



## Proximate Analysis of Locally Prepared Vended Dishes in Owerri Municipality of Imo State

**Adaramaja Mercy F.**

Imo State University, Owerri  
flourmatt@yahoo.com

### Abstract

This study is aimed at evaluating the food vendor's practices, proximate analysis of locally prepared vended dishes in Owerri Municipality of Imo state. Five zones (A, B, C.D and E) were considered and the food assessed were cooked spaghetti, beans, rice and stew. The proximate analysis of the food samples revealed that the mean moisture content ranged from 59.91% in cooked spaghetti to 89.0% in stew. Protein content varied from 2.23% in stew to 13.45% in cooked beans, while Fat varied from 0.13% in cooked rice to 8.02% in stew; Ash ranged from 0.22% in cooked beans to 0.81% in stew; Carbohydrate ranged from 17.73% in cooked beans to 36.33% in cooked spaghetti; the Nitrogen Free Extract (NFE) present only in stew ranged from 0.43% in Zone E to 3.28% in Zone A. It was concluded that street foods provide a source of affordable nutrients to the majority of the people especially the low-income group in the developing countries, however, all the proximate components were within the normal range in the zones.

**Keywords:** Proximate analysis; Street foods; Imo state; Owerri.



CC BY: [Creative Commons Attribution License 4.0](https://creativecommons.org/licenses/by/4.0/)

### 1. Introduction

Food is one of the most vital nutrients for the promotion of human health and prevention of disease. It is also regarded as one of human primary needs besides clothing and housing. Due to the vital role of food in human existence, it is imperative to maintain high level of food safety in order to ensure that human being is safe from diseases or other related health hazards associated with food [1]. Diseases that result from foods are one of the major health problems in developing and developed countries [2].

A balanced diet and consumption of food prepared in accordance with good practices are factors that contribute to maintaining a healthy lifestyle [3].

Nutrients are consumed through the food that we eat, and via metabolic processes in the digestive system, these nutrients are absorbed at a cellular level in the body. Optimum nutrition contributes to health, wellbeing, normal development, and high quality of life. However, malnutrition are linked to suboptimal health outcomes. Such poor diets have been linked to the occurrence of chronic diseases including, cardiovascular disease, Type-2 diabetes, cancer, osteoporosis and anemia [4]. The importance of good diet cannot be overlooked because food and eating well can make the difference between being alive or dead and being well or sick. Consuming a healthy diet which is usually obtained from a wide variety of foods and beverages can be attained with good dietary pattern [5].

Locally prepared foods can be defined as foods and beverages prepared and/ or sold by vendors on the street and in other public places for immediate consumption or consumption at a later time without further processing or preparation [4]. Conditions of food safety include efforts to avoid contamination from biological, chemical agents and other substances that can endanger human health [1]. The American Centres for Disease Control and Prevention (CDC) reported that about 77% of food poisoning occurs in restaurants, 20% in homes and 3% from commercial foods relating to non-compliance with food standards and secondary pollution [6].

In Owerri, preparing locally made foods in streets and markets even along the road for travelers is very common. These food vendors enjoy huge patronage from different societal classes. Unfortunately, none of these food hawkers or vendors is licensed or monitored by relevant agencies saddled with the responsibility of ensuring the safety of our foods. Thus, owing to the manner and conditions these vendors operate, there is possibility that some of the locally made foods may be contaminated by food borne pathogens. Therefore, this study explored the proximate analysis and microbial load of locally prepared dishes sold by food vendors in Owerri Municipality of Imo state because such foods have been implicated in food borne illnesses and diseases that remain major public health challenge.

The objective of the study is to determine proximate analysis of locally prepared dishes sold by food vendors in Owerri Municipal.

