



Nutrients and Anti – Nutrient Content of Sundried Cassava Starch Extract Pulp

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ABSTRACT: Cassava starch extract pulp is an important unconventional livestock feed rich in energy but rarely used as livestock feed due to anti-nutritional factor and lack of nutrient composition. Cassava starch extract pulp was detoxified by sun drying for two week due to high sun intensity and environmental temperature. Proximate and phytochemical composition, gross energy and cyanide content of the pulp were determined using appropriate standard methods. The results of the analysis shows that the percentage moisture, crude protein, crude fibre, ether extract, ash, dry matter and gross energy of the pulp are 5.10%, 1.30%, 3.15%, 0.71%, 4.40%, 94.90% and 4328.72kcal/kg while its cyanide content were 37.58mg/kg. The results revealed that the pulp is very rich in energy. The nutritional content of the pulp were very low, however the ranges of values obtained are below the values that can adversely affected the nutritive value or cause any toxic effects in animal. Based on the results of the study, the pulp should be supplemented with other feed ingredients such as (methionine) which are the limited amino acid and those nutrients whose nutrients are very high.

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The domestic and industrial utilization of cassava lead to generation of large volumes of wastes that can be utilized as animal feed. Africa accounts for more than 90% of the global cassava production in 2004 (FAO, 2006) with Nigeria contributing 38.4 million metric tons, as the largest producer of cassava in the world (Aro, 2008). A cassava starch production unit processing 100 tons of tubers per day has an output of 47 tons of fresh by-products which may cause environmental problems when left in the surroundings of processing plants or carelessly disposed of (Aro *et al.*, 2010). Cassava wastes are usually left to rot away or burnt to create space for the accumulation of yet another waste heaps and the heaps emit carbon dioxide and produce a strong offensive smell. Fresh cassava pulp which is delivered at the end of the cassava starch production process contains approximately 60-75% moisture and 50% starch on a dry matter basis due to the inextricable starch trapped inside the cell of cassava roots (Ukita *et al.*, 2006). The fresh cassava pulp is normally sundried to a moisture content of 10-13% and commonly used as animal feed. The nutritional quality of cassava pulp is variable depending on the starch extraction process and cassava cultivars cultivation practices adopted by farmers (Bede, 2010). Starch quantity and quality in cassava is affected by the conditions of the cassava during growing and harvesting (Chauynarong *et al.*, 2009) Cassava peels, residual pulp and other by-products

from garri processing are normally discarded as wastes and allowed to rot in the open thereby constituting health hazard (Oboh, 2006). About 10million metric tons of cassava tubers are processed into garri annually in Nigeria, this making the waste products potential important resources for animal feed if properly processed. The major limitation in the use of cassava starch extract pulp for monogastric animal feeding is its low protein content (Iyayi and Lossei, 2001). With the advent of biotechnological innovations many new avenues are opening up for their utilization (Akinyele *et al.*, 2011). Cassava processing waste can be easily obtained in regions near processing plants due to the large amount of waste produced and the need for its disposal (Reginatto *et al.*, 2011). This waste is a cheap energy substitute for the formulation of feed for ruminants and as it has a similar nutritive value to maize, it is a viable alternative (Ramalho *et al.*, 2006). In an effort to diversify from our mono-culture economy, the Nigerian Government has been intensifying campaigns to encourage the citizenry to produce more cassava for food and cash. An average Nigerian home will likely take cassava products as food every day, while industrially cassava is used to produce starch, alcohol and fuel. This paper reviews the potential value and constraints to increase use of sundried cassava starch extract pulp as dietary supplement for monogastric animals.

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MATERIALS AND METHODS

Source and preparation of cassava starch extract pulp for analysis: Cassava starch extract pulp were purchased in the month of February from Psaltery Farm International located along Ado-Awaye Maya road in Iseyin Local Government Area of Oyo State of Nigeria. The fresh cassava starch extract pulp collected were sundried for two weeks based on intensity of the sun and environmental temperature after which it was milled using hammer mill and stored for analysis.

