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Reproductive Performance of Grasscutter Does at First Parity and Growth Performance of their F1 Generation

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ABSTRACT

This study was conducted to assess the reproductive performance of does and growth performance of their F₁ generation weaned at different ages of 2, 4 and 6 weeks for each of the three mating groups, respectively. Twenty-four mature grasscutters were used comprising of six bucks and eighteen does. A total of sixty-nine pups were obtained from seventeen litters within the experimental period of one year and assessed for growth performance within first six weeks of life. Data collected revealed that 50% of the does showed an open vaginal status at first pairing while the remaining 50% were either closed or plugged. Results obtained showed that a higher percentage (50%) of does conceived at second exposure while a lower percentage (16.66%) conceived at first exposure. It was further observed that age at weaning did not significantly ($p > 0.05$) affect growth performance of pups at the end of six weeks. Therefore, pups can be weaned as early as two weeks of age without any adverse effect at early stage of life.

Key words: Grasscutters, pups, vaginal status, conception, male-female exposure

INTRODUCTION

The cane rat (grasscutter) which is a wild hystricomorphic rodent hunted aggressively for its meat (Fonweban and Njwe, 1990; NRC, 1991; Ntiamo-Baidu, 1998) is desirable for domestication. Grasscutter is known for its excellent taste, higher nutritional value (Asibey and Addo, 2000; Omole *et al.*, 2005; Opara, 2010b) and meat yield (Olomu *et al.*, 2003) when compared to other species of livestock. It is capable of contributing to bridge the gap of animal protein shortages in developing countries (Falconer, 1992). As the second largest wild rodent after porcupine in Africa, grasscutter is used to produce about 40,000 tonnes of meat per year for consumption in West Africa of which only 0.2% is produced by domesticated grasscutter (Mensah and Okeyo, 2005).

Unfortunately, the collection of this animal in the wild is followed by the destruction of the environment through the setting of bush fires by hunters (NRC, 1991; Yeboah and Adamu, 1995). This of course destroys valuable plants, animal life and tampers with the ecosystem (Taiwo *et al.*, 2009). Moreso, continued dependence on hunted wild production for the grasscutter meat does not lend itself to quality control of the meat nor does it enhance planned production, availability and use as and when required for any reasonable purpose (Opara, 2010a). Similarly, many individual populations of grasscutters in the wild are well below carrying capacity or near extinction because of exploitation.

Consequently, there is need to encourage domestication of grasscutter by making breeding and fattening stock readily available for intending producers or farmers. This can be achieved because

like rabbits, grasscutters are reflex ovulators and could therefore ovulate as a result of an orgasm induced by contact with other females (Fayenuwo *et al.*, 2003). Hemmer 1992 also points out that this animal is able to reproduce all year round. According to Addo (1997), these animals show variations in reproductive activity even though identified as induced ovulators. The availability of grasscutter populations will require vast understanding of its reproductive performance. Chukwuka *et al.* (2010) reported that livestock production efficiency is to a large extent dependent on reproductive performance. El-Hassan *et al.* (2009) noted that reproductive performance of animals is governed by genetic and non-genetic factors; the non genetic factors play a greater role. Aduku and Olukosi (1990) identified oestrus cycle, mating, pregnancy, parturition, gestation length, litter size, birth weights and weaning weights as measures of reproductive performance in breeding animals. Furthermore, Redford *et al.* (1995) reported that reproductive outputs can be measured according to animal maturity, length of inter-birth interval and age of last reproduction.

Notwithstanding, animals bred in captivity display a bewildering range of responses and problems are encountered. Therefore, being a relatively new initiative of interest it becomes important to provide valuable information to intending breeders for the sustainability of their stock. The objective of this study was to provide information about grasscutter breeders.

MATERIALS AND METHODS

This study was conducted between May, 2008 and April, 2009 at a grasscutter research unit under the supervision of the Department of Animal Science, University of Calabar, Calabar. Calabar is the capital of Cross River State, Nigeria and is located at latitude 4°57'N and Longitude 8°19'E.

Research animals: Twenty-four adult grasscutters comprising of eighteen females and six males were used for the study. The grasscutters were 6 to 7 months old with average body weight of 1.20 to 2.48 kg. The males presented a darkened perineum while the females manifested the vaginal membrane phenomenon (closure and rupture); signs of sexual maturity for this animal specie (Addo, 1997). These animals had never been used for breeding purposes before the commencement of the research.