## 2. Materials and Methods

### 2.1. Study Area

Owerri Municipal Council Area is an urban area with one autonomous community made up of five (5) indigenous Kindred namely; Umuoroonjo, Amawom, Umuoneeche, Umuodu and Umuoyima in the order of seniority under the leadership of one paramount ruler. Owerri Municipal Council covers areas such as World Bank,

Aladinma, Ikenegbu, Prefab, Tetlow, School Road, Wetheral and Douglas. Owerri Municipal Council is located in the humid tropical ecological zone of Nigeria between latitudes  $5^{\circ} 25^1\text{N}$  and  $50^{\circ} 23^1\text{N}$  and longitude  $7^{\circ} 2^1\text{E}$  and  $149^{\circ} 33^1\text{E}$  of the Greenwich meridian [7].

## 2.2. Procurement of Materials

The food samples were procured cross - sectionally from selected food vendors at different sites in Owerri Municipality of Imo State. The food samples were collected from each vendor at their respective vending site. Food was carefully transferred into a transparent polythene bags which were tightened, labeled and transported on ice to prevent bacterial multiplication during sample transportation to the laboratory for analysis.

## 2.3. Sample Population and Selection

The food vendors in Owerri municipality were used. The locations were grouped into 5 based on the extent of commercial activities taking place in these areas and their closeness namely; Zone A represents Prefab and Aladinma; Zone B represents Ikenegbu and Wethdral; Zone C represents Douglas; Zone D represents Tetlow and School-road; and Zone E represents World Bank. In the selected areas under Owerri municipal, list of available vendors was carried out within experimental limit; segregation of vendors based on food items they sold was done. From the collated list, four (4) common food samples were selected from each zone.

## 2.4. Collection of Food Samples

The food samples were procured from selected food vendors some minutes after food preparation at the different zones in Owerri municipality of Imo State. The samples that were collected included; cooked white rice, cooked spaghetti, cooked beans and stew, an appropriate portion of samples were purchased from each vendor and aseptically kept separately in a sterile labeled transparent polythene bags. The collected samples were then transported immediately to the laboratory within the shortest possible time for analysis according to method outlined by AOAC [8], microbial count was done according to International Commission on Microbiological Specifications for Foods [9].

## 2.5. Statistical Analysis

Data collected from respondents were entered into Statistical Package for the Social Sciences (SPSS) version 16.0 software, edited and subsequently used for univariate analysis. Analysis of Variance (ANOVA) (F-ratio) with the application of honest significant difference (HSD) was used to obtain the significant differences among the food samples for both microbial load and proximate analysis data. Percentage proportions were calculated for discrete variables while the mean with its standard deviation (SD) were computed for the continuous variable.

## 3. Results

**Table-1.** Proximate composition of cooked rice samples from different food vendors within Owerri municipal

Sample location	Moisture %	Protein %	Fat %	Ash %	Carbohydrate %
Zone-A	65.14 <sup>c</sup> +0.02	3.06 <sup>a</sup> +0.02	0.23 <sup>c</sup> +0.0	0.40 <sup>b</sup> +0.01	31.17 <sup>b</sup> +0.01
Zone-B	66.02 <sup>d</sup> +0.02	2.79 <sup>c</sup> +0.01	0.19 <sup>d</sup> +0.0	0.44 <sup>a</sup> +0.0	30.57 <sup>c</sup> +0.0
Zone-C	65.91 <sup>b</sup> +0.02	2.92 <sup>b</sup> +0.01	0.34 <sup>a</sup> +0.0	0.32 <sup>c</sup> +0.0	30.51 <sup>d</sup> +0.0
Zone-D	67.09 <sup>a</sup> +0.02	2.47 <sup>d</sup> +0.02	0.16 <sup>e</sup> +0.0	0.29 <sup>c</sup> +0.0	29.99 <sup>e</sup> +0.0
Zone-E	64.87 <sup>e</sup> +0.02	2.99 <sup>a</sup> +0.02	0.31 <sup>b</sup> +0.0	0.31 <sup>c</sup> +0.01	31.49 <sup>a</sup> +0.01
LSD (p<0.05)	0.02002	0.0198	0.00399	0.0083	0.01348

Mean values with different letters in the same column are significant (p<0.05)

Zone-A - Prefab and Aladinma areas, Zone B - Ikenegbu and Wethdral areas, Zone C - Douglas area, Zone D - School road and Tetlow areas, Zone E - World bank area.

