PROXIMATE AND PHYTOCHEMICAL ANALYSIS OF BREADNUT (*ARTOCARPUS CAMANSI*) AND BREADFRUIT (*ARTOCARPUS ALTILIS*) LEAVES

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ABSTRACT:
Fresh breadnut (Artocarpus camansi) and breadfruit (Artocarpus altilis) leaves were harvested from a reliable source at Abede area within Ogbomoso metropolis, Oyo State, Nigeria. The leaves were washed to remove debris, the leaves were air dried to retain the nutrient composition of the plant without any of the phytochemical properties been denatured by temperature. The dried leaves were ground to powder using mechanical blender. Each sample was stored in air tight properly labeled polythene bag and subsamples were sent for proximate analysis and quantitative phytochemical evaluation to test the presence of some phytochemical properties. The result shows that both breadnut (Artocarpus camansi) and breadfruit (Artocarpus altilis) leaves had appreciable percent of secondary metabolites such Flavonoids, Saponin, Tannin, Phytosterol, Alkaloids, Steroids, Phenol, Gums and Resins, Anthraquinones, Carotenoids and Total Antioxidants, indicating that the plant leaves would have good medicinal application as these metabolites have been reported to be good antibacterial, antifungal and good antioxidant. However, breadnut (Artocarpus camansi) leaves has the highest mean value in all the phytochemicals with the highest mean value of 21.93% crude protein (CP) from the proximate analysis which indicates that it has antibacterial and immunostimulant properties and could be used as phytogenic feed additives to enhance animal production performance.
Keywords: Breadnut leaf, Breadfruit leaf, Proximate analysis, Phytogenic feed additives

INTRODUCTION

Phytogenic feed additives (PFAs) are plant-derived substances that have been gaining traction in the animal feed industry due to their potential in improving animal health, productivity, and quality of the product output such as eggs quality and meat quality (Hernandez *et al*., 2012). It encompasses a wide range of bioactive compounds, including essential oils, alkaloids, tannins, saponins, and flavonoids, each with unique properties and potential benefits for animal health (Chattopadhyay *et al.,* 2005).

The plant-origin Phytogenic Feed Additives (PFAs) are natural, less toxic, residue-free, and ideal feed additives in meat animal production when compared to inorganic antibiotics or organic chemicals (Hady *et al.,* 2016). Furthermore, Haque *et al.* (2020) documented that Phytogenic compounds have antibacterial and immunostimulant properties and could be used as alternatives to antibiotic growth promoters (AGP) to enhance chicken production performance. Chicken producers currently face challenges in meeting the consumers' needs with zero antibiotic residues and improved production with optimum quality (Haque *et al.,* 2020).

Shahidi and Ambigaipalan (2015) reported that among various plant secondary metabolites, phenolic and flavonoid groups are abundant in almost all plant materials and believed to exhibit good antioxidant activity. *Artocarpus* genus is known to possess phenolic, flavonoid, and xanthone compounds.

Fawole *et al*. (2021) disclosed that *Artocarpus* is aboundantly available in Nigeria and the plant contains various phytochemicals, including flavonoids, alkaloids, saponins, and phenolic acids, which have demonstrated antimicrobial, antioxidant, anti-inflammatory, and immune-stimulating properties.

MATERIALS AND METHODS

Fresh breadnut and breadfruit leaves were harvested from a reliable source at Abede area, Ogbomoso, Oyo State, Nigeria. The leaves were carefully washed with tap water to remove debris. Thereafter, the leaves were air dried to retain the nutrient composition of the plant without any of the phytochemical properties been denatured by temperature. The dried leaves were ground to powder form with the help of mechanical blender. Each sample were stored in air tight properly labeled polythene bag and was

sent for proximate analysis and quantitative phytochemical evaluation to test the presence of some phytochemical properties such as Flavonoids, Saponin, Tannin, Phytosterol, Alkaloids and other phytochemical properties in the extract.

Table 1: Proximate properties of breadnut and breadfruit leaf samples

Parameters	Breadnut leaf Mean Value	Breadfruit leaf Mean Value
Proximate composition		
Dry Matter (%)	**89.24**	**88.28**
Crude Protein (%)	**21.93**	**18.74**
Carbohydrate (NFE) (%)	**35.84**	**42.59**
Crude Fiber (%)	**17.17**	**15.59**
Crude Fat (%)	**4.61**	**3.78**
Ash (%)	**9.70**	**7.60**
Calcium (%)	**0.63**	**0.50**
Phosphorus (%)	**0.41**	**0.36**

RESULTS AND DISCUSSION

The proximate analysis of breadnut and breadfruit leaf samples presented in Table 1, shows that breadnut leaf has the highest value in terms of the proximate analysis compared to the breadfruit leaf. The high crude protein (CP) content in the leaf can offer several benefits in animal nutrition, particularly when used as phytogenic feed additives (PFAs). This corroborate Ajibola *et al.* (2021) and Adedokun *et al.* (2022) report that high crude protein content in leaves provides animals with essential amino acids, the building blocks of proteins which is necessary for growth, tissue repair, and maintenance. Furthermore, increasing CP levels in animal diets can improve growth rate, feed efficiency, and bodyweight gain. However, Wang *et al*. (2021) and Abd El-Hack *et al*. (2022) reported that Phytogenic Feed Additives with high crude protein leaves can enhance nutrient digestibility, particularly protein digestibility, by stimulating digestive enzymes and improving the gut health thereby maximizing the nutritional value of the feed.

