



## Review Paper

# Structure and Nutritional Composition of Fonio (*Digitaria exilis*) Grains : A Review

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## Abstract

*Fonio is a traditional cereal which has often occupied a marginal position among the other cultures, in most of West African countries where it is cultivated, in spite of its cultural, nutritional and economic importance in many socio-cultural groups. Processing and utilization of fonio require adequate knowledge on its structural, chemical and nutritional characteristics which were the purpose of the present review. In this paper, the structure of fonio was reported and compared to the that of other major cereals, such as maize, rice, millet and sorghum. It seems that Fonio starch granules were like rice starches; hence some current applications of rice starch could be applied to that from fonio grains. The chemical and nutrient composition of D. exilis grain was also reviewed. The carbohydrates, protein, lipid, ash and fiber contents of fonio grains reported by various authors and also micronutrients mainly amino acids, fatty acids, minerals and vitamins were presented.*

**Keywords:** Structure, chemical composition, nutritional characteristics, fonio.

## Introduction

Cereals constitute the major sources of energy, protein, vitamins, and minerals for the world population. The cereal grains of economic importance are the cool-season crops mainly wheat, barley, oats, and rye and the warm-season cereals like rice, maize, sorghum and millet<sup>1-2</sup>. Maize produced about 46 million tons of protein per year. Besides other African traditional cereals, fonio grains have played a central role in the emergence and development of traditional agriculture, nutrition and indigenous medicine in the West African savannah<sup>3-5</sup>.

Fonio, though considered like one of the oldest West African indigenous cereals, has for a long time been neglected by scientific research and development programs. Fonio species belong to Poaceae family, sub-family of Panicoideae, tribe of Paniceae and the genus *Digitaria* Haller<sup>6-7</sup>. The genus *Digitaria* Haller comprises 230-325 annual and perennial grass species with a wide geographic distribution in the tropics and subtropics<sup>5-6</sup>. In the local agriculture of West Africa, hundreds of fonio landraces exist and derive from traditional selection<sup>3</sup>. White fonio (*D. exilis*) is the most diverse and widely cultivated species in West Africa and is called *Acha*, *Ipouaga*, *Feningué*, *Findi*, *Kansambahon*, *Ova* respectively in Nigeria, Benin, Burkina Faso, Guinea, Mali and Togo<sup>7</sup>. Fonio grains are extraordinary tiny with 1,000 weighting 0.5-0.6 g<sup>7</sup>. Some authors have shown that the general anatomical structure of the

fonio grain was similar to that of other grains<sup>8-10</sup>. Like rice, fonio grain is still surrounded by husks. Handling, processing, and utilizing grains depend on specific details of their structure. Chemical composition of different grain anatomical fractions varied according to cereals and nutrients were more concentrated in layers of pericarp and embryonic tissues.

The major constituents of cereals are the carbohydrates and proteins. However, other grain components such as lipids, minerals and vitamins may be of great significance in human nutrition because of the large contribution of cereals to the diet. Traditionally, fonio is a useful diet for those suffering from diabetes or for women after delivery<sup>11</sup>. According to Jideani<sup>12</sup>, fonio is one of the most nutritious and best-tasting of African cereals. Therefore, some authors, including Irving and Jideani<sup>9</sup>, Temple and Bassa<sup>13</sup>, Jideani and Akingbala<sup>14</sup>, Jideani *et al.*<sup>15</sup>, Jideani *et al.*<sup>16</sup>, Serna Saldivar<sup>17</sup>, Fliedel *et al.*<sup>18</sup>, Chukwu and Abdul-Kadir<sup>19</sup>, investigated macronutrient and micronutrient composition of fonio grains during these last years.

This paper aims to provide useful information of fonio (*Digitaria exilis*) grains about its structure, nutritional importance and current work carried out. Finally critical comments will be made for future directions that research and development should undertake to improve knowledge and promotion of fonio.

