ISSN No:-2456-2165

Comparative Analysis on Phytochemicals, Proximate composition and Mineral Element of Aqueous Seed Extract of Three Varieties of Wheat Cultivated in Kazaure

Gambo I[1]*, Rabi R. A[2], Abdulmumin Y[3], Abdulmumin T. M[3] and Dalhatu M[3]
*[1]Department of Forestry, College of Agriculture and Technology
Hussaini Adamu Federal Polytechnic Kazaure, Jigawa State.
[2]Department of Science Laboratory Technology, College of Science
Hussaini Adamu Federal Polytechnic Kazaure, Jigawa State[2]
[3] Department of Biochemistry, Faculty of Science,
Kano University of Science and Technology Wudil, Kano, Nigeria

Abstract:- The utilization of wheat based foods are now considered as an alternative to reduce the effect of hunger and malnutrition worldwide, this is due to increase in human population. This paper aimed to evaluate the phytochemical, mineral element and proximate composition of three varieties of wheat grain cultivated in Kazaure Local Government, Jigawa state, Nigeria. The qualitative phytochemicals were analysed according to Brain and tuner [3] methods, proximate composition by method described by A.O.A.C[7] while the mineral element were evaluated using AAS. The phytochemicals such as alkaloids, flavonoid, terpenoids, tannins, saponins, phenols and steroids were found in all the three wheat varieties. The proximate of the three varieties showed that the ash, carbohydrate, moisture, proteins, fats and fibre content were in range of 1.58± 0.15 to2.67±0.07, 73.30±0.22 to 74.38±0.04, 5.21±0.060 to 6.18±0.12, 11.48±0.21 to 13.49±0.010, 3.65±0.030 to 4.84±0.020 and 1.58±0.01 to 2.73±0.03 respectively. The mineral composition of the three wheat varieties indicated the sodium(Na), potassium(K), calcium(Ca), magnesium(Mg), iron(Fe) and zinc(Zn) for *T. Aestivum* were found to be 273.34±0.001, 318.67±0.001, 50.02±0.0017, 130.63±0.0042,56.12±0.0012, 12.43±0.0011 mg/100g and that of *T. Durum* were 250.20±0.001, 310.00±0.001, 20.92±0.0014, 88.65±0.0033, 38.83±0.0008 and 11.04±0.0016 mg/100g respectively while *T. spelta* revealed that the mineral elements were found to be 245.00±0.001,290.92±0.0012,15.65±0.0033, 68.83±0.0006, 30.04±0.0012 and 9.20±0.002 for sodium(Na), potassium(K), calcium(Ca), magnesium (Mg), iron(Fe) and zinc (Zn) respectively. In conclusion, presence of secondary metabolites in all the three varieties indicated the therapeutic properties of the wheat, the levels of mineral element were found to be within the recommended value by FAO/WHO for grains. While the proximate analysis revealed by the three varieties of wheat proved it as good source of nutrients.

Keywords:- *Phytochemicals, Proximate, Mineral Element, Wheat.*

I. INTRODUCTION

Wheat (*Triticum spp*.) is regarded as the most commonly grain with high beneficial to mankind. Its ranks in second after maize in for the production as a cereal crops in which rice was classified as the third cereals. Wheat grain is an essential food used for the production of flours used for making breads, cookies, pasta, cakes etc. as well also fermented to produced alcohol, bear etc. Wheat is cultivated for the production of forage as livestock feeds and it can also be used for roofing and other construction activities of thatch [1]. Wheat is a crop of interest in Nigeria as it is the main component of bread and other wheat-based products such as, biscuits, macaroni, spaghetti, etc. Due to high temperature and humidity cultivation of wheat is not very favorable in Nigeria for optimum yield.