In the same vein, Abd El-Hack *et al*. (2022) and Ojewole *et al*. (2023) further explain the significant effect of Phytogenic Feed Additives with high crude protein level that enhance nitrogen retention by reducing protein catabolism thereby improving amino acid utilization, while Ajibola *et al.* (2021) emphasis the vital role of Phytogenic Feed Additives with high crude protein leaf in relation to providing building blocks for antibodies and immune cells, making the animals more resistant to infections and diseases.

High phosphorus (P) and calcium (Ca) content in leaves can offer several benefits in animal nutrition. Adedokun *et al*. (2022) documented that P and Ca are essential minerals for bone development and strength. High P and Ca intake ensures adequate mineralization of bones, preventing bone abnormalities and improving overall skeletal health. This corroborate the findings of Abd El-Hack *et al.* (2022) who also reported that PFAs with high P and Ca leaves stimulate the absorption of P and Ca from the digestive tract and also ensure optimal utilization of these minerals and also maximizing bone mineralization and egg shell quality.

Crude fibre has been known to promote health as it aids the digestive system in performing optimally. However, Abd El-Hack *et al*. (2022) reported that high crude fibre level of monogastric animal diet can reduce the digestibility of other nutrients, such as protein and energy, due to the physical bulk of fiber and its potential interference with nutrient absorption.

The Ash contents helps in enhancing the mineral intake, it should be note that the Ash content is an indicative of the amount of mineral contained in the diet sample.

The phytochemical analysis of breadnut and breadfruit leaf samples presented in Table 2 shows that breadnut leaf has the highest value in terms of the phytochemical analysis compared to the breadfruit leaf.

Table 2: Phytochemical properties of breadnut and breadfruit leaf meal samples

Parameter	Breadnut Leaf Mean Value	Breadfruit Leaf Mean Value
Phytochemical properties		
Flavonoids (%)	**0.005**	**0.002**
Saponin (%)	**0.573**	**0.238**
Tannin (%)	**0.064**	**0.030**
Phytosterol (%)	**0.070**	**0.005**
Alkaloids (%)	**0.481**	**0.330**
Steriods (%)	**0.004**	**0.003**
Phenol (%)	**0.158**	**0.130**
Gums and Resins (%)	**0.002**	**0.002**
Anthraquinones (%)	**0.004**	**0.003**
Carotenoids (ug/100g)	**365.81**	**216.38**
Total Antioxidants (%)	**69.27**	**57.20**

The phytochemical analysis for Breadnut and breadfruit leaf confirmed the presence of flavonoids, phenolic group, saponins, tannins, alkaloids, and other phytochemicals properties in the extract. The results also indicated higher amount of the phytochemicals in breadnut leaf extract compared with the breadfruit leaf extract. The presence of secondary metabolites such as flavonoids, alkaloids, phenolic group, saponins, tanins, phytosterol, steroids, phenol, gums and resins, carotenoids and total antioxidants have been proven to be useful as antimicrobial agent and also use in the synthesis of complex chemical substances (Akrout *et al*., 2010). Ushie, *et al*., (2016) reported that flavonoids are potent water soluble super antioxidants and free radical scavengers which prevent oxidative cell damage and also have strong anticancer activity and inhibit tumor growth.

Shahidi *et al.,* (2018) reported that Phenolic compounds may help modulate the inflammatory response in animals, potentially contributing to overall well-being and also has immunomodulatory effects.

Piluzza *et al*., (2014) documented that Tannins possess antioxidant properties, helping to protect cells from damage caused by reactive oxygen species (ROS). This antioxidant activity can contribute to improved animal health and longevity. Furthermore, Alonso-Álvarez *et al*., (2022) said Tannins have demonstrated antiparasitic properties, potentially aiding in the control of internal parasites in herbivores. Ogunleye and Ibitoye (2003) also reported that Tannins can be used for protection of inflamed surfaces of the mouth and treatment of catarrh, wounds, haemorrhoids, and diarrhea, and as antidote in heavy metal poisoning.

Saponins have been shown to exhibit antimicrobial activity against a variety of pathogens, including bacteria, fungi, and parasites (Francis *et al*., 2002; Gyawali and Ojha, 2013). This property makes saponins potential candidates for use as natural antibiotics and antiparasitics in animal health. Furthermore, Saponnin lower cholesterol levels in animals by binding to cholesterol in the digestive tract and preventing its absorption (Gyawali and Ojha, 2013). Francis *et al.,* (2002) further explain that Saponins causes complexation with cholesterol to form pores in cell membrane bilayers, e.g., in red cell (erythrocyte) membranes, where complexation leads to red cell lysis (hemolysis) on intravenous injection

CONCLUSION

The breadnut leaf proximate analysis which presented high crude protein level indicates that the leaf is a good protein source especially when use as Phytogenic Feed Additives. The presence of phytochemicals is an indication that breadnut leaf is more medicinal and can be used as Phytogenic Feed Additives (PFAs) in animal diet.

RECOMMENDATION

Further studies should be done using breadnut (*Artocarpus camansi*) leaves and breadfruit (*Artocarpus altilis*) leaves as Phytogenic Feed Additives (PFAs) in poultry diet.

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