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EVALUATION OF PROXIMATE, MINERAL AND VITAMIN COMPOSITION OF SELECTED FOOD SAMPLES AND FORMULATED DIETS USED AS LOCAL WEANING FOOD IN NIGERIA

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Abstract

The rising cost of commercially prepared weaning formula, in addition to its accessibility and acceptability issues has necessitated the use of locally formulated weaning diets as alternatives. Such diet was prepared from maize (*Zea mays*), guinea corn (*Sorghum bicolor*), soybean *(Glycine max)*, groundnut (*Arachis hypogea*) and crayfish (*Procambarus clarkii*), singly and in combinations. Staples were processed by traditional methods and used in preparing maize-guinea corn based diet at 16% protein level. Proximate, mineral and vitamin analyses were carried out on both the food staples and the formulated weaning diets. The results showed highest compositions of moisture, protein, ash, calcium, zinc, iron, copper, vitamin A in crayfish; highest crude fibre in soybean and highest carbohydrate content in maize and guinea corn. Low carbohydrate, lipid, fiber and vitamin C contents were observed for crayfish and groundnut was also low in carbohydrate. For the formulated diets at 16% protein level, separate inclusions of soybean and groundnut caused significant reduction in moisture content and increase in the protein, lipid and ash contents compared to the base staples, maize and guinea corn. Also soybean and crayfish inclusions increased significantly the levels of calcium, iron, and Vitamin A, but not vitamin C. Crayfish also increased zinc and copper content of diet. Combined inclusion of soybean and groundnut reduced the level of the minerals and vitamins earlier increased by separate inclusions of soybean and crayfish.In conclusion, diet containing both soybean and groundnut did not significantly differ, in most parameters, from their separate inclusions. However, introduction of crayfish enhanced the mineral and vitamin A content of the diet, as well as its moisture content. Therefore, the use of soybean, groundnut and crayfish in the formulation of weaning diet at 16% protein level may provide the necessary nutrients required for the growth and health maintenance of the newborn.

Keywords

Proximate, Mineral, Vitamin, Formula, Weaning Diet.

1. Introduction

Breast feeding of infants has been a natural and age long process of infant nutrition. Human lives at early stage have been sustained by human breast milk, causing growth and development up to the weaning age and beyond. The duration of infant breast feeding in Nigeria, like in other countries has contracted over the years due to changes in social status, inconvenience, diseases or maternal mortality (Ella *et al*., 2016; Maharlouei *et al*., 2018; Aghaee *et al*., 2019). There has been recent emphasis on exclusive breast feeding of infants for at least six months and subsequent inclusion of complementary diets with continuous breast feeding for the next 18 months or more (WHO, 2021). Infant’s need for micronutrients such as iron and zinc increases rapidly form 6 months (WHO, 2021). While exclusive breast feeding provides immunity from diseases and adequate nutritional needs of the infant, complementary diets in addition, bridges the gap in mineral needs of the infant and assists in management and nutrition of infants that are very ill or under stress (Abeshu *et al*., 2016; Paintal & Aguayo, 2016; WHO, 2001; USDA & USDH&HS, 2020; Savarino *et al*., 2021). There is preponderance of commercial weaning foods: products of years of research and development and mostly of foreign origin; but use of such foods locally are limited by problems of availability, acceptability and affordability. Some infants don’t find such foods palatable and may also exhibit allergic responses to them. Also the high cost of the commercial weaning foods put them out of reach of average families. This has led to reliance on locally and poorly formulated weaning diets devoid of adequate nutrients. The attendant infant malnutrition has led to emergence of rapid weight loss and retarded physical and mental growth within the weaning period (Udoh & Amodu, 2016; Jahan *et al*., 2021). In Nigeria, weaning foods are usually formulated from cereal bases of maize, millet and/ or guinea corn. The gruels obtained from these fermented cereals are given various names such as akamu (Igbo) and ogi (Yoruba) in different parts and languages of the country. For economic reasons, most families feed gruels to their neonates without adequate supplementation (Abeshu *et al*., 2016). Such diets are nutritionally poor leading to cases of severe nutritional disorders (Abeshu *et al*., 2016). Soybean, groundnut or crayfish, either singly or in combination, are usually included for nutrient supplementation (Egbujie & Okoye, 2019). Cereals, legumes, vegetable and fruits have been reported to form good diet (Ibironke *et al*., 2014; Kumari & Sangeetha, 2017; Iwanegbe, 2021) and have been recommended for inclusion in weaning foods (UNICEF, 2020). Thus for a locally formulated weaning food to achieve its intended purpose, it must contain the right blend of food stuff capable of providing adequate nutritional benefit to the infant. While having the right compositions of carbohydrate, lipids and proteins, the mineral and vitamin content should be enough to forestall deficiency diseases and stunted growth and development. In addition, such formulated weaning food should be able to achieve acceptability and affordability by including the right proportion and avoiding foodstuff whose inclusion may not enhance the overall nutritional quality of the food. To achieve these, understanding of the proximate, mineral and vitamin composition of both the food samples and the formulated diets is very essential and this is the aim of this study.

