

Studies on the Effect of Drying and Varietal Differences on Chemical Composition of Some Selected Onion Cultivars

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Abstract

The present study was undertaken to evaluate the nutritive values of Local and Improved varieties of Onion. The Local varieties used were White, Red and Yellow. They were sourced from Monguno, Dikwa and Jere respectively through Borno State Agricultural Development Program (BOSADP). The improved varieties based on their agronomical data, were B-14 and B-18. They were all sun dried to constant moisture. The following parameters were assayed; Proximate Composition, Mineral elements, Vitamin contents, phytochemical constituents and Total sugar contents using standard laboratory methods. The data obtained from the study were subjected to statistical analysis. The Onion samples were analyzed in two forms; fresh and dried. There were significant differences ($P < 0.05$) in the values of moisture, fats, Ash, Crude Fibre, Carbohydrates, and total energy contents within and between the varieties. The values were 87.52%, 84.77% and 92.00% for moisture 0.60%, 0.18% and 0.58% for Fats, 0.49%, 0.50%, 0.31% for Ash, 2.79%, 2.41%, 2.31% for crude fibre, 6.82%, 10.30%, 2.52% for Total carbohydrates and 40.42 Kcal/j, 50.20 Kcal/j and 24.28 Kcal/J for Total Energy. These data were for fresh Local varieties; white fresh (WF), red fresh (RF) and yellow fresh (YF) respectively, while for the dried Local varieties; WD, RD and YD the values were 1.00%, 1.40%, 1.28% for moisture, 0.04%, 0.02%, 0.03% for Fats, 7.12%, 5.40%, 6.33% for Ash, 7.40%, 8.33%, 7.37% for crude fibre, 82.14%, 82.76%, 82.57% for Total carbohydrates, and 338.08 Kcal/j, 339.56 Kcal/j and 340.54 Kcal/j respectively. There were no significant difference ($P > 0.05$) in the protein contents of the Fresh and dried local varieties. Similar trends were observed in the fresh and dried improved varieties. The results also showed that the dried Onion varieties were well enhanced in terms of Total carbohydrates, protein contents and Total energy values as they have higher values due to the drying processing. Results of the Phytochemical constituents disclosed that Tannins, Alkaloids, Saponnins, Glycosides, Flavanoids, Terpenes, Steroids and Phenols were present in both fresh and dried local varieties, as well as fresh and dried improved varieties. Phlambo tannins were detected only in fresh and dried Local variety Yellow (YF and YD), while coumarin and volatile oil were not detected in all the samples assayed. Thus it can be concluded that, drying further enhances the nutritional values of both the local and onions with better agronomical data.

Keywords: Onion; Local; Improved and Drying

Introduction

Onion, *Allium cepa*, is considered as one of the most important crops in all countries. Domestic Onion is the round, edible bulb of *Allium cepa*, a species of the lily family, and one of the world's oldest cultivated vegetable crops. Red, White and Yellow Onions represent the most known varieties of this species, but growers distinguish them also between freshly-consumer Onions and Onions for industrial transformation, on the basis of sowing time and technique, harvesting time, bulb size, among other characteristics [1]. Onion is a strong-flavored vegetable used in a wide variety of ways, and its characteristic flavor (pungency) or aroma, biological compounds and medical functions are mainly due to their high organo-sulphur compounds [2,3].

