EFFECT OF THE ADDITION OF PROCESSED AFRICAN YAM BEAN ON THE FUNCTIONAL AND SENSORY PROPERTIES OF MILLET-BASED INFANT FORMULA

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Introduction

Malnutrition is a universal problem that has many forms and affects most of the world's population especially under-five children and Nigeria is not an exception. Application of processing methods such as fermentation and sprouting has been shown to increase nutrient bioavailability and equally modify the functional properties of foods. Employing these methods in the preparation of infant foods and complementing cereals with legumes will address nutrient density and viscosity problems associated with infant foods [1]. Most of the formulations were centered on only refining the cereal flour prior to blending. Therefore this study determined the effect of the addition of processed African yam bean on the functional and sensory properties of millet-based infant formula.

Materials and Methods

Infant foods were formulated from blends of treated African yam bean and pearl millet. Functional properties, pasting properties and sensory properties of the blends were studied. Millet and African yam bean were soaked separately in water and allowed to ferment for 48h at room temperature. While for sprouting, millet and African yam bean were soaked for 12 and 24h, respectively, at room temperature and soaked seeds were separately sprouted for 48h as described by Chikwendu *et al.* [2] and Okafor *et al.* [3] with slight modification. After fermentation and sprouting, the seeds were oven-dried and then milled into a flour of 0.6 mm size. The flours were formulated to six complementary diets (A, B, C, D, E, and F) 100% sprouted millet flour; 100% fermented millet flour; 95% sprouted millet flour & 5% sprouted african yam bean flour; 95% fermented millet flour & 5% fermented african yam bean flour; 95% sprouted millet flour & 5% fermented African yam bean flour; 95% fermented millet flour & 5% sprouted african yam bean flour respectively. Functional properties were determined as described by AOAC [4] and Onwuka [5]. Pasting characteristics were determined with a Rapid Visco Analyzer (RVA), New Port Scientific RVA Super4 Machine with serial number 2112582-S4A made in Australia. Sensory properties were also determined. All evaluation tests were conducted in triplicates and data obtained were subjected to one way analysis of variance (ANOVA) and differences among the means were determined using Duncan multiple range test (DMRT). Statistical Package for Service Solution (SPSS) Version 23.0 was used to analyze the data and $p < 0.05$ was considered to be statistically significant.

Results and Discussion

Table 1 revealed that sample D (95% fermented millet flour & 5% fermented african yam bean flour) had suitable water absorption capacity, while, for oil absorption capacity, various blends showed suitability except samples B and C (100% fermented millet flour; 95% sprouted millet flour & 5% sprouted african yam bean flour;). In terms of swelling capacity, sample F (3.16 ± 0.12%) was the suitable. Sample F (95% fermented millet flour & 5% sprouted african yam bean flour) was significantly low in foaming capacity while various blends had significantly high values. Treatment and blending ratios significantly influenced the pasting properties. In sensory acceptability, Sample F was adjudged the best.

Conclusion

This study revealed that samples showed suitable variability in respect to functional and pasting properties for infant food; however, sample F received the best general acceptability.

Table 1: Functional properties of millet-based infant formula

Sample	Foaming capacity ml/cm³	Bulk density g/cm	Water absorption ml/g	Oil absorption ml/g	Swelling Capacity g/g	Swelling Power g/g	Solubility Index g/g	Gelation (%)
A	4.10 ± 0.14^{b}	0.59 ± 0.00^{a}	2.06 ± 0.63^{a}	2.25 ± 0.66^{c}	7.24 ± 0.19^{a}	4.05 ± 0.20^{a}	0.91 ± 0.06^{c}	11.95 ± 0.07^{b}
B	2.05 ± 0.07^{d}	0.56 ± 0.00^{a}	2.04 ± 0.21^{bc}	2.06 ± 0.15^{e}	7.16 ± 1.31^{a}	3.84 ± 0.94^{a}	0.75 ± 0.07^{c}	4.95 ± 0.07^{d}
C	2.85 ± 0.21^{c}	0.58 ± 0.00^{a}	2.03 ± 0.86^{bc}	2.31 ± 0.64^{b}	3.38 ± 1.69^{b}	73.0 ± 0.21^{b}	39.93 ± 0.38^{b}	7.00 ± 0.00^{c}
D	2.00 ± 0.00^{d}	0.58 ± 0.00^{a}	1.99 ± 0.73^{d}	2.04 ± 0.77^{f}	7.13 ± 0.28^{a}	3.96 ± 0.53^{a}	9.36 ± 0.08^{d}	7.00 ± 0.00^{c}
E	4.85 ± 0.21^{a}	0.65 ± 0.00^{a}	2.05 ± 0.62^{b}	2.50 ± 1.06^{a}	3.54 ± 64.0^{b}	71.94 ± 0.55^{b}	46.84 ± 0.65^{a}	14.90 ± 0.14^{a}
F	1.00 ± 0.00^{e}	0.74 ± 0.00^{a}	2.03 ± 0.08^{c}	2.17 ± 0.12^{d}	3.16 ± 0.12^{b}	53.05 ± 0.28^{b}	28.55 ± 0.14^{c}	5.00 ± 0.00^{d}

Results are mean of replicate determination. Means on the same column with different superscript letter are significantly different ($p < 0.05$) while those with the same superscript letter are not significantly different. A: 100% sprouted millet flour, B: 100% fermented millet flour, C: 95% sprouted millet flour & 5% sprouted African yam bean flour; D: 95% fermented millet flour & 5% fermented African yam bean flour; E: 95% sprouted millet flour & 5% fermented African yam bean flour; F: 95% fermented millet flour & 5% sprouted African yam bean flour

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