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Research Article

ENRICHMENT OF FLOUR BEAN BY EGG YOLKS FOR MAKING FOOD WITHDRAWAL

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ABSTRACT

Local products, thanks to their nutritional value and favorable price, can be used for the preparation of weaning foods. Just know how to associate them. The goal of this work was to enrich the bean flour with egg yolk for the production of a weaning food. Targeted sampling of a market has been completed. A total of 15 improved chicken eggs and 3 kg of bean seeds were collected and organoleptically tested. The preparation of the enriched flour was made with 40g of bean flour against an egg yolk. Nutritional characteristics of raw materials and mixed flour gave for simple meal: dry matter 90.67%, 9.33% moisture, total ash 2%, total carbohydrates 61.46%, 2.06% lipids, protein 21.40%, with an energy value of 351, 34kcal. For egg yolk, 48% dry matter content, 52.00% moisture, 2.47% total ash, total traces of carbohydrates, 25.06% fat, 18.70% protein, energy value of 300.34 kcal. On the other hand pour flour mixed with the dry matter 87, 53%, 12, 47% of moisture, 2, 13% of total ashes, 51, 12% of total carbohydrates, 7, 86% of lipids, 23, 02 % of proteins, with an energy value of 367.30 kcal. The prepared mixture was evaluated by a group of 19 naive people, including 3 nutritionists, 8 mothers and 8 children, selected for their health and availability. The tasters gave their opinion according to the consistency, the taste, the smell and the color. The porridge was distributed in environments where every child with his mother was. The tasting sessions were held for 3 days before a good breakfast. Children who took the porridge were weighed and evaluated two weeks after their weight to determine the difference between reception and performance of the nutrition center. This work will allow the rational use of flour and egg yolk preparations for children of weaning age.

INTRODUCTION

From birth to the age of 6 months, all the nutritional needs of children are covered through breast milk [De Zoysa, T., 1991; Akre, J., 1989; WHO, 1989].

This is called the withdrawal period from 6 months to 1 year or 2 years. During this period, we must bring new foods in a liquid or semi-liquid to supplement the contributions of breast milk. These new foods given to children during the weaning period are called complementary foods and must bring in the major nutrients balanced proportions: proteins, fats and carbohydrates [CIE 1987; Trèche, S. *et al*, 1994; Mouquet Rivier, C., 2006].

Beans contain from 8 to 12% water, 60 to 65% carbohydrates especially in the form of starch, 5% cellulose, 23-26% protein and 1-2% lipids. They are rich in phosphorus and iron (such as meat and fish), fairly rich in calcium, rich in potassium and B vitamins, especially thiamine (vitamin B1) [Pavly, A. 1980].

The bean proteins have amino acid composition much less well balanced than that of meat, fish and eggs [Pakrovsky, A. 1978]. In Africa, during weaning, mothers usually feed their children with traditional porridge made from simple meals or made from cereals, tubers which are foods rich in carbohydrates and low in protein. These foods are unable to cover all the nutritional needs of the child [Briend, A. 2000]. The nutritional needs of newborn, infant and toddler (3 years before) were the subject of numerous studies for 30 years and WHO recommendations [Hall, B., 2009]; leading to the manufacture of various types of baby foods in order to provide children with good nutritional quality products [Hall, B. 2009; Trèche, S., *et al*, 1995; Beaufrère, B. al, 2001; Fomon, SJ, 1991]. In Africa, of infant flours good indeed exist on the market but they are imported industrial products and a high cost. Therefore they are not generally accessible to poor mothers. [FAO / WHO, 2009] advocate that complementary foods are made from local produce available and accessible and adequate nutritional quality to meet the nutritional needs of the child.

The vast majority of breastfed infants grow harmoniously until about six to eight months. But from that time, breast milk despite its nutritional quality, is no longer sufficient on its own to me *et al* l the nutritional needs of the child.

To remedy this situation, moms use boiled single flour cereals which are abundant and should be enriched (corn, rice, millet, etc.).

