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Research Article

EVALUATION OF THE GROWTH PERFORMANCE OF GRASSCUTTER FED WITH A GRANULAR FEED SUPPLEMENT BASED ON *STYLOSANTHES GUIANENSIS* IN BENIN

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ABSTRACT

Feeding grasscutter with forage during the dry season is a major challenge due to the scarcity of forage during this period. This study aimed to develop a forage-based feed supplement available in all seasons and capable of improving the growth performance, particularly weight gain and feed conversion ratio, of grasscutters (*Thryonomys swinderianus*) raised in close captivity. Thus, 24 two-month-old grasscutter were divided into two completely randomized groups of four individuals each, with three replicates. Each grasscutter represented one experimental unit. Two (2) types of pellet rations were made : the control ration (R1) containing 8% dry matter of *Moringa oleifera* leaves (Protein: 15.12%) and the experimental ration (R2) containing 8% dry matter of *Stylosanthes guianensis* leaves (protein: 14.28%), both served as a supplement to green grass forage (Penisetum and Panicum) to the groups for seven weeks. The results showed that the grasscutter fed with ration R2 had significantly higher weight gain, reaching an average weight of 1,200 ± 1.31g at the end of the trial, compared to 750 ± 0.25g for those fed with ration R1. In addition, the feed conversion ratio (FCR) was significantly lower for ration R2 (FCR = 4.86 ± 1.15) compared to ration R1 (FCR = 7.02 ± 0.71), indicating a better feed efficiency of the *Stylosanthes guianensis*-based ration. These results suggest that the diet of post-weaning grasscutter can be effectively improved by incorporating 8% dry matter of *Stylosanthes guianensis* leaves into a pelletized feed supplement, resulting in a better growth performance in close captivity.

Keywords: Grasscutter breeding, Zootechnical performance, Dietary supplement, *Moringa oleifera*, Pellet feed.

INTRODUCTION

Agriculture is the development pillar for poverty and hunger reducing in many world's countries, particularly those of the south (FAO, 2009). Today, it is the world's largest employer and the leading economic sector in many countries. In Benin, agriculture is the main activity of the population (FAO, 2009). The agricultural sector is of paramount importance for strengthening the Beninese economy (RPSA, 2015). Indeed, it contributes an average of 27% to the national Gross Domestic Product (GDP), represents approximately 76% of export earnings, and provides nearly 16.3% of state revenue, while ensuring food security for the population (DSA, 2024). It represents a real potential that must be wisely exploited to support national economic growth and thus contribute to effectively fighting poverty (RPSA, 2015). This sector has always been a priority for development for the various governments of Benin, as can be seen in the government's action program (PAG), which includes 32 projects, of which five are flagship projects and 27 are priority projects in the agricultural sector (PAG, 2016). The livestock, fisheries, and forestry sectors are an integral part of agriculture. The livestock sub-sector comprises two

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categories of livestock, including conventional species (poultry, rabbits, goats, cattle, etc.) and non-conventional species (snails, cricetomes, grasscutter, insects, etc.). Grasscutter (*Thryonomys swinderianus*, Temminck 1827) is a herbivorous rodent whose meat is highly prized by local populations (Aïzoun, 2017). It also has the undeniable advantage of having high economic value and a vast potential market (Mensah *et al*., 2003). The breeding of grasscutter is an important achievement in the breeding of unconventional animal species. The performance of this species is strongly linked to rigorous breeding practices, precise genetic selection, and improved nutrition (Jori *et al*., 2001). However, access to appropriate feed is one of the challenges faced by grasscutter farmers in Benin (Aizoun *et al.*, 2017). Indeed, the scarcity of forage in the dry season is a serious problem for farmers in providing adequate feed for their livestock. The present study aims not only to diversify the types of forage used for grasscutter, but also to incorporate them directly into the grasscutter diet in the form of pellets as a dietary supplement.

