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Supplementary effect of concentrate feed on the performance and nutrient digestibility of Cane-Rats (*Thryonomys Swinderianus*) fed a basal diet of Elephant Grass *(Pennisetum purpureum*)

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Abstract

A study was conducted to determine the effect of concentrate supplementation on performance and nutrient digestibility in cane-rats/grasscutters. There were initially three treatments; 0%, 10% and 20% concentrate supplementation on as fed basis to a basal elephant grass diet. Fifteen weaned cane-rats with average body weight of 1150g (±365.40) were randomly assigned to the three treatments based on weight and sex. The growth study was conducted for eight weeks. A nutrient digestibility study was also conducted using three grasscutters per treatment. The cane-rats fed 20% supplementary concentrate gained more weight than those offered 10% concentrate feed. Crude protein was better ($P<0.05$) digested by cane-rats on 20% concentrate feed whereas, ash and ether extract digestibility were better on 10% concentrate feed. The 0% concentrate treatment was terminated because three of the cane-rats (60% mortality) died within three weeks of the study. It is recommended from this study that cane-rat fed a basal grass diet should be supplemented with 20% concentrate feed on as fed basis.

Key words: Grasscutter/cane-rat, performance, nutrient digestibility.

Introduction

Cane-rat (*Thrynomys swinderianus* Temminck) meat is a culinary delicacy readily relished by the people both in the rural and urban communities in Nigeria and the entire West African countries. This is because the meat "bush meat" is socially acceptable by the different ethnic, cultural and religious groups (Ajayi and Tewe 1980). Cane-rat meat has good nutritional qualities: high quality animal protein, low fat,

high dressing percentage and good/unique taste (Fayenuwo *et al* 2003; Olomu *et al* 2003). The meat of cane-rat is more nutritious than meat from most domesticated animals except poultry (Ajayi and Tewe 1980). Infact, the meat is highly prized and sought after. It is readily sold for money by people living in the rural areas where it is obtained.

However, cane-rat meat is mainly obtained by hunting and trapping of the animals. This does not ensure steady and regular supply of the meat. It atimes involves bush burning in order to smoke out the animals from their hidings. This has its attendant problems of damage/destruction of valuable plants, animal life and the ecosystem. Thus, there is the need to domesticate the animal in order to avoid the ill effects of bush burning and ensure regular supply of cane-rat meat.

Nevertheless, domestication of cane-rat has its own teething problems. These include the need to provide regular supply of feeds rich and balanced in nutrients. It has been observed (that grasscutters normally prefer grasses (such as elephant grass, sugar cane, guinea grass e.t.c) with succulent stalk (Fayenuwo *et al*; 2003). However, grasscutters reared in captivity on forages/grasses alone does not do well compared to those living in the wild. This is because they normally obtain balanced nutrients from a variety of feeds such as grasses/forages, tubers, grains, nuts, herbs e.t.c in their natural habitat or in the wild.

Therefore, there is the need to supplement the basal grasses/forages that cane-rats are fed on with concentrate feeds. Studies with other species of livestock have demonstrated the positive effect of supplementary concentrate feeding. It has been reported that supplementation of the natural grazing of Bunaji cattle with agro-industrial by-products (such as maize offals, palm kernel cake and dried brewers grains) resulted in improved daily weight gain, body condition score and high milk yield (Olafadehan and Adewunmi 2007; Olafadehan *et al* 2007). Also, improved body weight gain and carcass yield have been recorded in rabbits fed sweet potato forage supplemented with concentrate diet as compared to forage only (Shoremi, 2001).

There is paucity of information on the effect of supplementary concentrate feed on the performance of cane-rat fed basal grass diet. Therefore, the objectives of the study were to investigate the supplementary effect of concentrate feed on the performance and nutrient digestibility of cane-rats in captivity.

Materials and Methods

The experiment was carried out at the Cane-rat Unit of the Institute of Agricultural Research and Training, Ibadan during the rainy season between July and September, 2006. Fifteen weaned cane-rats of mixed sexes, purchased from a private farm in Ibadan were used for the study. They were randomly assigned to three dietary treatments on the basis of sex and body weight. The average body weight of the animals was 1150g (±365.40).There were five animals per treatment and each animal served as a replicate. Each animal was placed in an appropriate plastic

basket with cover and weighed at the beginning of the study and weekly thereafter using a Salter scale to determine body weight changes.

The three dietary treatments were:

Treatment 1: Elephant grass *Pennisetum purpureum* only as basal diet.

Treatment 2: Elephant grass plus 10% concentrate feed.