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However, it is none of these simple flour does not in itself constitute a balanced diet at weaning. We can overcome this deficiency by developing food systems multicomponent (binary, tertiary, quaternary etc.), this would lead to the creation of rich and balanced food systems that meet the physiological needs of the body weaning.

Typically in formulating binary food systems, flour cereals are associated with animal products or legumes. The use of legumes in infant feeding is an important issue and that this age group has special protein requirements. It would be interesting to combine legumes and eggs especially the rich bean carbohydrate cereal close it which are commodities that can be stored for several months before consumption.

The objective of this work was to enrich the bean flour in the egg yolk for the manufacture of a weaning food at the Institute of Nutrition and Child Health Donka- Conakry, Guinea.

MATERIAL & METHODS

Sampling and Organoleptic Review

Targeted sampling in a market place was performed. Fifteen (15) improved poultry eggs and three (3) kg of bean grains have been purchased and removed and then, subjected to an organoleptic test for obtaining the Product.

Preparing bean flour

The haricot beans were purchased taking into account the degree of drying, the attack by insects, price and cleanliness of the place of sale. Then they were sorted, washed and winnowed in a container adapted to these various operations. After they have been dipped in a calabash containing water during 5 hours of time which helped to moisten and promote product cooking. Cooking was done in a pot to aid digestion of the product. Then the product was drained using a sieve then spread in a drying device for protection against contamination and hazards. Product milling was performed in a mortar properly washed clean with soap and water, and then the mortar was rinsed with a sponge and was allowed to dry for 30 minutes. After these preliminary steps beans was ground it to obtain the fine powder. The grind obtained undergoes a drying at low heat in a pot which decreased humidity and facilitated the screening. A 0.001 mm mesh sieve was used to obtain a fine bean flour. Finally, the flour was cooled before being packaged in predried glass boxes.

Forobtaining egg yolk Technique

The eggs of the hen improved, were purchased in a local market in hygienic conditions and good quality. They were washed with clean water using a toothbrush and detergent. They were then broken with a tablespoon at the tube. The content of the egg was poured into a small bowl. The white was separated from the egg yolk with a tablespoon. The recovered yellow was kept aside and used to obtain the mixed product.

Preparation of the mixed flour

The mixed flour was obtained by the following approach 40 grams of bean flour for Egg yolkss. This report was followed to the letter throughout the work.

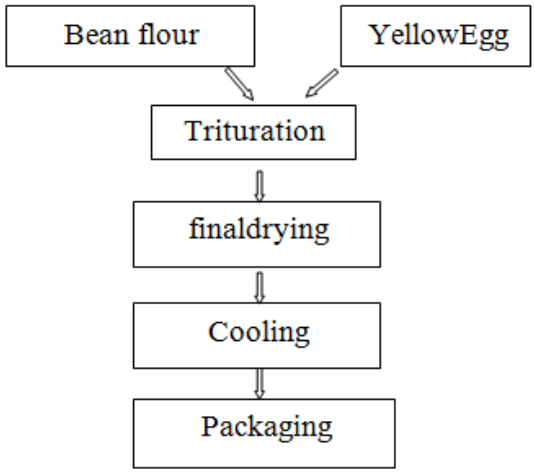

Diagram: Preparation of the mixed flour

Chemical analysis techniques food

Nutrient levels were determined in simple meal of beans and in the yolk (less carbs) and mixed meal, according to the following procedures:

Determination of moisture

He wasweighed 5 g of the sample into the petri dish previously dried and weighed, which was introduced into the oven set at a temperature of 105°C. After two hours of heating, the capsule was removed, placed in a desiccator to cool and subjected to the last weighing. The results were expressed as follows:

$$H\% = \frac{P_e \_ Ms}{Pe} \times 100$$

Hence H% = moisture content
Ms = P1 - P0
Pe = the sample

Then MS = 100% - H%

MS = dry matter%

Determination of Total ash

In a porcelain crucible previously weighed, it was introduced 5 g of the sample into a porcelain crucible, which was placed in the muffle furnace, and then set at a temperature of 600-700°C for 24h until the full calcination and the formation of white ash. After calcination the crucible was placed in a desiccator to cool. Subsequently the residue was weighed and weight was noted. This operation was repeated three (3) times until the constant weight.