Proximate and toxicant analyses: The proximate analysis of the sundried cassava starch extract pulp were determined using the procedure of AOAC, 2005. The pulp were analyzed for dry matter, crude protein, crude fibre, ether extract and ash. Gross energy of the pulp was calculated from data obtained on proximate analysis employing the formula established by Carpenter and Clegg, 1956. The cyanide concentration in cassava was determined using ninhydrin based spectrometer of trace cyanide at 485nm maximum wavelength (Surlevaet *al.*, 2013). A calibration graph was first constructed using standard solution of CN at concentrations of 0.02, 0.04, 0.08, 0.10 and 0.20ug/mL and was prepared by adding appropriate volumes of cyanide solutions at concentration of 20ug CN/MI to 1MI of 2% Na₂CO₃. Ninhydrin solution (0.5mL) containing 5mg/mL in 2% NaOH was added to each standard cyanide solution. The mixture was homogenized and incubated for 15 minutes for colour development. Similarly, the blank was prepared in the same way as above, except that instead of 1MI, 2% Na₂CO₃ containing CN, 1MI of 2% Na₂CO₃ without CN was added. UV-visible absorption of the reaction product of the different concentration of cyanide was measured using UV/ Vis spectrophotometer at 485nm. Total cyanide in the pulp was determined by adding 0.1g of the ground pulp in a standard volumetric flask (5MI) and made up to mark with 0.1% NaHCO₃. The pulp were sonicated for 20 minutes in a water bath and the mixture centrifuged at 10,000 rpm for 10 minutes. The supernatant was pipette with automatic pipette, two aliquots (2MI each) and added to 0.5MI ninhydrin in NaOH allowed for fifteen minutes for colour development and absorbance measured at 485nm.

RESULTS AND DISCUSSION

The results of the proximate and toxicant composition of the sundried cassava starch extract pulp are presented in Table 1. The test ingredient had low moisture content (5.10%). The value were lower than (10-13%) reported by Ukitaet *al.*, 2006. The relatively low moisture content of the pulp after sun drying promises a long shelf life for the pulp before use.

Cassava pulp would required shorter drying times being lighter and fluffer than chips (Dzisi and Wirth, 1994). The dry matter content of the pulp was high (94.90%) and this showed that the pulp were rich in organic matter. The dry matter content of cassava could varied depending on age of plant, season and location with temperature factor related to location (Kawano *et al.*, 1987). The crude protein of (1.30%) for the pulp was lower than (1.55%) reported by Suksombat *et al.*, 2007. The lower protein content of the pulp might not enhance growth and maintenance of tissue. The difference in the values might be as a result of difference in soil composition and geographical location. Iyayi and Lossel, 2001 findings was also in agreement with the value obtained that the major limitation in the use of cassava starch extract pulp for monogastric animal feeding was its low protein content. Crude fibre value of (3.15%) in the sundried cassava starch extract pulp was lower than (27.75%) reported by Suksombat *et al.*, 2007. The fibre content of sundried cassava starch extract pulp was reportedly to be in the form of insoluble fibre. Fibre content was a significant component of the diet, it increased stool bulk and decreased the time waste materials spend in the gut.

Table 1. Proximate and toxicant composition of sundried cassava starch extract pulp

| Parameters | Value |
|------------------------|---------|
| Crude Protein (%) | 1.30 |
| Ash (%) | 4.40 |
| Moisture Content (%) | 5.50 |
| Crude Fibre (%) | 3.15 |
| Ether Extract (%) | 0.71 |
| Dry Matter (%) | 94.90 |
| Gross Energy (kcal/kg) | 4328.72 |
| Cyanide (mg/kg) | 37.58 |

The ether extract of sundried cassava starch extract pulp (0.71%) was much higher (0.13%) than the value recorded by Khempaka *et al.*, 2009. Fat and oils are the most abundant lipids found in nature. The pulp was an ideal feedstuff for production of lean pork. The ether extract represent the fat/lipid content of a sample, it was also present the all important fat soluble vitamins (A,D,E and K).Ash content was the rough measured of the inorganic minerals of a sample (FAO, 2006). In this study, the ash increased and this implied that more essential inorganic minerals were made available in the test ingredient. The gross energy (4328.72kcal/kg) of sundried cassava starch extract pulp was very high than that of maize (3434kcal/kg). The test ingredient was very rich in energy and this allowed the animal to meet their nutrient requirement. The cyanide content of sundried cassava starch extract pulp obtained was 37.58mg/kg which was lower than 50ppm recommended to be harmful to animal (CIFA, 2005). Cyanide had great affinity for mineral such as

iron making them unavailable thereby reducing the haemoglobin count and effective transportation of oxygen and carbohydrate. Cyanide also caused reduction in growth rate by inhibiting the intra thyroidal uptake of iodine causing an increase in secretion of thyroid stimulating hormone (TSH) and thereby causing a reduction in thyroxin level which was necessary for growth (Tewe, 1992).

Conclusion: Results on the proximate and toxicant composition of sundried cassava starch extract pulp have shown that the pulp contains high nutrient (energy) with potentials to meet the nutritional requirements of farm animals if given proper supplementation and treatment with the deficient limiting amino acid (methionine). Further methods of efficient detoxification and processing of cassava starch extract pulp to enable full utilization as alternative feedstuff is being given consideration.

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