2. Materials and Methods

2.1. Materials

The moisture analyzer, Sartorius MA 150 (Germany) was used for moisture content determination, while the Atomic Absorption Spectrophotometer (AA-6800, Shimadzu) was used for the analysis of the mineral content of the food staples. All the chemicals used were of analytical grade and product of BDH Ltd. Poole, England. Maize (*Zea mays*) and Guinea Corn (*Sorghum bicolor*) grains, Soybean *(Glycine max)*, Groundnut (*Arachis hypogea*) and Crayfish (*Procambarus clarkii*) were purchased from markets in Aba, Abia State; South East Nigeria. Cerelac® was also purchased from a Pharmacy shop in the same town. All samples were kept in the Department of Biochemistry, University of Port Harcourt prior to preparation and analysis.

2.2. Preparation of Food Staples

The maize and guinea corn were processed using the traditional method of ogi preparation by Akingbala *et al*. (1981). Separate measures (1.5 kg) of grains of maize and guinea corn were carefully selected, washed and soaked in 5 litres of water for 72 hours. They were then milled in a hammer mill and the slurry sieved through 100mm mesh cloth (muslin cloth). The suspension was allowed to stand for 1 hour and the supernatant decanted to collect the sediment gruel. The collected gruel was drained and dried in an oven at 50^0C for 3days. The dried gruel was preserved in an airtight container until used for analysis and formulation. The soybean was properly cleaned, soaked at 25^0C-30^0C for 12 hours, washed and drained. It was later boiled for 2 hours at 100^0C and the husks separated. Dehusked grain was washed, drained and oven dried at 36^0C. Dried grain was ground into flour in a hammer mill and the flour stored in an air tight container for further use. The method described by Nkama *et al*. (2001) was adopted in the preparation of groundnut. The groundnut was properly cleaned, oven dried for 72 hours to dehusk and ground into paste. Fresh crayfish was oven dried at75^0C, ground into powder and stored in an air tight container.

2.3. Diet Formulation at 16% Protein Level (Pearson Square Method)

The maize-guinea corn based diets were thoroughly mixed with the individual components using an electronic mixer until a uniform mixture was obtained. The composition of the formulated diet is shown in Table 1.

2.4. Proximate, Mineral and Vitamin Analyses

These were carried out on both the food samples and the formulated weaning diets. Moisture content was determined using moisture analyzer, Sartorius MA 150 (Germany). Protein content was analyzed by the method of Kjedahl (1983). The fat content determination was carried out by Roese-Gottlieb method as reported by Manirakiza *et al*. (2001).

Table 1: Diet Formulation at 16% Protein Level Per 100 grams (Pearson Square Method)

Diets	Maize-Guinea corn (MG)	Soybean(S)	Groundnut (GR)	Crayfish (CR)	Sum
1	100.00g	-	-	-	100.00g
2	78.40g	21.60g	-	-	100.00g
3	62.80	-	37.20g	-	100.00g
4	82.60g	-	-	17.40g	100.00g
5	70.60g	10.80g	18.60g	-	100.00g
6	71.65g	5.4g	18.60g	4.35g	100.00g

Analysis of carbohydrate content was by AOAC (1984) and calorie evaluation was done by Atwater & Benedict (1902). Mineral content was determined using atomic absorption spectrometer, AA-6800 Shmadzu following the method of AOAC (1984), while vitamin A and ascorbic acid (vitamin C) contents were by Roe & Kuether (1943) and Carr & Price (1926).

2.5. Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) using IBM SPSS, version 21. Values were represented as mean ± standard error mean (SEM) and compared using post hoc multiple comparisons at 0.05 level of significance.

