Nigerian Research Journal of Chemical Sciences **(ISSN: 2682-6054)**
Volume 8, Issue 2, 2020

COMPARATIVE PROXIMATE AND MINERAL COMPOSITION OF VARIETIES OF INSTANT NOODLES SOLD IN SOKOTO, NIGERIA

[1]Suleiman, M., [1]Khalil, I., [1]Nasiru, Y., [1]Alhassan, M., [1]Kasim, A., [1]Garba, A.A., [2]Khadija, A.Y., and [1]Muhammad, U.L

[1]Department of Chemistry, Sokoto State University, Birnin Kebbi Road, Sokoto, Nigeria

[2]Department of Pure and Applied Chemistry, Usmanu Danfodiyo University, Sokoto, Nigeria

Corresponding author: masge007@gmail.com

ABSTRACT

Instant noodles also known as cup noodles in the Asian countries are noodle dish sold in a dried and precooked noodle block, with flavouring powder or seasoning oil. There are many types of noodles, but the "instant" types show increasing popularity globally as these products offer ease of preparation while being economical and tasty. The objective of the study was to compare the nutritional and mineral contents of selected instant noodles sold and consumed in Sokoto metropolis, Nigeria. The proximate composition was determined adopting the AOAC methods. Both the micronutrients and macronutrients were determined using flame photometry and atomic absorption spectrometric methods of analysis. Result of the proximate analysis showed that Noodles A had the highest of calorific value at 467.94±0.53 kcal/100 gDW, Noodles B had the highest crude fibre at 0.45±0.00 mg/100 gDW, Noodles C had the least concentration of ash content at 0.97±0.01 mg/100 gDW. The mineral results also showed that Noodles A had the highest content of Na at 257±0.48 mg/100 gDW. Also the mineral analysis showed the presence of sodium, potassium, calcium and magnesium in each of the samples. The results indicated that Noodles A contained the highest concentration of nutrients.

Keywords: Minerals, noodles, proximate, Sokoto

INTRODUCTION

The pasta industry is growing very fast due to global consumption of noodles. Noodles are produced from rice or wheat flours with other additions such as seasoning, pepper, chicken pieces, salts, etc. It lacks some nutritional components such as dietary fiber. Therefore, it is necessary to add lentil to increase the fiber content [1]. Noodles are an important food throughout the world, especially in Asian countries such as China, Korea, Malaysia, Philippines

and Thailand. Almost 40% of wheat products in Asian countries are consumed in the form of noodles [1, 2].

There are many types of noodles, but the "instant" types show increasing popularity globally as these products offer ease of preparation while being economical and tasty [3]. However, their significant sales volume were not reflected in the amount of research work been carried out [3].

In developing countries, there has been a high increase in the consumption of noodles owing to changes in lifestyle and urbanization [4]. Nigeria today has up to fifteen brands of noodles including, but not limited to the following: (a) Golden penny produced by Flour Mills Nigeria Plc (b) Mimee Noodles by May and Baker. (c) Honeywell Noodles by Honey Well Super Fine Food Limited, (d) Dangote Noodles by Dangote Group (e) Chef Me by Engels Foods. Olorunsogo et al [5], reported the physicochemical properties of instant noodles produced from blends of sweet potato, soybean and corn flour.

In this research, three common brands of instant noodles were sampled and analysed for proximate and physicochemical properties using standard analytical methods. Onyema et al [6] reported on the quality assessment of common instant noodles sold in Nigeria markets, and concluded that little variations were observed in the proximate and most especially the heavy metal compositions of the selected noodles samples.

MATERIALS AND METHODS

Sampling and sample treatment

A total of three brands of instant noodles were bought from Sokoto central market, SokotoState, Nigeria. The samples were disguised as Noodle A instant noodle, Noodles B instant noodle and Noodle C instant noodle. All the samples were in 120 g packets. The samples were ground into fine powder and sealed inside clean polyethene bag for further analysis. The samples were labeled accordingly: Sample A, Sample B and Sample C respectively.

