EFFECT OF PROCESSING ON THE NUTRIENTS QUALITIES OF RUBBER SEED MEAL

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ABSTRACT

The nutritive values of rubber seed meal (RSM) subjected to processing methods were evaluated to ascertain its usefulness in animal feeds. The rubber seeds were subjected to five differenttreatments; (a) soaking in hot water for 12 hours, drained and sundried; (b) soaking in ash solution for 12 hours, drained and sundried; (c) roasting for 15 minutes and cooled at room temperature; (d) Stored at room temperature for thirty five days. (e) Chemical de-fattened using Soxhlet apparatus. The samples were dried, milled and subjected to chemical analysis. The result revealed that defatted samples were significantly ($P<0.05$) highest in CP (40.36) and carbohydrate (41.48), Portion of energy due to protein (PEP) (37.08) and protein/fat ratio (3.25). Ash soaked and hot water sample had significant ($P<0.05$) highest energy (2675.61 and 2626.37 respectively); while those stored in room temperature sample where higher in NDF and ADL. Defatted samplehas better nutrient quality than other processed samples.

Keywords: fibre fraction Rubber seed, proximate analysis.

INTRODUCTION

The shortage of animal protein in the food of Nigerian has reached an alarming situation especially now that the country is experiencing economy melt down. This thus calls for concerted efforts at averting the persistent protein malnutrition (Ogunsipe and Agbede, 2012).The Nigerian poultry industry is facing the problems of high cost of feed ingredients precipitated by inadequate supply of these ingredients. Poultry feed is the most expensive aspect of poultry production accounting for about 60-70% of the total cost of intensive poultry production in Nigeria (Olomu, 2011). Abdu *et al*. (2009) suggested partial or complete replacement of the expensive conventional feed ingredients with the cheaper non-conventional substitutes in order to restore hope in Nigerian poultry industry.Thus, there is a need for nutritionists to focus in the direction of non-conventional feed ingredients such as palm kernel cake (PKC); cassava peels meal (CPM); cashew nut cake (CNC); rubber seeds meal (RSM) and cotton seed cake (CSC). However, the utilization of non-conventional feed stuff of plant origin had been limited by a number of factors such as high anti-nutritional components, low protein content and high fibre content. Rubber seed meal (RSM) can be used in feeding livestock especially poultry, pigs and rabbits with encouraging results (Babatunde *et al*., 1990). Nwokolo (1987) found out that RSM is a protein-rich feed which can supply essential amino acids for pigs. It is conceivable that processing RSM can improve its nutritive qualities beyond, the anti-nutritional factors is envisaged would reduce and this thus form a basis for this study.

MATERIALS AND METHODS

The study was carried out at Department of Animal Production and Health of the Federal University of Technology; Akure. The area is located between 7.15^0 North and 5.0^0 East. The climate condition of Akure follows the pattern of Southwest Nigeria where the climate is influenced mainly by the rain- bearing Southwest Manson winds from the ocean and the dry northwest wind from the Sahara desert. The rainy season lasts for about seven months (April-October). The rainfall is about 1524mm per year. The atmospheric temperature ranges between 28^0Cand 31^0C and mean annual relative humidity of about 80%.

Sample preparation

The rubber seeds used for this study were purchased from Ilusin rubber estate, Ilusin, Ogun state, Nigeria. The seeds were washed with distilled water, sundried, dehulled and allowed to pass through the different processing methods: (a) soaking in hot water for 12 hours; (b) soaking in ash solution for 12 hours; (c) roasting for 15 minutes and cooled at room temperature; (d) Stored at room temperature for thirty five days and (e) Chemical de-fattened using Soxhlet apparatus. The samples were dried, milled and chemically analysed

Sample Analysis

Proximate analysis of the rubber seed meal samples were carried out using the AOAC (1995) method, Gross energy of the milled samples were determined against thermocouple grade benzoic acid using a Gallenkamp ballistic bomb calorimeter (Model CBB-330-0104L). The Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) were determined according to Van Soest *et al* (1991) method.

RESULTS AND DISCUSSION

Proximate composition

The analysed proximate composition of the raw and differently processed rubber seed meals (RSMs) on dry matter basis are as presented in Table 1. The analysis revealed that the metabolizable energy value of RSMs ranged from 1828.65 to 2675.61Kcal with DRSM having the lowest significant ($P<0.05$) mean energy value and ASRSM having significant ($P<0.05$) highest value. Olomu (2011) reported the values of 2750, 2460 and 2069 ME (Kcal/kg) for groundnut cake, soybean cake and cotton seed cake. The crude protein (CP) of unprocessed and differently processed RSM samples ranged 22.16-40.36%; DRSM recorded the highest significant ($P<0.05$) CP value ($P<0.05$) while ASRSM had the lowest Significant ($P<0.05$) CP value. This is in accord with Batel *et al.* (2008) who reported that defatted sample rubber seed meal has the highest crude protein but low in gross energy. The crude fibre ranged 2.65 to 4.42%, soaking in ash solution (ASRSM) significantly reduced crude fibre ($P<0.05$) more than other processing methods; while the CF was significantly highest on STRSM. The values of fat content, carbohydrate and ash were 12.41- 55.67%; 17.59-41.48% and 2.16-6.57 respectively. ASRSM had significant highest value of fat, while DRSM was significantly lower in values than others. Ash content of UPRSM was significantly higher in comparison with other treatments; as least value from DRSM, which was significantly the same with HWRSM, RRSM, and STRSM. CHO was significantly highest in DRSM (41.48%) and least in UPRSM (14.09%). The decrease in crude protein levels of the samples that were soaked in hot water and ash solution could be as a result of leaching of soluble protein parts of the samples in water. Akingbade *et al.* (2009) reported a decrease ($P<0.05$) in crude protein of jack bean seed with increasing time of cooking and this was attributed to the fact that soluble nitrogenous compounds dissolved in water as the time of cooking increased

