

REPRODUCTION, GROWTH PERFORMANCE AND DOCILITY IN COMMON COAT AND ALBINO GRASSCUTTERS (*Thryonomys swinderianus*)

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The production efficiency of any livestock depends to a large extent on its reproductive performance. Research is needed to overcome the problems associated with reproduction and docility in domesticated grasscutter. The present study was conducted to compare the reproductive, growth and docility in common coat and albino grasscutters using the kindling records of 108 does (72 common coat and 39 albino does). Records collected include litter size at birth, litter size at weaning, weekly body weight and weight gain, and docility index. The common coat grasscutter does produced larger number of pups ($p < 0.001$) at birth and at weaning than albino grasscutters. However, albino does produced pups that were heavier ($p < 0.05$) in body weight and average daily weight gain from birth up to 72 days of age than common coat grasscutters. Prewaning mortality was lower in albino than common coat grasscutters. Docility index were 2.26 and 2.51 for albino and common coat grasscutters, respectively. The present study showed that albino grasscutter grows faster than common coat strain. There is the need to carry out selection work on albino grasscutter to further enhance increased body weight, livestock handling and grasscutter welfare.

Keywords: Animal welfare, Average weekly gain, Body weight, Litter records, Mortality

The grasscutter (*Thryonomys swinderianus*) also known as cane rat is the second biggest wild rodent after porcupine in Africa. It is a hystricomorphic rodent that inhabit Sub-Saharan Africa (Adenyo *et al.*, 2012). As

much as 40,000 tonnes of grasscutter meat is consumed per year in West Africa of which only 0.2% is produced by domesticated grasscutter (Mensah and Okeyo, 2006). The production efficiency of any livestock is to a large extent dependent on its reproductive performance (Chukwuka *et al.*, 2010). Research is needed to overcome the problems associated with reproduction in domesticated grasscutter (Soro, 2007). There is also the need improve its management to meet the periods of high demand (Lhoste *et al.* 1993). According to El-Hassan *et al.* (2009), the reproductive performance of animals is governed by genetic and non-genetic factors. Soro (2007) stated that reproductive performances vary depending on the rearing system and methods of mating employed. Livestock production often requires frequent movement and handling of animals. Docility or temperament has been defined as the animal's behavioural response to handling by humans (Fordyce *et al.*, 1988; Burrow 1997). Docility has become an important breeding objective not only on accounts of animal welfare and safety of the livestock handler, but more importantly on the productivity of livestock enterprise (Norris *et al.*, 2014). There is at present very little information on docility of the grasscutter (Anno *et al.*, 2011). A report by Anno *et al.* (2011) showed a direct heritability estimate of 0.58 for docility in grasscutters, which suggests that selection, would be more effective in producing animals with higher temperament. There is the need to improve docility in grasscutter because, even after several generations in captivity, the animals are still aggressive toward human handlings (Mensah and

Okeyo, 2006). Although field observation have shown differences in the reproductive, growth and docility performance of albino and common coat grasscutters there is no previous empirical report on the differences between the two strains. The aim of the present study is to compare reproduction, growth and docility in common coat and albino grasscutters.

MATERIALS AND METHODS

Location of study

The study was carried out at Sey-Toffo, Benin Republic. Toffo is a town in the Atlantique Department of Southern Benin. Toffo has a coordinate of Latitude 6° 50'60 North and Longitude 2° 4'60 East with an altitude of 70m above sea level. Toffo has a subequatorial climate with four seasons. Rainfall in the district is bimodal, occurring from March to mid-July (major rainy season) and from September to November (minor rainy season), with about 1100mm total rainfall per annum. It has two dry seasons that go from mid-July to August and from November to February (Akouehou *et al.*, 2014). The annual average of temperature varies between 25 and 29°C.