3. Results and Discussion

3.1. Proximate Composition of Food Staples

The results of proximate composition of food staples used for feed formulation are presented in Table 2. The results showed that the mean moisture content for all the samples are statistically significant compared to one another. The trend showed Crayfish > maize> guinea corn> soybean > groundnut. Crayfish has high moisture content being a fresh water organism (Ahmad *et al*., 2013; Ajala & Oyategbe, 2013; Fan *et al*., 2021). Foods with high moisture content are susceptible to microbial invasion (Adesuyi *et al*., 2012; Lorenzo *et al*., 2018). The relatively lower moisture content for the other food samples may be due to preservation procedures or processing which more or less involve some form of drying. Ayoola *et al.* (2012) and Shibli *et al*., (2017) also reported that groundnut had low moisture content. Also the protein contents of the samples are significantly different from one another. The result showed crayfish> soybean> groundnut> guinea corn> maize. Crayfish, groundnut and soybean have protein composition that met the recommended daily protein requirement of 23-56g or 0.8g/kg/day (Okaraonye & Ikewuchi, 2009; Smeuninx *et al*., 2020). This indicates that these food staples are good protein sources that can prevent protein energy malnutrition when included in the weaning food formulation. The result also showed lipid compositions that vary significantly from one food staple to another. It showed that groundnut>soybean> guinea corn> crayfish> maize in lipid composition. The high lipid content of groundnut and the low content in crayfish were in line with earlier reports (Ayoola *et al.*,2012; Ahmad *et al*., 2013; Afolabi *et al*., 2018; Smietana *et al*., 2021). Lipids are high energy nutrients and can provide tissue and organ thermal insulation (Coelho *et al*., 2013). The result also showed that soybean had the highest crude fibre content and crayfish, the least. There was no significant difference between the crude fibre content of maize, guinea corn, and groundnut. The fibre content of groundnut and crayfish (1.50%) corresponds to earlier reports (Ayoola *et al*., 2012; Ahmad *et al*., 2013). Food rich in fibre are known to aid digestion and bowel movement; stems constipation and effects body weight control (McRorie & McKeown, 2017; Barber *et al*., 2020). The ash content determination showed highest composition of ash in the crayfish which is statistically significant compared to other food staples. The lowest ash content was observed for maize and guinea corn. The trend is crayfish> soybean> groundnut> guinea corn/ maize. The ash content of any diet correlates with the inherent minerals (Adesuyi *et al*., 2012; Kfle *et al*., 2018); crayfish and soybean may be good sources of minerals when compared to the other food samples evaluated. The result also revealed that maize and guinea corn has the highest carbohydrate composition followed by soybean. Groundnut and crayfish have the least carbohydrate composition.

Table 2: Proximate Composition of Food Staples Used for Feed Formulation

Samples	Moisture (%)	Protein (%)	Lipid (%)	Crude fibre (%)	Ash (%)	CHO %)
Maize	11.72±0.35^{d}	8.57±0.41^{d}	1.72±0.41^{d}	2.33±0.50^{b}	0.95±0.95^{d}	74.71±0.85^{c}
Guinea corn	8.91±0.66^{e}	10.55±0.73^{e}	5.85±0.22^{e}	2.33±0.61^{b}	1.35±0.25^{d}	71.01±0.88^{c}
Soybean	2.74±0.01^{a}	39.51±0.35^{a}	15.10±0.01^{a}	4.60±0.13^{c}	5.29±0.25^{a}	32.76±0.55^{a}
Groundnut	1.50±0.01^{c}	28.25±0.45^{c}	48.66±0.25^{c}	2.66±0.10^{b}	2.25±0.50^{c}	16.68±0.55^{b}
Crayfish	20.50±0.38^{b}	43.55±0.91^{b}	2.36±0.65^{b}	1.50±0.50^{a}	15.58±0.41^{b}	16.50±0.01^{b}

Values represent Mean ± SEM of triplicate determination. Values with different superscripts down the column are statistically significantly ($p<0.05$). Carbohydrate is a ready source of metabolic fuel for body metabolic activities (Adesuyi *et al*., 2012; Hemagowda *et al*., 2019) and maize and guinea corn could serve as a diet base in the formulation of weaning food.

