

DEVELOPMENT OF CHEWY SNACK BARS FROM MECHANICALLY DEHULLED TOASTED AFRICAN BREADFRUIT (*Treculia africana*) GRITS.

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INTRODUCTION & AIM



Plate 1: Afrcan breadfruit.

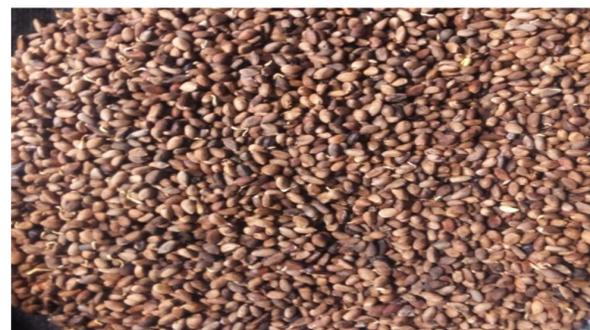


Plate 2: African breadfruit seeds

African breadfruit (*Treculia africana*) [Plate 1] is a tropical evergreen multipurpose tree specie, belongs to the Moraceae family, and grows in the forest zone (Agbogidi and Onomerebor, 2008). The seeds of African breadfruit (Plate 2) are highly nutritious and are of special interest to man for their cheap and rich content of vitamins, minerals, proteins, carbohydrates and fats (Osabor *et al.*, 2009). It holds a significant place in Nigerian traditions as an edible fruit tree, and offering substantial nutritional value to humans. In South-Eastern Nigeria, African breadfruit seeds are very popular; consumed as main dish (Baiyeri and Mbah, 2006), used for soup thickening; roasted and eaten with palm kernel or coconut as roadside snack (Ugwu and Iwuchukwu, 2013).

There is an alarming threat of extinction thus urgent conservation measures are needed to protect and preserve this species, such as diversification of the crop use. Expanding its utilization can contribute to its conservation. There has been limited investigation on how transforming the toasted seeds into snack products might influence specific qualities of these seeds such as the physical and sensory qualities.

The aim of this research work was to develop and evaluate the chemical, physical and sensory properties of chewy snack bars made from mechanically dehulled toasted African breadfruit (*Treculia africana*) grits, and to investigate the potential of this novel snack food as a value-added product for sustainable utilization and commercialization of African breadfruit.

Table 1: Toasted African breadfruit chewy snack bar formulation.

Treatment	Toasted African breadfruit grits (g)	Toasted African breadfruit flour (g)	Shredded coconut (g)
TB1	500	0	0
TB2	450	50	0
TB3	400	100	0
TB4	350	150	0
TB5	300	100	100

Key:

TB1= 100% African breadfruit grits.

TB2= 90% African breadfruit grits: 10% African breadfruit flour.

TB3= 80% African breadfruit grits: 20% African breadfruit flour.

TB4= 70% African breadfruit grits: 30% African breadfruit flour.

TB5= 60% African breadfruit grits: 20% African breadfruit flour: 20% Shredded Coconut.

Analyses:

- Proximate compositions and Energy values of the snack product samples were determined (AOAC, 2010) and (Onyeka, 2013), respectively.
- Mineral Analysis of the snack product samples were carried out; Fe, Ca, K (AOAC, 2005); P (Onwuka, 2005); Zn, Mg (Nnadi, 2020).
- Vitamin (A, B1, B2, B3, C, E) Analysis of the snack product samples were carried out (AOAC, 2010).
- Dietary fibre compositions of the snack product samples were determined (Onwuka, 2018).
- Anti-nutritional properties of the snack product samples were determined; Tannin, phytate, hydrogen cyanide (AOAC, 2005); trypsin inhibitor (Farinde *et al.*, 2018); oxalate (Falade *et al.*, 2004); saponin (Obadoni and Ochuko, 2001); flavonoid (Firn, 2010).
- Physical and Sensory properties of the snack product samples were determined (Igbabul *et al.*, 2015) and (Iwe, 2010), respectively.

METHOD

Materials: Fresh whole undehulled seeds of African breadfruit (*Treculia africana*), coconut and other ingredients used - sugar, corn syrup, honey, molasses, vanilla flavouring essence, sunflower oil, baking soda, egg, salt, etc were purchased from Relifef market and a supermarket in Owerri, Imo State. Production and analyses were carried out in the Department of Food Science and Technology (FST) laboratory in Federal University of Technology Owerri and the National Root Crops Research Institute (N R C R I) Umudike respectively, both in Nigeria.

Sample preparation: The procedures/ unit operations involved in the production of the products samples (Plate 3 and Plate 4) is shown in Figs. 1 and 2. The product formulation is shown in Table 1.