MATERIALS AND METHODS

Study framework

The animals were produced and raised in the experimental grasscutter facility at the Center for Agricultural Research in Animal and Fisheries Production (CRA-PAH) of the National Institute for Agricultural Research of Benin (INRAB). This farm is located at Agonkanmey site at the CRA-PAH's southern branch. Agonkanmey is 13 km northwest of Cotonou in the Atlantic department, where the climate is guinean with two dry seasons (mid-November to mid-March and mid-July to mid-September) and two rainy seasons (mid-March to mid-July and mid-September to mid-November). The average rainfall in the area is 1,200 mm/year, with 700 to 800 mm during the long rainy season and 400 to 500 mm during the short rainy season. The average monthly temperature varies between 27 and 31°C, with a difference of 3.2°C between the hottest month (March) and the coolest month (August). The average relative humidity is 80 to 90% (ASECNA, 2011).

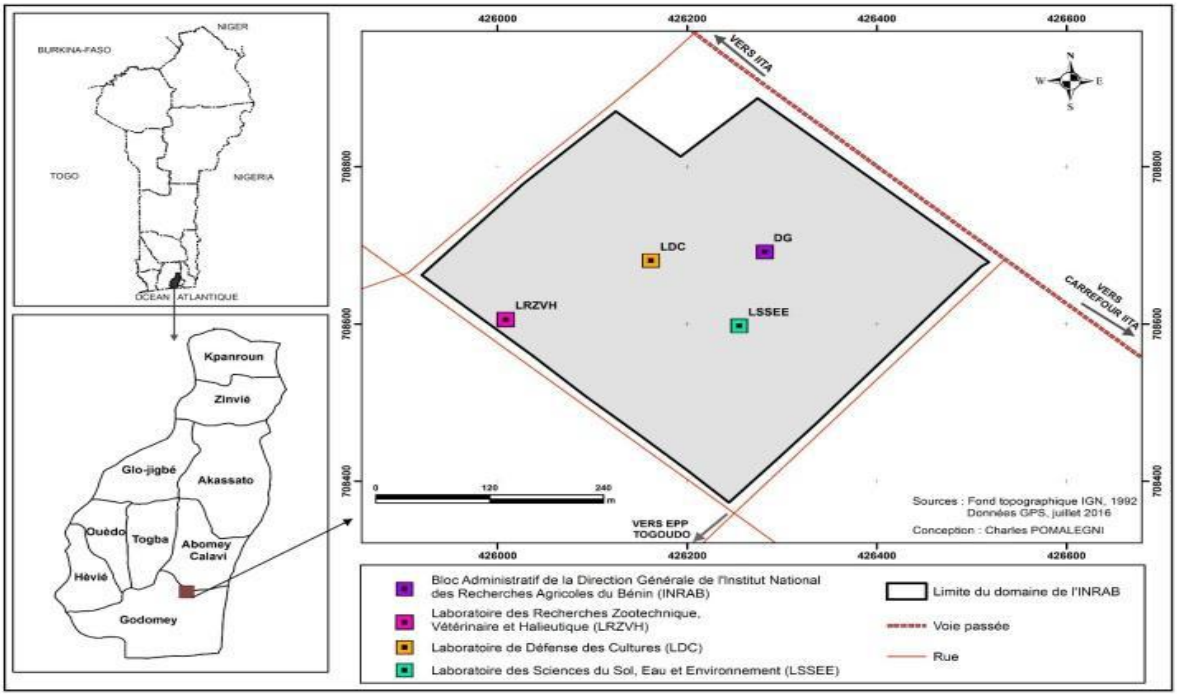

Figure 1. Geographic location of the experimental station. Source : Pomalégni (2017)

Animal material

For this study, we used two-month-old male and female weaned grasscutter (*Thryonomys swinderianus*, Temminck 1827), weighing an average of 645 g. A total of twenty-four (24) farmed grasscutters were used and divided into two groups of four grasscutters each with three replicates.