**Table-2.** Proximate composition of cooked spaghetti samples from different food vendors within Owerri municipal

Sample location	Moisture %	Protein %	Fat %	Ash %	Carbohydrate %
Zone-A	59.91 <sup>e</sup> +0.02	3.40 <sup>a</sup> +0.03	0.57 <sup>a</sup> +0.01	0.24 <sup>c</sup> +0.02	35.88 <sup>a</sup> +0.0
Zone-B	62.03 <sup>a</sup> +0.01	3.68 <sup>a</sup> +0.01	0.47 <sup>c</sup> +0.01	0.31 <sup>b</sup> +0.01	33.52 <sup>b</sup> +0.03
Zone-C	60.46 <sup>c</sup> +0.02	3.03 <sup>a</sup> +0.01	0.38 <sup>e</sup> +0.01	0.29 <sup>b</sup> +0.0	35.84 <sup>a</sup> +0.0
Zone-D	61.68 <sup>b</sup> +0.02	3.23 <sup>a</sup> +0.02	0.40 <sup>d</sup> +0.0	0.44 <sup>a</sup> +0.0	34.25 <sup>b</sup> +0.0
Zone-E	60.12 <sup>d</sup> +0.02	2.72 <sup>a</sup> +0.02	0.52 <sup>b</sup> +0.0	0.31 <sup>b</sup> +0.01	36.33 <sup>a</sup> +0.0
LSD(p<0.05)	0.01458	0.31723	0.00226	0.00522	0.31570

Mean values with different letters in the same column are significant (p<0.05)

Zone A- Prefab and Aladinma areas, Zone B- Ikenegbu and Wethdral areas, Zone C- Douglas area, Zone D- School road and Tetlow areas, Zone E- World bank area.

**Table-3.** Proximate composition of cooked beans samples from different food vendors within Owerri municipal

Sample location	Moisture %	Protein %	Fat %	Ash %	Carbohydrate %
Zone-A	67.12 <sup>c</sup> +0.0	13.45 <sup>a</sup> +0.0	0.67 <sup>a</sup> +0.0	0.33 <sup>a</sup> +0.0	18.43 <sup>c</sup> +0.01
Zone-B	68.01 <sup>c</sup> +0.0	11.23 <sup>d</sup> +0.0	0.59 <sup>c</sup> +0.0	0.25 <sup>c</sup> +0.0	19.92 <sup>b</sup> +0.01
Zone-C	69.01 <sup>a</sup> +0.01	12.04 <sup>c</sup> +0.0	0.61 <sup>b</sup> +0.01	0.22 <sup>d</sup> +0.01	18.14 <sup>d</sup> +0.02
Zone-D	68.55 <sup>b</sup> +0.01	12.89 <sup>b</sup> +0.01	0.52 <sup>d</sup> +0.01	0.31 <sup>b</sup> +0.0	17.73 <sup>e</sup> +0.01
Zone-E	67.68 <sup>d</sup> +0.0	10.78 <sup>e</sup> +0.01	0.63 <sup>b</sup> +0.0	0.26 <sup>b</sup> +0.0	20.66 <sup>a</sup> +0.01
LSD (p<0.05)	0.00519	0.00399	0.00464	0.00436	0.01375

Mean values with different letters in the same column are significant (p<0.05)

Zone A- Prefab and Aladinma areas, Zone B- Ikenegbu and Wethdral areas, Zone C- Douglas area, Zone D- School road and Tetlow areas, Zone E- World bank area.