3.2. Proximate Composition of Formulated Diets

The results of proximate composition of formulated diets at16% protein level is presented in Table 3. The result showed that the diet formulated based on maize and guinea corn (the base staples alone, when compared to the control (Cerelac®) and other diets, had relatively high moisture and carbohydrate contents; low protein, lipid and ash contents; and unvaried crude fiber composition. The calorie content is also lower except for the crayfish variant diet. This is an indication that diet composed of only these staples may not store for a long period and may not provide adequate amount of the nutrients needed for growth and development of the infant. When compared to Group 1, separate inclusions of soybean (Group 2) and groundnut (Group 3) caused significant reduction in moisture content and increase in the protein, lipid and ash contents. The reduction in the carbohydrate content had no effect on the calorific value, which also increased. These values are not significantly different from those obtained for the control. The groups 2 and 3 diets differ significantly in their lipid, ash and calorific.

Table 3: Proximate Composition of Formulated

Groups	Diets	Moisture %	Protein%	Lipid %	Crude fibre%	Ash%	CHO%	Calories (kcal)
1	MG	16.47±0.26b^{c}	8.73±0.15^{c}	1.70±0.23^{f}	2.66±0.97^{a}	0.26±0.06^{e}	70.18±0.63^{b}	325.32±0.43^{f}
2	MGS	10.29±0.42^{a}	17.77±0.18^{a}	7.24±0.03^{e}	2.29±0.10^{a}	1.94±0.80^{d}	60.48±0.28^{a}	375.59±0.39^{e}
3	MGGR	10.10±0.58^{a}	15.53±0.75^{a}	10.86±0.01^{c}	2.27±0.27^{a}	1.26±0.03^{c}	59.98±0.65^{a}	396.34±0.05^{ac}
4	MGCR	15.13±0.17^{cf}	17.87±0.89^{a}	1.02±0.05^{d}	2.33±0.15^{a}	4.96±0.17^{ab}	58.68±0.71^{a}	310.72±2.17^{d}
5	MGGRS	9.20±0.61^{a}	15.37±0.59^{a}	8.79±0.04^{ac}	2.19±0.02^{a}	1.59±0.21^{c}	64.06±0.50^{a}	376.46±0.36^{c}
6	MGGRCRS	11.97±0.29^{f}	16.33±0.87^{a}	5.82±0.53^{b}	2.54±0.15^{a}	2.70±0.32^{a}	60.63±0.51^{a}	355.20±1.83^{b}
7	CERELAC	8.17±0.86^{a}	15.69±0.71^{a}	8.54±0.53^{a}	2.62±0.21^{a}	2.99±0.06^{a}	60.47±0.51^{a}	383.74±0.84^{a}

Values represent Mean ± SEM of triplicate determination. Values with different superscripts down the column are statistically significantly ($p<0.05$). MG= maize/guinea corn; MGS= maize/guinea corn/soybean; MGGR= maize/guinea corn/groundnut; MGCR= maize/guinea corn/crayfish; MGGRS = maize/guinea corn/groundnut/soybean; MGGRCRS= maize/guinea corn/groundnut/crayfish/soybean.

Values which correlates with the proximate characteristics of the soybean and groundnut. Compared to Group 1, addition of crayfish alone (Group 4) results in sustained moisture level; increased protein and ash contents and lowered lipid, carbohydrate and calorific values of the formulated diet. This is also characteristics of crayfish as observed in Table 2. The result obtained for diet formulated from combination of soybean and groundnut (Group 5) does not differ significantly from those obtained for groups 3 and 4 with respect to the moisture, protein, crude fibre and carbohydrate contents. Here the result obtained for lipid, ash and calorific values are similar to those obtained for groundnut diet (Group 3). This indicates that while mixing does not affect the composition of the major macro nutrients, protein, lipid and carbohydrates, the groundnut may add to the lipid and calorific values and also diminish the ash content. Apart from the later, the difference in the mean values obtained for this diet blend is insignificant compared to the control (Cerelac®). Inclusion of the three food staples soybean, groundnut and crayfish in diet formulation (Group 6) did not affect the protein, and carbohydrate compositions significantly when compared to Group 5. However, there was significant increase in the moisture and ash content, and significant reduction in the lipid and calorific values. The diet differed significantly from the control only in the moisture content which increased significantly and the lipid and calorific values that reduced significantly. Thus the presence of crayfish bridges the mineral gap observed for Group 5 diet and at the same time diminished the lipid content and consequently, the calorific value of the formulated diet.