Management of research animals: The grasscutters were maintained in individual concrete cells within a properly ventilated concrete building. Dimension of each cell was 50×45×30 cm (length, width and height, respectively) with an entrance of 25 cm (length) and 20 cm (height). Temperature range over the experimental period was 21.2 to 28.4°C. Experimental animals were allowed two weeks of acclimatization, within which they were given anti stress and dewormed before breeding commenced (both were administered orally). The cell of each animal was clearly labeled for proper identification of each animal. Animals were raised under a mixed feeding regime made up of concentrate formulated to contain 24% crude protein and 2500 kcal kg⁻¹ metabolizable energy (Lameed and Ogundijo, 2006) and supplemented with *Pennisetum purpureum* (elephant grass). Grass was cut fresh, chopped to a dimension of 25-30 cm, sun dried for 24 h before being served to the animals. Feed and water were provided *ad libitum* and routine sanitation carried out throughout the experimental period.

Breeding experiment: The animals were randomly allotted to three mating groups identified as A, B and C. Each comprising of six does and three bucks. This was done to enable the ease in

monitoring the pups produced from matings. Does were hand mated to one of the six bucks in a ratio of 1 buck: 3 does. Vaginal status of each doe was observed at first exposure and continued subsequently. Body weight of each doe was carefully taken before being taken to the male's quarters. These weights were taken to aid in monitoring weight changes after females are withdrawn from the males to ascertain pregnancy. Other pregnancy associated perineal changes were also monitored as described by Addo (1997). Each doe was left with a male for a period of 3 days for mating. However, this duration was extended to one week when most of the does were observed as not pregnant. Pups obtained from matings were monitored up to 6 weeks of age.

Data collection and analysis: Data collected on does were vaginal status at pairing, number of male-female exposures before conception, non pregnant does, rate of receptivity, litter size at birth, overall sex ratio, gestation length (days), litter size at 6 weeks and mortality. Data collected on does were analyzed using simple descriptive statistics.

Growth characteristics of the pups

Experimental animals: Sixty-nine pups obtained from the does at first parity were used and monitored from birth to six weeks of age. The pups were weaned at different ages of 2, 4 and 6 weeks of age for pups from mating groups A, B and C, respectively.

Recorded data and experimental design: Litter size at birth and at the end of six weeks, individual birth weight, body weight and weight gains. The design of the experiment was the Completely Randomized Design (CRD). The model for the analysis of variance was:

$$Y_{ij} = \mu + R_i + e_{ij}$$

Where:

Y_{ij} = Individual observation on the i th treatment

μ = Overall mean of all observations

R_i = Fixed effect of weaning age ($i = 1, 3$)

e_{ij} = Random error, identically and independently normally distributed, with zero mean and constant variance [iind $(0, \sigma^2)$]

RESULTS AND DISCUSSION

Reproductive performance of does is presented in Table 1. Observation from data taken showed that 50% (9) of does had their vagina open at first parity while 27.78% (5) were closed and 4 (22.22%) were plugged. This result obtained for reproductive performance of does at first parity compares favourably with the reports of Addo *et al.* (2007) where they reported values of 13, 10 and 8 for number of does exhibiting open, closed and sealed vaginal status when 31 does were exposed to males.

Data collected in this study equally revealed that 3 does conceived at first exposure within 24 h while more female grasscutters (8/17) accepted males on the fourth day (96 h). Moreover, 50% (9/18) of the does conceived after second exposure. Out of the seventeen does that conceived, only one kindled on the 147th day while 8 kindled between 155 and 159 days and 8 within 160 to 166 days. The largest litter size of 7 pups was recorded for one doe while majority of the females

Table 1: Reproductive performance of does at first parity

Criteria	No.	Percentage
Vaginal status at first pairing		
Open	9	50.00
Closed	5	27.78
Plugged	4	22.22
No. of male-female exposures before conception		
1	3	16.66
2	9	50.00
3	4	22.22
4	1	5.56
Non pregnant	1	5.56
Rate of receptivity (h)		
24	3	17.65
48	-	-
72	6	35.29
96	8	47.06
20-168	-	-
Gestation length (days)		
147-154	1	5.88
155-159	8	47.06
160-166	8	47.06
Litter size at birth		
1-3	9	52.94
4-6	7	41.18
7-10	1	5.88
Overall sex ratio of off spring (M:F)		
Males	29	42.03
Females	40	57.97
Still birth	-	-

(9/17) recorded litter sizes of between 1 and 3 pups. Statistics revealed that the population of the pups obtained consisted of more females (40/69) than males (29/69) and with a mortality of 8 Pups (3 females and 5 males). The cause of death was predominantly as a result of the individual birth weight of pups which were lower than 60 g.