Management of animals

A total of 108 (72 common coat and 39 albino) does were used to evaluate reproductive performance of the two strains of grasscutter. The animals were housed in 2-tier brick cages. The cages were sectioned into hutches. Each hutch measures 50 cm in length, 40 cm in width and 40 cm in height. Entrance to the hutch was made of 6mm iron metal (Plate 1). Each of the experimental animals was identified by metal ear tags (Hauptner, Germany). They were fed basal diet of fresh Elephant grass (*Pennisetum purpureum*) and Guinea grass (*Panicum maximum*) and a supplementary concentrate that contained cassava butt (55.0%), Soy scrab (18.0%), palmist scrab (15.0%), cotton scrab (10.0%), Oyster shell (1.0%), common salt (0.4%), charcoal (0.1%), and vitamin-mineral-premix (0.5%). Fresh grass was fed at a rate of about 250g/head/day while concentrate was fed at 25g/head/day. About 40% of the grass fed per day was offered in the morning and 60% in the evening.

Concentrate was fed in the afternoon at 13:00 hours GMT. Fresh grass was harvested every day and spread on the floor to wilt before feeding it to the animals. Water was supplied in water troughs. Cleaning of feed and water troughs, cages and grasscutter house was carried out daily. All other procedures used in handling the animals were in line with approved ethical guidelines for grasscutter management.

Plate 1: Design of cages used in the housing of grasscutter



Data collection

The kindling records of 108 grasscutter does (39 albinos and 72 common) was used to compare reproductive performance of the two grasscutter strains. The reproduction records collected include Litter size at birth, mortality, and the litter size at weaning in different parity. A total of 117 new born pups (45 albinos and 72 common) kits were used to evaluate the body weight and average daily weight gain from birth to 72 days of age. Docility test was carried out on 50 kits (25 albinos and 25 common) which were selected at random at weaning (2 months). Docility was defined as the ability of an animal to accept human presence. Docility tests were carried out before feeding the animals in the morning by the same observer. The pups used for docility test were housed individually and were given two weeks to stabilize in their individual hutches. Docility test was carried out every week for one month. The capacity of the animal to accept human presence was scored on a scale of 1 to 4 as follows:
 Score 1: Docile - the animal is friendly and accepts being touched and caressed.
 Score 2: Flighty - the animal accepts being touched but moves away slowly.

Score 3: Restless - the animal does not allow physical human contact. It stays away, and moves around in the cage.

Score 4: Aggressive - the animal jumps when it sense human presence and attempts to escape.

Statistical analysis

The docility for each genotype is calculated as follows: $X_1Y_1 + X_2Y_2 + X_3Y_3 + X_4Y_4$

Where: X_1, X_2, X_3, X_4 represent the ratio of animals belonging to the docility groups 1, 2, 3, and 4, respectively. Y_1, Y_2, Y_3, Y_4 represent the scores for animals in docility group 1, 2, 3, and 4, respectively. Variance components were obtained and mean separation were done using the Generalized Linear Mixed Model (GLMM) procedure of Statistical Analytical System (SAS, 2008).

RESULTS

Results on mean litter size at birth, mean litter size at weaning and mortality in common coat and albino grasscutters are presented in Table 1. The litter sizes at birth and at weaning were higher ($p < 0.001$) in common coat grasscutters than albino grasscutters. However, common coat grasscutters were also higher ($p < 0.05$) in

total preweaning mortality than albino grasscutter.

The effect of parity on litter characteristics of common coat and albino grasscutters is presented in Fig.1. Common coat strain was consistently higher in litter size at birth and at weaning at parity 1, 2, 3 and 4.

Body weight (\pm SE) of common coat and albino grasscutter pups from birth to 72 days of age is presented in Table 2. Albino pups were heavier ($p < 0.001$) in body weight than common coat grasscutter from birth to 72 days of age. The average postweaning daily weight gain in albino grasscutter was between 10.40g and 12.22g, while the average postweaning daily weight gain in common coat grasscutter varied between 9.44g and 10.74g (Table 3). Albino grasscutters were higher ($p < 0.05$) in average postweaning daily weight gain than common coat grasscutters at all ages. The average docility index was 2.26 and 2.51 for albino and common coat grasscutters, respectively. The proportion of docile grower grasscutters was higher in albino (12%) than common coat strain (3%). There were higher ($p < 0.05$) proportion of restless and aggressive pups in common coat grasscutter (Table 4).