Proximate analysis

The proximate analysis, which is the analysing of the samples into six categories (moisture content, ash content, crude protein (kjeldahl protein), crude lipids, crude fibre and carbohydrates (Nitrogen free extracts) based on their chemical properties, analyses were done using standard analytical procedures [7] as follows:

Determination of moisture content

This involved drying to a constant weight at 100 ^{o}C and calculating moisture as the loss in weight of the dried Noodle samples. The crucible was thoroughly washed and dried in an oven at 100 ^{o}C for 30 min and allowed to cool inside desiccators. After cooling, they were weighed using weighing balance and their various weights recorded as (W_1). Then, 2.0 g of the finely ground Noodle samples were put into the crucibles and weighed to get W_2. Thereafter, the sample plus crucible were placed inside the oven and dried at 100 ^{o}C for 4 hours, cooled and weighed at the same temperature for 30 min until constant weights were obtained to get W_3. Then, the moisture content of the rice sample was calculated from the equation:

$$\% \text{ moisture} = (W_2 - W_3) / (W_2 - W_1) \times 100 \quad [7]$$

Determination of ash content

Total ash of the instant noodles samples was determined by furnace incineration based on the vapourization of water and volatiles with burning organic substances in the presence of oxygen in the air to CO_2 at a temperature of 600 ^{o}C (dry ashing). About 1.0 g of finely ground dried sample was weighed into a 277 tared porcelain crucible and incinerated at 600 ^{o}C for 6 hr in an ashing muffle furnace until ash was obtained. The ash was cooled in a dessicator and reweighed. The % ash content in the instant noodle samples was calculated as:

$$\% \text{ Ash} = \frac{\text{Weight of Ash}}{\text{Weight of the sample}} \times 100 \quad [7]$$

Determination of crude fibre

About 2.0 g of the instant noodles sample was hydrolyzed in a beaker with petroleum ether after which it was boiled under reflex for 30 min with 200 ml of a solution containing 1.25% H_2SO_4 per 100 ml of solution. The solution was filtered through a filter paper onto a fluted funnel. After filtration, the samples were washed with boiled water. Then, the residue was transferred onto a beaker and boiled for another 30 min with 200 ml of solution containing 1.25% NaOH per 100 ml. The boiled samples were washed with boiled distilled water. The residues were filtered through Gooch filter crucible, dried at 100 ^{o}C for 2 hours in an oven, cooled and washed. The percentage crude fibre in the instant noodle samples was calculated as per the formula:

$$\% \text{ Crude fiber} = (\text{Wt. after drying}) / (\text{Wt. of sample}) \times 100 \quad [7]$$

Determination of fat

Total fat in the instant noodle samples was determined using Soxhlet extraction for 4 hr starting with methanol and ethanol, respectively [8]. About 250 ml clean boiling flasks were dried in an oven at 105 – 110 ºC for about 30 min and cooled in a dessicator. Approximately, 2.0 g of samples were weighed accurately into labeled thimbles. The dried boiling flasks were weighed correspondingly and filled with about 300 ml of petroleum ether (boiling point 40-60 ºC). The extraction thimbles were plugged tightly with cotton wool. After that, the soxhlet apparatus was assembled and allowed to reflux for 6 hr. The thimble was removed with care and petroleum ether collected from the top container and drained into another container for re-use. After that, the flask was dried at 105 – 110 ºC for 1 hour when it was almost free of petroleum ether. After drying, it was cooled in a dessicator and weighed. Then, % fat in the instant noodle samples was computed using the formula below:

$$\% \text{ fat} = \frac{\text{Weight of fat}}{\text{Weight of sample}} \times 100 \qquad [7]$$

Determination of protein

The crude protein content of the instant noodle samples was determined using the Microkjeldahl method of AOAC [9], which involved protein digestion and distillation.

a. **Protein Digestion**: About 2.0 g of the instant noodle sample was weighed into a Kjeldahl flask and 4 tablets of Kjeldahl catalyst were added. This was followed up with addition of 1.0 g copper sulphate and a speck of selenium catalyst into the mixture, and 25 ml concentrated sulphuric acid was introduced. The whole mixture was subjected to heating in the fume cupboard. The heating was done gently at first and increased with occasional shaking till the solution assumed a green colour. The temperature of the digest was above 420 ºC for about 30 min. The solution was cooled and black particles showing at the neck of the flask were washed down with distilled water. The solution was re-heated gently at first until the green colour disappeared. Then, it was allowed to cool. After cooling, the digest was transferred into a 250 ml volumetric flask with several washings and made up to the mark with distilled water and then distilled using Markham distillation apparatus.

b. **Protein Distillation**: Before use, the Markham distillation apparatus was steamed through for 15 min after which a 100 ml conical flask containing 5 ml boric acid/indicator was placed under

the condenser such that the condenser tip was under the liquid. About 5.0 ml of the digest was pipetted into the body of the apparatus via a small funnel aperture. The digest was washed down with distilled water followed by addition of 50 ml of 60% NaOH solution. The digest in the condenser was steamed through for about 5 minutes after which enough ammonium sulphate was collected. The receiving flask was removed and the tip of the condenser washed down into the flask after which the condensed water was removed. The solution in the receiving flask was treated with 0.01M hydrochloric acid. Also, a blank was run through along with the sample. After titration, the % nitrogen was calculated using the formula below:

% Nitrogen = Vs–VB x Macid x 0.01401 x 100W

where, Vs = volume (ml) of acid required to titrate sample;

VB = volume (ml) of acid required to titrate the blank;

Macid=molarity of acid; W=weight of sample (g).

