Online Journal of Animal and Feed Research

Volume 4, Issue 2: 25-28 (2014) *ISSN 2228-7701*

PROXIMATE ANALYSIS AND ANTI-NUTRITIONAL FACTORS OF GROUNDNUT AND MELON HUSK

S. ABDULRAZAK[1], D. OTIE[2], Y.A. ONIWAPELE[2]

[1]Department of Veterinary Physiology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria
[2]Department of Veterinary Pharmacology and Toxicology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria

*E-mail: sazzak175@gmail.com

ABSTRACT: Groundnut and Melon husks (shell) were collected from the market side in Kaduna metropolis, Kaduna State and milled into powder for proximate and anti-nutritional analysis. The results of proximate analysis showed that groundnut shell contained moisture content, ash content, crude fibre, lipid, crude protein, carbohydrate, oxalate, phytate, cyanogenic glycosides and trypsin inhibitor are 8.0%, 2.50%, 59.0%, 0.50%, 4.43%, 25.57%, 220mg/100g, 362.1mg/100g, 1.60mg/100g, and 25 TUI/mg respectively while melon shells contained 7.50%, 6.50%, 51.50%, 11.90%, 4.68%, 17.92%,132mg/100g, 62mg/100g,0.50 and 60 TUI/mg. These two agricultural wastes were found to have high nutritive values and low anti-nutritive values and can be used as an alternative source of animal feeds for herbivores and also solve a waste disposal problem and helping in turning waste into a wealth.

Keywords: Groundnut Husk, Melon Husk, Proximate Analysis, Anti-Nutritional Factors And Animal Feeds

ORIGINAL ARTICLE
Received 18 Feb. 2014
Accepted 20 Mar. 2014

INTRODUCTION

The groundnut and melon husks, (*Arachis hypogea* and *Citrullus vulgaris*) are shells that are discarded after processingor shelling of groundnut and melon seeds. Groundnut (Arachis hypogea) is a specie in the legume or bean family (Fabaceae) and the most important legume in Africa (Sellscope 1962). It is an important crop of Brazilian origin, though now cultivated in tropical and temperate climates. Groundnut is a good protein source and has a high lysine content which makes it a good complement for cereal protein which is low in lysine (Okaka 2005). Groundnut plant is a low growing, annual legume with central upright stem. They are grown all over Nigeria with major production in northern part of the country. The numerous branches vary from low flat to almost erect. Groundnut varieties are separated into bunch and runner types. The nuts which are legume pods like peas and beans are closely clustered at the base of the bunch type. The runner varieties have nuts scattered along their prostrate branches from base to tip (Icrisat, 2005). The groundnut has a well developed tap root with numerous lateral roots that extends several inches into the ground. Most roots have nodules but bear very few root hairs (Icrisat, 2005). Groundnut provides an inexpensive source of high quality dietary protein and oil. The vast food preparations incorporating groundnut to improve the protein level has helped in no small way in reducing malnutrition in the developing Countries (Asibuo et al., 2008). Groundnut provides considerable amounts of mineral elements to supplement the dietary requirements of humans and farm animals. (Asibuo et al 2008).

Melon is a cucurbit crop belonging to the family cucurbitaceae (Abiodun and Adeleke, 2010). Melon (seed) crops are grown, harvested and processed in large tonnage in Kaduna Municipal Area of Kaduna State, Nigeria. The seeds are removed from the fruit, washed, sun-dried and sold in large quantities (tonnage) annually for commercial purpose (as a special soup condiment). They are also used as domestic remedy for urinary tract infection, hepatic congestion, intestinal worms and abnormal blood pressure (Moerman, 1998). The freshly shelled seeds has been reported to contained 34.24% crude protein, 45.95% fat, 7.18% crude fibre, 4.05% ash, 8.03% moisture and 0.56% carbohydrate (Fagbohun et al., 2011). Storage for long duration can decrease the percentage fat, ash, fibre and mineral contents (Fagbohun et al., 2011, Ekundayo and Idzi, 2005).

