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NUTRITIVE AND ANTINUTRITIVE COMPONENTS OF PENTACLETHRA MACROPHYLLA (AFRICAN OIL BEAN SEEDS), AND THEIR PROSPECTS IN LIVESTOCK NUTRITION: A REVIEW

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ABSTRACT

The increasing demand for livestock products, coupled with the rising cost and limited availability of conventional feed ingredients, has intensified the search for sustainable, locally available and nutritionally adequate alternative feed resources. Non-conventional feed resources, particularly indigenous leguminous plants, offer considerable potential for reducing feed costs, minimizing competition between humans and livestock for conventional food resources, and promoting sustainable animal production. One such underutilized resource is African oil bean (*Pentaclethra macrophylla* Benth.), an indigenous tropical leguminous tree widely distributed across West and Central Africa, including Nigeria. This review examines the botanical characteristics, traditional uses, nutritive and anti-nutritive compositions, processing requirements and potential applications of *P. macrophylla* in livestock nutrition. Available literature indicates that African oil bean seeds are rich in crude protein, essential amino acids, lipids, energy, minerals and vitamins, making them a potentially valuable alternative source of protein and energy in animal feed formulations. The seeds also contain biologically active compounds, including polyphenols, flavonoids and other phytochemicals with potential antioxidant and antimicrobial properties. However, their utilization is constrained by the presence of anti-nutritional factors such as phytates, oxalates, tannins, saponins, cyanogenic compounds and protease inhibitors, which may interfere with nutrient digestion, absorption and utilization. Evidence from previous studies suggests that

appropriate processing techniques, particularly boiling, fermentation and drying, can substantially reduce these anti-nutritional constituents while improving nutrient availability and digestibility. The potential application of processed African oil bean in poultry, ruminant and swine nutrition is also discussed. Although preliminary findings demonstrate promising prospects for its inclusion in livestock diets, further investigations are required to establish optimal processing conditions, nutrient digestibility, safe dietary inclusion levels, animal performance, toxicological safety and economic feasibility. The review concludes that properly processed *P. macrophylla* represents a promising indigenous non-conventional feed resource with potential to contributing affordable, sustainable and environmentally responsible livestock production, particularly in tropical Africa.

KEYWORDS: African oil bean; *Pentaclethra macrophylla*, non-conventional feed resources, nutritive composition, anti-nutritional factors, fermentation, livestock nutrition, and sustainable animal production.

1.0 INTRODUCTION

Livestock production has been the major source of protein through a wide range of meat products. The global increase in demand and consumption of meat has resulted in adverse impacts on the environment, such as increased methane (CH_4) emissions, significantly contributing to global warming, as well as increased water abstraction and depletion of resource (Shah *et al*., 2025). The quest to increase the output of animal product in some sectors of livestock production has led to increased use of feedstuffs such as cereal grains and soybean meals that are supposedly consumed by humans. Significant concerns have been raised regarding the efficiency of resource use and environmental impacts of conventional livestock production systems, particularly considering the feed-food competition for land and energy resources (Pexas *et al*., 2023).

In the context of sustainable production of high-quality foods from livestock, the use of potentially human-edible feed resources as animal feeds should be restricted to livestock with the highest daily nutrient requirements (Shah *et al*., 2025). Human-edible feed inputs should be targeted towards meeting the energy and protein requirements of livestock to rectify the imbalances in nutrient supply from pastures and forage crops such as high concentrations of nitrogen (N). Human-edible feeds play significant role in dairy production because forage-only feeds are associated with relatively low output per head, owing to low N use efficiency compared with systems which largely rely on human-edible feeds (Wilkinson and Lee, 2018).

The increasing cost and limited availability of conventional livestock feed ingredients have intensified interest in indigenous and underutilized plant resources capable of supplying protein, energy and minerals. In Africa, this is relevant since livestock producers often face seasonal feed shortages, high costs, and competition between humans and use of conventional crops in animal-feed (Shah *et al*., 2025). The adoption of non-conventional feed resources (NCFR) could be an important option for bridging the gap between demand and supply for animal feeds, for reduced competition between human and animals for food and for providing nutritional sufficiency to existing feed sources (Katoch *et al*., 2018).

A variety of feeds from perennial crops, agricultural trees and shrubs, weeds and agro-industrial byproducts are included in the category of NCFR, owing to their excellent source of nutrients. However, some of them are low in nutritive quality and contain high concentrations of anti-nutritive factors which reduce the nutrient utilization and inhibition of various metabolic processes (Onte *et al*., 2019).

