

Utilization and Acceptability of Improved Shea Butters in Food Preparations

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ABSTRACT---- Improved shea butters are manually extracted vegetable fat from fried, toasted, boiled and parboiled sheanuts that were clarified and deodorized with citric acid solution and coconut essence. Improved shea butters were used in preparation of foods such as jollof rice, stew, moinmoin, pancake and fried egg. The sensory scores and acceptability of these foods were determined using panelists on 9 points hedonic scale. Data were analyzed using ANOVA at $p = 0.05$. All foods prepared using improved shea butter samples were organoleptically acceptable (jollof rice 6.85 ± 1.31 to 8.05 ± 1.47 ; moinmoin 7.45 ± 0.94 to 8.25 ± 0.85 ; stew 7.31 ± 1.45 ; pancake 7.15 ± 0.99 to 7.95 ± 1.07 and fried egg 7.00 ± 1.38 to 7.95 ± 0.69). Foods prepared with the native shea butter had the least scores in almost all the organoleptic attributes. There were no significant differences in the overall acceptability of the stews. Moinmoin from toasted sheanuts improved shea butter had the best overall acceptability scores (8.25 ± 0.85). Foods prepared using improved shea butter from fried sheanuts ranked best. The commercial vegetable (Kings) oil had the best overall acceptability scores in pancakes but did not significantly differ from that of the fried sheanuts shea butter in fried eggs.

Keywords---- Improved shea butter, preparation of foods, organoleptically acceptable

1. INTRODUCTION

Shea butter is an under-utilized edible vegetable fat from nuts of the fruits of *Vitellaria paradoxa* plant. Fats and oils are chemical compounds called triglycerides which are formed from the combination of one unit of glycerol with three units of fatty acids (Fennema, 2004). At room temperature oils are liquid while fats are solid. Fats and oils are lipids, a group of organic products that are soluble in polar solvents such as petroleum ether, hexane and their likes but have lower densities than water and are insoluble in it (Meyer, 2004). They are essential nutrients in both human and animal diets and supply essential fatty acids, contribute to the feeling of satiety after eating and are also carriers of fat soluble vitamins and help to make food more palatable ((Potter and Hotchkiss, 1996).

The physico-chemical properties of solvent extracted shea butter from raw shea nuts have been widely reported by several researchers (Okullo *et al.*, 2010; Mbainin *et al.*, 2007; Chukwu and Adgidzi, 2008; Asuquo *et al.*, 2010). Akingbala *et al.* (2006) reported on the physico-chemical properties of manually extracted and screw pressed shea butter from roasted sheanuts while Mbainin *et al.* (2007) reported on the physical and chemical characteristics of shea butter from parboiled and oven dried sheanuts in Southern Chad. Meganou *et al.* (2013) reported that colour, odour and texture are the major sensory indices that influence the acceptability of shea butter among the Ivorians. Akingbala *et al.* (2006) noted that unbleached and unrefined traditionally extracted shea butter from roasted sheanut has poorer colour and flavour than commercial vegetable oil.

Shea butter like most vegetable oils is rich in saturated, monounsaturated, polyunsaturated fatty acids, some essential fatty acids and phytosterols such as sitosterol, avenasterol and stigmasterol (Okullo *et al.*, 2010, Ibanga *et al.*, 2015). Dietary fatty acids such as stearic acid, oleic acid and linoleic acid which are also found in shea butter influence total LDL and HDL cholesterol (Emkem, 1994). According to Emkem, 1994 and Hunter *et al.*, 2010 while palmitic,

myristic and lauric acids are cholesterol - raising, stearic acid and medium chain saturated fatty acids (6 – 10 carbon atoms) have neutral or lowering effect on blood lipids and lipoproteins. Monounsaturated and polyunsaturated fatty acid are cholesterol-lowering when they can replace significant level of saturated fatty acids in diet. They lower LDL cholesterol which result in a decrease in both LDL and HDL cholesterol. Shea butter contains omega3,6 and 9 (Ibanga *et al.*, 2015b). Linolenic acid (Omega – 3) has antithrombotic effects (Balch and Balch, 2000). Omega-3-fatty acids and phytosterols have been reported to suppress cancer formation in animals (Awad *et al.*, 2000a and b). Judd *et al.* (1998) reported that stearic acid diet has no effect on HDL cholesterol but lowers LDL cholesterol. Sitosterol, a plant sterol have been reported to lower serum cholesterol (Lee *et al.*, 1977).