However, large quantities of the groundnut and melon husks are discarded and burnt, which pollute the environment (Ogbe and George, 2012). A major factor limiting the wider food use of many tropical plants is the ubiquitous occurrence in them of a diverse range of natural compounds capable of precipitating deleterious effects in man and animals. Manifestation of toxicity ranges from severe reduction of food intake and nutrient utilization to profound neurological effects and even death. Compounds which act to reduce nutrient utilization and/or food intake are often referred to as anti-nutrient factors (ANF) (Onwuka, 2005).

To cite this paper: Abdulrazak S., Otie D., Oniwapele Y.A. 2014. Proximate analysis and anti-nutritional factors of groundnut and melon husk. *Online J. Anim. Feed Res.*, 4(2): 25-28.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Many chemical components of natural food products have been identified as toxicants and some of these include cyanogenic glycoside, hemagglutinin, saponin, gossypol, goitrogen, trypsin inhibitor, oxalates, phytates and anti-vitamins (Onwuka, 2005).

MATERIALS AND METHODS

Most of the methods adopted in this work (proximate analysis) are those recommended by (AOAC 1980) except otherwise stated.

Proximate Analysis

Moisture Content: 2.0g of the sample(s) were placed in an oven maintained at 100 - 103°C for 16 hours with the weight of the wet sample and the weight after drying noted. The drying was repeated until a constant weight was obtained. The moisture content was expressed in terms of loss in weight of the wet sample.

Ash Content: 2.0g of each of the oven-dried samples of A and B in powder form were accurately weighed and placed in crucible of known weight. These were ignited in a muffle furnace and ashed for 8 hours at 550°C. The crucible containing the ash was then removed, cooled in a dessicator and weighed and the ash content expressed in term of the oven-dried weigh of the sample.

Protein: The protein nitrogen in 1g of the dried samples were converted to ammonium sulphate by digestion with concentrated H_2SO4 and in the presence of CuSO4 and Na_2SO4. These were heated and the ammonia evolved was steam distilled into boric acid solution. The nitrogen from ammonia was deduced from the titration of the trapped ammonia with 0.1M HCl with Tashirus indicator (double indicator) until a purplish pink color was obtained. Crude protein was calculated by multiplying the valve of the deduced nitrogen by the factor 6.25mg.

Crude Fibre: 2.0g of each sample was weighed into separate beakers, the samples were then extracted with petroleum ether by stirring, settling and decanting 3 times. The samples were then air dried and transferred into a dried 100ml conical flask. 200cm^3 of 0.127M sulphuric acid solution was added at room temperature to the samples. The first 40cm^3 of the acid was used to disperse the sample. This was heated gently to boiling point and boiled for 30 minutes. The contents were filtered to remove insoluble materials, which was then washed with distilled water, then with 1% HCl, next with twice ethanol and finally with diethyl ether. Finally the oven-dried residue was ignited in a furnace at 550°C. The fibre contents were measured by the weight of the left after ignition and were expressed in term of the weight of the sample before ignition.

Lipid Content: The lipid content was determined by extracting the fat from 10g of the samples using petroleum ether in a soxhlet apparatus. The weight of the lipid obtained after evaporating off the petroleum ether from the extract gave the weight of the crude fat in the sample.

Carbohydrate: The carbohydrate content of the samples were determined as the difference obtained after subtracting the values of organic protein, lipid, ash and fibre from the total dry matter.

Anti-nutritional Factors *(Toxicants)*

Oxalate: This was determined using Dye method (Dye, 1956).2g each of the samples was extracted with dilute HCl, 10ml concentrated ammonia and then precipitated with calcium chloride as calcium oxalate. The precipitate was then washed with 25ml of hot 25% H_2SO_4 and dissolved in hot water and titrated with 0.05M $KMnO_4$ to determine the concentration of oxalate

Phytate: This was determined using McCance-Widdowcon method (McCance-Widdowcon 1935) as modified by (Wheeler and Ferrel 1971). 2g of the defatted samples were extracted with 3% Triochloroacetic acid (TCA) was precipitated with 4ml of ferric chloride solution. The precipitated ferric phytate was converted to ferric hydroxide with 4ml 1.5M sodium hydroxide each and was then dissolved in hot 40ml 3.2M HNO_3 and then diluted with 20ml of 1.5M KSCN. The iron was determined colorimetrically

Trypsin Inhibitor (TI): 1.0g grounded samples was extracted with 50ml 0.5M NaCl, centrifuged and filtered and the filtrate was then used for assay (Onwuka, 2005).

