Evaluation of the Protein Quality of Composite Meals produced from Selected Cereals and Legumes for infants

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Weaning foods were formulated using a cereal-legume combination for feeding infants at weaning age. The pearl millet was fermented to produce “Akamu”, the wheat was germinated while the cowpea and groundnut were roasted separately. The weaning foods were formulated as follows: Pearl millet (60%)-cowpea (30%)-wheat (10%) (PCWG); Pearl millet (60%)-cowpea (30%)-wheat (10%) (PCW); Pearl millet (60%)-groundnut (30%)-wheat (10%) (PGW). Protein quality was evaluated by animal feeding experiment using 24 weanling male albino rats of 21-24 days weighing 48 \pm 5g. Commercial weaning food Cerelac\textregistered was used as control. The lysine content of PCWG (5.46 g/100g), PCW (4.96 g/100g) and PGW (5.20 g/100g) met the RDA also; the methionine content of PCWG (2.01 g/100g), PCW (2.01 g/100g) and PGW (2.01 g/100g) met the RDA. The weaning food formulations were found to be limiting in the amino acids Histidine, Arginine and Tyrosine. A steady increase in weight gain and feed intake was observed in the all the group of rats. The Protein Efficiency Ratio (PER) of PCWG (2.39\pm0.01), PCW (1.93\pm0.03) and PGW (2.04\pm0.01) were comparable to Cerelac\textregistered (2.55\pm0.01) also the Food Efficiency Ratio (FER) of PCWG (0.37\pm0.03), PCW (0.26\pm0.01) and PGW (0.29\pm0.01) were comparable to that of Cerelac\textregistered (0.38\pm0.03). The Biological Value (BV) of PCWG (80.83\pm0.03\%), PCW (77.82\pm0.02\%) and PGW (79.29\pm0.04\%) were comparable to that of Cerelac\textregistered (82.81\pm0.01\%). The Net Protein Utilization (NPU) of PCWG (75.10\pm0.01\%) and PGW (70.01\pm0.03\%) were comparable to that of cereals\textregistered (80.69\pm0.05\%) while the NPU of PCW(66.78\pm0.01\%) was lower than PCWG, PGW and cereals\textregistered. The weaning food blend PCWG was found to be superior to PCW and PGW while the groundnut based weaning food blend (PGW) was found to be nutritionally better as compared to the cowpea based weaning food blend (PCW).

Key words: Complementary weaning food, Protein quality, Commercial weaning food.

INTRODUCTION

Scientific study has proved that breast milk is the perfect food for the infant during the first six months of life. It contains all the nutrients and immunological factors an infant requires to maintain optimal health and growth (UNICEF, 1999). WHO (1998) reported in a special review the importance of the breast feeding for the infants for the two years with additional complementary foods at the same time when the infant reach 6 months of age.

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2012). Thus, protein energy malnutrition can be said to be a major problem that frequently occurs during the important transitional phase of weaning in infants, thereby affecting the physical and mental growth of many infants in developing countries. WHO, (2002) estimates that about 150 million children less than five years of age in developing countries are malnourished and additional 200 million have stunted growth. The problem of protein energy malnutrition can be prevented by introducing weaning foods of the correct protein quality and quantity at the right stage of the weaning period (FAO/WHO, 1985).

Pearl millet and wheat are staple foods in many developing countries. They are rich in carbohydrate but deficient in essential amino acids such as lysine thus making their protein quality poorer than that of animals. Legumes such as cowpea and groundnut represent a major source of valuable but incompletely balance protein (Akande and Fabiyi, 2010) because of the deficient sulphur containing amino acids methionine and cysteine. The objective of this paper is to prepare complementary weaning foods from locally available materials such as pearl millet, wheat, cowpea and groundnut that will meet the nutritional requirement of infants of weaning age and evaluate the protein quality of the weaning foods.

MATERIALS AND METHODS

Sources of raw materials

Improved varieties of pearl millet SOSAT C-88 and wheat Atilla Gan Atilla were obtained from Lake Chad research institute (LCRI) while the cowpea seeds (Borno red) and groundnut (Dakar) were obtained through a seed breeder at LCRI. The grains and legumes were authenticated by a seed breeder at LCRI.

Commercial weaning food

The commercial weaning food (maize based Cerelac®) was selected on the basis of popularity. This weaning food was purchased from a supermarket in Maiduguri. It is recommended for infants of 6 months and above and it is a product of Nestle Nigeria Plc.

