International Journal of Engineering Science Invention
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org Volume 3 Issue 4 ǁ April 2014 ǁ PP.30-33

Chemical and Sensory Attributes of Complementary Foods Produced From Maize and African Yam Bean Water Soluble Protein Extract

Sule, S
[1](*Department of Food Science and Technology, College of Food Technology/ University Of Agriculture, Makurdi, Nigeria)*

ABSTRACT: *Maize (Zea mays) and African yam beans (Sphenostylis stenocarpa) were used to formulate two complementary foods: One was made of 100% cereal which served as the control and the other (blend) was made of 70% cereal and 30% legume extract. The samples were analyzed for proximate compositions, microbiological properties, physicochemical properties as well as sensory attributes. The control (100% maize) was found to contain 9% protein, 4% fat, 76.40% carbohydrate, 2.4% fibre, 2.3% ash and 7.4% moisture, while the blend (maize and African yam bean water soluble protein extract) was found to contain 19.02% protein, 2.80% fat, 65.55% carbohydrate, 1.75% fibre, 1.66% ash and 9.22% moisture. pH values of 6.3 and 6.4 were recorded for the control and blend samples respectively. Microbial counts of 1.15 x 10^5cfu/g and 1.30 x 10^5cfu/g were recorded for the control and blend samples respectively. There was no evidence of the presence of yeasts and molds in the prepared samples. Viscosity measurements for the control and blend samples observed at 30rpm were 690 and 712 respectively. There was no significant difference (P< 0.05) in the sensory attributes between the control and the blend samples.*

KEYWORDS: *African Yam Bean Water Soluble Extract, Cereal, Complementary, Legume, Maize.*

I. INTRODUCTION

Generally, food is very important for human existence. The optimum health and nutritional status of an individual is dependent upon a regular supply of food and balanced diet. In the first year of life, infants undergo periods of rapid growth when nutrition is crucial. In fact, nutrition in the early years of life is a major determinant of healthy growth and development throughout childhood and of good health in adulthood. Pediatricians and nutritionists have established nutritional guidelines to meet the specific needs of these early years [1].While if at all feasible breastfeeding is recommended during the first six months, the most vulnerable period for developing under-nutrition remains the transition from breastfeeding to family foods. Breast milk composition may vary dramatically between women and from the beginning and month six [2]; [3]. Additional foods may be required to complement or replace breast milk after this time. Generally, children double their birth weight by 6 months of age and triple it by 12 months. When breast milk is no longer enough to meet the nutritional needs of the infant, complementary foods should be added to the diet of the child. The transition from exclusive breast feeding to family foods, referred to as complementary feeding, typically covers the period from 6 to 18 – 24 months of age and is a very vulnerable period. It is the time when malnutrition starts in many infants, contributing significantly to the high prevalence of malnutrition in children less than five years of age worldwide [1].In a weaning process there is always the need to introduce soft, easily swallowed foods to supplement the infant's feeding early in life. The weaning process may be gradual, lasting for months until the infant is finally introduced to the family diet. In Nigeria the usual first weaning food is called pap, *akamu, ogi,* or *koko* and is made from maize (*Zea mays*), millet (*Pennisetum americanum*), or guinea corn (*Sorghum* spp.)[4].

Over the years, the most common substitute for breast milk is a well reconstituted infant formula based on cow milk. This is usually imported from foreign countries, but due to the economic situation, the importation of this formula is expensive and thus, influences the retail price of this imported formula. This makes such substitute very expensive for an average Nigerian nursing mother. On this basis, a research work on the production of a formula which is rich in protein and at the reach of the vast majority of the vulnerable groups of the population in form of complementary food is considered important. This food will be such with desirable organoleptic qualities from cereal and legume, rich in protein and inexpensive since it is locally oriented. The objective of this work is therefore to evaluate the quality attributes of complimentary foods produced from maize and African yam bean water soluble protein extract

II. MATERIALS AND METHODS

1.1. Source of Raw Materials

The raw materials (maize and African yam bean) were purchased from high level market in makurdi, Benue State. The chemicals and reagents used in the analysis were of analytical grade and available in the Department of Food Science and Technology.

2.2. Sample Preparation

2.2.1. Preparation of Maize Flour

Maize flour was prepared by the method described by [5]. The seeds were carefully sorted to separate dirt, dust, stones and other contaminants. The sorted seeds were then washed in clean water and removed after which they were placed in an oven to dry and then sieved through a sieve of aperture 0.5µm to obtain the desired flour size.