Cyanogenic glycosides: 5g of the samples were grounded into paste and were soaked in distilled water for 4 hours for the liberation cyanide. The liberated cyanide was steam distilled and 4ml of 6N NH_4OH and 5% w/v KI were added to the distillate portion before titration with 0.02N $AgNO_3$ to a faint but permanent turbidity (ml of 0.02N AgNO3 = 1.08 mg HCN) (Onwuka, 2005).

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of groundnut and melon husk while Table 2 shows antinutritional factors of groundnut and melon husk. The results of the proximate analysis showed groundnut shells and melon husk to contained appreciated amounts of moisture content (8.0%, 7.50%), ash content (2.50%, 6.50%), crude fibre (59.0%, 51.50%), lipid (0.50%, 11.90), crude protein (4.43%, 4.68%), and carbohydrate (25.57%, 17.02%), (Table 1). The results obtained from this research work are in agreement with Jekayinfa and Omisakin (2005) who reported a similar range of values. The presence of these essential nutrients and minerals imply groundnut and melon husks could be utilized as a feed ingredient for poultry and domestic animal. Minerals are essential nutrients, which are said to be present in small amounts in the body or in several parts per million (Gafar and Itodo, 2011). They are essential because they each play important role in metabolic processes of the body and their absence can cause deficiency symptoms in animals (Gafar and Itodo, 2011, McDonald, 1995).The moisture, ash,

To cite this paper: Abdulrazak S., Otie D., Oniwapele Y.A. 2014. Proximate analysis and anti-nutritional factors of groundnut and melon husk. *Online J. Anim. Feed Res.*, 4(2): 25-28.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

and crude fibre content of the two samples indicate that they can be easily dried so that they could easily burn off when used as a source of heat (Jekayinfa and Omisakin, 2005). The anti-nutrients such as phytates in foods are known to bind with essential minerals (like calcium, iron, magnesium and zinc) in the digestive tract, resulting in mineral deficiencies (Bello et al., 2008). They bind minerals to form insoluble salts, thereby decreasing their bioavailability or absorption (Thompson, 1993, Guil and Isasa, 1997).Oxalate binds with calcium to form calcium-oxalate crystals which are deposited as urinary calcium (stones) that are associated with blockage of renal tubules (Blood and Radostits, 1989). Proper food processing would reduce anti-nutrients. Bacteria and fungi have often been identified as cyanide detoxifying microorganisms (Dwivedi et al., 2011). In this study, the levels of anti-nutrients and cyanide detected in the melon husks were very low. The presence of nutrients in melon husks imply they could be utilized as a feed ingredient in poultry diets. Nutrients are known to improve the performance and health of birds. Nutrients are required for proper bone development and improved eggs quality.

Groundnut shell has a higher carbohydrate content than the melon shell while the melon shell has a higher protein and lipid content than the groundnut shells as shown in (Table 1). The result of these analysis shows that the two samples have a relatively high nutritive value and can be used as an alternative source of animal feed for herbivores.

The antinutritional factor analysis of groundnut shells and melon shells revealed that groundnut shells have a higher oxalate and phytate content than the melon shell while the melon shells have a higher cyanogenic glycoside and trypsin inhibitor content than the groundnut shells as shown in Table 2. The lethal level for these anti-nutrients is 50 - 60rng/kg for cyanogenic glycoside and phytate (Onwuka, 2005) and 2 - 5g/kg for oxalate and trypsin inhibitor (Onwuka, 2005).

Table 2 show that the results obtained for both groundnut and melon shell for the anti-nutritional factors were below the lethal level so they are safe for consumption as agricultural feed for herbivores.

Table 1 - Proximate Composition of the shells

Samples	Parameter (%)					
	Moisture content	Ash content	Crude fibre	Lipid	Crude protein	Carbohydrate
Groundnut shell	8.00	2.50	59.0	0.50	4.43	25.57
Melon shell	7.50	6.50	51.50	11.90	4.68	17.02

Table 2 - Antinutritional factors of the shells

Samples	Parameter (mg/100g)			
	Oxalate	Phytate	Cyanogenic glycoside	Trypsin inhibitor (TUI/mg)
Groundnut shell	220	362.1	1.60	25
Melon shell	132	62	0.50	60

CONCLUSION

The relatively high nutritive value of these two samples indicates the need for the use of these two samples as agricultural feed for herbivores. The anti-nutritional contents of these samples are below the lethal level and are safe for consumption. It is envisaged that the usability of these samples as agricultural feed would solve a waste disposal problem and help in turning the waste around us for wealth.