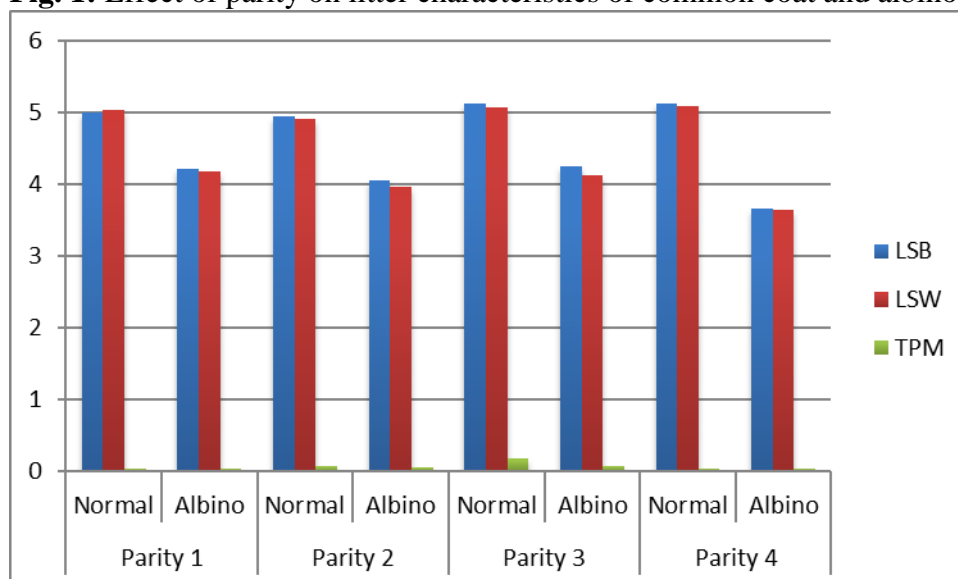
Table 1: Litter characteristics of common coat and albino grasscutters

Variable	Common coat	Albino	Significant levels
Litter size at birth	4.96 \pm 0.06 ^a	3.41 \pm 0.09 ^b	$p < 0.001$
Litter size at weaning	4.92 \pm 0.07 ^a	3.38 \pm 0.09 ^b	$p < 0.001$
Pre-weaning mortality	0.09 \pm 0.01	0.05 \pm 0.02	$p < 0.05$

Mean (\pm SE) with different superscripts are significantly different ($p < 0.05$)

Table 2: Body weight (\pm SE) of common coat and albino grasscutters

Age (days)	Common coat (n=72)	Albino (n=45)	Significant levels
	Body weight(\pm SE)	Body weight (\pm SE)	
1	125.89 \pm 0.69	142.13 \pm 0.08	$p < 0.001$
7	193.94 \pm 1.27	221.36 \pm 1.61	$p < 0.001$
14	266.11 \pm 1.73	302.18 \pm 2.19	$p < 0.001$
21	333.80 \pm 1.91	379.71 \pm 2.41	$p < 0.001$
28	407.36 \pm 2.36	645.31 \pm 2.98	$p < 0.001$
35	482.53 \pm 2.86	548.02 \pm 3.15	$p < 0.001$
42	548.64 \pm 3.10	623.36 \pm 3.90	$p < 0.001$
49	621.22 \pm 3.42	699.67 \pm 4.32	$p < 0.001$
56	689.83 \pm 3.73	780.04 \pm 4.72	$p < 0.001$
63	752.19 \pm 3.69	852.63 \pm 4.67	$p < 0.001$
72	830.58 \pm 3.60	934.33 \pm 4.60	$p < 0.001$

Fig. 1: Effect of parity on litter characteristics of common coat and albino grasscutters

LSM, LSW, TPM represent Litter Size at Birth, Litter Size at Weaning, Total Pre-weaning Mortality, respectively.