Non-conventional feed resources are generally defined as "Shrub fodder, tree fodder, and agroindustrial by products which have not been utilized traditionally and/or commercially in livestock feeding (Onte *et al*., 2019). Among the indigenous resources with nutritional potential is the African oil bean (AOB), *Pentaclethra macrophylla* Benth. It is a leguminous tree distributed across tropical Africa, including Nigeria, Cameroon, Côte d'Ivoire, Ghana, Togo and the Democratic Republic of Congo. *Pentaclethra macrophylla* is a specie of the family leguminosea and an indigenous of tropical Africa. The seed is widely consumed in Nigeria especially in the Eastern part of the country. In Nigeria, *Pentaclethra macrophylla* is locally identified by different names in different tribes for example; Yoruba call it Apara, Igbo; Ukpaka or Ugba and Efik call it Ukana. It can be used as a flavouring agent in food and also serves as a substitute for meat in some local communities (Oguazu *et al*., 2025).

The *Pentaclethra macrophylla* is a highly nutritious seed which could be converted to highly aromatic and protein-rich delicacy commonly known as "ugba" by fermentation. Due to human migration, the "*ugba*" delicacy is common, and currently available in most European and American countries (Azi *et al*., 2019). The seed contains high contents of essential amino acids, fatty acids and volatile organic compounds, hence it is extensively utilized as a flavouring agent. The major constraint to wider utilization, however, is the presence of anti-nutritional factors. These include phytate, tannins, trypsin inhibitors, oxalates, saponins and other secondary metabolites. Importantly, these compounds are not necessarily permanent nutritional liabilities, therefore, appropriate processing, especially cooking and fermentation, and shade-drying the sliced seeds can substantially reduce their effects (Amoah *et al*., 2025).

However, the major limitation to the processing and utilization of fermented AOBS is susceptibility to microbial degradation and subsequent loss of aromatic and nutritional value within short periods of processing (Azi *et al*., 2019).

The processing of AOBS produce approximately 500 to 650 kg of meal or cake from each ton of oilseed. These by-products are often discarded or used in livestock feed formulations, and it is important to note that these meals/cakes are nutrient-dense, containing high protein contents, and rich in polyphenols. This suggests oilseed meals could serve as valuable alternative sources of high-quality proteins (Amoah *et al*., 2025). Despite availability of literatures on the bioactive composition, and the nutritional benefits of AOBS, data related to its incorporation into animal feedstock are limited. This review therefore seeks to highlight the nutritive and ant nutritive composition of this underutilized leguminous seed: *Pentaclethra macrophylla*, its numerous uses in human diets, and the possible application in livestock feed production.

2.0 Botanical description and traditional uses of Pentaclethra macrophylla

Pentaclethra macrophylla, also known as African oil bean tree, is a member of the Leguminosae family. It can naturally grow up to 21 m in high, with a diameter of about 60 cm (Sinda *et al*., 2021). The natural habitat of this tree includes Eastern, Middle Belt region, and Western regions parts of Nigeria, and the coasts of Senegal, Angola, Cameroon and Gabon (West and Central Africa). The seeds are considered as nutritional supplements after processing and fermentation. The seed contain minerals such as calcium and phosphorus, vitamins such as niacin, riboflavin, and thiamine, and fatty acids (Nsudea *et al*., 2026).

The outer bark of the tree is greyish to reddish brown, thin, and flakes irregularly, while the inner bark is fibrous. The plant has yellow to orange stellate-hairy twigs, and the seeds are elliptical, flattened and smooth, purple-brown in colour when mature. The ripe fruit is a black and hard, with a woody pod measuring about 35-36 cm long and 5-10 cm in width. When the fruit matures it splits open by explosion releasing about eight flat, glossy brown seeds measuring about 5-7 cm in diameter, and between 15-20 g in weight (Ojimelukwe, 2024).



Figure 1; Showing Pentaclethra macrophylla seeds. Source: Okoro et al. (2024).

P. microphylla tree offers a number of important advantages to both rural and urban residents with a range of domestic and medicinal applications. Research data showed the anti-oxidant, anti-microbial, hypolipidemic, and anti-ulcerogenic properties of various extracts of P. microphylla (Erharuyi et al., 2025; Ugwu et al., 2025). In tradomedicinal approach, a decoction of fermented extract of P. macrophylla seeds has been used effectively in the management of malnutrition, gastrointestinal disorders and dental caries. The bark, fruits, seeds and the leaves have been used as anthelmintics, in the treatment of gonorrhoea, convulsion, and as analgesic (Sinda et al., 2021). The oil extracted from the seeds have been used as remedy against pruritus ani, worms, and dysentery, pain in animals and humans, as well as in the treatment of diabetes in Nigerian folk medicine (Sinda et al., 2021).