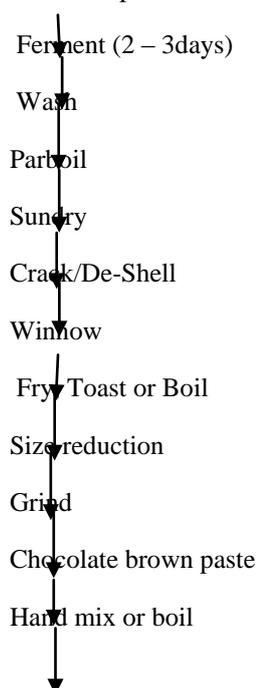
Literature is however sparse concerning utilization of shea butter as an edible fat and lacks empirical information/data on the acceptability and utilization of native and non-solvent improved shea butter from fried, toasted, boiled and parboiled sheanuts in foods. This is because shea butter is not attractive as an edible vegetable fat/oil in many places of its production and its consumption is minimal due to its inherent limitations such the unpleasant odour, taste and flavour apart from its non- flowing nature, poor packaging and presentation (Ibanga, 2007). . Virtually, little or nothing is known about its potentials as an edible fat by the non- natives in the towns and cities in Nigeria. According to the author, the elites especially civil servants and students look down on shea butter as inferior to groundnut and other vegetable oils.

Improvement of the organoleptic attributes using a simple, non- solvent and adoptable method helps to improve its acceptability and edibility. Improved shea butter is a vegetable fat that was clarified and deodourized with citric acid and flavoured with coconut essence. Shea butter is cheap and if properly processed with improved sensory and keeping qualities can complement and compete with groundnut and other vegetable oils which have become rather too expensive for regular household use. This work aimed at using improved shea butter to prepare some selected foods and evaluation of their sensory attributes and acceptability compared with the native shea butter and a popular commercial vegetable oil.

2. MATERIALS AND METHODS

2.1 Preparation of Improved shea butter: Improved shea butter samples were processed thus: Shea butter samples were manually extracted from boiled, toasted and fried sheanuts that were previously parboiled, dried and dehusked before further processing. Citric acid solution (2.5g in 100ml of distilled water) was poured into 500ml of shea butter samples and heated for five minutes at 60°C. The mixture was stirred and left overnight at ambient temperature to cool and settle. The oils at the top were decanted and filtered through muslin cloth and sieve size 200µ. Into 500ml of the sieved shea oil, one ml (1ml) of food grade coconut flavour (Conflaco Aromatic Ltd England) was added and heated for 5mins with proper stirring at 60°C before cooling and usage. The flow chart is as shown in Figure 1.