These nutrients are essential for the physiological functions of human body. Such nutrients and biomolecules like carbohydrates, fats, and proteins play an important role in satisfying human needs for energy and life processes [2]. Additionally, chemical composition diversity in grain also includes many compounds that are beneficial to humans; vitamins, antioxidants, anti-carcinogens and many other compounds with medicinal value. This wheat grain is made up of many important secondary metabolites that are good free radical scavengers used for management of cancer and other related diseases for human health. Secondary metabolites may be applied in nutrition and as pharmacologically active agents. Plants are also known to have high amounts of essential nutrients, vitamins, minerals, fatty acids and fibre [2]. The research is aimed to evaluate the phytochemicals, mineral elements and proximate compositions of three varieties of wheat grain cultivated in Kazaure Local Government, Jigawa state, Nigeria.

II. MATERIALS AND METHODS

A. Sample Identification and Collection:

The wheat grains were harvested at farms and identified at the Department of Agriculture, College of Agriculture, Hussaini Adamu Federal Polytechnic, Kazaure.

B. Sample Treatment

The wheats samples were washed twice with tap water and rinsed with deionized water. Samples were air-dried for 7days and then dried in an oven as at 60^0C for 12 hours. This followed by grinding using pestle and mortar. The obtained samples were sieved using (125µm mesh sieve).

C. Extraction of the Wheat Extract

Extraction of the powder wheat was conducted using water (Aqueous). The extracts were concentrated in vacuum using rotary evaporator. After concentration, each extract was allowed to dry and kept for further analysis.

D. Preliminary Phytochemical Screening

Preliminary phytochemicals screening was carried out on each of the three wheat varieties for alkaloids, tannins, saponins, glycosides, steroids/triterpenoids flavonoids and Anthraquinones using standard techniques of Brain and tuner [3]

- **Test for Alkaloid**: This was carried out by the methods of Trease and Evans [4] .

Exactly 0.5g of the wheat extract was stirred with 1% aqueous HCl ($5cm^3$) and few drops of Dragren droffs reagent (potassium bismuth iodide solution) was added and a lcm^3 portion of the solution form was treated with wagners reagent (solution of iodine in potassium iodide), the formation of precipitate indicated the presence of Alkaloids.

- **Test for tannins:** This was carried out by the method of Earl and Waren [5].

Exactly 0.5 g of the dried powdered of the wheat extract was boiled in $20cm^3$ of water in a test tube and then filtered. A few drops of 0.1% ferric chloride were added and observed for brownish green coloration.

- **Test for saponins**: This was carried out by the method of Earl and Waren [5].

Two gram (2g) of the powdered wheat was boiled in $20cm^3$ of distilled water in a water bath and filtered. Then the filtrate($10cm^3$) was mixed distilled water($5cm^3$) and vigorously shake till a forth formed. Three (3) drops of olive oil was mixed with frothing and shake for the formation of emulsion.

- **Test for Flavonoids**: This was carried out by the method of Sofowara [6]

Exactly $5cm^3$ of dilute ammonia solution was added to a portion of the filtrate (obtained using filter paper) of the wheat extract followed by addition of concentrated H_2S0_4. A yellow colouration observed indicate the presence of flavonoids. The yellow colouration disappeared on standing.

- **Test for terpenoids** This was carried out by Salkowski test:

To five ($5cm^3$) of the wheat extract was added in $2cm^3$ of chloroform, and concentrated H_2S0_4 ($3cm^3$) were carefully added to form a layer. A reddish brown coloration at the interface was formed to show positive results for the presence of terpenoids.

- **Test for cardiac glycosides**: This was carried out by Keller-Killani test

Five 5 cm^3 of extract was mixed with 2 ml of glacial acetic acid followed by addition of a drop of ferric chlorides solution. This was under-layed with 1 ml of concentrated sulphuric acid. A brown ring at the interface formed which signified a deoxysugar properties of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form gradually throughout thin layer.

E. Proximate Composition Determination:

The proximate composition such as moisture, ash, crude lipids, fibre and protein content were determine according to The method described by A.O.A.C [7] , while the carbohydrate was evaluated by differences [8].

F. Minerals Analysis

Mineral elements were determined using Atomic Absorption Spectrophotometer.

G. Data Analysis

The data were statistically analysed at P-value ($p<0.05$) significant was accepted and comparison between the data was performed using one-way analysis of variance (ANOVA).