3.0 Nutritive composition

The results of proximate analysis for *Pentaclethra macrophylla* from different experiments have shown significant variation and inconsistency, probably due to differences in varieties, geographical origin, maturity level, moisture content, processing and analytical methods. However, majority of research results on the nutritive value of *P. macrophylla* Benth showed that, the leaves and seeds contains high compositions of carbohydrate, protein (23 – 28 %) including all the 20 essential amino acids, fat including 10 % essential fatty acids, and fibre with low level of ash (Osabor *et al*., 2017 and Afia, 2020). Analysis of the mineral elements and phytochemistry revealed the presence of macro and micro mineral elements, as well as saponins, alkaloids, tannins, polyphenols (anthocyanins, leucoanthocyanins) quininees, cardiac glycosides and reducing sugars, oleic acid, linoleic acid, lignoceric acid, palmitic acid, and terpenes respectively (Afia, 2020).

The analysis of toxic components of *P. macrophylla* Benth seeds has revealed high levels of oxalates and low levels of phytic acid, hydrocyanic acid and tannin. The high concentration of bio-active compounds such as polyphenols, cardiac glycosides and reducing sugar,

carbohydrate, protein and fat in the seeds indicates that *P. macrophylla* is a good source food, as well as therapeutic agent (Osabor *et al*., 2017).

3.1 Protein and amino acid profile

P. macrophylla (African oil bean) seeds contain 36.2-43.89 % crude protein which contains the 20 essential amino acids. The presence of essential amino acid in high concentrations makes the seeds a good source of quality protein, once there is complementation of sulphur containing amino acids. This is necessary because the lower occurrence of sulphur containing amino acid in *P. macrophylla*. The amino acid profile of the seeds shows that glutamic acid occurs highest in concentration, aspartic acid, lysine and phenylalanine are also present in appreciable amounts (Ojimelukwe, 2024).

The high protein concentration makes the seed potentially useful as a plant protein supplement. Although, crude protein concentration alone does not establish its quality, feeding value of protein depends on amino acid composition, digestibility, protein solubility, processing conditions, presence of protease inhibitors, dietary energy concentration and amino acid requirements of the animal species. Digestibility refers to the protein quantity absorbed by an organism in relation to the amount consumed, which depends on the protein structure, previous processing methods, and the presence of anti-nutritive compounds (Sá *et al*., 2020).

3.2 Lipid and fatty-acid composition

Oils from the raw, cooked, and irradiated, cooked/irradiated seeds of *P. macrophylla* were analysed for fatty acid content by Olotu *et al*. (2014). Results showed that omega-6-fatty acid (linoleic acid) was the key unsaturated fatty acid (24.6%) in the bean seed oil. Results of treatments also showed cooking had significantly enhanced Erucic acid by 3.3% and Linolenic acid by 23.0%. Combined treatment increased C18:2, C6:0, C20:2, C18:3, C20:3, C24:0, and C22:6 being linoleic, caproic, eicosadienoic, linolenic, eicosatrienoic, ligoceric, and docosahexaenoic acid, respectively.

The results also showed total saturated fatty acid, the monounsaturated fatty acid of the oil from the cooked oil, y-irradiated, and cooked and y-irradiated oils from African bean seed ranged from 0% to 5.35% and 5.24% to 138.7%, respectively (Olotu *et al*., 1014). Proximate composition of fermented *Pentaclethra macrophylla* seeds extract (FPMSE) revealed the fats and oil composition to be (80.60 ±0.00%). However, the pulverised sample constitute fats and oil, (32.33 ± 0.12%) (Okoro *et al*., 2024).

The high oil content of *P. macrophylla* is one of its distinctive nutritional characteristics, which has two implications for livestock nutrition. In one hand, it increases the energy density of the ingredient. In the other hand, inclusion of highly unsaturated oil in the diets can influence carcass fat composition and, in ruminants, if provided in excess, it may interfere with ruminal fermentation. Consequently, African oil bean could potentially serve simultaneously as a protein and energy ingredient, rather than simply replacing soybean meal on a protein-for-protein basis.