Then, percentage crude protein in the instant noodle sample was calculated from the % Nitrogen as:

% crude protein = % N x F,

Where, F (conversion factor) is equivalent to 6.25.

Determination of carbohydrate

The total percentage carbohydrate content in the instant noodle sample was determined by the difference method as reported by [10]. This method involved adding the total values of crude protein, lipid, crude fibre, moisture and ash constituents of the samples and subtracting it from 100. The value obtained is the percentage carbohydrate constituent of the sample. Thus:

% carbohydrate = 100– (% moisture + % crude fibre + % protein + %lipid+% ash).

Mineral analysis

The samples were digested into solution by wet digestion using a mixture of conc. Nitric, perchloric and sulphuric acids in the ratio 9:2:1 respectively. Sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe) and zinc (Zn) were determined by AAS (Alpha 4 model, Buck Scientific Ltd, USA). While Na and K were determined using atomic emission spectrometer (200-A model, Buck Scientific Ltd, UK), and colorimetric method was used to determine phosphorus.

RESULTS AND DISCUSSION

Table 1: Proximate content of the selected instant noodles

Parameters (%)	Noodles A (mg/100)	Noodles B (mg/100g)	Noodles C (mg/100g)
Moisture content	2.98± 0.01	2.95± 0.03	3.43±0.05
Ash content	0.99± 0.01	0.99± 0.01	0.97± 0.01
Crude protein	12.34± 0.42	12.25± 0.13	11.54± 0.10
Crude lipid	14.71± 0.09	13.48± 0.02	13.64± 0.13
Crude fibre	0.42± 0.02	0.45± 0.00	0.40 ± 0.02
Carbohydrate	71.54± 0.48	72.83± 0.12	73.45± 0.14
Caloric value (kcal/100g)	467.94±0.53	461.63±0.14	462.68± 0.65

Table 2: Mineral composition of the selected instant noodles (mg/100g)

Element	Noodles A(mg/100)	Noodles B (mg/100)	Noodles C (mg/100)
Sodium	257.00±0.23	247.00±0.25	246.50±0.87
Potassium	233.00±0.12	246.50±0.14	224.00±0.54
Calcium	76.00±0.05	60.00±0.19	56.00±0.22
Magnesium	43.20±0.91	38.40±0.98	40.80±0.36
Iron	3.07±0.01	5.35±0.02	5.77±0.10
Zinc	1.25±0.00	1.12±0.00	1.02±0.00

The result of the moisture content revealed that Noodles C recorded the highest amount of moisture content at 3.43 ±0.05 mg/100g, Noodles A recorded 2.90.03 mg/100g, while Noodles B had the lowest moisture content of 2.98±0.01 mg/100g. This is in agreement with Hassan et al [11] who reported the moisture content of instant noodle to range from 2.50% to 3.50%. The moisture content in these noodles is in line with the common knowledge that the higher the moisture content of a food sample, the lower its shelf life because of its high susceptibility to bacterial attack.

The ash content of these selected noodles ranged from 0.97% to 0.99% with Noodles A having the highest ash content. This showed that Noodles A and Noodles B have the highest mineral index (0.99 ± 0.01 mg/100g) and Noodles C recorded the least ash content. It was within the range of IITA [12] since the ash content of a food sample gives an insight into the inorganic (mineral) content of the sample. This is in agreement with previous studies that ash content of instant noodles was 1.0% [13, 14].

The crude lipid content of Noodles B was 13.48 ± 0.02 mg/100g and 14.71 ± 0.09 mg/100g was recorded for Noodles A, while 13.64 ± 0.13 mg/100g for Noodle C. Noodle A with the highest amount of lipid at 14.71% is expected to give more energy upon consumption than Noodles C and Noodles B. This is because the sample that has more lipids has more energy than the one that has fewer lipids. However this might pose a health risk as high consumption of these noodles would lead to the development of more fatty acid in the adipose tissue and would contribute to the cholesterol level in humans with their associated health implications such as obesity and the risk of heart disease. Bilgicli [15] reported the crude lipid of instant noodles as 21.00% which is slightly different from the values recorded for this research.