3.3. Mineral and Vitamin Compositions of Food Staples

The results of mineral and vitamin composition of food staples used for feed formulation are presented in Table 4. The result showed that crayfish had the highest composition of calcium, zinc, iron, copper, vitamin A and lowest composition of Vitamin C. While maize showed the lowest composition of calcium and vitamin A, groundnut and guinea corn had the lowest content of zinc and iron respectively. Soybean has high copper content which was not detected in maize, guinea corn and groundnut. Lead was not detected in any of the food samples. Crayfish and soybean met the recommended dietary allowance for calcium which is 210 ppm (Food and Nutrition Board, Institute of Medicine, 1997; Oria *et al*., 2019). Thus they could be reliable sources of calcium when included in the weaning diet. The low level of calcium in maize has been reported by Osagie & Eka (1998). Calcium is required for strong bone and teeth development (Osagie & Eka, 1998; Vannucci *et al*., 2018). However, the dietary requirement for zinc (2ppm) is met by crayfish only. The recommended dietary allowance for iron and copper in infants from 7months to 11 months are 11 ppm and 0 .02ppm respectively (Food and Nutrition Board, Institute of Medicine, 1997; Trumbo *et al.*, 2001; Oria *et al*., 2019) and these can be realized with the iron and copper levels of crayfish and soybean. Iron and copper are required in the synthesis of red blood cells; and deficiency in infant may results in anemia and osteoporosis (Trumbo *et al.*, 2001; Kohla *et al*., 2020; Animasahun & Itiola, 2021).

Table 4: Minerals and Vitamin Composition of Food Samples Used for Feed Formulation

Samples	Ca (ppm)	Zinc (ppm)	Iron (ppm)	Cu (ppm)	Lead (ppm)	Vit A (IU)	Vit C (mg/100g)
Maize	45.85±0.33^{d}	0.68±0.88^{d}	0.35±0.11^{d}	Nd	Nd	101.34±3.22^{e}	8.42±0.04^{c}
Guinea corn	59.04±2.58^{e}	0.35±0.95^{a}	0.28±0.54^{d}	Nd	Nd	105.44±0.17^{d}	8.35±1.34^{c}
Soybean	269.44±0.04^{a}	0.32±0.02^{a}	14.69±0.13^{a}	0.04±1.10^{a}	Nd	241.22±0.34^{a}	9.48±1.89^{a}
Groundnut	88.48±0.77^{c}	0.23±0.82^{c}	5.45±0.25^{c}	Nd	Nd	160.22±0.55^{c}	8.71±0.03^{c}
Crayfish	1469.18±0.11^{b}	2.56±0.20^{b}	20.45±0.11^{b}	0.04±0.22^{a}	Nd	280.33±1.24^{b}	1.89±4.32^{b}

Values represent Mean ± SEM of triplicate determination. Values with different superscripts down the column are statistically significantly ($p<0.05$). Nd = not detectable.

The vitamin A and vitamin C contents of all the food staples did not meet the recommended dietary allowances for infants within the ages of 7 to 12 months (500 µg or 1666.7 IU and 50mg per day respectively). Therefore, there will be need for supplementation. Vitamin A is required for maintenance of clear vision, healthy skin and hair condition and immunity against infection (Huang *et al*., 2018; Gombart *et al*., 2020). Vitamin C has been reported to help in the absorption of non heme iron and zinc from diets (Hallberg *et al.*, 1986; Kapil, 2017; Basrowi & Dilantika, 2021). It is also a potent antioxidant required for healthy skin growth (Pullar *et al*., 2017; Kaiqin *et al*., 2018). Lead was not detected in any of the food staples and therefore safe for infant consumption. Lead has been implicated in kidney, brain and tissue damage in infants (Wani *et al*., 2015).

3.4. Mineral and Vitamin Compositions of Formulated Diets

The results of mineral and vitamin composition of formulated diets at 16% protein level are shown in Table 5. Apart from Vitamin C (unchanged for all diets except control), the base diet (Group 1) showed significantly lower values for all the parameters determined (calcium, zinc, iron, copper, and Vitamin A) compared to other groups and control. Inclusion of soybean in the diet (Group 2) caused significant increase in the levels of all the parameters determined except vitamin C. The comparatively high level of calcium, iron and vitamin A is characteristic of soybean as shown in Table 4 and reported by Messina (2016). The groundnut diet (Group 3) showed significantly higher zinc level compared to Group 2.