3.3 Minerals and vitamins composition

A number literatures have reported that *P. macrophylla* contains several nutritionally relevant minerals, including calcium, phosphorus, magnesium, potassium, iron, zinc, copper, cobalt, lead, chromium, and manganese (Agbo, 2024). In a more recent report, minerals, vitamins and oil characteristics of *P. macrophylla* seed were analysed. The result for macro and microminerals shows that the seed is a rich source of magnesium, sodium, calcium, and potassium at (5.747, 5.923, 8.484, and 5.270) ppm, respectively. However, calcium had the highest concentration of all the macrominerals that were analysed. The seed also contains microminerals including Iron, Zinc, Selenium, Copper, Cobalt, and Manganese at (2.199, 0.430, 0.777, 0.395, 0.045, and 0.172) ppm respectively, where Iron occurred with the highest concentrations (Oguazu *et al*., 2025).

Another analysis of the mineral composition of *Pentaclethra macrophylla* stem bark extracts and fractions revealed the presence of Potassium, Calcium, Sodium, Copper, Zinc, Magnesium, Lead, Nickel, Cadmium, Chromium, and Iron. Potassium and calcium occurred with highest concentrations (Erharuyi *et al*., 2025). However, total mineral concentration does not necessarily equal mineral availability, since phytates and oxalate can bind minerals and reduce their intestinal absorption, which makes the phytates/mineral relationship more important in terms of bioavailabity, than total mineral concentration alone.

P. macrophylla also contains vitamins and phytochemicals. Oguazu *et al*. (2025) investigated vitamins A, D, C, E and folate in the seed and reported detectable quantities of all the five vitamins. Another research have shown that the traditionally fermented *P. macrophylla* seeds contain thiamine (vitamin B1), riboflavin (vitamin B2), niacin (vitamin B3), retinol (vitamin A), and α-tocopherol (vitamin E), in significant proportions (Ahaotu and Maduka, 2025). Reports shows variation in the nutritional compositions between raw, boiled and fermented seeds, demonstrating that processing can influence the phytochemical profile of the seed.

4.0 Anti-nutritive compounds

Anti-nutritional factors may be defined as those substances generated in natural feedstuffs through the normal metabolic processes of species and via different mechanisms which exert effects contrary to optimum nutrition. Substances which act to reduce nutrient intake, digestion, absorption, and utilization, and lead to the production of other adverse effects are referred to as anti-nutritional factors (Augustine *et al.*, 2024). Anti-nutritional composition often affects the nutritional quality of plant-based foods since they can bind minerals or interfere with nutrient utilisation. For instance, phytates reduces the bioavailability of minerals, while oxalate and tannins can also affect mineral utilisation and protein digestibility (Ome *et al*., 2026).

Raw *P. macrophylla* seeds normally have a bitter taste, and contain several anti-nutritional factors which include oxalates, cyanide, pancine, saponin, tannins, phytate, and phytic acid (Ahaotu and Maduka, 2025). Another research reported that tannins, oxalate, and phytic acid are found in significant quantities in the raw and fermented *P. macrophylla* seeds (Ugba). Saponin, alkaloids, anthracene glycoside, cardiac glycoside, steroidal aglycone, and flavonoid are present in *P. macrophylla* seeds (Abdulmalik and Samaila, 2026).

4.1 Phytic acid (phytates)

Phytic acids (phytates) are polyanionic compound that can bind to phosphorus (P), minerals such as calcium, iron, zinc, and sodium, amino acids such as histidine, lysine, and arginine, among others, and other nutrients, thereby reducing the solubility and bioavailability of proteins, starch, lipids and trace elements (Sanches *et al*., 2026). Phytic acid is one of the most important anti-nutritional factors associated with *P. macrophylla* seeds. This molecule poses a significant anti-nutritional threat to the diets of poultry and swine, as it can form insoluble salts with divalent cations in the diet and chelate critical nutrients in an indigestible form, especially in monogastric animals (Wise *et al*., 2024; Erharuyi *et al*., 2025). Recent study reported a very significant reduction in the quantity of phytic acid during fermentation process. Although the amount of phytates in the reported study is significant, comparative studies should be carefully conducted because values of phytates in plant seeds can vary substantially according to extraction methods and analytical procedures undertaken (Amaka *et al*., 2024).

