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ABSTRACTS

The study was conducted to evaluate the proximate and Phytochemical composition of moringa (*Moringa oleifera*) seed meal. Raw *Moringa oleifera* seeds which served as the control was milled into a fine powder to ensure homogeneity then tied in a polythene nylon prior laboratory analysis. The moringa seeds (1kg) used for fermentation study were soaked inside 3litres of water in a clean steel bowl for a period of 24hours. Thereafter, the water was discarded and the moringa seeds were further sub-divided into two (500g each) and were labelled appropriately. The samples were packed in separate airtight polythene bags ready for fermentation. Half part was fermented for a period of 24 hours, while second half was fermented for 48hours duration. The samples were then sundried for 5 days and milled. The three samples were then analyzed for proximate and phytochemical analysis. Proximate results revealed a linear improvement in the Crude protein (32.25 and 33.60%) and ether extract (11.27 and 12.42%) contents of the (24 and 48 hours) fermented moringa seeds when compared with the raw (26.57 and 9.5%) sample for the crude protein and ether extract respectively. There was a remarkable decreased in the phytochemical contents of the fermented samples across all the parameters as compared to the raw sample. The percentage reduction of 91.70,94.36% and 92.77, 94.83%for phytic acid and oxalate respectively increased with the duration of fermentation over 24 and 48 hours respectively. Therefore, it was concluded that fermentation over 24 and 48 hours period greatly improved the nutritive value of the moringa seed meal.

Keywords: Moringa Seeds, Fermentation, Proximate,Chemical Composition, Phytochemical Contents,

INTRODUCTION

The ever increasing growth of human and livestock population has necessitated a continuous improvement in the scientific knowledge for utilization of locally available agro-industrial by-products in poultry feed in order to reduce feed cost. Feed constitutes 60 to 80% of the total cost of production and any attempt to reduce the feed cost may lead to a significant reduction in the total cost of production. Afolayan *et al* (2019) had earlier recommended the use of non- conventional feedstuff in animal feeds. Most of these alternative feed resources have nutritional and medicinal properties that can be attributed to their antioxidant effects. Hence they can be used to fortify livestock feeds. However, leguminous seeds contain various natural constituents which can affects their nutritive values especially when they are used as feed resources. Makkar and Becker (2009) reported the presence of phytic acid which interferes with mineral elements absorption and utilization, and reacts with proteins to form complex product which have inhibitory effect on protein digestion. *Moringa oleifera* is commonly known as drumstick- tree or horse radish tree. It is also known with the following local names: " Ewe- igbale" in Yoruba , " Okwe Oyibo" in Igbo, " Zogallagandi" in Hausa. *Moringa oleifera*tree is a multipurpose plant. *Moringa oleifera* is very rich in essential amino acids, 10 out of the 19 observed amino acids in *Moringa oleifera* categorized as essential amino acids (threonine, tyrosine, methionine,valine, phenylalanine, isoleucine, leucine, histidine, lysine and tryptophan). It also has high levels of lipids such as alpha linilenic acid, heneicosanoic, gama linolenic, palmiteic and capric acid (Moyo *et al* 2011). Inspite of the widespread claim of the high nutritional profile of *Moringa oleifera* ,utilization of the raw seeds in livestock feeds has not produced efficient results especially on the growth parameters. This has necessitated the need to evaluate the effects of soaking and fermentation on the chemical and anti-nutritional composition of *Moringa oleifera* seeds.

MATERIALS AND METHODS:

The study was carried out at the Agricultural Technology Program, Samaru College of Agriculture, Ahmadu Bello University, Zaria. Samaru is located within the Northern Guinea Savannah zone of Nigeria. It lies between latitude 7^0 and 11^0N, and longitude 7^0 44^0E and has an average rainfall of between 1,000 to 1,250mm and an average ambient temperature of between 17^0 to 33^0 C and a vegetation cover of predominantly trees and grasses (KDSG, 2011).

Processing of Moringa seeds

The moringa seeds used for this study were sourced from the seed unit of the Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria. The raw (control)*Moringa oleifera* seeds were milled into a fine powder to ensure homogeneity then tied in a polythene nylon prior laboratory analysis.The moringa seeds (1kg) used for fermentation study was soaked inside 3litres of water in a clean steel bowl for a period of 24hours. Thereafter, the water was discarded and the moringa seeds was further sub-divided into two (500g each) and were labelled appropriately. The samples were packed in separate airtight polythene bags ready for fermentation. Half part of the sample was allowed to ferment for a period of 24 hours, while remaining half part was fermented for 48hours duration. The samples were then sundried for 5 days and milled into powdery form. The milled samples (both the raw and fermented) were then taken to the Biochemical laboratory of the Department of Animal Science, Ahmadu Bello University, Zaria for proximate and Phytochemical analysis.