Plant material

The plant material consisted primarily of forage commonly used in livestock farming in the required proportions (Mensah and Ekué, 2003). However, two feed supplements have been produced from S. *guianensis* and *M. oleifera*. These two plants were first harvested from the CRA-PAH germplasm at INRAB, then dried in the shade and finally incorporated into the feed according to the selected feed formulas. The mixture obtained was granulated in order to limit feed waste and facilitate handling and consumption by the grasscutters.

Technical equipment

The technical equipment used consisted of : data collection sheets and a pen to record the weight of the animals, the quantity of feed given to the subjects, and the leftovers; an

electric scale with a capacity of 50 kg and an accuracy of 10 grams for weighing the grasscutters; an electric scale with a capacity of 10 kg and an accuracy of 0.1 grams for feed weighing; a medium-sized bag used to hold the grasscutters while weighing them, a digital camera for taking pictures; a computer for data entry and analysis, and then writing the report. livestock infrastructure and equipment (hay rack, feeder, water trough).

Methodology

Experimental setup

Two rations of feed, R1 and R2, were made for the experiment (Table 1). They consisted of the usual raw materials (corn, rice bran, wheat bran, oyster shell powder, salt) (Aïzoun *et al*., 2017). However, soybean meal was replaced by the forage legumes *M. oleifera* and *S. guianensis* in both rations. The proportion of the feed supplement in the grasscutter diet was 30% (Heuzé *et al*., 2015). The control group T1 was fed by ration R1, containing *M. oleifera*, which is the legume usually used, while the treatment group T2 was fed by ration R2, containing *S. guianensis*, which was incorporated at 8% dry matter in the rations. The animals were raised in groups of four (4), with three replicates, i.e., 24 grasscutter at a rate of 12 per treatment. Before the start of the experiment, a dietary transition phase was observed to prevent digestive problems related to the sudden change in the diet. Throughout the experimental period, feed rations were served twice a day: in the morning (between 8 :00 and 9 :00 a.m.) after removing any leftovers, and in the evening (between 4 :00 and 5 :00 p.m.) at a rate of 25 g/day/grasscutter. Water, on the other hand, was provided ad libitum and renewed daily. Individual live weights were determined at the start of the experiment and weekly until the end of the trial. Daily measurements of feed intake per batch were also taken. The experiment was conducted over a period of seven (07) weeks.

Table 1. Centesimal composition of experimental feed rations.

Ingredient (%)	R1	R2
Maize grains	65	65
Rice bran	8	8
Wheat bran	15	15
Crushed shells	3,5	3,5
Salt	0,5	0,5
Dried leaves of *Stylosanthes guianensis*	0	08
Dried leaves of *Moringa oleifera*	08	0
Total	100	100

Table 2. Chemical composition of experimental rations.

Composition (%)	T1 (*Moringa oléifera*)	T2 (*Stylosanthes guianensis*)
Total nitrogen	2,419	2,285
Crude protein	15,120	14,280
Total phosphorus pentoxide	0,901	0,907
Total calcium oxide	2,211	2,728
Total magnésium oxide	*0,294*	*0,301*

Table 3. Calculated parameters.

Parameters	Data collected	Calculation formula
Feed intake (FI)	Amount of feed served (fs) Leftover feed (Lf) Number of subjects (n)	FI = F*s*−Lf/ (n * Nd) (g/MS /subject/d) Nd = number of day
Average daily gained (ADG)	Initial weight of the week (IWw) Final weight of the week (FWw)	ADG = FWw − IWw / (n * N) (g) Nd= number of day
Feed Conversion Ratio (IC)	Amount of feed served (fs) Feed leftover (FL) Initial weight of the week (IWw) Final weight of the week (FWw)	IC = Fs−Lf / (FWw − IWw)

Data collected and parameters calculated

The data collected related to the quantities of feed served and leftovers on a daily basis per batch and per repetition. The animal's weight per repetition and per batch was recorded on a weekly basis. The calculated parameters are presented in Table 3.

