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# Effect of drying temperature on the proximate, vitamins and mineral compositions of tigernut (Cyperus Esculentus)

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**ABSTRACT:**
Effect of drying temperature on the Effect of drying temperature on the proximate, vitamins and mineral composition of tigernut (Cyperus esculentus) was investigated. The raw tiger nuts (yellow varieties) were dried at different temperatures (70, 75, 80 and 85)$^{o}$C using an electric oven until constant weight was achieved. The samples were milled and chemical compositions were analysed using standard procedures. The result of moisture varied from (3.63±0.32 to 42.53±2.73 %), fat (18.5±0.30 to 31.01 ± 0.11 %), protein (8.54±0.46 to 8.68±0.46 %), ash (2.30± 0.10 to 5.01±0.01 %), fibre (10.17±0.05 to 14.40±0.01) and carbohydrate content (19.96±1.94 to 39.20±0.99%).Vitamins analysis results showed the following ranges (mg/100g): vitamin C (21.53±1.96 to 29.80±0.40), vitamin E (4.273±0.404 to 5.073±0.237), vitamin $B_1$ (0.720±0.052 to 0.860±0.053), vitamin $B_2$ (0.473±0.0058 to 0.6067±0.0306), vitamin $B_3$ (0.0573±0.064 to 0.0817± 0.0031). Mineral analysis also revealed the following ranges (mg/100g): calcium (87.64±0.69 to 144.53±0.46), magnesium (53.12±1.20 to 65.81±1.63), phosphorus (146.33±0.115 to 155.8±0.15), zinc (0.022±0.005 to 0.88±0.006), iron (3.57±0.10 to 4.33±0.09), Potassium (170.8 to 198.5) and sodium (0.66±0.09 to 0.77±0.46). The drying temperatures used in this study did not have negative effect on the nutritional composition of the nut, except on the vitamin C content which decreased slightly as the temperatures were increased. The drying process reduces the moisture content of the food to a safe storage limit. Dried tigernut are better source of fat, fibre, protein and carbohydrate than fresh or raw tigernut sample.

**Keywords:** Tiger nut, drying, vitamin, mineral proximate, temperature, oven.

## I. INTRODUCTION

Tiger nut (Cyperus esculentus L.) is perennial edible grass-like plant which is native to the old World, and is one of the less known vegetable that produces sweet nut (Cos-kuner, et al., 2002). It an under-utilized plant that belongs to the family Cyperaceous and produces rhizomes from the base and its tubers are somehow spherical (Cortes et al., 2005). Cyperus esculentusis a monocotyledonous plants with about 4000 species worldwide (Ekeanyanwn and Ononogbu, 2010). Other names of the nut includes “chufa”, yellow nut sedge, Zulu nuts and earth nut, nut, and edible galingale (Pascual et al., 2000; Rubert et al, 2011; Oderinde and Tairu 1988). Tigernut grows freely and iswidely consumed in Nigeria, other parts of West Africa, East Africa. It is also cultivated in some part of Europe especially Spain including Arabia peninsula (Abaejoh et al., 2006). The nut grows up to 50- 250 tubers per plant and it tubers weighs 2 – 26 g (FAO, 1988).Tigernut has been considered to be a foodstuff since ancient times (Pascual, et al., 2000). It is highly harvested in Spain, and other West Africa countries like Nigeria, Ghana, Senegal, as well as South America and Chile (De-Castro et al., 2015; Sanchez-Zapata et al., 2012). Economically Cyperus esculentus has been described as an underutilized African crop with great potential for development (Bamishaiye and Bamishaiye, 2011). Tigernut in West Africa, are often part of the diet, they are cheap and available all year round, and having great nutritional benefits (Bamishaiye and Bamishaiye, 2011). In composition the nut has 3.75 % moisture, 5 % protein, 30 % lipid, 6.5 % fibre, 29.5 % starch and 47 % carbohydrates (Arafat et al., 2009). It is lactose or gluten free (Belewu and Abodunrin, 2006).