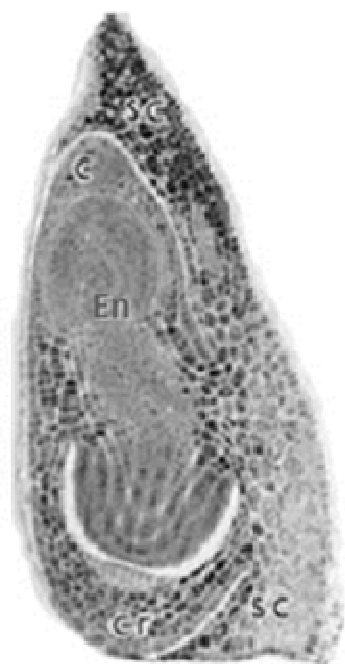
## Structure of fonio Grain

Fonio is a cereal, which is surrounded by an outer protective covering or the husk (glume) like the rice. Fonio grains with husk or paddy fonio measured between 1.5 and 1.8 mm long and approximately 0.9 mm wide<sup>9-10</sup>. Husks are removed by dehusking, to get whole grains or dehusked grains, and they constituted about 23 % of the paddy fonio weight<sup>10</sup>. Similar results were reported for rice grains of which the inedible husk represented 16-28 % (mean: 20 %) of paddy rice weight. Main anatomical parts of dehusked fonio or caryopsis were tegument, germ or embryo and endosperm. Caryopsis structure of fonio grains (figure 1) was mainly the same as that of the other major cereals such as maize, rice, millet and sorghum.

The tegument, external structure of caryopsis, is composed of pericarp and a layer of aleurone cells which are the first endosperm tissues. The endosperm of fonio grains consisted of the aleurone layer and the starchy endosperm. Aleurone cells contained lipid droplets and protein bodies<sup>9</sup>. The endosperm contained also lipids and proteins which were most abundant at its periphery and that decreased progressively toward the center of the grain contrary to the wheat<sup>10</sup>. The bulkiest element of fonio grains, as in most cereals, is the endosperm which is an important reserve tissue constituted of simple, polyhedral starch granules with diameters ranging between 2 and 13  $\mu\text{m}$ <sup>8,9,20</sup>.

Starch granules of rice grains were similar to those of the fonio with their polyhedral shape but their size ranging between 3-9  $\mu\text{m}$  is relatively lower than that of fonio grains. The microscopic aspect of starch granules is different for each cereal species. Some authors reported that fonio starches were like rice starches; hence some current applications of rice starch could be applied to starch from fonio grains<sup>11,14</sup>. Protein bodies of endosperm cells differed comparatively to those of cells of the aleurone layer in their composition, structure and function even though they are both classified as part of the endosperm<sup>9</sup>. The cells of the starchy endosperm have storage function exclusively, and are, in fact, non-living, whereas the cells of the aleurone layer possess synthetic and secretory functions<sup>9,21</sup>.

The germ of the fonio, a portion very essential to the cereal germination, is divided into two parts mainly the embryo and scutellum which separated it from the endosperm. The fonio embryo was larger in proportion to the caryopsis (about a third of the total caryopsis) than that of other cereal grains<sup>9</sup>. The cells of the embryo and scutellum were rich in lipid and protein bodies and contained globoids which are phytic acid inclusions. In contrast to fonio grains, the globoids have been found in the aleurone layer of wheat, barley, and oats and were determined to be crystals of calcium and magnesium double salt of myoinositol hexaphosphate<sup>9,22</sup>.



### Legend

sc: scutellum

En: starchy endosperm

c: coleoptile

cr: coleorhiza

**Figure-1**  
**Diagrammatic longitudinal section through a fonio grain**  
Source: Irving and Jideani<sup>9</sup>

## Chemical composition and nutritional value of fonio grains

The proximate chemical composition and major nutrient contents of fonio grain are presented in table 1. It should be noted that these values refer to the whole or dehusked grains.

**Energy value:** The energy value of fonio grains was not very much studied in literature. Fonio energy value has been investigated by Jideani and Akingbala<sup>14</sup>, who found 19400 KJ/kg (table 1). This result was higher than that reported by Serna Saldivar<sup>17</sup> for other cereals such as rice (18091 KJ/kg), maize (16982 KJ/kg) and sorghum (16245 KJ/kg).

**Carbohydrates:** Carbohydrates are major components in cereals and constitute the main energy sources used by the human organism. Carbohydrates form the basis of several important industries in the food and feed sectors, and provide renewable and environmentally friendly raw materials for industrial applications such as biodegradable plastics, adhesives, and ethanol-based fuels. The carbohydrates of fonio grains can also have many uses in industrial sector and their contents were ranged from 67.1 to 91 % with a mean value of 79.05 % (table 1). Nitrogen-Free Extract (NFE) or method by difference was used by all authors to determine the fonio carbohydrate contents. The lowest carbohydrate content was reported by Serna Saldivar<sup>17</sup> while the highest value was obtained by Jideani and Akingbala<sup>14</sup>. Carbohydrates are present in food products in the form of monosaccharides, oligosaccharides and polysaccharides like the starch and cellulose of vegetable cell walls.