2.2.2. Preparation of African Yam Bean Water Soluble Protein Extract.

The African yam bean flour was prepared by the method described by [6].The seeds were cleaned and then boiled in hot water to enable dehulling. After dehulling, the seeds were then oven dried for 10hours at 600C. the dried seeds were then milled using attrition mills and sieved with a sieve of 0.50.5µm aperture to obtain African yam been flour. To obtain the water soluble protein extract, the method described by [7] was adopted. One hundred grams of African yam been flour was suspended in 1500ml of distilled water. The pH of the suspension was adjusted to 9.0 with 1M NaOH. The materials were then stirred for 20minutes using a high speed stirrer and then centrifuged at 1000g for 20 minutes. The protein in the extract was precipitated at pH 4.0 using 1M HCl. The precipitate was then washed once with distilled water and readjusted to pH 7.0 with 1M NaOH and dried in and oven at 400^0C.

2.3. Formulation of Complementary Food

The complementary food was made into two samples: A (control) made up of 100% maize and B(blend) made up of 70% maize and 30% African am bean water soluble protein extract.

2.4. Analytical Methods

Proximate analysis (moisture, protein, fat, ash and crude fibre) was carried out on the samples according to the methods described by [8]. Carbohydrate content was calculated by difference.

2.5. Sensory Evaluation of the Formulated Complementary Foods.

On a series of trial experiments, about 250ml of water was used for the reconstitution of the formulated flour from the two samples. The reconstituted mix was then stirred continuously over boiling water to obtain semi-solid paste. This was then served to a 10member panel for evaluation of colour, flavor, texture, taste and general acceptability. The panelists rated the product on a 9-point hedonic scale as described by [9], where 1 indicated extremely dislike and 9 indicated extremely like.

2.6. Statistical Analysis

The results for the sensory evaluation of the complementary foods were then subjected to analysis of variance and test of least significance

III. RESULTS AND DISCUSSION

Table 1 shows the proximate composition of the complementary foods from maize and African yam bean water soluble protein extract. The result showed that the control (100% maize flour) contained 9.00% protein, 4.00% fat, 76.40% carbohydrate, 2.40% fibre, 2.30% ash and 7.40% moisture while those of the blend (70% maize and 30% African yam bean water soluble protein extract) contained 19.02% protein, 2.80% fat, 65.55% carbohydrate, 1.75% fibre, 1.66% ash and 9.22% moisture. There was significant difference observed between the results for protein, carbohydrate, ash and moisture ($p > 0.05$) while those of fat and fibre showed no significant difference ($p < 0.05$) between the two complementary food samples. The protein (19.02%) and moisture (9.22%) contents were higher in the supplemented samples than the control samples (9.00% and 7.40%) respectively. While the results for fat (2.80%), carbohydrate (65.55%), fibre (1.75%) and ash (1.66%) were lower in the supplemented sample than the control (4.00%, 76.40%, 2.40%, 2.30%) respectively. The decrease in carbohydrate, fat, fibre and ash contents in the supplemented complementary food is brought about by their low contents in the African yam bean water soluble protein extract. While the increase in protein and moisture contents is conversely brought about by their high contents in the water soluble protein extract. The results show that African yam bean water soluble protein extract is highly efficient for use in supplementation to increase protein content of foods. These results compare favourably with those reported by [10] and [11]. The variations in results may be due to varieties, geographical location or processing techniques employed. Table 2 shows the mean scores of sensory analysis of the complementary foods produced from maize and African yam bean water soluble protein extract. For the control sample (100% maize flour), the results are shown as; colour (6.60), taste (6.70), flavor (6.90), texture (7.30) and general acceptability (7.00), while for the supplemented complementary food (70% maize and 30% African yam bean water soluble protein extract), the results are shown as; colour (7.70), taste (6.80), flavor (7.70), texture (7.00) and general acceptability (7.30).In general, the mean scores for the supplemented complementary food sample were higher than the control complementary food sample for colour, taste, flavor and general acceptability, but lower in texture. This shows that the supplemented complementary food was preferred over the control.

Table 1: Proximate Composition of the Formulated Complementary Foods

Samples	Protein	Fat	CHO	Fibre	Ash	Moisture
Control	9.00^{b}±0.28	4.00^{a}±0.42	76.40^{a}±0.42	2.40^{a}±0.71	2.30^{a}±0.07	7.40^{b}±0.28
Blend	19.02^{a}±0.03	2.80^{a}±0.14	65.55^{b}±0.33	1.75^{a}±0.09	1.66^{b}±0.13	9.22^{a}±0.16
LSD	0.86	1.36	1.29	2.17	0.44	0.98

Values are means ± standard deviations of triplicate determinations. Mean scores on the same column with the same superscript are not significantly different ($p<0.05$)

Key:
LSD: Least Significant Difference
Control: 100% maize flour
Blend 100% maize flour + 30% African yam bean water soluble protein extract

Table 2: Sensory Scores for the Formulated Complementary Foods

Samples	Colour	Taste	Flavor/aroma	Texture	General acceptability
Control	6.60^{a} ± 1.35	6.70^{a} ± 1.55	6.90^{a} ± 0.99	7.30^{a} ± 1.03	7.00^{a} ±1.10
Blend	7.70^{a} ± 0.95	6.80^{a} ± 1.14	7.70^{a} ± 1.16	7.00^{a} ± 1.15	7.30^{a} ±0.82
LSD	1.45	2.40	1.38	1.38	1.27

Values are means ± standard deviations of triplicate determinations. Mean scores on the same column with the same superscript are not significantly different ($p<0.05$)

Key:
LSD: Least Significant Difference
Control: 100% maize flour
Blend 100% maize flour + 30% African yam bean water soluble protein extract

The lower content in texture of the supplemented sample might be due to its lower fibre content. Maize flour has higher fibre content than African yam bean water soluble protein extract. The mean scores showed no significant difference ($p < 0.05$) in all cases for colour, texture, taste, flavor and general acceptability in both the control and the supplemented complementary samples. When compared with results from [12], the results compared favourably.

IV. CONCLUSION

The result of this study shows the successful production of nutritious complementary foods with local food stuffs using simple methods that can be adopted by families. This formulation is therefore recommended as complementary food for infants to provide requirements for their growth and development. Determination of minerals, vitamins, protein quality and physicochemical properties can be further carried out on the product to establish useful information about the product.

REFERENCES

[1] WHO, Global strategy for infants and young child feeding. Report of the expert consultation of the optimal duration of exclusive breast feeding, Geneva, Switzerland, 2001, 28-30

[2] J.C. Allen, R.P. Keller, P. Archer, M.C.Neville. Studies in human lactation: milk composition and dailysecretion rates of macronutrients in the first year of lactation. American Journal of Clinical Nutrition.54(1), 1991, 69-80.

[3] M.A. Laskey, A. Prentice, J. Shaw, T. Zachou, S.M. Ceesay, L. Vasquez-Velasquez, D.R.Fraser, Breast milk calcium concentrations during prolonged lactation in British and rural Gambian mothers. Acta Paediatr Scand, 79(5), 1990, 507-512.

[4] J. King, A.Ashworth. Changes in infant feeding practices in Nigeria: An historical review, Occasional Paper No. 9. London: Centre for Human Nutrition, London School of Hygiene and Tropical Medicine, 1987

[5] M.K. Bolade, I.A. Adeyemi, A.O. Ogunsua (2009). Influence of particle size fractions on the physicochemical properties of maize flour and textural characteristics of a maize-based non-fermented food gelation. International Journal of food science and technology, 44, 2009, 646-655.

[6] M.I. Ojukwu, I. Olawuni, A. Ibeabuchi, C. Amandikwa. Physical, proximate and functional properties of 'Nsama' A local variety of African yam bean(*Sphenostylis stenocarpa*) grown in southern states inNigeria, 2012

[7] S.P. Nath, M.S. Narasinga Rao, Functional properties of guar proteins. Journal of Food Science, 46, 1981, 1255-1259.

[8] AOAC, Official methods of analysis of the association of official analytical chemists International (17th Ed. Published by the Association of Official Analytical Chemists International, Suite 400 2200 Wilson Boulevard, Arlington, Virginia USA, 2000, 2220-3301).

[9] M.O.Iwe, Handbook of sensory methods and analysis(Rejoint Communications Services Ltd, Uwani Enugu-Nigeria, 2002)

[10] S. Dorosko, N. Rollins (2003). Infant formula preparation by rural and semi-rural women in south Africa. Food policy, 117-130 (28)

[11] K.M. Amigo, D.A. Ameh, S. Ibrahim, S. S. Danbauchi, (2009). Nutrient composition of commonly used complementary foods in north western Nigeria.African Journal of Biotechnology. 8(17), 4211-4216.

[12] M.E. Ukhun, I.E. Ukpebor. (1991), Production of instant plantain flour, sensory evaluation and physicochemical changes during storage. Food Chemistry, 42, 297—299