Treatment 3: Elephant grass plus 20% concentrate feed on as fed basis.

However, treatment 1 was deleted when three of the animals on it died at the third week of the experiment. The remaining two animals on treatment 1 were re-assigned to treatments 2 and 3 to make six animals per treatment.

The animals were housed individually in well ventilated cages with wooden frame and the inside lined with wire mesh. This was to prevent the animals from eating the wood. Separate feed and water troughs were provided. Each cage had dimension of 0.5m, 0.4m, 0.4m, for its length, width and height respectively. The cages were placed in a standard concrete animal house that offered complete protection to the animals from rainfall, direct rays of the sun and predators.

Elephant grass wilted overnight and chopped to between 10-15cm was offered to the animals in the morning. These were placed on the floor of the cage and concentrate feed was offered in the afternoon in addition to the grass to the supplemented groups in ceramic troughs. The concentrate diet was pelleted and comprised the following (%): maize: 36.20, wheat offal: 25.00, palm kernel cake: 12.00, maize bran: 14.00, groundnut cake: 7.00, soyabean meal: 3.55, fishmeal: 0.50, bone meal: 1.25, salt: 0.25 and grower's vitamin mineral premix: 0.25. The diet was formulated to contain 16% crude protein and metabolizable energy of 2598 Kcal /kg. The grass was offered *ad libitum* while animals on treatments 2 and 3 had concentrate diet at 10 and 20% of the grass offered on as fed basis.

Water was offered *ad libitum* to the animals in ceramic troughs. The left over of the grass mainly the stalk, concentrate feed and water were weighed/measured the following morning. These were subtracted from quantities offered in order to calculate intakes.

The growth study conducted for eight weeks was preceded by a two week adjustment period to the feeding regime and the experimental conditions. Digestibility trial was also conducted. Three cane-rats per treatment were used for the study. Total collection of feaces was done in the cages with suitable collection trays/drawers underneath them for four days. The remnant feed was carefully removed from the feaces to avoid contamination.

Parameters measured included grass, concentrate and water intakes, body weight changes, and nutrient digestibility. Feed conversion ratio was derived from feed intake and weight gain.

Samples of the grass, concentrate and feaces were analyzed for proximate composition using appropriate methods (A.O.A.C., 1990). Calcium and phosphosrus contents of the samples were also analysed (A.O.A.C., 1990).

Statistical analysis of the data generated was initially planned to be done by analysis of variance technique. However it was carried out using T-test (Steel and Torrie, 1980) when treatment 1 was deleted and there were only two treatments remaining.

Results

The proximate, calcium and phosphorus contents of elephant grass (*Pennisetum purpureum*) and the supplementary concentrate feed offered to cane-rats are shown in Table 1. The grass contained more crude fibre, ash, ether extract and phosphorus than the concentrate feed. However, the supplementary concentrate feed had higher levels of dry matter, crude protein, nitrogen free extract and calcium.

Table 2. shows the performance characteristics of cane-rats fed elephant grass (*Pennisetum purpureum*) supplemented with concentrate feed. Cane-rat offered 10% supplementary concentrate feed to a basal diet of elephant grass consumed more grass but not significantly (P>0.05) more than those fed on 20% concentrate feed (132.77, versus 123.37g respectively). However, those on 20% concentrate feed had higher (P<0.05) concentrate intake than the 10% supplemented concentrate group (55.97 versus 37.96g respectively). On dry matter basis, the 10% supplementary concentrate groups consumed 77.77% grass and 22.23% concentrate while the 20% supplementary group took 68.7% grass and 31.31% concentrate feed. There was also significant difference (P<0.05) in the grass plus concentrate intake between the two groups with the 20% concentrate group having higher intake (179.33g/animal/day). Cane-rats fed 20% supplementary concentrate on as fed basis gained more weight and consumed less water (P<0.05) than those offered 10% concentrate feed on as fed basis . Also, the 20% concentrate group utilized the feed more efficiently (30.14) (P<0.05) than the 10% supplementary concentrate group (39.80). No mortality was recorded in the supplemented groups, whereas the elephant grass only group

Table 1. Proximate composition of elephant grass (*Pennisetum purpureum*) and concentrate feed (g/100g on DM basis).