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Onion has different nutritional compositions, depending on the variety and stage of maturity, among others. However, according to the USDA National Nutrient Database for Standard Reference [4], the nutritional composition of raw Onions, per 100g of edible portion is 89.11g of water, 1.10g of protein, 0.10 total lipids (fat), 0.35g of ash, 9.34g of carbohydrate, 4.24g of total sugars and 1.7g of total dietary fiber, corresponding to an energy of 40 kcal. The most important minerals are potassium, calcium and selenium. Bulbs from Onion species are widely used as food flavoring and have been very much appreciated over the years, not just for its characteristic taste and smell but also because they contain significant amounts of beneficial compounds such as *allicin* and their derivatives or flavonoid glycosides [5,6]. In addition, *Allium* species are rich in flavonol, among which quercetin 3, 4'-*O*-diglucoside and 4'-*O*-glucoside represent the major components. Quercetin is known for its antioxidant and free radical scavenging power and its capability to protect against cardiovascular disease [7-10]. Bonaccorsi, *et al.* [1] identified seven flavonol glucosides on different varieties of Onion and consumption typologies and showed that two of which, quercetin 3, 4'-diglucoside and quercetin 4'-glucoside, and 3 represent about 90% of the overall contents. Significant differences in flavonol contents were also identified, from the very low quantity of antioxidant compounds in White Onion, about 7 mg/kg against 600-700 mg/kg that were found in Red and Yellow varieties, to the enormous content of flavonols that are present in Onions of prompt consumption. Thus, Onion represents a source of Beneficial components, which makes it a good antioxidant additive for food [11,12], increasing its potential usability as a functional food and in ethno medicine [13]. Moreover, garlic and Onion extracts have been recently reported to be effective in protecting against cardiovascular disease, because of their hypocholesterolemic, hypolipidemic, anti-hypertensive, anti-diabetic, antithrombotic and anti hyper homocysteinemia effects. Moreover, they possess many other biological activities including antimicrobial, antioxidant, anti carcinogenic, anti mutagenic, anti asthmatic, immunomodulatory and prebiotic activities [3]. In many countries, the major sources of nonnutritive components such as dietary flavonoids are Onions, Apples and Tea [5,14].

In the manufacture of processed foods such as soups, sauces, salad dressings, sausage and meat products, packet food and many other convenience foods, dehydrated Onion is normally used as flavor additive, being preferred to the fresh product, because it has better storage properties and is easy to use [15,16].

In addition, the preservation of vegetables, such as Onion, in the dried form is commonly practiced to reduce the bulk handling, to facilitate transportation and to allow their use during the off-season. However, in the drying process of shelf stable vegetables it is essential to preserve their desired quality attribute. The moisture removal during drying processes is greatly affected by the drying air conditions as well as the characteristic dimension of the material, whereas all other process factors have a practically negligible influence [17]. However, the drying conditions, such as temperature and moisture content, have a great influence on the food properties, such as flavor or colour and nutritional composition during processing or storage [16]. The new (improved) varieties of Onion are found to be resistant to diseases and as well have very short cultivation period with acceptable agronomical data, but there are no enough or adequate data on their end use utilization qualities. This work intends to investigate their nutrient contents in both fresh and dried and that of the local varieties in the same manner.

Materials and Methods

Materials

Sample Collection

The different varieties of matured and healthy Onion (white, yellow and red) of the local varieties were obtained from Monguno, Dikwa and Jere and improved varieties (BOSADP-VG-IH014N, BOSADP-VG-TH18F) were collected from the Agricultural field through Borno state Agricultural Development Program (BOSADP), and authenticated by a Seed Officer, in Borno state Agricultural Development Program (BOSADP), were used for this study.

Pre-treatment of Samples

All the varieties of Onion (local and the improved) were cleaned manually to remove all foreign matter and were washed with distilled water as described by Greenfield and Southgate, (2003). The samples were grouped as follows:-Local fresh and Dried, Improved

Fresh and Dried respectively. The fresh samples were immediately assayed for Vitamin, Mineral elements, Total sugar contents and phytochemical constituents. The dried samples were processed as follows:-, it was sliced into pieces < 5 cm and oven dried at 45°C to constant weight. The dried sample was grinded into a fine powdered form using a blender, and sieved using sieve, and were used for analysis in accordance with FOA standard.

