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Effect of Graded Levels of Full-Fat Toasted Soya Bean Meal (Glycsine Max) on the Performance of Grower Cane Rats (Thryonomys swinderianus) under Captivity

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ABSTRACT

A total of twenty-four cane rats with an average initial weight between 500-700g were randomly allotted to four dietary treatments (R0, R1, R2 and R3) containing 0,10,15 and 20% toasted full-fat soybean grains as replacement for maize and wheat brand pellets respectively. Freshly harvested *Pennissetum purpureum* (basal diet) was served *ad libutum* to the treatment groups. The experiment spanned 72 days during which average data on feed intake (g), body weight gain were collected and feed conversion ratio (FCR) calculated. No significant difference ($p>0.05$) was observed between treatment groups for feed consumption and weight gain. Male cane rats fed R2 diet recorded a significant ($p<0.05$) higher feed intake compared with the females fed on the same diet. Similarly, weight gain was significantly ($p< 0.05$) higher for the male cane rats fed diet R2 compared with the females fed on the same diet. Generally, feed conversion ratio (FCR) decreased with increasing levels of the test diets. Mail cane rats fed R2 diet recorded a significant ($p<0.05$) lower FCR compared with the rest of the treatments. Full-fat toasted say bean meal can incorporated up to 10 and 15% levels in a maize-wheat brand concentrate meal for female and male cane rats, respectively without adverse effect on the growth performance.

Keywords: *full fat toasted soybean, energy, crude protein, scane rats (Thryonomys swinderianus) and growth performance*

1. INTRODUCTION

The grasscutter (*Thryonomys swinderianus)* is a wild hystricomorph rodent found currently only in Africa Adoun (1993). It is among several kinds of animals that are used locally and regionally for meat (Anonymous 1993). The grasscutter is widely distributed and therefore exploited in most areas south of the Sahara, particularly West Africa Mensah and Baptist 1986. It is the preferred and perhaps the most expensive meat in West Africa National Research Council (1991); Asibey and Addo (2000). The high demand for grasscutter meat and the economic benefit that accrues from its sale has resulted in aggressive hunting with complete disregard for conservation of the species and the environment. Domestication of the grasscutter is being encouraged in West Africa to help address these problems. Inspite of the great potential of grasscutter as a source of animal protein and income, high cost and inadequate supply of feed pose a challenge to sustainable intensive production. Animal production in the tropics is adversely affected by the cost and inadequate feed supply. Raviundran *et al*. (1982). Major hindrances to the development of captive grasscutter include lack of improved breeding stock Annor (2006), and lack of technical know-how. Nutrition and feeding is one of the technical aspects in grasscutter husbandry in captivity. Thus, the establishment of the nutritional requirements of grasscutter under captivity according to the physiological stages and defining the feeding system is crucial in the domestication processes of this specie.

There is a direct relationship between nutrition, reproduction and survival of mammals Barrick and Herman (1991). Optimal nutrition results in faster growth rate, low mortality rate and high reproductive and survival rates Betrridge (1986). Soyabean meal is one of the most widely used protein supplement in the diet of domestic animals. It is the standard for the comparison of other protein sources Newkrik (2010) and has one of the highest (47.6%) levels of essential amino acids among the common plant protein used in animal feeds Schwab (1999). Full-fat toasted soybean meal has been highly appreciated by rabbits yielding high growth rates and high reproductive performance. Wheat offals are widely used as a source of energy and fibre in the diets of animals. On dry matter basis, the chemical composition of wheat offals is 87.6% DM, 16.9% Cp, 11.3% CF, 6.4% ash and 61.6% nitrogen free extract Malau-Aduli *et al.* (2003). Little is known about the energy and protein requirements of cane rats under captivity in its various physiological and productive states. The experiment was designed to determine the dietary energy and crude protein requirements for grower cane rats under captivity fed graded levels of full-fat toasted soybean meal as a replacement for maize and wheat brand pellet.

2. MATERIALS AND METHODS

Study site: The study was conducted from May to July, 2013 in the cane rat distribution centre CIPCRE, Bafoussam-Cameroon, located in the Western highlands of Cameroon (WHL), which is in the Sudano-Guinean ecological zone. The area lies between (Latitude 5-6e 15N, Longitude 10-11° 26 E). The mean annual temperature and relative humidity of the area varies between 20-25°C and 49-97%, respectively. The mean annual rainfall is about 2017mm with the wet season running from mid March to October and the dry season from November to mid March.

Processing of full-fat soya bean: The grains of soybean (*Gylcine max*) were bought from a local foodstuff market in Bafoussam - Cameroon in the dry state. The grains were soaked in salt solution (10g of table salt/litter of water) in a 20-litter container for 8 hours, sieved and sun-dried for three days at temperatures between 25-28°C, them toasted for 10 minutes at 55 ºC to light brownness and spread thin on a tapeline sheet, allowed to dry on the sun for a day before incorporating in the diet.