Parameters	Elephant grass	Concentrate feed
Dry matter	40.82 ± 13.60	87.27 ± 0.62
Crude protein	8.76 ± 0.88	17.94 ± 1.31
Crude fibre	27.00 ± 1.00	10.00 ± 1.00
Ash	7.50 ± 1.50	6.00 ± 2.00
Ether extract	6.50 ± 0.05	2.50 ± 0.50
Nitrogen free extract	50.25 ± 1.13	63.56 ± 0.81
Calcium	0.36 ± 0.01	0.87 ±10.01
Phosphorus	0.48 ± 0.00	0.46 ± 0.10

Table 2: Performance characteristics of cane rats fed elephant grass (*Pennisetum purpureum*) supplemented with concentrate feed

Treatments	Feed intake DM basis (g/animal/day) Grass	Concentrate	Grass+ Concentrate g/animal/day	Weight changes m/day	Feed efficiency	Water intake m/animal/day
T2: 10% Supplementary concentrated feed % DM consumed	132.77± 11.91 (77.77%)	37.96^{b} ± 3.92 (22.23%)	170.73^{b}± 13.79	4.29^{b}	39.80^{b}	86.67^{b}
T3: 20% supplementary concentrate feed % DM consumed	123.37 ± 14.22 (68.79%)	55.97^{a} ±5.87 (31.21%)	179.33^{a} ± 19.03	5.95^{a}	30.14^{b}	79.44^{b}

suffered three mortalities or 60% mortality within three weeks of the study before the treatment was terminated.

The nutrient digestibility values of cane-rats fed on elephant grass supplemented with concentrated feed are shown in Table 3. There exist significant differences ($P<0.05$) in the crude protein, ash and ether extract digestibilities in the two supplemented groups.

Crude protein was significantly ($P<0.05$) digested by cane-rats on 20% supplementary concentrate feed whereas ash and ether extract digestibilities were better on 10% supplementary concentrate feed. However, there were no significant differences ($P>0.05$) in the dry matter, crude fibre, nitrogen free extract, calcium and phosphorus digestibility values between the 10% and 20% supplementary concentrate feeds (Table 3).

Discussion

The crude protein, crude fibre and nitrogen free extract contents of elephant grass used in this study are similar to those reported in another study where dried, and milled elephant grass was used in feeding grasscutter (Wogar *et al* 2007a). However, the ether extract and ash contents of the grass in the two studies differed. Also, the crude protein and ash contents of the supplementary concentrate feed in this study are similar to that used in supplementary forages fed to weaned rabbits (Taiwo *et al* 2005).

The feed intake recorded in this study was higher than those recorded in weaned rabbits with

Table 3: Nutrient digestibility (%) of cane rats fed elephant grass *(Pennisetum purpureum)* supplemented with concentrate feed

Treatments	Dry matter Digestibility	Crude protein digestibility	Crude fibre digestibility	Ash Digestibility	Ether extract digestibility	NFE Digestibility	Calcium Digestibility	Phosphorus digestibility
T2: 10% Supplementary concentrate feed	90.88	80.85[a]	86.80	85.63[a]	66.22[a]	98.79	78.68	80.10
T3: 20% supplementary concentrate feed	90.88	86.68[a]	87.49	81.40[b]	63.90[b]	97.64	78.67	79.62
Statistical significance	NS	*	NS	*	*	NS	NS	NS

mean final liveweight of about 1300g, that were fed forages (Taiwo *et al* 2005) and in growing rabbits fed on rabbit meal and chloris grass (Iyeghe-Erakpotobor *et al* 2003). On the contrary, high concentrate and grass intakes were recorded in grasscutter with average final liveweight of 1350g compared with this study (Wogar *et al* 2007b).

The higher concentrate intake recorded in the 20% supplementary concentrate feed compared to the 10% level can be explained by the higher quantities offered to the grasscutters. This also positively influenced the overall feed intake (grass plus concentrate that was significantly higher ($P<0.05$) in the 20% supplementary concentrate treatment compared to the 10% concentrate treatment. The animals would want to eat to satisfy their nutrient requirement since the feed is rich in nutrients with about 17% crude protein level. The concentrate feed consumed by grasscutter on the 20% supplementary concentrate feed partly substituted for the grass intake. Thus, a slightly lower grass intake was recorded in the 20% as compared to the 10% supplementary concentrate feed treatment.

The higher feed intake recorded on the 20% supplementary concentrate treatment also translated to a higher weight gain compared to the 10%concentrate treatment. The weight gain observed in this study are however lower than the daily weight gain range of 9.35 – 10.83g recorded elsewhere (Wogar *et al* 2007a) where grasscutters were fed with a minimum of 22.4% crude protein where fermented and milled elephant grass replaced between 0-50% fermented cassava meal in the rations of the animals.