Growth performance of grasscutter pups at first parity

Litter size at birth: Litter sizes at birth across the three groups were between 2.67 to 5.00 (Table 2). This range compared favourably with ranges of 2 to 6 (Addo *et al.*, 2007), 3 to 5 (Lameed and Ogundijo, 2006) and 3.8 to 5.7. Mills and Hes (1997) reported litter size of 4 pups and Ogunjobi (2008) reported litter sizes of 4 and 5 for grasscutters raised in iron cage and block cement pens, respectively. The values reported in this study agree with other research findings.

Birth weights and weight gains: The average individual birth weights obtained in this study agrees with the values of 120 to 150 g reported by Schrage and Yewadan (1995), as well as the range of 81 to 157 g recorded by Addo (2002). The lower birth weight reported by this author was observed for litter size of five pups. Similar result was also obtained in this study as the least birth weight was recorded for the larger litter size of 5.00. This may however, be attributed to individual

Table 2: Growth performance of grasscutter pups at first parity for a period of 6 weeks (n = 69)

Weaning ages parameter	2 weeks	4 weeks	6 weeks	±SEM	Significance
Av. Litter size at birth	3.83	5.00	2.67	0.56	NS
Av. Individual birth weight (g)	140.75	123.63	140.65	1.63	NS
Av. Litter weight at birth (g)	472.54	538.69	505.35	3.00	NS
Final body weight at 6 weeks	554.32	469.47	602.65	4.28	NS
Av. Weekly weight gain (g)	68.93	69.60	76.65	1.08	NS
Av. Total weight gain (g)	413.57	345.84	462.00	3.99	NS
Av. Litter size at 6 weeks	3.50	4.17	3.00	0.48	NS
Mortality (%)	8.69	16.66	6.25	1.20	NS

±SEM: Standard error of means, NS: Not significant, n: No. of progeny

pup weight as had earlier been stated that litter weight decreased with increase in litter size due to decrease in individual body weight (Odubote and Akinokun, 1991). Average litter birth weight ranged from 472.54 to 538.69 g across the treatments with litter size of 5.00 recording the highest value. Average body weight values of pups at 6 weeks across the treatment groups in this study are higher than the weight range of 378.24 to 503.13 g reported by other researchers for pups the same age. It was further observed that pups weaned at 2 weeks recorded higher ($p>0.05$) body weight at six weeks than those weaned at 4 weeks and its value was competitive with the value for pups weaned at 6 weeks of age. Total weight gain values ranged between 345.84 and 462.00 g with pups weaned at 6 weeks recording the higher value while least value was recorded by those weaned at 4 weeks.

Mortality: Mortality ranged from 6.25 to 16.66% for the period (0 to 6 weeks). It was observed that pups weaned at 6 weeks recorded the least value of 6.25%. This could be attributed to the nursing length of the pups. It will be interesting to note that the pups weaned at 2 weeks recorded a low mortality value of 8.69% when compared to those weaned at 4 weeks of age. This may be as a result of the precocious nature of grasscutters and the fact that ingestion of slight solid feed led to earlier development of digestive tract (Gallois *et al.*, 2003, 2004).

These conditions may have assisted the earlier weaned pups adjust to total dependence on solid feed without any adverse effect. The mortality records in this study were not alarming and were lower when compared to values of 18.8 and 31% reported by Jori and Chardonnet (2001) for pre-weaning mortality. Both authors further stated that mortality was particularly high during the period before weaning and this agreed with the findings of this research. In rabbits, Ferguson *et al.* (1997) and Gidenne and Fortun-Lamothe (2001, 2004) reported higher mortality in early-weaned rabbits but same did hold true for grasscutters. The non-significant ($p>0.05$) effect of weaning age on mortality of grasscutters is comparable to the results reported for rabbits (Trocino *et al.*, 2001; Xiccato *et al.*, 2003).

CONCLUSION

The precocious nature, good reproductive potential and ability to utilize forages and grasses by grasscutters makes this animal a good option that can contribute positively to meat production. From data obtained in this study breeders/farmers could be encouraged into embracing the raising the raising of this micro livestock with minimal losses recorded. In addition to meat provision, revenue can also be generated from sale of live animals.

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