METHODS

Sample preparation:

Preparation of “Akamu”

The “Akamu” was prepared by method described by Akingbala et al., (1981(fig. 3.1)). One hundred grams (100g) of the cleaned pearl millet was steeped in 200mls of distilled water (1:2w/v ratio) for 72 hours. At the end of the 72 hours, the top water was decanted and 200mls of distilled water was added, milled with a warring blender for 4mins at rheostat setting of 120. The slurry obtained was sieved through a nylon cloth to separate the bran, leaving behind the “Akamu” slurry. The volume was gradually increased to a final volume of 600mls with distilled water. The “Akamu” was allowed to stand for 24 hours for the starchy part to settle, after which the water was decanted and the “Akamu” was sun dried to a constant weight. The dried “Akamu” was ground into a fine powder and sieved using a 1mm pore sieve.

Preparation of wheat

One hundred grams (100g) of wheat grains were cleaned to remove dirt. The grains were washed three times with water and then soaked (1:3 w/v) for 2 hours at room temperature after soaking the grains were drained and wrapped in the damped cotton cloth. Germination was carried out at room temperature for 48 hours. The mouldy seeds were removed by hand and sprouted grains were washed before sun drying to a constant weight. The dried grains were ground into a fine powder and sieved using a 1mm pore sieve to obtain a fine powder. (Chaturvedi and Sarojini, 1996).

Preparation of cowpea

Cowpea seeds were cleaned of dirt and soaked in water for 20 minutes. The cowpea seeds were dehulled using a mortar and a pestle. The seeds were washed to separate the coat and dried to a constant weight. The dried seeds were roasted at temperature of 120°C for 30 minutes. The seeds were continually stirred until a characteristic slightly brown colour was obtained. The seeds were allowed to cool and then ground into a fine powder. The ground seeds were sieved using a 1mm pore sieve (Udensi et al., 2007)

Preparation of groundnut

The groundnut was cleaned of dirt, washed, soaked, dried, roasted at low temperature, dehulled to remove the testa and milled. (Nkama et al., 2001).

Preparation of the weaning food blends

The formulation of the weaning foods was done in the following ratios: (flow diagram for the preparation of the weaning foods is presented in figure 1):

1. 60 parts of pearl millet, 20 parts of roasted cowpea, 10 parts of germinated wheat and 10 parts of roasted groundnut i.e. 60:20:10:10 – PCWG
2. 60 parts of pearl millet, 30 parts of roasted cowpea and 10 parts of germinated wheat i.e. 60:30:10 –PCW.
3. 60 parts of pearl millet, 30 parts of roasted groundnuts
and 10 parts of germinated wheat i.e. 60:30:10 - PGW.

**Amino acid composition**

The amino acid profile in the sample was determined using methods as described by Sparkman *et al.*, (1958). The sample was defatted, hydrolysed, evaporated in a rotary evaporator and then loaded into the Technicon Sequential Multi Amino Acid Analyzer (TSM).

**ANIMAL FEEDING EXPERIMENT**

**Experimental Design**

Twenty four weanling albino rats of 21-25 days of age weighing 30 ± 5g (supplied by the animal house of the department of biochemistry, University of Maiduguri) were used. The rats were divided into four groups consisting of six rats. Each group of rats were fed on the
complementary weaning food.

1). Group one was fed the weaning food PCWG.
2). Group two was fed the weaning food PCW.
3). Group three was fed the weaning food PGW.
4). Group four was fed commercial weaning food Cerelac®.

**Growth experiment**

Protein Efficiency Ratio (PER) and Food Efficiency Ratio (FER) were determined using the method of Chapman, (1959). The period of the study for PER and FER was 28 days. The weanling rats were weighed weekly. A weighed diet was given daily and unconsumed food was collected, dried and weighed. Body weight gain was calculated and recorded. Food and protein intake were also calculated. PER and FER were calculated using the following formulas:

\[
\text{PER} = \frac{\text{Change in body weigh}}{\text{Protein intake}} \times 100
\]

\[
\text{FER} = \frac{\text{Change in body weigh}}{\text{Total food consumed}} \times 100
\]