Grasscutters fed on 10% concentrate feed as supplement to elephant grass in this study however had comparable weight gain (4.29 versus 4.41g) to grasscutters elsewhere (Wogar

et al 2007b) where elephant grass (*Pennisetum purpureum*) was fed alongside a 24% energy – protein supplement to the animals.

No mortality was recorded in the 10% and 20% concentrate feed treatments. However 60% of the grasscutters initially on treatment 1, grass only diet died within three weeks of the commencement of the study. The deaths were not due to any disease from veterinary reports. When the two animals remaining on this treatment were reassigned to the other treatments, no mortality was suffered. This goes to show that the grass diet alone was inadequate to meet the minimum requirement of the animals in captivity thus leading to their death on treatment 1. This assertion is corroborated by the report of a farmer that lost two out of five of his grasscutters kept in captivity when he could not feed them supplementary concentrate at all for a period of seven days.

Conclusion

Cane-rat should not be fed grasses alone without concentrate feed as 60% of the animals on elephant grass diet alone died. Cane-rats fed on 20% supplementary concentrate feed performed better in terms of weight gain, feed efficiency and crude protein digestibility than those offered 10% concentrate feed on as fed basis. Therefore it is recommended that cane-rats/grasscters in captivity should be offered 20% supplementary concentrate feed in addition to basal diet of elephant grass for better performance.

References

Ajayi S.S and O.O. Tewe 1980 Food preferences and carcass composition of the grasscutter (*Thryonomys swinderianus*) in captivity *African J. Ecology* 18:33-34

A.O.A.C. 1990. Association of Official Analytical Chemists, Official methods of Analysis, 15th ed Washington DC.

Fayenuwo J.O, Akande M, Taiwo A.A; Adebayo A.O., Saka J.O, Lawal B.O, Tiamiyu A.K and P.O. Oyekan 2003. *Guidelines for grasscutter rearing.* Technical Bulletin, IAR&T., Ibadan. p38

Iyeghe-Erakpotobor G.T., R.A. Aliyu and J. Uguru 2003. Combination of concentrate, grass and other forage mixtures for feeding grower rabbits. In: Proc 28th Ann. Conf. Nigeria Soc. for Anim. Prod. held at IAR&T. Ibadan. p363-366.

Olafadehan O.A and M.K. Adewunmi 2007. Liveweight and body condition of prepartum supplemented bunaji cows in agropastoral farming systems in the derived savanna of Oyo State. In: Proc. 32nd Annual Conf. of Nig. Soc. For Anim. Prod. Calabar. March 18-21, 2007 p198-200.

Olafadehan O.A, M.K. Adewunmi, A.A. Busari, E.A. Salako, C.O. Obun, A.M. Yusuf and F.T Ajayi 2007. On farm assessment of milk yield in gestating bunaji cattle through agropostoral by- product supplementation In Proc. 32nd Ann. Conf. of Nig. Soc. For Anim. Prod. Held at UNICAL, Calabar, March 18-21.2007. p195-197.

Olomu J.M.; V. E. Ezieshi and A.M. Orheruata 2003. Grasscutter *Production in Nigeria:* Principles and Practice. Jachem Publisher p.62.

Shoremi O.I.A, Akor J.A, Igoche L.E and Onaa S.O. 2001. Effect of graded levels of sweet potato (*Ipomea batata*) forage on growth and carcass characteristics of weaner rabbits. In: Proc. 26th Ann Conf Nig. Soc. For Anim. Prod, held at NAPRI, Zaria p168-170.

Steel R.G.D and J.H Torrie 1980 Principles and Procedures of statistics McGraw - Hill, New York.

Taiwo A.A, A.D Adejuyigbe, E.A Adebowale, J.S. Oshotan and O.O. David 2005. Performance and nutrient digestibility of weaned rabbits fed forages supplemented with concentrate. *Nigerian Journal of Animal Production.* 32: 74-78.

Wogar G.S.I, L.N. Agwunobi and A.S Anieunam 2007a. Effect of replacing cassava meal with dried, milled elephant grass (*Pennisetum pupureum)* on the performance of growing grasscutters (*Thryonomys swinderianus).* In: Proc. 32nd Ann. Conf. NSAP, UNICAL, Calabar p.365-368.

Wogar G.S.I, U.E Umorem and R.M Samson 2007b. Effect of legume forages on performance of growing grasscutters fed cassava based energy and protein diets. In: Proc. 32nd Ann. Conf. Nig. Soc. for Anim. Prod. UNICAL, Calabar p369-372

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