Table 3: Average daily weight gain (\pm SE) of common coat and albino grasscutters

Age (Weeks)	Common coat (n=72)	Albino (n=45)	Significant levels
	Average daily weight gain (\pm SE)	Average daily weight gain (\pm SE)	
1	9.72 \pm 0.17 ^b	11.32 \pm 0.22 ^a	p<0.001
2	10.31 \pm 0.19 ^b	11.55 \pm 0.40 ^a	p<0.001
3	10.53 \pm 0.14 ^b	11.08 \pm 0.19 ^a	p<0.05
4	9.65 \pm 0.19 ^b	12.22 \pm 0.24 ^a	p<0.001
5	10.74 \pm 0.22 ^b	11.82 \pm 0.28 ^a	p<0.01
6	9.44 \pm 0.21 ^b	10.76 \pm 0.27 ^a	p<0.001
7	10.37 \pm 0.13 ^b	10.90 \pm 0.16 ^a	p<0.01
8	9.82 \pm 0.13 ^b	11.48 \pm 0.17 ^a	p<0.001
9	9.89 \pm 0.16 ^b	10.40 \pm 0.20 ^a	p<0.05
10	10.20 \pm 0.19 ^b	11.64 \pm 0.24 ^a	p<0.001

Table 4: Docility in common coat (n=25) and albino (n=25) grasscutters

Variable	Common coat		Albino		Significant levels
	%	CR	%	CR	
Docile	3.00	0.01	12.00	0.02	p<0.001
Flighty	46.00	0.04	50.00	0.04	p<0.05
Restless	48.00	0.04	38.00	0.04	p<0.05
Aggressive	3.00	0.01	0.00	0.00	p<0.001
Average docility	2.51		2.26		

DISCUSSION

The litter size at birth and birth weight of common coat and albino pups in this study were between the range of 2.67 and 5.00 reported by Henry (2011) for grasscutters raised in Southern Nigeria. The birth weight of 123.63g to 140.75g reported by Henry

(2011) was close to the values obtained in this study. Schrage and Yewadan (1995) reported pup birth weight of 120 to 150g. A wider range of pup birth weight (i.e. 81 to 157g) was reported by Addo (2002). The body weights of albino pups at birth and at 42 days (6 weeks) and the litter size at

weaning of common coat grasscutter were higher than the values reported by Henry (2011). The lower pups' birth weight obtained for common coat pups may be the result of negative correlation between litter size and mean kit weight at birth. Similar results have been reported by Ado (2002) and Henry (2011). Ikpeze *et al.* (2004) reported that litter size at birth has significant effect on birth weight and 60 days body weights of pups. However, Yewadan (2000) obtained poor phenotypic and genetic correlation between litter size and body weight in 4 to 8 months old grasscutters. Previous studies showed that nutritional differences, reproductive management and embryonic resorption may result in variation in litter size (Robinson 1990, Owusu *et al.*, 2010, Hagan *et al.*, 2012). Average daily weight gain for both common coat and albino pups were higher than the mean daily weight gain of 5.70-6.58g reported by Ikpeze *et al.* (2004) for grasscutters managed almost entirely on cocktails of forages. Such difference is expected for grasscutter exposed to different nutritional managements.

The pre-weaning mortality in the present study for parity 1 does was lower than the range of 6.25 and 16.66 percent reported by Henry (2011). Mensah (2000) reported a mortality rate of 5-25% for young rabbit. The very low pre-weaning mortality in this study therefore suggests good mothering ability of does and the adaptation of pups to the rearing condition.

The average docility index obtained for common coat grasscutter is close to the median of 2.5 (on a scale of 1 to 4), which represents animals that are in-between flighty and restless. The docility index obtained for common coat grasscutters was close to the average docility scores of 2.54 and 2.80 obtained by Udeh and Isiorho (2016) for light and heavy strains of grasscutters. The docility index obtained for albino grasscutter was below the range of 2.5 and 3.0 reported by Annor *et al.* (2011) in their evaluation of genetic and non-genetic factors influencing the docility of grasscutters. The present study suggests that albino grasscutter are more docile as its

average docility index (2.26) fell below the median of 2.5. An earlier report by Anno *et al.* (2011) showed a fairly high (0.58) direct heritability estimate for docility in grasscutters. Mensah and Okeyo (2006) suggests the need to include docility as one of the breeding objectives in future grasscutter improvement programmes.

CONCLUSION

The present study showed that albino grasscutter grows faster and had higher 72-day body weight than common coat rabbit. The results further suggest that albino grasscutter are more docile as its average docility index was lower compared with that of common coat strain. There is the need to carry out selection work on albino grasscutter to further enhance increased body weight, livestock handling and grasscutter welfare.

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