**Starch:** Starch is the most abundant carbohydrate in fonio grains as in other cereals and the main provider of calories. Very few researchers have investigated the starch content of fonio grains. Cruz *et al.*<sup>10</sup> reported a starch content of 68% for the fonio grains (table 1). This starch percentage of the fonio grains was lower than that reported for sorghum and rice which was in average respectively 73.8 and 77.2%. Starch is normally composed of one-quarter amylose, with the remaining three-quarters being amylopectin but proportions varied generally according to species. Jideani and Akingbala<sup>14</sup> determined amylose content of fonio grains, procured from a local market in Nigeria, by the method described by Robyt and Bemis<sup>23</sup> and they obtained 28 % of amylose. According to Jideani and Akingbala<sup>14</sup>, this high amylose content was indicative of the non-waxy type of the fonio endosperm. The amylose contents of fonio from Nigeria have been also calculated with the iodine affinity (IA) values of starch, amylose and amylopectin and the results were ranged from 22.1 to 26.9 %<sup>24</sup>. The amylose percentage of fonio varied of 22.1-28 % (average: 25.05 %) <sup>14,24</sup>. Blakeney *et al.*<sup>25</sup> reported that the amylose content of rice influenced cooked grain texture and the resistance of the starch to overcooking. Starches from different sources differed in their overall properties due to differences in granule size distribution and shape, in amylose and lipid content, in distribution of chain

length in amylopectin, in phosphorylation and crystallinity. Starch hydrolysis gives various components including soluble sugars.

**Soluble sugars:** Soluble sugars were generally in very small quantities in the cereal grains and their concentration varied according to botanical species. The detected sugars in measurable quantities in the cereal grains were mainly saccharose, raffinose, stachyose, glucose and fructose. Some of these sugars, essentially the saccharose, glucose and fructose (table 1), were also identified in fonio grains and their average soluble sugar content was 1%<sup>10</sup>.

**Fibers:** Fibers, constituted of lignin and polysaccharides other than the starch, are the fraction of a consumed food which is not degraded in the gut. Crude fiber contents reported for fonio grains were in the range of 0.41-11.3 % with a mean value of 5.85 % (table 1). The lowest value (0.41 %) of crude fiber content was presented by Jideani and Akingbala<sup>14</sup> while the highest value (11.3 %) was reported by Serna Saldivar<sup>17</sup>. The high variation in the crude fiber contents of fonio grains could also be attributed to environmental influences, geographical location, agronomic and genetic factors on the one hand and to different analytical methods on the other hand. The highest average value of crude fiber content was obtained with fonio compared to results reported by Serna Saldivar<sup>17</sup> for sorghum (average: 2.7 %), millet (average: 2 %) and rice (average: 0.9 %). Hemicellulose, cellulose and lignin contents of fonio grains were respectively 3 %, 4 % and 0.5 %<sup>10</sup>. All cereals considered a rich source of insoluble dietary fiber mainly cellulose and insoluble hemicellulose<sup>17</sup>. According to some authors, a high-fiber diet may contribute to reduce the risk of cardiovascular diseases, colonic cancers and diabetes.

**Proteins and amino acids:** The main source of protein for the human diet comes from the cereal grains because they constitute the basic food in many developing countries. Protein contents of fonio grains were ranged from 5.1 %<sup>22</sup> to 11 %<sup>10,18</sup> with a mean value of 8.05 % (table 1). The methods of the Association of Official Analytical Chemists were used to assess the protein content of fonio grains by most of the authors<sup>13,14,19</sup>. Fonio protein contents were in average lower than values reported<sup>17</sup> for sorghum, millet and rice. Literature is limited on different protein fraction of fonio grains; only Jideani *et al.*<sup>15</sup> investigated the percentage of each protein fraction of fonio grains in various Osborne fractions. Fonio possessed also the four protein fractions, frequent in most cereals, mainly albumin (3.5 %), globulin (1.8 %), prolamin (5.5 %) and glutelin (14%). These results showed that the glutelin was the most important protein fraction in the fonio grains. The prolamin content of fonio (5.5 %) can be compared with rice-prolamin content of about 5 %<sup>15,26</sup>. However, in cereals such as maize, wheat and barley, prolamin is present in greater amounts<sup>15,27</sup>. Amino acid profiles of different fonio protein fractions showed that, as in the case of other cereals, prolamin and glutelin of fonio were storage proteins while albumin and globulin fractions contained

metabolic proteins of the grains<sup>15</sup>. Albumin and globulin, mainly located in cereal germ, contained the best profiles of essential amino acids. Amino acid composition of fonio grains (table 2) was determined by some authors who have used different methods and units expressed in g per 16 g N<sup>13,19,28</sup>, mol %<sup>16</sup> and percentage<sup>18</sup>. Essential amino acids identified in fonio grains were phenylalanine, histidine, isoleucine, leucine, lysine,

methionine, threonine, tryptophan and valine (table 2). However, lysine was deficient essential amino acid in fonio grain proteins as for most cereals<sup>18</sup>. The fonio grains were on the other hand rich in methionine and cysteine, two human-vital amino acids almost deficient in the major cereals like sorghum, rice, wheat or barley<sup>12,18,29,30</sup>.