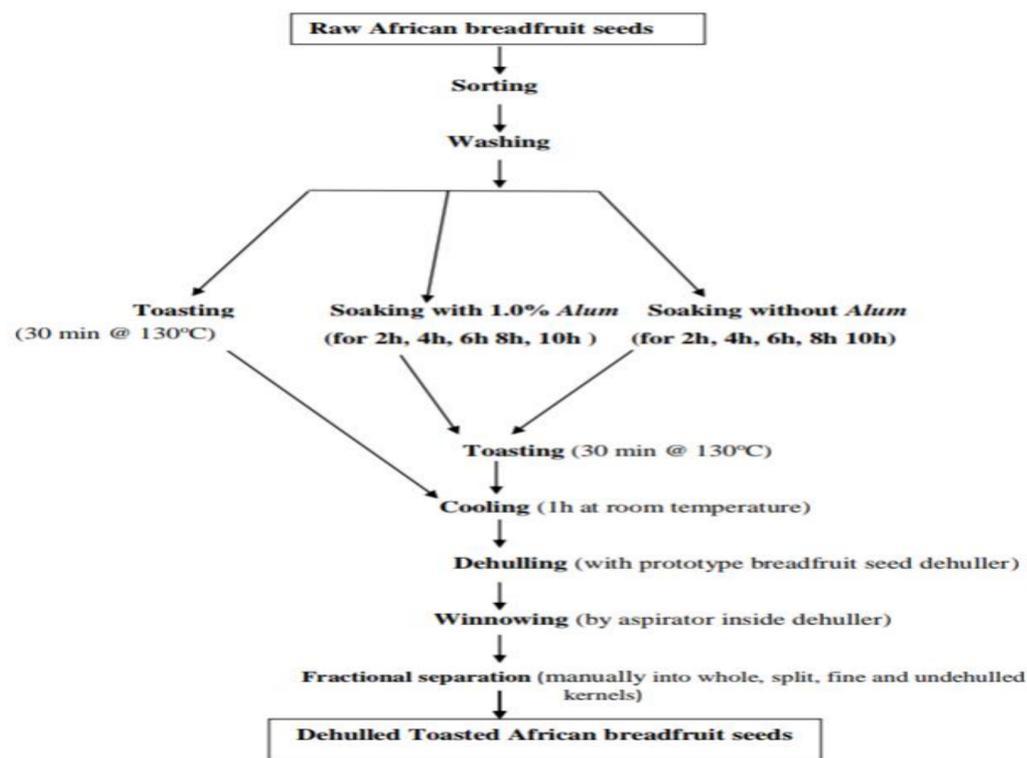


Fig. 1: Processing of dehusled toasted African Breadfruit seeds (Opoku *et al.*, 2013 with modifications).

