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Effect of Varied Dietary Protein Levels on the Reproductive Performance of Grasscutter *(Thryonomys swinderianus)* in Captivity

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Abstract: This study examined the effect of varied dietary protein levels on the reproductive performance of grass-cutter with a focus on birth weight, litter size and survival rate of baby grass-cutters. Eight growing grass-cutters comprising 4 males and 4 females were used with one male and one female paired per treatment. Observations were made on feed intake and litter birth characteristics of the animals. Four dietary treatments containing Crude Protein (Cp) percentages: 18%, 20%, 22% and 24% levels were fed to the animals. Results obtained showed that significant differences ($p<0.05$) existed in the mean weekly feed intake of the grass-cutters, with highest dry matter intake (68.26±8.64 g/head/wk) in Cp 18% followed by Cp20, 22 and 24% in descending order. There were no significant differences ($P>0.05$) in the survival rates, with 5 and one mortalities recorded for Cp 18 and 20%, respectively, while none for Cp 22%and 24%. Litter size of grasscutters produced by the parental stocks indicated highest rate (5) for Cp24% and significant differences ($p<0.05$) existed in the birth weights of offspring produced in respective feed treatments. It was concluded that a protein inclusion rate of 24% gave the best reproductive performance when compared to other crude protein percentages.

Key words: Grasscutters, dietary, birth rates, crude-protein, reproduction

INTRODUCTION

Africa lies behind other developing continents in food production. International Livestock Center for Africa[1] reported that the index of food production per capita in Africa has dropped by almost 10% between 1972 and 1982 compared to 12-18% rise in Asia and South America. FAO[2] gave worldwide picture of the state of food production indicating a generally low per capita food production performance in 71 out of 108 developing countries between 1987 and 1988. The production of animal protein in Nigeria had been largely dependent on domestic livestock and this has been unable to meet demand. Oladokun[3] had observed that animal protein production in Nigeria from domestic livestock has been falling steadily by about 1.4% annually, while human population increases at an annual rate of 3.3%. According to Ayeni and Ajayi[4], the only virgin area capable of solving the problem of low protein intake in Nigeria is wildlife domestication.

Animal production in the tropics is adversely affected by cost and inadequate feed supply[5]. Feed contributes substantially to the cost of production. The high cost of animal production results in low yield and high prices of its product in the market. This made them unaffordable by majority of consumers in Africa. This results in many nutritional problems emanating from low consumption of animal protein in this part of the world. The long-term growth of animal production in Nigeria is dependent on a better utilization of farm waste products, which attract little or no monetary values[6]. Therefore use of non-conventional feed ingredients is daily gaining ground in Africa.

Though some studies had been done on grass-cutter farming in Nigeria, not much has been carried out on the correct amount of dietary protein necessary for optimum reproductive performance in the animal. This study was therefore carried out to determine the appropriate dietary protein inclusion rate in grass-cutter diets for the best reproductive performance using feed compounded with agro-industrial by-products. With the objectives of determine the effect of varied dietary protein levels on the reproductive performance of grass-cutters and the appropriate protein inclusion rate in grass-cutter diets for the best reproductive performance.

MATERIALS AND METHODS

This study was conducted at the University Mission Research (UMR) Cane Rat Unit of the University of Ibadan, With a total of 8 growing grass-cutters (4 months old) comprising 4 males and 4 females were used for this

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study. Two 2-tier cages measuring 1.60 m (L) x 1.3 m (H) x 0.60 m (W) were used to house the animals and these cages were located in the cane rat stable which measures (L) 10 m x (H) 2.5 m x (W) 5.5 m. This study lasted a total of 9 months besides an acclimatization period of 2 weeks. The animals were randomized into 4 groups on live weight basis, 1081.25g±3.75, 1120.00g±5.0, 1087.50g±6.25 and 1075.15 g 14.60 representing Cp 18, 20, 22 and 24%, respectively. Elephant grass (*Pennisetum purpureum*) of 400 g per treatment was fed to the animals coupled with 120 g of pelleted ration fed per treatment per day. The daily feed consumption rates were estimated by subtracting the quantity of leftover feed from the measured amount earlier served to the animals at the beginning of each day. Water was also served to the animals. All data collected were subjected to analyses of variance (ANOVA) in a Completely Randomized Design (CRD)[7]. Duncan's[8] Multiple Range Test (DMRT) was used to test for significant differences among treatment means. Feed samples were analyzed using AOAC[9] procedures.

RESULTS

The proximate composition of the diets is shown in Table one with components such as dry matter, crude protein, ether extract and nitrogen free extract for the four experimental feeds, with the proximate composition of the elephant grasses inclusive. The feed intakes of the experimental animals for the first ten weeks of the experiment and from week eleven to twenty two are shown in Table 2, with Cp 18% has the highest mean value of 682.61g±8.64 and lowest mean value 481.78g±6.54 from the Cp22%. Table 3 shows the birth weights of grasscutters produced by the experimental animals with Cp18% having no fawning while the 24% crude protein had the highest mean weight of 150.50±3.32g. From Table 4, the birth characteristics of the grasscutters indicated that survival rates of the littered grasscutters for crude protein 22% and 24% were 4 and 5, respectively while there was no mortality, but crude protein 18 and 20% had high mortality with lower survival rates. Table 5 shows the gross composition of experimental diets with all the ingredients similar in all the four dietary composition but under different crude protein percentages.