Statistical analysis

The data were recorded in Excel 2019. They were subjected to the Student's t-test to compare the two treatments in our study using R4.4.0 softwares (R Core Team, 2024). All assumptions were verified. The results were expressed as mean ± SE and considered significant at $P < 0.05$. The intake and growth curves were obtained using GraphPad Prism 10.

RESULTS AND DISCUSSION

The feed intake of farmed grasscutters fed with different rations fluctuated over the weeks for both treatments (Figure 2). The animals fed with the *S. guianensis*-based dietary supplement (T2) had lower feed consumption than those fed with the *Moringa oleifera*-based dietary supplement (T1), with less marked variations over the weeks. From week 6 onwards, the consumption of animals fed with the *Stylosanthes guianensis*-based dietary supplement (T2) increased compared to that of the T1 group (Figure 2). The effect of the treatments (T2 to T1) on the average daily gain (ADG) of grasscutter over seven (7) weeks are compared in Table 4. No significant difference ($P > 0.05$) was observed at the start of the trial (W1 and W2).

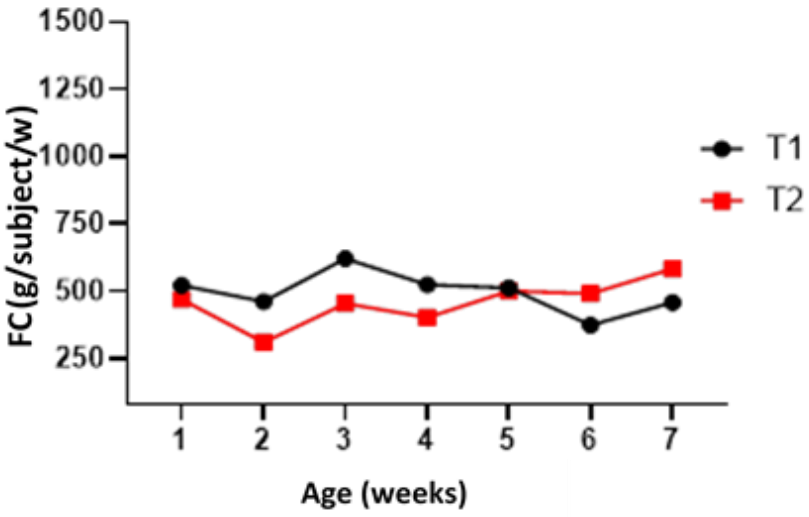

Figure 2. Feed intake of grasscutters, FC : Food Consumption.

Table 4. Effect of the Stylosanthes guianensis-based feed supplement on the average daily gain (ADG (g/day)) of grasscutters.

Parameters	Treatments		P
	T1	T2	
ADG W1	13.42±1.30	13.49±0.73	0.93
ADG W2	9.79±1.06	10.30±2.42	0.80
ADG W3	8.98±1.48	12.61±0.53	0.05
ADG W4	8.09±1.34^{b}	12.45±1.41^{a}	0.03
ADG W5	8.05±0.17^{b}	12.96±0.61^{a}	0.006
ADG W6	11.76±0.72^{b}	14.44±0.59^{a}	0.016
ADG W7	13.08±0.25^{b}	16.60±1.31^{a}	0.04

T1 : Control, T2 : *Stylosanthes guianensis*-based dietary supplement, ADG : Average daily gain, W : Week, P : Probability. Means of the same row followed by different letters are significantly different.

Table 5. Effect of the S. guianensis-based dietary supplement on the feed conversion ratio in grasscutter.