Report have shown Cyperus esculentus to be a healthy food, as it consumption can help prevent heart disease, thrombosis and it is said to activate blood circulation (Chukwuma, et al., 2010). The nut has starch content closely related to that of cassava, while the lipid and fiber contents are in resemblances to those found for almonds or pistachios. Tigernut has been found to be helpful in reducing the risk associated with colon cancer (Adejuyitan, et al., 2009). It is a good source of energy, minerals like phosphorus and potassium, and vitamins C and E (Belewu and Belewu 2007). Depending on the origin of the tubers tigernut contains 22 % to 45 % of fat in dry matter (Rosello-Soto et al., 2018). Its oil has fatty acid composition close to that of olive oil. Meaning that the nut consists of oleic acid with range of value of 65.5%-76.1% of the oil content (Muhammad et al., 2011; Yeboah et al., 2012) when compared to values for olive oil from 56% to 85% (Visioli and Galli, 1998; Fomuso and Akoh, 2002). It helps to prevent erectile dysfunction and it gives potassium boost (Bamgbose et al, 2003). The milk found in the nut can be used as alternative to that of cow milk as it is lactose free and can be used by individuals who are intolerance to lactose (Akoma et al, 2000). From report Cyperus esculentus is effective in preventing colon cancer, treating urinary tract and bacterial infection (Adejuyitan et al., 2009). It can also be used as feed for livestock as reported by other researchers (Wikipedia, 2005; Bamgbose et al., 2003; ONRG, 2005). Tigernut is a based food that can be prepared on a wide range of recipes and preparation methods. The health benefit and the nutritional potential associated with this nut makes it to offer a great potential for product development. It can be eaten raw, dried, baked roasted or can be processed into beverages or flour (Sanchez-Zapata et al., 2012). Flour from tiger nut (roasted) can sometimes be added bakery products or bisciuts (Coskuner, et al., 2002), as well as in soap making, oil, and starch extracts (Adejuyitan, 2011).

Drying has been known to prolong the shelf life of foods and is one of the most common and simple form of food preservation. The main aim of drying of foods is to reduce the moisture content to a level which allows safe storage over a period of time. Drying brings about reduction in weight and volume, minimizing packaging, storage and transportation cost (Okos et al., 1992). It stabilizes the fresh product by lowering the water activity and prolonging the keeping quality thus, reducing the storage volume and decrease transport costs (Govindarajan and Salzer, 1985). To make the product all year round and to prevent post-harvest losses, drying is extremely essential. The desire to prevent significant quality loss and to achieve fast and effective food dehydration has resulted in this study. Thus, the objective of this study is to determine the effect of drying temperature on the proximate, vitamins and mineral composition of tigernut (Cyperus esculentus)"

## II. MATERIALS AND METHODS

### 2.1. Materials

The yellow variety of tiger-nut sample (Cyperus esculentus) that was used for this study was purchased from main market, Nsukka, Enugu state, Nigeria.

### 2.2. Methods

**Sample Preparation**

The samples were prepared by sorting and hand picking to remove broken ones from the whole tiger-nut seeds. The sorted Tiger-nut sample was washed using a distilled water, to remove dirt or contaminant and the water further discarded. The sample was dried at four different temperatures (70, 75, 80, and 85) $^{O}$C using an electric oven and milled prior to analysis.

#### 2.2.1. Proximate composition

The proximate composition of the sample including the moisture, fat, ash, fiber, and protein content, were determined by method AOAC (2010)

#### 2.2.2. Vitamin composition

The method of Onwuka (2005) was used to determine the vitamin C content. AOAC (2000) was used to determine the Vitamin E (Tocopherol), Vitamin B1 (Thiamine), Vitamin B2 (Riboflavin) and Vitamin B3 (Niacin) content of the samples.

#### 2.2.3. Mineral composition

AOAC (2000) was used to determine Magnesium, zinc and iron content of the sample. Phosphorous content was determined using the molybdate calorimetric method**;** sodium content was determined using flame photometer as described by James (1995).

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### 2.2.4. Experimental Design and Data Analysis

The result obtained was laid out in Completely Randomize Design (CRD). Data was subjected to one-way analysis of variance (ANOVA) using statistical package (SPSS) and the mean was separated using Duncan's new multiple range test. Difference between mean was accepted at P<0.05.