Phytochemical Analysis

Phytochemical Screening: Phytochemical analysis of the sample was performed according to standard method as described below:

Test for Tannins

The plant extract (200 mg) was added to 10 ml distilled water. This process was immediately followed by filtration, addition of 2 ml filtrate and also 2 ml ferric chloride 10% (FeCl_3). A positive test was indicated by a blue black precipitate [18].

Test for Alkaloids

Exactly 200 mg of the extract was added to 10 ml methanol before subsequent shaking and filtration. To 2 ml of the filtrate, 1 ml of 1% HCl was added before the mixture was then boiled for 5 minutes, filtered and 6 drops of Mayer's reagent were added to 1 ml of the filtrate. A positive test was indicated by a creamy precipitate/brownish-red precipitate/orange precipitate [18].

Test for Saponin

The extract was subjected to the frothing test. The filtrate (0.5 ml) and 5 ml distilled water was taken and shaken in a test tube. If frothing or foaming persists for five minutes, it will indicate the presence of saponins [18].

Test for Cardiac Glycosides

Keller- Killiani's test by Evans [18] was used. Two ml of filtrate was added to 1 ml each of glacial acetic acid, FeCl_3 solution and conc. H_2SO_4 . Presence of cardiac glycosides was confirmed by a green colour.

Test for Steroids

Lieberman-Burchard reaction: A 200 mg portion of the plant material in 10 ml chloroform, 2 ml filtrate, 2 ml acetic anhydride and conc. H_2SO_4 was also added. A positive test was indicated by a blue-green ring indicating the presence of triterpenoids/steroids [18].

Test for Flavonoids

The presence of flavonoids was determined by adding 200 mg plant material to 10 ml ethanol, filtered, 2 ml of filtrate, conc. HCl and magnesium chips (3 pieces) were taken into a test tube. Presence of flavonoids will be indicated by a pink tomatocolour [18].

Test for Phloba tannins

A small amount of each extract was boiled with distilled water and then filtered. The filtrate was further boiled with 1% aqueous HCl. The appearance of red precipitate shows the presence of phlobatannins [18].

Test for Free Anthraquinone (Bontrager's test)

Bontrager's test was used to test for the presence of free Anthraquinone. The plant extract (0.5g) was shaken with 10 ml of benzene and then filtered. Five millimeters of the 10% ammonia solution was added to the filtrate. The mixture was then shaken and appearance of a pink, red or violet colour in the ammoniacal (lower) phase was taken as the presence of free anthraquinones [18].

Results

Table 1, presents the proximate composition of fresh and Dried Local varieties of Onion. The fresh Local varieties; WF, RF and YF recorded a values 87.52%, 84.77% and 92.00% for moisture, while the Dried Local varieties; WD, RD and YD recorded a value 1.00%, 1.40% and 1.28% respectively. The differences between the Local fresh and dried varieties were statistically significant ($P < 0.05$). The results of the protein contents of the fresh Local varieties and dried local varieties implied that the fresh local varieties: WF, RF and YF recorded a lower value as against the Dried Local varieties; however, the differences were statistically significant ($P < 0.05$). The Fresh

local varieties recorded a higher value of Fat contents when compared with dried local Varieties. The differences were statistically significant ($P < 0.05$). Significant increase in Total Ash and Crude fiber contents were recorded in the dried samples when compared with Fresh local varieties. The table also showed that the fresh Local varieties had a lower value of Carbohydrates and Total Energy contents when compared with dried Local varieties and were statistically significant ($P < 0.05$).