The protein content in this research work was 11.54 ± 0.10 mg/100g for Noodles C which is least compared to what was obtained for Noodles B at 12.25 ± 0.13 mg/100g and Noodles A with the highest protein content of 12.34 ± 0.42 mg/100g. This is in conformity with what was reported by Fen et al. [16]. The protein content of the samples in this research is relatively high compared to results obtained in Indian noodles [17]. Sample A has high protein content as compared to Noodles C and Noodles B. This showed its efficacy in supplying adequate amount of dietary protein needed for growth and development especially in children.

Crude fiber content of these analyzed noodles ranged between 0.40% and 0.44% with Noodles C at 0.40 ± 0.02 mg/100g and Noodles B has 0.45 ± 0.00 mg/100g having the lowest and the highest fibre respectively. The crude fibre content of all the analyzed noodles are within the permissible limit [10] as crude fibres are not of definite or unique nutritive benefits but simply helped in the bowel movement [18]. This is in agreement with what was obtained by Edet et al. [14] who reported the crude fibre of instant noodles formulated from wheat flour and soya beans flour to be 0.40% and 0.46% respectively.

The result of the carbohydrate content showed that Noodles C had 73.45 ± 0.14 mg/100g, and Noodles B recorded 72.83 ± 0.12 mg/100g, while Noodle A had 71.54 ± 0.48 mg/100g.

Noodles C recorded the highest carbohydrate content and as such will give more energy to consumers upon consumption. This is in agreement with Edet et al. [14] who reported the carbohydrate content of different noodles to be range from 59.59% to 74.11%.

Noodles A was found to have highest energy value (467.94 ± 0.53 kcal/100g) compared to Noodles C (426.68 ± 0.65 kcal/100g) and Noodles B with 462.68 kcal/100g and 461.60 kcal/100g respectively. Gull et al. [19] reported the calorific value of instant noodles to be between 378 kcal and 356 kcal.

Mineral analysis

Sodium is the most abundant element in the samples. Noodles A has the highest concentration of sodium (257.00±0.23 mg/100g), followed by Noodles B (247.00±0.25 mg/100g) and Noodles C recorded the least concentration of sodium (246.52±0.87 mg/100g). Sodium is required by the body to regulate blood pressure and blood volume. Sodium also helps to regulate the fluid balance in the body. It also helps in the proper functioning of the muscles and nerves [20].

Potassium is the second most abundant element in the samples with the range between 224.00 mg/100g and 233.00 mg/100g. Noodles B had the highest at 246.50 ±0.05 mg/100g and Noodles C had the lowest concentration at 224.00 ± 0.54 mg/100g. The values are relatively high which make them good food material for hypertensive people [21]. High amount of potassium in the body increases iron utilization [22] and beneficial to people taking diuretics to control hypertension and suffer from excessive excretion of potassium through the body fluid [23].

Calcium and magnesium in this study had the least values which ranged from 56.00 mg/100g to 76.00 mg/100g for calcium, and 38.40 mg/100g to 43.20 mg/100g for magnesium. Calcium, if available in the body helps in development of strong teeth and bones. In addition, it helps in the formation of blood, intra-cellular and extra-cellular fluids within and outside the cell of the tissues [24]. Magnesium is closely associated with calcium to the body, as magnesium helps regulate intracellular flow of calcium ions. Magnesium deficiency may lead to fatigue, confusion, weakness and problem with muscle contraction. Thus, at 40.80±0.36mg/100g for Noodles C, 38.40±0.95mg/100g, Noodles B and 43.20±0.91mg/100 for Noodles A, it shows that sample A has the highest concentration of magnesium.

CONCLUSION

The study revealed that Sample A had relatively high amount of carbohydrate, protein and minerals such as (Na, K and Ca) which signifies the sample's potential as a good source of nutrients and energy.

REFERENCES

1. Gary, G.H. (Ed.). (2010). Asian noodles science, technology, and processing, p. 99-154. Hoboken, New Jersey: John Wiley & Sons, Inc.,
2. Ojure, M.A. & Quadri, J.A. (2012). Quality evaluation of noodles produced from unripe plantain flour using xanthan gum. *International Journal of Recent Research and Applied Studies* (IJRRAS), 13(3), 740-752.
3. Akanbi, T.O., Nazamid, S., Adebowale, A.A., Farooq, A. & Olaoye, A.O. (2011). Breadfruit starch-wheat flour noodles: preparation, proximate compositions and culinary properties. *International Food Research Journal*, 18, 1283-1287.
4. Ando, K. (2010). Instant Noodles as Earth Food, The Answer to Food Crisis. Retrieved from World Instant Noodles Summit, World Instant Noodles Association (WINA) website: https://instantnoodles.org/
5. Olorunsogo, S.T., Adebayo, S.E., Orhevba, B.A. & Awoyinka, T.B. (2019). Physicochemical properties of instant noodles produced from blends of sweet potato, soybean and corn flour. *Food Research* 3 (5), 391 - 399
6. Onyema, C.T., Ekpunobi, U.E., Edowube, A.A., Odinma, S. & Sokwaibe, C.E. (2014) Quality Assessment of Common Instant Noodles Sold in Nigeria Markets. American *Journal of Analytical Chemistry*, 5, 1174-1177.http://dx.doi.org/10.4236/ajac.2014.517124
7. AOAC (1998). Official Method of Analysis. 15th Edition, Association of Official Analytical Chemists, Washington DC.
8. Eromosele, I.C. & Eromosele, C.O. (1994). Studies on the chemical composition and physic-chemical properties of seeds of some wild plants, *Plant Foods for Human Nutrition*, 46, 361-365
9. AOAC, (1984). Standard Official Methods of Analysis of the Association of Analytical Chemists, 15th edition, S.W. Williams (ed.), Washington DC. 5-9