## III. RESULTS AND DISCUSSION

### 3.1. Proximate composition of tiger nut samples

From Table 1, the moisture content varied from 3.63±0.32 to 42.53±2.73 % with sample D recording the lowest value and the raw sample the highest value. The moisture content from the raw sample is higher than the ones obtained for dried samples at different temperatures. There exist significant differences (p<0.05) among the raw and the dried samples. The moisture content of the dried samples decreased with increase in drying temperatures, though there were no significant differences (p<0.05) among the samples respectively. According to Ogunlade et al. (2015), the moisture content of raw tigernut sample is 43.84 % the value is slightly higher than 42.53±2.73 % obtained from this study. The results showed that raw tigernut sample has high moisture content. The drying operation significantly (p<0.05) reduced the moisture content of the sample. Oladele and Aina (2007) reported that the moisture content of dried tigernut sample for yellow variety is 3.50 %. The result agrees with the range of values (4.31±0.28 to 3.63±0.318 %) obtained from this study. According to Pearson (1994) moisture content is the measure of the amount of water in food samples, low moisture content suggests that food can be stored for a long time without mould development. Low moisture content is required for safe storage limits for plant food materials (Umar et al., 2007). The values obtained for the dried samples are in the range of 16.0 for safe storage of foods. This shows that these food materials can stay for a long period of time without deterioration.

Crude protein content of the dried sample varied from 8.54±0.46 to 8.68±0.46 % and the raw sample is 6.77±0.46 % respectively. The raw sample recorded the lowest value and sample D the highest protein value. The values obtained are more than double that of cow's milk (3.20 g/100 g), and was are three times the amount obtained for spinach (Gernah and Sengev, 2011).The result of the protein content for dried sample is similar to 7.15 % Oladele and Aina (2007) and lowers than 14.9% as reported by Ogunlade et al. (2015).

The Fat content varied from 18.5±0.30 to 31.01 ± 0.11 % with raw sample recording the lowest value and sample dried at 85 $^{o}$C the highest value. They were significantly differences (p<0.05) between the raw and the dried samples at different temperature respectively. The drying operation increased the fat content from 18.5±0.30 to 31.01 ± 0.11 %. The values of fat content obtained for the dried sample is slightly lower than 32.13% reported by Oladele and Aina (2007) but higher than 17.00 % as reported by Mohammed et al. (2018). The result showed that the raw sample had the lowest fat content and the dried samples had the highest fat content. There were significant differences (p<0.05) among the samples. The result also showed that tigernut has high fat content which could be extracted and utilized both in food industry and at home.

Ash content is a measure of the total mineral content of a food material. The ash content varied from 2.30± 0.10 to 5.01±0.01 % with raw sample recording the lowest value and sample D the highest value. There were significant differences (p<0.05) between the samples. The raw sample has ash content of 2.30 ± 0.10 respectively. There were significant differences in the ash content of the dried and the raw sample at (p<0.05). The values of ash content obtained in this study were increasing with increase in the drying temperatures. This result is in agreement with the report of Gernah and Sengev (2011) for dried food materials. According to Kumar et al. (2014), mild drying conditions with lower temperature may decrease drying rate but improve the product quality. From the report of Mohammed et al. (2018), the ash content of raw tigernut sample is 1.8 % respectively. The value is lower than 2.30±0.10 % obtained in this study. The difference may be due to environmental factors or differences in location where the samples were purchased. The values for the dried sample are in the range of 5.64 % reported by Ogunlade et al. (2018).

Fibre content for both the raw and the dried sample at different temperatures varied from 10.17±0.05 to 14.40±0.01 % respectively. The raw sample recorded the lowest value and sample D the highest value. There were significant differences (p<0.05) between the raw and the dried sample at different temperatures. The values obtained for all the samples are lower than the recommended average daily requirement for an adult (16-32 g) Gernah and Sengev (2011), while the value of the raw sample (10.17±0.05 %) is slightly lower than 13.10% reported by Mohammed et al., (2018) and also lower than 16.14% reported by Ogunlade et al.

(2015) but are still in the range, though the differences in the values may be due to seasonal factors or the locations where the sample where procured. The range of value (10.17±0.05 to 14.40±0.01 %) obtained in this study is still slightly higher than 6.25 % reported by Oladele and Aina (2007). The result shows that dried tigernut sample are better source fibre than fresh or raw tigernut sample.

Carbohydrate content varied from 19.96±1.94 to 39.20±0.99 % respectively. The result shows that raw tigernut sample is lower in carbohydrates when compared to the dried ones. There were significant differences ($p<0.05$) between the carbohydrate contents of the raw and dried sample. The result of carbohydrate content of the raw sample is lower than 17.82 % reported by Mohammed et al., (2018). The carbohydrate content of the dried sample is also lower than 46.99 % reported by Oladele and Aina (2007). The result obtained from the experiment shows that tigernut when dried could be a good source of carbohydrate. Dreonet al., (1990) showed that fruit had high carbohydrate content depending on the fruit maturity, type and environment where it is grown.

