

NUTRITIONAL EVALUATION OF THE LEAF AND SEED MEALS OF GMELINA (*Gmelina arborea*)

Saka, A. A., Ogunleke, F. O., Adedeji, O. Y., Adekanbi, A. O., Bolarinwa, M. O. and Osinubi, A. A.

Federal College of Animal Health and Production Technology, P. M. B. 5029, Moor Plantation, Ibadan.

*Corresponding author: azeez.saka@fcahptib.edu.ng; +234 802 297 4050

ABSTRACT

This study evaluated the proximate analysis of *Gmelina arborea* leaf meal and seed meal. Fresh leaves and mature seed of *Gmelina arborea* were collected from botanical gardens of the College's compound. Proximate analysis of *Gmelina arborea* was determined. Results revealed that proximate analysis of the leaf meal showed dry matter ($97.09 \pm 0.3\%$), crude protein ($21.98 \pm 0.13\%$), ether extract ($2.01 \pm 0.02\%$), crude fibre ($8.05 \pm 0.07\%$), Ash ($6.10 \pm 0.03\%$) and Nitrogen free extract (58.96 ± 0.00) while in seed meal dry matter ($96.49 \pm 0.11\%$), crude protein ($6.49 \pm 0.02\%$), ether extract ($1.07 \pm 0.02\%$), crude fibre ($12.02 \pm 0.16\%$), ash ($5.48 \pm 0.09\%$) and nitrogen free extract ($71.44 \pm 0.18\%$). The result of proximate composition showed that the leaf meal and seed meal of *Gmelina arborea* had good protein content that is comparable with good sources of plant protein. It can be concluded *Gmelina arborea* leaf and seed meals can be used as source of protein supplement to improve the production and performance of livestock animals.

Keywords: Proximate composition, Leaf meal, Seed meal, Nutrient, Ruminants

INTRODUCTION

Gmelina arborea leaves are a non-conventional feed resource that remains available throughout the year. They retain their green colour for most of the dry season and have been successfully used as feed for ruminants, yielding favorable results (Lamidi *et al.*, 2009). These leaves are rich in protein, with protein content ranging from 10.01% to 38.4%, as reported by Osakwe and Udeogu (2007). *Gmelina arborea* leaves are available year-round, ensuring a consistent feed supply for animals even during the dry season (Amata, 2014). This tree is widely found in Nigeria, particularly in the rainforest and derived savanna zones. It is among the unconventional resources utilized for feed production (Jiwuba *et al.*, 2016). The leaves of *Gmelina arborea* are recognized as a valuable nutrient source for both ruminants and non-ruminants. Additionally, various parts of the tree, including its leaves, flowers, roots, and bark, have medicinal applications (Kumaresan *et al.*, 2014) and may function as natural growth promoters (Offor, 2014). Research indicates that *Gmelina arborea* leaves and seed meal serve as an affordable protein supplement that can enhance voluntary feed intake, improve digestibility, and boost the overall performance of animals consuming low-quality diets (Kakengi *et al.*, 2001). Bioactive compounds interact with nutrients and dietary fibre to help protect against diseases (Sangeeta and Sujata, 2006). Therefore, this study aimed to evaluate the proximate composition of *Gmelina arborea* seed meal and leaf meal.

MATERIALS AND METHODS

Plant Leaf and Seed collection: Fresh, mature *Gmelina arborea* leaves and seeds were harvested from the Botanical Garden of the Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan, Oyo State, Nigeria. The leaves, which showed no signs of infection, were thoroughly rinsed with water to remove dirt and debris. The leaves were air dried under room temperature for five days while the seed meal was crushed with mortar, pestle and it was air dried for seven days before it was taken to the laboratory for analysis.