**Nitrogen balance studies**

After the 28 days growth study, the nitrogen balance study was conducted. The experiment was conducted for 7 days. Another group of rats of the same weight and age were fed on a nitrogen free diet to calculate the endogenous urinary nitrogen (EUN) and metabolic faecal nitrogen (MFN) losses. At the end of the 7 days, urine and faeces were collected. The urine was collected into a container containing 0.1NHcl. The faeces collected was dried, weighed and ground into a fine powder for determination of nitrogen. Daily food consumption was recorded for the 7 days period. Unconsumed and spilled foods were collected, dried and weighed, then deducted from the food offered. The nitrogen content in the urine and faeces were estimated by the micro kjedahl method. The data from this experiment was used to calculate Biological value (BV), True protein digestibility (TPD) and Net protein utilization (NPU). (Chick and Roscoe, 1930):

\[
\text{TFD} = \frac{N \text{ intake} - (\text{FN} - \text{MFN})}{N \text{ intake}} \times 100
\]

\[
\text{BV} = \frac{N \text{ intake} - (\text{FN} - \text{MFN}) - (\text{UN} - \text{EUN})}{N \text{ intake} - (\text{FN} - \text{MFN})} \times 100
\]

\[
\text{NPU} = \frac{\text{BV} \times \text{TPD}}{100}
\]

Where

FN = Faecal Nitrogen.
UN = Urinary Nitrogen.
MFN = Metabolic Faecal Nitrogen.
EUN = Endogenous Urinary Nitrogen.

**STATISTICAL ANALYSIS**

Data obtained from the research were analysed using Analysis Of Variance (ANOVA). Duncan multiple range test was used to compare the differences between the means. Significance was accepted at \( p \leq 0.05 \).

**RESULTS AND DISCUSSION**

**Amino acid Composition**

The amino acid profile of the three weaning food blends is presented in table 1. The levels of the essential amino acids lysine and methionine in the weaning food blends PCWG, PCW and PGW met the RDA of infants 0-1year. The level of the essential amino acid histidine in the three weaning food blends was below the RDA also the level argenine and tyrosine in the three weaning food blends were below the RDA. The limiting essential amino acid in cereals (lysine) and the limiting essential amino acid in legumes (methionine) met the RDA of infants 0-1 year this indicates that the multiple protein sources (co-supplementation) provided complementary supplies of essential amino acids in the three weaning food blends in adequate quantities required for growth and development of infants 0-1year.

**Feed intake and weight gain of experimental rats**

Table 2 shows the average weekly feed intake of the rats fed the complementary weaning foods (PCWG, PCW and PGW) and the rats fed the commercial weaning food cerelac®. Marked increases in feed intake were recorded for the three weaning food blends and cerelac® from week 1 through to week 4. Cerelac® had the highest mean feed intake (65.50g) which was closely followed by the complementary weaning food PCWG (63.21g) which was followed by PGW (53.92g) while PCW had the lowest feed intake (50.32g). Significant differences (\( P \leq 0.05 \)) were observed in the weekly feed intake of the three weaning food blends and cerelac®.

The average weekly weight gain of the rats fed the complementary weaning foods and the rats fed the commercial weaning food is presented in table 3. Increases in weight were observed from week 1 through week 4 in the rats fed the complementary weaning foods (PCWG, PCW and PGW) and the commercial weaning food cerelac®. The highest mean weight gain (25.10g) was recorded in the rats fed cerelac®, which was closely followed by
Table 1: Shows the Amino acid composition of weaning food blends and the RDA values