The Results Were Expressed As Follows

The percentage of total ash is computed from the formula:

$$C_{T\%} = \frac{P_1 \_ P_0}{P_e} \times 100$$

Ct = total ash as a percentage;
P1 = mass crucible containing the raw ash gram;
Po = empty crucible of the mass in grams;
Pe = Weight of the sample

Determination of Total Carbohydrate (Method Gauss Bonas)

It was introduced into a conical flask 5 g of flour and 50 ml of 5% hydrochloric acid. The solution thus obtained was heated in a water bath for 2 hours. Cooled was added drop by drop of

phenolphthalein to neutralize excess acid by 40% sodium hydroxide until the appearance of pink color.

The excess of soda in turn was removed by addition drop wise of 10% acetic acid. The pink color disappears when the entire excess amount of sodium hydroxide is neutralized and the hydrolyzate was defecated by adding 5 ml lead acetate. Then 0.5 g of sodium sulfate was added and stirred vigorously. The solution thus obtained was filtered using a suction pump. The filtrate was transferred into a volumetric flask of 250 ml capacity and distilled water was added up to the mark.

The weight of Carbohydrates is Found Using the Formula:

$$pg = \frac{T}{V} \times 250$$

With
Pg: carbohydrate weight;
T: Title Fehling's solution;
V: volume of the filtrate read from the burette;
250: is the volume of the volumetric flask.

Found the Percentage of Carbohydrates Reported to the starch by the Following Formula:

$$\%Gt = \frac{P \times 0,9}{Pe} X\ 100$$

Gt% = percentage of total carbohydrates;
P = weight carbohydrate;
Pe = weight of the test sample;
0.9 = conversion coefficient Gauss Bonas

Determination of lipids (Method of separating funnel)

A 5 g sample was introduced into a separatory funnel and was then added a certain amount of petroleum ether. Allow to stand for a while until extraction. The extract was collected in a tared Petri dish and placed in an oven for evaporation of the petroleum ether was then removed and placed in a desiccator to cool and subjected to the last weighing.

The lipid Content was Calculated Using the Formula below

$$\%L = \frac{P_1 - P_0}{Pe} x\ 100$$

With
% R = percent lipid
P1 = the weight of the fat
Pe = weight of the test sample
P = Weight of the empty flask$_0$

Protein assay (Method of Kjedhal / Vinogradova (1975)

The nitrogen content was calculated and the result was multiplied by the factor 6.25. The nitrogen and protein were determined according to the following formula:

$$\%N = \frac{VH_2SO_4 \times CH_2SO_4 \times 0,014}{Pe} \times 100$$

Or
NOT: nitrogen rate (%)
Pe: Sample (g)
C: concentration of H2S04 to 0.1 (N)
0.014: Molecular weight of nitrogen (in mg)
V: Volume of H2S04

After Determining the Nitrogen Content, the Protein Content was Calculated Using the Formula

P =% N x 6.25
Where P = protein content
N% = nitrogen content
= 6.25 nitrogen conversion factor

Determination of the Energy Value of Flour and Egg Yolks

The energy value of a food compound is the sum of products of each major food (carbohydrates, proteins, lipids) and its thermal coefficient corresponding atwater. Enrichment was evaluated through this process.

Preparation of slurry

Two tablespoons shaves enriched flour were slurried and dissoutent in 125 ml of water and then 8 teaspoons of sugar were added. A quantity of 250 ml of water was boiled and the stirred mixture was added to boiling water. The whole mixture was cooking for 20 minutes while stirring. After cooling 2 tablespoons orange juice coffee were added.

Tasting

A hedonic analysis was done in this tasting. Consumer preference over the bean flour porridge enriched with the yolk was appreciated. A group of 19 naive individuals, including 3 women nutritionists, 8 mothers and 8 children were selected based on their availability, their health. The porridge was distributed in environments where each child with their mother was. The tasting sessions were held during 3 days before breakfast.

