Reproductive performance of rabbits fed groundnut (*Arachis hypogea*) haulms

Abe O.S. and J.A. Abiona

Dept. Animal Breeding and Genetics University of Agriculture, P.M.B. 2240, Abeokuta Nigeria.

Abstract

The 20 parent rabbits used in this study were randomly assigned to 4 treatments (diets 2-5) plus a control diet (Diet1) while the 20 F1 does were maintained on the parental diet. The number of matings per conception were higher in the parent does than the F1 does. Generally the F1 does performed better than the parent does in most of the parameters considered. The lowest value of 50.0 and 50.0 obtained in F1 does were higher than the lowest value of 33.33 and 25.0 obtained in parent does for conception rate (%) and reproductive efficiency (%) respectively. Although, one case of abortion and two cases of stillbirth were recorded in parent does, none was observed in F1 does. The litter size of F1 does which ranged between 4.0-5.5 was lower than the parent does which ranged between 4.0-6.5. It could however be inferred that the overall superior performance of the F1 does may not be unconnected with the inclusion of groundnut haulms in their diet from the start after weaning.

Keywords: Phenotypic variation, Groundnut haulms, reproductive performance, F1 does

Introduction

In Nigeria, the expensive nature of animal products like meat, milk and egg is as a result of the high cost of conventional feedstuff. Since feed cost is estimated to represent over 70% of the total cost of producing livestock intensively (Oluyemi and Robert, 1984), most small animal producers (rabbit and poultry farmers) are folding up due to the cost of feeding the animals.

Animal protein production can be increased substantially in Nigeria if the potentials of some fast growing small animals like rabbit, under intensive system of rearing can be exploited at a minimum cost. Rearing at a minimum cost requires alternatives for most of the expensive conventional feedstuffs and this has called for the integration of some non-conventional feedstuffs that have little or no value in human feeding. Rabbit has higher rate of gain in terms of small body size, short generation interval, rapid growth rate, genetic diversity and high

reproductive potentials, thus making them suitable as meat producing small livestock in developing countries (Arijenwa, 2000). Rabbit eats different kinds of green plants most of which are considered as wastes product of harvested crops (Bello, 2003).

Groundnut haulms, a farm residue, is an example of unconventional green feed that can serve as an alternative for fibrous component in rabbit feed. Some studies have been carried out on the replacement or supplementation of cereals grains in rabbit pellet as alternative protein/energy source (Eshiett *et al.*, 1984). However, little is known about the potential of groundnut haulms with respect to the resultant reproductive performance of rabbit after consuming such feed. The objective of this study was to investigate the influence of groundnut haulms as a partial substitute for corn bran in rabbit feed vis-à-vis variations in observable reproductive traits of parent and offspring.

Materials and methods

Collection and processing of Groundnut haulms

The experimental materials (groundnut haulms) is the residue left after harvesting the groundnut seeds. It comprises the leaf, branches and stem. The groundnut haulms were collected, air dried on concrete floor. The root was removed at the end of drying period, after which the haulms were milled and bagged.

Experimental Animals and Housing

The twenty (20) parent rabbits used for this study were procured from farms in Oyo State, Nigeria and weighed an average of 626.75 -79.69g. The animals were grouped into five, with four animals per group and assigned to the experimental diets. Two different male rabbits (Buck) were used to mate the parent rabbits in the course of experiment. After weaning (6 weeks), four (4) FI weaner rabbits were randomly selected per group to be used for FI reproductive performance. The four (4) weaner rabbits were maintained on the experimental diet fed to their parent. The animals were housed individually.

Experimental Diets

The experimental diet was formulated with different levels of groundnut haulms as substitute for corn bran. The test ingredient (groundnut haulms) was incorporated into the diets at levels 0% (diet1), 5% (diet 2), 10% (diet), 15% (diet 4) and 20% (diet 5) of the total quantity (Table 1). The 0% substitution level was used as the control diet. The different diets were pelleted before offering it to the animals. The proximate analysis of all the experimental diets (Table 2) was done according to the standard of AOAC (1980).

Experimental Procedures and Processes

Acclimatization of the parent rabbits was done in the cage for a period of 6 days on the

experimental diets. The animals were offered the experimental feed and water twice daily at 8h and 16h for a period of 60 days and 5days post partum while the FI does were maintained on the experimental diet till post partum. The average reproductive performance of the does per group were investigated vis a vis traits like average number of mating per conception , conception rate , reproductive efficiency, litter size, sex ratio mortality . The crossing for both the parent and FI does was carried out in such a way that the sires were interchanged for the parental and FI crossing to avoid inbreeding i.e. a buck used for parent does in group 1 (PD1) was not used to mate the resultant offspring (F1D1) Table 3.