Energy content

Table 2 revealed the contribution of various nutrients to energy in processed and unprocessed RSM. It was revealed that protein contribution to energy (PEP) of RSMs ranged 13.97 (ASRSM) to 37.08 (DRSM). PEP from DRSM was significantly higher ($P<0.05$) than others.Energy contribution from fat (PEF) ranged 24.40 (DRSM) to 76.41 (ASRSM). This finding is in agreement with report of Adeyeye (2013) that fat and proteins are better contributors of energy than carbohydrate. Most energy in RSM samples were contributed by fat except in defatted sample where there was significant lower level of fat contribution. Energy contribution from carbohydrate (PEC) ranged from 9.60 (URSM) to 38.12 (DRSM). Utilizable Energy due to Protein (UEDP) was significantly higher in DRSM (22.62) while ASRSM recorded the lowest (12.70). Protein/fat was equally higher in DRSM (3.25) but the variation in other treatments were not significant ($P>0.05$). High UEDP and protein/fat are beneficial in animal feed so as to enhance production of lean meat.

Fibre fractions

The results of fibre fractions of unprocessed and differently processed RSMs were recorded in Table 3. Acid detergent fractions (ADF) were found to be 3.34; 3.89; 4.69; 4.74; and 5.43 for ASRSM; RRSM; URSM; HWRSM; and DRSM respectively. Though DRSM and STRSM recorded higher values of ADF, there were no significant differences in their values ($P>0.05$). NDF were found to be lowest 7.23% in ASRSM

and highest 11.98% in STRSM. The result revealed that there were significant differences ($P<0.05$) in the values of NDF across treatments. ADL values ranged 2.87% in ASRSM to 4.80% in STRSM. DRSM recorded higher values of cellulose and hemicellulose (7.04 and 6.21%) respectively. The result revealed that ash solution reduced ADL value significantly ($P<0.05$). These results were in the range reported by Ravindran and Ravindran(1988) indicating that RSM would have better digestibility with its low levels of fibre fractions

CONCLUSION

Based on the results of this study, Processing method of RSM should be taken into consideration in including RSM in poultry diet, since defattening enhance CP, CHO and high protein fat ratio which make it a good alternative protein source but reduce crude energy content while other methods enhance energy which equally made them a good alternate energy source. Rubber seed meal can therefore be used as either protein or energy source.

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Table 1: Proximate composition (%) and energy value of unprocessed and processed rubber seed meal samples

Samples	URSM	HWRSM	RRSM	DRSM	ASRSM	STRSM	SEM
ME	2398.84^{b}	2626.37^{a}	2490.13^{b}	1828.65^{c}	2675.61^{a}	2478.10^{b}	32.24
CP	27.26^{c}	24.73^{d}	28.67^{b}	40.36^{a}	22.16^{d}	25.98^{c}	0.25
CF	3.62^{b}	3.48^{b}	3.26^{b}	3.60^{b}	2.65^{c}	4.42^{a}	0.30
Fat	48.47^{c}	52.00^{b}	42.68^{d}	12.41e	55.67^{a}	47.87^{c}	10.02
Ash	6.57^{a}	2.20^{c}	3.07^{bc}	2.16^{c}	4.27^{b}	2.25^{c}	0.23
CHO	14.09^{f}	17.59^{d}	22.32^{b}	41.48^{a}	15.25^{e}	19.49^{c}	4.62

Keys: Unprocessed rubber seed meal (URSM): Hot water soaked rubber seed meal (HWRSM), Roasted rubber seed meal (RRSM); Defatted rubber seed meal (DRSM); Ash soaked rubber seed meal (ASRSM); Store at room temperature rubber seed meal (STRSM),Metabolizable energy (ME Kcal/kg), , SEM standard error of measurement. Crude protein (CP) Crude fibre (CF)Means of the same superscript are not significantly different (P<0.05)

Table 2: Calculated Energy and other Nutrients Values (%) of Rubber Seed Meal[s]

Samples	URSM	HWRSM	RRSM	DRSM	ASRSM	STRSM	SEM
ME(kcal/kg)	2398.84^{b}	2626.37^{a}	2490.13^{b}	1828.65^{c}	2675.61^{a}	2478.10^{b}	32.24
PEP	18.56^{b}	15.90^{d}	19.93^{b}	37.08^{a}	13.97^{e}	17.36^{c}	0.05
PEF	71.25^{b}	72.79^{b}	64.57^{d}	24.40^{e}	76.41^{a}	69.59^{c}	0.1
PEC	9.60^{d}	11.32^{cd}	15.50^{b}	38.12^{a}	9.62^{d}	13.07^{c}	0.19
UEDP	15.06^{c}	14.18^{cd}	16.81^{b}	22.62^{a}	12.70^{d}	14.57^{c}	0.2
Protein/fat	0.56	0.48	0.67	3.25	0.4	0.54	0.02

Keys: Unprocessed rubber seed meal (URSM): Hot water soaked rubber seed meal (HWRSM): Roasted rubber seed meal (RRSM): Defatted rubber seed meal (DRSM): Ash soaked rubber seed meal (ASSRSM): Store at room temperature rubber seed meal (STRSM) PEP: Percent of energy due to protein, PEF: Percent of energy due to fat , PEC:Percent of energy due to carbohydrate, UEDP: Utilizable energy due to protein. MC Moisture Content, ME Metabolizible energy, PV: P values, Means of the same superscript are not significantly different ($p < 0.05$)