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Crude fiber (%)	Carbohydrate (%)	Total energy (KJ/cal)
WF	87.52+1.23 ^a	1.92+0.55 ^a	0.60+0.64 ^a	0.49+0.06 ^a	2.79+0.59 ^a	6.82+1.50 ^a	40.42+6.25 ^a
WD	1.00+0.60 ^b	2.30+0.17 ^a	0.04+0.01 ^b	7.12+2.91 ^b	7.40+1.28 ^b	82.14+3.63 ^b	338.08+1.40 ^b
RF	84.77+2.31 ^a	1.84+0.50 ^a	0.18+0.19 ^a	0.50+0.10 ^a	2.41+0.38 ^a	10.30+1.53 ^a	50.20+8.60 ^a
RD	1.40+0.46 ^b	2.09+0.47	0.02+0.02 ^b	5.40+1.43 ^b	8.33+0.51 ^b	82.76+1.30 ^b	339.56+3.80 ^b
YF	92.00+1.16	2.16+0.56 ^a	0.58+0.59 ^a	0.31+0.19 ^a	2.35+0.41 ^a	2.52+2.19 ^a	24.28+3.77 ^a
YD	1.28+0.58 ^b	2.41+0.13 ^a	0.03+0.02 ^b	6.33+2.00 ^b	7.37+0.64 ^b	82.57+2.24 ^b	340.54. 8.16 ^b

Table 1: Proximate composition of fresh and dried local and varieties of Onion.

Values are mean \pm S.D. $n = 9$.

Values with different superscript under the same sample along the column are significantly different ($P < 0.05$).

Key; WF = White fresh, F = Red fresh, YF = Yellow fresh, WD = White dried, RD = Red dried and YD = Yellow dried.

Table 2 presents the proximate composition of fresh and dried improved varieties of Onion. Higher moisture contents were observed in fresh improved varieties when compared with dried improved varieties. The differences were statistically significant ($P < 0.05$). Protein contents of fresh and dried improved varieties were in a range between 2.21-2.60%. The differences were statistically insignificant ($P > 0.05$). The table also showed that Fresh improved varieties B14F and B18F recorded values of 0.49 and 0.62, while the dried improved B14D and B18D varieties recorded 0.04 and 0.06 for Fat respectively. The differences were statistically significant ($P < 0.05$) Total Ash, Crude fibre, percentage carbohydrates and Total Energy contents recorded higher values in Fresh Improved varieties when compared with dried improved varieties. The differences were also statistically significant ($P < 0.05$).

Sample	Moisture	Protein	Fat	Ash	Crude fiber	CHO	Energy Kcal/J
B14F	89.30+0.01 ^a	2.50+0.01 ^a	0.49+0.02 ^a	0.37+0.01 ^a	2.00+0.01 ^a	5.34+0.00 ^a	35.77+0.19 ^a
B14D	1.62+0.03 ^b	2.21+0.18 ^a	0.04+0.01 ^b	6.22+0.11 ^b	6.23+0.25 ^b	83.68+0.34 ^b	343.91+1.30 ^b
B-18F	87.49+0.08 ^a	2.46+0.01 ^a	0.62+0.01 ^a	0.33+0.01 ^a	3.01+0.01 ^a	6.08+0.08 ^a	39.75+0.48 ^a
B18D	1.82+0.03 ^b	2.60+0.02 ^a	0.06+0.01 ^b	5.61+0.02 ^b	7.39+0.21 ^b	82.52+0.23 ^b	340.62+1.55 ^b

Table 2: Proximate composition fresh and dried improved varieties of Onion (%).

Values are the mean \pm S.D., $n = 9$.

Values with different superscript vertically along the column within the same treatment are significantly different ($P < 0.05$).

KEY: B14F=improved varieties BOSADP-14 Fresh, B18F = improved varieties BOSADP-18 Fresh, B18D = improved varieties BOSADP-18 Dried.