Animals and experimental design: Twenty-four grower cane rats (16 males and 8 females) weight between 500-700g were used for the trial. Six animals (4 male and 2 female) per treatment were randomly assigned to individual cages (0.7 x 0.5 x 0.4m) in a completely randomized design. Each cane rat was a replicate. The cane rats were fed the experimental diets formulated such that diet R0 (control) was composed of maize grains (M) and wheat brand pellets (W) in a ratio of 2M: 1W and free full-fat toasted soybean meal while the other three diets R1, R2 and R3 contained 10, 15 and 20% full-fat toasted soybean meal as a replacement for maize and wheat brand pellets. The percentage and proximate compositions of the experimental diets (Table 1) were determined according to the methods described by AOAC (1996).

Forage (*Pennissetum purpureum*) harvested the previous day was served daily in all the treatment groups and in sufficient quantity (*ad-libitum*) to each animal. Two hours after the distribution of forage, the experimental diet corresponding to 1/8 of the animal's live body weight was served. This quantity was adjusted weekly up to the end of the trial. The cages and equipments were cleaned daily to avoid accumulation of urine and faeces. Concentrate and forage left over and / or wastage was weighed daily before feeding with the aid of a tap loading (Mark 'STUDE' with 20kg capacity and sensitivity of 5g) weighing scale balance.

Data collection: Data were collected at the start of the trial and subsequently at intervals of 7 days on body weight and feed intake as follows:
Average weight gain (g) = final weight minus previous weight (g) for a week
Feed conversion ratio (FCR) = total feed consumed in a week: kg weight gain
Feed cost (cost/kg body weight = FCR X cost of 1kg feed). Prices for the ingredients were taken at the time of the trial.

Statistical analysis: Data collected or calculated for feed consumption (g) weekly weight gain (g), feed conversion ratio (feed: gain) were subjected to one-way analysis of variance (ANOVA) and significant differences between the means were compared using the (Ducan's Multiple Range Test (1980).

3. RESULTS

The metabolized energy of the experimental diets ranged from 3887.50 control (R0) to 4295.56 kcal/kg R3 diet and CP from 9.89 to 14.80% for the control (R)) and diet R3 respectively (Table 1). The CP, crude fat and the energy content of the experimental diets increased with the inclusion levels of the test grains. Contrary, the crude fibre content, decreased with increasing levels of the test ingredient.

The mean performances of cane rats as affected by graded levels of full-fat toasted soybean grains are summarized in Table 2. Generally, grower cane rats fed low dietary energy and CP levels consumed more fed than those fed high dietary energy and CP levels. At equal sex, feed consumption for cane rats fed with R1 diet containing 10% of the test ingredient was numerically higher but comparable (P>0.05) with the rest of the treatments. When sex was considered, male cane rats fed diet R2 containing 10% of the test ingredient numerically (P>0.05) consumed more feed (945.38±75.84) compared with the rest of the treatments. Similar trend was observed among the female cane rats for this parameter. However, the male cane rats fed R2 diet containing 15% of the test ingredient significantly (P<0.05) consumed more feed compared with the females fed on the same diet. Feed consumption was comparable (P>0.05) among the mail cane rats. Generally, average daily weight gain was significantly (P<0.05) higher with cane rats fed diets R1, R2 and R3 compared with the control (R0) group. At equal sex, total body weight gain was significantly (P<0.05) higher with cane rats fed diet R2 compared with cane rats fed the control (R0) diet. No significant (P<0.05) difference was observed among cane rats fed diets R0, R1 and R3for this parameter. Generally, feed conversion ratio (FRC) improved with the inclusion level of the test ingredient. At equal sex, feed consumption ration was significantly (P<0.05) higher for cane rats fed the control (R0) diet compared with the rest of the treatments. No significant (P<0.05) difference was observed among rabbits fed diets R1, R2 and R3 for this parameter irrespective of the sex.

4. DISCUSSION

The increasing levels of the test ingredient in the treatments seem to induce a numerical reduction (P>0.05) in total feed intake. However, Feed consumption was significantly ($p < 0.05$) higher for the mail cane rats fed R2 diet compared with the rest of the treatments. This result agrees with those reported by Kenfack et al (2007) on grower cane rats but still bellow the suggestions by Mensah and Ekue (2003) and Fantodji and Dofara (2004). The difference in fed intake with regards to sex could be attributed to the palatability of the diet, the nutritional

requirements of the cane rats and the chemical composition of the diets. The male cane rats fed R2 diet significantly ($p < 0.05$) consumed more feed and acquired heavier weight than the females. This implies that the male cane rats efficiently utilized feed consumed (FCR) to produce a kg live body weight.