### 3.2. Vitamin composition of tiger nut samples

From Table 2, the result of the raw vitamin C content of the sample is 29.80±0.40 mg/100g respectively. This value is lower than (30.70 %) reported by Mohammed et al. (2018) but are still in range, though the differences in the value may be due to sample procurement location or seasonal factors. The result of the dried samples at different temperatures Table 2 varied from 21.53±1.96 to 27.88±0.42 mg/100g with sample dried at 85$^{o}$C (D) recording the lowest value and sample dried at 70 $^{o}$C (A) the highest value. The result shows that increase in temperature leads to decrease in the vitamin C content of the sample and this shows that vitamin C is heat labile. There were significant differences ($p<0.050$ among the samples.

The result for vitamin E varied from 4.273±0.404 to 5.073±0.237 mg/100g with sample D recording the lowest value and the raw sample the highest value. The values obtained are in the range of value reported by Mohammed et al. (2018). There were significant differences ($p<0.05$) among the samples.

Vitamin $B_1$ content for the raw sample is 0.860±0.053 mg/100g respectively. The result obtained is slightly different from the value obtained by Mohammed et al. (2018) and the result obtained for the dried sample at different temperatures ranged from 0.720±0.052 to 0.8200±0.052 mg/100g respectively. These values agree with the report of Oladele and Aina (2007). The result obtained for the dry samples is slightly higher than the one obtained for the raw sample. There were significant differences ($p<0.05$) among the samples.

Vitamin $B_2$ content which ranged from 0.473±0.0058 to 0.6067±0.0306 mg/100g with raw sample recording the highest value and sample dried at 80 $^{o}$C (D) the lowest value. There was significant difference ($p<0.05$) between the raw sample and the dried samples. The values decreased with increase in the drying temperatures. The values are in the range of value reported by Oladele and Aina (2007).

Vitamin $B_3$ for the dried samples ranged from 0.0573±0.064 to 0.0817± 0.0031 with sample dried at 80$^{o}$C (D) the lowest value (0.0573±0.064 mg/100g) while sample dried at 70 $^{o}$C recorded the highest value. The values obtained for the dried sample were decreasing with increase in temperature but there was no significant difference ($p<0.05$) between the samples. The result of the raw sample is 0.187±0.058 mg/100g. Though the result obtained are still in the range of value reported by Mohammed et al. (2018).

### 3.3. Mineral composition of tiger nut samples

Table 3; shows the result of calcium content of the raw sample and the dried samples at different temperatures. The result obtained for the raw sample is 87.64±0.69 mg/100g respectively. The result is higher than 83.00 reported by Ogunladeet al. (2015). The result of the dried sample varied from 140.0±1.00 to 144.53±0.46 mg/100g. There was an increase in the values as the temperature increased. The values obtained were lower than 155 mg/100g reported by Oladele and Aina (2007) and higher than 91.60 mg/100g reported by Ogunlade et al. (2005). All the values are in the range of 155 mg/100g reported by Oladele and Aina (2007). There were significant differences ($p<0.05$) among the samples. Calcium helps to builds healthy, strong bones and teeth and also assists blood clotting (Gordon, 1999). Deficiency can cause rickets, bone pain and muscle weakness. Taking tigernut fresh and dried will help to meet the calcium need of adults and children based on RDA of 0.6 to 0.8 g (Glewe et al., 2001).

Magnesium content of the raw sample is 53.12±1.20 mg/100g, while the dried samples varied from 60.23±0.29 to 65.81±1.63 mg/100g. The values of the magnesium content increased with increase in temperature. Raw sample recorded the lowest value and the sample dried at 85 °C had the highest magnesium content. There were significant differences ($p<0.05$) in the magnesium content of the samples. The values of the magnesium content are higher than 51.2 mg/100g reported by Oladele and Aina (2007).

The value of phosphorous for the raw sample is 155.8±0.15 mg/100g which is lower than 267.18 mg/100g reported by Mohammed et al., (2018) for raw sample, the differences may be due to the location in which the sample where purchased and the handling processes. The values obtained for dried samples at different temperatures ranged from 128.17±0.63 to 146.33±0.115 mg/100g with sample dried at 85°C (D) recording the lowest value and sample dried at 70°C (A) had the highest value. The values obtained decrease with increase in drying temperatures. There were significant differences ($p<0.05$) among the samples. The value obtained for the dried samples are higher than 121 mg/100g reported by Oladele and Aina (2007) but are still in the same range of value for dried samples of tigernut (cyperus esculentus).