Table 5: Mineral and Vitamin Composition of Formulated Diet at 16% Protein Level

Groups	Diets	CALCIUM (ppm	ZINC (ppm)	IRON (ppm)	COPPER (ppm)	LEAD (ppm)	VIT A (IU)	VITC (mg/100g)
1	MG	44.53±0.390^{f}	0.075±0.005^{c}	2.97±0.060^{d}	nd	nd	103.67±8.760^{d}	9.21±0.060^{b}
2	MGS	211.35±0.280^{e}	0.128±0.005^{d}	7.62±0.030^{a}	0.03±0.001^{c}	nd	250.33±5.490^{c}	8.54±0.200^{b}
3	MGGR	63.95±0.032^{d}	0.19±0.003^{b}	4.05±0.140^{c}	0.008±0.002^{d}	nd	179.00±4.160^{b}	8.80±0.060^{b}

4	MGCR	839.74 ± 0.340^{c}	0.15 ± 0.000^{b}	9.39 ± 0.030^{f}	0.03 ± 0.001^{c}	nd	251.67 ± 5.780^{c}	8.83 ± 0.120^{b}
5	MGGRS	66.63 ± 0.065^{d}	0.17 ± 0.003^{b}	4.47 ± 0.210^{b}	0.02 ± 0.001^{c}	nd	162.33 ± 6.960^{b}	8.73 ± 0.120^{b}
6	MGGRCRS	538.05 ± 0.530^{a}	0.15 ± 0.000^{b}	7.82 ± 0.050^{a}	0.02 ± 0.002^{c}	nd	163.00 ± 13.520^{b}	9.30 ± 0.150^{b}
Control	Cerelac	598.67 ± 0.880^{a}	5.91 ± 0.050^{a}	7.48 ± 0.140^{a}	0.06 ± 0.030^{a}	nd	1296.67 ± 8.820^{a}	50.01 ± 0.580^{a}

This is Values represent Mean ± SEM of triplicate determination. Values with different superscripts down the column are statistically significantly ($p<0.05$). MG= maize/guinea corn; MGS= maize/guinea corn/soybean; MGGR= maize/guinea corn/groundnut; MGCR= maize/guinea corn/crayfish; MGGRS = maize/guinea corn/groundnut/soybean; MGGRCRS= maize/guinea corn/groundnut/crayfish/soybean.Uncharacteristic of groundnut compared to soybean. The diet formulation at 16% protein level may have affected availability of zinc in soybean as reported by Erdman *et al*. (1980) and Ketelsen *et al*. (1984). Compounds such as tannins, phytate, oxalate and proteins have been identified as affecting the bioavailability of zinc (Coulibaly *et al*., 2011; Popova & Mihaylova, 2019; Sheethal *et al*., 2022).The crayfish inclusion in the formulated diet (Group 4) resulted in significantly higher contents of calcium, iron and vitamin A and lower copper content compared to groups 2 and 3. Although diet formulation may have diminished the levels of these parameters, this corresponds to the result obtained for crayfish in Table 4. The calcium and iron content of this diet is also significantly higher than the control. Group 5 diet showed significant decrease in the levels of calcium, iron and vitamin A and significant increase in zinc level when compared to Group 2. Except for iron and copper levels that increased significantly, the levels of all parameters in Group 5 diet vary insignificantly compared Group 3. Thus the combination of soybean and groundnut in diet formulation at 16% protein level diminished the contributions of soybean to calcium, iron and vitamin A levels of the diet. The zinc contribution of groundnut was maintained. The Group 5 diet showed significant decrease in the levels of all the parameters compared to the control. Combination of all the food staples in diet formulation (Group 6) caused significant increase in the calcium and iron content compared to GrouThese are significantly lower than group 4 and insignificant compared to control. The improvement in the calcium and iron content may be a factor of the crayfish component of the diet.

4. Conclusion

The various formulated diets from individual ingredients showed significant proximate compositions that correlated with the moisture and nutrient contents of their respective food staples. The moisture content of each staple may be a factor of preservation or processing procedures and formulation either preserved or altered the composition of diets. Alteration may be a diminution or an enhancement of proximate, mineral or vitamin composition. This is inconsistent with Lewis *et al*. (2006) who reported that the quality of the diet is directly proportional to the number of ingredients included. While diet containing both soybean and groundnut does not significantly differ, in most parameters, from their separate inclusions, introduction of crayfish enhanced the mineral and vitamin A content of the diet, as well as its moisture content. Reduction in moisture content is necessary for adequate preservation and can be achieved through proper drying. Thus the use of soybean, groundnut and crayfish in the formulation of weaning diet at 16% protein level may provide the necessary nutrients required for the growth and health maintenance of the newborn.

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