<table>
<thead>
<tr>
<th></th>
<th>PCWG</th>
<th>PCW</th>
<th>PGW</th>
<th>RDA'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine</td>
<td>5.92</td>
<td>4.20</td>
<td>4.75</td>
<td>5.8</td>
</tr>
<tr>
<td>Threonine</td>
<td>2.42</td>
<td>2.37</td>
<td>2.38</td>
<td>3.40</td>
</tr>
<tr>
<td>Valine</td>
<td>2.80</td>
<td>2.76</td>
<td>2.71</td>
<td>3.50</td>
</tr>
<tr>
<td>Methionine</td>
<td>2.17</td>
<td>1.48</td>
<td>1.95</td>
<td>2.20</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>1.41</td>
<td>1.40</td>
<td>1.38</td>
<td>2.80</td>
</tr>
<tr>
<td>Leucine</td>
<td>4.51</td>
<td>3.47</td>
<td>3.45</td>
<td>6.60</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>4.80</td>
<td>4.70</td>
<td>4.71</td>
<td>6.30</td>
</tr>
<tr>
<td>Histidine</td>
<td>0.45</td>
<td>0.33</td>
<td>0.40</td>
<td>1.90</td>
</tr>
<tr>
<td>Aspartic acid</td>
<td>1.32</td>
<td>1.31</td>
<td>1.30</td>
<td>-</td>
</tr>
<tr>
<td>Serine</td>
<td>0.75</td>
<td>0.91</td>
<td>0.77</td>
<td>-</td>
</tr>
<tr>
<td>Glutamic acid</td>
<td>2.47</td>
<td>2.28</td>
<td>2.47</td>
<td>-</td>
</tr>
<tr>
<td>Alanine</td>
<td>0.90</td>
<td>0.88</td>
<td>0.87</td>
<td>-</td>
</tr>
<tr>
<td>Glycine</td>
<td>0.60</td>
<td>0.91</td>
<td>0.46</td>
<td>-</td>
</tr>
<tr>
<td>Cysteine</td>
<td>2.36</td>
<td>2.10</td>
<td>2.10</td>
<td>2.50</td>
</tr>
<tr>
<td>Arginine</td>
<td>0.87</td>
<td>1.15</td>
<td>0.78</td>
<td>2.00</td>
</tr>
<tr>
<td>Proline</td>
<td>0.39</td>
<td>0.43</td>
<td>0.39</td>
<td>-</td>
</tr>
<tr>
<td>Tyrosine</td>
<td>0.41</td>
<td>0.19</td>
<td>0.32</td>
<td>6.30</td>
</tr>
</tbody>
</table>

Table 2: Average weekly food intake (g) of rats

<table>
<thead>
<tr>
<th></th>
<th>PCWG</th>
<th>PCW</th>
<th>PGW</th>
<th>Cerelac® (Maize)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>20.37±0.45a</td>
<td>15.76±0.52b</td>
<td>16.24±0.74b</td>
<td>30.19±0.45c</td>
</tr>
<tr>
<td>Week 2</td>
<td>33.82±0.66a</td>
<td>24.35±0.73b</td>
<td>25.28±0.91b</td>
<td>40.70±0.87c</td>
</tr>
<tr>
<td>Week 3</td>
<td>70.21±0.83a</td>
<td>53.87±0.85b</td>
<td>57.64±0.74b</td>
<td>67.58±0.91d</td>
</tr>
<tr>
<td>Week 4</td>
<td>128.45±1.05a</td>
<td>107.30±0.94b</td>
<td>116.52±0.93b</td>
<td>123.53±0.97a</td>
</tr>
<tr>
<td>Grand mean*</td>
<td>63.21±48.31a</td>
<td>50.32±41.34b</td>
<td>53.92±45.36b</td>
<td>65.50±41.765</td>
</tr>
</tbody>
</table>

Values are recorded as mean± SD of seven days feed intake. Values in the same row with different superscript are significantly different (P≤0.05). * Values are mean±SD of four weeks feed intake.

PCWG - 60 parts of Pearl millet, 20 Parts of Cowpea, 10 parts of wheat and 10 parts of groundnuts.
PCW - 60 parts of Pearl millet 30 parts of cowpea, 10 parts of wheat.
PGW- 60 parts of Pearl millet, 30 parts of groundnut, 10 parts of wheat.

Table 3: Average weekly weight gain (g) of rats

<table>
<thead>
<tr>
<th></th>
<th>PCWG</th>
<th>PCW</th>
<th>PGW</th>
<th>Cerelac® (Maize)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>8.17±0.96a</td>
<td>5.92±0.89a</td>
<td>6.85±1.65a</td>
<td>10.23±0.87a</td>
</tr>
<tr>
<td>Week 2</td>
<td>12.68±0.98a</td>
<td>7.81±0.85a</td>
<td>13.26±0.96a</td>
<td>13.92±0.97a</td>
</tr>
<tr>
<td>Week 3</td>
<td>26.24±0.87a</td>
<td>18.20±0.71b</td>
<td>12.51±0.82c</td>
<td>25.68±0.79a</td>
</tr>
<tr>
<td>Week 4</td>
<td>47.15±0.95a</td>
<td>20.67±0.87b</td>
<td>30.54±0.75a</td>
<td>50.67±0.91a</td>
</tr>
<tr>
<td>Grand Mean*</td>
<td>23.56±17.50a</td>
<td>13.15±7.36b</td>
<td>15.79±10.24c</td>
<td>25.10±18.20e</td>
</tr>
</tbody>
</table>