III. RESULT AND DISCUSSION

A. Qualitative determination of Phytochemicals analysis of three varieties of wheat (Triticum aestivum, Triticum Durum and Triticum. spelta)

The phytochemicals screening of the three varieties of aqueous wheat extract has shown that all the three varieties contain alkaloids, flavonoid, terpenoids, tannins, saponins, phenols and steroid (Table 1). The presence of these secondary metabolites in all the three varieties further support therapeutic properties of the wheat. Saponins are known for their anti-inflammatory and antimicrobial effects [9]. While, flavonoids have been reported to possess many useful properties such as anti-inflammatory activity, estrogenic activity and antimicrobial activity [10]. Similarly, alkaloids have significant pharmacological potentials in modern medicine, this includes analgesic (e.g., morphine), anti-hyperglycemic (e.g., piperine), anticancer (e.g., berberine), antiarrhythmic (e.g., quinidine), antibacterial (e.g., ciprofloxacin). Plant secondary metabolites served as radical scavengers, with positive biomedical effects against cardiovascular diseases. Polyphenols are present in cereals including maize. While

terpenoids were reported to be a good natural flavor, additive for foods and play an important role in alternate medicine[10].

Table 1:- Phytochemicals constituent of *Triticum aestivum, Triticum Durum* and *Triticum. Spelta*

Phytochemicals	*T.Aestivum*	*T. Durum*	*T. spelta*
Alkaloids	+	+	+
Flavonoids	+	+	+
Terpenoids	+	+	+
Saponins	+	+	+
Phenols	+	+	+
Steroids	+	+	+

Keys: (+) mean present , (-) means Absent

B. Proximate Composition of three varieties of wheat cultivated in Kazaure farming areas.

The results of the proximate composition of the three wheat samples are presented in Tables 2 Moisture content was highest in *T. Durum* (9.19%) followed by *T.Aestivum* and then *T. spelta* which is the lowest among the three varieties. The lower moisture content of all the three wheat variety indicates that it has a good keeping quality than the other cereals such as maize, rice etc which has high moisture content [11]. This is because food-spoiling mostly occur where there is higher moisture or moisture environment during storage. Therefore, the low moisture content found in foods is related to it longer periods of storage and prevent growth of microbes and biochemical changes in the foods. [11]. Similarly, higher moisture content in foods causes the growth of micro-organism and damage to the food [12].

Protein being the body building nutrient was found to be the highest in *T.Aestivum* (12.39%) followed by *T. spelta* (11.03%) and *T. Durum (*10.49%) implying that the cereals are particularly useful in reducing the prevalence of malnutrition and it relatives. The differences among the three varieties may be related to geographical location this is because soils with high nitrogen levels have higher protein levels [13]. Similarly, Ijabadeniyi and Adebolu [14] reported that the % protein from three maize varieties in Nigeria ranged from 10.67-11.27%. While Iken *et al*. [15] study showed that the mean content of protein was 10.8%, 11.1% and 10.5% for the three maize samples investigated. In Pakistan the composition of protein from wheat flour was ranged from 10.13 to 14.74%. while sorghum samples evaluated showed that the content of protein are in ranged from 14.51 to 14.80%. Pearson reported that most food source from plant have more than 12% of its total protein content and its regarded as good potential source of protein [13].