Mature/Ripe Shea fruits



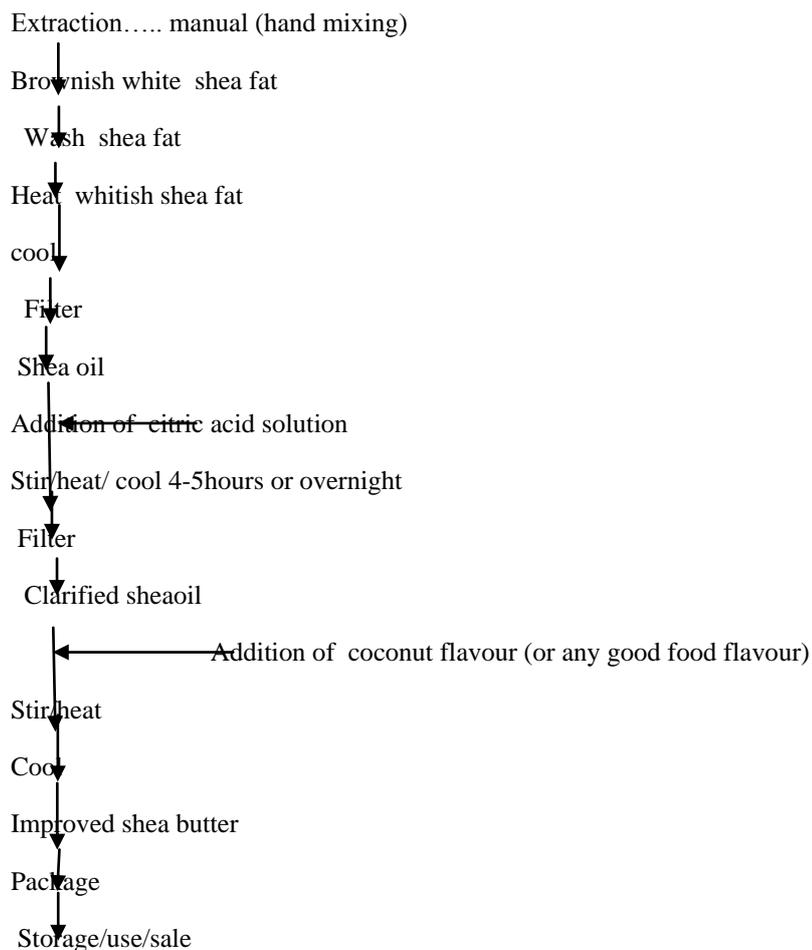


Fig.1 Processing of Improved Shea butter

2.2 Preparation of Foods using improved shea butter.

Tomato stew, Jollof rice, moinmoin, pancakes and fried eggs were prepared using the improved shea butter samples as follow. Native shea butter and Kings commercial vegetable oils were control A and B.

2.2.1 Stew

Stew was prepared using a slightly modified method of Madubike (2014). The ingredients used were, fresh plum tomatoes (725g), pepper (100g), Tin tomatoes (300g), improved shea butter 600g (generous quantity), Beef (0.5kg), onions (a big bulb), seasonings (3 Knorr cubes), thyme and salt to taste. Before cooking, the fresh tomatoes, pepper and onions were washed, blended together and boiled to dry. The tin tomato was opened and added to the boiled tomatoes mix. The beef was boiled with some water and seasonings. The improved shea butter was melted and heated in a pot. The cooking involved pouring the tomato - mix into the hot shea oil to fry. The beef stock and seasonings were added and mixture thoroughly stirred and allowed to cook to form stew. Native shea butter and Kings commercial vegetable oils were also used to prepare stews.

2.2.2. Jollof rice

Jollof rice is a popular dish in Nigeria. The ingredients used were improved shea butter, rice (500g), tomato puree from fresh and tin tomatoes (500g), fish 1/2kg, onions (2 medium bulbs), pepper and salt to taste, seasonings, knorr and thyme. A modified method of Madubike (2014) was used to prepare the jollof rice. Before cooking commenced, the fish was cut into pieces, cleaned, washed and cooked seasoning with thyme, chopped onions and salt.

Rice was parboiled and drained. Onions and tomato puree were poured into a sizeable pot containing the melted improved shea butter to fry. The drained parboiled rice, salt, pepper and water (to taste) were added. The water level was same with the level of the rice to ensure it dries up when the rice is cooked. The pot was covered and the rice was left to cook on low to medium heat. The prepared jollof rice was tasted to confirm it cooked. Native shea butter and Kings commercial vegetable oils were also used to prepare jollof rice.

2.2.3 MoinMoin

Moinmoin is a Nigerian steamed beans pudding made from a mixture of washed, peeled bean paste and seasonings. The recipe used were black eyed beans (750g), crayfish (two table spoonful), dried pepper (20g), tatashe (100g), Onions 2 medium sized bulb, Knorr, cool water (1L), tomato paste, improved shea butter samples (100g), and salt to taste. A slightly modified method of Madubike (2014) was used to prepare the moinmoin. The preparation involved soaking the beans to remove the coats, the dehulled beans was soaked for about 30minutes in clean water before fine blending with washed tatashe and onions. Tomato pastes, pepper, knorr, ground crayfish, were added with intermittent addition of cool water. Shea butter was melted and the hot oil was poured into the mixture and stirred. Salt was added to taste and the mixture further stirred. The moinmoin mixture was dispensed into aluminum pans before steaming in a covered pot containing at least one inch depth of hot water on stove. Small quantity of water was added from time to time. The moinmoin was cooked for about one hour and was confirmed cooked when a dry knife dipped into it came out clean or with a slight smear of moinmoin. The cooked moinmoin was allowed to set before serving. Native shea butter and Kings commercial vegetable oils were also used to prepare moinmoin too as controls.