Values are recorded as mean± SD of six rats. Values in the same row with different superscript are significantly different (P≤0.05). * Values are mean SD of four weeks weight gain, weight gain of rats fed

PCWG - 60 parts of Pearl millet, 20 Parts of Cowpea, 10 parts of wheat and 10 parts of groundnuts.
PCW - 60 parts of Pearl millet 30 parts of cowpea, 10 parts of wheat.
PGW- 60 parts of Pearl millet, 30 parts of groundnut, 10 parts of wheat.

the rats fed the complementary weaning food PCWG (23.56g) then PGW (15.79g). The lowest weight gain was recorded in the rats fed the complementary weaning food PCW (13.15g). Significant difference (P≤0.05) was observed in the weight gain of rats fed the weaning food PCWG and cerelac® in weeks 1, 2 and week 4 while no significant difference (p>0.05) was recorded in week 3. While Significant difference (P≤0.05) was observed in the weight gain of rats fed the weaning foods PCW and PGW in weeks 3 and 4, while no significant difference (p>0.05) was recorded in weeks1 and 2. Both the groups of rats fed the complementary and commercial weaning foods (PCWG, PCW and PGW) and cerelac® had steady increases in their weight gains. This is in agreement with
Table 4: Food intake, weight gain, Protein Efficiency Ratio (PER) and Food Efficiency Ratio (FER) of rats fed complementary weaning foods.

<table>
<thead>
<tr>
<th></th>
<th>PCWG</th>
<th>PCW</th>
<th>PGW</th>
<th>Cerelac®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food intake (g)</td>
<td>63.21±48.31a</td>
<td>50.32±41.34a</td>
<td>53.92±45.36a</td>
<td>65.50±41.76a</td>
</tr>
<tr>
<td>Protein intake(g)</td>
<td>9.87±0.17a</td>
<td>6.80±0.01b</td>
<td>7.73±0.28c</td>
<td>9.83±0.01a</td>
</tr>
<tr>
<td>Weight gain (g)</td>
<td>23.56±17.50a</td>
<td>13.15±7.36b</td>
<td>15.79±10.24c</td>
<td>25.10±18.20d</td>
</tr>
<tr>
<td>PER</td>
<td>2.39±0.01a</td>
<td>1.93±0.03c</td>
<td>2.04±0.01a</td>
<td>2.55±0.02a</td>
</tr>
<tr>
<td>FER</td>
<td>0.37±0.03a</td>
<td>0.26±0.01a</td>
<td>0.29±0.01c</td>
<td>0.38±0.03a</td>
</tr>
</tbody>
</table>

Values are recorded as mean± SD. Values in the same row with different superscript are significantly different (P≤0.05).

PCWG - 60 parts of Pearl millet, 20 Parts of Cowpea, 10 parts of wheat and 10 parts of groundnuts.
PCW - 60 parts of Pearl millet 30 parts of cowpea, 10 parts of wheat.
PGW- 60 parts of Pearl millet, 30 parts of groundnut, 10 parts of wheat.

Table 5: Nitrogen Balance study of the weaning food blends

<table>
<thead>
<tr>
<th></th>
<th>PCWG</th>
<th>PCW</th>
<th>PGW</th>
<th>Cerelac®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Intake (g)</td>
<td>0.41±0.17a</td>
<td>0.31±0.01a</td>
<td>0.35±0.28c</td>
<td>0.43±0.01a</td>
</tr>
<tr>
<td>Faecal Nitrogen (g)</td>
<td>0.019±0.03a</td>
<td>0.045±0.01b</td>
<td>0.042±0.01c</td>
<td>0.011±0.01d</td>
</tr>
<tr>
<td>Urinary Nitrogen (g)</td>
<td>0.043±0.05a</td>
<td>0.058±0.05b</td>
<td>0.063±0.03c</td>
<td>0.032±0.01b</td>
</tr>
<tr>
<td>Retained Nitrogen (g)</td>
<td>0.308±0.01a</td>
<td>0.207±0.01b</td>
<td>0.245±0.02c</td>
<td>0.347±0.03c</td>
</tr>
<tr>
<td>Absorbed Nitrogen (g)</td>
<td>0.381±0.05a</td>
<td>0.266±0.03b</td>
<td>0.309±0.05c</td>
<td>0.419±0.01c</td>
</tr>
<tr>
<td>TPD (%)</td>
<td>92.92±0.01a</td>
<td>86.81±0.03c</td>
<td>88.29±0.01c</td>
<td>97.44±0.06c</td>
</tr>
<tr>
<td>BV (%)</td>
<td>80.83±0.03a</td>
<td>77.82±0.02c</td>
<td>79.29±0.04c</td>
<td>82.81±0.01d</td>
</tr>
<tr>
<td>NPU (%)</td>
<td>75.10±0.01a</td>
<td>66.78±0.01b</td>
<td>70.01±0.03c</td>
<td>80.69±0.05c</td>
</tr>
</tbody>
</table>