DISCUSSION

There was significant different ($p<0.05$) in the mean dry matter intake (g/head/week) of the experimental animals. The highest dry matter intake (682.61±8.64 g /head/wk) was recorded in cp18% followed by 530.73g±3.32 g/head/wk in cp 20%. Feed intake in cp 22% was 481.78g±6.54/head/wk while that of the control was 519.88±10.12 g/head/wk. Douglas[10] reported significant differences in the body weight of broilers fed on ingredients of varying percentage crude protein levels.

Litter size among respective treatments did not differ significantly ($p>0.05$) with cp20, 22 and 24% having litter sizes of 3, 4 and 5, respectively. Though an abortion was recorded in cp18%, the litter size was 5. This abortion could be due to the low protein content in the diet, which did not meet the mother's body requirements. The litter sizes recorded in this study confirm the findings of Ayeriyina[11] who reported a litter size of between 3 and 5. Adeyemo[12] reported that delay in sexual maturity of avian might be an indication that the level of protein supplied is too low to support an early development of reproductive organs.

There were no significant differences ($p>0.05$) in survival rates among treatment groups, though one mortality was recorded in Cp20% and this was probably due to the low protein content in the diet, which had a negative effect on the offspring. Cp18% recorded an abortion of 5 fetuses, which could have resulted from the low protein level (18%) in the mother's diet, which did not meet her body requirements. This is an indication of poor dietary level, which adversely affects reproduction at this level[13]. While there existed total survival for the Cp22% and 24% (4 and 5 litters, respectively) the mortality rate in Cp 18% and 20 % was more than average.

Table 1: Proximate composition of experimental diets

Nutrients	Cp 18%	Cp 20%	Cp 22%	Cp 24%	Elephant grass
Cp	18.69	20.27	22.12	24.17	10.11
DM	91.70	92.31	90.16	89.77	17.37
CF	11.80	13.05	13.23	13.75	32.03
ASH	4.28	4.80	4.66	4.62	10.02
EE	2.92	3.10	3.18	3.23	1.69
NFE	47.94	46.17	45.35	44.17	51.23

CP = Crude Protein DM = Dry matter CF = Crude Fibre EE = Ether Extract NFE = Nitrogen-free Extract

Table 2: Mean feed intake (g) of grasscutters fed on 4 planes of nutrition

Week	Cp18%	Cp20%	Cp22%	Cp 24%
1-10	6818.70	5633.30	5540.43	5370.60
11-14	2651.40	1850.24	1528.24	1778.20
15-18	2668.12	2212.63	1657.88	2014.38
19-22	2879.15	2212.63	1872.56	2274.17
Total	15017.37	11676.01	10599.11	11437.35
Mean	a	bc	d c	
	682.61g±8.64	530.73g±13.32	481.78g±6.54	519.88g± 10.12

Table 3: Birth weight of (fawn) grasscutters (g)

Week	Cp18%	Cp20%	Cp22%	Cp24%
1-	-	130.00	128.50	145.00
2.	-	135.00	130.00	150.00
3.	-	135.00	135.00	150..
4.		135.75	152.50	155.00
Total	-	400.00	529.25	752.50
Mean		133.33±2.36	132.31±3.12	150.50±3.32

Table 4: Birth characteristics of grasscutters fed on four planes of nutrition

	Litter size	Mortality	Survival
Cp18⁰%	5	5	0
Cp20%	3	1	2
Cp22%	4	0	4
Cp24%	5	0	5

Table 5: Gross composition of experimental diets (kg)

Ingredient	Cp18%	Cp20%	Cp22%	Cp24%
Maize	34.00	26.00	28.00	24.00
GNC	8.00	10.00	12.00	15.00
Soya bean meal	8.00	10.00	12.00	15.00
PKC	12.00	12.00	12.00	12,00
Wheat offal	12.00	12.00	12.00	11.00
BDG	12.00	12.00	12.00	13.00
Rice bran	8.00	12.00	8.00	10.00
Bore	2.00	3.00	2.00	1.00
Oyester shell	4.00	3.00	2.00	1.00
Vitamins	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.250	0.25
Salt	0.25	0.25	0.25	0.25
Furazolidone	0.004	0.004	0.004	0.004
Total	100.00	100.00	100.00	100.00

Birth weight of baby grasscutters among respective treatments differed significantly ($p<0.05$). Cp20 and 22% had mean birth weight of 133.33g±2.36 and 132.31g±3.12, respectively while the control had the highest mean birth weight of 150.50g±3.32. The mean birth weight for all treatments was calculated to be 140.15g±9.68. Birth weights recorded in this study contrasts with the findings of Ayeriyira[11] who reported in his study that birth weights of grasscutters varied from 75.00 to 188.00 g.Though birth weights recorded in Cp20 and 22% confirm the findings of Ayeriyina[11] that birth weight decreases with increasing litter size, the birth weight in the control did not confirm this finding as a mean birth weight of 150.50g±3.32 was high for a litter of 5. Ayeriyina[11] had reported a mean birth weight of 165.70g±6.20 for a tripled litters 133.25g±7.20 for quadruplet litter and 86.60g±2.40 for a litter size of 6. The range of birth weight (132.31g±3.12 to 150.50g±3.32) recorded in this study also contradicts a mean birth weight of 117.00±2.0g to 123.00±3.0g, which was reported by Mensah and Baptist[14]. The 5 aborted fetuses in cp18% weighed 31.00, 34.50, 35.00, 32.00 and 28.50 g, respectively.

It was concluded that a protein inclusion rate of 24% gave the best reproductive performance when compared to other crude protein percentages.

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