Experimental Design and Statistics Analysis

The experimental design was complete randomized design (CRD), the data obtained were subjected to one-way analysis of variance and Duncan Multiple Range Test (DMRT) as described by Steel and Torrie (1980) was used for mean comparison where differences existed.

$$\text{Conception rate} = \frac{\text{no. of pregnancy}}{\text{Ave. no. of mating/ conception}} \times 100$$

$$\text{Reproductive efficiency} = \frac{1}{\text{No. of service / conception}} \times 100$$

$$\text{Non - conception} = 100 - \text{conception rate (\%)}$$

Results and Discussion

In Table 4, more matings per conception were recorded for the parent does than for the FI does (Table 5). Parent does had between 1 and 3 mating times with 20% groundnut haulms based diet producing the highest number of times while 0% and 20% inclusion levels produced the highest

Table 1. Composition of experimental diets

Ingredient	Diet 1 (0%)	Diet 2 (5%)	Diet 3 (10%)	Diet 4 (15%)	Diet 5 (20%)
Corn bran	45	40	35	30	25
Groundnut	0	5	10	15	20
Dry brewer's grain	25	25	25	25	25
Fish meal	3	3	3	3	3
Wheat offals	1	1	1	1	1
Groundnut cake	16	16	16	16	16
Bone meal	3	3	3	3	3
Salt	1	1	1	1	1
Oil	4	4	4	4	4
Premix*	2	2	2	2	2

*Premix/kg diet: vitamin A (8000.000iu), Vit. D₃, Vit E(3.0g), Vit. K (3.1), Vit B₂ (2.59A), Calcium -D-pantothenate (3.0g), Vit. B₆ (0.3g), Vit. B₁₂ (8.0mg), Nicotinic acid (8.0mg, Calcium-D-pantothen, Mn (10.0g), Fe (5.0g), Zn (4.5g), Cu (0.2g), I (0.15g), Co (0.02g), Se (0.01g).

Table 2. Proximate composition of experimental diets (%DM)

Constituents	Diet 1	Diet 2	Diet3	Diet 4	Diet 5
Dry matter	95.00	95.00	96.00	95.00	95.05
Crude protein	20.67	20.67	21.25	21.34	21.56
Crude Fiber	8.40	9.45	10.42	10.64	11.34
Ether extract	9.45	10.50	9.38	9.58	10.31
Crude ash	13.65	15.75	12.50	14.90	12.37
Nitrogen free extract	47.83	43.63	46.45	43.54	44.42

Table 3. Crossing procedure

Diet	Parental crossing	F1 crossing
1	PD1 x B1	F1D1 x B2
2	PD2 x B1	F1D2 x B2
3	PD3 x B1	F1D3 x B2
4	PD4 x B2	F1D4 x B1
5	PD4 x B2	F1D5 x B1

PD = Parent does; B= buck; F1 does

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Table 4. Reproductive performance of parent does fed groundnut haulms

Parameter	Diets				
	1	2	3	4	5
Average no. of matings/conception	1	2	2	1	3
Conception rate (%)	100.0 ^a	50.0 ^b	50.0 ^b	100.0 ^a	33.33 ^c
Reproductive efficiency (%)	100.0 ^b	50.0 ^{ab}	50.0 ^c	100.0 ^a	33.33 ^c
Abortion (%)	-	50.0	-	-	50.0
Gestation length (days)	33.0	31.5	30.0	30.5	31.0
Non-conception (%)	-	50.0	50.0	-	66.67
Litter size	4.0 ^b	6.5 ^a	6.5 ^a	4.0 ^b	5.5 ^a
Male: Female ratio	1:4	4:3	2:5	2:2	0:5
Kindling period (day: night)	0:4	0:4	4:0	0:4	0:4
Still birth	-	1 ^a	2 ^a	-	-

^{a,b,c} Means with a common letter in the same row are not statistically different (P>0.05)

number of times (2) in F1 does. This indicates that groundnut haulms inclusion in rabbit diets improves their ovarian function as the F1 does started on this feed immediately after weaning. The subsequent conception rate (%) and reproductive efficiency (%) followed the pattern of number times mating occurred before conception. The F1 does had 100% in both their conception rate and reproductive efficiency except for the control diet (0%) and reproductive efficiency of diet 5. This showed that number of matings per conception is negatively correlated with conception rate and productive efficiency. High conception rate (100%) was observed for F1 does while conception rates as low as 33.3% was observed for parent does in diet 5 (20%). This follows the conclusion that an increase in

conception rate indicates a decrease in non-conception rate. Ajayi *et al.* (2005) in their study reported high conception rates of between 50% and 100% for rabbit fed maize milling waste based diet. Also Sanchez *et al.* (1985) and Raharjo *et al.* (1986) reported high conception rates of 67 to 100% for New Zealand White breed of rabbit. In Table 4, cases of non-conception were observed in parent does except those fed with control diet and 15% (diet 4) inclusion level that no record of non-conception. However, two of those cases of non-conception recorded abortion in 5% (diet 2) and 20% (diet 5) inclusion level of groundnut haulms in the feed (Table 4). Still birth noticed in diets 2 and 3 for parent does was absent in F1 does.