Values are recorded as mean± SD of three determinations.
PCWG - 60 parts of Pearl millet, 20 Parts of Cowpea, 10 parts of wheat and 10 parts of groundnuts.
PCW - 60 parts of Pearl millet 30 parts of cowpea, 10 parts of wheat.
PGW- 60 parts of Pearl millet, 30 parts of groundnut, 10 parts of wheat.

The formulated weaning food blends PCWG, PCW and PGW had high PER and FER comparable to that of cerelac®. The high PER and FER exhibited by the weaning food blends indicates that the improved pattern of amino acid was utilized by the rats for the synthesis of tissue protein.

The group of rats that were fed Cerelac® and the group of rats that were fed the weaning food PCWG had lower faecal and urinary nitrogen loss, higher retained nitrogen, BV and NPU. This could be as a result of higher protein content of PCWG and cerelac®. On the other hand, the group of rats that were fed the weaning foods PCW and PGW had higher faecal and urinary nitrogen loss, lower retained nitrogen, BV and NPU. More nitrogen is retained when a foods amino acid pattern closely matches the body’s demand for various amino acids (Bryrd-Brdbenner et al., 2009). Faecal nitrogen affects digestibility. High faecal nitrogen losses indicate low nitrogen digestibility and utilization (Onweluzo and Nwabugwu, 2009).

**Protein Efficiency Ratio (PER) and Food Efficiency Ratio (FER)**

Table 4 presents the food intake, weight gain, Protein Efficiency Ratio (PER) and Food Efficiency Ratio (FER) of the weaning food blends. Rats fed with commercial weaning food Cerelac® had the highest food intake and weight gain which was closely followed by the rats fed PCWG and then the rats fed PGW. The lowest food intake and weight gain are the rats fed PCW. The PER of the three weaning food blends and cerelac® did not show any significant difference (P>0.05) while the FER of the three weaning foods and cerelac® showed significant differences (P≤0.05).

The PER of a food reflects its biological value because the weight gain measured in PER are dependent on the incorporation of food protein into body tissue. FER is measured as a function of gain in body weight and food consumed. Foods with high FER tend to add to weight gain while low FER are prone to be used as energy rather than stored as body weight (Bryrd-Brdbenner et al., 2009).

**Biological Utilization**

The nitrogen balance study of the weaning food blends is presented in table 5. The group of rats that were fed Cerelac® had the highest retained nitrogen, absorbed nitrogen, Biological value (BV) and Net protein utilization.
(NPU) which was closely followed by the weaning food blend PCWG, then PGW and then PCW which had the lowest value.

The group of rats that were fed PCW had higher faecal nitrogen and urinary nitrogen than the other groups that were fed Cerelac®, PCWG, and PGW. The group of rats that were fed Cerelac® had the lowest faecal nitrogen and urinary nitrogen than the other groups.

The group of rats that were fed Cerelac® had the highest BV and NPU which was closely followed by the weaning food PCWG, PGW and then PCW.

CONCLUSION

The results showed that the co-supplementation of pearl millet and wheat with cowpea and groundnut had improved the limiting essential amino acid (lysine and methionine) content of the three weaning food blends and this was found to be nutritionally desirable. The lysine content of PCWG (5.46 g/100g), PCW (4.96 g/100g), and PGW (5.20 g/100g) met the RDA for infants 0-1year. The high values for PER, FER, BV and NPU of the complementary weaning food blends which were comparable to that of Cerelac® indicate that they can promote growth and can be recommended for infants at weaning age.

REFERENCES