Table 3 presents the proximate composition of Fresh (local and improved) varieties of Onion. The Fresh local varieties; WF, RF and YF recorded a values 87.53%, 84.77% and 92.00% for moisture. The differences within the varieties were statistically significant ($P < 0.05$). The fresh improved varieties; B14F, and B18F also recorded a value of 89.30% and 87.49% for moisture. The differences within the fresh improved varieties were also statistically significance ($p < 0.05$). The result of the moisture content shows that there were no significance difference ($p > 0.05$) between the fresh local variety; WF (87.52%) and fresh improved variety B18F (87.49%). However, there were statistical difference ($P < 0.05$) between the fresh local varieties RF, YF and fresh improved variety B14F. The crude protein content for the local (fresh) varieties were statistically insignificant ($P > 0.05$) when compared within the local fresh varieties and with

the improved fresh variety B18F. The result of the protein contents of fresh improved varieties B14F (2.50) and B18F (2.46) indicated that there were statistically insignificant ($P > 0.05$) within the varieties. Analysis of the fat content revealed that there was no statistical difference ($P > 0.05$) within the fresh local varieties, within the fresh improved varieties, and between the fresh local and fresh improved varieties. The ash content of the fresh (local and improved) varieties shows that the local varieties; WF, RF and YF recorded a value of 0.50%, 0.31% and 0.37%. The differences within the Local varieties; WF and RF, were statistically significant ($P < 0.05$) when compared with YF variety. The improved (fresh) varieties B14F and B18F recorded (0.37%) and (0.33%), the differences were statistically insignificant. The difference between the local varieties WF and RF and improved variety B14F were statistically insignificant ($P > 0.05$), while the local variety YF and improved variety B18F were statistically insignificant ($P > 0.05$). The crude, fibre content of the fresh local varieties WF, RF and YF recorded 2.79%, 2.41% and 2.35% respectively. The difference within the varieties were statistically significant ($P < 0.05$). The fibre content of the improved fresh varieties B14F (2.00) and B18F (3.01%) shows that the differences were statistically significance ($P < 0.05$). The difference between local variety WF and improve variety B18F were statistically insignificant ($p > 0.05$), while the differences between the local varieties RF and YF and improved variety B14F were statistically insignificant ($P > 0.05$). The result of the Carbohydrate content and total energy content of the local fresh varieties of Onion WF, RF, and YF recorded values of 6.82, 10.30, 2.52 and 40.42, 5.02, and 24.88 respectively. The differences within the varieties were statistically significant ($P < 0.05$). The improved varieties followed the opposite trend for both the Carbohydrates and total energy content. The total Carbohydrates and total energy contents of the fresh improved varieties were statistically significance ($P < 0.05$).

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Crude (%)	Carbohydrate (%)	Total energy (KJ)
WF	87.52+1.23 ^a	1.92+0.53 ^a	0.60+0.64 ^a	0.49+0.06 ^a	2.79+0.59 ^a	6.82+1.50 ^a	40.24+6.25 ^a
RF	84.77+2.31 ^b	1.84+0.50 ^a	0.18+0.19 ^a	0.50+0.10 ^a	2.41+0.38 ^{ab}	10.30+1.53 ^b	50.20+8.60 ^b
YF	92.00+1.16 ^c	2.16+0.56 ^{ab}	0.58+0.59 ^a	0.31+0.19 ^b	2.35+0.41 ^{ab}	2.52+2.19 ^c	24.28+3.77 ^c
B-14F	89.30+0.01 ^d	2.50+0.01 ^b	0.49+0.02 ^a	0.37+0.01 ^{ab}	2.00+0.01 ^b	5.34+0.00 ^a	35.77+0.19 ^a
B-18F	87.49+0.08 ^a	2.46+0.01 ^{ab}	0.62+0.01 ^a	0.33+0.01 ^b	3.0+0.01 ^a	6.08+0.08 ^a	39.75+0.42 ^a

Table 3: Proximate composition of fresh (local and improved) varieties of onion.

Values are the mean \pm S.D., n = 9.

Values with different superscript vertically along the column are significantly different ($P < 0.05$).