Quantitative phytochemical analysis of *Pentaclethra macrophylla* in another research has revealed the presence of Oxalates and Phytates (Ubiji *et al*., 2026). High dietary phytate are generally reported to possess growth retarding capacity, lowering of digestibility and

absorption of important dietary nutrients, and inhibit the protease and analysis of the intestinal track (Eziuche and Okezie, 2018; Adebayo *et al.*, 2022).

4.2 Oxalates

Oxalate (oxalic acid) is a naturally occurring organic compounds, an anti-nutrient found in many plant food items, especially in fruits, nuts, cereals, fungi, vegetables, aromatic plants, and beverages, usually in trace amounts, with plant-based products as the main sources of dietary oxalates. In plants, oxalate serve important functions like storing calcium, regulating acidity, and acting as a defence mechanism against pests (Salgado *et al*., 2023).

Oxalates can bind calcium and form relatively insoluble calcium oxalate, the origin of most kidney stones is caused by calcium oxalate (Ghanati *et al*., 2024). Ome *et al.* 2026) reported that thermal processing reduced oxalate concentration, alongside reductions in tannins and phytate for effective uptake and utilization of minerals and protein digestibility. For livestock nutrition, this is important because calcium availability is particularly relevant to laying hens, growing animals and lactating livestock (Kazaev *et al*., 2024). Also, calcium and phosphorous have been implicated in the growth and maintenance of bones, teeth and muscles in humans and live stocks (Ome *et al.* 2026).

4.3 Cyanogenic compounds

Cyanogenic glycosides are compounds that are chemically bound to sugars and release cyanide in the form of hydrogen cyanide (HCN, prussic acid) under certain conditions, notably in an acid environment or through enzyme action (Niyogi *et al*., 2025).

Cyanogenic glycosides are hydrolysed by enzymes to give off hydrogen cyanide (HCN) which is a potent respiratory poison. The HCN is associated with many of the diseases of the central nervous system and it is very toxic even at low concentrations (Olaniyan, 2016). More recently, Abdulmalik and Samaila (2026) reported a remarkable reductions in cyanogenic glycosides following their processing protocol. However, these findings should not be considered as evidence that every batch of *Pentaclethra macrophylla* is automatically free from toxicological hazards, since feed safety often depends on seed quality, processing, drying and storage conditions.

4.4 Effects of processing (fermentation) on Pentaclethra macrophylla seeds.

Fermentation, cooking, and canning, are considered the most important traditional processing operations associated with *Pentaclethra macrophylla* seeds. Fermentation has been extensively used in the food industries to produce desirable food products with enhanced

nutritional qualities. However, fermentation can sometimes cause deterioration of food and edible substances, because, during fermentation, microbes produces enzymes which acts on organic substrates to produce a chemical change in the physicochemical and nutritional characteristics of the food item (Ubiji *et al*., 2026).

One of the most widely consumed fermented seed condiments in south-eastern Nigeria is Ugba, which is produced from fermentation of *Pentaclethra macrophylla* seeds. Ugba occupies a significant place in the traditional diet of the Igbo people and is commonly consumed either as a delicacy or as a flavouring ingredient in soups and salads (Chigaemezu *et al*., 2026). Fermentation of the *Pentaclethra macrophylla* seeds helps to remove the anti-nutritional factors, as well as its nutrient bioavailability, and digestibility. Research has shown that fermentation causes a slight increase in protein content, and a decrease in carbohydrate contents (Obianom *et al*., 2024).

Another research also reported a reduction in the anti-nutrition factors, where the rate of decrease in the anti-nutrient (phytate, and oxalate) compositions are directly proportional to specified fermentation period (Eziuche and Okezie, 2018). The ash-assisted fermentation strategy produced higher total amino acid composition, and lower content of anti-nutritional factors than untreated fermentation. The most recent findings by Abdulmalik and Samaila (2026), further supported this literature by showing that fermentation combined with protein modification can dramatically reduce several anti-nutritional constituents.

5.0 *Pentaclethra macrophylla* Benth in Animal Nutrition

A range of alternative protein sources that could partly replace the conventional plant-based protein meals, such as soybean meal, canola meal, DDGS, cottonseed, corn meal, and their combinations in livestock diets have been reported (Aydın *et al*., 2026). They include legume seeds such as peas, chickpeas, faba beans, and lupins which can successfully enhance the nutritional value and shelf-life of meat, milk, and eggs. Legume grains are currently in competition between human and animal feeding, yet, they could represent useful options as protein requirements of livestock in place of soybeans (Lanza *et al*., 2025).