Paramètres	Traitements		P
	T1	T2	
FCR W1	7.32±3.56	4.99±0.61	0.11
FCR W2	6.83±1.22	4.34±1.01	0.07
FCR W3	7.08±1.81a	5.15±0.56b	0.04
FCR W4	6.51±1.54a	4.60±0.08b	0.04
FCR W5	7.09±1.30a	5.50±0.59b	0.04
FCR W6	7.02±0.71a	4.86±1.15b	0.006
FCR W7	5.13±0.56	5.03±0.23	0.68

T1 : Control, T2 : Stylosanthes guianensis-based dietary supplement, FCR : Feed Conversion Ratio, P : Probability. Means of the same row followed by different letters, are significantly different.

From W3 onwards, grasscutters fed with the *S. guianensis*-based dietary supplement (T2) showed a significant improvement in ADG ($P < 0.05$) compared those fed with the *M. oleifera*-based dietary supplement (T1). The effect of the S. guianensis-based feed supplement on the feed conversion ratio of grasscutters is presented in Table 5. From the third week to the sixth week, the animals fed with the Stylosanthes-based feed supplement (T2) had a significantly lower FCR than those of the feed supplement T1 ($P = 0.04$). The greatest difference was observed in the sixth week, when T2 had an FCR of 4.86 ± 1.15 compared to 7.02 ± 0.71 for T1 ($P = 0.006$). Grasscutters fed with the *S.guianensis*-based dietary supplement (T2) had lower feed consumption at the start of the experiment. This must be due to a lower palatability or a better feed utilization by the body if the feed is more digestible. At the end of the trial, these animals experienced an increase in consumption, which may indicate a gradual adaptation to the diet. These results are similar to those of Ghandi *et al*. (2022), who found that rabbits fed with *S. guianensis* had lower feed intake, which can be explained by the lower palatability of *S. guianensis* leaves or by a gradual adaptation to this diet. However, Sylvester-Bradley *et al*. (2019) showed that *S. guianensis*-based feeds are highly palatable and improve farm animals' » health and performance (horses, rabbits, calves, sheep) compared to those observed when using cereal-based feeds. Similarly, Miranda Pen *et al*. (2013) found that adding approximately 30% of *S. guianensis* to the diet of *Bos indicus* cattle significantly improved dry matter intake and nitrogen metabolism, indicating a better nutrient utilization. The *S. guianensis* feed supplement promotes better ADG from the third week onwards, suggesting that animals gradually adapt to this feed supplement. The improvement in ADG can be attributed to a better digestibility, a better nutrient assimilation, or an optimization of energy metabolism thanks to this plant's compounds. These results corroborate those of Kouadio *et al*. (2023), who found that incorporating up to 30% of *S. guianensis* into the diet of weaned rabbits improved their growth rate compared to the control diet. The lower feed conversion ratio for grasscutters fed with the *S. guianensis*-based feed supplement (T2) means that they convert feed into weight gain more efficiently. The improvement in FCR after the third week shows that the animals took time to adapt to the new feed, but once they did, their growth was more efficient. At the seventh week, the lack of difference between T1 and T2 may indicate the existence of a limitation of the dietary supplement effect depending on the grasscutters age, or that the animals' metabolism stabilized. These results contradict those of Kambashi *et al*. (2016), who claimed that feeding forage legumes such as *S. guianensis* does not affect the feed conversion ratio in pigs.

CONCLUSION

At the end of this study, it appears that the *Stylosanthes guianensis*-based feed ration induces growth and a better feed conversion ratio in grasscutter. These results suggest that, a part from *Moringa oleifera*, which is commonly used as legume fodder and a source of protein for farmed grasscutter, it is also possible to use *Stylosanthes guianensis,* as a dietary supplement for farmed grasscutter. The granular form of the supplement facilitates the incorporation of 8% dry matter into the fodder. This form of fodder utilization will allow to produce large quantities of supplements during periods of fodder abundance and store them for use during dry periods. This will reduce the cost of feed supplements and consequently lower the cost of farmed grasscutter feeding, thereby boosting grasscutters production in Benin.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

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AI TOOL DECLARATION

The authors declare that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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