The low crude fats content exhibited by all the three wheat variety in which *T.Aestivum* was the lowest follows by *T. Durum* and then *T. spelta*. The low crude fat content revealed that wheat can be stored for a long periods and prevent the development of odour as well oxidation of some fatty acids that may be present, this also increased the quality of the foods. Fats also provides essential fatty acids developments in children and adult [16]. Similarly, the results on sorghum revealed that the fat ranged from 3.58 to 4.47%. this cereal has low fat content similar to what was obtain in this study [17]. Crude fibre helps in the prevention of heart diseases, colon cancer, diabetes e.tc [18]. In this study crude fibre of *T. Durum* was highest (3.19%) followed by *T. spelta* (2.83%) and *T.Aestivum* (1.86%). The higher fibre of *T. Durum* may be served as laxative on GIT and increased faecal bulk and reduction in plasma cholesterol level [19] than the *T.Aestivum* and *T. Durum* . Similar study reported a higher fibre values ranged from 2.07-2.77% grown in Nigeria [14]. However, the fibre content indicated from study (1.09-3.19%) is found to be within the recommended value for many children. The ash content, which is an index of mineral contents, the ash content of *T.Aestivum* was the highest follows by *T. Durum* and then *T. spelta* (Table 2). However, all the value obtained were lower than the recommended value. The carbohydrate content of cereals is starch, in which 56 percent was found in oats while 80 percent in maize grain [20]. Foods like millet, maize etc absorbed large quantity of water during cooking this may be due to high amount of starch, this make this food bulky and is consumed by children in large quantity when compared with other type of foods for energy and it contained high amount of nutrients as reported by FOA [21]. The major food component in grains is carbohydrates, and in this study the wheat was found to have high carbohydrates which ranged from 73.30±0.22 to 74.38±0.04 with highest value for *T. Durum*. Ikram Ullah *et al* [22] reported that maize has similar carbohydrates values ranging from 69.659-74.549%. While Ijabadeniyi and Adebolu[14] reported lower values that maize cultivated in Nigeria was found to be ranged from (65.63-70.23%) in carbohydrate content [14]. Carbohydrate in sorghum and rice were found to be range from 68.34 to 69.65%. 51.5-86.9% respectively [23]. This indicated that wheat used in this study has high carbohydrate content when compared with other cereals [24].

ISSN No:-2456-2165

Table 2:- Proximate Composition of Three Variety of Wheat Cultivated in Kazaure farming area

Cereals	Ash (%)	Carbohydrate(%)	Moisture(%)	Protein(%)	Fat (%)	Fibre(%)
T. aestivum	2.67±0.07[a]	74.38±0.22[e]	5.46±0.10[d]	12.04±0.05[g]	3.66±0.050[i]	1.79±0.11[l]
T. Durum	2.18±0.01[b]	73.78±0.04[e]	6.18±0.12[f]	11.48±0.21[h]	3.65±0.030[i]	2.73±0.03[l]
T. spelta	1.58±0.15[c]	73.30±0.38[e]	5.21±0.06[d]	13.49±0.01[g]	4.84±0.020[k]	1.58±0.01[m]
Recommeded valus	<3.00	≥64.00	<5.00	7-15.00	1.00-7.00	<5.00

Result are presented in triplicated as means± standard deviation. Mean value with different superscript in the same column are significantly different (p≥0.05)

C. Mineral composition (mg/100 g) of three varieties of wheat grain

The mineral composition of the three wheat varieties shown in Table 3. The result indicated the level of sodium(Na), potassium(K), calcium(Ca), magnesium(Mg), iron(Fe) and zinc(Zn) for *T.Aestivum* were 273.34±0.001, 318.67±0.001, 50.02±0.0017, 130.63±0.0042, 56.12±0.0012, 12.43±0.0011 mg/100g and that of *T. Durum* were 250.20±0.001,310.00±0.001,20.92±0.0014, 88.65±0.0033, 38.83±0.0008 and 11.04±0.0016 mg/100g respectively while *T. spelta* revealed that the mineral elements were found to be 245.00±0.001, 290.92±0.0012, 15.65±0.0033, 68.83±0.0006 30.04±0.0012 and 9.20±0.002 for sodium(Na), potassium(K), calcium(Ca), magnesium(Mg), iron(Fe) and zinc(Zn) respectively.