REFERENCES

Abiodun OA and Adeleke RO (2010). Comparative studies on nutritional composition of four melon seeds varieties, *Pakistan Journal of Nutrition*, 9(9): 905-908

Association of Official Analytical Chemist (AOAC) Official Method of Analysis.1980, 1984 and 2000. 12th and14th ed. edited by William Harwite and Sidney Williams respectively, Washington DC USA Official Method of Analysis.

Asibuo JY, Akromah R, Safo-Kantanka, O.Osei, Adu-Dapaah, Hanskofi, OS and Agyeman A (2008). Chemical Composition of Groundnut, Arachis hypogaea(L) landraces. African Journal of Biotechnology. Vol,7(13),pp: 2203-2208.Website http://www.academicjournais.org/AJB

Bello MO, Farade OS, Adewusi SRA, and Olawore NO, (2008). Studies of some lesser known Nigerian fruits, *African Journal of Biotechnology,* (7): 3972- 3979

Blood DC and Radostits OM (1989). Veterinary Medicine, 7th Edition, BalliereTindall, London, pp. 589-630

Dwivedi N, Majumder CB, Mondal P and Dwivedi Shubha (2011). Biological Treatment of Cyanide Containing Wastewater, *Research Journal of Chemical Sciences,* 1(7): 15-21

Dye, WB (1956). Chemical studies of Halogeton glomeratus. *Journal of Horticultural Sciences,* 4: 55-58

Ekundayo CA and Idzi E (2005). Mycoflora and nutritional value of shelled melon seeds (*Citrullus vulgaris schard*) in Nigeria. Journal of Plant Foods for Human Nutrition, (40): 31-40

Fagbohun ED, Lawal OU and Hassan OA (2011). The chemical composition and mycoflora of sundried shelled melon seeds (*Citrullus vulgaris*) during storage, *International Research Journal of Microbiology*, 2(8): 310-314

Gafar MK and Itodo AU (2011). Proximate and mineral composition of hairy indigo leaves. Electronic *Journal of Environmental, Agricultural and Food Chemistry*, 10(3): 2007-2018

Guil JL and Isasa MET (1997). Nutritional composition of leaves of *Chenopodium* species. International Journal of Food Science Nutrition, (48): 321-327

Icrist (2005). Crops Gallery: Groundnut. http://www.icrisat.org/text/coolstuff/crops/gcrops4.html.

Jekeyinfa S and Omisakin O (2005). The Energy Potentials of some Agricultural Wastes as Local Fuel Materials in Nigeria

Ogbe AO and George GAL (2012). Nutritional and Anti-nutrient Composition of Melon Husks: Potential as Feed Ingredient in Poultry Diet *Research Journal of Chemical Sciences* Vol. 2(2): 35-39

McDonald P, Edward RA, Greenhalti FD and Morgan CA (1995). Animal Nutrition, Prentices Hall, London, 101-122

Moerman D, (1998). Native American Ethno botany, Timber press, Oregon, 453-459.

Okaka, JC (2005). Handling, storage and processing of plant foods. *Academic publisher*, Nigeria, pp. 250-270.

Onwuka GI (2005). Food analysis and instrument (theory and practice).Department of Food Science and Technology, Michael Okpora University of Agriculture.

Sellscope, JPF (1962). Cowpea (Vignaunguiculata L Walp). Field Crop Abstract 15: 259-266.

Thompson LU (1993). Potential health benefits and problems associated with anti-nutrients in foods. *International Journal of Food Resources,* (26): 131-149

Wheeler EL and Ferrel RE (1971). A method for phytic acid determination in wheat and wheat fractions. Western Regional Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Albans, California.

To cite this paper: Abdulrazak S., Otie D., Oniwapele Y.A. 2014. Proximate analysis and anti-nutritional factors of groundnut and melon husk. *Online J. Anim. Feed Res.*, 4(2): 25-28.

Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir