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NUTRIENT COMPOSITION OF ZOBO WASTE: A BY-PRODUCT OF ROSELLE (*Hibiscus sabdariffa*) CALYX

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Abstract

"Zobo" waste is largely produced and disposed as waste in homes that produced "zobo" drinks particularly in Nigeria. This study was conducted to determine the nutrient composition of "zobo" waste: a by-product of roselle **(***Hibiscus sabdariffa*) calyx. Samples of "zobo" waste were collected and analysed for proximate and mineral compositions using standard protocols. The results showed that "zobo" waste contained higher percent of ash and crude fibre; and it is lower in crude protein, ether extract, nitrogen free extract, lysine and methionine contents. It was concluded that "zobo" waste can serve as alternative mineral and fibre sources for monogastric animals such as rabbits, pullets and layer hens which require high crude fibre levels in their diets.

Keywords: calyx, fibre source, monogastic animals, nutrient composition, "zobo" waste,

INTRODUCTION

Human and livestock, particularly the monogastric animals derived energy, proteins and fats from the same basic foodstuffs. The main energy foodstuffs include maize, wheat, sorghum, millet, oats, barley, fonio and tamba whereas, protein and fats/oils sources include soybeans, oil seed cakes, fish meal, milk, meat and abattoir's offals. In an event of food crisis food is served to humans at the detriment of animals. However, livestock farmers do not take the chance of losing their animals to starvation, hence,a strong competing demand is put on the scarce foodstuffs (Maidala *et al*., 2021). Thus, leading to high cost of feedstuffs and the resultant high cost of animal production (e.g. poultry and swine). To mitigate this situation, non-conventional feedstuffs such as cereal grain by-products, legume seed by-products, oil seed by-products, fruit by-products, animal/dairy by-products and insects have long been used in developing countries to cut down feed cost (Heuzé *et al*., 2015; Orose *et al*., 2016). These by-products are used in other sectors of the economy leading to competition for their demand. Therefore, to solve this challenge, it becomes necessary to further search for raw materials that are not less useful and considered waste. One of such raw materials is zobo waste. "Zobo" waste is the leftover of roselle (*Hibiscus sabdariffa*) calyx after producing soft drinks called 'zobo' and it has been neglected despite its availability in Nigeria and other tropical countries. The calyx is first boiled, filtered and the chaff or residue is described as "zobo" waste. The boiling of the calyx helps to reduce anti-nutritional factors. The objective of this study was to determine the nutrient composition of "zobo" waste: a by-product of roselle (H*ibiscus sabdariffa*) calyx.

Materials and methods

This study was conducted at the Central Laboratory, Federal University, Gashua, Yobe State, Nigeria. A fresh sample of "zobo" waste was collected in Gashua town immediately after the production of the "zobo" drink to avoid being adulterated with debris. It was dried under the shade for a week. It was milled using hand mortar and pestle to pass 2 mm screen sieve. It was

analysed for proximate, mineral (calcium and phosphorus) and amino acid composition (lysine and methionine) according to procedures described by AOAC (2006), AOAC (2006) and Beniter (1989) respectively. The moisture content was determined by drying the sample to a constant weight. The ash content was determined by heating the sample in a furnace at a constant temperature of 550° for eight hours. Fat was determined using Soxhlet extractor. Crude Fibre was determined by boiling sample in sulphuric acid solution, it was washed and boiled in Sodium Hydroxide solution, and the residue was ashed at constant temperature of 550°. The crude protein content was determined using the micro kjeldahl method and the nitrogen determining instrument designed in Sweden by Foss Assembly in 2012 (model kjeltec^{Tm} 2100). The nitrogen content was multiplied by a factor of 6.25 to obtain crude protein content. The nitrogen free extract was determined by difference: carbohydrate = 100 - (% moisture + % Ash + % fat + % Protein + % Fibre). Phosphorus was determined by Vanadomolybdate method while calcium was determined after wet digestion with a nitric, sulphuric and hydrochloric acid, using atomic absorption spectro-photometer (Buck Scientific, 2000 A. USA). Lysine and methionine were determined by ion exchange chromatography using the Technicon Sequential Multisample (TSM) Amino Acid Analyser (Technicon Instruments Corporation, New York) as described by Beniter (1989). These nutrients determined are crucial when formulating animal feeds.

Result and Discussion

Table 1 shows the nutrient composition of "zobo" waste. It contains higher ash and crude fibre contents in comparison to 5.60% ash and 10.40% crude fibre in wheat offal (Heuzé *et al*., 2015), 4.7% ash and 6.4% crude fibre in sorghum offal (Mopaté *et al*., 2011). The higher ash content of "zobo" waste would help reduce bulk requirement for mineral ingredients such as limestone, oyster shell, bone meal and dicalcium-phosphate in feeds, as evident by its high calcium and phosphorus contents. The higher crude fibre content makes it a cheap alternative to more expensive ingredients such as wheat offal, maize offal among others which are utilized in diets for rabbits, pullets, layer hens etc. The crude protein, ether extract, and nitrogen free extract contents as well as lysine and methionine were lower in comparison to most alternative feedstuffs which are fibrolytic sources (Heuzé *et al*., 2015). This implies that "zobo" waste should be included in diets with nutrient rich feedstuffs to avoid deficiency in protein and energy.

Table 1: Nutritional composition of zobo waste

Moisture	CP	A	CF	EE	NFE	Ca.	P	Lys	Meth
10.84± 0.58	3.33± 0.73	6.23± 0.59	19.64± 0.55	1.91± 1.03	58.06± 0.06	0.33± 0.25	1.27± 0.01	0.04± 0.02	0.10± 0.02

Values are mean ± standard deviation of 3 samples collected at different environments, CP = crude protein, A = ash, CF = crude fibre, EE = ether extract, NFE = nitrogen free extract, Ca = calcium. P = phosphorus, Lys = lysine and Meth = methionine.

Conclusion

This paper showed that the ash and crude fibre contents of "zobo" waste are considerably high. Therefore, it is recommended for its mineral and crude fibre contents in diets for rabbits, pullets, layers hens etc.

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