05) difference between each of the samples analyzed. The protein contents of the developed complimentary food samples containing the varying percentages of inclusion of Garden pea flour were significantly higher than that of the 100% Maize *ogi* flour (Control). However, the values of the protein content of all the samples were lower than the 15% recommended by World Health Organization for complimentary food [16]. The increase in protein content due to supplementation with the Garden pea flour is in agreement with Temple and Bassa [26] who reported that addition of legumes to cereals improves the protein content of the cereals. The results of the study were also comparable to 8.51%-12.20% reported by Okoye and Egbujie [27] for Maize-based complementary foods supplemented with Soybean and Sweet Potato flours and 9.87%-14.38% as revealed by Lawan et al. [3] for formulated complementary foods as affected by sorghum processing methods, addition of cowpea and carrot. Germination and fermentation improves the protein content and quality of food products [28]. Increase in the protein content during fermentation of the seeds

Table 2. Proximate composition of maize based complimentary food supplemented with garden pea flour

Sample	Parameters (%)					
	Moisture content	Crude protein	Crude fat	Crude fiber	Total ash	Carbohydrate content
A	7.96[e]±0.01	6.24[a]±0.04	1.11[a]±0.03	2.13[a]±0.03	0.66[a]±0.03	81.90[e]±0.11
B	7.45[b]±0.03	8.04[b]±0.04	2.77[a]±0.02	3.05[b]±0.04	0.86[b]±0.02	77.83[d]±0.07
C	7.55[c]±0.04	8.56[c]±0.01	5.37[b]±0.02	3.95[c]±0.03	0.95[c]±0.02	73.62[c]±0.04
D	7.76[d]±0.03	9.23[d]±0.03	8.39[c]±0.02	4.27[d]±0.03	1.25[d]±0.03	69.10[b]±0.10
E	7.34[a]±0.07	12.04[e]±0.04	10.16[d]±0.02	4.27[d]±0.03	1.44[e]±0.03	64.75[a]±0.05
LSD	0.06	1.00	0.08	0.30	0.06	1.30

Values are means ± standard deviations of duplicate determinations. Means with different superscripts in the same column are significantly (p<0.05) different
A= 100% Maize ogi flour: 0% Garden pea flour; B= 90% Maize ogi flour: 10% Garden pea flour; C= 80% Maize ogi flour: 20% Garden pea flour; D= 70% Maize ogi flour: 30% Garden pea flour and E= 60% Maize ogi flour: 40% Garden pea flour and LSD: Least Significance Difference

may be attributed to the net synthesis of enzymic protein by the germinating and fermenting seeds [29]. Fat content usually plays a role in the shelf life stability of flour samples [20]. The fat content of the complementary food samples ranged from 1.11% to 10.16%. The fat contents of the developed complimentary food samples incorporated with Garden pea flour were higher than the control sample (100% Maize *ogi* flour). However, of all the samples containing Garden pea flour, only the sample containing 40% Garden pea flour met the Required Daily Allowance (RDA) of 10-25% [16] for infant foods. All the experimental crude fat values are in agreement with the values of 4.80% to 9.42% as reported by Ikujenlola and Fashakin [30] for complimentary diets produced from quality protein maize-soy blends. Lalude and Fashakin [31] reported that the fat content of weaning food from sorghum and oil seeds was 9.21% which was in the same range with those obtained in this study. A complimentary food with high fat content shows that such food will increase the energy level in the diet, which is a nutritional advantage. Unfortunately, a high fat yielding food could also be susceptible to oxidative rancidity which will ultimately, reduce the shelf life stability of the food product during storage. Crude fiber measures the cellulose, hemicelluloses and lignin content of food [32]. The crude fiber content ranged from 2.13%–4.75%, with the Control sample (100% Maize *ogi* flour) having the lowest value, while the sample incorporated with 40% Garden pea flour had the highest value. There was an increase in the fiber content with increasing addition of Garden pea flour to the blend formulation. All samples had fiber contents that were within the recommended range for diets of not more than 5 g dietary fiber

per 100 g dry matter [33]. Weaning food with low fiber content is very important as this would enable children to consume food that is more nutrient-dense and to meet the daily energy and other vital nutrient requirements [34]. Emphasis is placed on the importance of low fiber in weaning food because the gastrointestinal system of the infants may not be well developed to handle diet high in fiber content as this has been reported to impair protein and mineral digestion and absorption in human subjects [35]. Ash content of food product is an indication of the mineral content of the food products [36]. The result showed that the ash content ranged between 0.66% to 1.44%, with the Control sample (100% Maize *ogi* flour) having the lowest value, while the sample supplemented with 40% Garden pea flour had the highest value. There was significant (p<0.05) difference between all the samples analyzed. The ash content of the formulated complimentary food samples increased with increasing addition of Garden pea flour. This could probably be due to the improved bio-availability of minerals during fermentation and germination. With increase in the inclusion of Garden pea flour into the maize based formulated complimentary food, there was a corresponding and significant (p<0.05) decrease in carbohydrate content from 81.90% to 64.75%. The values obtained in this study were comparable to those obtained by Obasi et al. [37] for complementary foods from flour blends of sprouted paddy rice (*Oryza sativa*), sprouted african yam bean (*Sphenostylis sternocarpa*) and pawpaw fruit (*Carica papaya*). Carbohydrate contributes to the bulk of energy of the sample which makes it high energy food and ideal for the growth of growing infants [16]. The calories in an infant diet are provided by the protein, fat and

carbohydrate which are major components of complimentary foods that help to meet the energy requirement of growing infants and lack of any of these may lead to malnutrition [35].

3.2 Some Functional Properties of Maize Based Complimentary Food Supplemented with Garden Pea Flour

Results of the functional properties of the Maize based complementary food supplemented with Garden pea flour are presented in Table 3. Knowledge of the bulk density of a food product is necessary as it helps in determining a product's handling, processing, packaging material, storage and distribution/transportation requirements. The bulk density values of the formulated complimentary food samples ranged between 0.65 g/mL to 0.73 g/mL, with the fortified samples having higher values than the control sample (100% Maize *ogi* flour). All the samples incorporated with Garden pea flour were not significantly different from one another, but were significantly different from the Control containing 100% Maize *ogi* flour. The values for bulk density obtained in this study agree with the findings of Msheliza et al. [38] who prepared weaning food from the blends of Sorghum and Soybean. Nutritionally, loose bulk density promotes easy digestibility of food products, especially among children with immature digestive systems [3]. The significance of this is that less bulky flour will have higher nutrient density, since more flour can be packed in a given volume [3]. The water absorption capacity(WAC) of food materials is an index of the maximum amount of water that it can take up

and retain [39]. It illustrates the amount of water available for gelatinization [40]. The WAC of the samples ranged from 1.73 g/g to 1.87 g/g. Significant difference (P<0.05) does exist between the samples. However, there was minimal variability in water absorption capacity among the complementary food formulations studied. The inclusion of Garden pea flour into the blend formulation led to an insignificant increase in the water absorption capacity of the developed products. However, complimentary food should have low water absorption capacity and bulk density in order to produce a more nutritious and suitable food [41]. In other words, the significance of a lower water absorption capacity of the complementary food formulations is that it will have a lower water absorption and binding capacity which is desirable for making thinner, gruels with high, caloric density per unit volume [3]. Oil absorption capacity (OAC) is an important functional property in food formulation as it enhances mouth feel while retaining food product flavor [37]. The OAC of the samples ranged between 1.61 g/g to 1.78 g/g. It also decreased with increase in addition of Garden pea flour, but there was no significant difference (P>0.05) between Samples, B and C. The reduced values of OAC in the samples containing Garden pea flour might be due to collapse of the flour blends proteins thereby increasing the contact between protein molecules leading to coalescence and thus reduce stability of the samples [42]. Form capacity (FC) is used to determine the ability of the flour to foam which is dependent on the presence of the flexible protein molecules which decrease the surface tension of water [20]. The

Table 3. Some functional properties of maize based complimentary food supplemented with garden pea flour

Sample	Parameters					
	BD (g/mL)	WAC (g/g)	OAC (g/g)	FC (%)	SI(v/v)	LGC (%)
A	0.65[a]±0.02	1.73[a]±0.02	1.78[c]±0.04	8.91[c]±0.00	1.51[a]±0.02	6.00[a]±0.00
B	0.73[b]±0.03	1.76[ab]±0.02	1.69[b]±0.04	5.97[a]±0.03	1.88[c]±0.03	8.00[b]±0.00
C	0.75[b]±0.04	1.81[b]±0.03	1.70[b]±0.03	8.91[c]±0.00	1.54[a]±0.04	8.00[b]±0.00
D	0.75[b]±0.02	1.83[bc]±0.02	1.66[ab]±0.03	8.91[c]±0.00	1.96[d]±0.04	10.00[c]±0.00
E	0.74[b]±0.02	1.87[c]±0.03	1.61[a]±0.04	6.80[b]±0.00	1.66[b]±0.03	14.00[d]±0.00
LSD	0.02	0.05	0.05	0.00	0.03	1.50

Values are means ± standard deviations of duplicate determinations. Means with different superscripts in the same column are significantly (p<0.05) different
A= 100% Maize ogi flour: 0% Garden pea flour; B= 90% Maize ogi flour: 10% Garden pea flour; C= 80% Maize ogi flour: 20% Garden pea flour; D= 70% Maize ogi flour: 30% Garden pea flour and E= 60% Maize ogi flour: 40% Garden pea flour; BD: Bulk Density; WAC: Water Absorption Capacity; OAC: Oil Absorption Capacity; FC: Foaming Capacity; SI: Swelling Index; LGC: Least Gelation Concentration and LSD: Least Significance Difference

Table 4. Sensory characteristics of maize based complimentary food supplemented with garden pea flour

Sample	Attributes				
	Appearance	Aroma	Texture	Taste	Overall acceptability
A	7.45[b]±1.15	7.25[a]±1.62	7.50[b]±1.15	7.30[b]±1.45	7.60[c]±0.60
B	6.85[ab]±1.04	6.95[a]±1.61	6.90[ab]±1.21	6.75[ab]±1.71	7.05[bc]±1.05
C	6.80[ab]±1.44	6.45[a]±1.36	6.10[a]±1.71	6.25[ab]±1.45	6.40[ab]±1.27
D	6.35[ab]±1.35	6.65[a]±0.93	6.55[ab]±1.19	6.20[ab]±1.47	6.00[ab]±1.69
E	6.10[a]±1.59	6.40[a]±1.05	6.45[ab]±1.67	5.40[a]±1.85	5.90[a]±1.17
LSD	0.25	0.27	0.38	0.07	0.05

Values are means ± standard deviations of duplicate determinations. Means with different superscripts in the same column are significantly (p<0.05) different
A= 100% Maize ogi flour: 0% Garden pea flour; B= 90% Maize ogi flour: 10% Garden pea flour; C= 80% Maize ogi flour: 20% Garden pea flour; D= 70% Maize ogi flour: 30% Garden pea flour and E= 60% Maize ogi flour: 40% Garden pea flour and LSD: Least Significance Difference

values of FC of the formulated samples ranged between 5.97% to 8.91%. There was no significant difference (p>0.05) between the Control (100% Maize *ogi* flour) and samples incorporated with 20% and 30% Garden pea flour respectively. Swelling index ranged from 1.51 v/v to 1.96 v/v. There was no significant difference ((p>0.05) between the control and the sample incorporated with 20% Garden pea flour. It was observed that the Control had the lowest value, while the sample with 30% Garden pea flour had the highest value. Swelling index of the sample illustrates the ability of the sample to absorb a particular amount of water and retain some within the duration of study. Moorthy and Ramanujam [43] reported that swelling of flour granule is an indication of the extent of associative forces within the granules. Least Gelation Concentration (LGC) measures the minimum amount of flour needed to form a gel in a measured volume of water [20]. The study showed that the Control (100% Maize *ogi* flour) gelled at 6%, while the gelation of samples containing supplementation of Garden pea flour gelled with significant higher percentages. Gels are characterized by their viscosity, plasticity and elasticity and the higher the least gelation concentration, the lower is the ability of the flour to form stable gel [16]. There was no significant difference between the samples incorporated with 10% and 20% Garden pea flour. From the present study, it was observed that the Control sample formed a stable gel than the samples incorporated with Garden pea, and such product will serve as a good binder and provide consistency in food preparation such as semi-solid beverages like *Kunu-zaki* [44]. However, high least gelation concentration observed in the samples with Garden pea flour are desirable as Adeoti and Osundahunsi [16] reported that high

least gelation concentration will lead to reduction in viscosity which therefore leads to increase in nutrient density and low dietary bulk which is highly favorable for a good weaning diet.

3.3 Sensory Characteristics of Maize Based Complimentary Food Supplemented with Garden Pea Flour

Table 4 shows the result of the sensory attributes of the formulated maize based complimentary food supplemented with garden pea flour. There was no significant difference in the aroma of the samples. The result also revealed that aside the Control sample (containing 100% Maize *ogi* flour), Sample B containing 10% inclusion of Garden pea flour was the most preferred by the panelists.

4. CONCLUSION

The inclusion of Garden pea flour to the Maize *ogi* flour resulted in the improvement of the macro- and micro-nutrient composition of the complimentary food formulation. However, the protein content fell short of the 15% recommended for complimentary food. Therefore, further work could be done in exploring processing methods that produces Pea protein hydrolysate from Garden pea grains which could be more useful in the supplementation of the maize based complimentary food in order to meet up with the protein demands of infants. The formulated food product also has low moisture content, which will reduce drastically the proliferation of microorganisms which will ultimately guarantee the shelf life stability of the food. The samples developed showed good functional qualities as a weaning food. The sensory attributes of the

developed complimentary food samples also revealed that aside the Control sample (100% Maize *ogi* flour), the panelists preferred the sample with 10% Garden Pea flour inclusion. All the other samples were also of acceptable quality on a 9 point hedonic scale. The findings from this study will help in improving the utilization of the Garden pea which is still underutilized in developing countries and so could be useful in developing complimentary diet for low income family, instead of overdependence on available, but expensive Nigerian commercial complimentary foods that are in the market today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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