**Table-4.** Proximate composition of stew samples from different food vendors within Owerri municipal

Sample location	Moisture %	Protein %	Fat %	Ash %	Nitrogen free extract (%)
Zone-A	87.23 <sup>c</sup> +0.0	2.23 <sup>d</sup> +0.0	6.45 <sup>d</sup> +0.0	0.81 <sup>a</sup> +0.0	3.28 <sup>a</sup> +0.01
Zone-B	89.0 <sup>a</sup> +0.0	3.11 <sup>a</sup> +0.0	8.02 <sup>a</sup> +0.0	0.66 <sup>d</sup> +0.0	0.80 <sup>d</sup> +0.0
Zone-C	88.11 <sup>b</sup> +0.0	2.88 <sup>b</sup> +0.01	7.83 <sup>b</sup> +0.0	0.75 <sup>b</sup> +0.0	0.43 <sup>c</sup> +0.0
Zone-D	85.78 <sup>e</sup> +0.0	3.12 <sup>a</sup> +0.0	8.02 <sup>a</sup> +0.01	0.52 <sup>e</sup> +0.0	2.56 <sup>c</sup> +0.01
Zone-E	86.26 <sup>d</sup> +0.0	2.66 <sup>c</sup> +0.0	7.52 <sup>c</sup> +0.01	0.71 <sup>c</sup> +0.0	2.85 <sup>b</sup> +0.02
LSD (p<0.05)	0.01815	0.00361	0.00549	0.00276	0.01875

Mean values with different letters in the same column are significant (p<0.05)

Zone A- Prefab and Aladinma areas, Zone B- Ikenegbu and Wethdral areas, Zone C- Douglas area, Zone D- School road and Tetlow areas, Zone E- Worldbank area.

## 4. Results

**Table 1** reveals the proximate components of cooked rice samples from different food vendors within Owerri municipal. The proximate components of cooked rice from Zone A were 65.14%, 3.06%, 0.23%, 0.40% and 31.17 for moisture, protein, fat, ash and carbohydrate, while Zone B were 66.02%, 2.79%, 0.19%, 0.44% and 30.57; Zone C were 65.91%, 2.92%, 0.34%, 0.32% and 30.51; Zone D were 67.09%, 2.47%, 0.16%, 0.29% and 29.99; Zone E were 64.87%, 2.99%, 0.31%, 0.31% and 31.49 for moisture, protein, fat, ash and carbohydrate respectively

The proximate components of cooked spaghetti samples from different food vendors within Owerri municipal is presented in **Table 2**. The proximate components of cooked spaghetti from Zone A were 59.91%, 3.40%, 0.57%, 0.24% and 35.88; Zone B are 62.03%, 3.68%, 0.47%, 0.31% and 33.52; Zone C were 60.46%, 3.03%, 0.38%, 0.29% and 35.84; Zone D were 61.68%, 3.23%, 0.40%, 0.44% and 34.25; Zone E were 60.12%, 2.72%, 0.52%, 0.31% and 36.33 for moisture, protein, fat, ash and carbohydrate respectively.

**Table 3** presents the proximate components of cooked beans samples from different food vendors within Owerri municipal. The proximate components of cooked spaghetti from Zone A were 67.12%, 13.45%, 0.67%, 0.33% and 18.43; Zone B were 68.01%, 11.23%, 0.59%, 0.25% and 19.92; Zone C were 69.01%, 12.04%, 0.61%, 0.22% and 18.14; Zone D were 68.55%, 12.89%, 0.52%, 0.31% and 17.73; Zone E were 67.68%, 10.78%, 0.63%, 0.26% and 20.66 for moisture, protein, fat, ash and carbohydrate, respectively.

**Table 4** reveals the proximate components of stew samples from different food vendors within Owerri Municipal. The proximate components of stew sample from Zone A were 87.23%, 2.23%, 6.45%, 0.81% and 3.28%; Zone B were 89.0%, 3.11%, 8.02%, 0.66% and 0.80%; Zone C were 88.11%, 2.88%, 7.83%, 0.75% and 0.43%; Zone D were 85.78%, 3.12%, 8.02%, 0.52% and 2.56%; Zone E were 86.26%, 2.66%, 7.52%, 0.71% and 2.85% for moisture, protein, fat, ash and nitrogen free extract, respectively.

## 5. Discussion

Proximate analysis deals with the chemical composition of food and the quality of food is based on the natural composition, combined nutrients in it, quantity of anti-nutrients and synergistic or qualitative balance between the nutrient amino acids [10]. Proximate which comprises ash, moisture, protein (Kjeldahl protein), fat, fibre, and carbohydrate or nitrogen-free extracts (digestible carbohydrate) which is gotten by difference is one of the methods of identifying nutrient composition of foods

Due to socio-economic changes characterized by increased mobility, resulting in more locally prepared foods taken outside the home, food vendors services are on the increase and responsibility for the food safety have been transferred from individuals/families to the food vendors. These vendors rarely enforce good manufacturing practices which are linked with gastrointestinal diseases such as diarrhea and typhoid fever due to poor environmental sanitation which is largely responsible for much of the contamination and poor personal hygiene among the food handlers [11].

Proximate result on cooked rice samples obtained in Zone D area has the highest moisture content of 67.09% whilst cooked rice from zone A area had the lowest value of moisture (65.14%). According to **Mariam [12]** moisture content is a measure of bio-degradability of food due the action of micro-organisms afforded by water activity. Correspondingly, the highest (31.49%) and lowest (29.99%) amounts of carbohydrate contents were estimated in the

samples obtained at zone E and zone D areas respectively. The protein content ranged from 2.47-3.06 % whilst the fat content ranged from 0.16-0.34% and the ash values ranged from 0.29-0.44 %. Cooked rice samples obtained in all the Zones were all found to be rich for its carbohydrate. The protein, moisture, fat, ash and carbohydrate contents were significantly ( $P < 0.05$ ) different across the treatments. The moisture content slightly increased from zone A to B. This report is consistent with the observation of [Mariamu \[13\]](#); [Nassar and Sousa \[14\]](#) who reported low protein content in cassava. The low level of fat in cooked rice is important because excess intake of dietary fat has some well-established health implications especially for the overweight. The consumption of excess amounts of saturated fats has been recognized as the most important dietary factor aiding increased level of cholesterol [\[15\]](#).

Results on the proximate composition of cooked spaghetti samples from different vendors in Owerri municipal indicated that there were no significant ( $P > 0.05$ ) differences across the zones for moisture, protein and carbohydrate composition of cooked spaghetti by different food vendors in the municipal. The results showed that a large part of cooked spaghetti samples consisted of water and carbohydrate, the values obtained in this study fell within the normal range previously reported by [Silifat, et al. \[16\]](#) but contrary with the reports of [Isreal and Steve \[17\]](#) on nutrient composition of some foods from a Nigerian eatery.

Results on cooked beans showed that it has high protein and ash contents of 13.45% and 0.33 % for samples sold in Zone A area. The high protein will enhance the prevention of low protein intake. The cooked beans samples have a low carbohydrate (17.73%) because of its protein content. Across the location, there were significant ( $P < 0.05$ ) differences in the proximate composition of the collected cooked beans. This result is consistent with the findings of [Christene, et al. \[18\]](#); [Iwe and Onuh \[19\]](#); [Oguntona and Kanye \[20\]](#) and [Oguntona, et al. \[21\]](#) but contrary to the reports of [Alayande, et al. \[22\]](#). According to [Sanchez, et al. \[23\]](#), the proximate composition of cooked beans showed significant differences due to varieties, degree of cooking and hardness. [Inobeme, et al. \[24\]](#) also reported that fats play important role in diet as important energy source, and also aid the transportation of fat soluble vitamins (A, D, E, and K).

The results of the proximate composition of stew at different locations in Owerri showed that the stew had high moisture, protein and NFE content but less ash content. The moisture ranged from 85.78-89.00 %, protein ranged from 2.23 – 3.12 %, fat ranged from 6.45-8.02 %, ash content ranged from 0.52-0.81 % whilst NFE ranged from 0.43-3.28%. The result also showed that tested stew was low in ash content. In terms of zones, the highest value of moisture (89.00%), protein (3.12%), fat (8.02%), ash (0.81%) and NFE (3.28%) contents were found in stew sampled at zone B, D (B,D), A and A, respectively. These findings are contrary with the reports of [Folasade, et al. \[25\]](#); [Chike, et al. \[26\]](#) and [Edidiong and Ubong \[27\]](#) but consistent with the findings of [Raji and Akinoso \[28\]](#) and [Akubugwo \[29\]](#). Variation in the fat contents of the stew across the zones might be as a result of different quantities of palm oil added during its preparation.

## 6. Conclusion

The study shows that majority of the food vendors in Owerri Municipal were neat and well kept. They use standard procedures in preparing the foods locally and they used safe water for food preparations. The Vendors environments were clean and they keep their surroundings clean often. The proximate analysis carried out on the food samples compared favorably with the findings of past works of other researchers.

## References

- [1] Adolph, E. A., 2009. "Evaluation of food hygiene knowledge, attitudes and practices of food handlers in food businesses in Accra, Ghana." *Food and Nutrition*, vol. 2, pp. 830-836.
- [2] Clarence, S. Y., Obinna, C. N., and Shalom, N. C., 2009. *African Journal of Microbial Research*, vol. 3, pp. 276-279.
- [3] Francesco, B., Tiziana, G., Francesca, S., Adele, I., and Antonella, D. D., 2013. "Dietary habits and health among university students living at or away from home in Southern Italy." *Journal of Food and Nutrition Research*, vol. 52, pp. 164-171.
- [4] World Health Organisation, 2016. "World Health Organisation global strategy for food safety: safer food for better health."
- [5] Gladys, A. A., Cynthia, A. M., and Jovita, N. O., 2016. "Nutrition assessment of rural farmers in imo state, Nigeria; implication for health and well-being." *International Journal of Advanced Academic Research*, vol. 2, pp. 7-18.
- [6] Razavilar, L. O., 2010. "A review on microwave baking of foods." *International Journal of Food Science and Technology*, vol. 36, pp. 117-127.
- [7] Microsoft Cooperation, 2009. *A concise guide, oxford journal of food legislation of the UK*. 3rd edn ed. Butterworth Heinemann.
- [8] AOAC, 2010. *Association of official analytical chemist official method of analysis*. 15th Edition ed. Washington, D.C., pp. 70 -88.
- [9] ICMSF, 2012. *Microorganisms in food. In: Book of Microbiological testing in food safety management* NY Kluwer Academic, Plenum ISBN.
- [10] Akinjayeju, A. and Ajayi, A., 2011. "Food consumption pattern in Eskisehir." *International Journal of Financial Research*, vol. 7, pp. 101-108.

- [11] Cho, M. M., Chet, O., and Naing, N. N., 2011. "Sociodemographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: a preliminary report." *Southeast Asian Journal of Tropical Medicine and Public Health*, vol. 33, pp. 410–417.
- [12] Mariam, P., 2014. "Persistent diarrhea in Ghana. Report submitted to Japan international cooperation agency."
- [13] Mariamu, S., 2012. "Nutritive value of three potential complementary food based cereals and legumes." *Afr. J. Food Agric. Nutri. Devt.*, vol. 5, pp. 1-15.
- [14] Nassar, N. M. A. and Sousa, M. V., 2007. "Amino acid profile in cassava and its interspecific hybrid Genetics." *Mol. Res.*, vol. 6, pp. 292-297.
- [15] Wardlaw, G. M. and Kessel, M., 2012. *Prospective in nutrition*. 5th ed. Boston: McGraw-Hill. p. 278.
- [16] Silifat, A. S., Clara, R., Bernstein. Oguntona1., and Lateef, O. S., 1999. "Chemical and nutritional composition of some common foods in Abeokuta, Nigeria." *Braz. Arch. Biol. Technol.*, vol. 42, pp. 331-338.
- [17] Isreal, K. and Steve, E., 2014. "Hygienic and sanitary practices of vendors of street foods in nairobi, Kenya." *Afr. J. Food. Agric. Nutr. Dev.*, vol. 5, pp. 1–15.
- [18] Christene, R. D. M., Veiros, M. B., Feldmanb, C., and Cavalli, S. B., 1976. "Food safety and hygiene practices of vendors during the chain of street food production in Florianopolos, Brazil: A cross-sectional study." *Journal of Food Control*, vol. 62, pp. 164-178.
- [19] Iwe, M. O. and Onuh, J. O., 2012. "Functional and sensory properties of soyabean and sweet potato mixtures." *Lebensmittel-Wissenschaftund-Tech*, vol. 215, pp. 569-573.
- [20] Oguntona, C. R. B. and Kanye, O., 2005. "Contribution of street foods to nutrients intakes by Nigerian Adolescents." *Nut. Health*, vol. 10, pp. 165-171.
- [21] Oguntona, C. R. B., Razaq, M. A., and Akintola, T. T., 2008. "Pattern of Dietary intake and consumption of street foods among Nigerian Students." *Nutr. and Health*, vol. 12, pp. 247-256.
- [22] Alayande, L. B., Mustapha, K. B., Dabak, J. D., and Ubom, G. A., 2012. "Comparison of Nutritional Values of brown white beans in Jos north local government markets." *African Journal of Biotechnology*, vol. 11, pp. 10135-10142.
- [23] Sanchez, N. O., Winarno, F. G., and Allain, A., 2014. "Street foods in developing countries: Lessons from Asia. Rome." *Food and Agriculture Organisation*, Available: <http://www.fao.org/docrep/U3550T/U3550T00.htm>
- [24] Inobeme, L., Muinde, O. K., and Kuria, E., 2014. "Hygienic and sanitary practices of vendors of street foods in Nairobi, Kenya." *Afr. J. Food Agric. Nutr. Dev.*, vol. 5, pp. 1–15.
- [25] Folasade, O., Gabriel, A., Stella, D., Akinoso, R., and Doko, B., 2015. "Proximate composition and fatty acid profile of Nigerian melon seeds." *Life Science Archives (LSA) Volume*, vol. 1, pp. 59-65.
- [26] Chike, C. P. R., Nlerum, F., and Amah-Tariah, F., 2013. "Effect of long term administration of defatted egusi (*citrulluslanatus*) and soya flour (*glycine max*) on body weight and rectal temperature of wistar rat (*rattusrattus*)." *African Journal of Applied Zoology and Environmental Biology*, vol. 13, pp. 23-30.
- [27] Edidiong, A. E. and Ubong, M. E., 2013. "Chemical analysis of *Citrulluslanatus* seed oil obtained from Southern Nigeria." *Elixir Org. Chem.*, vol. 54, pp. 12700-12703.
- [28] Raji, A. and Akinoso, M., 2013 "Street-food: the hygiene conditions of hot-dogs sold in Sao Paulo, Brazil." *Journal of Food Control*, vol. 17, pp. 312-3. Available: <http://www.who.int/features/qa/malnutrition>
- [29] Akubugwo, M., 2007. "Effects of dehulling on functional and sensory prperties of flours from black beans *Phaseolus vulgaris*." *Journal of Food and Nutrition Sciences*, vol. 2, pp. 344-349.