The value of the zinc content is shown in Table 3. The value for the raw analysed sample is 0.022±0.01 mg/100g, the value is lower than 1.39 mg/100g as reported by Mohammed et al., (2018). The value of the dried samples at different temperature ranged from 0.041±0.004 to 0.88±0.006 mg/100g with sample dried at 70 °C having the lowest value and sample dried at 85°C had the highest value. The value increased with increase in drying temperature, and the result obtained is higher than 0.01 mg/100g reported by Oladele and Aina (2007). There was significant difference among the samples of $p<0.05$.

The result of the iron content for the raw sample is 3.57±0.10 mg/100g. The result is higher than 2.82mg/100g reported by Mohammed at al., (2008) and lower than 3.60mg/100g as reported by Ogunlade et al. (2015). The value for the dried samples at different temperatures ranged from 3.79±0.01 to 4.33±0.09 mg/100g. Sample dried at 70 °C recorded the lowest value and sample dried at 85 °C the highest value. The result obtained shows that increased in temperature leads to increase in the value of iron content. The value obtained is higher than 0.65 mg/100g (Oladele and Aina, 2007) and 3.80 mg/100g (Ogunladeet al., 2015). The values obtained are still in the same range. There were significant differences ($p<0.05$) among the samples.

Potassium content of the raw sample is 170.8 to198.5 mg/100g while the values for the dried samples varied from 193.0±10.6 to 198.5±2.52 mg/100g respectively. Sample dried at 70 °C recorded the lowest value and sample dried at 85°C the highest value. The value increased with increase in drying temperatures, and the result obtained is lower than 267.18 mg/100g as reported by Mohammed et al., (2018) and 216 mg/100g (Oladele and Aina, 2007). There were no significant differences ($p<0.05$) among the samples dried at different temperatures. Significant differences exists between the raw sample and the dried sample at $p<0.05$.

Sodium content of the raw sample is 0.77±0.46 mg/100g, while the dried samples ranged from 0.66±0.09 to 0.68±0.11 mg/100g. The values of the sodium content decreased with increase in temperature. Sample raw recorded the highest value 0.77±0.46 mg/100g and the sample dried at 85 °C the highest magnesium content 0.66±0.09 mg/100g. There were no significant differences ($p<0.05$) in the sodium content of the samples. The values of the sodium content are higher than 0.83 mg/100g reported by Ogunlade et al. (2015).

## IV. CONCLUSION

The effect of drying temperature on the chemical composition of tigernut was investigated. The result shows that tigernut is rich in macro and micronutrients required for proper growth and good health of humans. As the drying temperature was increasing, the Vitamin C content was decreasing, though the drying temperatures did not deplete the mineral content of samples. Thus, did not have negative effect on the nutritional content of the samples. The drying process reduces the moisture content of the food material to a safe storage limit and should be encourage.

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**Table 1. Proximate composition of tigernut samples dried at different temperatures is presented in Table 1**

| **Parameter (%)** | **Raw** | **A** | **B** | **C** | **D** |
|---|---|---|---|---|---|
| Moisture | $42.53^{b}\pm2.73$ | $4.31^{a}\pm0.28$ | $3.80^{a}\pm0.17$ | $3.71^{a}\pm0.38$ | $3.63^{a}\pm0.32$ |
| Protein | $6.77^{a}\pm0.46$ | $8.54^{b}\pm0.42$ | $8.60^{b}\pm0.44$ | $8.65^{b}\pm0.47$ | $8.68^{b}\pm0.46$ |
| Fat | $18.50^{a}\pm0.30$ | $30.51^{b}\pm0.62$ | $30.54^{b}\pm0.04$ | $30.68^{b}\pm0.05$ | $31.01^{b}\pm0.11$ |
| Ash | $2.30^{a}\pm0.10$ | $3.42^{b}\pm0.52$ | $3.70^{b}\pm0.53$ | $4.00^{b}\pm0.20$ | $5.00^{c}\pm0.95$ |
| Fibre | $10.17^{a}\pm0.05$ | $14.24^{bc}\pm0.05$ | $14.14^{b}\pm0.05$ | $14.40^{d}\pm0.01$ | $14.27^{c}\pm0.12$ |
| Carbohydrate | $19.96^{a}\pm1.94$ | $38.99^{b}\pm1.19$ | $39.2^{b}\pm0.99$ | $38.57^{b}\pm0.47$ | $37.4^{b}\pm0.50$ |

Values are means of triplicate determinations. Means with different superscripts within the same column are significantly different from each other ($p<0.05$). A = oven dried at 70 $^{0}$C, B = oven dried at 75 $^{0}$C, C = oven dried at 80 $^{0}$C, D = oven dried at 85 $^{0}$C.

**Table 2: Effect of drying temperature on vitamin composition tigernut (cyperusesculentus).**

| **Parameter (mg/100g)** | **Raw** | **A** | **B** | **C** | **D** |
|---|---|---|---|---|---|
| Vitamin C | $29.80^{d}\pm0.40$ | $27.88^{c}\pm0.42$ | $26.97^{bc}\pm0.75$ | $25.30^{b}\pm0.63$ | $21.53^{a}\pm1.96$ |
| Vitamin E | $5.073^{c}\pm0.24$ | $4.567^{ab}\pm0.29$ | $4.78b^{c}\pm0.72$ | $4.45^{ab}\pm0.26$ | $4.27^{a}\pm0.40$ |
| Vitamin B1 | $0.86^{c}\pm0.05$ | $0.820^{bc}\pm0.052$ | $0.767^{abc}\pm0.038$ | $0.737^{ab}\pm0.06$ | $0.720^{a}\pm0.052$ |
| Vitamin B2 | $0.607^{c}\pm0.03$ | $0.527^{b}\pm0.02$ | $0.493^{a}\pm0.01$ | $0.487^{a}\pm0.006$ | $0.473^{a}\pm0.01$ |
| Vitamin B3 | $0.187^{b}\pm0.06$ | $0.082^{a}\pm0.002$ | $0.071^{a}\pm0.001$ | $0.063^{a}\pm0.01$ | $0.057^{a\pm}0.006$ |

Values are means of triplicate determinations. Means with different superscripts within the same column are significantly different from each other ($p<0.05$). A = oven dried at 70 $^{0}$C, B = oven dried at 75 $^{0}$C, C = oven dried at 80 $^{0}$C, D = oven dried at 85 $^{0}$C.

**Table 3: Effect of drying temperature on mineral composition tigernut (cyperusesculentus).**

| **Parameter (mg/100g)** | **Raw** | **A** | **B** | **C** | **D** |
|---|---|---|---|---|---|
| Calcium | $87.64^{a}\pm0.69$ | $140.0^{b}\pm1.00$ | $142.5^{c}\pm0.57$ | $143.7^{cd}\pm1.27$ | $144.5^{d}\pm0.46$ |
| Magnesium | $53.12^{a}\pm1.20$ | $60.23^{b}\pm0.29$ | $62.04^{bc}\pm3.8$ | $64.21^{c}\pm1.5$ | $65.8^{c}\pm1.6$ |
| Phosphorous | $155.8^{e}\pm0.15$ | $146.3^{d}\pm0.12$ | $137.8^{c}\pm0.31$ | $135.9^{b}\pm0.46$ | $128.17^{a}\pm0.63$ |
| Zinc | $0.022^{a}\pm0.005$ | $0.041^{b}\pm0.004$ | $0.059^{c}\pm0.009$ | $0.07^{d}\pm0.005$ | $0.88^{e}\pm0.006$ |
| Iron (fe) | $3.57^{a}\pm0.098$ | $3.79^{b}\pm0.012$ | $3.967^{b}\pm0.153$ | $4.167^{c}\pm0.075$ | $4.327^{c}\pm0.092$ |
| Potassium | $170.8^{a}\pm9.06$ | $193.0^{b}\pm10.6$ | $195.2^{b}\pm5.64$ | $196.0^{b}\pm2.75$ | $198.5^{b}\pm2.52$ |
| Sodium | $0.77^{a}\pm0.46$ | $0.68^{a}\pm0.11$ | $0.67^{a}\pm0.05$ | $0.66^{a}\pm0.104$ | $0.66^{a}\pm0.093$ |

Values are means of triplicate determinations. Means with different superscripts within the same column are significantly different from each other ($p<0.05$). A = oven dried at 70 $^{0}$C, B = oven dried at 75 $^{0}$C, C = oven dried at 80 $^{0}$C, D = oven dried at 85 $^{0}$C.