At equal sex, the test diet induced higher daily weight gain ($P<0.05$) on rabbits fed diet R1, R2 and R3 compared with the control. This result is similar to the findings of Kuis *et al.* (2012) who fed cane rats on graded levels of dietary protein and attributed increase in daily weight gain to the increasing levels of proteins in the diets available for growth, if growth is considered as an increase in size of body cells, tissues and organs which occur as a result of consumption, digestion and assimilation of dietary proteins. Also, high protein levels might have increased the breakdown and digestibility of fibre contained in treatment R3 diet containing 14.8% CP because microbes in the saecum, which are responsible for breakdown of fibre, are basically protein as reported by Radzicka and Wolfenden (1995) and would need dietary protein to build body protein for effective breakdown of fibre. High protein level might have also increased the digestibility of nutrients contained in the diets fed since the enzymes responsible for digestion are proteins. Thirdly, since protein forms the greatest portions of muscles, nails, hairs, and hooves of farm animals Schaiable (1970), increased levels of protein in diets could directly be associated with an increase in weight gain. Weight gain was significantly ($P<0.05$) higher for male cane rats fed diet R2 compared with males in the other treatments and also females fed on the same treatment. Similar results were reported by Kenfack *et al* (2007). This is probably due to the anabolic effect of the male cane rats while, the low body weight gain recorded by the female could be due to the early appearance of secondary sexual characteristics (3 to 4 months) as opposed to the male (5 to 6 months). This is in agreement with Mensah and Ekue (2003) who reported that secondary sexual characteristics in cane rats negatively affect body weight gain in the females. As the CP content in the diets increased and energy: protein ration decreased the efficiency of the animal to convert feed into body weight also increased. Feed conversion ratio improved with increasing levels of protein in the diet. Generally, body weight gain was lower and feed FCR values obtained in the study were higher than those reported by Schrage and Yewadan (2002) and Mensah and Ekue (2003) in Cotonou on grasscutters fed diets containing 17% crude protein and 3973kcal/kg energy. The high FCR recorded in this study could be attributed to the poor quality of the diets and the poor use of nutrients by all the groups of the animals including the control. Full-fat toasted say bean meal can be incorporated up to 10 and 15% levels in a maize-wheat brand concentrate meal for female and male cane rats respectively without adverse effect on the performance of the animals.

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Table 1: Percentage Composition of the Experimental Diet

Ingredients	Diets			
	RO	R1 (10%)	R2 (15%)	R3 (20%)
Maize	75.00	67.50	63.75	60.00
Wheat brand	25.00	22.50	21.25	20.00
Toasted soya bean	00.00	10.00	15.00	20.00
Total	100	10.00	100	100

Table 2: Proximate Composition (%) and Energy Values of the Experimental Diets

Ingredients	Diets			
	RO	R1 (10%)	R2 (15%)	R3 (20%)
DM (%)	86.45	86.66	86.77	86.88
Crude protein (%)	9.90	12.25	13.52	14.80
Crude fat (%)	3.85	5.41	6.17	6.94
Crude fibre (%)	4.27	4.46	4.39	4.32
M.E (kcal/kg)	3887.50	3995.75	4060.87	4295.56
E / P radio	400.77	326.18	300.36	290.24

Table 3. The effect of graded levels of full-toasted soy bean grains on the growth performance of cane rats under captivity

Paramet-ers	Dietary level of the of full-toasted soy bean grains											
	Control (R0)			R1 (10%)			R2 (15%)			R3 (20%)		
	♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀	♂	♀	♂♀
Feed consumption (g)	886.71± 44.83^{ab}	768.571± 64.79^{a}	863.91± 62.52^{a}	945.38± 75.84^{ab}	797.16± 46.72^{a}	890.67± 76.46^{a}	937.72± 44.88^{b}	683.04± 99.73^{a}	858.16± 28.38^{a}	863.00± 23.68^{ab}	680.35± 93.50^{a}	850.32± 36.57^{a}
Average daily weight (g)	13.58± 2.87^{a}	12.18± 0.15^{a}	13.02± 2.43^{a}	17.21± 6.32^{b}	14.04± 1.30^{a}	**16.45± 5.32^{b}**	19.01± 1.08^{bc}	12.84± 3.08^{a}	**16.10± 3.95^{b}**	17.45± 3.15^{bc}	12.66± 0.32^{a}	**15.86± 3.43^{b}**
Total weight gain (g)	1043.2± 21.3^{a}	938.6± 12.4^{a}	1008.3± 27.0^{a}	1325.7± 40.5^{ab}	1150.5± 10.2^{a}	1267.4± 10.3^{ab}	1494.1± 38.4^{b}	975.0± 37.7^{a}	1308.8± 30.9^{b}	1344.2± 43.6^{ab}	970.7± 25.6^{a}	1221.5± 27.1^{a}
Feed conversion ratio	9.16± 1.8^{a}	9.21± 0.8^{a}	9.39± 1.3^{b}	7.75± 1.6^{a}	7.78± 1.5^{a}	7.69± 1.0^{a}	5.13± 0.7^{b}	8.61± 2.1^{a}	7.21± 2.2^{a}	7.07± 1.4^{a}	7.08± 1.7^{a}	7.23± 1.3^{a}

A,b and c: means along the same row with different superscript are significantly different (P<0.05) s
♂♀: male and female cane rats respectively