Key: WF = White Fresh, RF = Red Fresh, YF = Yellow Fresh B-14F = improved variety BOSADP- 14 Fresh, B18 = improved variety BOSADP-18 Fresh

Table 4 presents the proximate composition of local and improved varieties of dried onion. The result of dried local varieties; WD, RD and YD recorded 1.00%, 1.40% and 1.28% for moisture. The difference within the local varieties was statistically insignificant ($P > 0.05$). The dried improved varieties B14D and B18D recorded 1.62 and 1.82% for moisture. The differences within the improved varieties were statistically insignificant ($P > 0.05$), but statistically significant ($P < 0.05$) when compared with the local variety. The result of the protein, Carbohydrates and total energy contents showed that the difference within the Dried local varieties were statistically insignificant ($P > 0.05$), and also between the Dried local and improved varieties were statistically insignificant ($P > 0.05$). The total fat content of the local varieties WD (0.04%), RD (0.02) show that the differences were statistically significant ($P < 0.05$). The values of the dried improve varieties B14D (0.04) and B18D (0.08) showed that the differences were statistically insignificant ($P > 0.05$). Data on the total ash content of the dried local varieties indicated that there was significant difference ($P < 0.05$) within the varieties; the dried improved varieties also followed the same trend. The results for the fibre contents showed that the values obtained were statistically significance ($P < 0.05$) within the dried local varieties WD, RD and YD; while the dried improve varieties B14D & B18D also followed the same trend.

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Crude (%)	Carbohydrates (%)	Total energy (KJ)
WD	1.00+0.60 ^a	2.30+0.17 ^a	0.04+0.01 ^a	7.12+2.91 ^a	7.40+1.28 ^a	82.14+3.63 ^a	338.08+14.10 ^a
RD	1.40+0.46 ^{abc}	2.09+0.47 ^a	0.02+0.02 ^b	5.40+1.43 ^b	8.33+0.51 ^a	82.76+1.30 ^a	339.56+3.80 ^a
YD	1.28+0.58 ^{abc}	2.41+0.13 ^a	0.03+0.02 ^{ab}	6.33+2.00 ^c	7.37+0.64 ^{ac}	82.57+2.24 ^a	340.54+8.96 ^a
B-14D	1.62+0.03 ^b	2.21+0.18 ^a	0.04+0.01 ^a	6.22+0.11 ^{dc}	6.23+0.25 ^b	83.68+0.34 ^a	343.91+1.30 ^a
B-18D	1.82+0.03 ^c	2.60+0.02 ^{ab}	0.06+0.01 ^a	5.6+0.02 ^{eb}	7.39+0.21 ^{ad}	82.52+0.23 ^a	340.62+1.55 ^a

Table 4: Proximate composition of Dried (local and improved) varieties of Onion.

Values are the mean ± S.D., n = 9.

Values with different superscript vertically along the column are significantly different (P < 0.05).

Key: WD = White Dried, RD = Red Dried, YD = Yellow Dried B-14D = improved variety BOSADP- 14 Dried, B-18D = improved variety BOSADP-18 Dried.

Table 5 presents Phytochemical constituents of Local and improved varieties of fresh Onion. The results of the preliminary phytochemical analysis of the local varieties WF, RF and YF contains Tannins, Alkaloids, Saponnins, Glycosides, Flavanoids, Terpenes, steroids and Phenols. Phlobatannin was only detected in Local WF variety. Volatile oil and Coumarin were not detected in fresh Local varieties of the Onion. The improved varieties B14F and B18F also showed the presence of Tannins, alkaloids, Saponnins, Glycosides, flavonoids, terpenes, steroids and phenol. Phlobatannins, coumarin and volatile oil were not detected in the fresh improved varieties.

Sample	WF	RF	YF	BOSADP 14F	BOSADP 18F
Tannins	+	+	+	+	+
Alkaloids	+	+	+	+	+
Saponins	+	+	+	+	+
Glycosides	+	+	+	+	+
Flavonoids	+	+	+	+	+
Terpenes	+	+	+	+	+
Steroids	+	+	+	+	+
Phlobatannins	-	-	+	-	-
Phenol	+	+	+	+	+
Coumarin	-	-	-	-	-
Volatile Oil	-	-	-	-	-

Table 5: Phytochemical constituents of Fresh (Local and Improved) varieties of Onion.