2.2.4 Pancake

Pancake is a flat cake, often thin and round prepared from flour-based batter and cooked on a hot shallow frying. The recipe used were: all-purpose flour (1cup), granulated sugar (2 tablespoon), baking powder (1 teaspoon), salt (1/4 teaspoon), a pinch of salt, milk (1 cup), improved shea butter (3 tablespoons), eggs (3). The flour, sugar, baking powder and salt were mixed together and set aside. The milk, melted improved shea butter and whisked egg were mixed and the dried ingredients were added to form a batter. 2 to 3 tablespoon pancake batter were fried on both sides to cook, till the surface of pancake has some bubbles and few burst on surface in a non-sticky frying pan containing 2 to 3 spoons of melted and hot improved shea butter. Pancake was fried one at a time for 1 to 2 minutes on both sides and served warm. Native shea butter and Kings commercial vegetable oils were also used to prepare pancakes as controls.

2.2.5 Fried egg

Plain fried eggs were prepared with egg, salt and improved shea butter, native shea butter and Kings vegetable oils respectively. The eggs were broken, beaten and fried one at a time, salt was added to taste and the mixture fried in a shallow melted and heated improved shea butters, native shea butter and kings vegetable oil respectively and served warm.

2.3 Sensory evaluation of foods prepared using shea butters.

Coded samples of foods prepared using shea butter samples and Kings vegetable oil were in turn dished and presented warm to twenty panelists familiar with the foods in the Sensory Evaluation Unit for sensory evaluation. The panelists were drawn from the Federal College of Freshwater Technology, New Bussa. They evaluated the samples on a nine point hedonic scale for mouth feel, aroma, colour, taste and overall acceptability. The native shea butter was the Control A and the commercial vegetable oil was Control B.

3. RESULTS AND DISCUSSION

3.1 Jollof rice:

Table 1 shows mean sensory values of Jollof rice prepared using shea butter. All the improved shea butter jollof rice samples were acceptable (6.85± 1.31 to 8.05± 1.47). Jollof rice prepared with coconut- flavoured shea butters from toasted and fried sheanuts (C and D) were the most acceptable. There were no significant differences ($p \leq 0.05$) between them in taste, color, mouthfeel, aroma and overall acceptability but they however differed in taste from boiled sheanuts coconut - flavoured shea butter, native shea butter and commercial vegetable oil jollof rice. The native shea butter and the commercial vegetable oil jollof rice did not differ from each other in taste ($p \leq 0.05$). There was no significant difference in the colour of jollof rice prepared with native shea butter (A) and coconut - flavoured shea butter from toasted and fried sheanuts (D and C) as shown on Table 1. They differed significantly ($p \leq 0.05$) in colour from the jollof rice prepared with coconut-flavoured shea butter from boiled sheanuts (E) and commercial vegetable oil (A).

There was no significant difference ($p \geq 0.05$) in the mouthfeel of all the jollof rice prepared with the shea butter samples though the coconut - flavoured shea butter jollof rice from toasted and fried sheanuts have better scores than others.

Coconut - flavoured shea butter jollof rice from fried and toasted sheanuts (C and D) did not differ ($p \geq 0.05$) from each other but differed significantly ($p \leq 0.05$) from those of the boiled sheanuts (E), native shea butter (B) and the commercial vegetable oil (A) in aroma. Samples A and E jollof rice did not differ significantly ($p \geq 0.05$) from each other in aroma (Table 1) Native shea butter had the least score (6.1 ± 2.27) in aroma. Samples C and D had higher scores and did not differ significantly ($p \geq 0.05$) in over all acceptability.

Olajide *et al.* (2010) reported that native shea butter are consumed as cooking oil in Ghana, Togo and some parts of Nigeria. Akingbala *et al.* (2006) noted that unbleached and unrefined traditionally extracted shea butter from roasted sheanut has poorer colour and flavour than commercial vegetable oil. In Kainji area as reported by Ibanga (2007) and Ibanga and Oladele (2008) the natural smell of shea butter is unpleasant to most people especially the elites as an edible fat, treatment with citric acid and flavour improvement of shea butter increased its acceptance in jollof rice and thus enhance its value as an edible fat.