Table 5. Reproductive performance of F1 does fed groundnut haulms

Parameter	Diets				
	1	2	3	4	5
Average no. of matings/conception	2	1	1	1	2
Conception rate (%)	50.0 ^b	100.0 ^a	100.0 ^a	100.0 ^a	100.0 ^a
Reproductive efficiency (%)	50.0 ^b	100.0 ^a	100.0 ^a	100.0 ^a	50.0 ^b
Abortion (%)	-	-	-	-	-
Gestation length (days)	32.5	32.5	30.0	31.0	33.0
Non-conception (%)	50.0 ^a	-	-	-	-
Litter size	4.5 ^{ab}	5.5 ^a	5.0 ^a	4.0 ^b	4.0 ^b
Male: Female ratio	1.5	3.3	2.3	2.2	2.2
Kindling period (day: night)	1:4	0:4	1:4	0:4	0:4
Still birth	-	-	-	-	-

^{a,b,c} Means with a common letter in the same row are not statistically different ($P>0.05$)

The gestation length of parent does was not significantly ($P>0.05$) different from each other except the control diet that had 33.0 days. In general the average gestation length was 30.8 days. For the F1 does, diet 5 had longer gestation period of 33.0 followed by control group (diet1) and diet 2 with 32.5 days (Table 3). On the average the F1 does had a higher average gestation length of 31.4 days when compared with the average of the parent does. This was in agreement with the findings of Ajayi *et al.* (2005), they reported an average gestation length of 31.4 days with 16.89% of crude protein consumption while Omole (1982) reported a higher gestation period of 33.7 days for diet containing 10% crude protein.

Cases of stillbirth were only observed in parent does fed diet 2 and diet 3. Diet 2 was also observed to present a case of abortion. The

stillbirth and abortion may not be unconnected with diet consumption as there was no observable occurrence of abortion or stillbirth in F1 does. Thus, it could be deduced that starting a rabbit with such a diet composition containing groundnut haulms helps to prevent abortion and stillbirth.

The litter size obtained in parent does (Table 2) showed no significant ($P>0.05$) difference in diets 2, 3 and 5. Diets 2 and 3 had the highest litter size (6.5) while diets 1 and 5 had the lowest litter size (4.0). In Table 3, the highest litter size of 5.5 obtained in F1 does was lower compared to the highest value in parent does. Like in parent does, diets 2 and 3 supported the highest litter size of 5.5 and 5.0 respectively in F1 does. Although care was taken during mating combination to prevent inbreeding, parent does still have better

litter size than the F1 does. From Tables 2 and 3, it was observed that more females were born per litter by both parent does and F1 does while all kindling was observed to have occurred in the night. The reason for this could not be ascertain in this study.

References

- AOAC; 1980. Official method of anaysis. 14th Edn. Association of Analytical chemist. Arlington, Virginia U.S.A.
- Arijeñiwa, A., Otaikhian, S.O., Imaseum, J.A. 2000. Performance of weaner rabbit fed poultry grower mash supplemented with different grass legume rations. *Proceedings of 5th Ann. Con. Anim. Sci. Ass. Nig.* 103-105
- Ajayi, F.O., Balogun, O.O., Ovuru, S.S, Mgbere, O.O. 2005. Reproductive performance of rabbit fed Maize milling waste based diets. *African J. Biotech.* 4 (5): 439-443.
- Bello, K.M. 2003. Chemical composition of some plants used as feed for rabbit in Bauchi metropolis. *Nig. J. Anim. Prod.* 30: 32-36.
- Eshiett, N.O., Ademosun, A.A., Omole, T.A. 1980. The effect of feeding cassava root meal on the reproductive performance of rabbit. *J. Nutr.* 110: 697-702.
- Oluyemi, J.A. and Robert, F.A. 1984. Poultry production in warm wet climate. 1st Edn. MacMillan pub. Press. Pp 134-135.
- Omole, T.A. 1982. The effect of level of dietary protein on growth and reproductive performance in rabbits. *J. Appl. Rabbits Res.* 5: 83-88.
- Raharjo, T.C., Checke, P.R., Patton, N.M., Supriyati, K. 1986. Evaluation of tropical forages and by-product feeds for rabbit production. 1. Nutrient digestibility and effect of heat treatment. *J. Appl. Rabbit Res.* 9 (5): 6-11.
- Steel, G., Torrie, J.H. 1980. Principles and procedures of statistics 2nd ed. McGraw Hill Book Co. NY. USA.

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