**Table-1**  
**Proximate chemical and nutrient composition of fonio grains**

Composition	Fonio			References
	Min	Average	Max	
Energy value (KJ/kg)		19400		Jideani and Akingbala <sup>14</sup>
Carbohydrates (%)	67.1	79.05	91	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Starch (%)		68		Cruz <i>et al.</i> <sup>10</sup>
Amylose (%)	22.1	25.05	28	Cruz <i>et al.</i> <sup>10</sup> , Jideani and Akingbala <sup>14</sup> ; Jideani <i>et al.</i> <sup>24</sup>
Soluble sugars (%)		1		Cruz <i>et al.</i> <sup>10</sup>
Glucose (%)	-			Cruz <i>et al.</i> <sup>10</sup>
Fructose (%)	-			Cruz <i>et al.</i> <sup>10</sup>
Saccharose (%)	0.7	0.75	0.8	Cruz <i>et al.</i> <sup>10</sup>
Crude fiber (%)	0.41	5.85	11.3	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Protein (%)	5.1	8.05	11	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Jideani <i>et al.</i> <sup>15</sup> , Jideani <i>et al.</i> <sup>16</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Albumins		3.5		Jideani <i>et al.</i> <sup>15</sup>
Globulins		1.8		Jideani <i>et al.</i> <sup>15</sup>
Prolamins		5.5		Jideani <i>et al.</i> <sup>15</sup>
Glutelins		14		Jideani <i>et al.</i> <sup>15</sup>
Lipid (%)	1.3	3.25	5.2	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Ash (%)	1	3.5	6	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
<b>Vitamins</b>				
Thiamin (mg/100g)	0.3	0.39	0.48	Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup>
Riboflavin (mg/100g)	0.05	0.07	0.1	Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup>
Nicotinic acid (mg/100g)		3		Serna Saldivar <sup>17</sup>

**Table-2**  
**Amino acid composition of fonio grains**

Amino acid (%)	Fonio (g per 16 g N)			Fonio (mol %)	Fonio (%)
	Min	Average	Max	Average	Average
<b>Essential</b>					
Phenylalanine	2.34	3.72	5.1	3.1	0.47
Histidine	1.33	1.71	2.1	1.4	0.17
Isoleucine	1.37	2.68	4	3.2	0.28
Leucine	4.4	7.1	9.8	8.8	0.91
Lysine	1.9	2.25	2.6	1.3	0.19
Methionine	2.98	4.3	5.6	3.7	0.34
Threonine	1.89	2.94	4	4.9	0.34
Tryptophan	0.9	0.92	0.95	-	0.16
Valine	2.34	4.07	5.8	6.1	0.52
<b>Non essential</b>					
Aspartic acid	3.5	5	6.5	7.2	0.68
Glutamic acid	6.9	13.55	20.2	18.2	2.16
Alanine	4.2	6.6	9	11.4	1.24
Arginine	1.3	2.55	3.8	2.1	0.93
Cysteine	2.8	2.9	3	2.5	0.07
Glycine	1.9	2.55	3.2	6.5	0.08
Proline	3.2	5.15	7.1	7.2	0.51
Serine	2.1	3.6	5.1	7.9	0.49
Tyrosine	0.91	2.25	3.6	2.2	0.23

Source: Carbiener *et al.*<sup>28</sup>, Temple and Bassa<sup>13</sup>, Jideani *et al.*<sup>16</sup>, Fliedel *et al.*<sup>18</sup>, Chukwu and Abdul-Kadir<sup>19</sup>

**Lipids:** Lipids are relatively minor constituents in cereal grains. However, they are significant in human nutrition as energy source and essential fatty acids. Lipid contents reported for fonio grains were ranged from 1.3 % to 5.2 % with a mean value of 3.25 % (table 1). This mean value obtained for fonio grains are comparable to the average lipid contents reported for sorghum (3.2 %), lower and higher than those of millet (5.1 %) and rice (2.5 %) respectively<sup>17</sup>. Fatty acids found in cereal grains were mainly linoleic acid, oleic acid and palmitic acid. The fonio grain lipids constituted of more than 75 % unsaturated fatty acids (table 3) represented by linoleic acid (45.7 %) and the oleic acid (30.6 %). Other fatty acids were also identified in small quantities from the fonio grain lipids mainly palmitic acid, myristic acid, palmitoleic acid, stearic acid, linolenic acid, arachidic acid and behenic acid (table 3).

**Table-3**

**Fatty acid composition of fonio grains**

Fatty acid (%)	Fonio
C14:0 myristic acid	0,1
C16:0 palmitic acid	16,8
C16:1 palmitoleic acid	0,3
C18:0 stearic acid	4,1
C18:1 oleic acid	30,6
C18:2 linoleic acid	45,7
C18:3 linolenic acid	0,8
C20:0 arachidic acid	1,1
C22:0 behenic acid	0,4

Sources: Fliedel *et al.*<sup>18</sup>

**Minerals:** Ash contents of fonio grains varied from 1 to 6 % with an average value of 3.5 % (table 1). The lowest ash content (1 %) was found by Jideani et Akingbala<sup>14</sup> and Fliedel *et al.*<sup>18</sup> while the highest value was reported by Serna Saldivar<sup>17</sup>. Most of these authors have used atomic absorption spectrophotometry to determine the mineral elements contained in the fonio ash. Major mineral elements in the fonio grains were magnesium, phosphorus and potassium. The results of table 4 showed that Ca content ranges from 0.0067 to 0.03 %; P content varies between 0.09 and 0.25 %; K value ranges from 0.02 to 0.26 %; Na reported is in the range of 0.005-0.03 %; Mg content varies between 0.07-0.85; S content is in average 0.16 %; Fe level is 36-133.6 ppm; Cu value is 1.5-15 ppm; Mn level is 21.6-30 ppm and Zn content is 30-42.3 ppm. Fliedel *et al.*<sup>18</sup> reported that the fonio grains were richer in sulphur than other cereals.

**Vitamins:** Vitamins are essential organic molecules needed in very small amounts for cellular metabolism. Cereals are considered like important sources of B vitamins, except B<sub>12</sub> or cobalamin<sup>17</sup>. Very few authors have studied the vitamin contents of fonio grains (table 1). The fonio grains contained also the B complex vitamins mainly thiamin. The content of which ranged from 0.3 to 0.48 mg/100 g (average: 0.39 mg/100 g) and riboflavin the value of which ranged between 0.05 - 0,1 mg/100 g (average: 0.07 mg/100 g). Nicotinic acid or PP vitamin has been found in concentrations (3 mg/100g) higher than the other vitamins in fonio grains according to the results reported by Serna Saldivar<sup>17</sup>.

**Table-4**  
**Mineral composition of fonio grains**

Minerals	Fonio			References
	Min	Average	Max	
Macroelements (%)				
Calcium (Ca)	0.0067	0.018	0.03	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Phosphorus (P)	0.09	0.17	0.25	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup>
Potassium (K)	0.02	0.14	0.26	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Jideani and Akingbala <sup>14</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Sodium (Na)	0.005	0.017	0.03	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Magnesium (Mg)	0.07	0.46	0.85	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Sulphur (S)		0.16		Fliedel <i>et al.</i> <sup>18</sup>
Microelements (ppm)				
Iron (Fe)	36	84.8	133.6	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Copper (Cu)	1.5	8.25	15	Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Manganese (Mn)	21.6	25.8	30	Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>
Zinc (Zn)	30	36.15	42.3	Irving and Jideani <sup>9</sup> , Cruz <i>et al.</i> <sup>10</sup> , Temple and Bassa <sup>13</sup> , Serna Saldivar <sup>17</sup> , Fliedel <i>et al.</i> <sup>18</sup> , Chukwu and Abdul-Kadir <sup>19</sup>

## Conclusion

Large variations are observed in the reported values by different authors on chemical and nutritional composition of fonio grains. These differences can be attributed to environmental influences, geographical situation, agronomic characteristics, genetic factors and used analytical methods. Few authors have on the other hand investigated the energy value, starch, amylose, amylopectin, amino acid, fatty acid and vitamin contents of fonio grains. The fonio energy value was higher than those presented by some authors for other cereals such as millet, rice, maize and sorghum. Some authors have also revealed that fonio grains were rich in methionine and cysteine, two human-vital amino acids almost deficient in the major cereals. These interesting results would deserve to be validated on a great number of samples. Moreover, a large diversity of fonio landraces was reported in literature and available information on chemical and nutritional composition of fonio grains was limited.

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