5.1 Poultry nutrition

Poultry is one of the most relevant target species because broilers require high quality dietary protein and energy. The major potential benefits of processed *Pentaclethra macrophylla* seed meal include high protein concentration, high energy density, availability of locally sourced feed material and potential partial substitution for conventional protein/energy ingredients.

However, poultry are particularly sensitive to some anti-nutritional factors because they have limited endogenous capacity to degrade phytate and other plant anti-nutrients. Consequently, processed rather than raw seed is the more appropriate candidate for poultry diets.

An important recent study was published by Pistis *et al*. (2026). The study evaluated a 10% inclusion of *P. macrophylla* ("Kiseka") in broiler diets in Kinshasa. The study found no statistically significant differences in the measured feed consumption and growth-related parameters, although a lower numerical feed conversion ratio was reported for the *P. macrophylla* treatment.

5.2 Ruminants nutrition

Ruminants may have an important advantage over monogastric animals owing to the ability of guts microorganisms to degrade or transform some plant secondary metabolites. Evidence specifically involving *P. macrophylla* as a ruminant feed resource is emerging. A research by Adebayo *et al*. (2023) reported a selected browsed plants including *Pentaclethra macrophylla* alongside four other plants which were evaluated for crude protein contents, results have confirmed their efficacies as good protein supplements to poor quality feeds for ruminants, especially during feed scarcity without detrimental effect on the animals, with *Pentaclethra macrophylla* showing higher CP composition.

5.3 Swine nutrition

The high protein and energy density of *Pentaclethra macrophylla* seeds makes it theoretically suitable for pig nutrition. However, pigs are monogastric animals, and may be more adversely affected by phytate, protease inhibitors and other anti-nutritional factors present than ruminants, as the endogenous mucosal phytase in monogastric animals appears incapable of hydrolysing sufficient amounts of phytate-bound P (Humer *et al*., 2015). A viable alternative to reduce the negative effects of phytate is the use of exogenous phytase, an enzyme which catalyses the stepwise hydrolysis of phytate. Exogenous microbial phytate has been considered as the most suitable enzyme supplement for use in animal feeds (Sanches *et al*., 2026). Therefore, before embarking on a large-scale use of *Pentaclethra macrophylla* seeds in pig diets, research covering ileal amino-acid digestibility, apparent and standardized phosphorus digestibility, net energy value, optimal processing conditions (Eziuche and Okezie, 2018), maximum safe inclusion level, effects on growth and carcass characteristics, effects on gut microbiota (Ubiji *et al*., 2026), and effects on fatty-acid composition, should

be conducted to establish its efficient application (Li *et al*., 2022; Huang *et al*., 2024; Hwang *et al*., 2026).

6.0 Processing requirements for utilization as animal feed

Based on the available literature (Chigaemezu *et al*., 2026; Ubiji *et al*., 2026), a rational processing protocol for investigation as an animal-feed ingredient would include: Seed selection → de-hulling → washing/soaking → thermal treatment → slicing → controlled fermentation → drying → milling → chemical and microbiological quality control. The exact protocol should be optimized experimentally rather than simply copied from traditional food processing. The exact protocol should be optimized experimentally rather than simply copied from traditional food processing. Particular attention should be given to: Moisture content, residual antinutritional factors, peroxide value, free fatty acids, microbial contamination, mycotoxins, protein digestibility, and amino-acid availability. Adegbola et al. (2025) identified short shelf life and postharvest management as important challenges associated with fermented African oil bean.

7.0 CONCLUSION

African oil bean (*Pentaclethra macrophylla* Benth.) represents a potentially valuable indigenous feed resource because of its combination of high protein, substantial oil, energy, minerals and biologically active compounds. Published studies consistently demonstrate its nutritional potential, although reported nutrient concentrations vary substantially among samples. The principal limitation to its use is the presence of anti-nutritional constituents, particularly phytate, tannins, trypsin inhibitors, saponnins and oxalates. Importantly, fermentation and heat treatment can improve its nutritional characteristics, however, the optimum processing method and inclusion levels are species-specific and require further experimental validation.

African oil bean should be considered a processed feed resource rather than a raw-seed ingredient. Also, future research should prioritize standardized processing, nutrient digestibility, amino acid availability, animal performance, gut health, product quality, toxicological safety and economic feasibility. The findings would determine whether African oil bean can progress from a traditionally important food resource to a scientifically validated component of sustainable livestock-feed systems in tropical Africa.

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