Immediately after the preparation of the slurry, it was subjected to cooling for a period of time, then the slurry was put into small bowls with spoons has soups (for nutritionists and mothers) and teaspoons (for children).

Three (3) sessions were conducted by following the behavior of children to the slurry which was to observe the acceptance or rejection of the product. As for the mothers and nutritionists the slurry was assessed on the following organoleptic criteria: color, texture, smell and taste.

Finally, children who took the porridge were weighed and two weeks later, their weight was evaluated to know the difference between the reception and the release of children.

RESULTS AND DISCUSSION

The composition of raw materials and the mixed flour prepared in organic components are shown in the following table 1.

Table 1 Summary of results of the physical and chemical analysis of raw materials and finished product

Settings Samples	Humidity average in (%)	dry matter in (%)	averageash (%)	average carbohydrat ein (%)	Lipidaverage (%)	Averageprot ein in (%)
flour mixed	12.47 ± 0.41	87.53	2.13 ± 0.30	51.12 ± 0.72	7.86 ± 0.11	23.02 ± 0.31
Egg yolks	52.00 ± 1.33	48	2.47 ± 0.50	-	25.06 ± 1.10	18.70 ± 0.31
Flour Bean	9.33 ± 0.94	90.67	2.00 ± 0	61.80 ± 0.45	2.06 ± 0.11	21.40 ± 0.40

The humidity of the mixed flour was much higher than that of the simple flour respectively 12.47% and 9.33% which corresponds to the solids content of 87.53% and 90.67%. The raw materials can then be stored for long if they are stored away from moisture because the moisture levels are all below 14%, which are the limits of discretion dry drugs [Pavly, A 1980]. Mineral materials conventionally called ash the sample the calcination products. The found contents (bean flour: 2%; mixed flour: 2.13%), the variation in these rates indicated that the mixed flour has slightly higher mineral content than the single bean flour which is due to the introduction of the Egg yolks that has a slightly higher ash content (2.47%) than the simple meal of beans (2%). The ash content of bean flour is higher than 0.93% for fresh bean mentioned by [Clément, J.M.,

1978]. This increase is due to the drying process which led to obtaining flour. The value of carbohydrates obtained from simple flour 61.80 ± 0.45% is higher than that of the mixed flour 51.12 ± 0.72%, which is due to the low amount of carbohydrates contained in the egg yolk and which involves a reduction in the carbohydrate content of 61.80% for single flour and 51.12% for the mixed flour. The carbohydrate content is less than 72.20% by mentioned [Clement, J.M., 1978] but it is in the 60-65% range found by [Pakrovsky, A 1978]. Theegg yolk contains a lot of fat than that of the flour mixed with content found 7.86 ± 0.11%; this is the second component after the proteins. Its introduction into the flour has however led to any significant increase in the lipid content of the mixed flour. The flour of the simple lipid content is higher than 4.30% of values and 1 to 2% found respectively by Keita, F. 1985 and Fats occupy the bulk of the dry matter of the egg yellow because for a dry matter content of between 52.3% and 53.5%; lipids represent 31.8 to 35.5%. [Belitz and Grosch, 1985]. The egg yolk is very rich in protein is a protein food; the found content is 18.70 ± 0.13%. Its introduction into the flour of beans has led to a slight increase in protein content in the mixed flour. The values found are respectively equal to 21.40 ± 0.40% and 23.02 ± 0.30%.

Quantitatively bean flour is higher in protein than the 21.40% 18.70% yolk. The protein content in the yolk is slightly higher than the range of 15.7 to 16.6% which could also depend on the supply and race (table 2).

Table 2 Results of the determination of the energy value of flour and egg yolk

Samples	Carbohydrate%	Lipid%	Protein%	Energy value Kcal	Standard flour Kcal
Bean flour	61.80	2.06	21.40	351.34	400
Egg yolks	-	25.06	18,70	300.34	400
flour mixed	51.12	7.86	23,02	367.30	400

The mixed flour is energy; it could be due to the contribution of bean flour and egg yolk then bean flour as vegetable products are characterized by high wealth carbohydrate and lipids that provide the bulk of energy in the body,finally the yolk through his poverty carbohydrate.

Monitoring and evaluation of children who took the porridge based bean flour enriched with egg yolk in login at the table 3.

Table 3 Monitoring of child weight

Ages	Weight in September	Weight after 2 weeks	Weight difference
11 months	8.560g	8.610g	+ 50g
8 months	6.160g	6.250g	+ 90g
10 months	10.15g	10.75g	+ 60g
9 months	6.930g	6.925g	-0,005g
7 months	8.200g	8.930g	+ 730g
11 months	7.340g	7.338g	- 0.002 g
10 months	7.750g	8.810g	+ 85g
9 months	7.910g	7.910g	0

A staff of five children of 8 or 62.5% gained weight for two weeks; Weight gain which varied 50 to 90 g;a child has stagnated while two children were slightly lost weight. We have not seen any allergy (vomiting, diarrhea, itching etc. in children).

We found a value of 25.06% of lipid that is less than the mentioned range. This difference could be due to food and breed of the hen. Thus the introduction of the Egg yolkss resulted in an increase of the fat content of 2.06% bean flour in the single meal to 7.62% in the mixed flour.

The yolk of the egg is rich in phospholipids, including phosphatidylcholine (70%), phosphatidylethanolamine (14%) and, in lesser proportion, lysophosphatidylcholine and sphingomyelin (2%). The phospholipids of the egg are therefore three times as rich as phosphatidylcholine soybean lecithin and are 90% of choline derivatives. Man being directly dependent on the dietary intake of this nutrient, essential for the development of the brain, liver function and prevention of cancers [Zeisel,S.H.,1992], can be found in the bud a contribution to cover this need specific [Zeisel, S.H. *et al*., 2003]. Its composition is remarkably stable and independent of breeding and feeding conditions for its major components can be enriched in nutrients,

Note, however, that our markets are flooded with industrial weaning flours; Yet the alternative foods are many and varied in our country; it is to select to compose balanced rations and promote sound and rapid growth of children as young as 6 months. Local thanks to their nutritional value, availability and favorable cost can serve as good products for the preparation of weaning foods. Just know how to combine them.

This study was conducted to contribute to improving the nutritional quality of complementary foods, to compose balanced rations and promote sound and rapid growth of children as young as 6 months. It is therefore proposing to households generally low monthly income, infant foods of good quality available and accessible from local products. For the preparation of weaning foods. Just know how to combine them. The advantage of the incorporation of the bean and egg yolk in weaning porridge is also justified by the fact that the bean contains in balanced proportions of good biological value protein containing all the essential amino acids as well as vitamins and minerals. Its high content of fat gives it a significant calorific value. Because animal protein is often scarce and expensive enough in poor countries, the incorporation of vegetable protein, especially soy proteins is encouraged because they are inexpensive and available in relation to other animal protein [Agbo, N.G., 2000; Zannou Tchoko, V.J., 2005].Comparing the nutritional value of bean flour, egg yolk and mixed with the flour reported standard flour Sanogo and Mr.*al*. In 1994 in Table II shows that the chemical components and the energy value of mixed flour and beans have energy values and nutrient levels broadly similar to those of standard flour (51.12% Carbohydrates, 23,02% Protein and 7.86% Fat and energy values of 367, 30 Kcal.).

CONCLUSION

The work done in order to make our contribution to the improvement of the food supplement of young children during weaning helped to develop a mixed infant flour (bean and egg yolk) children age withdrawal in developing countries. These jobs have enriched bean flour in the egg yolk. Such an approach if sustained and amplified will reduce imports of infant foods. The results obtained allowed to infer that there is no objection to the use of egg yolk in bean flour. The analysis of the enriched flour gave a high dry matter and a significant energy value. The resulting mixed flour is higher in protein, fat and ash than the original bean flour. The mixed flour has a higher energy value than the simple bean flour despite the decrease in total carbohydrate content in the mixed flour.This work will

allow the use of egg yolk meal mixes in a rational way. It will contribute to the improvement of the food supplement intended for children at the age of weaning.

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