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A substitution trial of cow meat meal by earthworm meal in the finishing diet of broilers

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Introduction

Tropical regions are abundant in non conventional sources of proteins which could be valorised to reduce import cost of oil cakes and meal flours used in animal production. Earthworms are one of these potential protein sources, especially Eudrilus eugeniae which is likely rich in proteins and is also easily grown in wet organic matters. The aim of this study was to evaluate the substitution effects of cow meat meal by this earthworm meal in the finishing diet of broilers.

Material and methods

Earthworms were grown in wet decomposed droppings as described by Nguekam (1990). After harvesting, the worms were washed in fresh water and killed by dipping into water at 60°C. Afterwards, they were drained under the sun on an aluminium sheet for some hours before being completely dried at 60°C in the oven during 36 hours. Then dried worms were ground up to obtain worm meal. To assess the nutritive value of this earthworm meal, dry matter, crude energy, crude proteins, calcium, phosphorus and sodium contents were determined using bromatology techniques. The substitution trial itself was carried out using 70 broilers, 28 days old, of the "hubbard" breed raised in individual cages. They were divided into 2 groups of 25 males and 10 females each and fed with diets R1 and R2 containing 5% cow meat meal and 3.65% E. eugeniae worm meal respectively. They were fed and watered ad libitum. Average weekly feed consumption and weight gain were recorded in order to determine the average feed consumption index. At the end of the 4 weeks experiment period, 5 individuals of each group were killed and the carcass and abdominal fat proportions determined as proposed by Jourdain (1980). Variance analysis was used to compare the different means at the significant level of $P < 0.05$.

Results

E. eugeniae meal appeared to be an interesting source of protein (68.45 percent) as shown in Table 1. Considering broiler's average weights during the 4 weeks experiment period no significant difference was observed between the 2 groups R1 and R2 (Table 2). More over the average consumption index was practically the same in the 2 groups during the experimental period (Table 3). The average carcass weights were 2 480 g and 2 580 g respectively in R1 and R2 whereas average abdominal fat weighed respectively 65.40 g and 62.88 g. No significant difference was also observed in relation to these parameters.

Table 1 *Chemical composition of earthworm and cow meat meal*

Characteristics (Percentage)	Earthworm meal*	Cow meat meal**
Dry matter	90.20	93.00
Crude energy (Kcal/kg)	2984	2550
Crude proteins	68.45	50.50
Ca	0.38	9.30
P	0.92	4.50
Na	0.02	–

*Results of bromatologic analysis ; ** Ministère de la coopération française (1993).

Table 2 *Average lively weight evolution (g)*

	Week 0	Week 1	Week 2	Week 3	Week 4
R1	622	1019	1457	1927	2323
R2	622	1036	1453	1926	2332

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Table 3 *Average consumption index evolution*

	Week 1	Week 2	Week 3	Week 4
R1	2.03	2.28	2.47	3.02
R2	1.91	2.38	2.47	3.02
SPC standard for "hubbard" breed	1.69	1.87	2.04	2.22

Conclusions

The results obtained in this experiment show that cow meat meal could efficiently be substituted by E. eugeniae meal in broiler's diet. However further investigation is needed to optimize earthworm production techniques and the level of earthworm meal required to improve consumption index.

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Nutrient Analysis of *Moringa Oliefera* as a High Protein Supplement for Animals

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Introduction

Sustainable small livestock production in the Caribbean experience many challenges including: nutrition, health and management. Nutritional limitations include poor feed quality and cost of feed and forage resulting in deficiencies in both energy and protein. Small farmers who practice mixed agriculture are more likely to graze their animals and use feed as a supplement. Forage production is challenged by the vagaries of the dry-season, inherent low protein and available energy content. The aim of this paper is to present an evaluation of *moringa* as a sustainable high crude protein supplement for animal.

Materials and Methods

This study was conducted at the Waterloo Research Facilities, University of Trinidad and Tobago, during the period April, 2008 to May 2010. Dry pods of *moringa* were harvested, the seeds sun-dried (72 hrs to achieve 12 to 14% Moisture Content (MC)], and then dehulled and aspirated manually and separated into 3 categories viz: Whole grain – [whole kernel not crushed]; De-hulled – [kernel subjected to full or partial crushing]; Un-hulled – [testa retained and subjected to crushing]. The seeds [1 kg at 10% MC] were de-fatted or the oils extracted by press method (Weiss, 1971) or hot water treatment. The two press extraction methods are : Hydraulic Press [Carver Laboratory Equipment, Model #3925 @ 2500psi], and Screw Press [Electrolux Extruder with heater, Model#N24@ 400W]. The hot water extraction was conducted on both dehulled and unhulled seed (250 g), and the ground treatment done using a hand mill (1.0 mm particle size). The material was boiled in 1 *l* of water for 5 minutes, and then strained. The extractant was chilled at 5°C for 72 hrs and the solid residue oven-dried at 100°C for 72 hrs for nutrient analysis. All extractions were done in 3 replicates. Proximate analyses were conducted according to AOAC for DM, ash, CP, crude fibre (CF) and ether extract, for NDF (Goering and van Soest, 1970), and for ADF (Van Soest *et al.*, 1991). The Amino Acid Profile (Spackman *et al.*, 1959) was conducted using the Technicon Sequential Multi-sample (TSM) amino acid analyzer(DNA0209). Both analyses were conducted at the University of West Virginia, USA. All data were subject to preliminary statistical analysis.

Results

The CP content varied between 32 and 45% for hulled and defatted seed, respectively.The energy content from the expressed oil was 24 to 38%. The oil cake meal [48.9% CP] yield was 6.42 $t.ha^{-1}$. The seed contained 18 essential amino acids and no anti- nutritional factors were present.

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