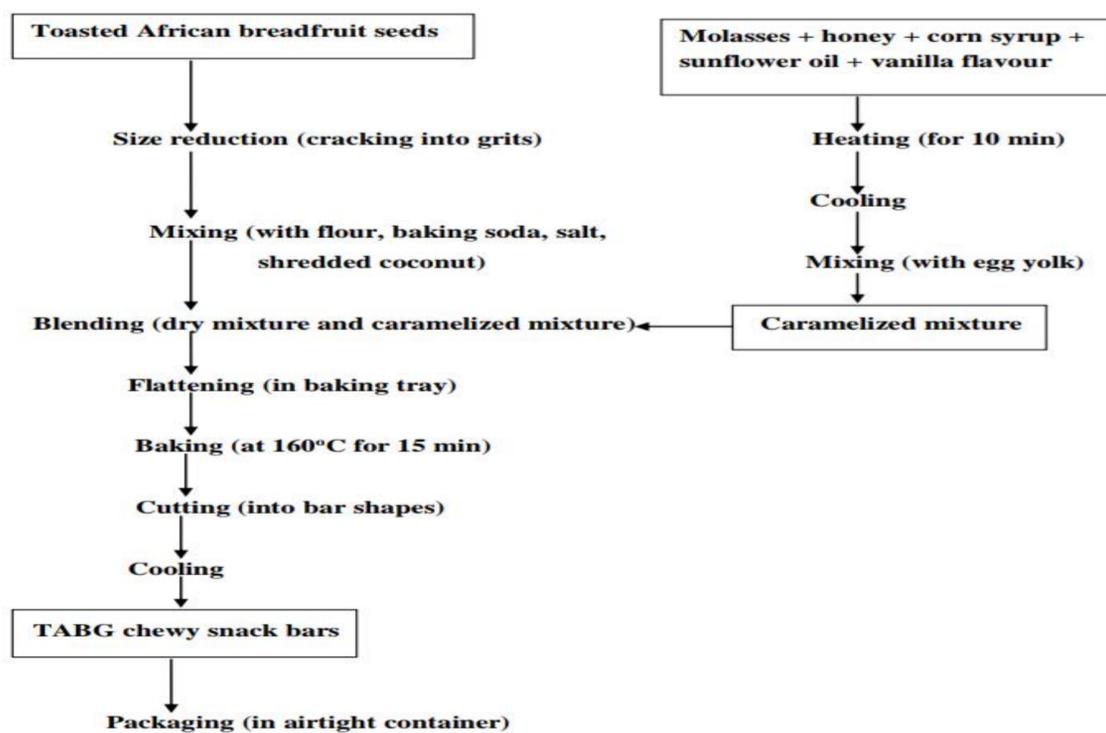


Fig.2: Production of toasted African breadfruit chewy snack bar.

Experimental design: Complete Randomized Design was employed, 5 treatments and 3 replicates per treatment.

RESULTS & DISCUSSION



Plate 3: 100% African breadfruit grits chewy snack bar



Plate 4: Chewy snack bar with 90% African breadfruit grits: 10% TABS

The results of proximate composition and sensory properties of the product samples (Plate 3 and Plate 4) obtained are shown in Tables 2 and 3, respectively. The vitamin, mineral and dietary fibre compositions of the product samples revealed values up to recommended ratios for healthy diets. The products developed also exhibited values of anti-nutrients and physical properties that were comparable to other snacks and snack bars reported by previous researchers.

Table 2: Proximate composition of toasted African breadfruit chewy snack bar samples.

SAMPLE	MOISTURE (%)	PROTEIN (%)	FIBER (%)	FAT (%)	ASH (%)	CHO (%)	EV (Kcal)
TB1	8.82 ±0.08 ^a	18.45±0.01 ^e	1.88±0.01 ^e	18.72±0.01 ^e	1.21±0.01 ^e	50.95±0.01 ^a	445.95 ±0.06 ^d
TB2	8.71 ±0.01 ^b	21.0±0.02 ^d	2.03±0.02 ^d	19.24±0.01 ^d	1.58±0.01 ^d	47.43 ±0.00 ^b	446.94 ±0.04 ^d
TB3	8.63 ±0.03 ^c	22.72±0.03 ^c	2.27±0.02 ^c	20.43±0.01 ^c	1.68±0.01 ^c	44.28±0.01 ^c	451.90 ±0.27 ^c
TB4	8.41 ±0.02 ^d	25.18±0.01 ^b	2.41±0.02 ^b	21.68±0.01 ^b	1.78±0.02 ^b	40.54±0.02 ^d	455.90 ±2.84 ^b
TB5	8.11 ±0.02 ^e	27.32±0.02 ^a	3.69±0.01 ^a	26.51±0.01 ^a	2.49±0.02 ^a	31.9 ±0.01 ^e	475.45±0.10 ^a

Values are means ± standard deviation of triplicate determination. Mean values in the same column with different superscript are significantly different ($P < 0.05$). CHO = carbohydrate, EV = energy value.

Table 3: Sensory scores of toasted African breadfruit grits chewy snack bar samples

Samples	Taste	Appearance	Aroma	Mouth feel	Overall Acceptability
TB1	6.96 ^a ±1.07	6.17 ^{bc} ±1.44	6.33 ^b ±1.35	6.80 ^{ab} ±1.39	7.00 ^a ±1.38
TB2	6.63 ^{ab} ±1.58	6.53 ^{bc} ±1.61	6.13 ^b ±1.41	6.33 ^b ±1.39	6.70 ^a ±1.14
TB3	6.16 ^b ±1.89	6.00 ^c ±1.61	6.33 ^b ±1.44	6.30 ^b ±1.37	5.87 ^b ±2.16
TB4	6.83 ^a ±1.26	6.83 ^{ab} ±1.21	6.10 ^b ±1.18	6.37 ^b ±1.47	6.61 ^a ±1.37
TB5	6.97 ^a ±1.16	7.40 ^a ±1.35	7.27 ^a ±1.14	7.17 ^a ±1.48	7.13 ^a ±0.97

Means with different superscript within the same column are significantly different ($p < 0.05$)

CONCLUSION

The results revealed that the optimal formulation consisted of 60% grits, 20% toasted African breadfruit flour, and 20% shredded coconut. Sensory evaluation revealed that the snack bars were acceptable and but sample TB5 was preferred by consumers. Nutritional analysis showed that the snack bars were rich in fiber, protein, and carbohydrates. This research demonstrates the potential of toasted African breadfruit grits as a sustainable and nutritious ingredient for developing value-added snack foods.

FUTURE WORK / REFERENCES

Further studies can focus on scaling up production of toasted African breadfruit grits chewy snack bar and exploring other applications of toasted African breadfruit grits in food products.

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