Table 1: Sensory Scores of Selected Improved Shea butter jollof rice

Samples	Taste	Colour	Mouth feel	Aroma	Overall acceptability
A	6.60 ± 2.11 ^b	7.45 ± 1.50 ^a	6.65 ± 2.03 ^a	6.10 ± 2.27 ^b	7.30 ± 1.22 ^{a,b}
B	6.65 ± 1.98 ^b	6.10 ± 2.13 ^b	6.85 ± 1.76 ^a	7.05 ± 1.96 ^a	6.85 ± 1.31 ^b
C	7.90 ± 1.12 ^a	7.06 ± 1.82 ^a	7.50 ± 1.05 ^a	7.50 ± 1.57 ^a	8.05 ± 1.47 ^a
D	7.95 ± 0.94 ^a	7.35 ± 0.75 ^a	7.75 ± 1.05 ^a	7.70 ± 1.22 ^a	7.95 ± 0.89 ^a
E	6.75 ± 1.62 ^b	6.75 ± 1.29 ^{a,b}	6.70 ± 1.52 ^a	6.95 ± 1.23 ^{a,b}	7.40 ± 1.39 ^{ab}

Legend

- A. Native Shea butter in jollof rice
- B. Commercial vegetable oil (Kings) in jollof rice
- C. Improved fried shea nuts Shea butter in jollof rice
- D. Improved toasted shea nuts Shea butter in jollof rice
- E. Improved boiled shea nuts Shea butter in jollof rice

±: Standard Deviation

Values are mean sensory scores and standard deviation of triplicate analysis.

Values with same letter on a column are not significantly different ($p \geq 0.05$)

3.2 Moin Moin

The mean sensory scores of moin moin prepared with selected improved shea butter and the controls are shown on Table 2. Moin- moin as reported by Olapade *et al.* (2005) is a popular steamed cowpea product obtained from cowpea paste flavoured with pepper, onion, vegetable oil and salt. All the moin moin prepared using shea butter oils (A—E) were acceptable on a 9 point hedonic scale and there was no significant difference ($p \geq 0.05$) in the colour of coconut - flavoured boiled sheanuts shea butter moin moin (E) and that of fried sheanuts (D) ($p \geq 0.05$). The colour of the native shea butter moin moin (6.68 ± 2.58) was the least accepted and there were no significant differences ($p \geq 0.05$) in the mouthfeel and taste of the moinmoin from all the samples. The moin moin from improved shea butter samples were preferred in overall acceptability to those of the Kings commercial vegetable oil and the native shea butter.

Moin moin from coconut-flavoured shea butter from boiled sheanuts had the highest score in aroma (8.05± 0.76) and differed significantly ($p \leq 0.05$) from other samples. Results obtained in this study showed that clarification with citric acid and improving the flavour of shea butter increased its acceptability as edible fat that could be used for moin moin preparation.

Table 2. Sensory scores of moin-moin produced using improved shea butter

Samples	Colour	Aroma	Mouth Feel	Taste	Overall Acceptability
A.	7.35± 1.09 ^a ^b	7.40±0.94 ^b	7.55 ± 1.09 ^a	6.90 ± 1.17 ^a	7.10± 1.12 ^c
B.	7.10 ±1.00 ^b	7.06±1.40 ^b	7.30 ± 1.22 ^a	7.06 ±1.00 ^a	7.15 ± 1.42 ^c
C.	7.55± 0.82 ^a ^b	7.10±1.30 ^b	6.70 ± 1.66 ^a	7.20 ± 1.36 ^a	7.45± 0.94 ^{bc}
D.	7.85 ± 0.99 ^a	7.20±1.24 ^a ^b	7.45 ± 1.20 ^a	7.60 ± 1.60 ^a	8.25 ± 0.85 ^a
E.	8.00 ± 0.73 ^a	8.05 ± 0.76 ^a	7.35 ± 1.42 ^a	7.15 ±1.66 ^a	7.95 ± 0.76 ^a ^b

Legend

- A. Native Shea butter in moin moin
- B. Commercial vegetable oil in moin moin
- C. Improved fried sheanuts shea butter in moin moin.
- D. Improved toasted sheanuts d shea butter in moin moin
- E. Improved boiled shea nuts shea butter in moin moin

±: Standard Deviation

Values are mean sensory scores and standard deviation of triplicate analysis.