Key: + means present, - means absent, WF = white fresh, RF-Red fresh, and YF = Yellow fresh.

Table 6 presents Phytochemical constituents of dried (Local and improved) varieties of Onion. The results of the preliminary phytochemical analysis of the dried local varieties WD, RD and YD contains Tannins, Alkaloids, Saponnins, Glycosides, Flavanoids, Terpenes, steroids, Phenols. Phlobatannin, coumarin and volatile Oil were not detected in all the dried Local varieties. The dried improved varieties B14D and B18D also showed the presence of Tannins, Alkaloids, Saponnins, Glycosides, Flavanoids, Terpenes, Steroids and Phenol, Phlobatannins, coumarin and volatile oil were not detected in the improved varieties.

Sample	White	Red	Yellow	BOSADP 14	BOSADP 18
Tannins	+	+	+	+	+
Alkaloids	+	+	+	+	+
Saponins	+	+	+	+	+
Glycosides	+	+	+	+	+
Flavonoids	+	+	+	+	+
Terpenes	+	+	+	+	+
Steroids	+	+	+	+	+
Phlobatannins	-	-	+	-	-
Phenol	+	+	+	+	+
Coumarin	-	-	-	-	-
Volatile Oil	-	-	-	-	-

Table 4.4b: Phytochemical constituents of Fresh (Local and Improved) varieties of Onion.

Key: + means present, - means absent.

Discussion

The moisture contents of fresh Local varieties WF, RF and YF were found to be 87.52, 84.77 and 92.00%. The value of the fresh local variety YF was higher compared to fresh local varieties RF and WF. The slight differences observed in the moisture contents may be attributed to their differences in variety, geographical region and experimental error. These results were also found to be similar to those found by Pandey, *et al.* [19], and Pruthi [20]. They reported that fresh Onion contain 86.6-86.9 percent moisture. The moisture content of the fresh improved varieties B14F and B18F were within a closer range of between 87.49-89.30. The differences were statistically significant ($P < 0.05$). The differences in the moisture contents within the fresh improved varieties may be due to soil condition, maturity and experimental error. The highest moisture contents were found in fresh local variety YF (89.30%) followed by the improved fresh variety B14F (89.30%). Significant reduction ($P > 0.05$) was recorded after drying both the Local and the improved varieties of Onion as expected. The present study is in agreement with the literature of Watt and Merrill [21]. They found that dried onion contain 4% moisture.

The protein contents of the fresh Local varieties WF, RF and YF were found to be 1.92, 1.84 and 2.16 %. The fresh Local variety YF recorded a highest value (2.16%). The differences within the fresh Local varieties were statistically insignificant ($P > 0.05$). The slight differences observed within the Local varieties may be attributed to varietal differences, maturity and soil types among others. The protein contents of the fresh improved varieties B14F and B18F were found to be statistically significant ($P < 0.05$). The protein contents of the fresh (local and improved) varieties were statistically insignificant ($P > 0.05$) when compared with the protein contents of the dried (Local and improved) varieties. This finding implied that drying process did not result in any lose of protein content. The results of this findings is also in accord with the literature of Okos., *et al.* [22], Sangwan., *et al.* [23] and Roy [24]. They reported that protein contents in fresh and dried product are almost similar.

The fat contents of the fresh local varieties were found to be statistically insignificant ($P > 0.05$). However; there was a little variation within and between the varieties. This may be due to variety differences and geographical regions. The values of the fresh Local and improved varieties were higher when compared to dried Local and improved varieties. The decrease in the fat contents observed in dried Onion samples may be due Oxidation during drying. Similar findings were reported by Okos [22], that oxidation can lead to decrease in fat contents.