Chemical Analysis of Moringa seeds:

Proximate Analysis

The proximate composition (Dry Matter,Crude Protein, Crude Fibre, Ether Extracts, Ash and Nitrogen Free Extracts) of the powdered moringa seeds were determined using the methods of the Association of Analytic Chemists (A.O.A.C., 2000). All chemical analysis was replicated twice.

Phytochemical Analysis

The Phytochemical contents (tannin, oxalates, phytic acid and saponin) of the powdered moringa seeds were determined quantitatively using the method of the (A.O. A.C., 2012).

Data Analysis

The results obtained were subjected to descriptive statistics

RESULTS AND DISCUSSION

There was a significant improvement in the Crude protein (CP)and ether extract (EE) contents of the fermented moringa seeds when compared with the raw sample as shown in Figure 1.This is an indication that fermentation has the potential of enhancing the nutritive values of the moringa seed meal. This is in consonance with the findings ofAkinola *et al*., (2017)who reported that fermentation leads to an increased in the level of essential nutrients in food and feed products. The increased ether extract values obtained after fermentation is contrary to the findings of (Ijarotimi and Kashinro, 2013 and Akinola *et al*.,2017) who reported that the low fat contents in fermented soybean supplemented food samples could be due to the activities of colonizing microorganism and lipolytic enzymes. The moringa seeds fermented for 48 hours duration had the highest values (33.60, 12.42%) followed by the sample that was fermented for 24 hours (32.25,11.27%) whereas the raw sample had the leastvalues (26.57, 9.50%) for the Crude Protein (CP) and Ether Extract (EE) respectively.Crude Fibre (CF) content of the moringa seeds was observed to decline as the duration of fermentation increased (5.61 and 5.25%respectively) for the 24 and 48 hours duration, while the raw sample had the highest crude fibre content. This results contradict the findings of Ologhobo*et al*.(2006) who reported an increase in the crude fibre level of processed lima beans.The increased in the levels of crude protein contents in the fermented moringa seed meal is in line with the report of Makkar and Becker (2009) who gave a report that soaking and fermentation increased the crude protein value of moringa seeds.

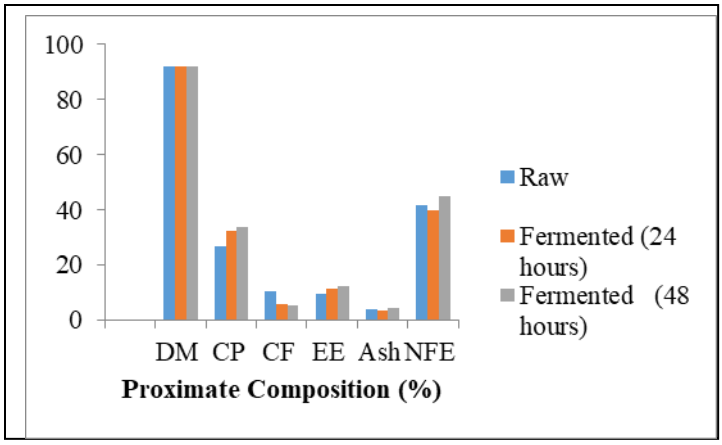

Figure 1: Proximate Composition of Raw versus fermented Moringa Seed Meal

Table 1:Phytochemical Contents in the Raw and Fermented Moringa Seed Meal

Parameters (mg/100g)	Raw	Fermented 24 hours	Percentage Reduction(%)	Fermented 48 hours	Percentage Reduction(%)
Tannin	2.45	1.15	53.06	1.07	56.33
Saponin	3.79	2.3	39.31	1.98	47.76
Phytic acid	18.67	1.55	91.70	1.35	92.77
Oxalate	17.21	0.97	94.36	0.89	94.83

The levels of anti-nutritional factors in the raw and fermented moringa seed meal is shown in Table 1. The results revealed that the raw moringa seed meal contained (2.45%) tannin, (3.79%) saponin, (18.67%) phytic acid and (17.21%) oxalate. (24 and 48 hours)These results are in consonance with the findings of Christiana and Mercel (2008) who reported a linear reduction in the anti-nutritional contents of locust bean seeds as the duration of fermentation increases, and also agreed with the findings of Akangbe and Abu. (2016) who reported a decreased in the anti- nutritional content of moringa seed at various soaking and fermentation durations. The levels of Phytic acid and oxalate was observed to declined appreciably which is an indication that fermentation is an efficient method of reducing the levels of these anti – nutrients. This observation is in agreement with the report by Osman (2004,2011), who reported that phytic acid is heat stable therefore it is easily removed by fermentation.

CONCLUSION AND RECOMMENDATION

It can be concluded from the results of this study that fermentation improved the crude protein and ether extract values of the moringa seeds meal, whereas the phytochemical contents declined with the duration of fermentation. Therefore,fermented moringa seed meal could be utilized by the livestock farmers infeed formulation.

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