10. Onyeike, E.N., Olungwe, T. &Uwakwe, A.A. (1995). Effect of heat treatment and defatting on the proximate composition of some Nigerian local soup thickeners, *Food Chemistry*, 53, 173-175
11. Hassan, L. G., Dangoggo, S. M. Umar, K. J. Saidu, I. & Folorunsho, F. A. (2008). Proximate, Minerals and Anti-nutritional Factors of *Daniellia oliveri* seed kernel. *Chemclass Journal, 5*, 31-36
12. IITA (1988). Selected Methods for Soil and Plant Analysis (Manual series No.1) International Institute for Tropical Agriculture, Ibadan, Nigeria, Pp55-56.
13. Kovacs, M. I. P., Fu, B. X., Woods, S.M. & Khan, K. (2004). Thermal stability of wheat gluten protein: Its effect on dough properties and noodle texture. *Journal of Cereal Science*. 39, 9–19.
14. Edet, E.E., Onwuka, G.I. &Orieke, C.O.M. (2017). Nutritional Properties of Composite Flour (Blends of Rice (*oryza sativa*), Acha (*Digitariaexilis*) and soyabeans (*Glycine max)* and sensory properties of Noodles Produced from the Flour. *Asian journal of Advanced in Agricultural Research,* 1(2), 1-13.
15. Bilgicli, N. (2013). Some chemical and sensory properties of gluten-free noodle prepared with different legume, pseudocereal and cereal flour blends: *Journal of Food and Nutritional Research,* 52 (4), 251-255.
16. Fen, X., Honghai, H., Xiaofeng, D., Qiannan, L., Yanjie, H. & Hong, Z. (2017*).* Nutritional Composition of Various Potato noodles: Comparative Analysis. *International Journal of Agriculture and Biological Engineering,* 10(1), 218-225.
17. Debbarma, J., Viji, P., Rao, B. M. &. Prasad, M.M. (2017). Nutritional and Physical Characteristics of noodles Incorporated with Green Seaweed (*Ulva reticulata*) and fish *(Pangasianodon hypophthalmus)* mince. *Indian Fish Journal,* 64(2), 90-95.
18. Wu, T. P., Kuo, W. Y. & Chend, M. C. (1998). Modern noodle based food product range and production methods. **In**: Pacific People and Their Foods, pp. 37–89. Blakeney, A. B. & O'Brien, L., Eds., *American Association of Cereal Chemists,* St. Paul, MN, USA
19. Gull, A. Prasad, K. & Kumar, P. (2016). Nutritional, antioxidant, microstructural and pasting properties of functional pasta. *Journal of Saudi Society of Agricultural Sciences*. 05(1), 1-16

20. Payne, W. J. A. (1990). An Introduction to Animal Husbandry in the Trophics. Longman Publishers, Singapore Pp 92-110
21. Tornori, W. & Obijole, A. (2004). Proximate and Mineral Composition of Seeds and Pulp of African Locust Bean, *Nigeria Journal of Basic and Applied Science 13, 15-27.*
22. Adeyeye, E. I. (2002). Determination of the Chemical Composition of the Nutritionally Valuable Parts of Male and Female Common West African Fresh Water Crab *(Sudananoutes africanus*). *International Journal of Food Sciences and Nutrition*, 53, 189-196.
23. Arinanthan, V., Mohan, V. R. & Britto, A. J. (2003). Chemical Composition of Certain Tribal Pulses in South India. *InternationalJournal of Food Sciences and Nutrition,* 3, 103-107.
24. Malan, K. & Stump, E. (2004). *Krause's Food Nutrition and Diet Theraphy,* The Curtis Centre U.S.A. 23-24.