Chemical Analysis: The proximate analysis of the *Gmelina arborea* leaf and seed meal were determined according to the procedures of (AOAC, 2001)

RESULTS

Proximate Analysis of *Gmelina arborea* leaf meal and seed meal

Table 1 shows the proximate analysis of *Gmelina arborea* leaf meal and seed meal. The Dry matter, crude protein, Ether extract, Crude fibre, Ash and Nitrogen free extract in leaves were $97.09 \pm 0.03\%$, $21.98 \pm 0.13\%$, $2.01 \pm 0.02\%$, $8.05 \pm 0.07\%$, $6.10 \pm 0.03\%$ and $58.96 \pm 0.00\%$, respectively, while in seed, were $96.49 \pm 0.11\%$, $6.49 \pm 0.02\%$, $1.07 \pm 0.02\%$, $12.02 \pm 0.16\%$, $5.48 \pm 0.19\%$ and $71.44 \pm 0.18\%$, respectively.

DISCUSSION

The proximate analysis of *Gmelina arborea* leaf meal and seed meal revealed that dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract content observed in this study align with the findings of Abdullahi *et al.* (2020) The dry matter content of *Gmelina arborea* leaf meal (97.09%) and seed meal (96.49%) obtained in this study falls within the typical range of values (94.5%) reported by Omotoso *et al.* (2014) on the nutritional composition of *Gmelina arborea* leaf meal. The crude protein content in the leaf meal (21.98%)

Table 1: Proximate Analysis of *Gmelina arborea* Leaf meal

Parameters (%)	Leaf Meal	Seed Meal
Dry Matter	97.09 ± 0.03	96.49 ± 0.11
Crude Protein	21.98 ± 0.13	6.49 ± 0.02
Ether Extract	2.01 ± 0.02	1.07 ± 0.02
Crude Fibre	8.05 ± 0.07	12.02 ± 0.16
Ash	6.10 ± 0.03	5.48 ± 0.09
Nitrogen free extract	58.96 ± 0.00	71.44 ± 0.18

is notably higher compared to the seed meal (6.49%). The result obtained in this study aligned with the finding of Adejumo and Oyelade (2017) who reported 21.6% crude protein content for *Gmelina arborea* leaf meal. The crude protein (CP) content of *Gmelina arborea* exceeds the recommended 8% required for the optimal functioning of rumen microorganisms (Van Soest, 1994). Additionally, it surpasses the 11.0–13.05% range necessary to provide sufficient protein for maintenance and moderate growth in goats (NRC, 2002).

Browse plants are known for their high CP content, which is highly digestible and beneficial for livestock nutrition. The ether extract of leaf meal (2.01%) and seed meal (1.07%) obtained in this study were in line with the results reported by previous researchers (Adejumo and Oyelade, 2017; Ademola *et al.*, 2018). *Gmelina arborea* leaf meal exhibits a high crude protein content (21.98%), which is essential for the growth, development, and maintenance of livestock. Adequate protein intake is crucial for muscle development, milk production (in dairy animals), and overall health. Incorporating leaf meal into livestock feed formulations can help meet their protein requirements (Adejumo and Oyelade, 2017). Protein is essential for various physiological functions, including enzyme synthesis, immune function, and tissue repair (Ademola *et al.*, 2018). This observation was consistent with previous studies conducted on *Gmelina arborea* (Adejumo and Oyelade, 2017; Ademola *et al.*, 2018). Considering the nitrogen-free extract content, it is higher in the seed meal (71.44%) compared to the leaf meal (58.96%). This aligns with previous research indicating higher carbohydrate content in seed meals compared to leaf meals (Omotoso *et al.*, 2014). Both leaf and seed meals contain moderate levels of crude fiber, which is essential for maintaining gastrointestinal health and promoting normal digestive function in livestock. Adequate fiber intake can help prevent digestive disorders such as bloat and acidosis, particularly in ruminants (Adejumo and Oyelade, 2017). The ash content in both leaf and seed meals indicates the presence of minerals essential for livestock health, including calcium, phosphorus, magnesium, and trace minerals. These minerals play crucial roles in bone development, muscle function, reproduction, and overall metabolic processes in animals (Ademola *et al.*, 2018).