The total Ash contents of the fresh Local varieties WF, RF and YF were between a range of 0.31-0.50%. The value of the fresh Local variety RF was higher compared to fresh Local varieties WF and YF. The differences may be due to different in the Total solid of the

samples. The result of the total ash content of the fresh improved varieties showed that there were no significant different ($P > 0.05$) The total Ash contents of the Fresh Local and improved varieties were in a range of 0.31-0.50%. The fresh Local variety RF (0.50) was higher when compared with the fresh improved varieties B14F (0.37) and B18F (0.33). The differences may be attributed to genetic composition, maturity and experimental error.

The total crude fibre contents were statistically insignificant ($P > 0.05$) when compared within the Fresh local varieties. These values were lower when compared with fresh improved variety B18F. The differences may be due to variety differences and genetic composition. Significant increase ($P < 0.05$) in the crude fibre contents were recorded after drying.

The carbohydrate content of the Fresh Local variety RF (10.30%) was higher when compared to the fresh local varieties WF and YF. This is because the moisture content of the RF variety was lower. Carbohydrate contents were obtained by differences, the higher the moisture contents, the lower the carbohydrate contents. The improved varieties followed the same trend. Significant increase ($P < 0.05$) in the carbohydrate content of the loc was recorded when compared with the dried samples. The results of the present study is in accord with the literature of Pandey, *et al.* [19]. He found that fresh big Onion contains 11.0% and dried Onion contains 74.1% carbohydrate. It was also in accord with the findings of Watt and Merill [21] that dried Onion contains 80.2% carbohydrate. The differences in the carbohydrate contents of the present study and the literature cited above was very little and may be attributed to among others, sample to sample variations, variety, maturity and weather.

The result of the mean values of the total energy contents of the fresh local varieties WF, RF and YF indicated that the RF variety recorded the highest value when compared with the fresh local WF and YF. This variation may be due to variety differences, maturity and Onion size. The energy contents of the fresh improved varieties were statistically significant ($P < 0.05$). The improved variety B14F had the higher value compared to B18F. This may be due Geographical region, maturity and experimental error. Significant increase was observed the dried (local and improved) varieties of Onion when compared with the fresh (local and improved) varieties. The total energy contents of the dried local and improved varieties were between the range of 338-34.9 Kcal/J. This caloric value of dried (Local and improved) varieties showed that it could be a reliable source of energy and can thus provide a large portion of the daily requirement of 2,500 to 3,000kcal/J for adults if large quantities are consumed.

Total phenolic contents were found to be present in both local and the improved varieties, and are found to be present even after drying. This implies that phenolic compounds are relatively stable to heat. The antioxidant activity of Onion suggests that phenolic compounds would be major contributors to the antioxidant capacity of Onion [25]. Other Phytochemicals present in both the local and the improved varieties of the Onion include Tannins, alkaloids, saponins, glycosides, flavonoids, Terpenes and steroids. This suggests that variety has no effects on the phytochemical contents of Onion. Coumarin and volatile oil neither were nor detected in both the local and the improved varieties. This implied the essential oil is very volatile. This is in line with the report of Martinez, *et al.* [26], that volatile oil have tendency to evaporate on exposure to air even at ambient condition. Phlobatannin is present only in Yellow Local varieties. The results of the drying also follow the same trend. This also suggests that phytichemoical constituents are thermo stable and are not affected by heat.

Conclusion

On the basis of the comparative assessment, it can be disclosed from this work that local varieties were better due to their higher, ash, carbohydrates and total energy contents with an adequate quantity of vitamins and mineral elements with potentials to meet the nutritional requirements of human health. However, the improved varieties were still within the acceptable standards in terms of energy values, proteins. On the other hand, the study of the dried Onion varieties indicated that there were minimum loss of the nutrient in both the local and improved varieties of Onion during drying process, but the calorie content of the dried Onion were relatively better than the fresh variety and have a longer shelf-life than the fresh Onion varieties because of the significant decrease in the moisture contents due to drying effects. The studies on the phytochemical screening also showed that drying does not have any effect on the parameters screened.

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