Table 3:- Mineral composition (mg/100 g) of three (3) varieties of wheat grain

Cereals	Na	K	Ca	Mg	Fe	Zn
T. aestivum	273.34±0.001[q]	318.67±0.001[s]	50.02±0.0017[u]	130.63±0.0042[w]	56.12±0.0012[z]	12.43±0.0011[c]
T. Durum	250.20±0.001[r]	310.00±0.001[s]	20.92±0.0014[v]	88.65±0.0033[x]	38.83±0.0008[a]	11.04±0.0016[c]
T. spelta	245.00±0.001[r]	290.92±0.001[t]	20.65±0.0033[v]	68.83±0.0006[y]	30.04±0.0012[b]	9.20±0.002[d]
Recommended value FAO/WHO (2001)	296.00	516.00	60.00	76.00	≥16.00	≥3.20

Result are presented in triplicate as Mean ± standard deviation . *Result are presented in triplicated as means± standard deviation. Mean value with different superscript in the same column are significantly different (p≥0.05)*

The level of mineral elements of *T.Aestivum* was high then that of *T. Durum* and *T. spelta* but were all found to be within the recommended level, except sodium, the sodium level of all the three varieties were below the recommended value. The high level of Zinc and iron obtained in this study is in line with FAO/WHO [21] report of cereal crops. Iron and calcium are important mineral element used in management of iron and calcium deficiency and also help in bone development in children and adolescent, cereal crops were reported to have large amount of these mineral elements. In adult it was reported to have used in the improvement of blood pressure and other cardiovascular related diseases [25]. High amount of sodium to potassium ratio was obtained in this study when compared with lower values obtained in rice and maize grain. This make the food from wheat as the most suitable for infant and thus with premature heart. The role of potassium on the effect of sodium is control of blood volume and pressure this proved that high potassium consumption is related to protection against high blood pressure and other heart diseases. Therefore, Na:K ratio in the body play an important role against blood pressure. And its recommended to be less than one in the diet specifically for thus affected with high blood pressure and children with premature heart [26]. The building block of bones in living system is calcium and it is an important chemotherapeutic element that can lead to osteopenia Hassan *et al*, [27]. While magnesium served as an activator of coenzymes in protein and carbohydrate metabolism. In summary the three varieties wheats studied indicated that the variation in the mineral element composition may be related to agricultural practices, genetic factors, soil composition and fertilizer used during cultivation.

IV. CONCLUSION

In conclusion, presence of secondary metabolites in all the three varieties indicated the therapeutic properties of the wheat, the levels of mineral element were found to be within the recommended value set by FAO/WHO for grains. While the proximate analysis revealed by the three varieties proved the wheat grain as good source of nutrients.

ACKNOWLEDGEMENT

The authors wish to acknowledged Tertiary Education Trust fund (TETFUND) Nigeria and Hussaini Adamu Federal Polytechnic Kazaure, Jigawa State. Nigeria for sponsoring the Research under Institutional Based Research Grant (TETFUND/DESS/POLY/KZR/IBR/2017).

- *Conflict of Interest*

The authors declared no any conflict of interest

REFERENCES

[1]. Orakwe, F. C., Olugbemi, L. B., Olarewaju, J. A. and Aremu, J. A. (1991). Development of wheat germplasm with moisture tolerance in Nigeria. *Proceeding of the 11TH National Irrigation and Drainage Seminar.* 93-99.

[2]. Gafar, M. K., and Hodo, A. U. (2011) *Electronic Journal of Environmental Agricultural and Food Chemistry* 10 (3) Pp 2007 – 2018.

[3]. Brain KR. and Tuner TD, (1975), The practical evaluation of phytopharmaceuticals.Wright Scientectica Publishers, *Bristol.* Pp57-58.

[4]. Trease, G.E., and Evans, W.C. (1989). *Pharmacognsy.11th edn.Brailliar Tiridel Can*. Macmillian publishers. Pp 357-359.

[5]. Earl,J.K and Waren. M. S. (1962). *Chemical composition of plant Chemistry* 5th ed. W.B Saunders Company. Pp 352 -770.

[6]. Sofowora, A.E. (1993). *Medicinal plants and Traditional Medicine in Africa.*2nd edition spectrum Book Ibadan, Nigeria, P, 289.

[7]. A.O. A. C. (Association of Official Analytical Chemists) (1980). *Official Method of Analysis* 15th Edition Washington D. C.

[8]. Eno-Obong HN, Carnovale E A (1992). Comparison of the proximate, mineral and amino acid configuration of some known and lesser known legumes in Nigeria. *Food Chemistry*; 43:167-175.