CONCLUSION:

This study demonstrated that *Gmelina arborea* leaf meal possesses a notably higher crude protein content compared to seed meal and thus holds a promising valuable protein supplement for ruminant diets, particularly when aiming to enhance protein intake from low-quality forages.

RECOMMENDATION:

It can be recommended that *Gmelina arborea* leaf meal and seed meal could be used as feed ingredient in livestock production being a good source of protein.

REFERENCES

- Abdullahi, M., Umar, R. and MS, I. (2020). Nutritional Characterization of *Gmelina Arborea* Roxb Leaf and Seed meal as potential aquaculture feed ingredient. *Journal of Agripreneurship and Sustainable Development*, 3(1), 11-17.
- Adejumo, I. O. and Oyelade, O. J. (2017). Proximate and phytochemical analyses of *Gmelina arborea* leaf meal. *International Journal of Science and Research*, 6(9): 274-277.
- Ademola, S. S., Oluwatayo, B. O., and Awoyinka, O. A. (2018). Nutritional evaluation of *Gmelina arborea* seeds. *Food Science & Nutrition*, 6(8): 2279-2283.
- Amata, I. A and Lebari, T. (2011). Comparative evaluation of the nutrient profile of four selected browse plants in the tropics, recommended for use as nonconventional livestock feeding materials. *African Journal of Biotechnology*, 10(64): 14230-14233.
- AOAC (2001). Association of Official Analytical Chemists. Official Methods of Analysis, 17th ed. Published by Association of Official Analytical Chemists, Washington, D.C.
- Jiwuba, P. C., Ugwu, D. O., Kadurumba, O. E., and Dauda, E. (2016). Haematological and serum biochemical indices of weaner rabbits fed varying levels of dried *Gmelina arborea* leaf meal. *International Blood Research & Reviews*, 6: 1-8.

- Kakengi, A. M. V., Shem, M. N., Otsyina, R. and Mtengeti, E. (2001). Performance of grazing cattle in semi-arid areas of Western Tanzania and the marginal productivity of *Leucaena leucocephala* leaf meal supplement. *Agroforestry System*, 52: 73-82.
- Kumaresan, P., Jeyanthi, K. A. and Kalaivani, R. (2014). Biochemical evaluation of anti-diabetic activity of aqueous extract of *Gmelina arborea* in Alloxan induced albino rats. *International Journal of Herbal Medicine*, 2(2): 90-94.
- Lamidi, A.A., Aina, A.B.J., Sowande, S.O. and Johosho, A.O. (2009). Assessment of *Panicum maximum* (Jacq), *Gliricidia sepium* (Jacq) and *Gmelina arborea* (Roxb) based diets as all year round feed for West African Dwarf goat. Proceedings of the 14th Annual Conference of Animal Science Association of Nigeria (ASAN), September 14- 17, 2009, Ogbomoso, Nigeria.
- NRC (2002). Nutrient requirements for dairy cattle seventh revised edition. National Research Council, National Academy of Science press. Washington DC, USA
- Omotoso, O. T., Akinola, M. O., and Ashaye, O. A. (2014). Nutritional evaluation of *Gmelina arborea* leaf meal as a non-conventional feedstuff for livestock production. *IOSR Journal of Agriculture and Veterinary Science*, 7(5): 1-4.
- Osakwe, I. I. and Udeogu, R. N. (2007). Feed intake and nutrient digestibility of West African Dwarf (WAD) goats fed *Panicum maximum* supplemented with *Gmelina arborea*. *Animal Resource International*, 4: 724-727.
- Sangeeta, S. and Sujata, B. (2006). Bark and Fruit Extracts of *Gmelina arborea* Protect Liver Cells from Oxidative Stress. *International Journal of Pharmaceutical Biology*, 44 (40): 237–243.
- Van Soest, P. J. (1994). Nutritional Ecology of Ruminants, 2nd edn. Cornell University Press,