Values with same letter on a column are not significantly different ($p \geq 0.05$)

3.3Stew

Table 3 shows the result of sensory scores of stew prepared using improved shea butter and a commercial vegetable oil. Stews from samples of improved shea butter were acceptable in colour. There was no significant difference ($p \geq 0.05$) in the colour of fried and boiled sheanuts improved shea butter stew. Apart from the aroma of the stew from toasted sheanuts improved shea butter, there were no significant differences ($p \geq 0.05$) in the aroma, mouthfeel and taste of stews from all improved shea butters and commercial vegetable oil samples. Native shea butter had least scores in all the sensory attributes. Stew from improved shea butter of fried sheanuts (C) had the highest acceptance and differed significantly ($p \leq 0.05$) from other stews. Ifesan *et al.* (2012) noted that shea butter can be spiced with esoteric adjuncts such as ginger, garlic and suya spices to enhance its sensory qualities. Improving the sensory quality of shea butter through clarification with citric acid, deodorization and flavour addition enhanced the organoleptic attributes of shea butter and thus its acceptability in stew.

Table 3. Sensory scores of stew produced using improved shea butter

Sample	Colour	Aroma	Mouth feel	Taste	Overall acceptability
A	7.94±1.47 ^a	7.36±1.30 ^a	7.0±1.53 ^a	7.4±1.71 ^a	7.79±1.62 ^{ab}
B	7.31±1.00 ^{ab}	7.21±1.13 ^b	7.21±0.92 ^a	7.15±1.30 ^a	7.31±1.45 ^{ab}
C	7.89±1.24 ^a	7.63±0.76 ^a	7.3±0.95 ^a	7.63±1.11 ^a	7.94±1.07 ^{ab}
D	7.42±1.74 ^{ab}	7.63±1.16 ^a	7.36±1.42 ^a	7.52±1.77 ^a	7.73±1.14 ^a
E	6.68±2.58 ^b	7.26±2.13 ^a	6.79±2.09 ^a	6.89±1.59 ^a	6.78±2.15 ^b

Legend

- A. Improved boiled sheanuts shea butter in stew
- B. Improved toasted sheanuts shea butter in stew
- C. Improved fried shea nuts shea butter in stew
- D. Commercial vegetable in stew
- E. Native shea butter in stew

±: Standard Deviation

Values are mean sensory scores and standard deviation of triplicate analysis.

Values with same letter on a column are not significantly different ($p \geq 0.05$)

3.4 Pancake

Sensory attributes of pancakes from improved shea butter from fried, toasted, boiled, native shea butter and kings vegetable oils are shown on Table 4. Kings commercial vegetable oil pancake, (control A) scored highest and differed significantly ($p \leq 0.05$) from others in colour, mouthfeel, and overall acceptability. It did not however differ from fried and toasted sheanuts coconut flavoured shea butter pancakes in aroma (7.65 ± 1.13 and 7.40 ± 1.43) and taste (7.60 ± 1.60 and 7.10 ± 1.33) respectively. The native shea butter was the least acceptable in attributes of colour, aroma, mouthfeel, taste and overall acceptability and its low acceptance in most foods is one of its major setback as an edible fat/oil. Improved processing aims at correcting this. Pancake from native shea butter (A) differed significantly from improved shea butter pancakes from fried, tasted and boiled sheanuts which did not differ significantly ($p \geq 0.05$) from each other in colour and over all acceptability. Flavoured shea butter from boiled and toasted sheanuts shea butter pancakes did not significantly differ ($p \leq 0.05$) from each other. Consumption of shea butter should therefore be not limited to the place of its production particularly as Akhter *et al.* (2008) reported that shea butter has an increasing market in Europe and Asia as baking fat, margarine, fat spread, confectionery and chocolate industries.

Table 4: Sensory scores of pancakes produced using improved shea butter

Samples	Colour	Aroma	Mouth feel	Taste	Overall acceptability
A.	6.60 ± 1.57 ^b	6.45 ± 1.10 ^c	6.30 ± 1.38 ^c	6.10±1.48 ^c	7.05 ± 1.15 ^b
B.	7.65 ± 1.14 ^a	7.65 ± 1.13 ^a	7.50 ± 1.40 ^a	7.60±1.27 ^a	7.95 ± 1.15 ^a
C.	7.40 ± 1.14 ^{a,b}	7.40 ± 1.43 ^a	7.15 ± 1.18 ^{a,b}	7.10±1.33 ^a	7.65 ± 1.18 ^{a,b}
D.	7.00 ± 1.12 ^{a,b}	7.15 ± 1.18 ^{a,b}	7.15 ± 0.93 ^{a,b}	6.85±1.18 ^{a,b}	7.40 ± 1.14 ^{a,b}
E	7.25 ± 1.21 ^{a,b}	6.95 ± 1.28 ^{a,b}	6.45 ± 1.15 ^{bc}	6.70±1.38 ^{a,b}	7.15 ± 0.99 ^b

Legend

- A. Native Shea butter in pancake
- B. Commercial vegetable oil in pancake
- C. Improved fried Shea nuts Shea butter in pancake
- D. Improved toasted Shea nuts Shea butter in pancake
- E. Improved boiled Shea nuts Shea butter in pancake

±: Standard Deviation

Values are mean sensory scores are standard deviation of triplicate analysis.

Values with same letter on a column are not significantly different ($p \geq 0.05$)

3.5 Fried eggs

Table 5 shows sensory scores of fried eggs prepared with improved shea butter from fried, toasted and boiled sheanuts. Fried eggs using commercial vegetable oil ranked best in colour (8.10 ± 1.12), aroma (7.50 ± 1.15), mouthfeel (7.60 ± 0.99), taste (7.90 ± 0.97) and overall acceptability (8.30 ± 0.00) and it differed significantly ($p \leq 0.05$) from other samples except in aroma. It was closely followed by the fried sheanuts coconut flavoured shea butter fried egg. Fried eggs using native shea butter had the least scores in most sensory qualities. The acceptability of shea butter from fried sheanuts was enhanced by the improved treatment of clarification and flavouring with citric acid. Ifesan *et al.* (2012) reported that acceptable bread spread were made from 100% shea butter and 85: 15 shea butter and garlic respectively. Flavouring and spicing are ways of improving the acceptability of shea butter as an edible fat/ oil in foods. Thus, Musa (2012) suggested that value addition techniques, extension and practice are needed to enhance shea butter utilization for a sustainable livelihood in Nigeria.

Table 5: Sensory scores of fried egg produced using improved shea butter

Samples	Colour	Aroma	Mouth feel	Taste	Overall Acceptability
A.	7.10 ± 1.12 ^b	6.70 ± 1.30 ^a	6.25 ± 2.02 ^d	6.90 ± 1.55 ^b	7.15 ± 1.18 ^b
B.	8.10 ± 1.21 ^a	7.50 ± 1.15 ^a	7.60 ± 0.99 ^a	7.90 ± 0.97 ^a	8.30 ± 0.98 ^a
C.	7.50 ± 1.23 ^a	7.05 ± 1.10 ^a	7.25 ± 1.21 ^a	6.95 ± 1.58 ^b	7.95 ± 0.69 ^a
D.	7.01 ± 1.25 ^b	6.75 ± 1.16 ^a	6.80 ± 1.51 ^{bc}	6.55 ± 1.18 ^b	7.00 ± 1.38 ^b
E.	7.10 ± 0.97 ^b	7.15 ± 1.69 ^a	6.50 ± 1.18 ^{bc}	6.35 ± 1.50 ^b	7.05 ± 0.95 ^b

Legend

- A. Native Shea butter in fried egg.
- B. Commercial vegetable oil in fried egg
- C. Improved fried Sheanuts Shea butter in fried egg.
- D. Improved toasted Sheanuts Shea butter in fried egg.
- E. Improved boiled Sheanuts Shea butter in fried egg.

±: Standard Deviation

Values are mean sensory scores and standard deviation of triplicate analysis.

Values with same letter on a column are not significantly different ($p \geq 0.05$).

4. CONCLUSION AND RECOMMENDATION

Shea butter is a vegetable fat of nutritional importance but contributes minimally to edible fat and oil supply due to its inherent unpleasant sensory attributes. Treatment with citric acid solution and addition of coconut essence improved the sensory quality of shea butter. Fried eggs, jollof rice, moinmoin, pancakes and stews prepared using improved shea butters were acceptable and in most cases preferred to the commercial Kings vegetable oil by taste panelists. Since clarification and improvement of crude shea butter involves simple and adoptable technology, it should be popularized by extension workers. This will increase the awareness, acceptability, demand and utilization of shea butter as an edible fat. Improved shea butter should also be tried in other foods to increase the scope of its utilization.

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