[9]. Shittu, O. K. and Tanimu, M.(2012), "Proximate analysis of wheat supplemented diet and its anti-trypanosomal effect on infected rat", *IJABR* Vol. 4(1&2) pp. 109 – 103.

[10]. Cushnie TPT, Cushnie B, Lamb AJ (2014). Alkaloids: An overview of their antibacterial, antibiotic-enhancing and antivirulence activities. Vol. 44, *International Journal of Antimicrobial Agents*. *Elsevier* B.V.:377-86

[11]. Alozie YE, Iyam MA, Lawal O, Udofia U, Ani IF (2009). Utilization of Bambara ground flour blends in bread production. *Journal of Food Technology*;7(4):111-114.

[12]. Temple VJ, Badamosi EJ, Ladeji O, Solomon M (1996). Proximate chemical composition of three locally formulated complementary foods. *West African Journal of Biological Sciences*; 5:134-143.

[13]. Brown, K. H. (1991) "The importance of Dietary Quality versus Quantity for weanlings in the developed countries", A Framework for Discussion. *Food and Nutrition Bulletin.* 13 (2): 86-93.

[14]. Ijabadeniyi AO, Adebolu T.T (2005). The effect of processing methods on the nutritional properties of ogi produced from three maize varieties. *Journal of Food. Agriculture and Environment*.;3:108-109.

[15]. Iken JE, Amusa NA, Obatolu VO (2002). Nutrient composition and weight evaluation of some newly developed maize varieties in Nigeria. *The Journal of Food Technology in Africa*. ;(7):27-29.

[16]. Mustafa AA, Magdi A (2003). Proximate composition and the content of sugars, amino acids and anti-nutritional factors of three sorghum varieties. Res. Bult., No. (125), *Agric. Res. Center*, King Saud Univ.;5-19.

[17]. Moss, R., Gore, P.J. and Murray, I.C (1987) "The influence of ingredients and processing variables on the quality and microstructure on Hokkien, Cantonese and instant noodles" *Food Microstructure*. Vol. 6, 63-74.

[18]. Aiyesanmi, A. F. and Oguntokun, M. O. (1996), "Nutrient composition of Dioclea reflexa seed an underutilized edible legume" Rivista Italiana delle Sostanze *Grasse*. Vol. 73 pp. 521–523.

[19]. Okoye ZSC (1992). Biochemical aspects of nutrition. Prentice-Hall of India, New Delhi;147- 195.

[20]. Eliasson AC, Larsson K (1993). Cereals in bread making. New York, Marcel Dekker, Inc.;376

[21]. FAO/WHO (2001). Human vitamin and mineral requirements, Report of a joint FAO/WHO expert consultation, Bangkok Thailand, *Food and Nutrition Division*, FAO Rome. ;7-8.

[22]. Ikram U, Muhammad A, Arita F (2010). Chemical and nutritional properties of some maize (*Zea mays* L.) varieties grown in NWFP, Pakistan. *Pakistan Journal of Nutrition*. ;9(11):1113-1117.

[23]. Oko AO, Ubi BE, Efisue AA, Dambaba N (2012). Comparative analysis of the chemical nutrient composition of selected local and newly introduced rice varieties grown in Ebonyi State of Nigeria. *International Journal of Agriculture and Forestry*.;2(2):16-23.

[24]. Butt and MS Batool R (2010) "Nutritional and Functional Properties of Some Promising Legumes Protein Isolates", *Pak, J. Nutri*. 9(4): 373-379

[25]. Corleone J (2011). Nutritional & therapeutic values of guinea corn, Demand Media, Inc. Retrieved on October 20, 2012. Available: www.livestrong.com/article/474074

[26]. Cappuccio FP, McGregor G.A(1991). Does potassium supplementation lower blood pressure? A meta-analysis of published trials. *Journal of Hypertensive*.;9:465-473.

[27]. Hassan, L.G, Abdulrahman F.W and Zuru A.A (2004). Nutritional and Phytochemical investigation of *Diospyromespiliformis* (L). *Nigerian Journal of Basic and applied Science*. 13:1-8.